KATALIN SULYOK

SCIENTIFIC ENGAGEMENT OF INTERNATIONAL COURTS AND TRIBUNALS IN ENVIRONMENTAL DISPUTES

SCIENCE AND THE LEGITIMACY OF ADJUDICATORY REASONING

PhD dissertation

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Budapest
2018
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<tr>
<td>AB</td>
<td>WTO Appellate Body</td>
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<tr>
<td>ACHR</td>
<td>American Convention on Human Rights</td>
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<tr>
<td>ACtHPR</td>
<td>African Court of Human and Peoples’ Rights</td>
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<tr>
<td>ARSIWA</td>
<td>Articles on Responsibility of States for Internationally Wrongful Acts</td>
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<tr>
<td>BIT</td>
<td>Bilateral Investment Treaty</td>
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<tr>
<td>CJEU</td>
<td>Court of Justice of the European Union</td>
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<tr>
<td>CFI</td>
<td>Court of First Instance</td>
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<td>DSU</td>
<td>Dispute Resolution Understanding</td>
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<td>EC</td>
<td>European Communities</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>ELD</td>
<td>Environmental Liability Directive</td>
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<td>EU</td>
<td>European Union</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>ECHR</td>
<td>European Convention on Human Rights</td>
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<tr>
<td>ECtHR</td>
<td>European Court of Human Rights</td>
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<td>EEZ</td>
<td>Exclusive Economic Zone</td>
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<td>“F4” Panel</td>
<td>Panel of the UNCC administering environmental damage claims</td>
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<tr>
<td>GATT</td>
<td>General Agreement on Tariffs and Trade</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
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<tr>
<td>IACtHR</td>
<td>Inter-American Court of Human Rights</td>
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<td>ICC</td>
<td>International Chamber of Commerce</td>
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<td>ICRW</td>
<td>International Convention on the Regulation of Whaling</td>
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<td>ICSID</td>
<td>International Center for Settlement of Investment Disputes</td>
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<tr>
<td>ILC</td>
<td>International Law Commission</td>
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<tr>
<td>ICJ</td>
<td>International Court of Justice</td>
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<td>ISDS</td>
<td>Investor-State Dispute Settlement</td>
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<td>ITLOS</td>
<td>International Tribunal for the Law of the Sea</td>
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<td>MEA</td>
<td>Multilateral Environmental Agreements</td>
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<td>MS</td>
<td>Member State of the EU</td>
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<td>NAFTA</td>
<td>North American Free Trade Agreement</td>
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<td>Abbreviation</td>
<td>Full Name</td>
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<tr>
<td>PCIJ</td>
<td>Permanent Court of International Justice</td>
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<td>PCA</td>
<td>Permanent Court of Arbitration</td>
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<tr>
<td>SPS Agreement</td>
<td>Agreement on Sanitary and Phytosanitary Measures</td>
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<td>STS</td>
<td>Science and Technology Studies</td>
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<td>Agreement on Technical Barriers to Trade</td>
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<td>TEU</td>
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<td>UN SC</td>
<td>United Nations Security Council</td>
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<td>United Nations Compensation Commission</td>
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<td>UN Convention on the Law of the Sea</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>US</td>
<td>United States of America</td>
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<tr>
<td>VCLT</td>
<td>Vienna Convention on the Law of Treaties</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WTO</td>
<td>World Trade Organization</td>
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Chapter 1

Introduction to a comparative study on judicial engagement with science in international environmental adjudication

“Progress must and can be made in the social sciences to come abreast of the new advances in the physical sciences.”

Philip C. Jessup

“Is the relationship between science, technology and the law an essential alliance or a reluctant embrace, a collaboration or an unhappy marriage? Is it a “culture clash” that can be bridged only by individuals or institutions with multicultural expertise?”

Sheila Jasanoff

I. Science and law in modern international environmental adjudication

The phenomenon that modern life is becoming more and more permeated with science and technology warrants no specific illustration. Though lesser known is perhaps the fundamental impact that science and technology exert on every form of human organization. Adjudication, as a social practice ordained by judges to serve the needs of society, is no exception. Science may enter the course of adjudication in a myriad of ways. Sometimes scientific facts are embedded in the primary rule upon which the controversy rests, such as in the case of disputes revolving around environmental harm and causality. In other cases, scientific results become relevant to the interpretation of concepts in which law and science are closely interwoven. Notions of ‘genuine environmental risks’ become crucial to appraise the legality of a risk assessment measures under EU law, and the exercise of host States’ regulatory

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powers in investment arbitration. In turn, WTO law contains express “scientific legality criteria”.

Accordingly, “cases concerned with highly complex scientific and technological facts” are gradually becoming the norm in environmental adjudication. Still, both in scholarship and in the practice of legal adjudication, law and science are often regarded as “distinct cultures”. International law is no exception. Despite the multiple ways in which science underlies and impacts international law, they have been for the most part treated as “virtual strangers”. This is all the more remarkable given that science nowadays has a “central place” in substantive rules governing international environmental law and one hardly finds a multilateral environmental agreement not incorporating scientific or technical standards.

Moreover, we witness an increasing number of judicial fora hearing and deciding disputes with environmental relevance. In such cases, judges increasingly confront scientific facts, directly and indirectly, through weighing the parties’ positions regarding techno-scientific matters. Notably, international adjudicatory fora differ in their approaches to science-backed claims. While some hesitate to decide cases based on highly technical, scientific evidence on the grounds of their lack of expertise, others go to great lengths to evaluate scientific inputs.

Science inevitably underlies disputes concerning natural resource allocation, environmental liability, risk assessment requirements, violations of human rights guarantees serving to ensure a safe and clean environment, and States’ right to regulate environmental risks to the detriment of foreign investments or international

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11 Peel, ‘Changing Conceptions of Environmental Risk’, p. 78.
This would intuitively warrant a significant role for scientific arguments in the resolution of respective disputes. Yet a closer look at the landscape of international environmental adjudication reveals that scientific input is often marginalized or addressed only minimally by judges.

The role of science in environmental adjudication requires special attention considering its strategic importance in the judicial process. Science enters adjudication as a source of objective, extra-legal cognitive authority, to which the parties appeal supporting their arguments. Its strategic value distinguishes scientific arguments from various other types of factual, policy and legal arguments raised by the parties in litigation. While scientific references may lend considerable persuasive force to the parties’ argument, science normally falls within the blind spot of international adjudicators. Judge Cancado Trindade summarized the ambivalent role science plays in adjudication: “conflicting evidence seems to make the paradise of lawyers and practitioners at national and international levels. It seems to make, likewise, the purgatory of judges and fact-finders, at national and international levels.” Yet science could also be an important ally of international adjudicators, which if treated properly, can lend persuasive force to their judgments. The legitimacy of adjudicatory decisions will be perceived as a product of proper argumentation, and therefore, this survey will focus on different types of adjudicatory reasoning, with which adjudicators can justify their choices in science-intensive cases.

Present day society seems to have an ambivalent relationship with science too. The beginning of the 21st century has seen a rise in anti-vaccination movements, proponents of Intelligent Design, considerable public support for climate change deniers, and post-truth politics. Yet the same decades have experienced breakthrough in 3D printing, gene therapy, smart technology, and artificial intelligence. These opposing trends shape the extent to which science can order the life of modern societies and impact the functioning of social institutions. As Susan Haack puts it, “[a]ttitudes to science range all the way from uncritical admiration at one extreme, through distrust, resentment, and envy, to denigration and outright hostility at the other.” Almost similar trends can be distilled from international jurisprudence.

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Responses given to science’s intrusion into adjudication range from affording automatic deference to expert evaluations, through attempts to reveal ‘the’ single scientific truth among competing scientific positions, to various avoidance strategies that view science-intensive aspects non-justiciable or circumvent their consideration in more subtle ways.

Against this background, the judicial treatment of science is well worth its own inquiry, dedicated specifically to revealing the weight and impact of scientific arguments on adjudication. Yet surprisingly little scholarly work has been dedicated to the various forms of adjudicatory treatment of scientific disputes. Earlier scholarly works have dealt mainly with the use of expert evidence,16 or scientific fact-finding more generally,17 or addressed the scientific engagement of specific judicial fora.18 Thus far only a couple of articles have sought to survey relevant judicial methods across multiple jurisdictions.19 This dissertation strives to provide a comprehensive taxonomy of international environmental adjudication using judicial techniques for scientific engagement as a benchmark. Understanding the limits of judicial engagement with science and portraying the different argumentative tools through which persuasive and legitimate legal decisions may be brought in science-intensive cases constitute the main objectives of this research.

The lack of scholarly efforts to systematically interrogate the many ways in which science impacts adjudication stands in stark contrast with the environmental policy-making, where the role of science has long been acknowledged and analyzed. Canonized notions such as ‘science based policy-making’,20 or ‘regulatory science’21 confirm this. Tellingly, there is no similar expression in the context of adjudication, which signals the marginalized role of science in resolving environmental disputes or,

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at best, a lack of awareness about the specific difficulties it entails in the adjudicatory context.

Science as a common underlying thread poses similar challenges in the judicial inquiry, though often triggers divergent solutions across different jurisdictions. This variety of international adjudicatory reactions will be put in the focus of this inquiry.

II. Methodology of assessing judicial engagement with science

The present research examines the differing extent and ways in which international adjudicators engage with scientific facts and arguments in settling international environmental disputes, which are defined here as disputes including considerable environmental component. 22 Throughout the dissertation, scientific engagement of international courts and tribunals will refer to a host of practices, with which adjudicators assess, interact, and occasionally investigate the scientific dimension of legal disputes.

To make this concept less abstract and more amenable to a fine-grained comparative analysis, judicial engagement with science will be measured at four distinctive aspects of the adjudicatory process. This research will identify and comparatively assess the judicial techniques serving for engaging with science specifically at the following stages of adjudication:

(i) Framing legally relevant issues to decide in a dispute – that is the ways in which adjudicators carve out science-intensive aspects of disputes from their inquiry;

(ii) Scientific fact-finding – that is the extent to which courts request and rely on expert evidence in reaching their decisions, and the ways in which judges garner expert opinions. Different methods of taking expert evidence will also be discussed;

(iii) Causal inquiry – that is whether courts are willing to conduct a thorough causal inquiry with appropriate causal tests or they rather circumvent or substitute causal analysis in reaching their decision; and whether courts are

willing to consider uncertain, probabilistic scientific proof of causation and establish a causal link thereon;

(iv) **Extent and standard of judicial review** – that is the willingness and techniques of courts to assess the credibility and validity of scientific arguments put forward by expert opinions. The standard of review chosen by adjudicators describes the degree of deference they accord to legislators in making scientific evaluation. Margin of discretion and margin of appreciation are also used to describe related phenomena.

As to its methodology, this dissertation conducts a comparative case-law analysis, with a strong focus on analyzing the judicial reasoning employed in environmental cases by the eight relevant international adjudicative fora that will be addressed below.

As to its theoretical foundations, the dissertation heavily draws on interdisciplinary insights. First and foremost, on natural science literature, which extensively deals with the problem of scientific uncertainty – a central concept of this research. Second, insights of the philosophy of sciences, especially Science and Technology Studies (“STS”) will be cited to inform legal debates surrounding the appropriate boundaries of judicial purview in international environmental dispute resolutions.

STS studies analyze epistemic complexities surrounding the use of scientific knowledge in social context such as the process of adjudication. STS scholarship focuses on the interrelations of legitimacy, public authority, and accountability of both science and law. These insights can, thus, bring important benefits in better understanding the difficulties of reconciling society’s two major “*authoritative institutions*” in legal adjudication. Sheila Jasanoff, an eminent scholar of the field, argues that STS enriches legal analysis by informing our understanding as to “*how to exercise power with reason, how to make good decisions in the face of epistemic as well as normative uncertainty, and how to strike an accountable balance between the sometimes conflicting pressures of knowledge and norms.*”

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Against this backdrop, insights from STS will influence the legal analysis as to the limits of judicial purview, and to the extent of deference that is justifiably accorded by adjudicators to expert evaluations in selecting the standard of review. Also, understanding the social preconditions of scientific research influencing the daily practice of scientific knowledge production could help devise legal procedures that alleviate or, at best, do not exacerbate the epistemic difficulties of using science in an adjudicatory setting.

III. International environmental adjudication – the subject matter and scope of the research

This research zeroes in on environmental adjudication and examines the ways in which scientific arguments are handled by international adjudicative bodies. The presence of scientific evidence and arguments is of course not confined to environmental disputes, but occurs in various other fields, such as intellectual property law, food safety law, international economic law, or those using forensic evidence. The narrower scope of this inquiry is necessary on the one hand with regard to the rapidly expanding scope of international adjudication and the proliferation of adjudicative bodies. On the other hand, environmental disputes arguably form a distinct category of international cases due to the peculiar normative principles and the distinctive competing interests that underlie environmental disputes. All these reasons justify examining scientific engagement with respect to decisions that are as homogenous as possible as to the relevant factual and normative background.

Various definitions have been proposed earlier for the term ‘international environmental disputes’ with differing scope. This research builds on a rather broad definition, which encompasses all international “disputes with environmental

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26 Stephens proposes to define the concept as “any legal or factual disagreement between states which involves one or more questions of environmental protection or natural resource use or management.” Tim Stephens, “International Environmental Dispute Settlement,” in The Rio Declaration on Environment and Development: A Commentary, ed. Jorge E. Vinuales (Oxford: Oxford University Press, 2015), 604–5; Cesare offers the following definition: "A conflict of views or of interests between two or more states, taking the form of specific opposing claims and relating to an anthropogenic alteration of an ecosystem, having detrimental effect on human society and leading to environmental scarcity of natural resources.” Cesare P. R. Romano, The Peaceful Settlement of International Environmental Disputes A Pragmatic Approach (London: Kluwer Law International, 2000), 29.

components”. In this vein, the scope of this research is not confined to those proceedings that entertained claims regarding strict sense international environmental law obligations. Rather, they encompass also the cases, which concern questions of environmental protection or environmental management, where principles of environmental law are invoked by a party, which concerns assessment of environmental or related health risks, as well as where a party’s conduct or the exercise of alleged rights may adversely impact the natural environment. Importantly, ‘environmental disputes’ in such a broad sense cannot be equated with cases entertaining ‘purely’ environmental claims, since environmental questions never appear in isolation from other substantive questions of law in a dispute.

As to the scope of the present research, it is important to distinguish legal adjudication from various non-legal dispute settlement mechanisms. Decisions resulting from diplomatic means of dispute settlement, and various non-compliance procedures will not be analyzed. Adjudication in the context of the present dissertation stands for the legal proceedings of international courts and tribunals aiming to decide environmental disputes through a binding decision. Therefore, non-binding recommendations of non-judicial organs, such as the World Bank Inspection panel or the World Heritage Convention, are excluded from the scope of this research.

International environmental disputes, as understood above, are brought before a growing “patchwork of jurisdictions”, i.e. a wide array of international adjudicatory bodies that confront environmental and thus, science-based claims in various contexts. As environmental considerations have markedly permeated into other branches of international law, such as regimes of trade law, investment

28 Pierre-Marie Dupuy and Jorge E. Vinuales point out that instead of ‘environmental disputes’ the more exact definition would be “disputes with environmental components”. Dupuy and Vinuales, International Environmental Law, p. 247.
protection, and human rights law, specialized judicial fora of these fields have been used as “borrowed fora”\textsuperscript{33} for bringing environmental claims.

As a result, for a comprehensive analysis on the judicial techniques of scientific engagement in environmental disputes, several fora shall be included in the analysis. The analysis extends to the case-law of the International Court of Justice, the Court of Justice of the European Union, the European Court of Human Rights, the Inter-American Court of Human Rights, the African Court of Human and Peoples Right, the ECOWAS Court and the International Tribunal for the Law of the Sea, as well as the case-practice of inter-State and investment arbitration tribunals together with decisions of the World Trade Organization’s dispute settlement mechanism. This proliferation of judicial fora seems to further undermine efforts of gathering momentum\textsuperscript{34} for the establishment of a specialized international environmental court, that has been developed by earlier scholarly proposals, but was ultimately abandoned largely due to the lack of sufficient support by States.\textsuperscript{35}

Importantly, I will not examine decisions that were handed down by domestic courts on the basis of international environmental conventions, such as the judgments arising from the application of Convention on Supplementary Compensation for Nuclear Damage\textsuperscript{36} and the International Oil Pollution Compensation Fund.\textsuperscript{37} Also, as a general rule the practice of compensation funds and international claims commissions and tribunals will only be referred to where their procedural or methodological innovations may serve as adjudicatory best practices, such as the practice of the UN Compensation Commission, the Eritrea-Ethiopia Claims Tribunal, and the Marshall Islands Claims Tribunal. Lastly, as this research focuses on judicial reasoning, those international environmental disputes will not be subject to further

\textsuperscript{36} The Convention provides jurisdiction for domestic courts, for more details see: G. Kecskés, \textit{A környezeti károkért való felelősség a nemzetközi jogban (Doktori értekezés)}, 2012 ed. (SZIE Doktori Iskola) pp. 169–72.
study that were settled out of court with an ex gratia payment, such as the arbitration following the incident of the Cosmos 958\textsuperscript{38} or the Gut Dam case.\textsuperscript{39}

IV. The structure of the dissertation

*Chapter 1* sets out the research questions, the scope and the methodology of the dissertation. *Chapter 2* proceeds in four main parts. In the first part, it will set out the analytic framework of this comparative study. As a point of departure of this research, this chapter identifies four stages of the adjudicatory process with respect to which it will analyze the ways in which scientific input and scientific arguments change the dynamics of legal adjudication. These stages of adjudication are: (i) the framing of dispute, (ii) scientific fact-finding, (iii) causal inquiry, and (iv) standard of reviewing scientific claims. This is followed by an overview on the epistemic and theoretical background of the challenges of scientific engagement in international adjudication. A separate discussion is dedicated the structural differences between law and science, which hinder adjudicatory engagement with science and engender problems for properly using science in adjudication. The chapter discusses the theoretical basis of how legal adjudicators may craft legitimate decisions in science-based cases. In this respect, the chapter comments on the significance of epistemic non-arbitrariness.

*Chapters 3-9* will detail how science becomes relevant in the practice of each relevant court and tribunal discussed and how international judges engage with scientific arguments raised in environmental disputes. The environmental case-law of the International Court of Justice (*Chapter 3*), along with awards rendered by tribunals in inter-state environmental arbitration (*Chapter 4*) will be analyzed. This is followed by an analysis of the practice of regional human rights courts (*Chapter 5*), and that of the Court of Justice of the European Union (*Chapter 6*). Separate chapters entertain the decisions brought by the WTO dispute settlement mechanism in science-intensive cases (*Chapter 7*), the awards rendered in investor-State dispute settlement


proceedings (Chapter 8), and the decisions of the International Tribunal for the Law of the Sea (Chapter 9).

Chapter 10 conducts a comparative assessment to assess the extent to which adjudicators allow science to penetrate the adjudicatory process. Specific argumentative techniques will be identified with which adjudicators may justify their decisions and can craft a legitimate adjudicatory reasoning. Chapter 11 sets forth a systematic analysis on the benefits and trade-offs of each argumentative technique with respect to the possibility to provide a persuasive reasoning. Even though the comparative assessment is dedicated to a specific and narrowly defined aspect of international adjudication, i.e. methods of scientific engagement, this analysis seeks to avoid the proverbial trap of conveying only a specialist’s narrative, which is famous for knowing “more and more about less and less.” For this reason, the dissertation will address broader implications of adjudicatory engagement with science, most notably as to how to craft persuasive judicial reasoning in complex science-based matters. It will conclude by arguing that more in-depth judicial engagement with science is warranted to allow for crafting persuasive and, thus, legitimate judicial reasoning.

40 The adage (“A specialist is a man who knows more and more about less and less.”) is generally attributed to William J. Mayo, quoted in Reader’s Digest, November 1927 as cited by J. Pauwelyn, ‘The WTO 20 Years On: “Global Governance by Judiciary” or, Rather, Member-driven Settlement of (Some) Trade Disputes between (Some) WTO Members?’ (2017) 27 EJIL 1119–26 at 1122.
Chapter 2
Using science in a legal setting: challenges of scientific engagement of judges in international environmental adjudication

“The Court is unable to accept the position that in order to decide this case, it must first make a determination upon a disagreement between scientists of distinction as to the more plausibly correct interpretation of apparently incomplete scientific data.” ICJ, 1985

“The conclusions of scientific experts might be indispensable in distilling the essence of what legal concepts such as “significance” of damage, “sufficiency”, “reasonable threshold” or “necessity” come to mean in a given case.” Judges Al-Khasawneh and Simma, 2010

I. Introduction: international courts and science

Before delving into a detailed assessment on the various techniques of the eight relevant international adjudicative fora with which they seek to evaluate and incorporate scientific arguments in the judicial inquiry, a brief overview is due on the theoretical and doctrinal challenges underlying the scientific engagement of judges. This chapter will then introduce the analytic framework of the dissertation and will map the relevant scholarly commentary to which it intends to contribute.

II. Theoretical foundations of the difficulties of using science in adjudication

The peculiar challenges of the interaction between law and science has long been a subject of studies in the field of the sociology of knowledge and the philosophy of science, therefore it appears appropriate to briefly discuss them before turning to the legal analysis. The theoretical background of using science in a legal setting may bring useful insights as to the reasons for the many difficulties and even

42 Pulp Mills case, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma.
deficiencies of science-intensive adjudication. First, accounts from STS will be reviewed to uncover the epistemic challenges inherent in science-intensive adjudication. It will be followed by theoretical insights on the delicate task of allocating competence between judges and experts in the adjudicatory process.

1. Clash of cognitive authorities: epistemic challenges

Science and law have both emerged as two disciplines that are capable of lending cognitive (epistemic) authority to knowledge claims.\textsuperscript{43} They therefore are both means of inquiry seeking to understand different aspects of the same reality. STS accounts reveal that science produces knowledge claims just as do other social practices. This is particularly salient when science enters the process of legal dispute resolution. When science enters adversarial proceedings, a struggle follows suit over the power to draw the boundary between science and non-science. The party who can successfully appeal to ‘science’ in its argument, it would also be able to harness the cultural authority attached to science.\textsuperscript{44}

It flows form the above that when these two major branches of human inquiry become entangled with each other in the context of adjudication, numerous complexities arise. Such problems belong to the realm of epistemology,\textsuperscript{45} also known as the theory of knowledge, which studies the ways and means of human understanding and inquiry; and is particularly concerned with identifying the conditions of knowledge and justified beliefs. Epistemic complexities underlie, impact, and sometimes even warrant certain legal techniques for engaging with scientific input in adjudication. Therefore, any detailed examination of the latter requires a brief overview of the epistemic difficulties inherent in using science in a legal setting.

First, ‘truth’ claimed by science can sometimes be in conflict with that of law. Suffice it to refer to mainstream ‘scientific’\textsuperscript{46} and ‘legal’\textsuperscript{47} discourse on climate

change, which run in a diametrically opposite direction in certain socio-political cultures. Second, adjudicators of one realm may lack requisite knowledge and training (i.e. epistemic competence) to adjudge the validity of knowledge claims of the other. This generates considerable tensions in science-intensive adjudication, where experts produce (scientifically authoritative) scientific inputs, which need to be translated into legitimate (thus, legally authoritative) judgments by scientifically non-trained adjudicators.

Third, epistemic dilemmas also arise with respect to setting the appropriate extent of deference with which adjudicators assess the parties’ highly technical and scientific claims. These will impact adjudicators’ choice on the standard of review. Such issues typically arise in the context of judicial review of scientific risk assessments. The divergent standards of review that are applied in international environmental adjudication will be further elaborated on in Section V.3.1.

Fourth, in light of the above it comes as no surprise that using scientific arguments in a legal dispute has considerable strategic value. The coming chapters will explore the ways in which science plays a strategic role in each of the adjudicative forum examined in the dissertation. Suffice it to note at the outset that parties employ science-based arguments to harness the persuasive force of science in a variety of contexts, and judges may also rely on its epistemic authority to include or exclude certain aspects of the case from the judicial purview.

The strategic use of science on part of adjudicators can be seen in selecting the legally relevant aspects that are deemed decisive in rendering a final decision. This judicial exercise will be dubbed framing of legal disputes. Framing of disputes in this sense will be addressed later in Section V.1 in more detail. On a more abstract level, the judicial selectivity leads to competing conceptions of the scope of judicial purview. The method of demarcating science impacts delineating ‘scientific’ questions that are reserved for experts from legal ones that can only be assessed by adjudicators. This brings us to a discussion on the extent of judicial review and the scope of the adjudicatory task. A general overview on these issues is provided under Section V.3.2.

In sum, STS scholarship reminds us that science is a social institution engaging in empirical inquiry, just like other social practices such as history or investigative journalism, as they all make “informed conjectures about the possible explanation of the phenomena that concern them.” Accounts from the sociology of knowledge warn us that “the core standards of good evidence and well-conducted inquiry are not internal to the sciences.” It follows that using the term ‘scientific’ in the context of a piece of evidence as a synonym for being ‘reliable’ would be a sign of misconceived respect for natural sciences. Against this backdrop STS scholarship reminds that the question whether a certain scientific input can be deemed ‘reliable’ or ‘legitimate’ in an adjudicatory context, is in fact a more complex exercise than a convenient appeal to scientific authority.

Insights from the philosophy of sciences also reveal the social conditions of scientific research. STS emphasizes the mundane, ‘non-scientific’ influences, which scientists are exposed to, ranging from political pressure, through expert bias, to power relations embedded in peer-review processes and extreme scandals of forging appealing results. Any impartial inquiry into the interrelations of science and law cannot deny that science, as all other forms of human enterprise, is fallible and occasionally may even be corrupt. STS provides ample critical analysis pointing to examples where science and technology function as a tool of power politics and domination or serve political agendas and industrial vested interests. STS scholars warn that such ‘ politicized’ use of science is inherent in the scientific exercise by deploying its cognitive authority. The famous words of Bruno Latour – “give me a laboratory, and I will raise the world” – refer to a host of social practices with which scientists can successfully claim monopoly over the creation of ‘scientific’ and therefore ‘true’ facts, while being insulated from critiques of the lay public in their laboratory, which functions not only as a physical workplace but also as a cultural place, where ‘ authoritative’ knowledge claims are produced by methods not intelligible for the lay public. This may seed distrust in scientifically laymen judges towards scientific claims. While this may provide a rationale for marginalizing

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49 Haack, Defending Science within Reason - Between Scientism and Cynicism, p. 97.
50 Haack, Defending Science within Reason - Between Scientism and Cynicism, p. 23.
science, it will be argued that such distrust does not justify the downplaying of science in adjudication either from a theoretical or a practical point of view.

There are further myths that need to be dissolved if one would like to better understand what science can and cannot deliver to adjudication. Critical STS studies point out that science can in no way be seen as the realm of ‘pure’ knowledge production. They also uncover the culturally embedded nature of objectivity, which feature is often attributed solely to natural sciences distinguishing them from other social practices of inquiry. Through the lens of STS, objectivity is rather seen as socially constructed and context-dependent attribute of science. Yet again, acknowledging this does not equal to denying existing differences between objective knowledge claims and subjective beliefs. It only entails that the real question is who can set the standards of ‘science’ and based on what considerations. Similarly, accounts from the philosophy of science do not render superfluous the legitimate efforts to identify and single out spurious claims of pseudo-sciences. STS only intends to dissolve widely held false beliefs that picture scientists making ‘pure’, ‘objective’, and therefore ‘true’ scientific knowledge in their isolated ivory tower in the atmosphere of disinterestedness. Challenging this pedestal on which natural science has often been put may encourage a more activist judicial involvement with the underlying scientific facts. However, such involvement is only desirable to the extent, which does not lead to replacing scientific knowledge with common sense rationality or epistemically arbitrary choices.

Emphatically, revealing the sociology of scientific knowledge production does not in any way justify carving out scientific aspects of disputes from the judicial inquiry. Neither it legitimates neglecting expert advice. Despite all its imperfections and pitfalls of scientific knowledge production, science undoubtedly is one of the most (if not the most) successful human endeavors aiming to understand the world. It


has produced a vast amount of empirically ‘true’ results, which proved to be fundamentally beneficial to humanity. Hence, marginalizing science in adjudication would not only be inappropriate from an empirical point of view, but would also seriously undermine the persuasive force of respective judicial decisions. Amid rapid development of science and in times when technology becomes embedded in everyday life to an unprecedented extent, appropriate methods of handling scientific input seems to be an inevitable necessity in order to render persuasive judgments.

For all these reasons, insights from the philosophy of science are informative for this study in as much they reveal why harnessing the cognitive authority of science is so essential not only for litigants but also for adjudicators in crafting judicial reasoning. Also, STS accounts explain the motivations behind frequent efforts challenging scientific integrity in a litigious context. Lastly, they help us better understand the causes of the apparent difficulties of science-intensive adjudication and, therefore, may guide us to offer solutions for better incorporating science in the adjudicatory process.

2. Theoretical dangers of judicial reliance on experts

As it may be clear by now from the foregoing discussion, science as an extra-legal cognitive authority may challenge the discretionary monopoly of judges over resolving the dispute. This leads to debates about the appropriate division of competence between adjudicators and scientific experts. The main concern in this respect relates to the possibility of inadvertent delegation of adjudicatory power to unelected experts, which is examined here in greater detail.

Ever since the Enlightenment, the so-called rationalist tradition of adjudication proclaimed that the function of a court of law is to apply law to the facts.\textsuperscript{54} Indeed, the established view on international adjudication provides that adjudicators ought not to decide scientific controversies. However, complying with such a mandate can become particularly difficult in environmental disputes that are based on rules, which themselves routinely incorporate scientific notions.\textsuperscript{55} Interpreting such concepts would in turn frequently drag scientific arguments into legal discourse. A distinctive feature of international environmental litigation is therefore the “closeness of law and

\textsuperscript{54} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 5.
fact”,  
which entails further challenges for judges faced with complex scientific evidence. Legally relevant facts have always mixed fact and law to some extent, and international courts have long been accustomed to that. The unprecedented challenge of science-intensive disputes lies in the need of judges to gather external epistemic support in making such factual determinations.

The apparent simplicity of drawing a clear distinction between establishing facts and applying law proves to be deceptive. Numerous theoretical and practical difficulties arise in allocating powers to experts (to reveal facts) and to judges (to apply rules to those facts) in a court proceeding. These are aptly reflected in an impressive body of scholarship on the theory of using expert evidence, to which now I shall turn to.

One particular danger of relying on expert evidence in science-heavy claims is that experts would inevitably get entangled in the interpretation of legal terms, given that the scientific facts of the case are inextricably linked to the content of legal definitions. As Judges Al-Khasawneh and Simma have put it clearly in their joint dissenting opinion in the Pulp Mills case: “[c]ertainly, experts will be drawn into questions of legal interpretations through their involvement in the application of legal terms”. This generates frustration among judges with rising fears of losing their decision-making competence by delegating too much of the judicial function to experts, which is perceived by some as an “erosion of judicial authority”.

Judge Yusuf in his Declaration attached to the Pulp Mills judgment aptly summarized this prime challenge of legal adjudicators:

“. . .the question arises as to whether there is a risk that the recourse to an expert opinion may take away the role of the judge as the arbiter of fact and therefore undermine the Court’s judicial function. My answer is in the negative. First, it is not for the expert to weigh the probative value of the facts, but to elucidate them and to clarify the scientific validity of the methods used to establish certain facts or to collect data. Secondly, the elucidation of facts by the experts is always subject to the assessment of such expertise and the determination of the facts underlying it by the Court. Thirdly, the Court need not entrust the

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56 Foster, Science and the Precautionary Principle in International Courts and Tribunals, p. 77.
57 H. Lauterpacht, The Development of International Law by the International Court (Stevens & Sons Limited, 1958) p. 35.
58 Foster, Science and the Precautionary Principle in International Courts and Tribunals, p. 77.
59 Pulp Mills case, Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, para. 17.
60 D. Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’ (2014) 84 British Yearbook of International Law 271–303 at 289.
61 Payne, ‘Mastering the evidence’, 1195.
clarification of all the facts submitted to it to experts in a wholesale manner. Rather, it should, in the first instance, identify the areas in which further fact-finding or elucidation of facts is necessary before resorting to the assistance of experts.\textsuperscript{62}

Another central problem concerns the appropriate division of competence between judges and experts. Adjudicators need scientific opinions to establish legitimacy for their decisions, since “\textit{insights necessary to make sound legal decisions may come from the experts}”\textsuperscript{63}; while they cannot delegate too much power to scientists given doing so would again lead to legitimacy concerns. Indeed, delegating adjudicatory functions to non-accountable experts is problematic.

The traditional cornerstone of judicial fact-finding is that it is for the adjudicators to assess the significance and legal relevance of the facts of the case, while experts ought only to assist judges by elucidating the facts.\textsuperscript{64} Despite all the intricacies, “\textit{it certainly remains for the Court to discharge the exclusively judicial functions, such as the interpretation of legal terms, the legal categorization of factual issues}”.\textsuperscript{65} Given that, however, in science-based disputes law and facts run closely together,\textsuperscript{66} it is particularly difficult to maintain the traditional boundaries of judicial competence in adjudication.\textsuperscript{67}

These theoretical foundations sought to lay ground for a key proposition of this research, namely, that the use of science in an environmental dispute resolution setting should not be conceived as a judicial quest for ‘scientific truth’\textsuperscript{68} or the final investigation of factual reality, but as a more complex process in which judges aim to accommodate probabilistic and volatile scientific facts to reach their legal determination. Adjudicators need to be “\textit{sophisticated consumers}” of scientific insights in as much as they ought to understand “\textit{the power and the limitations of}

\textsuperscript{62} Pulp Mills case, Declaration of Judge Yusuf, para. 10.
\textsuperscript{64} C. E. Foster, ‘New Clothes for the Emperor? Consultation of Experts by the International Court of Justice’ (2014) 5 Journal of International Dispute Settlement 139–73 at 152.
\textsuperscript{65} Pulp Mills case, Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, para. 12.
\textsuperscript{67} Foster, ‘The Consultation of Independent Experts by International Court and Tribunals in Health and Environmental Cases’, 396.
Faigman emphasizes that it does not necessarily require statistical training on part of judges, as they only need to be able to “exert control over critical translation points between what scientists study and what the law needs to know.” For such ‘translation’, however, judges ought to better understand the basic characteristics and the specificities of the ‘language’ of science to a certain extent. The next section will address the perplexing differences in the vocabulary of law and natural sciences, which impose further difficulties for adjudicators.

III. Structural differences between law and science: doctrinal challenges for science-intensive adjudication

Truism holds that “law and science speak two different languages”, and indeed, a closer examination reveals several structural differences in their fundamental concepts and ways of reasoning. These divergences impose doctrinal difficulties for evaluating scientific facts in a legal setting; specifically, for integrating scientific facts into causal inquiry or evidentiary assessments, and for crafting legal justification for accepting or rejecting a certain scientific claim.

A central hypothesis of this research holds that better understanding the inherent characteristics of science and scientific inquiry would facilitate a more in-depth and meaningful judicial engagement with scientific input. As David Faigman has put it: “[i]f the law is to use science, truly the best engine for discovering ‘truth’, it must understand what it is getting.”

In this vein, the following section explores these fundamental differences between law and natural sciences. Namely, the difference in the way law and science conceive fundamental rules governing their inquiry (i.e. their ‘laws’), in how they treat concepts of ‘cause’ and ‘causation’, their different approaches to what constitutes valid evidence, the divergent modes of persuasion, and their different levels of tolerance towards uncertainty.

1. ‘Laws of Nature’ vs. ‘Laws of Culture’\textsuperscript{73}

Most salient is perhaps the difference between the character of ‘laws’ as understood in the realm of natural sciences and in that of law. Both realms have such fundamental rules or principles, albeit in essence, laws of natural sciences are descriptive, while ‘man-made’ laws pursue prescriptive functions. Readers will be familiar with Kepler’s laws of planetary motions, and Newton’s laws on motion and will be aware of the fact these do not operate as normative rules. A related difference concerns the role of exemptions in the structure of laws. While exceptions from a general rule are commonplace among legal rules and do not touch upon the validity of the given legal rule, exceptions are alien to laws of science and exceptions from a scientific law invalidate the given ‘law’. The “domain of science” concerns “how the world works” is often juxtaposed to “the domain of the law” as preoccupied with “what should be done about [the world]”\textsuperscript{74}

Yet contrasting science and law and purely normative and purely descriptive realms is not immune to analytical challenges. Some commonalities between ‘laws of nature’ (i.e. scientific laws) and ‘laws of culture’ (i.e. legal laws) should be borne in mind. Importantly, they are both results of social practices in as much as scientific laws are ‘produced’ by scientists,\textsuperscript{75} meaning that they have to be agreed on by the relevant scientific community and being canonized in light of the prevailing paradigm. To put it differently, scientific laws ultimately gain their validity from the scientific community, just as norms of law are produced through legislative processes as agreed rules of the legislature.

2. Causes and causal inference

Causes of legal relevance are of narrower scope than naturally occurring factors (natural causes) that lead to the same outcome. Although there is a virtually infinite number of naturally occurring factors, not all of them are equally relevant for

\textsuperscript{73} These expressions have been frequently used by Sheila Jasanoff describing the difference between law and natural sciences at the „Science, Power, and Politics“ course, taught by Porf. Jasanoff at Harvard Kennedy School in the Fall term of 2015.
\textsuperscript{74} Faigman, ‘Where Law and Science (and Religion) Meet’, 1661.
\textsuperscript{75} Jasanoff, ‘Serviceable truths’, 1725.
the purposes of law. Reflecting these qualitative differences in approach to causal argument, *H.L.A. Hart* and *Tony Honoré* distinguish between causally relevant factors (‘causes’) and ‘mere conditions’. Those factors identified as causal have legal relevance, while mere conditions do not form part of legal inquiry. Accordingly, typical causal questions in law emerge as to whether a specific harm was caused by a certain human conduct or omission.

Legal regimes, thus, adopt certain tests to establish the causes they regard as legally appreciable among the various conditions of an outcome. U.S. tort law developed an especially sophisticated theory of causation, which serves here as an illustration of legal causation theories. According to the Third Restatement of the Law of Torts (“Third Restatement”), “a conduct is a factual cause of a harm when the harm would not have occurred absent the conduct.” This definition allows that there can be several factual causes of an outcome, as long as a conduct is necessary for the outcome, it is regarded as a factual cause (cause-in-fact, or but-for cause). Therefore a particular conduct need only be “a” cause and not “the” (sine-qua-non) cause of the harm for qualifying as a factual cause. A causal agent is regarded as a cause-in-fact if, but for its presence, the result would not have occurred or would have occurred later. Other causal agents that complement the necessary causal sets are regarded as background causes.

The Third Restatement provides further guidance with respect to more complicated causal scenarios. In exceptional cases there are multiple acts, each of which would have been a factual cause of the outcome alone in the absence of the

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76 Examples from everyday experiences are weather conditions ‘causing’ slippery road before a car accident, or an enduring drought that ‘generates’ dry leaves feeding a bush fire illustrates this point.


78 *Hart* and *Honoré, Causation in the Law*, pp. 112–13.


80 *The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §26 Comment c.


82 *The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §26 Comment c.


84 *The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §26 comment d.
other act. This situation is known in tort law as the multiple sufficient causes scenario. According to the Third Restatement, each of the multiple sufficient causes should be regarded as a cause-in-fact, even though none is by itself a but-for cause of the harm. This scenario is often called causal overdetermination. Multiple sufficient causes are to be distinguished from multiple causes, as the latter simply accounts for a scenario when there are multiple but-for causes of a certain outcome. Multiple sufficient causal sets can also emerge consecutively, in what is called the preemptive causes scenario. In that case, the supervening act or omission, the so-called duplicative factor, cannot be regarded a factual cause as the harm would have occurred anyway.

The concept of causation in law is different in many respects from the causal concepts used in science. Carl F. Cranor suggests that the scientific understanding of causation is “more complex than the law legitimates”. The but-for test of legal causation favors a “mechanistic understanding of causation” which is predicated upon the metaphor of a causal chain consisting of discrete events, where each event is dependent upon the previous one. However, in fact, elements of the ‘chain’ might be independent of the first triggering action and hence, the causal process is better conceived as a “complex set of conditions”. Consequently, judges often run into difficulties when they try to select a certain event from the hypothetical chain of events to be the but-for cause of the injury. Moreover, lawyers often fall prey to the

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86 Id. at §27, §27 Comment a.
87 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §27.
88 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26 Comment i.
90 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, n. §26 Comment j.
91 Id. at §26 Comment k.
92 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26 Comment k.
93 The textbook example of duplicative factors is hitting an already deceased man by car.
97 Hart and Honoré, Causation in the Law, p. 72.
98 Brennan, ‘Causal chains and statistical links’, 486.
'post hoc ergo propter hoc' way of reasoning\(^9^9\) that is, to causally attribute subsequent effects to prior events in an automatic way.

Finally, law and science differ also in their methods of reasoning. Consistent with their thinking in terms of the metaphor of a causal chain, lawyers tend to apply deductive reasoning.\(^1^0^0\) However, this approach in itself creates the illusion of causality, since it is necessarily loaded with causal assumptions.\(^1^0^1\) As a result, the substantiated causal link may only result from the method of deductive reasoning.\(^1^0^2\) Scientists, in contrast, normally use inductive reasoning,\(^1^0^3\) which is built on a series of specific observations and seeks to draw its final conclusion on their basis. The conclusion thus reached remains always probabilistic.

### 3. Standard of required proof, acceptance of probabilistic evidence

Legal regimes establish a particular standard of proof to determine the required level of proof above which a causal claim is to be accepted as valid and legally appreciable. Tort law systems, for instance, use the preponderance of evidence standard, \(i.e.\) the balance of probability.\(^1^0^4\) By contrast, there is no generally agreed standard for proof of causality in science.\(^1^0^5\)

These different approaches towards proof of causation might be attributable to the fact that scientists actually "\textit{disprove the null hypothesis}" (emphasis added),\(^1^0^6\) instead of proving their actual hypothesis. A null hypothesis stands for the negation of a hypothesis. If for instance a given hypothesis assumes a certain relation, the null hypothesis would posit that they are in fact random variables. The basis of scientific inquiry is thus the \textit{rejection} of the null hypothesis by collecting statistically significant evidence for that.

There is also a striking difference in the approach of lawyers and scientists towards probabilistic evidence. While statistical evidence treated as normal in

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\(^{99}\) Lecture of Bostjan Zupančič entitled „Causation”, the English language transcript of which has been provided to the author out of courtesy of Judge Zupančič.

\(^{100}\) Brennan, ‘Causal chains and statistical links’, 482.

\(^{101}\) Id.

\(^{102}\) Id.

\(^{103}\) Brennan, ‘Causal chains and statistical links’, 481, 490.

\(^{104}\) Steel, \textit{Proof of Causation in Tort Law}, p. 50.


\(^{106}\) Brennan, ‘Causal chains and statistical links’, 511.
science, it is conceived only as “a second best” option in law. The robustness of evidence in science is assessed in terms of the level of significance (‘p’), which is conceived to be a statement of probability.

In contrast to the approach used in science, judges often do not want to engage in probabilistic reasoning and tend not to regard the preponderance rule as a purely mathematical question according to which a statistical chance bigger than 50 percent automatically results in a finding of causation. One reason for this difference might be that this so-called ‘naked statistical evidence’ approach can easily lead to counterintuitive results. The Smith v. Rapid Transit case well illustrates the dilemmas of basing the preponderance rule solely on one mathematical probability calculation. In the case at hand, a bus pushed the plaintiff’s car off a road on which one company, Rapid Transit, had the exclusive right to run coach service. The court was not ready to accept that Rapid Transit was the actual tortfeasor based on purely mathematical calculations of probability. Evaluating the conclusion of the court, Sandy Steel emphasizes the importance of subjective belief embedded in the preponderance rule, as it requires “that the factfinder believe(s) that [X] actually occurred not merely that probably [X] (occurred)”.

4. Persuasion in Law and in Science

The above structural differences between law and science entail some pragmatic differences between the two realms of inquiry. Herbert Kritzer, a U.S. scholar analyzed the differing ways in which lawyers and scientists seek to lend persuasive force to their argumentation. Kritzer traces the differences in persuasion in legal and scientific settings back to four main factors: the source of data, the use of evidence, inquirers’ mindset, and the goal of inquiry.

108 Brennan, ‘Causal chains and statistical links’, 482.
111 Steel, Proof of Causation in Tort Law, p. 92.
The differing ways of persuasion should be born in mind in the critical appraisal of the ways in which ‘scientific’ arguments are used in resolving environmental disputes. They gain particular relevance in identifying some of the root causes of scientific evidence’s limited reach in the judicial process.

5. Comfort with uncertainty in law and in science

5.1 Uncertainty in science

Scientific facts underlying environmental harm are highly complex and uncertain, furthermore, their effects are temporally and spatially spread out. In scientific literature, the concept of scientific uncertainty, in the broad sense, means that human knowledge will always remain imperfect when it comes to understanding and describing highly complex natural phenomena. In the narrow sense, scientific uncertainty stands for the fact that scientific research can only provide probabilistic results, as some uncertainty always remains as to the precise value of a given parameter. Throughout this dissertation, uncertainty is used in this narrow sense. Note that scientific uncertainty is an inherent feature of even the

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116 D. Ludwig, M. Mangel, and B. Haddad, ‘Ecology, Conservation, and Public Policy’ (2001) 32 Annual Review of Ecology and Systematics 481–517 at 487. This is why scientists attach a confidence interval to every result. This indicates the range in which the parameter lies in a given percentage of the time. As a scientific consensus, the 95% confidence interval stands for a statistically significant finding (Brennan, ‘Causal chains and statistical links’, 510.).
117 In legal literature, scientific uncertainty is sometimes used to describe the lack of conclusive evidence regarding the health effects of a hazardous substance. M. Geistfeld, ‘Scientific Uncertainty and Causation in Tort Law’ (2001) 54 Vand. L. Rev. 1011–37 at 1012. This paper uses scientific
most accurate scientific result and therefore cannot be equated with the insufficiency or contradicting nature of relevant evidence, as would be suggested by a more colloquial meaning of uncertainty.

Scholars repeatedly take note of the challenges that scientific uncertainty poses in their field, yet legal literature rarely engages in more in-depth discussion on the specific sources of uncertainty. In the following, I will present a brief taxonomy of these sources to demonstrate the factors that make science essentially and irreducibly uncertain. Better understanding the root causes of uncertainty helps society fully face the extent and nature of the problems it entails. Moreover, to reach an optimal decision, stakeholders should be able to evaluate the emerging forms of uncertainty and to attach different weights to different kinds of ambiguities.

Scientific uncertainty can be traced back to certain attributes of scientific facts and the scientific inquiry that produces them, which are usually termed as ‘types’ or ‘sources’ of uncertainty. These sources vary across different fields of natural sciences. Certain sources of uncertainty can be reduced or even minimized, however, scientific results to some extent will always be burdened with scientific uncertainty, due to the very nature of scientific inquiry and the underlying facts.

Scholarly literature in environmental sciences provides various classifications of scientific uncertainty. Instead of attempting to provide an all-encompassing review of these taxonomies, I only summarize the major categories of uncertainty that are present in environmental sciences, the use of which is typical in environmental adjudication:

(i) uncertainty due to natural variability over time or space;
(ii) uncertainty due to extremely high complexity of natural systems;
(iii) model uncertainty;

uncertainty in a somewhat broader sense, referring to the statistical, probabilistic nature of scientific results.


(iv) uncertainty due to limitations of measurement devices;
(v) uncertainty due to insufficient or ambiguous data;
(vi) judgment uncertainty;
(vii) linguistic uncertainty; and
(viii) unknown unknowns in science.

(i) Natural variation\textsuperscript{121} across time and space

This type of uncertainty arises in systems that change in ways that are difficult to predict\textsuperscript{122} and, thus, are exceptionally hard to account for in models. An apposite example of the difficulties entailed by natural variation is making predictions on a species’ population size. This prediction is inevitably uncertain as populations vary depending on many factors, such as availability of food, abundance of predators or disease spread.\textsuperscript{123} For all these reasons, any predictions as to future population sizes will always be burdened with uncertainty flowing from background natural variation. Moreover, this type of uncertainty makes the detection of environmental trends difficult even in light of data collected for decades.\textsuperscript{124}

(ii) Extremely high complexity of environmental systems

Simply put, a great deal of uncertainty is a result of the extremely high complexity of environmental systems, which are not fully understood. It is virtually impossible to describe all relevant connections and feedbacks in ecosystems. Food web research well illustrates this challenge. In marine ecosystems that comprise dozens of species, there can be up to 28 million different pathways between two particular species throughout the ecosystem’s food web.\textsuperscript{125} Such extreme level of complexity can only be represented in models if the natural system is grossly

\textsuperscript{122} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 618.
\textsuperscript{123} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 618.
\textsuperscript{125} P. Yodzis, ‘Must top predators be culled for the sake of fisheries?’ (2001) 16 Trends in Ecology & Evolution 78–84 at 80.
simplified, which entails a great deal of uncertainty as to the convergence between model results and the real behavior of the system.

Prior lessons of food web research for the purposes of fisheries management also warn us that indirect connections are often overlooked by scientists. This may result in fundamentally mistaken policies. In case one considers only direct connections, it seems to be an intuitively appealing management option to cull top predators (such as seals or whales) of an industrially important fish species (target species) in order to increase attainable yields of fishery. However, in complex food webs, where fish predators also prey on the target species on a lower level of the food chain, the population of the target species will be, in fact, decreased if top predators are removed from the ecosystem, since these predators also prey on the fish predator itself. Consequently, decreasing the number of top predators via culling will decrease the population of the target species, which is exactly the opposite of the desired outcome.

With regard to the extreme complexity of living networks, this cause of uncertainty remains pervasive and dominant. Therefore, it is vital for decision-makers to get familiar with and recognize this type of uncertainty.

(iii) Model uncertainty

A certain extent of irreducible uncertainty results on the one hand from the necessary simplification inherent in every model used to describe natural processes. Such simplification may lead to omitting a variable from the model, which will later on prove to be a relevant factor in the system’s behavior. On the other hand, uncertainty may also arise from constructing imprecise models of relatively known processes. This takes places when scientists describe essentially stochastic natural systems with deterministic models.

Moreover, uncertainty may also flow from the fact that we do not always know all the relevant processes of the real world, which may give rise to multiple working hypotheses for the same phenomenon, and thus, different models for

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126 Yodzis, ‘Must top predators be culled for the sake of fisheries?’, 80.
representing the same process.\textsuperscript{131} This type of uncertainty is well illustrated by the historic example of modeling ozone depletion in the 1980s. Initially, there were three competing scientific theories for explaining the decay of atmospheric ozone: a dynamic, a solar, and a chemical theory.\textsuperscript{132} However, all these models dismissed the role of heterogeneous reactions, which later turned out to be precisely the driving mechanism behind ozone hole formation.\textsuperscript{133}

Another subset of model uncertainty is called parametric uncertainty and it arises from using uncertain parameters in a model,\textsuperscript{134} for example when a model relies on uncertain thresholds of an otherwise known relationship.\textsuperscript{135} Parametric uncertainty may also be a result of abstractions in a model, which generates parameters that cannot be translated to direct biological interpretation.\textsuperscript{136} As alluded to above, many forms of model uncertainty cannot be fully eliminated and, thus, it emerges as one of the most pervasive type of uncertainty.

(iv) Measurement error

Measurement error manifests in three main types: operator error, instrument error, and systematic error.\textsuperscript{137} Operator error can be traced back to imperfections in handling the measurement device, and instrument error stands for random problems with the device itself.\textsuperscript{138} Systematic errors arise from biased sampling procedure,\textsuperscript{139} which may be a result of unintentional erroneous calibration of the device or

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\textsuperscript{133} O’Reilly, Brysse, Oppenheimer, and Oreskes, ‘Characterizing uncertainty in expert assessments’, 731.

\textsuperscript{134} Payne, Barange, Cheung, MacKenzie, Batchelder, Cormon, Eddy, Fernandes, Hollowed, Jones, Link, Neubauer, Ortiz, Queirós, and Paula, ‘Uncertainties in projecting climate-change impacts in marine ecosystems’, 1277.

\textsuperscript{135}Arnulf Grubler, Yuri Ermoliev, and Arkady Kryazhimskiy, “Coping with Uncertainties-Examples of Modeling Approaches at IIASA,” \textit{Technological Forecasting and Social Change} 98 (September 2015): 214.


\textsuperscript{139} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 619.
consistent, incorrect recordings of the results.\textsuperscript{140} This observational bias may also be a result of entrenched theories, which can influence the observation itself.\textsuperscript{141} The observer’s error can largely be eliminated with the observer’s appropriate training,\textsuperscript{142} and systematic errors occurring on theoretical grounds can also be reduced if properly recognized by the observer.\textsuperscript{143}

\emph{(v) Ambiguity of resulting data}

Uncertainty also arises from the fact that observations and modeling often can only provide scarce or ambiguous data. Estimation error may also occur, which stands for inaccuracies in data due to the erroneous choice of statistical methods.\textsuperscript{144} The absence of long-term consistent data sets is indeed one of the regular challenges that regulatory scientists face.

\emph{(vi) Judgment uncertainty}\textsuperscript{145}: subjective elements in drawing inference

In lack of proper data, scientists need to make extrapolations and interpolations, which inevitably include making subjective judgments.\textsuperscript{146} Subjective inferences may bring significantly biased results. A classic example of such bias can be witnessed in the history of recording the ozone hole. Notably, scientists consistently dismissed data evidencing a growing ozone hole initially,\textsuperscript{147} when the data contradicted all accepted scientific theories on ozone dynamics. Scientists also warn that due to psychological factors, one may have a preference for making less ambiguous statements\textsuperscript{148} or for processing information selectively to confirm the observer’s expected outcome.\textsuperscript{149}

\textsuperscript{140} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 619.
\textsuperscript{142} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 619.
\textsuperscript{145} O’Reilly, Brysse, Oppenheimer, and Oreskes, ‘Characterizing uncertainty in expert assessments’, 737.
\textsuperscript{146} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 618, 621.
\textsuperscript{147} Grubler, Ermoliev, and Kryazhimskiy, ‘Coping with uncertainties-examples of modeling approaches at IIASA’, 215.
\textsuperscript{148} Brown, ‘Prospects for the Open Treatment of Uncertainty in Environmental Research’, 79.
\textsuperscript{149} Brown, ‘Prospects for the Open Treatment of Uncertainty in Environmental Research’, 79.
(vii) Linguistic uncertainty

This type of uncertainty arises from the often ambiguous, vague or underspecific scientific vocabulary.\textsuperscript{150} Besides these, certain terms carry different meanings in natural and social science, which gives rise to additional linguistic uncertainty.\textsuperscript{151} Interestingly, the terms ‘cause’ and ‘causal inference’ have divergent meanings in legal and natural sciences. Causes in natural sciences are naturally occurring factors that lead to the same outcome, whereas causes for the purposes of law are of narrower scope, hence, not all causes in science will be legally appreciable causes.\textsuperscript{152} For instance, through the lens of science, weather conditions leading to a slippery road are a ‘cause’ of a resulting car accident, however, in terms of establishing legal responsibility for the accident, the weather is a causal factor that is not necessarily regarded as a legally relevant ‘cause’ (as it would much rather be e.g. the failure of the relevant authority to maintain the road or repair road conditions).

Legal and natural sciences also use different concepts of causation.\textsuperscript{153} Legal tests that identify the legally relevant causes favor a “mechanistic understanding of causation” which is predicated upon the metaphor of a causal chain consisting of discrete events, where each event is dependent upon the previous one.\textsuperscript{154} However, in the scientific world causal relations are better conceived as a “complex set of conditions” and not as a linear chain of events.\textsuperscript{155}

(viii) Unknown unknowns

Last but not least, there are parameters, relevant relationships, and feedbacks that society is not even aware of.\textsuperscript{156} In surprisingly many fields of sciences, society simply “[d]oes not know enough about”\textsuperscript{157} the underlying processes to be able to meaningfully describe the system’s behavior. This is the terrain of scientific surprises.

\textsuperscript{150} Regan, Colyvan, and Burgman, ‘A taxonomy and treatment of uncertainty for ecology and conservation biology’, 618.
\textsuperscript{151} Grubler, Ermoliev, and Kryazhimskiy, ‘Coping with uncertainties-examples of modeling approaches at IIASA’, 215.
\textsuperscript{152} Hart and Honoré, Causation in the Law, pp. 112–13.
\textsuperscript{153} Brennan, ‘Causal chains and statistical links’, 471.
\textsuperscript{154} Brennan, ‘Causal chains and statistical links’, 485–86.
\textsuperscript{155} Hart and Honoré, Causation in the Law, p. 72.
\textsuperscript{156} Grubler, Ermoliev, and Kryazhimskiy, ‘Coping with uncertainties-examples of modeling approaches at IIASA’, 214.
The existence of such inherent ambiguity in scientific results often frustrates science-based legal decision-making.

5.2 Uncertainty in law

It is common knowledge among scientists that scientific uncertainty is inherent to some degree in all scientific results and can never be fully eliminated. Lawyers, however, often do not have a proper understanding of the true nature of scientific uncertainty. As Troyen A. Brennan warns, courts tend to subscribe to the ‘positivist’ philosophy of science, which assumes a constant expansion of scientific knowledge, and to hold associated belief to a view that uncertainty can be fully eliminated. In the last century scientists abandoned this view due to their increasing awareness of the ever uncertain and probabilistic nature of scientific results. Still, judges seem to be reluctant to accept the concept of irreducible uncertainty.

Nevertheless, uncertainty is not alien to law, partly because it “exists to regulate uncertainty in social relations”. Importantly, law resembles science in as much as it “never requires absolute certainty”, though neither it is comfortable with accepting the possibility of error and that of erroneous factual claims. The seminal book of Jörg Kammerhoffer provides a detailed account of the many respects in which international law to some extent will always remain uncertain. He distinguishes four levels of epistemological uncertainty: uncertainty of the law-making rules, uncertainty as to what constitutes a valid source of international law, uncertainty as to the normative content of substantive rules, and uncertainty due to the conflict of competing norms. Even though these types fall into the category of normative uncertainty in contrast to science’s uncertainty as to the facts, nevertheless,

159 Brennan, ‘Causal chains and statistical links’, 478.
167 J. Kammerhofer, Uncertainty in International Law - A Kelsenian perspective (Routledge, 2011).
the pervasive presence of ambiguity in law arguably prompts a heightened tolerance towards factual uncertainty in adjudication as well.

Yet the uncertain nature of science is often cited among the most daunting challenges of adjudicating environmental claims. The famous Joint Dissent of Judges Al-Khasawneh and Simma in the Pulp Mills case aims its criticism at the Court’s failure “to cope with scientific uncertainty in a state-of-the-art manner.” Problems engendered by scientific uncertainty emerge for instance when courts have to identify the legally relevant cause of the unlawful harm based on uncertain scientific facts or ought to rule on the evidentiary value of scientific input. The ways in which judges handle scientific evidence, and the inherent uncertainty that flows from the statistical and probabilistic nature of scientific evidence, play a decisive role in shaping environmental claims’ prospects for success and, therefore, are highly consequential for the adjudicative process.

6. Implications for judicial engagement with science

This detailed overview of the nature of science and scientific knowledge bears two important messages for adjudicators. First, contrary to laymen hopes, scientific knowledge remains ambiguous and inherently uncertain, and just as its subject the natural world, is in constant change and flux. Scientific facts are volatile and can only partially describe the infinite complexity they take part in. And this will not get any better. Our (rapidly) growing understanding may only bring previously unknown, uncertain details into the inquiry, but could not provide clear-cut answers. Second, as a closely related aspect of the latter, such instability is an inherent feature of not only science, but also our post-modern time and life itself. One could not escape this reality by insisting on getting the impossible. Society, policy-makers, and adjudicators alike ought to devise appropriate tools, which resonate with reality and provide effective answers to needs of society, even if those are backed by or cloaked in uncertain facts. Complexity is inextricably and inescapably linked to modern human life and now it needs to be incorporated in manmade social institutions too.

170 Pulp Mills case, Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, para. 2.
Undoubtedly, when adjudicators are willing to take scientific input into due account, the ambiguity of scientific results may cause hurdles in adjudication. Scientific data are often incomplete and are burdened with uncertainty, “volatility”\textsuperscript{171} and “paucity”\textsuperscript{172} which to some extent cannot be eliminated from scientific results despite constant progress of scientific research. This is at odds with a frequently held ‘myth’ of international adjudicators, namely, that courts could or should actually “find the truth” in scientific disputes.\textsuperscript{173} Also, the fundamental differences in the methods, approaches and fundamental concepts of law and science entail specific problems, when scientific facts need to be squeezed into traditional frames of legal doctrines, such as ‘causation’ or ‘proof’.

The deeper understanding of such differences would facilitate a better incorporation of scientific input in the adjudicatory process. As we shall see below, scientific arguments are often downplayed in contemporary adjudicatory practice. This not only results in a gloomy prospect for claims supported by scientific evidence and arguments, but on a more abstract level, marginalizing science poses challenges for adjudicators in terms of crafting a persuasive and legitimate reasoning.

\textbf{IV. The impact of science on the judicial reasoning}

The extent to which science is allowed to enter the adjudicative process will be examined in this research from the perspective of adjudicatory reasoning. More specifically, if adjudicators decide to marginalize science and carve it out from their inquiry, as will be shown, is often the case in contemporary environmental adjudication, specific challenges arise with respect to crafting a persuasive reasoning in science-heavy disputes. In such cases, adjudicators would need substitutes for scientific references in order to justify their choices between competing and often conflicting science-based claims. At the same time, engaging with the scientific aspects of the dispute is also an intricate task for judges in light of the many epistemic complexities addressed above.


\textsuperscript{172} Mbengue, ‘International courts and tribunals as fact-finders’, 62.

To play out this argument, I will first review recent scholarly literature on the science-intensity of international adjudication. Then I briefly discuss the scholarly commentary on the different rationalities international courts and tribunals may build upon their reasoning. Lastly, I will introduce the specific angle from which this dissertation seeks to contribute to these discussions and explain its analytic framework.

1. Low level of science allowed in international environmental adjudication

The ubiquitous nature of scientific facts and components in environmental disputes\(^{174}\) would intuitively warrant a significant role of science in international environmental adjudication. Simultaneously with a surge in the number of such disputes, Jorge E. Vinuales voiced a reasonable expectation that “the relative merits of the competing scientific views advanced by the parties will likely be a major point to be decided”\(^{175}\) by courts and tribunals. Yet the practice of international adjudication shows quite the opposite, as thorough scientific engagement is far from being the norm.

Many international judicial fora were criticized for being reluctant to engage in depth with scientific evidence.\(^{176}\) Generally speaking, environmental adjudication is known for “the low profile accorded to scientific input”.\(^{177}\) Mbengue shows based on a thorough review of the fact-finding of international courts and tribunals that adjudicators tend to “ignore factual evidence that is ... uncertain”, to “disdain ‘fragmentary and inconclusive’ evidence” and “to refuse to weigh intangible and elusive points of proof.”\(^{178}\) Rüdiger Wolfrum adds the criticism that international adjudicators sometimes omit indicating how they reached their final conclusion.\(^{179}\) Mbengue, in his elaborate and passionate series of criticism addressed to the scientific fact-finding of international courts and tribunals, argues that the desirable judicial attitude would be to “free themselves of any ready-made yardsticks against which

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\(^{175}\) Vinuales, ‘Legal techniques for dealing with scientific uncertainty in environmental law’, 478.


\(^{178}\) Mbengue, ‘International courts and tribunals as fact-finders’, 61. internal citations are omitted.

scientifc facts are to be scrutinized.”180 Later he adds that “greater integration of scientific uncertainty when ascertaining facts ... is necessary and ineluctable.”181

Science altogether does not enjoy a privileged position in the analysis of international adjudicators. Although commentators have long noted the differing extent to which science plays an influential role in adjudication,182 they only recently started to devote detailed examination to judicial strategies of scientific fact-finding. These contributions have started to raise awareness of the ways in which scientific arguments impact the judicial reasoning and the process of deciding scientific disputes.

For instance, Jorge Vinuales has recently distinguished four distinctive techniques that international courts employ for coping with science in adjudication. First, certain judicial fora tend to “minimize the role of science”183 in their legal evaluation. Others tend to rely on non-scientific external factors to make sense of scientific input provided by the parties.184 As a third option, judges may informally gather scientific information from trusted sources, as the ICJ does when consulting with ‘shadow experts’.185 Lastly, courts may bridge uncertain scientific findings by deciding disputes anyway through employing legal inference techniques, such as presumptions of a causal link or that of harm.186

Another elaborate account has been provided by Jean D’Aspremont and Makane Mbengue with a focus on strategies of scientific fact-finding.187 They distinguish first a “nihilist strategy”, when international courts opt for not engaging with the scientific dimension of the dispute, by referring to the non-justiciability of scientific questions. The second, more widespread, attitude is called a “protectionist approach,” which “substitut[es] legal argumentation for scientific

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185 Vinuales, ‘Observations sur le traitement des motifs scientifques dans le contentieux environmental international’, pp. 120–21.
argumentation”. This approach is highlighted by cases where international courts decide to evaluate cases without having recourse to experts. The third strategy is the “minimalistic engagement”, when adjudicators allow the parties to be the masters of evidence. Lastly, the “outsourcing” variant of engagement with scientific fact-finding is illustrated by fora that use experts and defer to such opinions in formulating their adjudicatory decisions.

2. Science and the legitimacy of the judicial reasoning

Throughout this research, judicial engagement with science will be analyzed with a view to legitimacy, more specifically, to explore how the different methods for scientific engagement affects the legitimacy of adjudicatory decisions. This research posits that the extent to which adjudicators choose to engage with the scientific dimensions of disputes will have repercussions on the ways in which they can craft persuasive decisions.

Providing well-reasoned judgments is a requirement for the legitimacy of judicial bodies. As Martti Koskenniemi stressed, the “correctness of a legal decision ... is a product of legal practice, argument, persuasion, not its precondition.” Against this backdrop, this research would concentrate on the argumentative practices with which international courts and tribunals can persuasively deal with scientific arguments in a legal dispute.

Simply put, legitimacy means “the right to rule”, due to which a given community regards the authority of a decision justified. Many have written about the legitimacy of a given international adjudicative body or that of international courts in general, and even about the legitimacy of international environmental law. However, none of them were specifically interrogating how the presence of science,

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194 Bodansky, ‘The Legitimacy of International Governance’.
as a source of epistemic authority, may impact the legitimacy of adjudicatory authority. Do cognitively authoritative scientific arguments in a legal dispute constitute obstacles to efficient legal dispute resolution? Or are they an asset, or even a necessary element? Is scientific legitimacy a prerequisite to legal legitimacy? Or legal legitimacy can be constructed irrespective of scientific facts? This research is dedicated to uncover these overlooked aspects of legitimacy with regard to international adjudicatory reasoning in science-heavy cases.

Many factors suggest that the treatment of science in adjudication is crucial for the legitimacy of adjudicatory decisions. To begin with an almost truism of fact-finding, “it is not possible to make sound legal judgments if they are not based upon a proper appreciation of the facts”, in our case, scientific facts. Due to the closeness and intertwined nature of scientific facts and legal concepts in science-based environmental disputes, “meaningful and considered judgments” can only be delivered if adjudicators adequately address the “law-science discourse” in such science-heavy cases.

Proper engagement with the scientific dimension of environmental disputes is crucial also because striking down “sensitive issues of policy spaces”, such as environmental or health regulations, in an unjustified way could easily “lead to headlines and street demonstrations”. It is for this reason vital in the context of international adjudication not to issue arbitrary judgments in scientific disputes. Transparent and well-reasoned engagement with science ultimately supports the legitimacy of adjudicatory fora, which are facing heightened scrutiny and expectations for impartial and unbiased treatment of cases. As a related aspect, engaging with the scientific dimensions of disputes and not to use lousy scientific findings hiding adjudicators position statements is also vital for preserving the legitimacy of international adjudicatory fora in the face of a rising global suspicion.

\[\text{Ridell makes this argument in a wider context relating to fact-finding of the International Court of Justice. A. Ridell, ‘Scientific Evidence in the International Court of Justice - Problems and Possibilities’ (2009) 20 \textit{Finnish Yearbook of International Law} 229–58 at 257.}\]

\[\text{Ridell and Plant, \textit{Evidence before the International Court of Justice} (British Institute of International and Comparative Law, 2009) p. 353.}\]


\[\text{Vinuales, ‘Observations sur le traitement des motifs scientifiques dans le contentieux environmental international’, p. 114.}\]
and backlash against globalization, and globalized institutions such as supranational adjudicatory bodies.

The extent to which adjudicators account for underlying scientific facts is also consequential due to the increasing competition between jurisdictions among proliferating international courts and tribunals. Omitting or marginalizing apparent scientific facts upon which the conflict rests would not only run the risk of undermining the legitimacy of adjudicatory decisions, but ultimately could challenge the confidence placed in the given judicial body. This could in turn drive away potential claimants towards other jurisdictions. As more and more adjudicatory fora are available for parties, they will have recourse to those fora where they can trust that all the aspects of the case “will be fully and duly appreciated by judges.”

Proper adjudicatory treatment of science is also warranted for a reason stemming from the ‘public’ function of adjudication. The private function only necessitates resolving the parties’ dispute, whereby the ‘public’ function of courts is to secure values and objectives of a wider community. Neil Craik explicitly suggests that the “establishment of scientific facts [...] and the resolution of disputes over contradictory facts should be seen as a public function of relevance to the international community as a whole rather than a simply part of a private dispute.” He argues that if dealing with science is left unchecked, findings may be abused to legitimate environmentally harmful practices. Hence, handling scientific input is not only important for buttressing the persuasiveness of adjudicatory decisions, but is also consequential with regard to the efficiency of enforcing environmental law obligations. In a somewhat analogous context, Jorge Vinuales points out that “scientific information is a pre-condition for ... any attempt at integrating environmental considerations into developmental policies.” This holds true also for integrating science-based environmental arguments into adjudication, where such considerations should be typically weighed against economic interests. Therefore, the

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201 D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 270.
ways in which adjudicators engage with science in their decision-making substantially determine the extent to which environmental law obligations could have a real ‘bite’. In order for international environmental adjudication to reach maturity, a more thorough engagement with the scientific dimensions of disputes is warranted.

2.1 Science and legitimacy – the importance of epistemic non-arbitrariness

As has been alluded to above, the cognitive authority of science may boost or hinder the persuasiveness of the legal judgment delivered in science-intensive cases. A central proposition of this research is that adjudicators have to engage with science in a proper way in order to harness the cognitive authority of science in crafting persuasive and legitimate reasoning. The central yardstick in this respect is not that using more science would necessarily result in better-reasoned judgments. Rather, the crucial question on which the legitimacy of a science-intensive judgment hinges is how adjudicators reflect on the scientific aspects of disputes in their reasoning. Among the many angels from which the legitimacy of adjudicatory decisions can be measured this research takes epistemic non-arbitrariness as its yardstick.

Epistemic non-arbitrariness is often seen as a prerequisite to the legitimacy of adjudicatory reasoning. In the context of legitimacy of judicial argumentation, the seminal work of D’Aspremont and Mbengue also points to the importance of epistemic non-arbitrariness. Epistemic non-arbitrariness stands for a proposition that a given knowledge claim ought not to be judged “based on standards alien to it”. In other words, it requires “a strict separation between scientific and legal rationalities”. In order to avoid making (epistemically) arbitrary decisions regarding accepting or refuting science-based legal claims and pieces of expert

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206 Grossman, ‘Legitimacy and International Adjudicative Bodies’.
evidence, legal adjudicators must understand “the cognitive aims and methods of science”.211

Epistemic non-arbitrariness was used as a benchmark by Jean D’Aspremont and Makane Mbengue to evaluate different scientific fact-finding methods of international adjudicatory bodies. This work focused, thus far most elaborately, on the various types of rationality adjudicators can build their reasoning on once they had recourse to scientific experts.212 D’Aspremont and Mbengue point out that as soon as judges become recipients of expert opinions, they ought to choose from different methods of reasoning to appraise the legal significance of the evidence provided. In order to appeal to “argumentative persuasiveness”,213 they assert214 that adjudicators may choose from essentially three types of epistemic rationality: they either apply (i) intuitive rationality, or (ii) radical epistemically deferent rationality, or they (iii) treat and weigh scientific facts according to rules of legal fact-ascertainment.

The comparative assessment of the dissertation will draw quite substantially on this piece; therefore it is apt to briefly summarize their main findings.

Ad (i) Intuitive rationality stands for reasoning, where adjudicators use simple yardsticks borrowed from conventional rationality to validate the scientific evidence received, such as singling out ‘incorrect’ evidence, ‘unreasonable’ suggestions, or ‘blatantly erroneous’ findings.215 Importantly, in this case, adjudicators rely on their own assessments and not on external, scientific benchmarks of correctness or fault. Since this reasoning “falls short of defining which exact standard of evaluation will be used”216 it arguably proves to be arbitrary from an epistemic point of view.217

Ad (ii) Radical epistemically deferent rationality is applied when experts’ findings are weighed against the scientific standards of their own field of expertise. This would imply that adjudicators defer completely to the epistemic standards and methodological rigor of the scientific community. D’Aspremont and Mbengue claim

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212 D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’.
that from a theoretical point of view, this is the most impeccable type of reasoning, as it fully observes rules of epistemic non-arbitrariness. Though they themselves acknowledge that such reasoning “rests on a illusion of scientific objective validation”. Earlier in this chapter I have shown that scientific results are inescapably remain uncertain and ambiguous to some extent, therefore such a myth could not be satisfied in the practice of adjudication. From a practical point of view, the weakness of such epistemic deference is that as soon as adjudicators themselves do not possess the technical knowledge necessary for assessing whether a given piece of evidence meets the applicable scientific standard, as is often the case, judges would in fact delegate their adjudicatory tasks to the experts, whom would be entrusted with making the final determination about key aspects of the case.

Ad (iii) The third type of rationality D’Aspremont and Mbengue distinguish is the legal fact-ascertainment method, in which adjudicators substitute their own rationality for scientific standards and would judge the scientific evidence under the rules of the burden of proof. In practical terms, it would entail that those expert positions will prevail that can generate more abundant scientific evidence, meeting the preponderance standard. The shortcoming of such a solution is that expert knowledge would be evaluated in an epistemically arbitrary way.

Another most relevant scholarly account stresses that adjudicators ought to comply with preconditions for “intellectual due process.” This concept, coined by Scott Brewer, stands for the proposition that adjudicators must have a basic understanding of the methods and aims of science, so as to be able to choose between competing scientific claims advanced by the parties on bases other than imprecise conventional external indications of expertise, such as experts’ credentials, institutional affiliation, or reputation. The intellectual due process theory

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223 The concept of intellectual due process was born in legal theory and was demonstrated by Brewer in the context of evidentiary proceedings of U.S. courts. It Brewer, ‘Scientific Expert Testimony and Intellectual Due Process’.
emphasizes that in order not to render judicial reasoning that is arbitrary from an epistemic point of view, it is inevitable that adjudicators demonstrate a basic understanding of the scientific basis of the parties’ arguments.

2.2 Searching for practices of persuasive judicial reasoning in science-intensive cases

This research takes the above-discussed scholarly commentaries as its point of departure for analyzing the legitimacy of judicial reasoning in science-intensive cases. Compared to earlier works, however, this dissertation adopts an approach that is both broader in its scope and deeper in its inquiry, and therefore it is different from prior analyses in many respects.

First, earlier scholarly works have been dedicated to the scientific engagement and argumentative techniques of certain national or certain international fora analyzing only a handful of decisions. This research aims to conduct a comprehensive survey encompassing all the eight international courts and tribunals that hear science-intensive environmental disputes.

Second, the scope of this dissertation’s inquiry is not confined to strategies of scientific fact-finding, as it is not concerned only with the use of expertise in adjudication. The legitimating role of expert knowledge has been widely discussed in the context of environmental law and adjudication. While D’Aspremont and Mbengue examine the different types of rationality solely in the context of handling expert advice, my research suggests that adjudicators confront science in many other ways as well along the adjudicatory process, most notably, while making decisions about the framing of disputes, during their causal inquiry, and in setting standards of review. It also follows that adjudicators ought to strive to have a deeper understanding of the underlying science in these contexts as well. Given that this research views adjudicatory engagement with science as a broader phenomenon than the evaluation of expert evidence, it will have a wider scope of inquiry.

Third, *D’Aspremont* and *Mbengue* describe three types of rationality\(^{229}\) whereas my analytic framework will distinguish a fourth category, that of ‘hybrid’ rationality where judges use a legal argumentation, but with a close engagement with the underlying science, which distinguishes it from ordinary forms of legal rationality. Furthermore, *D’Aspremont* and *Mbengue* regard the benchmark of ‘reasonableness’ as one of the prime examples of intuitive rationality.\(^{230}\) However, in my view, reasonableness can be regarded as a legal concept, which is inherent in exercising the judicial function,\(^{231}\) for which reason I will regard the reasonableness standard (and certain similar tests) as examples of ‘hybrid’ reasoning.

In sum, my research will first conduct a comparative survey on specific techniques for engaging with science in the course of adjudication. By examining the practice of eight different international fora, I will seek to identify judicial best practices of crafting persuasive, epistemically non-arbitrary reasoning in science-heavy cases. Lastly, I will comparatively assess how international adjudicative bodies answer the question as to how scientifically not trained judges can craft persuasive reasoning to justify their decisions and their choices between competing, and often ambiguous, scientific arguments offered by the parties or experts.

V. Adjudicatory techniques for engaging with science: the comparative framework of this research

I shall now turn to the analytic framework of the thesis. The analysis will focus on the ways in which scientific arguments are handled in the judicial process and vice versa, how the presence of science impacts traditional judicial doctrines and practices, especially, the adjudicatory reasoning.

A closer look at the case-law reveals numerous and divergent methods with which adjudicators seek to engage with the scientific aspects of disputes. These practices taken together will be referred to as judicial engagement with science. On an abstract level, this term serves to describe the ways in which adjudicators interact

\(^{229}\) D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 266.
\(^{230}\) D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 266.
with the scientific aspects of disputes, more specifically, the extent to which they assess, interpret, and investigate scientific arguments and expert evidence. Scientific engagement of international adjudicators will be used as an analytical framework to evaluate various judicial techniques adjusting the level of science that is allowed to enter the process of adjudication. In order to allow for a more fine-grained assessment, adjudicatory strategies for scientific engagement will be examined from the following aspects:

(i) with respect to the framing the legal dispute, *i.e.* to what extent scientific arguments are deemed as having a decisive force with respect to panel’s decision on the subject-matter of the dispute, and in what strategic ways adjudicators use scientific aspects in the course of deciding a dispute;

(ii) with respect to methods of fact-finding, *i.e.* the extent to which scientific experts are required and used by adjudicators, and the types of experts they are inclined to use;

(iii) with respect to causal inquiry, *i.e.* the causal tests and standards with which causal nexus are assessed between alleged harm and its consequences based on scientific evidence; and

(iv) with respect to the standard and extent of judicial review, *i.e.* the ways in which adjudicators scrutinize scientific evidence received, and the extent to which deference is accorded to claims of science, or conversely, the extent to which adjudicators are willing to review scientific claims in-depth. Different modes of reasoning will also be examined with which adjudicators choose to justify the outcome of their review.

As an important caveat, the above categories are not mutually exclusive in the sense that certain judicial techniques may operate on more than one stage of the adjudicatory process. Also, occasionally, certain aspects appear to run so closely together that their analytic separation seems to be artificial or strained exercise. Yet defining distinct stages allows for a more systematic and consistent assessment on the functioning of the different adjudicatory tools, and hence, appears necessary.

**1. Framing of disputes: adjusting the level of science entering the judicial inquiry**

This research views international judges as gatekeepers who set the level of science that may enter the judicial inquiry. Hence the reach of scientific arguments,
i.e. the extent to which they would be deemed legally relevant and occasionally even
decisive to the legal claim at hand, primarily depends on how adjudicators frame the
underlying dispute.

The willingness and ability of adjudicators to engage with science and expert
opinions have implications for the framing of a dispute. Identifying the legally
relevant aspects of a case is always a matter of judicial choice, given the competing
legal argumentations that are possible to grasp the relevance of the facts of the case.
Importantly, “whether a particular fact has legal relevance is a product of
interpreting some text”\cite{Faigman-2001} and may give rise to competing interpretations. Given that
there are many variations of selecting the legally relevant aspects of the same
contested set of facts, the extent to which science-based concepts and arguments are
placed in the center or on the periphery of the adjudicatory assessment depends on the
choice of the bench.

Framing of disputes is in fact a highly strategic choice on part of adjudicators
that has decisive impact on the outcome of the case. For this reason, adjudicators’
attitude towards framing science-intensive disputes have a fundamental impact on
science-backed environmental claims’ chances for success.

Framing is closely related, though not equal to, the phenomenon of judicial
economy. Framing of disputes comprises not only instances of judicial economy,\cite{Palombino-2010}
but also other choices of judicial reasoning whereby less science-intensive aspects of
obligations merit more judicial attention in rendering a final decision. In a wider
sense, judicial economy, being part of “the general canons of adjudication”,\cite{Palombino-2010}
requires an international judge to make “the most rational and efficient use possible
of his or her powers”\cite{Palombino-2010}. More concretely, it stands for judicial choices narrowing the
scope of a decision\cite{Palombino-2010} by not addressing particular issues that were raised by the
parties. Importantly, there is a significant limit to judicial economy, namely, that it

\begin{footnotesize}
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\item \cite{Faigman-2001} Faigman, ‘Where Law and Science (and Religion) Meet’, 1665.
\item \cite{Palombino-2010} F. M. Palombino, ‘Judicial economy and limitation of the scope of the decision in international
\item \cite{Palombino-2010} Palombino, ‘Judicial economy and limitation of the scope of the decision in international
adjudication’, 910.
\item \cite{Palombino-2010} Palombino, ‘Judicial economy and limitation of the scope of the decision in international
adjudication’, 909.
\item \cite{Palombino-2010} Palombino, ‘Judicial economy and limitation of the scope of the decision in international
adjudication’, 910.
\end{itemize}
\end{footnotesize}
must “not compromise ... the establishment of the true state of the world”. 237 As will be seen, in environmental disputes the exercise of judicial economy sometimes comes close to what threatens with deciding disputes irrespective of the underlying facts and, thus, with exceeding the above-mentioned limits.

The coming chapters will address the different approaches to selecting the judicially relevant aspects of cases. At the outset, however, one may note that in many cases the “configuration of the disputes to date has not ultimately required a closer involvement with the scientific evidence.”238

Throughout my research, I will regard the framing of environmental disputes as a closely connected though still separate issue from that of scientific fact-finding, and thus, they will be examined separately. Once disputes are framed in a way that scientific aspects are encompassed in the ambit of legally relevant aspects, adjudicators need to “translate science into law”,239 the first step of which will be the process of fact-finding.

2. Scientific fact-finding: the use of experts and expert opinions

Fact-finding,240 i.e. the “reconstruction of the reality that is supposed to have existed at the moment the dispute arose”241 confers a highly complex task on judges even in cases that do not involve scientific facts.242 When the facts of a case are science-heavy, science inevitably becomes part of the adjudicatory process as “in order to reach a legal decision it is indispensable to analyze the scientific evidence.”243

The process of scientific fact-finding is the main tool with which adjudicators garner scientific advice. Its types and modalities therefore influence the extent to which judges can control and adjust the entering of science in the litigious discourse.

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237 Palombino, ‘Judicial economy and limitation of the scope of the decision in international adjudication’, 910.
240 This dissertation uses the term ‘fact-finding’ as the evidentiary practice of international courts and tribunals. Fact-finding in other contexts is used as a synonym for inquiry, a means of non-judicial peaceful dispute settlement, see UN Handbook on Peaceful Settlement of Disputes between States, 1992, para. 77, available: http://legal.un.org/cod/books/HandbookOnPSD.pdf.
Therefore scientific fact-finding is essentially a procedural prerequisite of crafting persuasive science-intensive reasoning and in this sense, constitutes an important aspect of the present subject matter.

2.1 Free assessment of the evidence

The fact-finding of international courts and tribunals, as a general rule, is governed by the principle of free assessment of the evidence.244 Furthermore, normally the obligation to provide the court with the evidence rests with the parties.245 Due to the principle of the free admissions of evidence, parties have discretion to submit whatever evidence they deem most relevant to prove or disprove the facts of the case.246 However, international litigation procedures are not entirely adversarial, given that international judicial fora usually have the power to ask for independent bodies or experts’ advice to establish the facts of the case themselves. As a general rule, there is no hierarchy in terms of the different types of evidence.247

2.2 Different methods and procedures for taking expert evidence

Evidence, understood as “something [which] tends to prove or disprove the existence of an alleged fact”,248 may take diverse forms ranging from documents to expert testimonies. Expert opinions may be garnered in different institutional arrangements. In most cases, scientific evidence is brought before courts by party-appointed experts. Scientists who appear as experts may be cross-examined by the other party and by the bench as well. Nonetheless, it is also possible to include scientists in the team of counsels in the capacity of an advocate, in which case cross-examination is excluded and no solemn oath is required from the scientist acting as counsel.249 Although in such case parties have greater command over what science

244 Wolfrum, ‘Taking and Assessing Evidence in International Adjudication’, p. 142.
249 Foster, Science and the Precautionary Principle in International Courts and Tribunals, p. 89.
actually ‘speaks’ to the court, the persuasive value of such scientific position, in turn, may be less due to scientists’ apparent involvement in partisan advocacy.

More often than not, party-appointed experts provide the courts with conflicting scientific evidence, thus, judges easily get entangled in a ‘battle of experts’ as they lack the requisite training to readily choose between competing scientific claims. Allowing the parties to appoint independent experts may help such situations as independent experts are tasked with reviewing the evidence submitted by the parties. Accordingly, parties often seek to enhance the evidentiary value of their experts’ opinions by arguing that they are, in fact, present in the capacity of ‘independent expert’. In the Whaling case, for instance, Professor Mangel, one of the experts called by Australia stressed that the advocates of Australia did not familiarize him with their legal strategy and thus, argued to be appearing in an independent capacity. Yet despite the occasions when party-appointed experts do not receive compensation for their services, and irrespective of the fact that they indeed have “international reputation to protect”, the independence of partisan experts is seen questionable in the eye of the other party.

A better solution for the problem of partisan evidence might be to have recourse to court-appointed experts, and thereby gaining impartial expert opinions. Faced with saliently little use of this particular way of fact-finding in international practice, some scholars advocate for a more frequent appointment of **ex curia** experts. Judges Simma and Judge Al-Khasawneh also urged the ICJ to use such powers. The Court notably had recourse to court-appointed experts only twice in **Corfu Channel** and the **Gulf of Maine** cases, but it has never used such powers in

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253 This was the position of Canada in the Asbestos case decided by the WTO panel, European Communities – Measures Affecting Asbestos-Containing Products. Complaint by Canada (WT/DS135) cited by Foster, *Science and the Precautionary Principle in International Courts and Tribunals*, p. 100.
254 This was the argument of Argentina to argue for the independence of the experts she included in her team of counsels in the Pulp Mills case. See Verbatim Record, Tuesday 29 September 2009, para. 21.
256 The Permanent Court of International Justice used this power once in the Chorzów Factory case, and the ICJ appointed experts once in the Corfu Channel case.
258 Pulp Mills case, Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, para. 8.
259 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 277–79.
environmental disputes. Though tellingly, three out of the seven instances when even dissenting judges voiced concerns for not appointing *ex curia* experts, occurred in environmental disputes.\textsuperscript{260} The trade-off of using court-appointed experts is that it deprives the parties of the opportunity to cross-examine them.\textsuperscript{261} This leads some commentators to oppose the use of *ex curia* experts out of concerns for transparency and due process, given that such a procedure would effectively decrease the parties’ control over scientific fact-finding.\textsuperscript{262}

Despite their reluctance to avail themselves of the possibility, many international judicial fora have the power to request information from or even to consult with international organizations having the requisite expertise.\textsuperscript{263} Moreover, there are novel ways of scientific fact-finding, too. An example is called expert witness conferencing, and can be seen in the practice of certain investment tribunals, called. The procedure allows experts of both sides to present their views in the presence of the other side, and experts may ask questions from one another while answering questions of adjudicators.\textsuperscript{264}

Another increasingly used technique for fact-finding is to incorporate the necessary technical knowledge within the judicial panel itself, by appointing expert adjudicators and expert assessors. Expert assessors sit with a bench without having a right to vote,\textsuperscript{265} while expert adjudicators have the full power of an arbitrator even though they are not lawyers but experts of the field relevant to the dispute. Such a solution is most embraced in the practice of the Permanent Court of Arbitration (“PCA”), the procedural rules of which expressly allow the appointment of an expert on the panel. The judicial practice of the PCA in this respect will be discussed in more detail in Chapter 4.

There are many tools with which restoring or at best scaffolding judicial control over expertise is possible. These all require an active involvement of judges in

\begin{itemize}
\item \textsuperscript{260} These occasions were the *Temple of Preah Vihear, Kasikili/Sedudu Island, Qatar v. Bahrain, Nicaragua v. U.S.*, the *Gabčíkovo-Nagymaros*, the *Pulp Mills* and the *Whaling in the Antarctic* case as cited by Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 280–88.
\item \textsuperscript{261} *Pulp Mills* case, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 8.
\item \textsuperscript{262} M. M. Mbengue, ‘Scientific Fact-finding at the International Court of Justice: An Appraisal in the Aftermath of the Whaling Case’ (2016) 29 *Leiden Journal of International Law* 529–50 at 549.
\item \textsuperscript{263} See e.g. The Statute of the International Court of Justice, Article 34(2), and the WTO also sought the advice of the WHO in the Continued Suspension of Obligations dispute, *Canada – Continued Suspension*, Annex E
\item \textsuperscript{264} Foster, *Science and the Precautionary Principle in International Courts and Tribunals*, p. 123.
\item \textsuperscript{265} See e.g. the practice of ITLOS (see Chapter 9) and more generally: Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 298.
\end{itemize}
the assessment of scientific evidence. For instance, experts may be asked to comment on their expert opinions on a more general context, without prejudice to the given case, or judges may instruct party-appointed experts to prepare a joint report setting out their points of agreement or disagreement.\textsuperscript{266}

Despite all the complexities of judicial fact-finding, consensus is emerging among scholars to urge courts and tribunals to assume an active role in grasping the scientific dimension of disputes and to seeking expert opinions when needed.\textsuperscript{267} It is also suggested that a greater involvement in scientific fact-finding fits within the capabilities of international adjudicators.\textsuperscript{268} No less an insider than Judge Bruno Simma, writing extra-judicially, encouraged international judges \textit{“not to remain passive, rather to display greater readiness to use, indeed exhaust”}\textsuperscript{269} their various fact-finding powers.

\subsection*{2.3 Related evidentiary issues: the standard and burden of proof}

The chosen standard of proof signals the level of probative evidence that is required by the given forum to deem a certain claim established.\textsuperscript{270} The standard of proof may vary between a more lenient ‘more likely than not’ standard, which is often referred to as the preponderance of the evidence, and much higher standards of proof. The most well-known among the latter is the ‘beyond reasonable doubt’ standard. International judicial fora rarely announce their applicable standard of proof, though it appears that generally the standard corresponds to the ‘preponderance of the evidence’.\textsuperscript{271} Rüdiger Wolfrum points out the subjectivity inherent in finding the standard of proof established in a given case. He explains that \textit{“the decision of each judge to be convinced, or not to be convinced, by the evidence submitted embraces a subjective element [...] influenced by past experience and, probably, the professional \textsuperscript{272}}

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\textsuperscript{266} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 79.
\textsuperscript{268} Foster, ‘The Consultation of Independent Experts by International Court and Tribunals in Health and Environmental Cases’, 392.
\textsuperscript{269} B. Simma, ‘The International Court of Justice and Scientific Expertise’ (2012) 106 ASIL 230–33 at 232.
\textsuperscript{270} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 223.
\textsuperscript{271} Wolfrum, ‘Taking and Assessing Evidence in International Adjudication’, p. 354.
\end{footnotesize}
or other background of each judge.” As addressed later on in greater detail, this subjectivity works against uncertain facts of science and constitutes the Achilles heel of proving science-intensive environmental claims.

Rules of burden of proof are devised by courts to allocate the risks of possible errors in fact-finding on one of the parties. As to the burden of proof, generally, the *actori incumbit probatio* principle applies. This generates particular repercussions for the applicants’ chances of success in bringing environmental claims based on uncertain or incomplete scientific data. For this reason numerous scholarly suggestions have been put forward favoring a reversal of the burden of proof. One of the most elaborate accounts was provided by Caroline E. Foster, who suggested the reversal of the burden of proof for giving effect to the precautionary principle. Such a proposal, however, can only have a limited reach having the ICJ firmly rejected such a proposition in the *Pulp Mills* judgment. Adjudicative bodies tend not to alter the rules of the burden of proof even when the parties are in asymmetry as to their ability to produce relevant evidence.

3. Causal inquiry

Scientific facts generate idiosyncratic problems with respect to causation, which give rise to unique judicial techniques adjusting the extent to which scientific evidence may be relevant for the causal inquiry. Causal inquiry is particularly suitable to showcase the intricacies of judicial engagement with science for a host of reasons. First, causal links are a prerequisite for establishing international liability for environmental harm, therefore they often become subject to international litigation. Second, causality is among the very few questions of law, which actually “necessitate[s] the prior establishment of scientific facts.” Therefore, one may expect that judges would inevitably confront this science-intensive element during adjudication. Third, causality well displays the frictions between legal and scientific

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277 *Pulp Mills* case, Judgment, para. 164.
concepts given that the term carries fundamentally different attributes and requirements in law and in natural sciences, which has been discussed earlier in this Chapter. For all these reasons, causation serves as a litmus test for adjudicators’ scientific engagement, given that in scientifically correct terms, causal links “can only be established by a thorough understanding of the underlying science”.  

3.1.1 Causality in international law

Scholarly literature is virtually silent on the causal requirements and causal tests applicable in international law. International judicial bodies also address the issue of causation in broad brushstrokes, which often leads to inconsistent causal requirements and implicit causal inquiry. The disturbing absence of clarity in jurisprudence generates considerable frustration in those who seek to identify consistent rules and requirements of causal inquiries of international courts. As put forth by the perhaps two most eminent commentators on causation, Tony Honoré and H.L.A. Hart, “causation in the law is less a concept to be analysed than a ghost to be exorcized.” Though they were writing about causation in the law generally, the metaphor also holds true for causation problems in international law more specifically.

Causal requirements are not addressed explicitly either among rules of State responsibility. Article 31(1) of Articles on Responsibility of States for Internationally Wrongful Acts (“ARSIWA”) only provides that full reparation is due for the injury ‘caused’. The ILC has been repeatedly criticized for such brevity. As will be seen later in Chapter 3, similarly opaque are the causal requirements of the no harm rule, which imposes a due diligence obligation on States under customary international law not to cause significant transboundary environmental harm.

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281 Perhaps the single detailed account is provided by Ilias Plakokefalos, Causation in the Law of State Responsibility and the Problem of Overdetermination: In Search of Clarity, 26 EUROPEAN JOURNAL OF INTERNATIONAL LAW 471–492, 471–492 (2015); The paucity of scholarly opinions regarding causality in international law was also noted by Michael Straus, Causation as a Element of State Responsibility, 16 LAW & POL’Y INT’L BUS. 893, 893 (1984).
282 Hart and Honoré, Causation in the Law, p. 3.
Given the absence of explicit international law rules, it comes as no surprise that causal discussions in international law much rely on national tort law concepts. Building on common-law tort rules, international law also conceives the causal inquiry as a two-step analysis. First, factual causation needs to be established, which aims to ascertain a causal link between the causes and its consequences. Common-law torts apply the *sine qua non* or ‘but-for’ test for the factual causation inquiry. The but-for tests regards a conduct as a ‘cause’ if absent the conduct, the harm would not have occurred. With a view to the blind spots of this but-for test, the ‘substantial factor’ test is used as an alternative in some domestic laws, which corresponds to the Necessary Element of a Sufficient Set test that was developed by tort law scholars. These alternative tests are useful for identifying factual causes when no ‘but-for’ cause can be identified. An apposite everyday example for causes that fall short of the but-for test, but nevertheless have appreciable causal role can be illustrated through a simple majority vote. Out of the five participants, four cast an affirmative vote, therefore, the vote is successful with a simple majority. However, none of the votes alone would be a but-for cause of the action they have just decided. In contrast, under the substantial factor test the affirmative votes would qualify as a ‘cause’ of the action voted for.

Having established the factual causes of an injury, in the second step of the causal inquiry courts delineate the scope of responsibility through concepts of remoteness, foreseeability or proximity. For one may not be held liable for every material consequence flowing from its acts, certain factors limiting the scope of liability are necessary.

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287 R. W. Wright, ‘Causation, responsibility, risk, probability, naked statistics, and proof: Pruning the bramble bush by clarifying the concepts’ (1987) 73 Iowa L. Rev. 1001 at 1019. Wright explains that under the NESS test “a particular condition is a cause of (contributed to) a specific result if and only if it was a necessary element of a set of antecedent actual conditions that was sufficient for the occurrence of the result”.
3.1.2 Causal links based on uncertain scientific facts: uncertain causation

The question whether a certain conduct can be regarded as the cause of a harmful outcome is thus not a simple scientific and/or factual issue. Law on causation sets forth different causal tests, given that causal requirements are not necessarily the same in relation to every breach but may vary among the fields of international law.\(^\text{289}\) Causality thus should be conceived more as a mixture of factual inquiry and policy considerations. Policy marks a wide variety of considerations that courts do weigh when deciding about the limits of responsibility.\(^\text{290}\) Such considerations become all the more understandable in a view of the fact that the ultimate function of causal inquiry is to “blame” the result on some of the actors involved.\(^\text{291}\) Any analysis appraising causality should be mindful of the fact that causation is a “legal construct” designed “to integrate expert judgments about the plausibility of a particular causal story with law’s normative interest in deciding which kinds of stories are best for society.”\(^\text{292}\)

The causal inquiries of international courts and tribunals vary greatly, just like their tendencies to find a causal claim established. The judicial handling of causation involving uncertain science will in the forthcoming chapters serve as a litmus test for appraising the willingness of international judicial fora to engage with the scientific aspects of environmental cases.

Causation theories are often disrupted by uncertain causation (also referred to as “causal uncertainty”, \(^\text{293}\) “indeterminate causation”, \(^\text{294}\) and “causal indeterminacy” \(^\text{295}\)), that is, our incomplete knowledge about “the empirical causal

\[^{290}\text{Hart and Honoré, Causation in the Law, p. 103.}\]
\[^{292}\text{Jasanoff, Science at the Bar, p. 119.}\]
\[^{293}\text{Steel, Proof of Causation in Tort Law, p. 5.}\]
\[^{294}\text{J. Paterson, ‘Law’s Approach to Harm under Uncertainty’ in R. Goldberg (ed.), Perspectives on Causation, (Oxford and Portland, Oregon: Hart Publishing, 2011), pp. 383–408 p. 385. Paterson uses the term in a narrower sense, as a reference to the scenario when the plaintiff’s harm and the defendants’ breach of duty are established; however, it is not possible under the current state of scientific knowledge to determine with the balance of probability which of the defendants was the actual cause of the harm. This scenario combines two problems, defendant indeterminacy and the threshold of burden of proof.}\]
“truth” in the given case. This phenomenon is ubiquitous in all tort situations and is in no way unique to environmental cases. Causal uncertainty typically arises from the multiplicity and similarity of possible causes; the passage of time which impedes gathering relevant evidence; unobservability of causation; incomplete knowledge of causal mechanisms; the counterfactual nature of causation; human error, especially that of experts, which has obvious repercussions on expert evidence; and the costs of obtaining causal knowledge in a given legal proceedings. This list of difficulties in itself illustrates the considerable challenges posed for adjudicators’ science-intensive causal inquiry.

4. Standard and extent of judicial review

The fourth aspect of judicial engagement with science that will be examined throughout this dissertation is the standard and extent of review. The extent of review describes the intrusiveness of the chosen standard. Relying on more intrusive standards yields more extensive judicial reviews. And as will be shown below, more extensive judicial review will ultimately extend the scope of the adjudicatory purview.

4.1 Quest for an appropriate standard of review: how much deference courts ought to grant States?

In the context of international law, the applicable standard of review is seen as a procedural mechanism, which determines the “intensity of international judicial scrutiny” and, thus, determines “the extent of discretionary powers enjoyed by national authorities in making certain decisions.” In international adjudication, the standard of review functions as a mechanism for the distribution of powers between

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297 Steel provides a detailed analysis of these sources. Steel, *Proof of Causation in Tort Law*, pp. 7–10.
supranational judicial organs and States, by striking a balance between “competences conceded” to international bodies and “competences retained” by sovereigns.\(^\text{301}\) In the context of cases that will be examined in the upcoming chapters, judicial scrutiny, and the corresponding standard of review, typically concerns factual determinations \(i.e\). whether “a national measure is supported by sufficient evidence”.\(^\text{302}\) This is most typical in the judicial scrutiny of scientific risk regulation decisions, where adjudicators interrogate the correlation between a normative decision and its factual scientific basis.\(^\text{303}\) In this context specific challenges arise when a court of law is asked to distinguish valid ‘scientific’ claims from ‘non-scientific’ claims in which science serves only as a pretext.

The applicable standard of review may spread across a theoretical spectrum between two extremes: de novo review and total deference. Between these two, there are many formulations ranging from more intrusive tests to less intrusive ones.\(^\text{304}\) The upcoming chapters will detail the varying degrees of deference that international courts and tribunals tend to grant States in environmental cases. The de novo standard of review entrusts an additional actor, typically a judicial organ,\(^\text{305}\) with reviewing the initial determinations of national level decision-making authorities or primary judicial assessors. While more deferential standards would grant States certain latitude or discretion in making their own determinations.

According deference to sovereign primary decision-makers is an established practice of international courts and tribunals.\(^\text{307}\) The deferential approach in international litigation is usually distinguished from the also deferential national standards of review.\(^\text{308}\) The need for a deferential review by international courts is justified by a number of factors, \(e.g\). democratic legitimacy of primary decision-makers, or the allocation of powers between sovereigns and international courts. In an


\(^{303}\) Gruszczynski and Werner, 'Introduction’, p. 2.


\(^{305}\) Gruszczynski, ‘Standard of Review of health and environmental regulations by WTO panels’, p. 733.


\(^{308}\) See \(e.g\). the ISDS tribunal’s award in the Glamis Gold Ltd. v. U.S. case, Award of June 8, 2009, para 617. The tribunal rejected the respondent’s argument that a deferential standard of review is readily transferable from U.S. and Canadian law to international investment arbitration.

\(^{309}\) Gruszczynski and Werner, 'Introduction’, p. 2.
environmental law context, the apparent “push for deference” is normally explained with the absence of scientific expertise on the bench, which makes the judicial review of science-based decisions problematic from a legitimacy point of view.

Critics of a too deferential review point out that granting wide margin of appreciation to States would in fact enlarge sovereignty of a particular State to “encroach upon the sovereignty” of others. The dangers of a deferential judicial review is particularly relevant in the present inquiry as appealing to the authority of science may be used in certain cases to mask States’ political interests. In such cases, if adjudicators demonstrate self-restraint and adopt a deferential judicial approach to reviewing science-based claims they, in fact, would rubber stamp States’ political motivations disguised as science. Such fears appear to be legitimate if one considers either environmental risk regulation, where the often politicized nature of risk assessment decisions have now become well-known, or claims of ‘scientific’ research by a State seeking to insulate its whaling program from judicial review.

4.2 Extent of review and corresponding scope of the judicial purview

Different standards of review entail different boundaries for the judicial review and therefore endorse different scope for the judicial purview. Adjudicators’ approach to the boundaries of their inquiry will impact the ways and extent to which scientific arguments will be included in the judicial assessment and reasoning. As will be seen later in the analysis of each court and tribunal, certain judges are more inclined to perceive the law–science boundary as an impermeable wall, while others are more willing to identify some benchmarks based on which they can engage with the underlying scientific facts while exercising their judicial function.

The cognitive authority of science is often referred to as a reason for narrowing the scope of judicial task. In the extreme, litigants and even some international judges argue for the non-justiciability of science-intensive concepts. On

the contrary, there are a growing trend in the practice of international fora to evaluate concepts where law and science are closely interwoven. As explained by Judge Keith, a proponent of a more activist approach to the judicial task in the Whaling case, scientific concepts can be appraised from the law’s perspective given that “[The Court] does have the role of assessing ... the evidence to see whether it demonstrates coherent scientific reasoning supporting central features of the programme.”

At the end of the day, the purview of adjudication is a matter of judicial choice and it depends on judges’ willingness “to apply judicial mind to scientific data” in order to grasp and evaluate the complexity of these interlinked issues. The overview of international adjudication will reveal that the judicial purview in interpreting intertwined concepts of science and law is far from being settled as adjudicatory bodies develop divergent practices and tests to delineate the boundaries of judicial inquiry. Borrowing the words of Judge Keith, “such tests [...] become clearer as they are applied to the facts in issue”. In the following chapters we shall see how the different tests and strategies of scientific engagement play out in the practice of relevant international adjudicatory bodies.

VI. Interim conclusion

This chapter provided a general introduction to the epistemic and doctrinal difficulties of using science in an adjudicatory setting to lay ground for a comparative legal assessment of judicial engagement with science in international adjudication. This chapter introduced the basic judicial dilemmas surrounding the different framings of science-intensive disputes, various scientific fact-finding methods, causal tests, and standards of review. Lastly, the basis elements of the comparative framework were discussed, at this point, with a narrow focus on the main theoretical concepts. Now we shall turn to the actual practice of the eight international courts and tribunals that will be a subject of this comparative assessment.

315 Whaling case, Judgment, Declaration of Judge Keith, para. 8.
317 Whaling case, Judgment, Declaration of Judge Keith, para. 8.
Chapter 3
Evolving practices of scientific engagement in the environmental case-law of the
International Court of Justice

“In sum, the Court has missed a golden opportunity to demonstrate its ability to approach scientifically complex disputes in a state-of-the-art manner,” \(^{318}\)
Judge Al-Khasawneh and Judge Simma

I. Environmental disputes appear on the Court’s docket

This chapter investigates the ways in which questions of natural sciences appear before the International Court of Justice (“Court” or “ICJ”) and analyzes the judicial techniques dealing with scientific arguments in international environmental adjudication. State parties on both sides increasingly rely on highly technical and detailed expert analyses to offer interpretation on the scientific aspects of cases involving environmental risks and harm. Accordingly, one may expect that scientific arguments would have a decisive role in deciding environmental cases. Yet a closer look reveals that scientific arguments are often downplayed or even marginalized by the ICJ in the adjudicatory process.

If one includes the predecessor of the ICJ, the Permanent Court of International Justice (“PCIJ”) in the scope of this inquiry, the appropriate point of departure to study environmental jurisprudence would be the dispute concerning the Diversion of Water from the Meuse, \(^{319}\) decided by the PCIJ in 1937. The Netherlands initiated the proceedings against Belgium for the unilateral diversion of the water through the Albert Canal. In its counterclaim, Belgium alleged that the Netherlands committed an earlier breach by building locks. The PCIJ provided a narrow reading of the case and found that neither party was in breach of their obligations under the bilateral 1863 Treaty regime. The noteworthy aspect of the case for the purposes of

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318 Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, Pulp Mills case, Judgment.
the present analysis is that the PCIJ, for the first time in its history, arranged for a site visit to the locks in question.\textsuperscript{320}

Despite the fact that even early decisions\textsuperscript{321} of the ICJ contributed to the development of environmental law norms, the first strict sense environmental dispute has only been referred to the Court in 1993 in the \textit{Certain Phosphate Lands in Nauru} case. The fact that States have started bringing their disputes concerning alleged environmental harm to the ICJ has been attributed by commentators to the repercussions of the Stockholm process leading to increased environmental awareness of States.\textsuperscript{322} The \textit{Nauru} dispute has ultimately been settled out of court.\textsuperscript{323} It was followed by the \textit{Nuclear Tests} case, which involved claims of harm caused to Australia’s territory by nuclear fall-out of French atmospheric nuclear tests.\textsuperscript{324} The case did not reach the merits phase, since the Court found that the claim had no longer any object.\textsuperscript{325} The Court in its admissibility and jurisdiction judgment firmly refrained from “expressing any views”\textsuperscript{326} on the opposing scientific views concerning the harmful consequences of nuclear testing. It nevertheless noted that the UN Scientific Committee on the Effects of Atomic Radiation has recorded measurable quantities of radioactive matter throughout the world on account of nuclear testing. Yet when it was facing France’s allegations that its own tests had generated only “infinitesimal” quantities of radioactive matter, the Court deferred these questions to the merits phase.\textsuperscript{327} One may only guess how the Court would have handled these scientific dimensions had it reached its discussion.

\textsuperscript{321} The \textit{Corfu Channel case (U.K. v. Albania)} 1949 I.C.J. Rep 4. (Apr. 9.) and the \textit{Barcelona Traction, Light and Power Company, Limited case (Belgium v. Spain)} 1970 I.C.J. Rep 3, 32 (Feb. 5.) were relevant for the purposes of the subsequent development of international environmental law norms. The former declared due diligence obligations of States, while the latter announced the existence of erga omnes obligations, both of which are important normative development for international environmental law. For a more detailed discussion on the relevance of these early decisions see J. E. Vinuales, ‘The Contribution of the International Court of Justice to the Development of International Environmental Law: A Contemporary Assessment’ (2008) 32 Fordham Int’l LJ 232 at 236–44.
\textsuperscript{322} G. Kecskés, ‘A Nemzetközi Bíróság ítélekezési gyakorlata a környezet tárgyú ügyekben’ (2015) LVI Állam- és Jogtudomány 55–79 at 60.
\textsuperscript{323} \textit{Certain Phosphate Lands in Nauru}, (Nauru v. Australia), settled by the parties, Order of 13 September 1993.
\textsuperscript{325} \textit{Nuclear Tests} case, Judgment.
\textsuperscript{326} \textit{Nuclear Tests} case, Judgment, para. 18.
\textsuperscript{327} \textit{Nuclear Tests} case, Judgment, para. 18.
As late as in 1995, during the aftermath of the Nuclear Tests case, Judge Weeramantry in a passionate Dissenting Opinion still criticized the Court for remaining silent on “the evolving corpus of international environmental law”. The proceedings initiated by New Zealand’s Request for an Examination of the Situation would have equally provided ample opportunity for the Court to elaborate on its approach to scientific facts. Facing the risks of France’s underground nuclear tests on the Mururoa atoll, New Zealand filed an application requesting the Court to examine pursuant to paragraph 63 of the judgment of the Nuclear Tests case whether France had complied with its earlier commitment to cease its nuclear weapons tests in the South Pacific. New Zealand based its application essentially on a growing body of scientific evidence pointing to the direction that French underground nuclear explosions were compromising the atoll’s structure and threatening with long-term leakage. However, all these aspects were again not entertained by the Court as it ruled that the matters raised were outside the scope of paragraph 63 of its earlier judgment. Yet again, the ICJ maneuvered in a way that it did not need to touch upon contested scientific arguments.

Shortly after the Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons discussed some important concepts relating to international environmental law (e.g. the no-harm rule, the interests of future generations, etc.), though not in a contentious context. The Kasikili/Sedudu Island case also touched upon issues of environmental law, however, its subject matter concerned maritime delimitation and not an environmental dispute, therefore, it falls out of the scope of this analysis.

The turning point in the Court’s practice in resolving environmental disputes has arrived with the Gabčíkovo-Nagymaros case in 1997, which was the first environmental dispute decided by the Court on the merits. Since then, we witness a steady increase in the number of environmental disputes referred to and decided by

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329 Request for an Examination of the Situation case, Judgment.
330 Request for an Examination of the Situation case, Judgment, paras. 26-45.
331 Foster, Science and the Precautionary Principle in International Courts and Tribunals, pp. 56–58.
332 Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons, 1996 I.C.J. Reports 266 (July 8), para. 29.
334 Gabčíkovo-Nagymaros Project case (Hungary/Slovakia), 1997 I.C.J. Reports 7 (Sept. 25.).
the Court, such as the *Pulp Mills case* (2010),\(^{335}\) the *Aerial Herbicide Spraying case*\(^ {336}\) (referred to the Court in 2008 and settled by the parties in 2013\(^ {337}\)), the *Whaling case* (2014),\(^ {338}\) the *Certain Activities and Construction of a Road* joint cases (2015),\(^ {339}\) where the Court also issued interim measures,\(^ {340}\) and a compensation judgment.\(^ {341}\) Currently the *Dispute over the Status and Use of the Waters of the Silala* is pending before the ICJ (referred to the Court in 2016).\(^ {342}\)

An initial eagerness of the Court to deal with environmental disputes is signaled by the creation of a Special Environmental Chamber in 1993.\(^ {343}\) However, the Chamber has never been used given the lack of cases referred to it and in 2006 the Court decided not to hold elections for the bench of that chamber.\(^ {344}\) Tellingly, this move squares well with the Court’s more recent unwillingness to engage in depth with the environmental aspects of disputes, which will be discussed in more detail below.

1. **Scientific aspects of environmental cases brought before the Court – the ways in which scientific questions become legally relevant**

Perhaps the most salient way in which scientific dimensions of environmental disputes become legally relevant lies in the context of international responsibility for

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\(^{335}\) *Pulp Mills case*, Judgment.

\(^{336}\) *Aerial Herbicide Spraying case* (Ecuador v. Colombia), Order of 13 September 2013, I.C.J. Reports 2013, 278. ("Aerial Herbicide Spraying case").

\(^{337}\) *Aerial Herbicide Spraying* case, Order of 13 September 2013.

\(^{338}\) *Whaling* case, Judgment.

\(^{339}\) *Certain Activities Carried out by Nicaragua in the Border Area* (Costa Rica v. Nicaragua) and *Construction of a Road in Costa Rica along the San Juan River* (Nicaragua v. Costa Rica), Judgment, I.C.J. Reports 2015, 665 (Dec. 16.) ("Certain Activities and Construction of a Road joint cases").


\(^{341}\) *Certain Activities* case, Judgment on compensation, 2 February 2018, General List No. 150 ("Judgment on compensation").

\(^{342}\) Case Concerning the Dispute over the Status and Use of the Waters of the Silala (Chile v. Bolivia) instituted on 6 June 2016.


\(^{344}\) See the website of the ICJ overviewing the standing committees and chambers and those that have not been reconvened [http://www.icj-cij.org/en/chambers-and-committees](http://www.icj-cij.org/en/chambers-and-committees)
environmental harm. In such a context, factual issues of harm and causation are necessary though not sufficient prerequisites of finding a breach of the no-harm rule.

On the other hand, absent manifest ecological damage, scientific arguments could still emerge while describing environmental risks that may become legally relevant either in the context of an Environmental Impact Assessment (“EIA”) obligation or as possible grounds for invoking circumstances precluding wrongfulness, i.e. invoking the state of ecological necessity or distress. The legal standards for invoking ecological necessity lied at the heart of the Gabcikovo-Nagymaros case, whereas the question of environmental risks triggering an EIA obligation was entertained in the Pulp Mills as well as the Certain Activities and Construction of a Road cases. These will be addressed in more detail later in this chapter.

Furthermore, rights and obligations enshrined in Multilateral Environmental Agreements may become subjects of legal disputes, in which scientific arguments will be of relevance for interpreting certain provisions. Perhaps the most well-known treaty-based environmental claim with significant scientific aspect was filed in the Whaling case. This dispute zeroed in on the criteria due to which a State-funded whaling program can be regarded as being conducted ‘for purposes of scientific research’.

Thirdly, judges also typically confront scientific claims in the process of fact-finding. In order to evaluate legal claims supported with scientific arguments, judges need to assess scientific proofs of i.a. environmental harm, risk, and causation.

Lastly, science is also present in environmental disputes in more subtle ways. Given that the growing scientific understanding is an important factor in triggering formation of new international environmental law norms, science to a certain extent underlies all disputes relating to the environment. In Gabcikovo-Nagymaros, the Court expressly noted that “new scientific insights” gave rise to “new norms and standards”. These science-induced norms were those, which necessitated, in the Court’s view, that the parties “look afresh at the effects on the environment” and seek to reinterpret the original text of the 1977 Treaty in order to allow environmental

For a detailed commentary on the relevant cases see: P. Kovács, Nemzetközi közjog (Osiris, 2016) pp. 775–78; B. Majtényi, A környezet nemzetközi jogi védelme (Eötvös Kiadó, 2012).

Gabcikovo-Nagymaros case, Judgment, paras. 49-58.

Gabcikovo-Nagymaros case, Judgment, para. 140.

Gabcikovo-Nagymaros case, Judgment, para. 140.
objectives to be respected. This suggests that our growing scientific understanding of the impact of human activities on the environment can influence the ways in which the ICJ interprets existing legal obligations.

The ways in which the Court engages with the scientific dimension of environmental disputes will be analyzed with respect to four aspects of dispute resolution: (i) the framing of the dispute i.e. what questions are deemed legally relevant to resolving the dispute and how scientific aspects are carved out from the judicial inquiry; (ii) the Court’s fact-finding methods, i.e. by examining the extent to which judges rely on scientific expert evidence in their decision; (iii) the causal inquiry, i.e. the extent to and ways in which science is considered in establishing causal links; and finally (iv) the standard of review in cases of scientific claims. Each of these aspects now will be addressed in turn.

II. Framing science-intensive disputes: carving out science from the judicial inquiry

Given the myriads of different ways in which legally relevant questions may be identified and reconstructed from the facts of a case, it comes as no surprise that competing framings of the same legal conflict are not only possible but may also be inevitable. A closer look at the environmental case-law of the ICJ suggests that the presence of scientific facts and arguments fundamentally impacts the ways in which judicially relevant issues are selected and in which the judicial inquiry is framed. The epistemic authority of science impacts not only the Court’s reasoning, but also the willingness of the parties to submit their science-based dispute to a court of law. Examples for both will be discussed in this section.

Ever since the Enlightenment, science often appears as a source of objective and factual truth, which yields epistemic authority to decisions supported by it. This has a two-fold consequence for the judicial process. On the one hand, the autonomous and objective nature of scientific arguments may deterrent the parties from having recourse to adjudication, where such arguments would deprive them of influencing

349 Gabcikovo-Nagymaros case, Judgment, para. 142. With the wording of the judgment: “What is required in the present case by the rule of pacta sunt servanda, as reflected in Article 26 of the Vienna Convention of 1969 on the Law of Treaties, is that the Parties find an agreed solution within the cooperative context of the Treaty.”
judges’ perception of the key aspects of the dispute. This translates to frequent out of
courts settlements in science-intensive cases brought before the ICJ. On the other
hand, scientific justifications may appear as a convenient source of authority to the
judges, which can be called for as a final arbiter of intricate and highly sensitive
questions.

A typical reaction of ICJ judges to the entering of scientific arguments to
disputes is carving out science from the legal inquiry. This is manifest in four
different ways. First, in the Court’s willingness to refer science-heavy and sensitive
economic and political questions back to the parties’ negotiations. Second, in the
Court’s decision to evaluate risk assessment criteria of the Environmental Impact
Assessment (“EIA”) obligations based on non-scientific criteria, thereby carving out
science from the relevant aspects.

Third, in the majority of cases procedural obligations dominate the legally
relevant aspects of disputes. It is noteworthy that in Pulp Mills, Uruguay has been
found in breach of a procedural obligation to inform and notify affected parties,
whereas all claims concerning substantive breaches have been dismissed.350 Similarly,
in the Certain Activities and Construction of a Road judgment, claims concerning
significant transboundary harm were dismissed, and only a procedural violation has
been found on part of Costa Rica, namely, a failure to conduct a proper EIA.351 Some
ICJ judges argue that this is because procedural obligations are more concrete
compared to abstract substantive obligations.352 While this position undoubtedly holds
true, in light of the apparent reluctance of the ICJ to engage in meaningful scientific
fact-finding and causal inquiry, it is argued that procedural obligations allow judges to
decide cases more comfortably as they are less science-heavy aspects of the dispute.

Fourth, the Court tends to frame its causal inquiry to emphasize the
uncertainties inherent in the underlying evidence and it finds them as an
insurmountable obstacle to establish causality. The Court’s haphazard assessment of
the scientific aspect of causal claims results in the rejection of such links with brief
explanations that lack meaningful references to the scientific evidence adduced.

Finally, some ICJ judges seem to react to the uncertainties inherent in science
in an asymmetric way. Lawyers are normally not familiar with the conventions and

351 Certain Activities and Construction of a Road cases, Judgment, para. 229.
352 Pulp Mills case, Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, para. 26.
processes of scientific knowledge production, which entails that legally trained adjudicators are sometimes skeptical about the reliability and unbiased nature of scientific arguments. Some judges may assume political considerations behind environmental arguments that are based on uncertain science. The Dissenting Opinion of Judge Oda in the Gabcikovo-Nagymaros case appears to provide an example of that. Judge Oda first asserts that "it cannot be said that the drafters of either the Treaty or of the Joint Contractual Plan failed to take due account of the environment". This assumes that Judge Oda does not question the credibility and scientific soundness of the claims made by leaders of the respective Communist Parties, concluding the 1977 Treaty, who negated all scientific concerns pertaining to the project despite having no detailed prior EIA. In the following sentence, Judge Oda voices his "firm conviction" that concerns about environmental risks raised by environmental opposition groups in Hungary were without merit. A judicial decision that suspects political bias with regard to certain scientific claims but refutes those in case of other scientific assumptions without any in-depth assessment of the respective claims might be vulnerable to criticism. At a minimum, it appears to be arbitrary from an epistemic point of view.

I shall now turn to analyze some of these trends in greater detail.

1. The parties’ approach towards science: settling science-heavy claims out of court

Saliently, all international claims concerning solely alleged substantive breaches of the no-harm obligation were settled out of court. Given that diverse factors may motivate such a decision, attributing the parties’ settlement in a given case to a single cause may be impossible or even misleading. Nevertheless, from an analytic point of view, there are many reasons inherent in science-heavy claims that may induce the parties to reach a settlement.

354 Gabcikovo-Nagymaros case, Judgment, para. 57.
355 The Certain Phosphate Lands in Nauru case, the Aerial Herbicide Spraying case entertained only substantive claims of ecological damage and were all settled. Subsequent cases that included alleged violations of substantive as well as procedural obligations (Pulp Mills and Construction of a Road and Certain Activities in the Area cases) were decided on the merits by the Court, however, no violation has been found with regard to substantive obligations.
First, the absence of universally accepted definition of actionable ‘environmental damage’\(^{356}\) entails that there is no settled scope for compensable harm in international environmental lawsuits. Second, not only is there a considerable difference in the possible coverage of the definition on ‘environmental harm’\(^{357}\) there is also a variety of scientific methods for valuing environmental harm,\(^{358}\) which taken together engender a great deal of uncertainty surrounding ecological damage calculations. Certain methods that seek to capture the entirety of loss of ecosystem services may even suggest astronomical amounts of damages.\(^{359}\) These inherent ambiguities in ecological damage quantification may create an additional incentive for respondent States to settle claims of ecological damage.

This is of course not to imply that the complexities of science involved in these claims, coupled with corresponding fear of losing control over these claims, alone moved States to settle such claims. One should be mindful of the diplomatic and political sensitivities\(^{360}\) usually involved in liability cases. However, considerations of uncontrollable scientific complexities do appear to play a significant role in motivating settlements. Commentators have earlier noted with respect to the *Gut Dam Arbitration* between the U.S. and Canada that fears of allowing the adjudication of causal issues was the main motivation behind the out of court settlement.\(^{361}\)

Chronologically first in line among the disputes submitted to the ICJ, Australia settled claims with Nauru filed for irreparable damage caused to Nauruan territory by phosphate mining activities, by Australia the then trustee of these lands. Nauru claimed that the failure of Australia to enact any measure to rehabilitate mined-out lands breached its international law obligations.\(^{362}\) Upon settlement, Australia


\(^{359}\) Certain Activities case, Judgment on compensation, 2018, para. 57.

\(^{360}\) See e.g. with regard to the *Aerial Herbicide Spraying* case, analyzed later.

\(^{361}\) Lefeber, *Transboundary Environmental Interference and the Origin of State Liability*, pp. 90–91. The dispute concerned an unexpected increase in water levels along the St. Lawrence River on U.S. territory, which was attributed by U.S. citizens who suffered extensive property damage to a Dam built decades ago by Canada upstream on the River. See more on the dispute in Romano, *The Peaceful Settlement of International Environmental Disputes A Pragmatic Approach*, p. 31.

\(^{362}\) Application of Nauru, filed on 19 May 1989, paras. 42-48.
paid AU USD 107 million for compensation\textsuperscript{363} for the vast environmental damage that left 80 percent of Nauru’s territory barren.\textsuperscript{364}

The second instance when the parties opted to settle their claims of environmental damage – right before they could have been assessed by the Court on the merits – was in the \textit{Aerial Herbicide Spraying} case.\textsuperscript{365} Ecuador filed treaty-based\textsuperscript{366} claims against Colombia for aerial spraying of toxic herbicides across their shared borders. The spraying has allegedly “\textit{already caused serious damage to the environment}” and to the health of affected populations, and “\textit{pose[d] a grave risk of future damage}” on the territory of Ecuador.\textsuperscript{367} Commentators held high hopes that the Court would finally seize the opportunity to resolve an inter-state environmental liability claim, and in so doing would clarify the content and enforceability of key environmental law norms.\textsuperscript{368} Judging by the Application, which contained numerous references\textsuperscript{369} to scientific evidence of harm already occurred, and addressed the carcinogenic potential of herbicide use, the case indeed provided a strong call for judicial engagement with scientific fact-finding.\textsuperscript{370} The parties however decided, at a later stage, to settle the claims. In a bilateral agreement they set up an exclusion zone free from spraying to prevent any contamination from drifting to Ecuadorian territory.\textsuperscript{371}

With respect to the \textit{Aerial Herbicide Spraying} case, one should bear in mind that Ecuador alleged that Colombia’s herbicide spraying program targeted illicit coca and poppy plantations, and that Colombia refused to disclose even the chemical composition of the used herbicide.\textsuperscript{372} An international court proceedings concerning such claims would have required disclosing of such data in the spotlight of international attention. Avoiding such repercussions could have been an equally strong motivation for Colombia to settle.

\textsuperscript{365} \textit{Aerial Herbicide Spraying} case.
\textsuperscript{366} The ICJ’s jurisdiction in this case rested on the Pact of Bogotá to which both States are parties. See Foster, ‘New Clothes for the Emperor?’, 150.
\textsuperscript{367} Application of Ecuador, filed on 31 March, 2008, para 2.
\textsuperscript{368} Vinuales, ‘Contribution of the International Court of Justice to the Development of International Environmental Law’, 255.
\textsuperscript{369} Application Instituting Proceedings by Ecuador, 31 March 2008, paras. 13-23.
\textsuperscript{370} C. E. Foster, ‘New Clothes for the Emperor? Consultation of Experts by the International Court of Justice’ (2014) 5 139–73 at 151.
\textsuperscript{371} \textit{Aerial Herbicide Spraying} case, Order of 13 September 2013, 279.
\textsuperscript{372} Application of Ecuador, para. 3.
Against this background, any effort would be futile to guess whether the currently pending Silala case would reach the merits phase. This case features an international water dispute over a shared resource, which also involves claims of environmental harm and corresponding responsibility. Currently, we are waiting for the parties’ positions to be submitted, which are due in July 2018. The fate of these claims would provide further hints about the dynamics of adjudicating substantive environmental damage claims.

2. Judicial avoidance of deciding science-heavy aspects of disputes – mandating the parties’ negotiations

It is not at all newsworthy that the ICJ remains cautious in evaluating highly politicized and sensitive claims of sovereign States. ‘Judicial economy’ has long characterized the Court’s adjudication, that is, a tendency to narrow the scope of its judgment to the extent possible, and thereby to avoid elaborating on contested issues that are not deemed essential to decide the dispute at hand.

Though it is an established practice of the Court in various types of claims, yet the presence of science-heavy arguments appears to be a considerable impetus for the exercise of judicial economy. Commentators have also noted the apparent efforts made by judges in the Gabcikovo-Nagymaros case to “acrobatically avoid” the substantive, ecological aspect of the dispute. While deciding about issues of state succession, treaty law, and state responsibility, the Court saliently stopped short of mandating a reasonable and equitable allocation of the waters of the Danube, just

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373 The Application was filed with the Court on 6 June 2016.
374 Chile in its Application assert her right to equitable and reasonable utilization of the waters of the Silala River system and claims that Bolivia is under an obligation to prevent pollution and other forms of harm resulting from activities on Bolivian territory, most importantly from a construction of a military post. Application of Chile filed on 6 June 2016, paras. 49-50.
375 The Court in its Order of 1 July 2016 has fixed the time-limits for the filing of the memorial of Chile (3 July, 2017) and the counter-memorial of Bolivia (3 July 2018). As of August 2017, no such submissions have been disclosed by the Court.
376 Palombino, ‘Judicial economy and limitation of the scope of the decision in international adjudication’, 922.
379 Gabcikovo-Nagymaros case, Judgment, para. 140. The parties “must find a satisfactory solution for the volume of water to be released into the old bed of the Danube.”
as it did not concretize the scope of damage to be compensated by Slovakia.\(^{380}\) Equally, it failed to clearly express whether the objectives of the 1977 Treaty could be adequately fulfilled without building the Dam at Nagymaros.\(^{381}\) With respect to all these science-heavy aspects, the Court’s recurrent conclusion was that “the Parties [should] find an agreed solution.”\(^{382}\)

In his Separate Opinion, Judge Bedjaoui stressed that despite the extreme difficulties involved in fact-intensive disputes, the Court “ought ... to have the final say.”\(^{383}\) This basic requirement seems to be jeopardized by the path the Court has taken. Notably, it mandated the negotiation of the parties in virtually all substantive environmental aspects of the Gabcikovo conflict. As was aptly put by Cesare Romano, the Court “basically threw the dispute back into the lap of the parties.”\(^{384}\)

In the Court’s reading, it has only been asked to determine the basis of compensation but not the quantum of damages.\(^{385}\) It is submitted here that such reading does not strictly follow from Article 2 (2) of the Compromis, which provides that “the Court is also requested to determine the legal consequences, including the rights and obligations for the Parties, arising from its Judgment”. Even if the Court should have been confined to rule only on the basis but not the quantum of compensation, it did not determine the basis and scope of compensation with enough clarity. It is argued here that the Court in fact had a considerable room for maneuver in interpreting its judicial task based on the Compromis, and it made a strategic choice not to touch upon the science-intensive question of the quantum of compensation.

Judicial avoidance of deciding science-heavy questions has obvious repercussions on the underlying dispute and on the state of the environment as well. The Gabcikovo-Nagymaros dispute is a textbook example of that. The judgment rendered a rough justice by fulfilling only the most salient demands of the parties, i.e. finding a lack of obligation on part of Hungary to build the Nagymaros Dam and

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\(^{380}\) Gabcikovo-Nagymaros case, Judgment, para. 155, section (2) D.

\(^{381}\) Gabcikovo-Nagymaros case, Judgment, para. 137. “Whether this is indeed the case is, first and foremost, for the Parties to decide.”

\(^{382}\) Gabcikovo-Nagymaros case, Judgment, para. 142., and the same was mandated in para. 140: The parties “must find a satisfactory solution for the volume of water to be released into the old bed of the Danube.”

\(^{383}\) Separate Opinion of Judge Bedjaoui, Gabcikovo-Nagymaros case, para. 60.

\(^{384}\) Romano, The Peaceful Settlement of International Environmental Disputes A Pragmatic Approach, p. 256.

\(^{385}\) Gabcikovo-Nagymaros case, Judgment, para. 152.
enabling Slovakia to legalize the functioning of Variant C. However, none of these touch upon the underlying conflict regarding the shared use of a natural resource. As Marcel Szabó, former head of delegation appointed by Hungary to conduct negotiations with Slovakia, and former Agent of Hungary in the Gabcikovo case pointed out, the parties have had irreconcilable views on the preferred water allocation schemes and failed even to start a “meaningful dialogue” for more than a decade after the ICJ’s judgment.

In the meantime, Slovakia filed a request for an additional judgment asking the Court to determine the modalities for executing the original judgment. Although later the parties resumed negotiations, their efforts have remained fruitless. In 2017 the parties agreed to the formal discontinuance of the proceedings, albeit they could not find a mutually agreed solution for the equitable utilization of the water. Nevertheless, the Gabcikovo-Nagymaros case has not been removed from the Court’s list.

3. Decoupling the legal appraisal of risks from science – judicial review of EIA obligations

States have a customary law obligation to prepare an EIA regarding activities carried out within their jurisdiction risking to cause significant environmental harm to other States. The threshold of risk that triggers such an obligation and the content of a valid EIA are hotly contested in environmental disputes, however, the ICJ thus far has refrained from distilling any objective, scientific criteria, leaving States with broad discretion in this respect. This section will first address the criteria triggering EIA obligations in the contemporary practice of the Court. Then it will offer some

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391 Pulp Mills case, Judgment, para. 204.

392 This criticism was also reinforced by Judge Bhandari in his Separate Opinion attached to the Certain Activities and Construction of a Road cases, para. 6: “public international law presently offers almost no guidance as to the specific circumstances giving rise to the need for an EIA, nor the requisite content of any such assessment.”
grounds for criticism with respect to the ICJ’s approach to risk assessments under EIA obligations.

3.1 Criteria for assessing the threshold of risk triggering an EIA

EIA obligations lied at the heart of two recent disputes before the ICJ, namely, that of Pulp Mills and the Certain Activities and Construction of a Road cases. The Court avoided using scientific benchmarks in both cases, which raises some problematic points. Diane Desierto summarized them perhaps most succinctly: “[t]he main conceptual difficulty with the current broad parameters in international law on States’ duties to conduct EIAs lies with how much – if any – actual empirical or scientific approaches are actually relied upon by the Court, in order to determine the existence of a “significant risk of transboundary harm” that triggers the duty to conduct an EIA in the first place.”

A closer look indeed reveals that the ICJ only uses non-scientific benchmarks for assessing the significance of risks. In Construction of a Road the Court had to assess whether Costa Rica lawfully omitted preparing an EIA prior to constructing a road along the San Juan River. The judgment suggests that the significance of risk is to be judged in light of the territorial State’s own preliminary risk assessment. Although the Court also stresses that the risks are to be judged by the magnitude, the location, and the geographic conditions of the project, the ambiguous reference to domestic law raises concerns for decoupling risk assessments from the underlying science, which will be discussed further on.

The ICJ set similarly vague criteria as to the minimum requirements for the content of an EIA. Disputing States routinely refer to the failure of the other party to take into account the potential impacts of the activity complained of. The ICJ however does not give any objective, let alone scientific, standards to decide on the validity of an EIA from an international law point of view. In Pulp Mills, the ICJ expressly mandated that “it is for each State to determine ... the specific content of the ICJ’s approach to risk assessments under EIA obligations.

394 Certain Activities and Construction of a Road cases, Judgment, para. 154.
395 Certain Activities and Construction of a Road cases, Judgment, para. 155.
396 See e.g. the arguments raised by Uruguay in the Pulp Mills dispute, Pulp Mills case, Judgment, para. 203.
environmental impact assessment required in each case, having regard to the nature and magnitude of the proposed development and its likely adverse impact”. Arguably, this rule is not a simple renvoi to domestic law with respect to the content of an EIA, and the need for taking the nature and magnitude of the project into account entails objective assessment. Nevertheless, having such a formulation, any international law requirements on the minimum content of an EIA are deprived of real ‘bite’. This is well depicted by the fact that thus far no breach has been found on account of insufficient EIA.

3.2 Critical assessment of decoupling EIAs from the science of risk assessment

Judge Bhandari succinctly summarized the critical view on the international law criteria of EIAs by holding that “the situation as it currently stands is less than ideal.” A more detailed analysis on the possible grounds for criticism will follow.

First, this approach can be critiqued for failing to meet requirements for epistemic non-arbitrariness, that is, not to evaluate scientific notions according to standards alien to scientific logic, in this case, by purely legal standards. Tying the obligation of EIA to “the presence of significant risk of harm”, as was announced by the Court, is no more than an empty rhetoric, when in fact the Court decouples the meaning of ‘risk’ from the science of environmental risk assessment. The notion of ‘significant environmental risk’ remains essentially an extra-legal concept, which is elevated to a normative framework in the law on EIA, nevertheless remains a

397 Pulp Mills case, Judgment, para. 205.
398 The renvoi argument was raised by Costa Rica in the Constructions of a Road case (see para. 148), but it was implicitly refuted by the Court in its finding of a violation regarding Costa Rica’s conduct (see paras. 153-156). Several judges support the view that the judgment negates the renvoi argument (Separate Opinion of Judge Dunogue, para. 15, and Separate Opinion of Judge ad hoc Dugard, para. 18). However, Judge Bhandari is of the opinion that the Pulp Mills decision allows such a renvoi (Separate Opinion of Judge Bhandari, Certain Activities and Construction of a Road joint cases, para. 29).
399 Violations regarding EIA obligations were only found due to the failure to prepare an assessment before the authorization of the project (see Construction of a Road and Certain Activities cases, Judgment, paras. 161-173) or for not preparing it at all (see discussion on the South China Sea Arbitral Award in Chapter 4.)
400 Certain Activities and Construction of a Road cases, Separate Opinion of Judge Bhandari, para. 30.
402 Certain Activities and Construction of a Road joint cases, Judgment, para. 156.
403 V. Lowe, International Law (Oxford University Press, 2007) pp. 98–99. Lowe explicitly mention sustainable development, equity and fairness among those extra-legal concepts that in fact exist outside the law, and thus, they are not legal norms though are used in the process of legal reasoning.
scientific concept. Treating scientific concepts as if they were legal constructs is problematic.

Second, constructing the notion of ‘risk’ as an empty shell also runs against the approach of the International Law Commission (“ILC”), which regards ‘risk’ as an objective concept.\textsuperscript{404} In the 2001 Draft Articles on Prevention of Transboundary Harm from Hazardous Activities with Commentaries refer to “developments in scientific knowledge” within the ambit of requisite risk assessment procedures.\textsuperscript{405} Therefore, referring the threshold criterion essentially back to State’s discretion is problematic also from that perspective.

Third, States may too easily abuse such discretion. To prevent such abuses, Judge Bhandari proposed taking into account other international agreements and soft law documents. First, he referred to the Espoo Convention, which mandates compulsory EIAs with regard to certain types of industries that are harmful enough to warrant a presumption of potential for significant harm.\textsuperscript{406} Second, the UNEP Principles may also be relevant, since they stipulate certain minimum content for EIAs.\textsuperscript{407} Indeed, such substantive requirements would be most useful in better delineating the scope of EIA requirements under international law.

Fourth, decoupling minimum standards of EIA procedures from any sort of scientific standards results in inconsistent case-law, i.e. different decisions in factually comparable situations. The Court arrived at an opposite conclusion in Certain Activities and Construction of a Road joined cases regarding the obligation to prepare an EIA with respect to two activities that were equally alleged with threatening wetlands designated under the Ramsar Convention. While the Court found that Nicaragua had no obligation to prepare an EIA regarding its dredging activity,\textsuperscript{408} it ruled that Costa Rica was under such an obligation with respect to the construction of a road.\textsuperscript{409} Not only the outcome, but also the legal analyses leading thereto were

\textsuperscript{404} See more on that line of criticism: Desierto, ‘Evidence but not Empiricism? Environmental Impact Assessments at the International Court of Justice in Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) and Construction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica), EJIL Talk! (Feb. 26, 2016)’.
\textsuperscript{405} ILC 2001 Draft Articles on Prevention of Transboundary Harm from Hazardous Activities with Commentaries, Commentaries to Article 1, para. 15.
\textsuperscript{406} Separate Opinion of Judge Bhandari, Certain Activities and Construction of a Road cases, para. 42. Although the Espoo Convention is not yet regarded as reflecting customary international law, Judge Bhandari sets as progressive guidelines for future development (para. 33).
\textsuperscript{407} Separate Opinion of Judge Bhandari, Certain Activities and Construction of a Road cases, para. 45.
\textsuperscript{408} Certain Activities and Construction of a Road joint cases, Judgment, para. 105.
\textsuperscript{409} Certain Activities and Construction of a Road joint cases, Judgment, para. 155.
strikingly different. With respect to Costa Rica’s construction, the Court made a
detailed factual assessment of the relevant factors of the project, in which the fact that
the works impacted a Ramsar wetland was held decisive in mandating an EIA.\(^\text{410}\) In
contrast, regarding Nicaragua’s dredging that impacted another Ramsar site, the Court
concluded without any detailed factual assessment\(^\text{411}\) that there were no significant
risks warranting an EIA.\(^\text{412}\)

It is submitted here that by manifestly avoiding substantive benchmarks,
including objective, empirical, and scientific parameters, the not so empiricist\(^\text{413}\) ICJ
is susceptible to making inconsistent decisions concerning environmental risks.

**III. Scientific fact-finding techniques of the ICJ**

The extent to which the Court evaluates scientific evidence depicts most
saliently the role and weight of scientific arguments in deciding environmental
disputes. Despite some “cautious” improvements in this respect,\(^\text{414}\) the Court’s
scientific fact-finding methods are vulnerable to criticism.

**1. The beginnings – declining to consider scientific evidence**

The Court has been harshly criticized for not considering the abundant expert
evidence in *Gabcikovo-Nagymaros* by virtually all commentators, who assessed the
decision’s relevance from an international environmental point of view.\(^\text{415}\) Adriana

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\(^{410}\) *Certain Activities and Construction of a Road* joint cases, Judgment, para. 155.

\(^{411}\) *Certain Activities and Construction of a Road* joint cases, Judgment, para. 105.

\(^{412}\) Judge ad hoc Dugard comments on this aspect in his Separate Opinion attached to the *Certain
Activities and Construction of a Road* joint cases, para. 34.

\(^{413}\) Desierto, ‘Evidence but not Empiricism? Environmental Impact Assessments at the International
Court of Justice in Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)
and Construction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica), EJIL Talk! (Feb. 26, 2016)’.

\(^{414}\) Ridell, ‘Scientific Evidence in the International Court of Justice - Problems and Possibilities’, 229–
58; Desierto, ‘Evidence but not Empiricism? Environmental Impact Assessments at the International
Court of Justice in Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)

\(^{415}\) Adriana Koe, *Damming the Danube: The International Court of Justice and the Gabcikovo-
Nagymaros Project* (Hungary v. Slovakia), 20 SYDNEY L. REV. 612, 616 (1998); Stec and Eckstein, *supra* note 58 at 41–57; ROMANO, *supra* note 3 at 259; Romano eases his critical tone by suggesting
**Koe** summarized this problematic aspect of the judgment in a rhetorical question, namely, "*how did their Excellencies draw a determination on the factual risk inherent with the Project ... without evaluating the data and research findings describing such peril*"?416

Importantly, this line of criticism, which is also shared by the present author, does not relate to the actual outcome of the judicial assessment, but questions the procedure in which the judges formed their opinions. Solid and legitimate conclusions can hardly be drawn regarding matters of ecological risks without considering the weight of scientific reports submitted by the parties.417

Hungary and Slovakia both regarded the issue of environmental risks as a scientific question, which is clearly evidenced by the sheer number of evidence adduced.418 Also, the scientific aspect of the conflict was thoroughly investigated by a fact-finding mission of the European Communities,419 which also made express recommendations as to the amount of water to be discharged to the Danube’s old riverbed in order to prevent irreversible adverse impact.420

In contrast, the Court chose to circumvent evaluating the evidence regarding environmental risks. Invoking ecological necessity undoubtedly poses a challenge for scientific fact-finding. As highlighted by **James Crawford** as a Special Rapporteur on State responsibility: "*different views may be taken by different experts on whether there is a peril, how grave or imminent it is and whether the means proposed are the only ones available in the circumstances.*"421 In light of this, the Court’s tactic may be understandable.

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417 For similar proposition see: Ridell and Plant, *Evidence before the International Court of Justice*, p. 348.
418 The Hungarian Reply, 1992, alone included a 100-page long “Scientific rebuttal” in which it analyzed the Slovakian scientific claims in detail. Available on the Court’s website.
Yet marginalizing substantive scientific arguments on the existence of risks is problematic for many reasons. First, procedural fairness considerations alone would have warranted an express evaluation of the expert evidence submitted by the parties. Second, Judge Herczegh, in his famous dissent criticized the Court for taking too lightly the threat imposed on drinking water reservoirs. Moreover, Koe highlights the failure to consider the precautionary principle in assessing the parties’ conducts, and James Crawford has pointed out an apparent inconsistency between “the strong environmentally-friendly language” of the judgment and the conclusion reached.

Those who defend the judges’ aversion to evaluate scientific evidence make their case based on two recurrent arguments. They usually argue, on the one hand, with the lack of technical expertise on the bench, and on the other hand, with the fact that a clear distinction must be drawn between disputed legal claims and scientific controversies underlying these claims. Importantly, courts of law cannot decide about the latter aspects. However, Judge Herczegh aptly pointed out the limited reach of such arguments: “As a judicial organ, the Court was admittedly not empowered to decide scientific questions touching on biology, hydrology, and so on, or questions of a technical type which arose out of the G/N [Gabcikovo-Nagymaros] Project; but it could – and even should – have ruled on the legal consequences of certain facts alleged by one Party”.

This criticism goes to the crux of the weakness of the Court’s scientific fact-finding, namely, that it often draws conclusions about scientific arguments without making a transparent evaluation of the underlying facts. In the material case, the Court dismissed Hungary’s plea of ecological necessity by distinguishing “possible peril”, apprehended by uncertain scientific claims, from the “objective existence of a peril”, which was supported by foreseeable future damage. A slight majority found that the several hundred pages long scientific evidence only sufficed to suggest “serious uncertainties”, which could not establish an objective peril justifying a state of necessity. However, there is only a very thin dividing line separating uncertain risks of damage from foreseeable injurious effects, while the normative

422 Judge Herczegh, Dissenting Opinion attached to the Gabcikovo-Nagymaros judgment, p. 189.
423 Koe, ‘Damming the Danube’, 616.
425 Judge Herczegh, Dissenting Opinion attached to the Gabcikovo-Nagymaros judgment, p. 177.
426 Gabcikovo-Nagymaros Project case, Judgment, para. 54.
427 Gabcikovo-Nagymaros Project case, Judgment, para. 54.
consequences of the two differ dramatically. Choosing between these two scenarios without touching upon the scientific aspect, let alone providing any justification supported by the evaluation of the evidence, seriously undermines the legitimacy of the decision.

2. Using expertise: from counsels to witnesses and beyond

Compared to Gabcikovo-Nagymaros, where scientific submissions were essentially left unaddressed in the judgment, the Pulp Mills decision marks an improvement in the scientific fact-finding of the Court. All judges acknowledged the importance of expert opinions, though the bench was divided on the exact procedure in which these opinions should be presented to the Court. The parties chose to present scientific arguments by including scientific experts in their team of counsels. Under Article 43 of the Statute, these ‘expert counsels’ were only allowed to be questioned by the bench.

The majority found such a procedural solution less helpful compared to the option of having scientists acting as expert witnesses under Articles 57 and 64 of the Rules of Court. Importantly, in such a case the expert witnesses could have been subject to cross-examination under Articles 64 (b) and 65 of the Rules of Court. Cross-examination could assist the Court in testing the credibility and consistency of scientific data submitted by the other party. Also, according to Judge Greenwood, using scientists as counsels may seed some distrust in the bench, since the State offering such expert opinion could be viewed as “unacceptably blur[ring] the distinction between evidence and advocacy”. Judge Simma and Judge Al-Khasawneh also stressed that traditional fact-finding methods will not suffice in cases involving highly complex and technical scientific evidence. They argue that the Court should have had recourse to its own ex curia experts under Article 50 of the Court’s Statute.

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428 Pulp Mills case, Judgment, paras. 22-25. in Gabcikovo-Nagymaros dispute, the parties also had recourse to such an approach, and included hydrologists experts in their team of counsels and advocates. Gabcikovo-Nagymaros case, Judgment, I.C.J. Reports 1997, p. 7, 9-10.
430 Pulp Mills case, Separate Opinion Judge Greenwood, para. 27.
431 Pulp Mills case, Joint Dissenting Opinion of Judge Simma and Judge Al-Khasawneh, para. 12.
Arguably, the Whaling case has seen thus far the most effective judicial use of scientific expertise before the ICJ. Both parties nominated independent expert witnesses: Australia brought Dr. Nick Gale, the Chief Scientist of the Australian Antarctic Program and Professor Marc Mangel, a mathematician and a renowned expert in the field of providing scientific advice to environmental policy-making, who has affiliation both to the University of California and the University of Bergen, Norway, while Japan called Professor Lars Walloe from the University of Oslo.

For the first time in the ICJ’s jurisprudence, expert witnesses were cross-examined by the parties and were also questioned by the bench. Importantly, judges did not give “carte blanche acceptance of expert opinions” and did not use opposing scientific views as an excuse for disregarding the expert advice either. The Whaling judgment can be viewed as the first meaningful occasion when the Court “chose to engage with competing scientific claims”. Professor Mangel later formed a very optimistic opinion concerning the ICJ’s use of expert advice and its success in bridging the law – science divide. His words are worthy of being reproduced in full here:

“Judges demonstrated understanding of the need for testable questions, appropriate sample size (e.g. paras. 160-198), how models and data are connected, adjusting field work according to circumstances (e.g. paras. 201, 206-212), and peer review broadly defined (e.g., paras. 84, 155, 156, 219). That is, it is clear that the Judges understood the links between objectives of a scientific study, methods to achieve those objectives, and the importance of appropriate sample size”.

Yet, Japanese scholars would have preferred if a third independent expert had advised the Court in forming an objective opinion on the scientific evidence submitted. The Court, however, refused to avail itself of its power to do so. It thus far has never had recourse to its powers under Article 50 of the Statute of Court to order *ex curia* experts in environmental cases. Moreover, Article 67 of Rules of

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432 For information on his affiliation see the webpage of Professor Mangel: [https://users.soe.ucsc.edu/~msmangel](https://users.soe.ucsc.edu/~msmangel) (last accessed: 24 February 2018)

433 Whaling case, Judgment, para. 20.


435 Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14526.


437 Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14526.

Court gives the power to the Court to “arrange for an enquiry or an expert opinion ... after hearing the parties”. Hence, there were several procedures available at the Court’s discretion.

In the more recent Certain Activities and Construction of a Road cases, the Court again allowed cross-examination of the experts. As has been discussed above, however, the expert evidence was found to be insufficient for the Court to found established a breach of the no-harm rule, which has been criticized in scholarly literature. This casts considerable doubt as to the efficiency of the evidentiary proceedings.

Some scholars see ex curia experts as a panacea to the inefficiencies in the Court’s scientific fact-finding, while others see a greater reliance on court-appointed experts as threatening with “inadvertent delegation of the judicial function to experts”. Nevertheless even the critiques of court-appointed experts urge changes in the Court’s scientific fact-finding. Suggestions range from appointing so-called special masters to creating a pre-trial procedure where ex curia experts, chosen from a list provided by competent international organizations, would draft a report answering specific questions of the judges.

In contrast to court-appointed experts, the ICJ has been willing to consult experts on an informal basis, who are called ‘phantom experts’ given that their personalities are not revealed to the parties. Sir Robert Jennings, former President of the Court has alluded to the veiled use of such informal experts on many occasions in the Court’s practice. These “shadow experts” are functioning as temporary registry staff members, tasked with giving scientific insights to judges on a confidential basis. The use of such secret experts drew substantial criticism in the literature. Albeit commentators also appreciate that to some extent informal

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439 Certain Activities and Construction of a Road cases, Judgment, para. 34.
441 Foster, ‘New Clothes for the Emperor? Consultation of Experts by the International Court of Justice’.
442 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 289.
443 Payne, ‘Mastering the evidence’, 1201.
444 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 300–301.
446 Ridell and Plant, 338.
448 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 288; Ridell and Plant, Evidence before the International Court of Justice; Vinuales, ‘Observations sur le traitement des motifs scientifiques dans le contentieux environmental international’, p. 120.
consultations are inevitable and shadow experts enhances the parties’ confidence in the Court’s ability to grasp the technical aspects of the case.\footnote{Foster, ‘New Clothes for the Emperor?’, 171.}

3. Expert evidence: mathematical models and ecological damage valuation

The Court’s uneasy relationship with highly specialized model calculation has been manifest ever since the scarce evidentiary findings provided in 
\textit{Gabcikovo-Nagymaros} and in \textit{Pulp Mills}. The \textit{Certain Activities and the Constriction of a Road} cases showcased similar difficulties in evaluating highly technical model calculations. Nicaragua claimed among others that Costa Rica’s construction of a road along the San Juan River increased the sediment levels and allegedly changed the morphology and navigability of the River by accumulating and forming deltas in the riverbed.\footnote{\textit{Certain Activities and Construction of a Road} cases, Judgment, paras. 197-202.} The Court did not find persuasive enough those model calculations that described the deposition of the sediment from the construction site and found that they could not prove that the deltas were not formed naturally.\footnote{\textit{Certain Activities and Construction of a Road} cases, Judgment, paras. 203-204.}

The compensation judgment in the \textit{Certain Activities} case was hoped to bring a revolutionary turn in the ICJ’s scientific fact-finding. Although such expectations for a large part proved to be excessive, given that the Court did not hear experts, nor it appointed independent experts or consulted with international organizations,\footnote{D. Desierto, ‘Environmental Damages, Environmental Reparations, and the Right to a Healthy Environment: The ICJ Compensation Judgment in Costa Rica v. Nicaragua and the IACtHR Advisory Opinion on Marine Protection for the Greater Caribbean, EJIL Talk! (Feb 14, 2018)’ (2018).} the judgment did signal some considerable improvements in terms of commenting on the scientific aspects of disputes. In the material case, the ICJ awarded compensation to Costa Rica for direct injuries resulting from the wrongful conduct of Nicaragua, i.e. breaching Costa Rica’s territorial sovereignty. This was the first time that the Court “\textit{adjudicated a claim for compensation for environmental damage}”.\footnote{\textit{Certain Activities}, Judgment on compensation, para. 41.} Notably, the ICJ adopted an “\textit{ecosystem services approach}”,\footnote{\textit{Certain Activities}, Judgment on compensation, para. 46.} which in itself amounts to an innovative step to embrace the concept of ‘ecosystem services’, a key notion of ecology and contemporary environmental policy-making. It further announced that

\footnote{\textit{Certain Activities and Construction of a Road} cases, Judgment, paras. 197-202.}
any “consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law.”

It was in this context that the Court had to monetize the loss of ecosystem services provided by the wetland demolished by Nicaragua on the disputed territory, which was found to be belonging to Costa Rica. The parties could not agree on the quantum of reparation, and therefore Costa Rica requested the Court’s judgment to declare the amount of compensation. The Parties fundamentally disagreed as to the scientific methods for environmental damage calculations, hence, the Court allowed a separate reply and rejoinder dedicated to that issue. Costa Rica put forward a ‘value transfer approach’ to valuation, which would account for ‘direct use value’ of services that are traded on markets (such as timber), and also for ‘indirect use value’ for those ecosystem services that cannot be traded (e.g. climate regulation services). In contrast, Nicaragua would have preferred a valuation based on ‘ecosystem service replacement costs’. This approach was used by the UN Compensation Commission in administering the Gulf War reparation claims, which stands as an eminent international precedent for ecological damage valuation. The ICJ ultimately embarked upon conducting its own assessment regarding the valuation of various ecosystem services and did not accept any of the calculations offered by the parties in their entirety.

The Court itself declares its methodology to be an “overall assessment”, which provided only a rather “opaque” scientific reasoning. Indeed, the findings of the Court can be critiqued on numerous grounds, as they appear to be inconsistent with scientific principles and also with “settled environmental compensation

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455 Certain Activities, Judgment on compensation, para. 42.
456 Certain Activities, Judgment on compensation, paras. 22-23, 27.
458 Costa Rica indicated to the Court that it did not have the opportunity to contest the methodology used by Nicaragua for the assessment of environmental harm. For more details see Order 18 July 2017, General List No. 150, Certain Activities carried out by Nicaragua in the Border Area (Costa Rica v. Nicaragua). The Reply of Costa Rica is due by 8 August 2017, and the Rejoinder of Nicaragua is due by 29 August 2017.
460 Certain Activities case, Judgment on compensation, para. 47.
461 Certain Activities case, Judgment on compensation, para. 50.
462 Certain Activities case, Judgment on compensation, para. 52.
463 Certain Activities case, Judgment on compensation, paras. 80, 81, 83.
464 Certain Activities case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 22.
practices” reflected in the thorough fact-finding of the UNCC with respect to similar environmental damage claims. The bench takes issue with the calculations offered by the parties as it “has doubts regarding the reliability of certain aspects of [the parties’] methodology”. The Court decides to make adjustments to “account for the shortcomings” in the methodology, though without setting out the details of its own corrected analysis. It summarily concluded that only 5% of the total amount claimed by Costa Rica would be deemed reasonable. The methodology and the corresponding reasoning of the Court can be critiqued on the following grounds.

First, a problematic aspect of such reasoning is that the Court chooses between scientific methodologies without asking for any expert assistance (in a transparent way). Nor it assessed in detail the reasons for refuting the quantification methods offered by the experts of Costa Rica. The Court firmly declares that “an overall valuation can account for the correlation between the removal of the trees and the harm caused to other environmental goods and services (such as raw materials, gas regulation and air quality services, biodiversity...)”. This finding was not, however, supported with any scientific reasoning and hence, its well-foundedness remains questionable.

Second, many important details from the Court’s calculations were not revealed. Hence the Court does engage with science when cherry-picking bits and pieces from the diverse quantifications offered by the expert, but it does it in secret. With the words of Judge Dugard, “we simply do not know” how the trees were valued by the Court, whether the average price of standing timber was calculated for the eliminated stock and the growth potential of that stock over 50-year period or only the trees felled were valued together with the loss of loss such trees over a 50-year

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466 The scientific fact-finding techniques of UNCC will be addressed in greater detail in Chapter 9, Section 3.2.
467 Certain Activities case, Judgment on compensation, para. 79.
468 Certain Activities case, Judgment on compensation, para. 86.
470 Certain Activities case, Judgment on compensation, para. 157.
471 Certain Activities case, Judgment on compensation, para. 76.
recovery. The Court obviously opted for one of these methods but it conceals such details of its calculation. It is a particularly salient gap in the reasoning, as the Court itself noted that the removal of trees was "the most significant damage to the area".

Third, the Court did not indicate any explanation for rejecting the "well-reasoned report by Professor Thorne", an expert on soil science. Instead, it did not attach any monetary value for the impediment to the soil formation. Fourth, there were apparent gaps in the Court’s assessment also relating to environmental baseline conditions, the estimated recovery period, and the cost of remediation measures estimated during such period.

In sum, the Court’s reasoning as to the scientific justifications for its choices remains quite lousy, where scientific concepts are expounded without openly requesting for expert advice or indicating any explanation for the Court’s decision to accept or reject certain scientific data. Even though the precise quantification of ecological damage is "impossible", what the Court awards seems only to be an "inflated sum" for the damage caused.

Yet notwithstanding the many indications of the Court’s still "unsatisfactory fact-finding", the ICJ this time at least saliently tried to devote more attention to the scientific aspects of environmental damage valuation. These efforts should be viewed, despite all the deficiencies in the technicalities of execution, as step toward a laudable direction, as it marks a cautious divergence from earlier attempts to marginalize or even wipe out science from the judicial reasoning. However, there is considerable room for improvement for the Court in terms of transparency.

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472 Certain Activities case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 16.
473 Certain Activities case, Judgment on compensation, para. 79.
474 Certain Activities case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 27.
476 Certain Activities case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 47.
477 Certain Activities case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 22.
IV. Causal inquiry

Disputes concerning responsibility of States for causing transboundary environmental damage are of special relevance for this study, given that in such cases questions of scientific proof and alleged causal links between States’ conduct and the harm complained of lie in the heart of the dispute. In such cases, the ways in which the Court handles scientific proof of causation directly impacts the prospects of environmental claims. A review of the relevant decisions suggests that the Court tends not to deal with the scientific evidence adduced and dismiss them with vague and repetitive justifications. Before delving in the relevant cases an overview is due on the stages where causality is relevant in the Court’s inquiry in science-heavy environmental disputes.

1. Relevance of causal links in environmental responsibility

In cases involving international responsibility for environmental harm, causality is relevant at three stages of the judicial inquiry. First, when judges need to decide whether the obligation not to cause significant transboundary harm has been breached. Environmental damage causal upon wrongful State conduct is a necessary element of violating the primary norm. Second, causal inquiry will be relevant in cases when the breach at hand is of a nature that it potentially might have been caused by several possible sources, and the respondent State is only one of the potential causes (so-called ‘causal uncertainty’). And finally, causation may be relevant for the purposes of calculating the quantum of compensation, hence causality has a role on the level of secondary norms of State responsibility. A more detailed discussion of these three phases follows below.

1.1 Causal requirements on the level of primary norm: the no harm rule

The *sic utere tuo* principle, or the no-harm rule, which was first articulated in the *Trail Smelter Arbitration*,\(^{480}\) has been repeatedly regarded by the Court as an established part of customary international law.\(^{481}\) This rule confers an obligation on States to prevent significant transboundary environmental harm to occur. Causing damage to the global commons, areas beyond national jurisdictions or the territory of another State are equally prohibited.\(^{482}\)

Using some threshold criterion for establishing responsibility is regarded as a necessary corollary of the fact that a certain degree of environmental damage in inherent in pursuing economic development.\(^{483}\) The transboundary significant harm must be causal upon a human cause; consequently, States may exonerate themselves by demonstrating that natural factors triggered the harmful consequences.\(^{484}\)

The no-harm rule emphatically creates a due diligence obligation,\(^{485}\) and not that of result. Therefore, the occurrence of severe environmental harm in itself would not establish the origin State’s liability, unless a failure to fulfill a duty of care with respect to the prevention activities is also established. The precise content of such due diligence standard has remained thus far somewhat unclear\(^{486}\) and is subject to clarification by the Court.

Establishing a causal link between a State’s action or omission and the harmful consequences suffered is arguably the Achilles’ heel of international environmental liability.\(^{487}\) The challenges of proving causality lie at the heart of

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\(^{480}\) For a more detailed discussion of the case see Chapter 4, Section 1.

\(^{481}\) *Gabčíkovo-Nagymaros Project* case, Judgment, para. 53.

\(^{482}\) Alena Douhan, *LIABILITY FOR ENVIRONMENTAL DAMAGE MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW* (2013 ed.) See also Principle 21 of Stockholm Declaration.


\(^{484}\) Hanqin, *Transboundary Damage in International Law*, pp. 6–7.


deficient enforcement of environmental responsibility of States: difficulties in gathering sufficient causal proofs may deter prospective applicants from initiating burdensome and lengthy proceedings against wrongdoing States; and in case they do, evaluating scientific proofs poses a major challenge for international judges.

In this vein, some attribute the apparent lack of initiating international legal proceedings by injured States against the USSR for the Chernobyl incident to the inherent difficulties of establishing causality for transboundary harm.\footnote{Négre, ‘Responsibility and International Environmental Law’, p. 805.} In case of international nuclear damage claims, respondents eagerly use the causality requirement as a shield, which places the burden of proof on the applicant. Such strategic reliance on the causal requirement was most evident in the \textit{Nuclear Tests} case initiated by Australia against France.\footnote{\textit{Nuclear Tests} case, Order (Interim Measures), 22 June 1973, I.C.J. Reports 135.} The position of France well reflects that “\textit{the heart of the problem of state responsibility}”\footnote{Louka, \textit{International Environmental Law Fairness, Effectiveness, and World Order}, p. 475. (emphasis has been added).} for environmental harm lies in the fact that “\textit{in the absence of ascertained damage attributable to its nuclear experiments}” no violation of international law is committed.\footnote{\textit{Nuclear Tests} case, Order (Interim Measures), 22 June 1973, I.C.J. Reports 135, para 28. (emphasis added).}

\subsection*{1.2 Multiple possible wrongdoers: problems of uncertain causation in establishing environmental responsibility}

The most frequent obstacle to finding a causal link established between an environmental harm and the industrial activity authorized or controlled by a neighboring State is the presence of possible competing causes. Competing causes may contribute to the emergence of harm or may have caused the entire damage. In disputes of environmental liability, respondent States routinely argue with the presence of intervening natural causes unrelated to their activities, and claim that those have caused, wholly or partly, the injury. For instance, Costa Rica in \textit{Certain Activities and Construction of a Road} cases argues that „\textit{the aggradation of the Lower San Juan River is an inevitable natural phenomenon that is unrelated to the construction of the road.}”\footnote{\textit{Certain Activities and Construction of a Road} case, Judgment, para. 201.} The Court agreed and found that it was not proven “\textit{that any morphological changes in the Lower San Juan have been caused by the}
Such difficulties in establishing a casual link are illustrative consequences of uncertain causation.

1.3 Causal requirements on the level of secondary norms of state responsibility

Provided that all required elements of an internationally wrongful act has been established, the injured State may ask for full reparation of the injury caused in the form of restitution, compensation or satisfaction under Articles 31 and 34 of ARSIWA, which has been widely regarded as a general principle of international law since the Factory at Chorzów judgment of the PCIJ.\textsuperscript{494} Hence, the territorial State to which environmental harm was caused may only receive monetary compensation for the portion of the harm that was in fact caused by the State breaching the no harm rule.

The compensation judgment in Certain Activities provides an apposite example of causal problems arising on the level of secondary norms. Here the Court ruled on the quantum of compensation payable for ecological damage caused by Nicaragua in breach of Costa Rica’s sovereignty.\textsuperscript{495} The ICJ emphasized that environmental damage \textit{“may be due to several concurrent causes, or the state of science regarding the causal link between the wrongful act and the damage may be uncertain.”}\textsuperscript{496} Against this background, the Court’s causal test requiring \textit{“direct and certain causal link”}\textsuperscript{497} between the ecological damage and the unlawful acts strikes as a rather restrictive causal test. In the material case, however, the Court ultimately found that all heads of damages claimed by Costa Rica (\textit{i.e.} the trees cut, loss of raw materials, gas regulation and air quality services and loss of biodiversity) were direct consequences of Nicaragua’s wrongful activities.\textsuperscript{498}

\textsuperscript{493} Certain Activities and Construction of a Road case, Judgment, para. 204.
\textsuperscript{494} Third Report on State responsibility, by Mr. James Crawford, Special Rapporteur, DOCUMENT A/CN.4/507 and Add. 1–4, para. 34.
\textsuperscript{495} Certain Activities and Construction of a Road cases, Judgment, para. 139.
\textsuperscript{496} Certain Activities case, Judgment on compensation, para. 34.
\textsuperscript{497} Certain Activities case, Judgment on compensation, para. 72.
\textsuperscript{498} Certain Activities case, Judgment on compensation, para. 75.
2. The Court’s approach to assessing uncertain causal links: reluctance to deal with science

The Court has been famously "evasive" in conducting meaningful causal inquiries. Suffice it to refer to the opaque and somewhat inconsistent causal assessments conducted in Corfu Channel and in Bosnian Genocide. Both cases concerned a concomitant causes scenario, where the same loss could be potentially attributed to more than one cause. In Corfu Channel, the Court did not expressly discuss the applicable causal test. Nevertheless the UK was allowed to recover the full amount of its claim against Albania, irrespective of the fact that it was not proven that Albania had laid down the mines. As opposed to this, in Bosnian Genocide the Court found, on the apparent basis of a sine qua non test of causation, that since Serbia’s failure to prevent genocide was not a sine qua non (or but-for) cause, its conduct was no cause at all. The Court’s analysis as to the requisite causal link was as follows: “Such a nexus could be considered established only if the Court were able to conclude from the case as a whole and with a sufficient degree of certainty that the genocide at Srebrenica would in fact have been averted if the Respondent had acted in compliance with its legal obligations. However, the Court clearly cannot do so.”

The weakness of the applied sine qua non causal test was pointed out by James Crawford who, writing extra-judicially, stressed that in complex cases, where the damage is brought about by a combination of factors, often none of the causal factors can be regarded as a sine qua non cause. The most elaborate criticism concerning the application of this causal test in the Bosnian Genocide case was

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500 The lack of causal inquiry was criticized by Judge Ecer, Dissenting Opinion of Judge Ecer, Corfu Channel case (Albania v. UK)(Compensation), ICJ Report, 1949, para. 254.

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offered by Andrea Gattini, who passionately argued that “the fact that Serbia’s omission was not the only cause does mean that it was no cause at all.”

When causal claims are based on uncertain and contested scientific facts, establishing causality confers an even more complex task on judges. Perhaps the most salient way in which science impedes adjudication of international environmental claims is the extent to which it hinders finding a causal link established. This, in turn, impedes finding a breach of substantive obligation. The following analysis will briefly describe the cases in which the Court confronted with uncertain causal claims.

The Court remained dismissive of finding causal links established based on ‘uncertain’ scientific evidence reflecting mere statistical probabilities. In Pulp Mills, Argentina alleged that Uruguay had caused significant harm to the Uruguay River’s ecosystem by authorizing the operation of two pulp mills along the shared watercourse. In light of the evidence put on the case-file, judges had to consider various scientific questions, such as “the effects of the breakdown of nonylphenoletoxylates, the binding of sediments to phosphorus, the possible chain of causation which can lead to an algal bloom”.

Causal uncertainty is also present in the form of potential parallel causes. To take an example, in the Construction of a Road case the Court refused to find that macro-invertebrate richness in the San Juan River was harmed, as it “found it difficult any difference in macro-invertebrate abundance to the construction of the road alone, as opposed to other factors such as the size of the catchment area and the nutrient levels therein.”

In Pulp Mills, the Court chose to take a rather “passive approach” and missed the opportunity to interpret and legally appreciate the probative force of the evidence submitted. The judgment emphasizes that the Court “sees no need” to go into a detailed assessment of the diverse technical evidence submitted. Such approach has met with various criticisms. Members of the bench and scholarly

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507 The most troubling scientific aspects of the case were listed in the Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 4.
508 Certain Activities and Construction of a Road cases, Judgment, para. 212.
509 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 6.
510 Pulp Mills case, Judgment, para. 213.
511 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case.
opinions both claimed that the highly complex nature of the science involved should have not necessarily led to such limited evaluation of the underlying facts.

The joint dissenters even asserted that the judgment is “flawed methodologically” for not doing all the Court could to evaluate the scientific dimensions of the dispute, rather, it has clung to its old habits which prove to be deficient in science-intensive cases. The judgment only dealt expressly with the issue of burden of proof and omitted any discussion on the standard of proof. Coupled with the lack of detailed reasoning on the probative value attached to each of the evidence adduced, one cannot infer to the precise standard the Court employed in the *Pulp Mills* case. *Judge Greenwood* puts forth a proposition that in environmental cases a balance of probabilities standard is preferable, though he was of the opinion that the facts of the case would not have met even this lower standard. Neither was the applicable standard expressly announced in the subsequent *Certain Activities and Construction of a Road* cases. Here again, only the Separate Opinion of *Judge Dugard* touches upon the issue of standard of proof by proposing the preponderance of the evidence standard.

The *Pulp Mills* case was the first environmental dispute where the Court dedicated a lengthy discussion to the scientific evidence submitted, even though these findings essentially boiled down to a variation on expressing the insufficiency of scientific proof for finding a causal link established. The Court referred to diverse reasons for ruling that Argentina failed to prove its allegations: the lack of “significant difference between the sets of data” describing the amount of dissolved oxygen before and after the commissioning of the mills, the lack of “clear” attribution between the presence of polluting agents and the mill, lack of “clear

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513 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 2.
514 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 3.
518 *Certain Activities and Construction of a Road* cases, Separate Opinion of Judge ad hoc Dugard, para. 33.
519 *Pulp Mills* case, Judgment, paras. 229-265.
520 *Pulp Mills* case, Judgment, paras. 229-265.
521 *Pulp Mills* case, Judgment, para. 239.
evidence” of causality, the absence of “clear relationship”, and sometimes the absence of “conclusive evidence”.

These elusive findings triggered especially harsh criticism, most eminently put forward by certain members of the bench. Dissenting Judge Al-Khasawneh and Judge Simma even dubbed the Pulp Mills decision a “wasted opportunity” for the Court to demonstrate “its ability, and preparedness, to approach scientifically complex disputes in a state-of-the-art manner.”

The core of various criticisms lies in the fact that the scientific evidence has been “as scientifically certain as is possible in a judicial proceeding.” And indeed, to demonstrate the feasibility of evaluating the legal relevance of underlying scientific data, Judge Vinuesa in his dissent provided a detailed judicial assessment of all fact-intensive allegations of Argentina and also pointed out the inconsistencies and gaps in the lousy scientific findings of the judgment.

This may be the strongest indication that the shallow evaluation of scientific evidence is in fact a result of judicial unwillingness rather than inability on part of the ICJ to deal with scientific claims of causality involved in substantive obligations. Indeed, the Court’s reluctance to seek ex curia experts under the Rules of Court coupled with choosing not to examine the methodologies and the corresponding credibility of the evidence produced all seem to suggest that the majority consciously opted for a more limited scope of judicial review.

V. Standard and extent of judicial review

For the first time, the ICJ used the term ‘standard of review’ in the Whaling judgment. The heart of the dispute lay in the interpretation of the exemption provided

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523 Pulp Mills case, Judgment, paras. 257, 259.
524 Pulp Mills case, Judgment, para. 262.
525 Pulp Mills case, Judgment, para. 265.
526 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Declaration of Judge Yusuf, Dissenting Opinion of Judge Vinuesa.
527 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 28.
528 Joint Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, Pulp Mills case, para. 2.
529 Dissenting Opinion of Judge Vinuesa, Pulp Mills case, paras. 74-98. Judge Vinuesa expressly claims that some of the majority’s determinations were “made without a coherent scientific basis.” para. 79.
under the 1946 International Convention on the Regulation of Whaling ("ICRW") from the general moratorium for permitting whaling conducted under Article VIII which allows for Special Permit Whaling that is conducted ‘for purposes of scientific research’.

Japan essentially claimed that its whaling program, the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (“JARPA II”), pursues ‘scientific objectives’ and therefore fell under Article VIII of ICRW; while Australia argued that Japan relies on science only as a pretext as JARPA II led to the killing of several thousands of whales without producing any peer-reviewed scientific publication, while generated huge volumes of whale meat that can be lucratively sold on Japanese food market. Hence it was in fact economic whaling conducted under the “guise” of scientific research. At the heart of the controversy lied the standard of review, because in order to decide the controversy, the Court ought to provide a judicial pathway of singling out claims of ‘real’ science from non-science.

As a preliminary matter, the ICJ also had to face the question whether and if so in what respects such issue can be subject to legal determination. As a second step, the Court had to devise a standard of review with which it can scrutinize the scientific arguments of both parties, who submitted diametrically opposing views as to what constitutes a whaling program conducted ‘for purposes of scientific research’, and as ‘science’ more generally.

1. The extent of review: justiciability of the term ‘scientific research’

Taking an official position on the boundary between valid and spurious claims of science (and scientific research) is a rather delicate and sensitive task for a court of law, because ‘science’ is regarded as an independent epistemic realm, hierarchically juxtaposed to that of law, therefore, judges by default feel the absence of the necessary expertise and even legitimacy to provide a definition on science. It comes as no surprise then that the bench did not reach a unanimous position on this question.

531 During the course of JARPA II Japan produced only two peer-reviewed scientific study but those did not relate to the stated research objectives. Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14525.
1.1 The majority view on ‘scientific research’: a justiciable issue

The majority did not find it necessary to provide a general definition on ‘scientific research’ for the purposes of international law. Neither did the Court “pass judgment on the scientific merit” of the stated objectives of JARPA II. Without commenting on the abstract or concrete meaning of ‘scientific research’, the Court immediately proceeded to the second stage of its inquiry, to interpret the meaning of the phrase ‘for purposes of’. For this interpretation exercise, the ICJ construed an “objective” standard of review with which it ultimately ruled that JARPA II failed to satisfy requirements of the ICRW.

In reaching such a conclusion, the Court purposefully did not rely on any of the objective criteria for scientific research that were offered by Australia and New Zealand, which triggered substantial scholarly criticism. New Zealand suggested defining ‘science’ by relying on “methodology, design and characteristics”. Australia’s expert, Professor Marc Mangel submitted four “essential characteristics of science” to be used for distinguishing science from non-science. According to these, scientific research has (i) achievable objectives (research hypothesis), (ii) appropriate methods that are likely to achieve the stated objectives, (iii) is subject to peer review, and (iv) ensures avoidance of adverse effects on stocks.

What the Court did to approach the concept of scientific research from a legal perspective was devising a ‘reasonableness’ test to assess whether the program’s “design and implementation are reasonable in relation to its stated scientific objectives”. If not, then JARPA II cannot be regarded as being ‘for purposes of’ scientific research. The judgment then lists several factors that are relevant to decide whether the use of lethal methods is reasonable, among others, the scale of lethal sampling, the methodology to select such sample sizes, the program’s scientific output, and the extent of scientific co-operations of the program. Notably, these considerations do reflect several of the objective criteria advanced by Australia.

533 Whaling case, Judgment, para. 86.
534 Whaling case, Judgment, para. 88.
536 Whaling case, Judgment, para. 64.
537 Whaling case, Judgment, para. 74.
538 Whaling case, Judgment, para. 88.
539 Whaling case, Judgment, para. 88.
JARPA II, which replaced the first special permit whaling program JARPA with refined objectives, had four stated research objectives: (i) monitoring of the Antarctic ecosystem (i.e. monitoring their habitat and the “feeding ecology” of whales), (ii) constructing a multi-species model on competition among whale species (iii) elucidating temporal and spatial changes in stock structure, and (iv) improving the management procedure for Antarctic minke whale stocks.

Lethal methods were central to the design of JARPA II, since the Convention allows for selling the meat incidental to programs granted with special permits. The special permit provided Japan with catch limits of 850 minke whales, 50 fin whales and 50 humpback whales per season. The Court did not find lethal sampling per se unreasonable, however, it ruled that special permits ought not to “use lethal sampling on a greater scale than is otherwise reasonable in relation to achieving the program’s stated objectives.”

Therefore, the key aspect of the JARPA’s legal evaluation was whether lethal sample sizes were reasonable for achieving its stated objectives. To answer that question, the Court compared the sample sizes and the research objectives of JARPA and JARPA II, and found that while sample sizes approximately doubled, the objectives and methods used “appear to have much in common”, and therefore, the substantially increased target sample sizes were not reasonable. Also, the fact that no humpback whales have been taken despite the pre-set sample size was found to be an indicium of unreasonable design of the program, since nor the research objective or the methods were adapted to the actual numbers of the whales taken.

1.2 Dissents: variations on non-justiciability of scientific concepts

The different judicial views on the scope of science are consequential of the purview of the ICJ, given that a court of law could not legitimately decide on purely scientific issues. Expanding the boundaries of ‘science’ would, thus, narrow down the

540 Whaling case, Judgment, paras. 113-18.
541 Whaling case, Judgment, para. 113.
542 Whaling case, Judgment, paras. 83. and 94.
543 Whaling case, Judgment, para. 231.
544 Whaling case, Judgment, para. 135.
545 Whaling case, Judgment, para. 94.
546 Whaling case, Judgment, paras. 146-151.
548 Whaling case, Judgment, para. 224.
549 Whaling case, Judgment, para. 226.
sphere of judicial competence by carving out a great deal of controversy from the Court’s adjudicatory power.

Such a more restricted judicial task is reflected in the position taken by dissenting Judge Xue, who argues that “determination of scientific research is primarily a matter of fact subject to scientific scrutiny”.550 A similar approach was furthered by Japan, who wanted to persuade the Court that the entire matter at hand falls out of the ICJ’s purview. Professor Lowe, Japan’s counsel, argued during the oral hearing that the Court “can no more impose a line separating science from non-science than it could decide what is and what is not ‘Art’”.551

Similarly, Judge Abraham would have preferred a more narrowly construed judicial review in cases, where “nothing [is] truly solid”552 due to competing scientific claims. In his view methodological flaws in design and doubts about the proper nature of implementation are not sufficient to cast doubt as to Japan’s claim regarding the ‘scientific’ nature of its whaling program.553

Judge Sebitudine regarded such a definitional task “more suited to scientists rather than lawyers”, but then she concludes that the concept is perfectly susceptible to means of treaty interpretation, first and foremost by having recourse to the ordinary meaning of the term ‘scientific research’ as provided by the Oxford English Dictionary.554 The need for literal interpretation was advanced by Judge Bennouna as well.555 Judge Owada even argued that “this Court, as a court of law, is not professionally qualified to give a scientifically meaningful answer [to the question of what science is], and should not try to pretend that it can”.556

The Whaling judgment and the divergent dissenting opinions showcase a wide array of potential approaches to interpret science-intensive legal concepts. Depending on prevailing judicial choice, the different approaches would construe the legal significance of ‘science’ very differently. When the term of ‘scientific research’ is embedded in the text of the underlying international treaty, the Court had various interpretative paths to choose from. Some judges expressed the view that it is beyond the judicial task to interrogate the deeper meaning of a scientific concept and making

550 Whaling case, Judgment, Dissenting Opinion of Judge Xue, para. 15.
553 Whaling case, Judgment, Dissenting Opinion of Judge Abraham, paras. 41-46.
554 Whaling case, Judgment, Dissenting Opinion of Judge Sebitudine, para. 9.
555 Whaling case, Judgment, Dissenting Opinion of Judge Bennouna, para. 120.
evaluations about the essential characteristics of scientific research.\textsuperscript{557} Others\textsuperscript{558} regard it as an exercise of ordinary treaty interpretation under the VCLT. There are yet again divergent views as to the appropriate means of interpretation: should the ordinary meaning of the term of ‘scientific research’, as provided by leading dictionaries, be the relevant yardstick, or should the content be revealed through reliance on expert evidence?

If such an interpretation were to fall outside the judicial purview, the question would arise as to who should have the power of defining the meaning of scientific research as enshrined in the ICRW? Is it to be entrusted to the scientific community, or should that interpretation be reserved for the Contracting Parties? If so, what is the appropriate extent of latitude that is to be given to a contracting government? Should it have the discretion of giving a special permit for “what it considers to be”\textsuperscript{559} scientific research? Or should the judicial scrutiny be limited to a bad faith assessment as was put forward by Japan?\textsuperscript{560}

The Court declined the possibility in \textit{Whaling} to open the gates for a subjective interpretation holding that “whether the killing of whales ... is for the purposes of scientific research cannot depend simply on that State’s perception”.\textsuperscript{561}

It is argued here that \textit{Whaling} correctly regards this issue as a matter for judicial interpretation neatly fitting within judicial purview. The Court crafted an objective standard of review to limit States’ discretion with respect to invoking scientific research. This is all the more remarkable considering that Article VIII of ICRW on Special Permit Whaling provides that “\textit{any Contracting Government may grant to any of its nationals a special permit authorizing that national to kill, take and treat whales for purposes of scientific research subject to such restrictions as to number and subject to such other conditions as the Contracting Government thinks fit}”.\textsuperscript{562} Yet science, perceived as a source of objective cognitive authority, overruled the discretion enshrined in the provision.

\textsuperscript{557} See \textit{Whaling} case, Judgment, Dissenting Opinions of Judge Xue and that of Judge Sebitudine, discussed above.
\textsuperscript{559} \textit{Whaling} case, Judgment, Declaration of Judge Keith, para. 7.
\textsuperscript{560} \textit{Whaling} case, Judgment, para. 65.
\textsuperscript{561} \textit{Whaling} case, Judgment, para. 61.
\textsuperscript{562} Article VIII (1) ICRW
2. Standard of review: crafting the reasonableness test

The Court refused to accept the definition of science as provided by Australia’s expert witness and was equally reluctant to come up with its own definition on the defining characteristics of science. Instead, it decided to scrutinize the conformity of JARPA II with ICRW by examining whether “the programme’s design and implementation are reasonable in relation to achieving its stated objectives.”

2.1 Define or not the define science?

The majority of the judges preferred not to offer a general legal definition on scientific research. This interpretative solution triggered extensive debate among scholars of the field. Some commentators have criticized the Court for not crafting a legal definition on science, and for adopting a circular test instead, which is based on an “arbitrary” selection of certain criteria of scientific research that, in fact, “have been plucked from the ether”. Makane Mbengue and Rakimi Das see it as a failure “to provide a coherent explanation for a term crucial to resolving the dispute at hand.” They draw an intuitively appealing parallel from the ICJ’s case-law, where in the Navigational and Related Rights case between Nicaragua and Costa Rica, the Court found no difficulty in interpreting the term ‘commerce’ as appearing in a text of an international treaty. Interestingly, commentators with natural sciences background were less critical and acknowledged that “defin[ing] science was beyond the realm of this case” and applauded the judges for...
“demonstrating understanding of the need for testable questions, appropriate sample size, how models and data are connected”\textsuperscript{571}.

Yet I would argue that, from a theoretical and analytical point of view, ‘science’ is to be distinguished from those terms embedded in treaties, which gain their substantive meanings from practices of everyday life. With a view to the insights from the philosophy of science discussed above, not attempting to provide an essentialist definition on ‘scientific research’ seems to be justifiable.

Also, the practical implications of not defining science appear to be limited in the given case. The decision not to define science is not equivalent to not interpreting science. Clearly, the Court has “assigned a certain meaning to this term”\textsuperscript{572} to proceed with its analysis. The majority also geared the interpretation towards establishing an objective legal benchmark, that of reasonableness, which was to be assessed in light of an extensive body of expert evidence produced by written submissions and a vigorous questioning of experts.\textsuperscript{573}

2.1.1 Defending the Court’s approach on the basis of STS insights

Ample scholarly literature has been dedicated to the definition of science and its boundaries in philosophy, more specifically in STS studies. A number of scholarly accounts attempted to identify some deterministic characteristics of science, along which ‘science’ can be delineated from ‘non-science’.\textsuperscript{574} Chronologically first in line essentialists views were formed, contending the “possibility and analytic desirability of identifying unique, necessary and invariant qualities that set science apart from other cultural practices”.\textsuperscript{575} In contrast to that, the later prevailing constructivists questioned the possibility to select any particular demarcation criteria that work universally in every context, in which distinguishing ‘science’ from ‘non-science’ may be relevant.\textsuperscript{576}

Hence to the question concerning ‘what science is’, a range of evolving views and conceptualizations have been offered in the philosophy of science. An early eminent proposition came from Karl Popper, who placed falsifiability in the center of

\textsuperscript{571} Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14526.
\textsuperscript{572} Mbengue and Das, ‘The ICJ’s Engagement with Science’, 573.
\textsuperscript{573} Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14526.
\textsuperscript{574} Irwin, ‘STS Perspectives on Scientific Governance’, p. 588.
\textsuperscript{575} Thomas Gieryn, ‘Boundaries of Science’, p. 393.
\textsuperscript{576} Thomas Gieryn, ‘Boundaries of Science’, p. 393.
his definition on science. He demarcated ‘scientific’ claims from ‘non-scientific’ ones by asking whether they are potentially falsifiable through empirical evidence.\footnote{Popper, \textit{The Logic of Scientific Discovery}, p. 18.} Yet under such definition, non-empirical practices, such as mathematics would fail to count as ‘science’,\footnote{Thomas Gieryn, ‘Boundaries of Science’, p. 396.} therefore it is not a workable definition according to our modern understanding of science.

Later \textit{Robert K. Merton} discerned some social norms to distinguish scientific claims from non-scientific ideology. He suggested that the requirement of falsifiability be replaced by an institutionalized “ethos of science”, which takes form in four specific social norms of science. According to \textit{Merton}, those endeavors can be called science, which conforms to the following social norms: universalism, communism (\textit{i.e.} the results of scientific research is common property of humankind as a common achievement and shared heritage), disinterestedness (where the institutional goal of science prevails over private interests of scientists) and organized skepticism (as opposed to dogma-driven acceptance of claims in the absence of evidence).\footnote{Merton, ‘The Normative Structure of Science’, pp. 270–78.} Tellingly, the article in which \textit{Merton} originally proposed this idea in 1942 was entitled ‘Science and Democratic Social Structure’\footnote{Merton, ‘The Normative Structure of Science’, p. 267.} in firm acknowledgement that scientists are dependent upon a particular type of social structure, which ensures independence and universality enabling them to pursue scientific research. In times when Nazism and Aryan science exerted a “\textit{frontal assault on the autonomy of science}”\footnote{Thomas Gieryn, ‘Boundaries of Science’, p. 399.} in many ways, such questions were understandably in the forefront of scholarly interests of those seeking to define processes worth of being labeled as ‘science’.\footnote{Thomas Gieryn, ‘Boundaries of Science’, p. 399.} The Achilles’ heel of \textit{Merton}’s definition is that these social norms of science can be at best viewed as “surface rules”\footnote{Thomas Gieryn, ‘Boundaries of Science’, p. 400.} that do not necessarily translate into behavior patterns of actual scientists, and therefore, often fail to provide an accurate account of ‘science’.

While \textit{Popper} and \textit{Merton} were subscribed to the essentialism, \textit{Thomas Kuhn} was one of the early scholars who questioned the feasibility of drawing sharp demarcation lines,\footnote{Thomas Gieryn, ‘Boundaries of Science’, p. 401.} though in his seminal book entitled ‘The Structure of Scientific
Revolution’ proposed that the presence of a paradigmatic consensus among scientists could be used to distinguish science from non-science. And indeed, the progress of scientific research, although at least in natural sciences, can be described and explained through patterns of paradigm shifts. From this perspective, beliefs that later proves to be errors and unfounded myths ought not to be dismissed as non-scientific, if they conform to the paradigm prevailing that time. Kuhn’s definition on science is thus “working under the paradigm”, for deserting the paradigm is equated with “ceasing practicing science”. Yet a blind spot of such a definition lies in the fact that social sciences, including law, are usually not driven by or conform to any organizing consensus and, therefore, those would not qualify as ‘science’.

Acknowledging the repeatedly failed attempts to find inherent and universal characteristics of science, instead of demarcation, constructivists focus on “boundary-work”, which essentially is “an attribution of selected characteristics to the institution of science ... for the purposes of constructing a social boundary that distinguishes some intellectual activity as non-science.” As Thomas F. Gieryn, a leading constructivist has summarized, science is conceived as a “space that acquires its authority precisely from and through epistemic negotiations of its flexible and contextually contingent borders”.

Being mindful of the apparent limitations of any essentialist attempts to provide an a priori definition of ‘science’, scientific claims can be better recognized on a case-by-case basis, through the boundary-work of various actors involved in the specific context of a given case. As constructivists put it, the boundaries of science are “negotiated” epistemically by scientists and society, since “nothing of [science’s] borders and territories is fixed by ... in a deterministic way.”

The above discussion has important implications for the matter of interest here in as much as it suggests that any attempts on part of a court of law to define ‘science’ a priori and universally would be susceptible to analytical challenges, and therefore, the judicial task is ought to be conceived more as engaging in boundary-work rather

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585 Kuhn, The Structure of Scientific Revolutions, p. 34.
587 Kuhn, The Structure of Scientific Revolutions, p. 34.
than being entangled in a hopeless exercise of defining science that is understood as a ‘pure’ category of objective authority. Insights from STS suggest that adjudicators should in fact decide whether for the purposes of a given legal debate, a certain knowledge claim could legitimately appeal to the epistemic authority of ‘science’ in a social setting, in our case, legal dispute resolution. If so, then persuasive force will be legitimately allocated to ‘scientific claim’ by judges. Adjudicators should be cognizant of the fact that sorting out science and non-science is in fact an exercise of allocating cognitive authority to knowledge claims.

2.1.2 Potential criticism

Nevertheless, criticism seems to be warranted for the Court’s overly cautious and hesitant approach in pinpointing to the essential (though not deterministic) characteristics of a whaling program conducted for the purposes of scientific research. The often elusive reasoning may be read as undermining the firm operative part of the judgment by blurring the characteristics of scientific research that can be discerned from the judgment. Not only the judgment announces that JARPA II “can broadly be characterized as ‘scientific research’”\(^{592}\), but it also stops short of attaching significant enough legal relevance to several discrepancies revealed by the experts’ statements as to the implementation of JARPA II. Even Japan’s own expert, Professor Valloe admitted that neither did he “understand how they [Japan] have calculated their sample sizes”\(^{593}\). Yet the Court merely noted that “the lack of transparency in the …. sample size do[es] not necessarily demonstrate that the decisions made with regard to particular research times lack scientific justification.”\(^{594}\)

Also, the judgment appears to be too lenient with respect to the open-ended time frame and the scientific output of the program. The Court merely noted that “it would have been more appropriate”\(^{595}\) to establish at least some intermediary targets rather than designing an infinite research program, and it only stated that the “scientific output to date appear[ed] limited”\(^{596}\). These additional remarks can easily

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\(^{592}\) *Whaling* case, Judgment, para. 127.

\(^{593}\) International Court of Justice, Court Record CR/2013/14 p. 41.

\(^{594}\) *Whaling* case, Judgment, para. 195.

\(^{595}\) *Whaling* case, Judgment, para. 216

\(^{596}\) *Whaling* case, Judgment, para. 219.
be read as not bearing relevance as to the ‘scientific’ nature of a whaling program, which further weakens the applicability of the Court’s findings in future cases.

2.2 Conducting an intrusive review: the ‘reasonableness’ test

The Court created the yardstick of ‘reasonableness’ that was intended to function as an objective standard of review. Several scholarly opinions commenting on the judgment criticized the Court for using such standard, along with four of the dissenting judges. The reasonableness standard was attacked for not being “grounded in law or in the practice of the Court”, for being a “magic formula” used "out of the context", or a concept that simply falls out of the judicial purview.

However, as Asier Garrido-Munoz, an Associate Legal Officer of the Court points out, the reasonableness standard is an objective criterion flowing from States’ general obligation of good faith, for one cannot rely on an argument in good faith unless its position is reasonable. In his account, the reasonableness standard is, in fact, nothing else than “an appeal to an egregious human feature: rationality”. He also demonstrates through three examples from prior case-law that the standard of reasonableness is no way alien to the ICJ jurisprudence. What is more he contends that prior decisions “had already followed a similar line” on many occasions. Another commentator sees the merits of the reasonableness assessment in being a “loose limit, which does not excessively curtail the sovereign powers of states” while

597 Gogarty and Lawrence dismiss the judgment for using the reasonableness standard without providing a satisfactory explanation as to its basis in the Court’s case-law. See Gogarty and Lawrence, ‘The ICJ Whaling Case: Missed Opportunity to Advance the Rule of Law in Resolving Science-Related Disputes in Global Commons?’, 178–79.
598 Judge Abraham, Judge Jusuf, Judge Owada and Judge Xue all criticized the reasonableness test on diverse grounds.
599 Whaling case, Dissenting Opinion of Judge Yusuf, para. 15.
600 Whaling case, Dissenting Opinion of Judge Owada, para. 34.
601 Whaling case, Dissenting Opinion of Judge Xue, para. 15.
604 He cites Gabcikovo-Nagymaros, Pulp Mills, and Gulf of Maine decisions as examples for the application of the standard of “reasonableness”.
606 Garrido-Munoz asserts that “reasonableness” can be tied to standards of necessity, proportionality and adequacy as relied on by the Court in previous decisions Garrido-Munoz, ‘Managing Uncertainty: The International Court of Justice, ‘Objective Reasonableness’ and the Judicial Function’, 467–71.
at the same time prevents States from defining scientific research in a way as to “compress, or even defeat, the competing rights and interests of others”. 607

It is submitted that the reasonableness standard, as applied in Whaling, can be viewed as an ambitious version of the standard of review compared to some of the competing interpretations offered by the parties. Notably, Japan offered a much narrower reading, according to which reasonableness was only relevant in examining whether “a State [could] reasonably regard this [JARPA II] as scientific research” 608 but refuted the possibility of being an objective benchmark. In contrast, Australia submitted a broader notion of reasonableness, grounded in the obligation of good faith, a general principle of international law. 609 Australia argued that good faith implementation required Japan in the material case to „have due regard to and respond to the views of the IWC, particularly those urging the cessation of the lethal elements of any program.” 610 New Zealand proposed a slightly different third reading on reasonableness. They referred to Gabcikovo-Nagymaros judgment, which compelled States “to apply a treaty provision in a reasonable way and in such a manner that its purpose can be realised.” 611 The dissenting Judge Owada would have preferred yet another reading, under which reasonableness is conceived as a “yardstick for ascertaining whether a decision or an action is or is not “arbitrary” or patently “out of bounds”. 612

The reasonableness standard, as constructed by the Court, yields a rather intrusive standard of review. Japan would have preferred 613 the standard used by the WTO Appellate Body, which does not examine whether the science-based decision was correct, but only interrogates whether “the assessment is supported by coherent reasoning and respectable scientific evidence and is, in this sense, objectively justifiable.” 614 This standard of review is a rather intrusive one, however, it does not allow WTO panels to conduct a de novo assessment of the scientific facts. The Court

608 CR 2013/22, p. 60. paras- 19-20 (Lowe).
609 Whaling case, Memorial of Australia, para. 4.61.
610 Whaling case, Memorial of Australia, para. 5.126.
611 Whaling case, Written observations of New Zealand, para. 12.
613 Japan’s position was reiterated in the judgment, Whaling case, Judgment, para. 66.
ultimately decided no to borrow this test, and applied the reasonableness assessment instead, which arguably came close to a de novo appraisal, and thus was slightly even more intrusive than the one mandated by the WTO.

2.3 The reasonableness test: a ‘hybrid’ standard of review

It is also argued here that the reasonableness review is a laudable step towards taking up the task of interpreting concepts, which are situated on the border of legal and scientific parlance. The term ‘scientific research’ is exactly such a concept given that it is embedded in the ICRW, though to discern its meaning, the Court needs to rely on scientific expertise. Judge Owada was perplexed by the same hybridity of the reasonableness concept, when asked in his dissent that “is it the legal context or is it the scientific context that the Court claims to be engaged in?” The answer to that question, I believe, is ‘both’ because to provide a meaningful, in-depth legal interpretation of the term ‘scientific research’, which does justice to the complexities of modern scientific realities. Interpreting ‘scientific research’ ought not to be confined to the ordinary meaning of the term without consulting scientific experts on the substantive characteristics of scientific research as conducted in the specific field, on the specific research questions, and also with respect to the contemporary state of scientific technologies.

Support for applying such a ‘hybrid’ approach is also suggested by Judge Keith, whose position is worth reiterating here: “[The Court] does have the role of assessing ... the evidence to see whether it demonstrates coherent scientific reasoning supporting central features of the programme.” And indeed, the judgment should be praised for taking up “the dual tasks of treaty interpretation and judicial review of scientific evidence.” An important caveat seems to be warranted here. Making sense of the scientific processes from a legal point of view does not necessitate to decide the scientific controversies involved. As the joint dissenting opinion of Judge Al-Khawajneh and Simma in the Pulp Mills case famously emphasized: “the task of a

615 The dissenting opinion of Judge Owada referred to the report of the WTO AB in the Continued Suspension of Obligation case, WT/DS320/AB/R.
617 Whaling case, Judgment, Dissenting Opinion of Judge Owada, para. 25.
618 Whaling case, Judgment, Declaration of Judge Keith, para. 8.
court of justice is not to give a scientific assessment”\textsuperscript{620} regarding the scientific submissions’ credibility, validity or viability. The international judicial function does not create a need for resolving scientific debates.\textsuperscript{621}

In contrast to Judge Keith’s position, Judge Owada would have preferred a more restricted approach, where the judicial purview does not include expounding science-based concepts. He argues that “even though there may be certain elements in the concept that the Court may legitimately and usefully offer as salient from the viewpoint of legal analysis”,\textsuperscript{622} the Court should not do so, as it “should focus purely and simply on the issue of the scope of what constitutes activities ‘for purposes of scientific research’ according to the plain and ordinary meaning of the phrase”.\textsuperscript{623}

The ordinary meaning of ‘scientific research’, as provided by the Oxford English Dictionary is as follows: “systematic pursuit of knowledge concerning the structure and behavior of the physical and natural word through observation and experiment.”

As it is may be apparent by now, subscribing to such a formalistic and vague definition of science would have deprived the Court from conducting a substantive review of elements of JARPA II, and hence, in all likelihood the program would have been found meeting the requirements for being conducted ‘for purposes of scientific research’.

At the end of the day, the lack of providing a general definition on ‘scientific research’ did not bar the Court from conducting an in-depth, substantive and “\textit{de novo}”\textsuperscript{624} review into the research items of JARPA II. The ICJ in fact was assessing them against the legal benchmark of reasonableness. The roughly 80-paragraph long elaborate judicial evaluation of the elements of the design, methodologies, and implementation of the alleged research program\textsuperscript{625} evidences this. Even Professor Mangel acknowledges in his later publication in a leading scientific journal, Proceedings of the National Academy of Sciences, that “even though the Court did not define science, the process of science is interwoven in the standard of review for comparing the objectives, design and implementation of JARPA II.”\textsuperscript{626}

\begin{itemize}
  \item \textsuperscript{620} \textit{Pulp Mills} case, Judgment, Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, para. 4.
  \item \textsuperscript{621} Mbengue, ‘International courts and tribunals as fact-finders’, 76.
  \item \textsuperscript{622} \textit{Whaling} case, Judgment, Dissenting Opinion of Judge Owada, para. 24.
  \item \textsuperscript{623} \textit{Whaling} case, Judgment, Dissenting Opinion of Judge Owada, para. 23.
  \item \textsuperscript{624} Judge Owada described the Court’s approach as “making a de novo assessment”, though he criticized the Court for this, see \textit{Whaling} case, Dissenting Opinion of Judge Owada, para. 38.
  \item \textsuperscript{625} \textit{Whaling} case, Judgment, paras.147-222.
  \item \textsuperscript{626} Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14524.
\end{itemize}
It is argued here that the two-step analysis, which focused more on the first part of the definition (‘for purposes of’) that is more amenable to legal analysis compared to the second half (‘scientific research’) was a necessary if not appropriate judicial tool, which enabled the Court to provide a persuasive reasoning still speaking in the language of a legal assessment. Considering the complexity of sorting out claims of ‘science’ and ‘non-science’, one may see considerable merit in the argumentation of Garrido-Munoz, a legal officer of the Court, who suggests that the use of the ‘reasonableness’ standard contributes to exercising “the very essence of the judicial function”\(^{627}\) in complex cases, where the competing values judges need to balance are “simply impossible to quantify.”\(^{628}\)

### 2.4 Practical implications of the reasonableness test for future whaling disputes

Undoubtedly, the effectiveness and practical implications of the chosen standard of review will be best measured against future conflicts arising from the aftermath of the decision. Japan has announced that it would abide by the ICJ’s judgment.\(^{629}\) However, shortly after Japan designed a new whaling program under the special permit provision of the ICRW (called New Scientific Whale Research Program in the Antarctic Ocean, “NEWREP-A,”), which would include lethal take of 333 minke whales per annum, during a 12-year period, while pursuing broadly similar goals than JARPA.\(^{630}\) Hence, the question of reasonableness between research objectives and implementation would be in principle relevant with respect to the evaluation of NEWREP-A.

Many scholars doubt the usefulness of the ICJ’s newly announced standard of review in the future of the Whaling dispute. Some scholars criticize the reasonableness standard for being unclear and leaving too much room for maneuver for State parties to “redefine the scope of their own obligations” under the ICRW.\(^{631}\) They also assert that since the test fails to mandate a retrospective evaluation of the


\(^{630}\) Press, ‘Science in the Court! The Role of Science in ‘Whaling in the Antarctic’’, pp. 384–85.

\(^{631}\) Gogarty and Lawrence, ‘The ICJ Whaling Case: Missed Opportunity to Advance the Rule of Law in Resolving Science-Related Disputes in Global Commons?’, 182.
‘scientific’ research at hand, such a reasonableness criterion would only allow scrutiny to NEWREP-A after several years,632 when significant volume of data have been generated through the lethal taking of thousands of whales. This casts considerable doubts on the efficacy of the judgment with respect to ensure compliance with the ICRW regime. Others questioned the workability and usefulness of that approach on the long run with respect to situations in the future involving similar claims of science.633

Japan’s take on the reasonableness requirement also supports doubts about the efficiency of standard. As Shotaro Hamamoto, agent for respondent, has put it, the Court crafted the requirement of reasonableness “as an obligation to state reasons”,634 according to which “[e]ach time, in each situation and with respect to each action, States would need to publicly provide detailed reasons in a timely manner, otherwise, they might be held internationally responsible for the failure to do so.”635

Be that as it may, the material chances of a subsequent proceedings focusing on the compliance of Japan with the Court’s requirements have become ever weaker, given that Japan has amended its declaration under Article 36 (2) of the Court’s Statute. As of 6 October 2015, the declaration of Japan recognizing the compulsory jurisdiction of the ICJ does not extend to „any dispute arising out of, concerning, or relating to research on, or conservation, management or exploitation of, living resources of the sea.”636 Consequently, any further legal challenges as to Japan’s new ’scientific’ whaling programs may only reach the ICJ in case an interpretation of the 2014 judgment were to be requested by Australia637 or if new treaty-based claims were filed.

In the rather optimistic account of Anthony Press, Japan would still be in a difficult position to defend the ‘scientific’ nature of NEWREP-A before the Court in 632 Gogarty and Lawrence, ‘The ICJ Whaling Case: Missed Opportunity to Advance the Rule of Law in Resolving Science-Related Disputes in Global Commons?’, 183.
case the scheme remains essentially the same: ‘merely asserting that the Court’s views have been taken into considerations may not be seen as ‘reasonable’ if subsequently challenged.’\textsuperscript{638} The extent to which such a reasonableness-based review would indeed preclude using certain design and implementation schemes involving lethal methods ‘for purposes of scientific research’ will depend on the willingness of the Court to engage in a more nuanced and even more detailed demarcation of science and non-science in subsequent proceedings.

3. Doctrinal implications of the reasonableness test for the judicial purview

The intrusive standard of review broadens the extent of the Court’s review and therefore allows for expanding the scope of judicial purview. The reasonableness test therefore is consequential also for debates concerning the proper scope of judicial task in dealing with fact-intensive cases. Despite the fact that in \textit{Pulp Mills} the joint dissenters and the similarly dissenting Judge Vinuesa\textsuperscript{639} both dismissed the majority’s “flawed”\textsuperscript{640} methodology and criticized the judgment for the lack of finding substantive breaches established due to a poor evaluation of the evidence; they were in no agreement as to the appropriate scope of the judicial task. The two opinions in fact canvass entirely different picture on the appropriate judicial purview in science-intensive cases.

Judge Vinuesa emphasizes the Court’s apparent incapability to evaluate the “scientific integrity of the scientific methodologies applied”,\textsuperscript{641} and “the credibility of the scientific submissions”,\textsuperscript{642} which altogether suggest that the Court ought not to aspire to make conclusions as which it clearly lacks “proper expertise of knowledge”.\textsuperscript{643} In contrast to that, the joint dissenters, Judge Simma and Judge Al-Khasawneh saw in this case an opportunity for the Court to discharge “exclusive judicial functions” in “the interpretation of legal terms and the legal categorization of factual issues”.\textsuperscript{644} They also emphasized that “the task of a court of justice is not to

\textsuperscript{638} Press, ‘Science in the Court! The Role of Science in ‘Whaling in the Antarctic’”, p. 386.
\textsuperscript{639} \textit{Pulp Mills} case, Dissenting Opinion of Judge Vinuesa, para. 69.
\textsuperscript{640} \textit{Pulp Mills} case, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 2.
\textsuperscript{641} \textit{Pulp Mills} case, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 2.
\textsuperscript{642} \textit{Pulp Mills} case, Dissenting Opinion of Judge Vinuesa, para. 72.
\textsuperscript{643} \textit{Pulp Mills} case, Dissenting Opinion of Judge Vinuesa, para. 72.
\textsuperscript{644} \textit{Pulp Mills} case, Joint Dissent, para. 12.
give a scientific assessment”\textsuperscript{645} regarding the scientific submissions’ credibility, validity or viability. Scholarly opinions also suggest that the international judicial function does not create a need for resolving scientific debates.\textsuperscript{646}

The \textit{Whaling} case provided opportunity for ICJ judges to revisit the divergent views on the limits and essence of the judicial task. \textit{Judge Sebitudine} regarded such a definitional task “more suited to scientists rather than lawyers”.\textsuperscript{647} This view was shared by Judge Owada, according to whom “this Court, as a court of law, is not professionally qualified to give a scientifically meaningful answer [to the question of what science is], and should not try to pretend that it can”.\textsuperscript{648} This has been, however, countered by the majority, which declared the controversy surrounding the interpretation of the term ‘scientific research’ as a matter falling within the Court’s purview. As was explained by Judge Keith, scientific concepts can be appraised from the law’s perspective given that “[The Court] does have the role of assessing ... the evidence to see whether it demonstrates coherent scientific reasoning supporting central features of the programme.”\textsuperscript{649}

With the reasonableness standard of review, the Court could assess whether the evidence “demonstrates coherent scientific reasoning supporting central features of the programme.”\textsuperscript{650} By doing so, the ICJ took a step toward a more activist role of supervising science-based disputes without, however, putting the judges in a position of a ‘super-expert’. Emphatically, ‘reasonableness’ is not a scientific standard, as it presupposes an act of balancing, which is alien to scientific judgment. Therefore, forming an opinion on the reasonableness of JARPA II, does not in strict sense entail an evaluation of the ‘scientific’ nature of the program. The reasonableness is, in fact, a standard that is akin to judicial logic and thus allows international judges to assume a more active role in appraising the legally relevant characteristics of ‘scientific research’, without however making an epistemically arbitrary judgment about scientific ‘truths’.

This is highly consequential for future cases as it provides a valuable precedent for a broader conception of the ICJ’s judicial function that is not confined

\textsuperscript{645} \textit{Pulp Mills} case, Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, para 4.
\textsuperscript{646} Mbengue, ‘International courts and tribunals as fact-finders’, 76.
\textsuperscript{647} \textit{Whaling} case, Dissenting Opinion of Judge Sebitudine, para. 9.
\textsuperscript{648} \textit{Whaling} case, Dissenting Opinion of Judge Owada, para. 24.
\textsuperscript{649} \textit{Whaling} case, Declaration of Judge Keith, para. 8.
\textsuperscript{650} \textit{Whaling} case, Declaration of Judge Keith, para. 8.
to strictly non-scientific considerations, such as good faith assessments. As to the extent of judicial engagement with science, *the Whaling* judgment seems to strike the most appropriate balance between epistemic non-arbitrariness, which warns against judges acting as super-experts, as well as judicial inaction, which undermines the Court’s authority. As will be analyzed later in greater detail, various scientific and non-scientific benchmarks are available for the ICJ and other international courts to engage with science by focusing on the quality of the scientific or science-based reasoning.

VI. Interim conclusion

1. Framing science-intensive disputes: avoidance strategies

With the words of Judge Simma and Judge Al-Khasawneh, in environmental disputes scientific findings bear direct relevance in “*distilling the essence of legal concepts, such as “significance” of damage, “sufficiency”, “reasonable threshold” or “necessity”*” One may accordingly expect that scientific considerations have a major role in resolving environmental disputes. This chapter, however, demonstrated that science is in fact often accorded a minimal role in judges’ deliberation; and thereby, the ICJ seems to downplay the significance of science in resolving environmental disputes.

With regard to the framing of environmental disputes, the *Gabcikovo-Nagymaros* judgment illustrates most clearly the evasive judicial strategy of the Court towards resolving environmental disputes. Jorge Vinuales sees this case as an apposite example of judges’ decision to “minimizing science” in adjudication. Another discernible trend is that judges are more willing to find breaches of procedural norms relating to environmental protection than that of substantive ones, a considerable advantage of the former being that such claims are typically less closely tied to scientific facts and uncertain causation. Sometimes parties also try to avoid the

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651 See discussions in Chapter 11.
652 *Pulp Mills* case, Dissenting Opinion of Judge Al-Khasawneh and Judge Simma, para. 17.
adjudication of science-heavy conflicts, as evidenced by numerous instances of settling such claims out of court.

2. Downplaying science in fact-finding

With respect to the scientific fact-finding of the ICJ scholarly consensus holds that it is necessary to increase its capacities, and commentators only differ as to the modalities of the desirable change. Ridell and Plant emphasize the need to forego its evasive attitude towards being open regarding its use of scientific expertise. Caroline E. Foster advocates more specifically for a greater reliance on ex curia experts. Compared to the outright dismissal of expert evidence in Gabcikovo judgment or the overly dismissive approach to scientific evidence submitted in Pulp Mills, more recent cases display a “cautious” development with regard to the Court’s evidentiary assessments.

Nevertheless, the ICJ still lags behind other international judicial bodies with respect to scientific fact-finding. Even when the Court did award compensation for environmental damage, as it did most recently in the compensation judgment in Certain Activities, its scientific reasoning remains rather inconsistent as it still refused to request for expert evidence let alone to appoint ex curia experts. The most problematic aspect of the Court’s reasoning is perhaps the complete lack of transparency as it did not reveal any of its choices driving its calculation of the damages awarded.

Compared to the paths taken by other international judicial fora in cases involving scientific expertise, most notably the PCA, the WTO, ITLOS, or ISDS panels; the ICJ appears to be the most unwilling to engage with the scientific aspects of environmental disputes. As Ridell aptly summarizes: “the International Court of Justice can retain its importance in international dispute resolution, if it sufficiently addresses the easily rectifiable deficiencies in the area of scientific evidence.”

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654 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 299.
655 Ridell and Plant, Evidence before the International Court of Justice, p. 353.
656 Foster, ‘New Clothes for the Emperor?’, 141.
658 Ridell, ‘Scientific Evidence in the International Court of Justice - Problems and Possibilities’, 229.
3. Causal inquiry: uncertain prospects of uncertain causal links

The causal analysis of the Court also bespeaks the Court’s struggles with accommodating science in the judicial inquiry. This is evidenced by the fact that every claim of environmental harm where respective scientific evidence tainted with uncertainties was dismissed. The first instance when the ICJ awarded compensation for damage caused to the environment was in the recent compensation judgment in Certain Activities, where however, causality between Nicaragua’s unlawful dredging and the felling of trees was not debated. Thus far only dissenting opinions, most eminently of Judge Simma and Judge Al-Khasawneh called for the Court’s greater responsiveness to find causal claims established on the basis of such evidence.

4. Intrusive standard of review and the expanding boundaries of judicial purview

A most interesting trend regarding the environmental docket of the Court is the ways in which scientific arguments extend the scope of judicial inquiry. The majority of the Court in Whaling subscribed to the view that interpreting science-intensive legal concepts, such as that of ‘scientific research’ falls within the judicial purview and should be carried out by building upon experts that are thoroughly interrogated by the parties. The decision also featured an objective standard of review, in the form of a reasonableness assessment, which can be viewed as a step towards a laudable direction of engaging with science with a reasoning that is legalistic but also adequately rooted in the evaluation of the expert opinions received.
Chapter 4
Judicial engagement with science by inter-State arbitral tribunals

"The Tribunal is of the opinion that these [fumigations] are due to the existence for a considerable period of a sufficient velocity of the has-carrying air current to cause a mixing of this with the surface atmosphere."\(^{659}\)
Trail Smelter Arbitral Award, 1941

"Nor is it the task of this Tribunal to investigate questions of considerable scientific complexity as to which measures will be sufficient to achieve compliance with the required levels of environmental protection. These issues are appropriately left to technical experts."\(^{660}\)
Iron Rhine Arbitral Award, 2005

I. Introduction: science and environmental disputes in inter-State arbitration

This chapter will first discuss inter-state international environmental arbitration where scientific evidence and arguments played a significant role. Such disputes are brought before ad hoc tribunals, or more recently, before tribunals established under the aegis of the Permanent Court of Arbitration (“PCA”). Among international ad hoc arbitral awards, the Trail Smelter case and the Lac Lanoux arbitration will detail. From PCA practice those decisions will be discussed in which scientific arguments and expert evidence had direct bearing on the subject-matter of environmental cases and/or these were put in the center of the parties’ argumentation or the reasoning of the tribunal. In a chronological order, these are the Iron Rhine Railway, the Indus Waters Kishenganga, and the South China Sea Arbitrations.\(^{661}\) The earlier Rhine Chlorides case will not be discussed here, as it did not entertain scientific arguments in the merits phase.\(^{662}\)

From among the decisions of arbitral tribunals established under Annex VII of the United Nations Convention on the Law of the Sea (“UNCLOS”) those will be

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\(^{659}\) *Trail Smelter Arbitration*, Award, 1941, U.S./Canada, p. 1924.

\(^{660}\) *Iron Rhine Arbitration* Award, Belgium/Netherlands, para. 235.

\(^{661}\) The *Chagos Archipelago* case (Mauritius v. U.K., 2015) will not be discussed from PCA practice as it concerned a dispute over sovereignty, fishing rights and the rights of establishing a Marine Protected Area under the parties’ bilateral treaty.

\(^{662}\) The *Rhine Chlorides* (Netherlands v France, 2004) case concerned competing approaches to treaty interpretation, as the States involved differed in their preferred method for calculating the costs payable to France for the storage of chlorides under the 1976 Additional Protocol.
elaborated on that bespeak the scientific engagement of the arbitrators. These are the MOX Plant case and the MOX Plant OSPAR Arbitration, both concerning the commissioning of a nuclear power plant in Sellafield, UK located on the seashore of the Irish Sea less than 200 km away from Ireland, the complainant of both proceedings.  

The focus of the present analysis is the ways in which panels frame science-heavy disputes and to extent to which they rely on scientific arguments to craft their reasoning.

II. Framing disputes to carve out science from the inquiry

Arbitral tribunals have consistently regarded science-intensive disputes justiciable. The question of non-justiciability was most clearly advanced by Japan in in the Southern Bluefin Tuna arbitration.  

“At the core of the dispute” lied the parties disagreement as to whether “the stock has in fact begun to recover” due to restrictions as to the total allowable catch of tuna. Japan argued that the claims at hand were “questions of scientific judgments”, and hence not justiciable. Whereas Australia maintained that the treaty “would be devoid of meaning if disputes concerning questions of scientific fact and opinion were not justiciable.” The Chapter VII arbitral tribunal observed that the dispute at hand “is not confined to matters of scientific judgment only”, and hence these early attempts at carving out such disputes from adjudicatory competence remained futile.

The fact that arbitral tribunals do intend to adjudicate science-intensive claims does not mean they are equally willing to consider the scientific dimension of such disputes. In the majority of environmental disputes, tribunals adopted various

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663 Other Annex VII disputes containing an environmental component will not be detailed. The Land Reclamation by Singapore in an around the Straits of Johor (Malaysia v. Singapore) dispute was settled by the parties, therefore it falls out of the scope of the present inquiry. See Land Reclamation by Singapore in an around the Straits of Johor (Malaysia v. Singapore), Award on Agreed Terms, issued on 1 September 2005, award, recital 25

664 Southern Bluefin Tuna (New Zealand – Japan, Australia - Japan), Award, 4 August 2000, Reports of International Arbitral Awards, Volume XXIII pp. 1-57 (“Southern Bluefin Tuna arbitration”).

665 Southern Bluefin Tuna arbitration, Award, para. 22.

666 Southern Bluefin Tuna arbitration, Award, para. 22.

667 Southern Bluefin Tuna arbitration, Award, para. 40.

668 Southern Bluefin Tuna arbitration, Award, para. 41.

669 Southern Bluefin Tuna arbitration, Award, para. 65.
techniques to carve out scientific evidence from the legally decisive aspects of the dispute.

1. Marginalizing science by adjudicators

The first instance of an international arbitration arising out of a conflict over natural resources was the *1893 Bearing Sea Fur Seals Arbitration* between Great Britain, administering Canada, and the United States, which at the material time had just acquired the territory of Alaska from Russia. A rapid decline in the population of migratory fur seals ignited this dispute between these two leading fur sealer nations, given that shrinking herds jeopardized the viability of the industry. This historic dispute provides an early example of how international environmental disputes are often decided without touching upon the scientific aspects, even though they often lies at the heart of the dispute.

At the heart of the conflict lied a scientific issue, *i.e.* the scientific cause of the decreasing number of seals. The parties, unsurprisingly, were in harsh disagreement on that issue. The U.S. claimed that the decline was due to an increased pelagic sealing on the high seas from where the seals were migrating to the Pribilof Islands on U.S. territory. Whereas the U.K. claimed that the real cause was overexploitation of the seals on the island. Notwithstanding, the legal dispute as set forth in the Arbitration Agreement was strictly confined to the legal question as to whether the U.S. was entitled to enforce a protective legislation outside of its territorial seas on the basis of right of property or protection. The panel concluded that a domestic piece of legislation could not lawfully restrict another sovereign’s hunting rights on international waters, and thus, found in favor of Great Britain. As a corollary of

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670 REPORTS OF INTERNATIONAL ARBITRAL AWARDS, ‘Award between the United States and the United Kingdom relating to the rights of jurisdiction of United States in the Bering’s sea and the preservation of fur seals’ (1893).
674 REPORTS OF INTERNATIONAL ARBITRAL AWARDS, ‘Award between the United States and the United Kingdom relating to the rights of jurisdiction of United States in the Bering’s sea and the preservation of fur seals’, pp. 267, Question 5.
675 REPORTS OF INTERNATIONAL ARBITRAL AWARDS, ‘Award between the United States and the United Kingdom relating to the rights of jurisdiction of United States in the Bering’s sea and the preservation of fur seals’, p. 269.
such framing of the dispute, the judgment did not comment on the causes of the declining seal population.

1.1 The Iron Rhine Railway (Belgium v The Netherlands, 2005): a Solomonic Judgment

The *Iron Rhine* decision serves as an apposite example of instances, when arbitrators refuse to consider the scientific subject matter of the case, in an attempt to retain full control over the dispute settlement process. Indeed, commentators note the apparent concern among international judges about in case of reliance on scientific expert opinion.

The *Iron Rhine Railway* case concerned Belgium’s intended reactivation of the historic Iron Rhine Railway on the territory of the Netherlands. The dispute focused on the scope of obligations the Netherlands could reasonable impose on Belgium under the 1839 Separation Treaty with respect to the reactivation of the railway. The environmental aspect of the case flowed from the fact that the Netherlands designated some parts of the route as a nature reserve partly as a National Park established by Dutch law, and partly as constituent of the Natura 2000 ecological network, protected under EU law. The Netherlands required Belgium to take costly noise protection measures with respect to the railway, which the latter regarded as disproportionate burden alleging that they were not the “least costly available” means to mitigate the noise. The Netherlands at this point sought to require expert opinion to “identify objectively” the environmental measures that are deemed appropriate in this case.

Yet the Tribunal avoided “investigating questions of considerable scientific complexity,” and refused to take a position on this matter with or without having recourse to expert opinion. Instead, it chose to disregard the scientific aspect of the dispute, and it sought to resolve the conflict indirectly, by setting up a cost allocation scheme between the parties. The quantum of the costs payable was to be established

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676 *Iron Rhine Arbitration* (Belgium/Netherlands), PCA Case No. 2003-02, Final Award, 24 May 2005 (Award) ("Iron Rhine Arbitration").
677 *Iron Rhine Arbitration*, Award, para. 70.
678 *Iron Rhine Arbitration*, Award, para. 71.
680 *Iron Rhine Arbitration*, Award, para. 244.
by an independent expert committee set up by the parties within 4 month of issuing the Award.\textsuperscript{681} The Award required Belgium to pay the costs of noise barriers and the compensatory conservations measures, while the costs of building a tunnel in the territory of the National Park designated by Dutch legislation had to be born by the parties in equal parts.\textsuperscript{682} Possible reasons for and critique of such a judicial reasoning will be discussed in the following section.

It is submitted here that such judicial concerns over the "erosion of judicial authority"\textsuperscript{683} impact the very framing of environmental disputes. In order to preserve ultimate authority over the dispute, adjudicators rather not regard scientific arguments as having compelling force in resolving environmental disputes, since doing so would tie their hands in terms of the adjudicatory outcome.

From a pragmatic point of view, the Iron Rhine award can be regarded similar to the judgment of Solomon, which is considered to be an archetypal example for wise decisions made in the face of complex factual conundrum. According to such a reading, to prevent the Netherlands from imposing potentially exaggerated protection measures with overstated costs on Belgium, the panel split the costs evenly between the parties. Conferring costs on the Netherlands disincentivized, if not prevented, it from requiring measures that were not, in fact, strictly necessary for environmental purposes. The logic of setting up this scheme was not to allow environmental arguments that could be a mere pretext for economic interests to have a decisive influence on the reasoning. One may also argue that disregarding the scientific dimension of the case made it possible to eliminate uncertainties inherent in the environmental arguments of the Netherlands, and thus enabled a decision to be brought on a more transparent basis.

However, comparing this decision to the judgment of Solomon reveals the biggest weakness of the decision. King Solomon made his famous ruling to decide about motherhood without being able to benefit from scientific evidence on biological motherhood. Under such circumstances, basing a decision on strictly non-scientific considerations is perfectly legitimate and could be well considered as a wise ruling. However, international adjudicators are in a very different position as they are equipped with a range of options to have recourse to scientific evidence and expertise.

\textsuperscript{681} *Iron Rhine Arbitration*, Award, para. 235.
\textsuperscript{682} *Iron Rhine Arbitration*, Award, para. 244 section (e).
\textsuperscript{683} Payne, ‘Mastering the evidence’, 1195.
It thus seems justifiable to argue that Solomon’s judgments were only appropriate and legitimate in the past (n.b. the Biblical origin of the term), when nascent state of environmental sciences could have justified setting science entirely aside in a legal dispute. However, when present day ecological sciences are perfectly capable of listing and verifying scientific reasons warranting certain protection measures in a nature reserve, deciding a dispute on reasonable environmental protection requirements in complete disregard of expert opinions, seems to be problematic.

1.2 MOX Plant OSPAR Arbitration (Ireland v. UK, 2003):\textsuperscript{684} disregarding science-intensive arguments of both parties

The MOX Plant dispute generated several legal proceedings before different international adjudicatory fora, due to which it was regarded as a “poster child”\textsuperscript{685} of a fragmented system of international environmental dispute resolution.\textsuperscript{686} Complaints were filed with ITLOS, an Annex VII Arbitral Tribunal, and an arbitral tribunal set up under the OSPAR Convention. Later, the European Court of Justice also issued a judgment in an infringement proceeding launched against Ireland for violating the exclusive jurisdiction of the European Court of Justice by bringing the dispute to the Arbitral Tribunal under UNCLOS without first consulting with EC institutions.\textsuperscript{687}

The diverse legal claims all concerned a mixed-oxide fuel plant (“MOX plant”) made from a mixture of plutonium dioxide and uranium dioxide commissioned by the UK. MOX is a nuclear fuel produced from reprocessed spent nuclear materials. The Sellafield facility has long been used for both civilian and military nuclear program since 1947,\textsuperscript{688} and experienced several accidents before the MOX manufacturing facilities have been built there in 1994.\textsuperscript{689}

\textsuperscript{686} For a more detailed discussion on the fragmentation of environmental dispute settlement system see Y. Shany, ‘The First MOX Plant Award: The Need to Harmonize Competing Environmental Regimes and Dispute Settlement Procedures’ (2004) 17 815–27.
\textsuperscript{687} C-459/03 Commission v. Ireland.
\textsuperscript{688} Bodansky, ‘OSPAR Arbitration of the MOX Plant Dispute’, 4.
\textsuperscript{689} Bodansky, ‘OSPAR Arbitration of the MOX Plant Dispute’, 5.
The first award of the MOX Plant saga was issued by a Tribunal constituted under the 1992 Convention for the Protection of the marine Environment of the North-East Atlantic ("OSPAR Convention") for the UK’s refusal to provide Ireland with unredacted versions of two reports concerning the economic justifications for and the business rationale of commissioning the plant. The UK omitted certain data and figures with reference to business confidentiality. Ireland argued that the redactions in the reports preclude a meaningful assessment whether expected economic benefits are capable of outweighing and thus, justifying the negative environmental consequences from the perspective of a cost-benefit analysis.

Ireland based its claims on Article 9 of the OSPAR Convention, which ensures a right to access to any information “on the state of the maritime area, on activities or measures adversely affecting or likely to affect” the environment. Ireland claimed a broad definition of information comprising all data relevant to the cost-benefit analysis of the plant. Accordingly, in Ireland’s view all information was relating to the state of the environment, which lead to the decision of discharging nuclear material into the sea. The Tribunal disagreed and construed a more “restricted”690 definition of environmental information.

The reasoning provided by the panel for the narrow reading speaks directly to the issues relevant in this study. First, the majority of arbitrators rejected the causal argumentation of Ireland, labeling it as an “inclusive causality” doctrine, under which “anything, no matter how remote, which facilitated the performance of an activity is to be deemed part of that activity”.691 Arbitrator Gavan Griffith harshly criticized this causal theory in his dissent holding it unfounded and obfuscating the causal requirements under Article 9.692 Second, the majority was of the view that the request for the redacted information was out of the scope of Article 9 because it did not relate to an activity that was “likely to affect” the marine environment. Without hearing any expert evidence assessing the likelihood of impact, the majority concluded that there is no activity that has the potential of causing adverse effects on the marine environment, and that Ireland failed to demonstrate that the redacted items were “information ... on

690 MOX Plant OSPAR Arbitration, Award, para. 170.
691 MOX Plant OSPAR Arbitration, Award, para. 164.
692 Dissenting Opinion of Gavan Griffith, MOX Plant OSPAR Arbitration Award, para. 95.
the state of the maritime area or even if they were, are likely adversely to affect the
maritime area.” 693

The MOX Plant OSPAR Arbitration award provides an example of cases, where arbitrators frame disputes to conveniently circumventing complex factual questions. Gavan Griffith points out in his dissent that the majority’s finding against the likelihood of adverse effects to the environmental was “without any assessment and identification of its factual basis, and in an apparent disregard of the admitted environmental damage, the lower threshold of proof.” 694 The dissent also lends support to the proposition that the framing of the relevant issues in the award went quite against the parties’ submissions. Griffith draws attention to the fact that the parties’ submissions extensively dealt with “future environmental detriment” in Ireland’s Memorial, Reply, or oral submissions and in “the references made ... by the United Kingdom in the course of oral pleadings.” 695 Yet the adjudicatory analysis circumvented these issues.

1.3 MOX Plant award under UNCLOS (Ireland v. UK, 2008): 696 dismissing the claim without scientific inquiry

The second arbitral award in the MOX Plant saga was rendered by an Annex VII Arbitral Tribunal under UNCLOS, a mixed agreement to which both Member States and the EU is a party to. Ireland’s application was ultimately withdrawn following the European Court of Justice’s judgment finding a violation of its exclusive jurisdiction between Member States’ disputes. 697 In the main proceedings, Ireland claimed that the UK was acting contrary to Article 194 of UNLCOS prescribing an obligation to prevent pollution of the marine environment by discharging into the Irish Sea certain radioactive substances ancillary to the functioning of the MOX Plant. 698

For this reason, the arbitral tribunal only decided about a request of Ireland for interim measures necessary to prevent serious harm to the marine environment. It was in this context that the arbitral tribunal briefly touched upon on issues of

693 MOX Plant OSPAR Arbitration Award, para. 179.
694 Dissenting Opinion of Gavan Griffith, MOX Plant OSPAR Arbitration Award, para. 89.
695 Dissenting Opinion of Gavan Griffith, MOX Plant OSPAR Arbitration Award, para. 88.
697 MOX Plant case, Ireland v UK, PCA Case No. 2002-01, Order No 3.
698 C-459/03 Commission v Ireland.
699 MOX Plant case, Ireland v UK, PCA Case No. 2002-01, Order No 3, para. 9.

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environmental harm in dismissing the request for provisional measures.\textsuperscript{700} For purposes of the present analysis, it is noteworthy that it did so in an altogether 3-paragraph long assessment. After having noted the UK’s position, according to which the quantities of radioactive substances with extremely long half-life were “infinitesimally small”,\textsuperscript{701} the tribunal found that Ireland failed to establish any serious harm that may be causal upon the operation of the MOX plant.\textsuperscript{702}

2. Marginalizing science by the plaintiff

Scientific arguments are missing from the analysis sometimes because of the parties’ litigation strategy. The Lake Lanoux Arbitration provides an example for marginalized role of science in a dispute due to the plaintiff’s reluctance to bring any techno-scientific argument into the debate, even though in the tribunal’s view, the factual details could have been decisive for the outcome of the legal analysis.

2.1 Lake Lanoux Arbitration (Spain v. France, 1957)\textsuperscript{703}

This arbitration zeroed in on water usage rights of upstream and downstream States over shared freshwater resources. In order to create opportunities for an electricity generator dam, France intended to unilaterally divert a tributary, which stems form Lake Lanoux and provides 25\% of the waters of the River Carol that enters Spanish territory and flows into river Ariége.\textsuperscript{704} The French scheme proposed that the waters diverted would be returned to the Carol through a tunnel from the Ariége on French territory, well above the Spanish border.

The parties disagreed about the lawfulness of the French proposal.\textsuperscript{705} The legal basis of the dispute was a series of bilateral treaties concluded in 1865-66 among

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\textsuperscript{700} MOX Plant case, Ireland v UK, PCA Case No. 2002-01, Order no 3.
\textsuperscript{701} MOX Plant case, Ireland v UK, PCA Case No. 2002-01, Order no 3. para. 46.
\textsuperscript{702} MOX Plant case, Ireland v UK, PCA Case No. 2002-01, Order No 3. para. 55.
\textsuperscript{703} Lac Lanoux case (Spain v. France), Arbitral Award, 1957 („Lac Lanoux award”).
\textsuperscript{704} “It could have been argued that the works would bring about an ultimate pollution of the waters of the Carol or that the returned waters would have a chemical composition or a temperature or some other characteristics which would injure Spanish interests. Spain could have then claimed that her rights had been impaired in violation of the Additional Act. Neither in the dossier nor in the pleadings in this case is there any trace of such allegation.” Lac Lanoux award.
\textsuperscript{705} Spain insisted that any project involving diversion of the waters is only lawful to the extent that it consented to it, but it emphatically refused to do so. Spain further claimed that the French proposal is a prohibited modification of the natural flow of the waters under the Treaties of Bayonne, since the proposed re-channeling would change the “order of Nature” and would make the restoration of waters
\end{flushleft}
Spain and France: the Treaty of Bayonne and its supplement, the Additional Act. These provided that works by any one party aiming to change the course or the volume of watercourse were subject to notification and consultation with the affected State. The Additional Act also stipulated a prohibition to building dams or any other obstacle that was “capable of harming” the neighboring country.

Surprisingly, the parties couched their arguments as if the dispute were a battle of competing abstract conceptualizations of the scheme’s effects on the distribution of water. Therefore, they did not even address the techno-scientific feasibility and the consequences of the project. For instance, Spain failed to argue with the possibility that the works would pollute or change the chemical composition or the temperature of the waters, and only argued that the diversion of the water would change “the order of Nature”, but did not provide any scientific explanation for this concept nor it listed scientific objections to the project. Spain’s failure to employ techno-scientific arguments may be owed to the fact that no engineers were included in its delegation.

The panel itself noted that the lack of evidence on the alleged difference between the volume of the diverted and the returned waters prevented adjudicators from assessing the factual basis of the conflict. The arbitrators explicitly stressed that discussing the scientific and technological details of the project might have changed the outcome of the proceedings. In lack of any arguments regarding the potential harmful consequences of this novel technology, the panel regarded the diversion of water as a corollary of exercising sovereign power on a State’s own territory and ruled in favor of France. The reasoning of the tribunal gives the impression that

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706 Article 11 Additional Act of May 26, 1866.
707 Article 12 Additional Act of May 26, 1866.
708 Lac Lanoux award, Section 6 of the Reasoning pertaining to Question A.
709 Lac Lanoux award, Section 5 of the Reasoning pertaining to Question A.
710 Lac Lanoux award, Section 7 of the Reasoning pertaining to Question A.
712 Lac Lanoux award, Section 5 of the Reasoning pertaining to Question A.
713 “The state of modern technology leads to more and more frequent justifications of the fact that waters used for the production of electric energy should not be returned to their natural course “, Lac Lanoux award, Section 8 of the Reasoning pertaining to Question A.
714 “The risk of an evil use has so far not led to subjecting the possession of these means of action to the authorization of the States which may possibly be threatened”, Lac Lanoux award, Section 9 of the Reasoning pertaining to Question A.
should Spain be more willing to cite scientific findings and address the technical weaknesses of the project, it might have had better chance to win the case. Nevertheless, in the material case scientific arguments remained a missed opportunity.

3. Including science in the reasoning: neutralizing the dispute

Despite the above decisions that showcased instances where science is carved out and downplayed in the adjudicatory process, some arbitral tribunals have been willing to consider scientific arguments.

3.1 Trail Smelter Arbitration (U.S. v Canada, 1941)

The Trail Smelter Arbitration between U.S. and Canada has grown to be a symbol of international environmental dispute resolution for many reasons. Starting with the obvious, it was the first inter-State environmental pollution conflict that was resolved through international arbitration. Moreover, the award announced for the first time the perhaps single most important rule of international environmental law, the no-harm principle. Lastly, the very fact that the smokestacks of Consolidated Mining and Smelting Company is still operating nowadays in the town of Trail, though reportedly with reduced levels of toxic emission, signals the frequent inability of legal dispute resolution mechanisms to put an end to environmental nuisance.

The arbitration sought justice for apple producers in the State of Washington, whose orchards, property, and livestock have been damaged due to sulphur-dioxide emission of a smelter company located in Trail (Canada), called Consolidated Mining

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715 Trail Smelter case (U.S. v. Canada), Arbitral Award, April 16 1938 („Trail Smelter Award (1938)”), and Award 1941, 3 UN Rep. Int’l Arb. Awards p. 1931 („Trail Smelter Award (1941)”).

716 In announcing the no-harm rule, the Tribunal built on the practice of the U.S. Supreme Court in State of Georgia v. Tennessee Copper Company and Ducktown Sulphur, Copper and Iron Ltd.

717 It may be less well known that the historical arbitration was followed by another inter-state dispute between U.S. and Canada regarding the remediation of the contaminated site of the Trail Smelter. In 2003 the EPA issued an order seeking to enforce extraterritorially its domestic rules of remediation set out in CERCLA legislation. For more details, see N. Craik, „Transboundary Pollution, Unilateralism, and the Limits of Extraterritorial Jurisdiction: The Second Trail Smelter Dispute.” in R. Bratspeis, R. A. Miller (eds.), Transboundary Harm in International Law, (Cambridge, UK: Cambridge University Press, 2006), pp. 109–24 p. 109.

and Smelting Company, one of the largest smelters in North America that time. The Tribunal ultimately concluded that the Trail Smelter should be enjoined from causing harm to the territory of the U.S. and it ordered to pay USD 78,000 in indemnity for the injury caused.\textsuperscript{719} The forthcoming sections will address in more detail those aspects of the award, which evidences the Tribunal’s engagement with the scientific arguments of the case.

The proceeding reveals numerous shared characteristics between historic and present day environmental conflicts and hurdles to dispute resolution. First, the smelter was strategically located on the border of Canada, so that the bulk of toxic emissions were transported straight to U.S. territory to cause economic and ecological damage there. Second, the conflict was highly politicized by both sides partly due to vested industrial interests.\textsuperscript{720} Third, the experts of the two sides agreed on the existence of the injury, but adamantly disagreed as to its cause.\textsuperscript{721} Furthermore, the victim farmers were excluded from the legal proceedings,\textsuperscript{722} and lastly, it took more than 10 years for diplomats and arbitrators to resolve the underlying environmental dispute.\textsuperscript{723}

Initially, an International Joint Commission was set up to investigate the case and to recommend a solution.\textsuperscript{724} The Commission conducted a thorough investigation with field surveys, hearing of scientists and witnesses, as well as taking expert evidence.\textsuperscript{725} Since the U.S. rejected the Commission’s report containing its recommendations, a three-member Tribunal was set up to hear the case.

The case was shadowed by a “\textit{clash of sovereignties}”,\textsuperscript{726} yet this fact did not bar the Tribunal from giving due consideration to the underlying scientific facts. The Tribunal imposed limits on fumigations, taking into account highly technical details

\textsuperscript{719} \textit{Trail Smelter Award} (1941).
\textsuperscript{723} The conflict lasted from 1928 to 1941, when the Tribunal handed down its award. J. E. Read, ‘The Trail Smelter Dispute (Abridged)” in R. Bratspeis, R. A. Miller (eds.), Transboundary Harm in International Law, (Cambridge, UK: Cambridge University Press, 2006), pp. 27–33 p. 27.
\textsuperscript{724} Read, ‘The Trail Smelter Dispute (Abridged)’, pp. 27–28.
\textsuperscript{725} Read, ‘The Trail Smelter Dispute (Abridged)’, p. 28.
(e.g. “directions and velocity, atmospheric temperatures, lapse rates, turbulence, geostrophic winds, barometric pressures, sunlight and humidity”). The concentrations were set on a highly technical basis in order to ensure that they “will not cause injury to plant life” in U.S. territory.

The lengthy scientific reasoning of the Tribunal gives the impression that the objective, technical details of the case might have appealed to the arbitrators as a convenient way of neutralizing the political side of the dispute. The panel’s satisfaction with having science as the main arbiter in the dispute is also suggested by the clause of the final award regarding amendment or suspension of the regime, which provided for a mechanism to arbitrate future conflicts before a “Commission of Scientists.”

The Tribunal regarded the emission limitations set out in the award as a test regime, which could be altered, modified or suspended if future conditions so require. Interestingly, the Tribunal envisaged this mechanism to set even more progressive standards in case “scientific advance in the control of fumes should make it possible and desirable to improve upon the methods of control hereinafter prescribed.” That is all the more remarkable if one considers the high political stakes involved in the conflict.

III. Scientific fact-finding

1. Trail Smelter Arbitration: surprisingly thorough fact-finding

The Trail Smelter Arbitration is also noteworthy for its detailed scientific fact-finding, which was well ahead of its time.

The scientific aspect of the dispute concerned fact-finding, i.e. how American farmers would be able to prove that the smelter’s toxic emissions caused severe damage on the long run, even though the adverse processes remained invisible for years to the laymen eye. Unfortunately, U.S. scientists were only furbished with

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727 Trail Smelter Award (1941).
728 Trail Smelter Award (1938).
729 Read, ‘The Trail Smelter Dispute (Abridged)’, p. 32.
730 Trail Smelter Award (1941).
731 Trail Smelter case, Award (1941).
experimental data in this respect, which proved to be less convincing. Canadian government-funded scientists consciously built on this weakness of the U.S. argumentation to use it as a leverage; they sought to triumph by submitting convincing and straightforward data describing the economic loss the industry would suffer from the injunction.\(^{732}\)

The award elaborates on the legal relevance and persuasive force of each scientific study that was submitted by the parties; it even identifies their methodological errors and inconsistencies.\(^{733}\) It also dismissed a scientific theory that was endorsed by witnesses of both sides. The tribunal based its decision on its own “comparison of recorded data” with a detailed scientific reasoning:

> “the rate of gas attenuation down the river does not show a constant trend, but is more rapid in the first few miles below the boundary and more gradual further down the river. The Tribunal finds it impossible satisfactorily to account for the above conditions, on the basis of the theory presented to it. [...] It appears that the velocity and persistence of the upper air currents is greater that that of the surface winds. [...] A careful study of the time, duration, and intensity of the fumigations recorded at the various stations down the valley reveals a number of striking and significant facts.”\(^{734}\)

The reasoning of the Tribunal remains equally science-heavy later on as well; it refers to “characteristic curves” expressing changes in fumigations, and makes choices among competing scientific theories, for instance by holding that “the dominant influence here is evidently the heating action of the rising sun”.\(^{735}\)

The evidentiary assessment of the Tribunal is also noteworthy,\(^{736}\) especially if one considers the material time of the proceedings, and the lack of any guidance as to the scientific fact-finding in a dispute between sovereigns. During a 3-year long investigation, the panel, which was assisted by two scientists designated by the governments, observed three complete growing seasons and the behavior of smoke


\(^{733}\) The Tribunal objected i.a. that the total number of experiments was large, but “the number of tests devoted to establishing each type of result was rather small”; that none of the experiments lasted for an entire growing season; that the two expert teams worked separately and di not compare their results; that experimental results did not square with injuries observed in the field, etc. Trail Smelter Award (1938).

\(^{734}\) Trail Smelter Award (1938).

\(^{735}\) Trail Smelter Award (1938).

\(^{736}\) The tribunal was very well aware of the merits of its detailed findings: “This is probably the most thorough study ever made of any area to atmospheric pollution by industrial smoke”. Trail Smelter Award (1938).
clouds.\textsuperscript{737} Taken together the monitoring carried out by the Commission, the Tribunal and the parties’ experts, one may find that the harmful processes were studied for altogether 15 years, which is unprecedented in international environmental dispute resolution.\textsuperscript{738}

The Tribunal requested the injury to be established “\textit{with clear and convincing evidence}”.\textsuperscript{739} This is a much higher threshold compared to the usual standards set in contemporary environmental disputes. The historical context and the sensitive political issues at stake might well explain announcing such a standard.\textsuperscript{740} One commentator even regards the high threshold as a mere rhetorical tool, which in fact served to reassure sovereign powers that their interests were duly considered.\textsuperscript{741}

Despite the emphasized commitment towards a high standard of proof, the tribunal was mindful of the evidentiary difficulties of the injured State. This is signaled by the fact that the award\textsuperscript{742} cites decisions of U.S. courts\textsuperscript{743} emphasizing the unjust nature of letting the wrongdoer escape liability in cases, where the very nature of the harm makes it impossible to substantiate the full extent of harm. These considerations suggest that the panel was, in fact, much more open to accept lower standards of proof, when it was necessary to accommodate the nature of the types of evidence. Thus, arguably, the more restrictive rule was announced only for diplomatic reasons.

This author agrees with those scholarly opinions that regard this decision “\textit{courageous}”,\textsuperscript{744} “\textit{creative}”,\textsuperscript{745} and “\textit{path-breaking}”.\textsuperscript{746} The panel relied heavily on scientific evidence and did not refrain from critically assessing them and from singling out those that were regarded methodologically flawed. Also, the award

\textsuperscript{737} Read, ‘The Trail Smelter Dispute (Abridged)’, p. 30.
\textsuperscript{738} Romano, \textit{The Peaceful Settlement of International Environmental Disputes A Pragmatic Approach}, p. 277.
\textsuperscript{739} \textit{Trail Smelter Award} (1938).
\textsuperscript{742} \textit{Trail Smelter Award} (1938), Part Two.
\textsuperscript{744} McCaffrey, ‘Of Paradoxes, Precedents, and Progeny: The Trail Smelter Arbitration 65 Years Later’, p. 45.
\textsuperscript{745} McCaffrey, ‘Of Paradoxes, Precedents, and Progeny: The Trail Smelter Arbitration 65 Years Later’, p. 45.
\textsuperscript{746} McCaffrey, ‘Of Paradoxes, Precedents, and Progeny: The Trail Smelter Arbitration 65 Years Later’, p. 39.
contained review mechanisms to ensure that the regime would keep pace with
developing scientific understanding of the underlying harmful processes; a method
that has subsequently been forgone for quite some time only to be rediscovered in
recent practice of the WTO\textsuperscript{747} and the PCA.\textsuperscript{748}

For all these reasons, the \textit{Trail Smelter Arbitration} award seems to be well
ahead of its time. Compared to this, many of the more recent international
environmental judicial decisions would prove to be deficient.\textsuperscript{749} Romano also notes
that subsequent arbitral decisions did not produce scientific investigation comparable
to that in the \textit{Trail Smelter} case either in terms of the depth of the scientific inquiry, or
the length of legal assessment of scientific results.\textsuperscript{750} Judge \textit{ad hoc} Dugard in his
most recent Dissenting Opinion still sets the Trail Smelter decision as an example for
the ICJ to follow.\textsuperscript{751} One nevertheless may note that scientific evidence that time were
perhaps slightly less abstract, technical, and thus less inaccessible to non-experts
compared to the highly complex, computer-based modeling results that are often
presented to courts in contemporary proceedings.

2. The Kishenganga/Neelum Arbitration (Pakistan vs. India, 2013):\textsuperscript{752} expert
arbitrator

The underlying conflict in \textit{Kishenganga} much resembles the factual basis of
\textit{Lake Lanoux arbitration}. India devised a hydro-electric plant, called Kishenganga
Hydro-Electric Project (“KHEP”), for which waters of the Kishenganga/Neelum had
to be diverted via tunnels to the plant. The plans provided the waters to be returned
through a tributary, called the Jhelum, upstream to the Jhelum’s River juncture with
the Kishenganga/Neelum.\textsuperscript{753} Pakistan claimed that the diversion would decrease the
water she receives downstream, which would reduce the electricity generating

\textsuperscript{747} See e.g. Japan – Apples and Australia – Salmon cases, for more details on reassessment proceedings
\textsuperscript{748} See e.g. Kishenganga Arbitration, discussed below in this chapter.
\textsuperscript{749} Especially the International Court of Justice’s reluctance to thorough scientific fact-finding is
salient in its environmental case-law (e.g. Pulp Mills case).
\textsuperscript{750} Romano, \textit{The Peaceful Settlement of International Environmental Disputes A Pragmatic Approach},
p. 277.
\textsuperscript{751} \textit{Certain Activities} case, Judgment on compensation, Dissenting Opinion of Judge Dugard, para. 47.
\textsuperscript{752} Indus Water Kishenganga Arbitration (Pakistan v India) (Partial Award) (Feb 2013) („Kishenganga
Partial Award“) and Indus Water Kishenganga Arbitration (Pakistan v India) (Final Award) (Dec 2013)
(„Kishenganga Final Award“).
\textsuperscript{753} \textit{Kishenganga Partial Award}, para. 155.
capacity of its own hydropower project called Neelum-Jhelum Hydro-Electric Project ("NJHEP"), which is situated on Kishenganga upstream to the point where the diverted water is returned to its river bed.\textsuperscript{754}

The legal basis of the dispute was a bilateral 1960 Indus Water Treaty,\textsuperscript{755} which divided the Indus River System into two and allocated the Eastern Rivers exclusively to India, and the Western Rivers to Pakistan.\textsuperscript{756} The agreement further provided that the parties shall "use their best endeavors" to maintain the natural river basin and "avoid, as far as practicable, any obstruction to the flow in these channels likely to cause material damage to the other party."\textsuperscript{757}

There were three basic legal issues entertained in the dispute.\textsuperscript{758} First, whether India is entitled to use a so-called drawdown flushing method to tackle sedimentation. The Court ruled that such non-environmentally friendly method is not permissible under the Treaty. Second, whether inter-tributary diversion is allowed under the Treaty, in which respect the Court found that as long as a certain minimum flow of water is ensured by India, the diversion is in conformity with the Treaty. Lastly, as a follow-up question to the latter, the dispute concerned the quantity of minimum flow that ought to be ensured by India at the KHEP with regard to environmental considerations and the existing agricultural water use of Pakistan. This latter question entailed the most science-intensive inquiry of the Tribunal; therefore, this will be subject to further analysis below.

The parties submitted extensive scientific reports regarding the potential adverse environmental impacts associated with different volumes of ‘minimum flow’ that is to be released by KHEP. As scientific evidence seemed to be crucial for setting the minimum flow, advocates have started to mutually challenge\textsuperscript{759} each other’s data.

\textsuperscript{754} Kishenganga Partial Award, para. 158.
\textsuperscript{756} J. Ahmad, The Court of Arbitration Issues Partial Award in Indus Waters Kishengaga Arbitration (EJIL Talk!, June 12 2013).
\textsuperscript{757} Article IV(6) of Indus Water Treaty.
\textsuperscript{759} For e.g. India challenged the statistical regression analysis of Pakistan with reference to its failure to account for seasonal variations (Kishenganga Partial Award, para. 252.), the limited span of data (Kishenganga Partial Award, para. 252., Kishenganga Final Award, para. 31.). Pakistan critics India’s regression analysis for dismissing outliers and for being based on limited set of data (Kishenganga Final Award, para. 32.).
as “ill-suited”, “misleading”, and distorted. To question the results’ objective and ‘scientific’ nature, India even accused Pakistan of tainting data with “advocacy”.

The Tribunal was not disturbed by the science-heavy challenges, and singled out the data it deemed reliable by applying its own standards. The Tribunal’s active engagement with science is not very surprising considering that the panel included a highly qualified engineer besides eminent jurists.

The parties submitted divergent data also on the required minimum flows and associated environmental impacts. Pakistan’s submissions on preferred levels fell in the range of 10-100 cubic meters per second („cumecs”), while India submitted levels below 10 cumecs. The panel preferred Pakistan’s calculation for being based on several indicators and thus, being more holistic. Based on Pakistan’s calculations, the panel found in the first place that environmental considerations alone would compel a minimum flow of at least 12 cumecs.

The PCA established that the minimum flow would be set based on three factors: (i) environmental impacts, (ii) India’s right to the effective operation of KHEP, and (iii) rules of customary international law. Ultimately, the required level was lowered to 9 cumecs, which the Court itself found to be „a relatively severe criterion” for the environment. The 9 cumecs minimum flow was mentioned by the parties only once, when the Indian agent stressed that the highest acceptable flow

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760 Kishenganga Final Award, para. 60.
761 Kishenganga Final Award, para. 60.
762 Kishenganga Final Award, para. 35.
763 Kishenganga Final Award, para. 18.
764 Besides the open evaluation of the challenges against scientific methodologies, the Court also conducted two site visits. Ahmad, The Court of Arbitration Issues Partial Award in Indus Waters Kishenganga Arbitration (EJIL Talk!, June 12 2013).
765 Professor Howard S. Wheater, who holds a PhD in Hydrology and is an emeritus professor at the Department of Civil and Environmental Engineering, Imperial College London. www.imperial.ac.uk/people/h.wheater
767 Kishenganga Final Award, para. 97.
768 Kishenganga Final Award, para. 55.
769 Kishenganga Final Award, para. 44.
770 Kishenganga Final Award, para. 97. As opposed to Pakistan, India conducted a simpler assessment, based on a single indicator, which the Court deemed less adequate in light of the complexities of an ecosystem. Final Award, paras. 98-100.
771 Kishenganga Final Award, para. 104.
772 Kishenganga Final Award, paras. 106-110.
773 Kishenganga Final Award, para. 116.
774 Kishenganga Final Award, para. 113.
level for India was maximum 9cumecs.\textsuperscript{775} The ultimate decision of the panel, thus, appears to be based on a rule-of-thumb balancing, where the minimum flow requirement, and arguably the assessment of the underlying scientific data, was accommodated to the economic interests of India.

The Tribunal emphasizes that the "appropriate balance" in this case gives precedence to India’s right to electricity generation.\textsuperscript{776} This statement is sharply at odds with earlier findings of the ICJ\textsuperscript{777} and the concept of sustainable development,\textsuperscript{778} which is increasingly relied on as a guiding principle by international courts\textsuperscript{779} in integrating environmental concerns into socio-economic disputes. Such an expressly 'imbalanced' approach was rooted in the Tribunal’s earlier finding regarding the "significant rights"\textsuperscript{780} of the upstream State, India. This is an equally unprecedented finding, since the Kishenganga tribunal was the first international tribunal to ever replace the equality of riparian States with granting significant rights to the upstream State over the downstream neighbour.\textsuperscript{781}

Setting a minimum flow of 9 cumecs was also possible because the panel chose to assign a limited role to customary international law in interpreting the Treaty provisions, by emphasizing that it would not "substitute" customary law norms "in place of the Treaty".\textsuperscript{782} Some commentators have already criticized the panel for not applying the customary no-harm rule in this case,\textsuperscript{783} and also for not considering other customary law standards relevant for the shared use of international watercourses.\textsuperscript{784}

\textsuperscript{775} "It is impossible to justify a 10 cumec minimum release, let alone higher releases", see Kishenganga Final Award, para. 47.
\textsuperscript{776} Kishenganga Final Award, para. 113, footnote 163.
\textsuperscript{777} Such as the International Court of Justice, see Gabčikovo-Nagyamaros Project case, Judgment, I.C.J. Reports 1997, p.7, para. 140.
\textsuperscript{778} For a critical and in-depth assessment on the content and reach of the concept of sustainable development, see: GYULA BÁNDI, A FENNTARTHATÓSÁG ÉRTELMEZÉSÉNEK EYES JOGI SZEMPONTJAI (MTA DOKTORI ÉRTEKEZÉS) (2013); on the difficulties of delineating the legal content of the concept see: Gyula Bándi, A fenntartható fejlődés jogáról, 1 PRO FUTURO 11–28, 20–23 (2013).
\textsuperscript{779} Pulp Mills case, Judgment, para. 177, Iron Rhine Arbitration, award para. 58.
\textsuperscript{780} Kishenganga Partial Award, para. 420.
\textsuperscript{781} Moussa, 'Implications of the Indus Water Kishenganga Arbitration for the International Law of Watercourses and the Environment', 712. A further shortcoming is that the Court did not even define this novel concept. Ibid., 713.
\textsuperscript{782} Kishenganga Final Award, para. 112.
\textsuperscript{783} Moussa, ‘Implications of the Indus Water Kishenganga Arbitration for the International Law of Watercourses and the Environment’, 713.
\textsuperscript{784} Saliently, the award does not mention the concept of “equitable use”, which is especially surprising since Judge Schwebel, a former ILC Special Rapporteur on the law of watercourses was president on the bench. See Moussa, 'Implications of the Indus Water Kishenganga Arbitration for the International Law of Watercourses and the Environment', 711.
The Award mandates also a review mechanism for reconsidering the amount of minimum flow in the future, on the request of any of the parties from seven years after the diversion took place.\textsuperscript{785} The Tribunal expressly referred to unforeseen effects of climate change, which could make such adjustments necessary.\textsuperscript{786} Yet this can be also seen as a tool for arbitrators to mitigate the risks of setting an environmentally severe minimum flow, and thus, to ensure that Pakistan could request its reconsideration if downstream ecosystems manifested unexpected injuries from too low minimum flows.

In principle, the Kishenganga tribunal can be regarded as an ideal panel for deciding environmental disputes, since it was equipped with adequate scientific expertise that is crucial for being comfortable with assessing the technical details of the case. However, it also showcases judicial choices to not to allow environmental considerations having real 'teeth' in spite of adequate and full understanding of the techno-scientific data submitted on the adverse environmental consequences. In such cases, a lack of judicial willingness stands in the way of effective enforcement of environmental obligations of States, rather than judicial inability to fully evaluate uncertain science underlying the dispute.

3. The South China Sea Award (Philippines v. China, 2016)\textsuperscript{787}

The PCA in this case provided the secretariat for an UNCLOS Annex VII Tribunal, deciding a dispute concerning the status of artificial islands created by China over certain reefs in the South China Sea; a dispute the international legal significance of which may only be exceeded by its political repercussions.

The award makes numerous findings on obligations under international environmental law,\textsuperscript{788} especially regading the scope of those provided under UNCLOS. The decision brought important clarifications for other areas of law, mainly maritime law,\textsuperscript{789} which will not be examined here. As to the environmental

\textsuperscript{785} Kishenganga Final Award, paras. 117-19.
\textsuperscript{786} Kishenganga Final Award, para. 17.
\textsuperscript{787} PCA Case No. 2013-19, The Republic of the Philippines v. The People’s Republic of China, The South China Sea Arbitration, Award on the Merits (July 2016) (“South China Sea Award”).
\textsuperscript{788} For a general brief overview see: J. Paine, Environmental Aspects of the South China Sea Award (EJIL Talk! July 21, 2016).
\textsuperscript{789} Besides the aspects that are important for international environmental law, the dispute featured questions of sovereignty and aspects of maritime law: the validity under international law of a ’historic
law aspects, the Philippines alleged that China tolerated and actively supported harmful fishing techniques (including use of cyanide and explosives), and the harvesting of endangered species, the damaging of corals by propeller chopping, and was also engaged in artificial-island construction activities. The Tribunal ruled that China breached its obligation under UNCLOS Article 206 to assess the environmental impacts of its large-scale construction and to communicate its findings towards affected States. China was found also to be in failure to meet its duty to protect and preserve the marine environment under Article 192, which includes preventing the harvest of endangered species. China was also condemned for polluting the marine environment, for failing to preserve rare or fragile ecosystems and habitats of endangered species under Article 194(5), and to cooperate and coordinate with other States under Articles 123 and 197 of UNCLOS.

3.1 Fact-finding: using ex curia experts

The fact-finding of the South China Sea tribunal merits special attention. Given that China stayed away from the entire proceeding, the tribunal had to consider potential factual and legal arguments that may support the lawfulness of China’s
title’ of China to these islands, the criteria for determining law-tide elevations, and the criteria of lawfulness of a coastal State’s alleged ‘enforcement activities’.

790 South China Sea Award, para. 818. The Philippines intercepted several Chinese fishing vessels (non-state actors) that were engaging in illegal fishing activities under the protection of China Marine Surveillance ships and where the respective Chinese nationals were not prosecuted by China later on (paras. 827-851).

791 South China Sea Award, para. 848.

792 Coral reefs at Cuarteron Reef, Fiery Cross Reef, Gaven Reef, Johnson Reef, Hughes Reef, Mischief Reef, and Subi Reef (South China Sea Award, para. 979.).

793 The Tribunal emphasized that the obligation to prepare an EIA includes an obligation to communicate it to competent international organizations, and thereby to other States. (Award, para. 991.) Though the panel could not ascertained whether China in fact had prepared an EIA or not, for the violation the manifest lack of its communication was enough for finding a breach. (South China Sea Award, para. 991.).

794 The Tribunal found that Chinese vessels were harvesting giant clams (CITES Appendix II species), sea turtles (CITES Appendix I species), and reaffirmed that Article 192 extends to a duty to prevent harm to threatened species that would occur indirectly, through the destruction of their habitat (South China Sea Award, paras. 956-959, 966.).

795 The Tribunal ascertained that the destructed coral reefs qualify as rare and fragile ecosystems, by relying on the definition of ‘ecosystems’ as used in Article 2 of the Convention on Biological Diversity. (South China Sea Award, para. 945.)

796 States are required to coordinate the implementation of their duties to preserve and protect and shall cooperate in marine protection, which China failed to meet. (South China Sea Award, paras. 984-986.).
activities. Also, it needed to make sure that the scientific information, on which many alleged breaches were based, had been provided for the panel in an unbiased and solid manner.

The Tribunal adopted a „rather unusual and sophisticated” procedure for taking expert evidence. It amended its Rules of Procedure with Rule 24 providing for detailed procedural rules for appointing ex curia experts, and for raising objections in case of impartiality concerns. Reliance on court-appointed experts is an established practice in arbitration, and the PCA Optional Rules explicitly provide for such a possibility. However, since panels are usually satisfied with having the expert statements submitted by the parties, ex curia experts are, in fact, rarely appointed in international scientific adjudication. The Tribunal also garnered expert advice more informally, by addressing questions to scientists who were not formally appointed as ex parte or ex curia expert, though whose scientific study was cited by one of the experts.

The Philippines appointed one coral reef ecologist expert, Professor Carpenter, and submitted two experts’ reports to the panel. Nevertheless, the Tribunal sought the views of three additional coral reef specialists (Professor Ferse, Professor Ward and Professor Mumby) in the capacity of independent ex curia experts to fully investigate the harmful effects of the dredging activity and to review the scientific findings of party-adduced evidence. The Ferse report indeed found that the party-appointed expert, Professor Carpenter “may have overstated or understated” some aspects of the damage.

Mbengue draws attention to the unconventionally extensive dialogue that occurred between the Tribunal and the parties’ experts, on the one hand, and the

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798 China’s position was reconstructed by the panel from public statement of Chinese officials in paras. 912–924.
800 Foster, Science and the Precautionary Principle in International Courts and Tribunals, p. 108.
802 The Tribunal asked the expert to seek clarifications from Professor McManus. See also: Mbengue, ‘The South China Sea Arbitration: Innovations in Marine Environmental Fact-Finding and Due Diligence Obligations’, 288.
803 South China Sea Award, para. 818.
804 South China Sea Award, para. 89. section b).
805 South China Sea Award, para. 821.
806 South China Sea Award, para. 980.
Tribunal’s own experts and party-appointed experts. Procedural rules also allowed for the cross-examination of both ex curia and ex parte experts.

Both court-appointed and party-appointed experts’ findings were in stark contrast with the public statement of Chinese officials and reports prepared by the Chinese State Oceanic Administration (“SOA”). While the expert reports described large-scale ecological damage, and confirmed that the degradation of coral reefs caused by the propellers of Chinese vessels, Chinese statements maintained that the coral reef had been in a “sub-healthy” status even before the construction, mainly due to competing natural and man-made causes, such as overfishing, tourism, and climate change. The SOA Report further alleged that the construction mimicked natural island formation and, therefore, produced only natural ecological effects.

Independent experts claimed that these allegations were “contradicted by the facts” and are “in disagreement with the available information”. Therefore, the Tribunal firmly based its findings solely on the “compelling” ex curia expert evidence. The panel set aside all Chinese statements, dismissing their claims of being “thorough studies”, “rigorous tests”, providing “scientific proof”. Even though the Tribunal did not expressly voiced an opinion on the scientific merits of the Chinese claims, the wholesale rejection of these arguments implies that the panel regarded them as having no scientific credibility.

Mbengue observes that the Tribunal’s reliance on expert evidence lead the panel to placing the de facto “burden of proof upon the experts.” He argues that whenever experts could not provide clear-cut evidence on certain harmful conducts, the Tribunal inferred that it was because perhaps China complied with its

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809 South China Sea Award, para. 982.
810 South China Sea Award, para. 923.
811 South China Sea Award, para. 922.
812 South China Sea Award, para. 923.
813 South China Sea Award, para. 982.
814 South China Sea Award, para. 983. “Based on the compelling evidence, expert reports, and critical assessment of Chinese claims described above, the Tribunal has no doubt that China’s artificial island-building activities on the seven reefs in the Spratly Islands have caused devastating and long-lasting damage to the marine environment.”
815 Award, paras. 920-921. They also claimed that the ecological impact of dredging is “partial, temporary, controllable and recoverable” (South China Sea Award, para. 922.).
obligations.\textsuperscript{817} However, such an argument appears to be somewhat strained as it fails to consider the peculiarities of the \textit{South China Arbitration}, namely, that the respondent’s position had to be essentially reconstructed through experts’ statements given that China did not appear in the dispute. Hence the ‘placing of the burden of proof’ upon the experts should be viewed against this special background, and thus, it works more as a metaphor.

3.2 Exceptional finding of a breach of substantive obligation – and exceptional underlying facts

The \textit{South China Sea} Award marks one of the rare occasions when an international court or tribunal establishes a breach of a substantive environmental law obligation.\textsuperscript{818} However, one may wonder to what extent did the exceptional circumstances of the case influence the panel’s firm conclusion concerning the series of breach. As demonstrated in this chapter and were seen from the discussion on the ICJ’s environmental case-law, there are remarkably few occasions when the causal link between the alleged conduct and the environmental harm is found established in international environmental litigation.

It is submitted here that certain special circumstances of the \textit{South China Sea Arbitration} might have a role in the fact that the Tribunal readily found a breach of substantive obligations.

First, both the island construction activities and the ecological destruction at hand were of exceptional gravity and scale. The Chinese state policy on massive island-building activity practically entailed the creation of 12.8 million square meters of new land during less than three years on the top of submerged lands and reefs.\textsuperscript{819} The overall damage to coral reef was estimated to be 124 km\textsuperscript{2},\textsuperscript{820} a magnitude, which was justifiably dubbed as “Ecocide” by an article cited by the Award.\textsuperscript{821}

\textsuperscript{817} Mbengue, ‘The South China Sea Arbitration: Innovations in Marine Environmental Fact-Finding and Due Diligence Obligations’, 289.

\textsuperscript{818} The Tribunal found the lack of violation with respect to the use of cyanide and explosives for illegal fishing, since there was not enough evidence to establish that China failed to meet its due diligence obligations in this regard. (\textit{South China Sea Award}, para. 975.)

\textsuperscript{819} \textit{South China Sea Award}, para. 854.

\textsuperscript{820} \textit{South China Sea Award}, para. 850. citing the McManus Report.

\textsuperscript{821} \textit{South China Sea Award}, footnote 917 referred to the article V.R. Lee, „Satellite Imagery Shows Ecocide in South China Sea”, The Diplomat (15 January 2016).
Second, China’s absence from the proceedings also rendered it easier to make conclusive findings based on the scientific reports produced by independent experts. Otherwise, China might have challenged the expert findings or could have made clarifications on the statements of Chinese officials.

Third, the South China Sea region has recently become a hot spot of geopolitical rivalry. Hence, the award was issued amidst strong resentment of the Global North against China’s territorial ambitions, which arguably made it easier for the arbitrators to dismiss Chinese claims. For China, the South China Sea means a strategic place for expanding its military power from land to sea, while claiming continuing sovereignty over the islands in line with its growing nationalistic narrative. At the same time, the U.S. is increasingly worried about the territorial ambitions of China – its fiercest economic competitor, – which are jeopardizing the regional status quo and stability, in addition to threatening the U.S.’s unhindered access to waters with exceptional trade significance. The EU, though declaring its neutral position in the conflict, reinforced its commitment to closely collaborate its policy towards Asia-Pacific Region with the U.S.

Fourth, as China appointed no arbitrator on the bench as a way of protesting against the illegitimacy of the proceeding, the panel included no one that were to be more sensitive to China’s perspective. Perhaps it is not far from truth to say that a “Western-oriented” panel was appointed to adjudge the conduct of a growing

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829 South China Sea Award, para. 30.
830 Members of the panel were Judge Rüdiger Wolfrum (German national, appointed by the Philippines), Judge Stanislaw Pawlak (Polish national), Judge Jean-Pierre Cot (French national), Professor Alfred H.A. Soons (Dutch national) and Judge Thomas A. Mensah (national of Ghana) serving as President, all of whom were appointed by the President of ITLOS. See South China Sea Award, para. 30.
Eastern power, whose territorial and global ambitions met with the suspicion, if not resentment, of the panel.

To the extent of which the above circumstances indeed had a meaningful impact, directly or indirectly, on the outcome of the case, the less precedential value can be attributed to the Award’s environmental findings. Any analytical remarks on the award, thus, can be hardly disentangled from the heavy power politics lurking behind the legal dispute. Even the technicalities of the decision, such as the use of experts and the extent of finding substantive breaches established, could have been influenced to some extent by the global political context of the case. The South China Sea conflict is first and foremost a geopolitical dispute, which cautions against generalizing any analytical findings on the environmental aspects of the decision across time or jurisdictions. The award nevertheless has bearing on the contours of international environmental law norms since it qualifies as a subsidiary source of international law.831

In any event, the panel’s use of *ex curia* experts is an undoubtedly positive innovation, which would help other panels in the future assess data submitted by the parties. Scholars often urge courts and tribunals to assume an active role in grasping the scientific dimension of the disputes and to seeking expert opinions when needed.832 *Ex curia* experts may be preferable for adjudicators, since lengthy partisan evidence create additional problems, such as sorting out credible and reliable evidence.833 In the context of international arbitration, appointing independent experts is increasingly called for also by practitioners.834

831 D. Diane, ‘The Philippines v. China Arbitral Award on the Merits as a Subsidiary Source of International Law, EJIL Talk! (July 12 2016))’. The award helped further clarify the criteria of a valid EIA under international law as well as requirements under the obligation to cooperate and coordinate.
834 See the contribution of Mr. Andrew Loewenstein (Foley Hoag LLP) as speaker of the panel discussion entitled “Adjudicating environmental disputes” at ASIL Annual Meeting 2017, Washington D.C. Mr. Loewenstein served as agent in many international environmental arbitrations, among others in the South China Sea dispute and actively calls for using ex curia independent experts in inter-State environmental arbitration.
IV. Interim conclusion

Any assessment as to the trends in international arbitration could only provide a piecemeal approach considering that different arbitrators are appointed for each and every case, and thus the tribunals practice is much more fragmented compared to permanent judicial fora. Yet certain trends do emerge from the preceding analysis.

1. Framing of disputes: marginalizing scientific aspects

The issue whether scientific controversies lying at the heart of inter-state disputes are non-justiciable and, therefore, fall outside adjudicatory competence, was raised in inter-state arbitration too. In the Southern Bluefin Tuna arbitration, the panel rejected such a simplified reading of science-based adjudicatory task. Although as a general rule, disputed scientific facts are not construed as precluding the performance of adjudicatory function in inter-State arbitration, a closer look reveals that some panels do have a controversial relationship with science-intensive claims. The panels’ varying tolerance toward science is reflected in the ways in which they frame the relevant legal issues of a dispute.

Science has played various roles in environmental inter-States arbitrations. In some cases, arbitrators regarded scientific arguments as decisive to the case at hand, such as the Lake Lanoux panel, which expressly noted that techno-scientific arguments could have saved Spain from losing the case. Yet the Iron Rhine panel refused to consider scientific arguments let alone expert opinions in deciding about the extent of environmental protection measures deemed appropriate to be demanded by the Netherlands from Belgium. By doing so it eliminated the scientific dimension of the dispute and handled the question of appropriateness as a purely legal question. Similarly, the MOX Plant Arbitration panel disregarded the parties’ substantive arguments regarding the possibility of adverse effects, instead the majority “elevated” those aspects to be “decisive”\textsuperscript{835} that “received only a passing reference and attention” in the parties’ submissions.\textsuperscript{836} Certainly, one cannot aspire to clearly attribute the design of adjudicatory reasoning to the underlying facts alone, however, it is argued here that the similar patterns in framing science-intensive disputes do

\begin{footnotesize}
\textsuperscript{835} Dissenting Opinion of Gavan Griffith, MOX Plant OSPAR Arbitration Award, para. 65.
\textsuperscript{836} Dissenting Opinion of Gavan Griffith, MOX Plant OSPAR Arbitration Award, para. 65.
\end{footnotesize}
suggest that scientific controversies implicated in the underlying facts shape the adjudicatory reasoning and the scope of the decision reached.

Later on, I will provide a more elaborate critique of disregarding science from disputes that do have a scientific aspect. As for now, the case-law analysis sought only to illustrate that the extent to which science plays a role in environmental adjudication is a matter of judicial decision in each and every dispute, and the role assigned to science is not set *a priori*.

Importantly, the issue of attaching decisive weight to scientific arguments has to be distinguished from cases of judicial balancing between environmental and economic interests against each other. In numerous occasions, the dispute can only be decided by weighing environmental and economic considerations. In such cases, panels may accord primacy to economic interests, as it happened in *Kishenganga*. However, this is a matter of policy choice and not a question of taking scientific aspects into account. Notably, the Kishenganga Tribunal was famous for its rigorous scientific assessment, though it still set an environmentally severe minimum flow accommodating India’s industrial interests. This is of course can be criticized on the basis of environmental concerns, though not from a perspective of scientific engagement.

2. Scientific fact-finding techniques

Tribunals also differ in their approaches to evaluating scientific evidence. No uniform trend can be discerned given that the panels’ methods range between thorough assessment of the evidence, such as in the case of the *Trail Smelter Arbitration*, and intentional dismissal of hearing scientific evidence, as occurred in the *Iron Rhine* dispute.

However, the recently increasing recourse to the PCA may have positive implications for the degree to which science will be considered in inter-State arbitration. The PCA shows openness for resolving environmental conflicts as evidenced by its Optional Rules for Arbitration of Disputes Relating to Natural Resources and/or the Environment adopted in 2001.  

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tribunal to appoint the panel’s own experts and to request from the parties a non-technical summary indicating the elements of the scientific background of the case they agree on. The Optional Rules also facilitate ‘high-quality’ dispute resolution by making available for the parties two panels, one which is comprising arbitrators with a firm background in environmental disputes, and another with environmental science experts. Hence the PCA has important potential for resolving future environmental conflicts. Several international environmental treaties contain dispute settlement clause referring to the PCA, which can provide basis for a number of environmental dispute settlements in the future. One commentator explicitly suggests the superiority of arbitration over the ICJ to settle international environmental disputes, given that arbitral tribunals conduct a more thorough review of scientific facts. Finally, as Investor-State disputes are becoming an important arena for enforcing environmental values and norms, the role of PCA in international environmental dispute resolution will be further strengthened, being it one of the fora that can hear such cases.

The Kishenganga dispute was decided under the aegis of the PCA. The tribunal comprised an expert arbitrator, which might explain the panel’s thorough evidentiary assessment even in the absence of appointing independent experts. The South China Sea panel was rather unique compared to other arbitral tribunals for widely relying on ex curia experts and requesting clarifications for scientists not

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similar procedure is provided for science-intensive conciliation under the aegis of PCA, see Optional Rules for Conciliation of Disputes Relating to Natural Resources and/or the Environment.

838 Article 27(1).
839 Article 24(4).
appearing before the tribunal. Its procedural innovations may even be regarded as "drawing new contours" for scientific fact-finding.

Several proceedings bespeak the readiness of arbitrators to choose between competing scientific claims. The Trail Smelter Arbitration was a high-water mark for engaging with the evidence submitted, since the panel provided a legal assessment that was bordering scientific evaluation in order to justify its chosen model explaining the dynamic of the harmful processes. Similar engagement with science was only reproduced quite recently in Kishenganga, where the arbitrators were able to identify the environmentally induced minimum flow on the basis of scientific evidence, even though later on it appeared to set the final required flow more on the basis of a rule-of-thumb balancing, favoring the economic policy arguments of India.

Chapter 5
Science in the jurisprudence of regional human rights courts

“It is disappointing that the European Court of Human Rights remains (...) in the (...) not so enlightened perception of what cause and effect in law is – in a situation in which the environmental pollution is at least one of the major contributing factors to problems that led the plaintiff to the Court.”

Judge Zupančič

I. Science before human rights courts in environmental complaints

This chapter will review the weight regional human rights courts attach to scientific evidence and arguments in establishing violations of human rights standards in case of environmental destruction and pollution. The close link between human rights guarantees and environmental protection has now been widely acknowledged zeroes in on the adjudicatory practice of the three major regional or sub-regional human rights systems: the jurisprudence of the European Court of Human Rights (“ECtHR”), the Inter-American Court of Human Rights (“IACtHR”) and the African Court of Human and Peoples’ Rights (“ACtHPR”) as well as the Economic Community of West African States Court of Justice („ECOWAS Court“).

A growing number of cases are filed with these for a, in which applicants refer to scientific studies to support their claim on human rights violations occurring due to adverse environmental impacts. The majority of such claims concern environmental destruction and exposure to various toxic agents released by various industrial activities, ranging from oil wells to nuclear facilities. Such toxic exposure claims trigger science-intensive arguments on part of the victims and invite scientific considerations from (the often-reluctant) international courts. Special problems arise, first and foremost, in establishing causal links between the exposure and the protected sphere of human rights based on probabilistic and ambiguous scientific evidence. In hearing such claims, human rights courts are increasingly asked to evaluate scientific expert evidence. The causal assessment of human rights adjudication bespeaks a

845 Part of the research concerning the practice of the European Court of Human Rights was published in Vermont Journal of Environmental Law in 2017, Vol. 18 (4), 521-569.
846 Zupančič, ‘Causation in Cases of Environmental Degradation’, 122.
circumvention of science in assessing the causal role of the harmful conduct. In this respect, the ECtHR has adopted an especially elaborate approach to downplay and carve out scientific evidence from its inquiry. Lastly, solutions for setting the standard of review for the parties’ scientific claims, which also merit further analysis.

This chapter thus will examine the above aspects of human rights adjudication in the European, Inter-American, and the African systems.

1. The European system

The European regional system of human rights protection has two prongs with relevance for environmental protection: the European Convention on Human Rights (“ECHR”) and the European Social Charter (“ESC”). Judicial adjudication of human rights occurs solely on the basis of the ECHR before the Strasbourg Court, hence as far as the European regime is concerned, this study is dedicated to analyzing the case-law of the ECtHR.

As there is no explicit right to a safe, clean or balanced environment enshrined in ECHR, toxic exposure claims are adjudicated under other provisions of Article 2 (right to life), Article 8 (right to private and family life), Article 10 (Right to information), Article 1 of Additional Protocol No 1 (right to property) as well as Article 6 (right to fair trial). This chapter will focus on the jurisprudence pertaining to Article 8 and Article 2 of ECHR, as the ECtHR predominantly deals with toxic exposure claims under these provisions.

847 The EU Charter of Fundamental Rights notably falls short of enshrining a human right to environment under Article 37.
848 The ESC relates to environmental quality in as much as it is relevant to the right to the highest attainable standard of health protected under Article 11 of ESC.
849 To date there were 6 environmental nuisance cases that were found admissible under Article 2: Öneryildiz v Turkey, Budayeva and Others v Russia, Kolyadenko and Others v Russia, Vilhes and Others v Norway, L.D.C. v UK and Brincat ad Others v Malta. For a more detailed assessment of some of these cases see: Sandor Szemesi, “Questions of Environmental Protection in the Practice of the European Court of Human Rights Part III: Developments in International Law,” Hungarian Yearbook of International Law and European Law 2013 (2013): 252–53.
851 For a detailed assessment on aspets under Article 6 violations see L. Fodor, ‘Az Emberi Jogok Európai Bíróságának ítélete a zajterhelés csökkentésére tett intézkedésekről és a bírósági eljárási időtartamáról’ (2011) 3 JeMa 86–92 at 88–89.
Article 8 was applied, among others, to toxic industrial air pollution, \(^{852}\) risks entailed by gold mines using cyanide leaching technology, \(^{853}\) heavy metal pollution of drinking water, \(^{854}\) groundwater contamination, \(^{855}\) destruction of a swamp area near the applicant’s home, \(^{856}\) excessive noise of night clubs \(^{857}\) and public transportation, and as well as severe vibration caused by heavy traffic. \(^{859}\) In the context of such dangerous activities, there is a significant overlap between the scope of obligations arising under Article 2 and Article 8. \(^{860}\) However, the magnitude of risk involved largely determines the applicable provision, since Article 2 applies only to life-threatening circumstances \(^{861}\), whereas risks that fail to meet this relatively high threshold will be assessed under Article 8 provided that they clearly affect private life of the applicant. \(^{862}\) As a result, the majority of cases with environmental relevance are usually assessed under Article 8. The table below provides a brief overview of the doctrinal framework of inquiries under Article 2 and Article 8 of the Convention in toxic exposure cases.

<table>
<thead>
<tr>
<th>Triggering conditions for application</th>
<th>Article 2 (right to life)</th>
<th>Article 8 (right to private life)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>the physical integrity of an applicant was threatened (i) by the action of the State (or State agent) or (ii) by a third party’s action (^{863}) when the State</td>
<td>(i) pollution exceeding a minimum level of severity (^{865}) (ii) which is caused by a State directly or indirectly (in a failure to regulate</td>
</tr>
</tbody>
</table>

\(^{852}\) Ledyayeva v Russia, App.no. 53157/99.

\(^{853}\) Taskin and Others v Turkey, Öçakan v Turkey, Tatar v Romania, Lemke v Turkey, app. no. 17381/02, 2007.

\(^{854}\) Bacila v Romania, app.no. 19234/04, 2010.

\(^{855}\) Dzemyuk v Ukraine, app. no. 42488/02, 2014.

\(^{856}\) Kyrtatos v Greece, app. no. 41666/98.

\(^{857}\) Moreno Gómez v Spain, app. no. 4143/02.

\(^{858}\) Bor v Hungary, app. no. 50474/08.

\(^{859}\) Grimkovskaya v Ukraine, app.no. 38182/03, 2011, Deés v Hungary.

\(^{860}\) Brincat and Others v Malta, App.no. 60908/11, 2014, para. 85.

\(^{861}\) The right to life encompasses situations in which there is an imminent risk to life of the victims. The mere fact that the victims survive has no bearing on the applicability of Article 2. The provision is not only applicable to deaths caused directly by State action, but extends to those situations when the State has a positive obligations vis-à-vis private parties whose conduct might threaten the life of persons. Accordingly, the ECtHR emphasized that Article 2 encompasses cases where “the physical integrity of an applicant was threatened by the action of a third party.” Hence Article 2 is typically applied in case of natural disasters \(^{861}\) and dangerous activities such as nuclear tests, operation of landfills and deep-sea oil drilling requiring saturation diving.

\(^{862}\) Bricat v Malta, paras. 84-85.

\(^{863}\) Id. para. 82.
had regulatory obligations vis-à-vis the third party, and (iii) which has a “direct adverse effect” on the individuals’ private or family life or well-being.

| Obligation of State | (i) Negative: refrain from unlawful killing | (i) Positive: to adopt measures vis-à-vis private actors causing environmental harm to guarantee the right to private life. A “failure to regulate private industry” can raise the State’s liability. (ii) Negative: to refrain from undue interference with private life (when polluting entity is owned, operated or controlled by the State).

<table>
<thead>
<tr>
<th>Cases when the State can be held liable for injuries caused by third-parties</th>
<th>States’ positive obligations arise also when human lives are at “real and immediate risk” due to</th>
</tr>
</thead>
</table>
| If there is a “sufficient nexus” between the polluter and the State (in such a case the “State

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871 Id.
872 Id. para. 92.
| Private companies’ activity in case the State had known or ought to have known about the risks. | could reasonably be expected to act so as to prevent and to put an end to the alleged infringements.  
876 |
|---|---|
| **Actionable damage** 877 | (i) Death, or (ii) Real and imminent risk to life | Direct interference with private and family life.  
878 |
| **Causation should be established between:** | The conduct and the applicant’s death or imminent threat to her life | Pollution and “direct adverse effect” on private life. |
| **Causal test** | No specific test has been announced. | No causal test, the case is decided by assessing proxies. |
| **Judicial test of finding a violation** | States have a wide margin of appreciation, thus impossible or disproportionate burden must not be imposed on them without considering their choices and resources.  
879 | (i) Negative obligations: emissions exceeding domestic safety levels from a State-owned source is automatically unlawful (ii) Positive obligations: States have a wide margin of appreciation (deferential review). The test is whether national authorities have struck a fair balance between the individual’s right and the interest of the community in furthering economic development. |
| **Burden of proof** | On the applicant |
| **Standard of proof** | Beyond reasonable doubt (met by “the coexistence of sufficiently strong, clear and concordant inferences or of similar unrebutted presumptions of fact” 880). It allows flexibility with a view to the evidentiary difficulties.  
881 |

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876 *Id.* para. 89.
880 Fadeyeva v. Russia, para. 79.
881 *Id.*
Remedy (under Article 41)  
(i) Obligation to put an end to the breach 
(ii) Just satisfaction: pecuniary and non-pecuniary damages or finding of a violation \(^{882}\) (damages are not automatic consequences) and costs and expenses \(^{883}\)

Table 2: Doctrinal framework of Article 2 and Article 8 of ECHR in toxic exposure cases

2. The Inter-American system

The enforcement mechanism of the Inter-American systems consists of the Inter-American Commission of Human Rights and the IACtHR. The Commission decides about the admissibility of claims. In case of a positive decision, the Commission or the State party may refer the case to the IACtHR provided that the State in question accepted the jurisdiction of the court. Affected individuals will have again standing before the court to plead their case. The IACtHR also has the power of issuing Advisory Opinions upon the request of a State party.

In the Inter-American system, human rights guarantees are currently provided under the American Convention on Human Rights (“ACHR”) and its Additional Protocol on Human Rights in the area of economic, social, and cultural rights (“San Salvador Protocol”). Prior these instruments, the non-binding OAS Declaration of the Rights and Duties of Man (“OAS Declaration”) have listed human rights safeguards. Even after the entry into force of the ACHR, the OAS Declaration is still legally relevant as it complements the binding provisions of the former. \(^{884}\) For purposes of the present analysis, the following provisions are relevant from these catalogues: Article 4 (right to life), Article 5 (right to physical, mental and moral integrity) of ACHR, Article XI of OAS Declaration (right to the preservation of health and to well-being), as well as Article 11 of San Salvador Protocol providing for a standalone right to a healthy environment. These are the provisions in relation to which alleged violations are most frequently supported by scientific evidence or scientific arguments, and therefore they form the subject matter of this study. Notably, in environmental cases a host of other provisions are invoked as well, such as the rights

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\(^{884}\) Advisory Opinion No. 10, OC-10/89.
of access to information or public participation (Article 23 of ACHR), as well as the right to property (Article 21 of ACHR). These rights are especially important in the context of protecting indigenous communities.  

From a doctrinal point of view, the Inter-American system handles (the risk of) harm to human life or health quite similarly to the Strasbourg regime. The Commission stressed the relevance of environmental pollution for human rights protection with words echoing the López Ostra test of the Strasbourg Court: “[s]evere environmental pollution may pose a threat to human life and health, and in the appropriate case give rise to an obligation on the part of a state to take reasonable measures to prevent such risk, or the necessary measures to respond when persons have suffered injury.”

3. The African system

The chief human rights document in the African system is the African (Banjul) Charter on Human and Peoples’ Rights (“Banjul Charter”), which guarantees a standalone right to a general satisfactory environment (Art. 24) and right to natural wealth and resources (Art. 21). For toxic exposure cases, the right to life (Article 4) is also relevant.

Individual and interstate petitions may be filed with the African Commission on Human and Peoples’ Rights, a quasi-judicial body having the power of making recommendations. The adjudicatory enforcement mechanism comprises two main courts endowed with the power of accepting human rights claims: the ACtHPR and the ECOWAS Court. The ECOWAS Court can hear human rights claims since enacting a Protocol in 2005. The ACtHPR performs human rights adjudication also since 2005. Both fora have a peculiar mandate to hear cases not only the basis of the


Banjul Charter but on any other international human rights conventions, which both parties have ratified.\textsuperscript{888}

II. Causal inquiries to handle science in human rights claims

Human rights courts may award pecuniary and non-pecuniary damages for human rights violations caused by environmental pollution,\textsuperscript{889} for determining which a thorough causal inquiry is key. However, as will be seen establishing causality is an especially problematic part of the judicial inquiry in human rights adjudication. Judge Zupančič dubs causation the “missing link in adjudicating human rights” at the ECtHR.\textsuperscript{890} Dinah Shelton also takes note of the role of causality in developing the substantive content of a right to a healthy environment,\textsuperscript{891} and Philippe Sands acknowledges that proving environmental damage “is notoriously difficult”,\textsuperscript{892} while Alan Boyle highlights the evidentiary burdens of establishing proof of causation based on scientific facts.\textsuperscript{893} Indeed, as will be seen below, causal inquiry is framed in a way as to circumvent science in assessing violations.

Another common challenge in adjudicating toxic exposure claims is rooted in the underlying science. Before addressing the methods for causal inquiry, a short overview is due on the difficulties of establishing causal links based on uncertain and ambiguous science in case of toxic exposure.

\textsuperscript{888} Buergenthal, ‘The Evolving International Human Rights System Centennial Essays - In Honor of the 100th Anniversary of the AJIL and the ASIL’, 800.
\textsuperscript{889} There are three international human rights conventions that either explicitly guarantee a specific right to environment or, in the lack of express environmental provision, the respective human rights court interprets conventional human rights as requiring a certain level of environmental protection. These conventions are: the European Convention on Human Rights (central to this chapter, its environmental relevance will be discussed later); the American Convention on Human Rights (Article 11: „right to a healthy environment“); and the African Charter on Human and Peoples’ Rights (Article 24: „peoples’ right to a satisfactory environment“). See in more detail D. L. Shelton and D. K. Anton, \textit{Environmental Protection and Human Rights} (Cambridge University Press, 2011) pp. 335–55.
\textsuperscript{890} Zupančič, ‘Causation in Cases of Environmental Degradation’.
1. Sources of uncertainties inherent in causal links regarding toxic exposure cases

Applicants must establish a causal link between the harm and the allegedly wrongful conduct in order to prove the violation and to receive compensation. This requirement entails adducing pieces of scientific evidence concerning the victim’s health condition and the extent of environmental pollution that allegedly caused the injury. In toxic exposure cases, scientific uncertainty further aggravates these ‘ordinary’ sources of uncertain causation, addressed in Chapter 2. As a result of peculiar challenges present in these cases, judges face a specific set of evidentiary problems in establishing causality.

Throughout this chapter, uncertain causation is understood as referring to the following specific problems common to toxic exposure cases:

(i) The most typical difficulty is illustrated by the accident metaphor.\(^{894}\) In a car accident the cause of physical injuries is readily discernible and can rarely be attributed to anything else other than the collision. However, in toxic exposure cases identifying the ‘cause’ of injury can be particularly complicated, as there might be numerous possible sources of exposure, as in occupational-disease cases.\(^{895}\) Moreover, in case of an accident, the cause and effect relations between the collision and the injuries are plausibly justified in our everyday experiences.\(^{896}\) However, in toxic exposure cases the mechanism of disease development is usually not well understood and not directly observable.\(^{897}\)

(ii) An injury may have a long latency period,\(^{898}\) even trans-generational,\(^{899}\) that may render the identification of a causal link especially challenging. Latency periods

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\(^{896}\) The American Law Institute, *Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §28 Comment on Subsection (a)c.(1).

\(^{897}\) The American Law Institute, *Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §28 Comment on Subsection (a)c.(1)c.


\(^{899}\) For instance, the DES litigation concerned a drug containing diethylstilbestrol, the harmful effects of which manifested in the offsprings of the women who took the miscarriage prevention drug during their pregnancy.
complicate the finding of general causation and the lapse of time impedes identifying past exposures.  

(iii) Though human epidemiological studies provide the most precise and certain proof of causal links surrounding human health impairment, such studies are often not conducted for ethical reasons. Observational data on human exposure might be available; however, they can easily fall short of statistical significance due to the infrequency of the outcome of interest. In the absence of human studies, experimental animal studies may be relied on, but the need to extrapolate from such results weakens their probative value.

(iv) Epidemiological studies are resource intensive; therefore, research results concerning a particular toxin are often not readily available. The costs are compounded if one faces a rare disease, which requires studies involving larger samples.

(v) Toxins rarely have signature effects that allow fingerprinting the causal agent. It is far more common that several disease factors contribute to a symptom common to all of them. Additionally, the same causal agent might cause numerous health impairments, while only a few of them are unique enough that they can be regarded as signature diseases. For instance, while asbestos might cause asbestosis, mesothelioma, lung cancer, and fibrosis, only asbestosis and mesothelioma are regarded as signature diseases.

(vi) Uncertainty may surround the diagnosis of injury. Certain diseases can only be fully recognized after death has occurred, and some commentators highlight possible biases on the experts’ side if they are aware of the dose of exposure when making the diagnosis.

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901 Cranor, Toxic Torts Science, Law and the Possibility of Justice, p. 9.
902 This obstacle arose in re Neurontin case where causal factor leading to suicide was disputed. The court noted that the infrequency of suicide diminishes the probative value of the small number of such occasions. re Neurontin Mktg., Sales Practices & Prods. Liab. Litig., 612 F.Supp.2d 116 (Mass. 2009).
903 Cranor, Toxic Torts Science, Law and the Possibility of Justice, p. 10.
905 Cranor, Toxic Torts Science, Law and the Possibility of Justice, p. 175.
906 Cranor, Toxic Torts Science, Law and the Possibility of Justice, p. 175.
(vii) The level of exposure is often uncertain, yet in the case of certain diseases, exposure occurred in a specific time can be of particular relevance. Quantifying the latter can be difficult.

(viii) Epidemiological studies are group-based, meaning that they can only describe the incidence of a disease in a group, and not the cause of a given individual’s disease within that group. Specific problems arise in the context of determining whether the association of data indicates a causal connection. In group-based studies, selection bias and random error are particularly relevant. Even if the sample data are correct, attributing the group-based epidemiological findings to individual cases inevitably involves uncertainty.

To avoid such problems of group-based data, it might be advisable to supplement them with “particularized” evidence describing the individual plaintiff’s characteristics. However, the individualized approach does not preclude other types of uncertainty, since the role that toxic exposure and individual background risks play in developing a given disease may be in doubt. And even if science can substantiate the existence of genetic background risks, it remains uncertain whether the exposure and the genetic risk factor have additive, antagonistic, or synergetic effects.

(ix) Finally, multiple competing causal agents may be present, among which some have only “weak causal effects”, i.e. they create only a small incremental increase in disease risk, while others are of “strong causal effects”, conferring a substantial increase of risk.

The following sections analyze the of human rights courts to address such factual complexities in their legal analysis.

909 Kundis Craig, Klein, and Sanders, Toxic and Environmental Torts Cases and Materials, p. 159.
910 Green, ‘The Future of Proportional Liability: the Lessons of Toxic Substances Causation’, p. 378. In certain cases early or peak doses can be relevant while in others, the total length of the exposure.
914 Brennan, ‘Causal chains and statistical links’, 512.
916 Gold, ‘The More We Know, the Less Intelligent We Are?’, 394.
917 Gold, ‘The More We Know, the Less Intelligent We Are?’, 394.
919 Cranor, Toxic Torts Science, Law and the Possibility of Justice, p. 176.
2. Uncertain causality in the European system

Among the regional regimes, causal requirements are most nuanced in the European system, where ample case-law notes and comments on the role of causal links in establishing a violation. The Inter-American and African commissions and courts have just started to hear cases with disputed or ambiguous causal links, therefore only basic causal requirements have been announced so far.

2.1 Legal relevance of uncertain causation in the Strasbourg regime

Thus far scholars have paid little attention to the ECtHR’s mode of causal analysis in toxic exposure cases. The most authoritative commentary on causation in environmental jurisprudence was delivered by Boštjan M. Zupančič, a former judge at the Court and a former President of its Third Chamber. Judge Zupančič criticizes the Court for subscribing to an “archaic perception of causation”, meaning that it refuses to hold a State liable on the basis of probabilistic proof of causation.

This chapter aims to provide such an analysis by examining the Court’s reasoning in finding or not finding a violation. Although causal analyses remain hidden or at best marginal in the ECtHR’s judgments, certain causal requirements have been flagged in few cases. These causal links impact the applicability of Article 2 and 8, the violation of these provisions, or the awarding of damages under Article 41.

2.1.1 Relevance of uncertain causation under Article 2 of ECHR

In cases decided under the right to life, the causal link between the alleged violation and the applicant’s death or imminent threat to her life lies at the core of the inquiry. The *L.C.B. v. UK* case illustrates that a State’s positive obligations are triggered by a probable causal link between the injury and the State measure. This case featured claims by an applicant who had suffered from leukemia since her early childhood, allegedly due to her father’s exposure to radiation during his service at a UK nuclear military base before the applicant was born. The judgment clearly articulates that “the State could only have been required of its own motion to take

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920 Zupančič, ‘Causation in Cases of Environmental Degradation’, 118.
steps in relation to the applicant if it had appeared likely at that time that any such exposure of her father to radiation might have engendered a real risk to her health”. A failure to demonstrate such causal link, thus, is fatal to a claim under Article 2.

2.1.2 Uncertain causation under Article 8 of ECHR

In claims brought under the right to private life, causality is relevant at several stages of the inquiry; first in deciding the applicability of the provision, and subsequently, as to the finding of a breach.

(i) Pollution that triggers application

According to the Strasbourg case-law, which is consistent on this point, Article 8 is applicable when there is pollution caused by the State directly or indirectly in a failure to regulate private industry; when the pollution exceeds a certain minimum level of severity, and when it has a “direct adverse effect” on the individual’s private and family life or well-being. There is no arguable claim if the detriment is “negligible in comparison to the environmental hazards inherent to life in a modern city”.

In the case of toxic emissions, the ECtHR may find a ‘direct effect’ even when the pollution did not seriously impair the victim’s health. In Brândușe v. Romania, a prisoner suffering from noxious odours from a nearby rubbish tip succeeded with his claim in the clear absence of any health injury. The Court found that well-being can be affected even in such cases. The test of applicability focuses on whether the interference was capable of causing the harm at hand (whether it was “potentially harmful”). In practical terms this requirement means that proving a causal link between the pollution and the health impairment is a sufficient, but not necessary, requirement for applying Article 8.

923 Fadeyeva v. Russia, para. 89. where the ECtHR explicitly stated that State’s responsibility “may arise from a failure to regulate private industry”.
924 Fadeyeva v. Russia, para. 69.
926 Fadeyeva v. Russia, para. 69.
927 Brândușe v. Romania, App. No. 6586/03, 7 April 2009, para. 67. It was reinforced in Dzemyuk v. Ukraine, App. No. 42488/02, 4 September 2014, para. 82.
928 Dzemyuk v. Ukraine, para. 84.
(ii) The necessary causal link for finding of a violation – which remains hidden in the analysis

As addressed above, States have a negative obligation to refrain from interference with private life by engaging in severely polluting activity. Furthermore, by virtue of their power to regulate potentially harmful industrial activities, they have a positive duty to prevent others from interfering with the enjoyment of the amenities of one’s home and family life.\textsuperscript{929}

In order to decide whether severe pollution, whether caused by a public or a private actor, constitutes a breach of Article 8, the ECtHR requires “the existence of proven and serious consequences for the health of the applicant”\textsuperscript{930} (emphasis added), as this triggers States’ positive obligation “to adopt and implement reasonable and appropriate measures that protect [applicant’s] well-being.”\textsuperscript{931} Accordingly, a State cannot be held liable for a failure to regulate private industry, if the harm complained of is a result of pre-existing conditions and not that of the emission at hand. This formulation of the Court’s test renders causal links a prerequisite in finding a violation.

Problems engendered by pre-existing conditions, which appear as competing possible causes (also referred to as plurality of causes\textsuperscript{932}), are pervasive in toxic exposure cases. The ECtHR makes clear in \textit{Ledyayeva and Others v. Russia} that even though “severe pollution adversely affects public health in general, (...) it is often impossible to quantify its effects in each individual case, and distinguish them from the influence of other relevant factors, such as age, profession, etc.”\textsuperscript{933} Such statements, however, are never followed by a causal inquiry on deciding on the causal link. The ECtHR, instead, “refrain[s] from making any conclusive findings as to whether or not the industrial pollution was the cause of the applicants’ specific diseases”.\textsuperscript{934}

It is notable that almost none of the applicants has been able to successfully prove causation based on uncertain evidence when the causal link was disputed by the

\textsuperscript{929} Hatton and Others v. the United Kingdom [Grand Chamber], App. No. 36022/97, para. 98.
\textsuperscript{930} Bacila v. Romania, para. 71. The judgment is available in French only, translation by the author.
\textsuperscript{931} \textit{Id.}
\textsuperscript{933} Ledyayeva and Others v. Russia, App. Nos. 53157/99, 53247/99, 53695/00 and 56850/00, 26 October 2006, para. 90.
\textsuperscript{934} \textit{Id.} para. 100.
other party. Instead, violations are declared, when the defendant government does not contest the causal link surrounding the harmful effects. This provides a convenient factual basis for the ECTHR to find a violation without assessing the probative value of scientific evidence. In exceptional cases, when the ECTHR has found a violation, it has not elaborated on the reasons for accepting the evidence submitted; rather, it has simply concluded that it “has accepted the link between the medical conditions (...) and the exposure.”

The relevance of causal links is demonstrated also by the Leon and Agnieszka Kania judgment, where the ECTHR dismissed the application with reference to the applicant’s failure to submit “a valid claim supported by medical record” demonstrating adverse health effects caused by the lawful noise pollution. This statement implies that the ECTHR might consider finding a violation even if the pollution did not exceed domestic safety standards, provided that its adverse health effects and the respective causal link are established.

2.1.3 Uncertain causation under Article 41 of ECHR – latency periods

A causal connection between the violation and the damage sustained is relevant also to awarding compensation. The lack of causality precludes awarding damages. The problem of latency periods is well illustrated by the judgment in which the ECTHR denied pecuniary damages for loss of earnings associated with the health impairment caused by the violation. Among the reasons for awarding no pecuniary damages, the ECTHR explicitly referred to the “prevailing perceptions and lack of precise knowledge at the material time about the possible long-term effects”. This reveals latency periods to be an additional source of uncertain causation that burdens the applicant in toxic exposure cases.

2.2 Causal inquiry based on uncertain science: proxy-based assessment

Given the ECtHR jurisprudence conducts the most elaborate, and as will be argued, most controversial causal inquiry among regional human rights courts, this will be subject to closer scrutiny here.

As to the causal inquiry it is to be recalled that the first lines of cases under Article 8 concerning environmental nuisance were either settled, found inadmissible or concluded with finding of no violation. The first violation of Article 8 was declared in 1994 in the López Ostra v Spain case, which opened the door for an increasing number of environmental complaints.

The ECtHR has never expressly articulated its methodology for finding a violation of positive obligations under Article 8. Based on a survey of case law, it is argued that the ECtHR frames its causal inquiry in a peculiar way as to carving out science from the legally relevant factors. It has recourse to certain proxies when it decides about violations and does not assess the existence of a legally appreciable causal link between the toxic pollution and the health injury claimed. By virtue of this proxy-based methodology, the ECtHR can adjudicate environmental cases without re-examining complex scientific evidence, which undoubtedly eases and accelerates its procedure. It will be argued that this proxy-based judicial approach has serious shortcomings, which will be discussed in more detail in the coming section.

2.2.1 Decoupling Article 8 obligations from the uncertain causal link

The proxy-based approach is a corollary of the test announced in the López Ostra case, where the ECtHR decoupled Article 8 obligations from the requirement of causing health impairment to the plaintiff. In the material case, the first occasion when the ECtHR found a violation regarding pollution, the Court awarded damages to the applicant, who suffered from excessive toxic air pollution emanating from a neighboring plant.

The López Ostra test is formulated as follows: ‘severe pollution may affect individuals’ well-being and affect their private life adversely without seriously

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941 G and E v Norway, 1983.
942 Powell and Rayner v UK, 1990.
endangering their health." As a consequence, the applicant does not need to prove causation between the environmental pollution and its harmful physical or mental consequences to support his or her claim. The test, in fact, circumvents the problems arising from uncertain causation by requiring a "sufficiently close link" between the State’s measure—or omission—and the sphere of private life, and not the actual health injury itself. Under the judicially protected sphere of Article 8, the scope of the right to private life is thus broader than health. It encompasses not only protection against health injuries but other aspects of 'well-being' as well. However, health injuries caused by a State’s action or omission remain relevant under Article 8 as being the most direct form of interference that is prohibited by the provision.

The López Ostra test indicates a conscious turn away from assessing scientific evidence relevant to adjudicating causes of toxic exposure. Tellingly, the European Commission of Human Rights which examined the case as to admissibility at a quasi preliminary stage of the ECtHR’s proceeding, concluded that the plant at hand “could endanger the health of those living nearby and that there could be a causal link between those emissions and the applicant’s daughter’s ailments.” Given that the judgment itself cites this finding, it is difficult to escape the conclusion that the ECtHR purposefully formulated the López Ostra test so as to circumvent the issue of causation by not requiring proof of a causal link involving the health injury.

The López Ostra decision is usually praised by human rights scholars, since it has brought considerable benefits in terms of enforcing environmental claims, especially in light of the ECtHR’s previous practice, which was to dismiss environmental pollution claims. Indeed, relying on the abstract and less tangible concept of ‘private life’ alleviates the evidentiary burden that rests with the applicant, as it enables the ECtHR to find violations even when the causal link between the pollution and the harm cannot be substantiated. As a consequence of this approach,

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944 Dzemyuk v. Ukraine, App. No. 42488/02, 4 September 2014, para. 81; Hardy and Maile v. the United Kingdom, App. No. 31965/07, 14 February 2012, para. 189.
945 López Ostra v. Spain, para. 49.
947 Powell and Rayner v. the United Kingdom, App. No. 9310/81, Series A No 172, 21 February 1990
948 Indeed, judgments declaring a violation often note that the causal link with the injury claimed was dubious. Fadeyeva v. Russia, para. 80; Ledyayeva and Others v. Russia, App. Nos. 53157/99, 53247/99, 53695/00 and 56850/00, 26 October 2006, para. 37; Grimkovskaya v. Ukraine, App. No. 38182/03, 21 July 2011, para. 60.
one might expect that human rights-based environmental protection would entail “a slight easing of the requirements for scientific proof of causation.”\textsuperscript{949} However, in the practice of the ECtHR, plaintiffs rarely win toxic exposure cases, for reasons that will be explored later in the analysis.

2.2.2 The proxies that substitute for science-based causal inquiry: identification and assessment

The ECtHR evaluates whether defendants’ conduct amounted to a breach of their positive obligation based on certain criteria that intuitively seem to be reliable factors for estimating the harmful nature of the pollution at hand. Although the Court has never articulated its proxy-based methodology as a doctrinal approach to evaluating States’ conduct, it justifies its findings of a violation with reference to the non-causal criteria that I dub here as proxies.

The ECtHR uses the assessment by proxies as a substitute for a cause-and-effect inquiry. Instead of providing an elaborate causal assessment reconstructing the elements of the causal scenario that led to the injurious interference, the Court relies on the overall impression of the case. This approach enables the Court to circumvent assessing the uncertain causal link between the pollution and the injury and eliminates the peculiar “scientific” aspects of the case in order to avoid confrontation with its scientific (and uncertain) details. Even when the causal link could be established based on scientific evidence, the ECtHR justifies its finding of a breach with reference to other criteria. This approach, however, can only result in rough justice. As will be seen shortly, the majority of the proxies cannot be justified scientifically and therefore do not offer persuasive legal tests for distinguishing cases concerning factually comparable pollution.

I argue that six such proxies can be discerned from the Court’s environmental jurisprudence:

(i) the distance between the polluter and the applicant’s home;
(ii) whether the pollution was on-going or only a by-product of previous industrial activity;
(iii) the occurrence of prior accidents producing large scale pollution;
(iv) the lawfulness of the toxic emission under domestic law;

\textsuperscript{949} Boyle and Harrison, ‘Judicial Settlement of International Environmental Disputes’, 270.
(v) exceptional facts bearing on the case / the egregiousness of the circumstances;
(vi) whether the State’s decision-making process failed to comply with rule of law / procedural guarantees.

In some instances, the Court examines several of the proxies, while in others it only considers one of them. These proxies have not been articulated as exclusive criteria for applying Article 8 or for finding a breach under the provision. The Court did not announce the proxies a priori, rather, it developed them gradually in response to particular circumstances. However, the fact that the ECtHR dismissed a claim expressly because it did not meet its proxies suggests that it tends to regard them as exclusive criteria. Nevertheless, the Court is certainly free to add new proxies. What follows in a discussion of each of the proxies in a numerical order.

(i) The ECtHR tends to attach particular relevance to the distance between the polluter’s location and the applicant’s home, which is used as a proxy for assessing the “direct effect” of the toxic pollutant, a criterion for applying Article 8. As a reason for refusing to apply Article 8 in Ivan Atanasov v. Bulgaria, the ECtHR referred to the fact that the applicant’s home was “a considerable distance” from the tailings pond of a former copper mine, the source of the pollution. In this case, justifying the claim’s dismissal by the distance proxy was problematic in light of the risk assessment report of the national authority, which showed heavy metal concentration in the pond’s sludge in excess of statutory levels, and estimated a risk of contamination within a radius of ten kilometres around the pond. Given that the applicant lived only one kilometre away from the pond (and thus, within the zone of possible contamination), the facts of the case would have enabled the ECtHR to find a direct effect, had it engaged in proper evidentiary inquiry instead of relying solely on the formalistic distance proxy.

This proxy is objectionable from a scientific point of view, as the toxicity and the associated health risks of pollution cannot be examined merely with reference to the

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951 Sands, ‘Human Rights, Environment and the Lopez-Ostra Case’, 615. Sands noted that the ECtHR was “particularly impressed by the fact that the applicant lived just 12 metres from the offending plant”.
952 See Ivan Atanasov v. Bulgaria, para. 76.
953 Id.
954 Id. paras. 31-34.
distance between the source and the exposed individual. Further, this proxy-based
decision is also inconsistent with *Guerra and Others v. Italy*, where the polluting
factory was similarly one kilometre away from the applicants’ home,\textsuperscript{955} yet the
distance did not prevent the ECtHR from finding a violation under Article 8.

(ii) When it comes to assessing the conformity of a state conduct with the
Convention, the ECtHR also weighs whether the pollution is a “*result of an active
production*” that “*can lead to the sudden release of large amounts of*” toxins.\textsuperscript{956} This
proxy, however, cannot be justified from a scientific point of view either. Hazardous
substances released from a former industrial site can well remain dangerous for many
decades; thus, the fact that the factory ceased to operate has, in fact, no bearing on the
toxic nature of the site.

(iii) In terms of Article 8 obligations, the ECtHR also considers whether prior
incidents occurred involving the industrial activity under consideration.\textsuperscript{957} Prior
industrial accidents were an explicit ground for finding a violation of Article 8 in
*Guerra and Others v. Italy*.\textsuperscript{958} However, this proxy is clearly too permissive, as it
identifies only the most egregious instances of pollution. As discussed above, the
protected sphere of private life under the López Ostra test is much broader than
prohibiting interference caused by severe industrial accidents.

(iv) The lawfulness of an emission under domestic law is another important proxy
for assessing the facts of a case. A State-owned entity’s unlawful emission
automatically triggers a violation, while a private industrial actor’s unlawful emission
is only one relevant factor out of many for deciding whether a State has fulfilled its
positive obligations.

The ECtHR attaches a causal presumption to this proxy, by holding that where
pollution exceeds domestic safety levels it “*becomes potentially harmful to the health
and well-being of those exposed to it. This is a presumption, which may not be true in
a particular case.*”\textsuperscript{959} Applying the presumption, the ECtHR may find that “the
applicant’s health deteriorated as a result of her prolonged exposure to the industrial
emissions*”\textsuperscript{960} (emphasis added).

\textsuperscript{956} Ivan Atanasov v. Bulgaria, para. 76.
\textsuperscript{957} *Id.*
\textsuperscript{958} The ECtHR distinguished *Ivan Atanasov* from *Guerra* on the grounds of lack of prior incidents. *Id.*
\textsuperscript{960} *Id.* para. 88.
The presumption is evoked with two caveats. First, it is only triggered by pollution “significantly above statutory levels”. Thus, pollution that only slightly exceeds statutory limits, which is often the case, falls short. Second, the applicant needs to establish a “very strong combination of indirect evidence”, which is contingent upon the ECtHR’s approach to appraising scientific evidence. As will be seen shortly, the Court applies a rather strict approach to scientific evidence and tends not to rely on statistical probabilities, which narrows the scope of the presumption.

Nevertheless, the domestic legality proxy is the only one that can be justified on scientific grounds. In cases when the pollution exceeds health-based standards, the proxy directly relates to the toxic nature of the pollution and, thus, approximates the causal link between the exposure and the injury. Accordingly, when the ECtHR has invoked the presumption, it has noted that the applicable domestic safety levels were health-based standards. However, domestic safety levels may be established irrespective of the pollution’s health effects (e.g. technology-based standards). In these cases, this proxy can be over inclusive, namely, it can result in a violation even if the adverse health effects were not caused by the toxic emissions. Overall, this proxy leads to mixed results, since it provides a less precise outcome than a causal assessment based on the evidence of the particular case.

(v) As Phillipe Sands noted regarding the López Ostra case, “it is difficult to escape the conclusion that the exceptional facts of this case provided the principal bases for the Court’s finding”. This stance holds true for subsequent decisions as well. Thus, the egregiousness of the circumstances (such as the death toll among exposed individuals, the duration of pollution, and the obsolete nature of industrial technology involved) serves as an additional proxy. Although this proxy can undoubtedly be useful for finding a violation where the dirtiest polluters are involved; state-of-the art technology that is equally destructive to the individual’s

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963 Fadeyeva v. Russia, para. 88.
964 Id. para. 87.
967 Bor v. Hungary, App. No. 50474/08, 18 June 2013, para. 26. noting that it took 16 years for the State to resond adequately and abate the excessive noise pollution.
968 Ledyayeva and Others v. Russia, App. Nos. 53157/99, 53247/99, 53695/00 and 56850/00, 26 October 2006, para. 10; Fadeyeva v. Russia, para. 11.
well-being, would escape scrutiny. Similarly, the duration of unabated pollution would certainly work well as a proxy for violation, to find a breach in cases of long-standing emissions; however, it falls short of catching transient though injurious emissions.

(vi) Finally, compliance with the rule of law in States’ regulatory obligations also seems to play a major role in the ECtHR’s analysis. This proxy was relied on in Taşkin and Others v. Turkey, which concerned environmental and health risks imposed by a gold mine using cyanide technology. The authorities first refused to give a permit to the mine, however, after the Prime Minister intervened they ultimately issued authorization. The ECtHR noted that when state organs fail to comply with requirements for the proper administration of justice, the procedural guarantees that the State should ensure under Article 8 are “rendered devoid of purpose”. Thus, it declared a violation.

2.2.3 Drawbacks of the proxy-based method

Although the use of proxies might appear to be suitable for determining the vague scope of private life, and in many cases it provides a remedy against the most severe forms of environmental pollution, this method has several shortcomings.

Since proxies disregard the science underlying causal links, their use allows certain kinds of pollution to escape judicial scrutiny, even when the injury was, in fact, caused by the toxic agent released. This application of the López Ostra test runs afoul of its original meaning, according to which Article 8 prohibits even less severe interferences than actual health injuries. In avoiding complex causal inquires and scientific evidentiary assessments, the ECtHR sacrifices predictable and nuanced judicial decision-making based on an objective and consistent approach to the scientific evidence available in the case-file. Moreover, the use of proxies can only provide rough justice, as the decision results from an overall assessment of the facts rather than from a thorough causal analysis of the harm and the alleged violation, and therefore risks being over or under inclusive.

Without considering scientific evidence of causation, the Strasbourg jurisprudence inevitably leads to highly controversial results by not remedying the very core of the interference with private and family life, namely, the cause of

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physical injury to the applicant. Equally disturbing outcomes are the findings of a
violation where the actual harm was not a result of the defendant State’s action or
omission, even though that action satisfied many proxies. Diminishing the role
science and causation play in the court’s assessment hollows out the tort law function
of the Strasbourg regime and narrows the scope of environmental harm against which
the Convention provides protection.

Furthermore, the proxy-based approach yields inconsistent results by leaving
certain victims uncompensated. This shortcoming is flagged by sets of cases where,
despite similar facts and scientifically comparable harm, the ECtHR has reached
different outcomes as to whether they constitute a violation.

One of these sets is *Giacomelli v. Italy* and *Ivan Atanasov v. Bulgaria*. The
former complaint addressed a waste treatment plant, while the latter focused on a
restoration of the tailings pond of a former copper mine that contained heavy metals.
Both cases concerned situations where the authorities failed to prepare a proper EIA
study prior to the industrial activity.\textsuperscript{970} In *Ivan Atanasov*, robust expert evidence
suggested the existence of considerable risks of heavy metal pollution; in *Giacomelli*,
there was a risk of toxic waste leakage.\textsuperscript{971} In *Giacomelli*, the applicant did not prove
that any harm was sustained, nor did the ECtHR require actual harm for finding a
violation. In *Ivan Atanasov*, the applicant did not claim harm either,\textsuperscript{972} as his
application concerned pervasive the risks of a reclamation scheme that were left
unabated by the State.\textsuperscript{973}

However, while in *Giacomelli*, the ECtHR found a violation, in *Ivan Atanasov*
it reached the opposite outcome. It listed five reasons (proxies) for not finding a
violation: (1) the distance between the pond and the applicant’s home, (2) the lack of
active production on the site, (3) the lack of prior accidents, (4) the absence of proof
of an increased morbidity rate, and (5) the lack of a showing of actual harm to the
applicant’s health.\textsuperscript{974} The only proxy whereby *Giacomelli* produced a different result
was the presence of active operation. However, this is hardly a scientifically sound
reason for treating these cases differently, if one considers the grave health risks

Bulgaria, App. No. 12853/03, 2 December 2010, para. 22.
\textsuperscript{971} Giacomelli v. Italy, para. 55.
\textsuperscript{972} Ivan Atanasov v. Bulgaria, para. 78.
\textsuperscript{973} Id. para. 3.
\textsuperscript{974} Id. para. 76.}
posed by non-restored former industrial sites. Hence, this proxy cannot justify the different judicial outcome.

Another set concerns the different the awarding of pecuniary damages under Article 41 for adverse health consequences. In Tătar, the “plurality of causes” problem barred the ECtHR from deciding whether the cyanide leakage was the cause of the applicant’s aggravated asthma. As a result, the Court did not award damages to the applicant.\textsuperscript{975}

In contrast, in Vilnes, competing causes were not an obstacle to the finding of a violation and the awarding of non-pecuniary damages. This complaint concerned health damages incurred by seven former divers who worked for oil drilling companies at the North Sea and sustained damage to their central nervous systems after their employment.\textsuperscript{976} To prevent divers from getting decompression sickness, domestic authorities were responsible for enforcing safety standards set out in decompression tables for governing the length of time for decompression. In this case, the ECtHR concluded that the diving company’s overly rapid decompression tables “had probably been a strong contributory cause of the applicants’ health deteriorations.”\textsuperscript{977} Possible competing causes, thus, did not preclude the finding of a causal link.

Still another inconsistency emerges from a comparison of the L.C.B. and Brincat cases. The judgments in these cases took different directions on whether the defendant State ought to have known about the existence of health risks associated with toxic exposures caused by the State. In the first case, the underlying hazardous activity consisted of nuclear tests run by the UK between 1952 and 1967, to which the applicant’s father was exposed.\textsuperscript{978} The second case featured Malta’s ship repair industry, which from the 1950’s exposed to asbestos unprotected workers, who later either died of mesothelioma, or sustained various types of cancer.\textsuperscript{979}

In both cases, the States submitted that they were not aware of the risks imposed on their citizens. They also contested the causal link between the exposures

\textsuperscript{977} Id. paras. 233, 273.
and the health injuries claimed.\textsuperscript{980} A further similarity is that scientific discourse had begun to raise awareness about the pervasive health risks of both types of exposure at the time of the States’ conduct.\textsuperscript{981} The applicant in \textit{L.C.B.} relied on research that was conducted prior to his exposure, right after the Hiroshima and Nagasaki bombings, which showed a statistical association between the incidence of leukaemia and radioactive exposure. In \textit{Brincat}, the ECtHR acknowledged that WHO and ILO started to raise awareness about the dangers of asbestos already in the 1950’s. Therefore, the extent of uncertainty surrounding the harmful effects of both exposure was arguably comparable at the time of States’ injurious conduct; and thus, the respective States ought equally to have known about the health hazards.

In spite of these similarities, the ECtHR reached different outcomes. In \textit{L.C.B.}, the court subscribed to the view that the UK should not have known about the risks of nuclear radiation,\textsuperscript{982} whereas in \textit{Brincat}, Malta was held liable for violating the workers’ right to life because, in the ECtHR’s view, Malta ought to have known about the health hazards of asbestos.\textsuperscript{983}

Finally, due to the lack of a clear causal inquiry, the court’s reasons for finding or not finding a violation remain obscure and, thus, future plaintiffs are left with little guidance as to the evidentiary requirements of the ECtHR.

For all these reasons, this peculiar judicial framing of causal assessment yields decisions that may run against the factual realities of the case and therefore are vulnerable to challenges based on factual scientific data. As will be argued later on, the ECtHR could hardly justify its isolation from scientific facts in times where scientific fact-finding techniques could in fact offer legally relevant insights into the actual causal relations leading to the harmful injury complained of in a human rights claim. The price of using such a proxy-based assessment is therefore weakening the persuasiveness and legitimacy of the judicial decision.

\textit{2.2.4 Room for improvement in the causal inquiry}

This section presents a plea for handling causation in a way as to consider the scientific evidence in claims that involve health injuries. It is argued that in such

\textsuperscript{980} L.C.B. v. United Kingdom, para. 31. and Brincat and Others v. Malta, para. 75.
\textsuperscript{981} L.C.B. v. UK, paras. 17., 28; Brincat and Others v. Malta, para. 9.
\textsuperscript{982} L.C.B. v. UK, para. 38.
\textsuperscript{983} Brincat and Others v. Malta, para. 105.
cases, the Court should revisit the scientific evidence submitted to it and should base its decision on whether a violation had taken place on the causal assessment of the scientific aspects of the case.

Conducting a thorough causal analysis in toxic exposure cases does not mean that the ECtHR should disregard its proxies entirely. Proxies can be suitable tools for determining unlawful conduct that encroaches upon the broader sphere of private life, *i.e.* those adverse effects on well-being that do not cause health injuries (*e.g.* grave health risks imposed on the individual). Violations of the procedural aspects of States’ environmental obligations (such as conducting an EIA or providing access to environmental information) can also be assessed through proxies. However, once health injuries emerge in the context of a toxic exposure, consistent and predictable jurisprudence can only be achieved if the Court considers causation and evaluates the scientific evidence submitted when it decides whether the López Ostra test has been fulfilled. Basing decisions on causal inquiry would produce more accurate results, would result in a procedurally fairer jurisprudence by revealing the evidentiary standards parties need to meet and which the Court would be expected to follow in future cases. Hence it is argued that engaging with the underlying science would buttress the persuasive force of the ECtHR’s argumentation.

3. Science-intensive causal links in the Inter-American system

From an analytical point of view, causal links can be legally relevant in the Inter-American system in two respects: for establishing extra-territorial application of human rights standards and, to a lesser extent, for substantiating violations of certain guarantees.

3.1 Extraterritorial application of human rights guarantees

Causal links between activities and environmental harm came to the forefront of the IACtHR’s interest in the recent Advisory Opinion requested by Colombia ("Environment and Human Rights Advisory Opinion"). Colombia essentially requested the court to define the scope of State obligations in relation to the...
environment under the rights to life and to personal integrity recognized in Articles 4 and 5 of ACHR. Specifically, it asked the question whether a person, even if he or she is not within the territory of a State Party, should be considered subject to the jurisdiction of that State if as a result of damage to the environment or the risk of environmental damage in the area protected by a convention, which can be attributed to the State party – both to the given convention and to the ACHR –, the human rights of the person in question have been violated or are threatened.\footnote{An almost identical hypothetical question provides the main thread of the scholarly assessment of J.E. Vinuales published less than a month after the Advisory Opinion was sought on March 14, 2016. The IACtHR could benefit from the theoretical foundations laid out therein. See J. E. Vinuales, ‘A Human Rights Approach to Extraterritorial Environmental Protection? An Assessment’ in N. Bhuta (ed.), The Frontiers of Human Rights, (Oxford: Oxford University Press, 2016), pp. 177–221 p. 192.}

In a remarkable opinion, the IACtHR answered in the affirmative by holding that extraterritorially affected victims are subject to the jurisdiction of the State of origin if there is a causal link between activities present on that State’s territory and the adverse effects on human rights outside of it. Causal nexus between a State’s due diligence obligation to prevent transboundary environmental harm to occur and violations of human rights has therefore become crucial for establishing extraterritorial jurisdiction of a State within the Inter-American regime. The IACtHR stressed that “in all cases, there must be a causal relationship between the damage caused and the action or omission of the State of origin vis-à-vis activities in its territory or under its jurisdiction or control”\footnote{Environment and Human Rights Advisory Opinion, para. 103. (translated by the author from the authoritative Spanish version).}

The idea of extraterritorial application of human rights has been first advocated for in scholarly literature. The issue was first suggested by Alan Boyle,\footnote{A. Boyle, ‘Human Rights and the Environment: Where Next?’ (2012) 23 European Journal of International Law 613–42 at 638.} who argued that a “State which fails to control harmful activities within its own territory which cause or risk causing foreseeable environmental harm extraterritorially does owe certain human rights obligations to those affected, because they are within its jurisdiction and control, even if they are not within its territory.”\footnote{Boyle, ‘Human Rights and the Environment’, 840.}

A most elaborate account on the conditions and the theory of extraterritorial application of human rights guarantees in the context of environmental protection was

Having reviewed the conceptual difficulties and caveats applicable to asserting extraterritorial application of human rights in an environmental context, Vinuales concludes that

“a possible extension of state responsibility could arise from its effective control over the source of the harm, as noted by some human rights bodies in connection with international sanctions. Two inquiries would have to be conducted. One concerning causality (the link between, firstly, state action or inaction and environmental degradation and, secondly, between such degradation and an impairment of human rights abroad) and the other one concerning responsibility (in order to factor in the responsibility, or lack thereof, of the state exercising effective control over the victim).”

The IACtHR has substantially drawn on these foundations in issuing the Environment and Human Rights Advisory Opinion in November 2017. Its point of departure was also Principle 2 of Rio Declaration to announce that “States have the obligation to avoid transboundary environmental damage that could affect the human rights of people outside their territory. For purposes of the American Convention, when transboundary harm occurs that affects conventional rights, it is understood that the persons whose rights have been violated are under the jurisdiction of the State of origin if there is a causal link between the fact that originated in their territory and the human rights of people outside its territory”.

The IACtHR specifically listed the obligations owed by States to persons under their jurisdiction, both territorially and extra-territorially. In this vein, States must prevent significant environmental damage within and outside their territory, they shall prevent such damage by regulating, supervising, and monitoring the activities under their jurisdiction that could cause significant damage to the environment; they should carry out environmental impact assessments, observe procedural obligations of cooperation and notification as well as they must provide affected individuals with access to information, public participation, and access to justice.

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Extraterritorial jurisdiction of a State has traditionally been accepted in areas under the effective control of that State. The IACtHR designed a new, causality-based jurisdictional link, with which it extends the traditional, effective control-based scope of jurisdiction. This extension goes one step further along the imaginary causal chain of events tracing the consequences of the State’s exercise of effective control. This extension is rooted in the understanding “that it is the State, in whose territory or under whose jurisdiction these activities are carried out, that has effective control over them and is in a position to prevent causing transboundary harm that affects the enjoyment of the human rights of individuals outside its territory.” From this obligation to prevent transboundary harm, it follows that “[t]he exercise of jurisdiction arises when the State of origin exercises effective control over the activities carried out that caused the damage and consequent violation of human rights.”

For limiting the scope of extraterritoriality, the Advisory Opinion only requires the harm caused to be ‘significant’. It rules that any damage qualifies as such “that may entail a violation of the rights to life or personal integrity”. The Court reminds, in line with previous observations of Vinuales, that the duty to prevent human rights violations is an obligation of conduct and not that of result; hence, the key aspect of the IACtHR’s inquiry will focus on the State’s behavior. Accordingly, non-compliance of a State would not necessarily flow from the mere fact of violating human rights. The IACtHR does not specify the limits any further but refers the question of delimiting the scope of extraterritorial jurisdiction to a case-by-case analysis. What clearly emerges even from these vaguely described contours is that extraterritorial jurisdiction is tied only to severe forms of

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994 Environment and Human Rights Advisory Opinion, para. 102. (translated by the author from the authoritative Spanish version).
995 Environment and Human Rights Advisory Opinion, para. 104. h) (translated by the author from the authoritative Spanish version).
996 Environment and Human Rights Advisory Opinion, para. 140. (translated by the author from the authoritative Spanish version).
997 Environment and Human Rights Advisory Opinion, para. 140. (translated by the author from the authoritative Spanish version).
999 Environment and Human Rights Advisory Opinion, para. 143. (translated by the author from the authoritative Spanish version).
1000 Environment and Human Rights Advisory Opinion, para. 140. (translated by the author from the authoritative Spanish version).
environmental destruction that are capable of infringing the protected spheres of human rights. This confirms the trends anticipated by Jorge E. Vinuales, namely that “spatial expansion [of jurisdiction] may potentially come at the price of a contraction of the scope for environmental protection per se.”

As highlighted in scholarly commentary, IACtHR takes causality as “a standalone basis to establish the State’s extraterritorial jurisdiction”, which has been unprecedented in international human rights law. From a doctrinal point of view a problematic aspect of this innovative ruling is, however, that it remains silent on the actual causal test. As rightly pointed out by Antal Berkes, and has been repeatedly emphasized throughout this research, “causality might be an oversimplification to describe the often complex factual link between the State’s omission and its extraterritorial consequences.”

A further shortcoming in the reasoning is that it fails to close an important doctrinal gap pointed out earlier by Vinuales concerning the allocation of relationship between the State that exercises effective control over the victim of the harm on the one hand, and that of the State of origin that exercises control over the source of the harm.

In sum, for purposes of the present analysis the most noteworthy aspect of the Advisory Opinion is the strategic role that causal inquiry will play in extraterritorial human rights claims that now allowed under the Inter-American regime. The causal nexus, which – depending on the actual test, may either be ‘direct’, ‘clear’, ‘plausible’ or even ‘indirect’ or ‘contributory’ – will govern the applicability of human rights obligations of a State for violations triggered by transboundary environmental threats or harm. As causal claims are inextricably tied to underlying scientific facts, human rights claims in this field will in all likelihood entertain disputed causal chains and conflicting scientific views on the actual cause of the alleged human right violation. Causality, therefore, has just been placed at the heart of human rights claims brought by extraterritorial victims before the IACtHR. This may trigger unparalleled

1002 For a detailed assessment on possible doctrinal and pragmatic problems arising from the wide scope of causality and jurisdiction see A. Berkes, A New Extraterritorial Jurisdictional Link Recognised by the IACHR (EJIL Talk! March 28 2018).
1003 A. Berkes, A New Extraterritorial Jurisdictional Link Recognised by the IACHR (EJIL Talk! March 28 2018).
consequences not only for enforcing human rights guarantees extraterritorially, but also for the judicial treatment of science embedded in causal claims and causal proof. How the IACtHR would frame its causal assessments and to what extent it will engage with scientific evidence is yet to be seen.

3.2 Causality in proving violation in individual cases

Although adverse health impacts causal upon environmental destruction or toxic pollution is present at least in subtle ways in every toxic exposure claim, for establishing a violation of the right to physical integrity, no actual health injury needs to be established. The Inter-American Commission on Human Rights has emphasized that „severe environmental pollution which may cause serious physical illness, impairment and suffering on the part of the local populace, are inconsistent with the right to be respected as a human being.“

Causal links are, in contrast, an expressly necessary element in the context of awarding compensation under Article 63 of ACHR. In the Saramaka case, the IACtHR emphasized that people must be compensated for the material damage “directly caused” by the violation.\textsuperscript{1005}

A good number of toxic exposure claims are yet to reach the IACtHR. Such claims have thus far been heard by the Commission in the admissibility phase. The claims were virtually always rendered admissible based on the review of underlying facts. The petitions will later be heard on the merits first by the Commission and if the State failed to meet the recommendations addressed to it, the Commission could refer the case to the IACtHR provided that all procedural prerequisites are met.

These are particularly science-intensive claims alleging violations on account of severe health injuries caused by toxic exposure. Chronologically first in line, the petition of the Community of San Mateo were filed against Peru, claiming that the authorities permitted a toxic waste dump near the community causing serious contamination and negative health effects.\textsuperscript{1006} The Commission also issued precautionary measures calling for immediate governmental action.\textsuperscript{1007} Later in 2009,

\textsuperscript{1005} Saramaka case, Judgment, para. 199.
\textsuperscript{1006} Inter-American Commission on Human Rights: Community of San Mateo de Huanchon v. Peru, Admissibility Decision, Report No. 69/04.
the Community of La Oroya lodged a complaint for authorizing a metallurgic plant to operate causing serious pollution and contamination resulting in illness and death of local residents.\textsuperscript{1008} The Commission relied on a WHO guideline\textsuperscript{1009} to support its finding that the claim was admissible under Article 4 and 5 of ACHR.

In 2010, the Commission declared admissible a petition concerning the controversial ‘cancer alley’ of Louisiana in the \textit{Mossville v. U.S.} case. Residents of Mossville alleged various health problems caused by toxic pollution released from fourteen chemical-producing industrial facilities that have been granted permits in and around the city. Petitioners submitted a report prepared by the University of Texas showing widespread injuries, attesting that “\textit{84\% of the Mossville residents surveyed present nervous system problems; 71\% cardiovascular problems; 57\% skin problems; and that in addition to physical problems”}.\textsuperscript{1010} Residents who had their blood tested by the U.S. Agency for Toxic Substances and Disease Registry found to have dioxin in their blood three times higher than the national average. Documents were also filed showing that the facilities emitted substances that were “\textit{scientifically known to cause cancer}”\textsuperscript{1011} and various health damage. Bearing in mind “\textit{the complex questions of fact and law}”,\textsuperscript{1012} the Commission for the first time declared a case admissible under the right to privacy while referring to the established practice of the Strasbourg Court. Though interestingly, the petition was denied under the right to life and right to health and well-being respectively, due to “\textit{lack of specific facts or arguments}.”\textsuperscript{1013} In light of the serious environmental justice concerns involved, commentators urge\textsuperscript{1014} the Commission to find a violation.

Two more recent toxic exposure claims were rendered admissible in 2014. In \textit{People of Quishque-Tapayrihua v. Peru}, petitioners allege that mining activities caused the pollution of a river on which their subsistence depended. The Commission concluded that the petition is admissible under inter alia the right to physical, mental

\begin{footnotesize}
\textsuperscript{1008} Inter-American Commission on Human Rights, the Community of La Oroya La Oroya v Peru, Admissibility Decision, Report No. 76/09.
\textsuperscript{1009} In more detail see D. Shelton, ‘Developing substantive environmental rights’ (2010) 1 Journal of Human Rights and the Environment 89–120 at 117.
\textsuperscript{1011} \textit{Ibid.}, para. 11.
\textsuperscript{1012} \textit{Ibid.}, para. 43.
\textsuperscript{1013} \textit{Ibid.}, para. 43.
\end{footnotesize}
and moral integrity guaranteed under Article 5 of ACHR. The *Communities of the Sipakepense and Mam Mayan People v Guatemala* case also concerns a mining project allegedly causing severe contamination of the Tzala River and its tributaries. Petitioners claim that water pollution caused health problems to them. The Commission found the petition admissible under Article 5.

Merits discussions and final decisions in the above cases could not only remedy egregious environmental pollution but, from a doctrinal point of view, would also answer many crucial questions as to the prospects and technical requirements of proving toxic exposure claims and could reveal how the IACtHR frames its causal assessment in science-heavy claims.

4. Causal links in the African system

In the African regime, toxic exposure claims usually concern large-scale and egregious pollution, where the excessive health risks caused by apparent lack of State policies are evident, and sometimes even openly acknowledged by the State. For this reason scientific evidence demonstrating causality between the severe health consequences and the governmental act or omission thus far has not played a crucial role in substantiating a violation.

In the African system, the tort law function of human rights adjudication is less articulated compared to that of the Strasbourg Court. African courts thus far have taken an action-forcing approach in environmentally destructive pollution cases, requiring effective policies and regulations from the government rather than awarding monetary compensation for the victims of toxic pollution. As the ECOWAS Court noted “the core of the problem in tackling the environmental degradation in the Region of Niger Delta resides in lack of enforcement of the legislation and regulation

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1016 Inter-American Commission on Human Rights: Communities of the Sipakepense and Mam Mayan People v Guatemala, Admissibility Decision, Report No. 20/14.
1017 Socio-Economic Rights and Accountability Project v. Republic of Nigeria Judgment, N° ECW/CCJ/JUD/18/12, (“SERAP case”), para. 95.
1018 SERAP case, Judgment, para. 97.
1019 Some authors explicitly call the Strasbourg regime as a “system of tort law”. Oliphant and Ludwichowska, ‘Damage’, p. 447.
The Court in that case decided not to award monetary compensation for the health injuries resulting from the State’s omission. Albeit the reason for doing so was apparently that the applicants did not specify the individual victims among whom the astronomical amount of damages claimed (USD 1 billion) could have been distributed.

The ACTHPR has only recently started to hear cases involving environmental destruction. The *Ogiek case* was decided in 2017 and concerned the eviction of the Ogiek people from the Mau Forest by Kenya. Causality became relevant in the context of proving a violation of the right to life. Due to the lack of sufficient evidence, the Commission could not establish a causal connection between the evictions of the Ogieks and the violation ensued by the allege death of some members of the community.

### III. Scientific fact-finding techniques

Scientific evidence and factual allegations are filed with every regional human rights court though they differ in terms of the depth and the level of detail in which they comment on such expert reports. What appears to be a common feature nevertheless is the reluctance to engage with probabilistic and contested scientific evidence.

#### 1. Fact-finding of the Strasbourg Court: dismissing probabilistic evidence

The ECtHR does have the necessary powers to deal with the scientific aspects of the toxic exposure claims submitted. The procedural rules of the ECtHR allow for more scrutiny of scientific facts than is currently done in the Court’s practice. To surmount its lack of scientific expertise, the Court has the power to appoint

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1020 *SERAP* case, Judgment, para. 108.
1021 *SERAP* case, Judgment, paras. 114-115.
1023 For a general analysis see R. Roesch, *The Ogiek Case of the African Court on Human and Peoples’ Rights: Not So Much News After All? EJIL Talk!* (June 16, 2017).
1024 *Ogiek* case, Judgment, para. 155.
experts. Pursuant to the Rules of Court, the ECtHR can “ask any person or institution of its choice to obtain information, express an opinion or make a report, upon any specific point.” By the time the ECtHR started to decide environmental cases on the merits, scholars expected the court to use its evidentiary powers in environmental cases. However, judicial practice evolved in the opposite direction.

1.1 Too high a level of certainty is required

The ECtHR’s standard of proof is generally high as it uses the beyond reasonable doubt standard, which is met by “the coexistence of sufficiently strong, clear and concordant inferences or of similar unrebutted presumptions of fact.” While the Court emphasized that it allows flexibility in this respect with regard to the evidentiary difficulties involved, in its practice, it rarely accepts probabilistic proof of causation.

The Court’s approach to statistical evidence was at the core of the decision reached in Tatar v. Romania. Several pieces of evidence were not refuted by the ECtHR, however, it still refused to accept them as adequate proof of causation. A report jointly issued by the UNEP and the Romanian authorities established the existence of excessive cyanide pollution near the applicant’s home, the city hospital reported an increased number of respiratory diseases among local children, and many experts agreed that cyanide might cause irritation to the respiratory tract. However, the Court found that these pieces of evidence were insufficient “to create a causal probability” between the cyanide leaching and the aggravated asthma. The Court refused to engage in “probabilistic reasoning” as in its view, this would only be acceptable if the claim is “accompanied by sufficient and convincing statistics”.

1030 Id.
1032 Tătar v. Romania, para. 105.
1033 Id.
1034 Id. (”raisonnement probabiliste” - translation from French by the author).
1035 Id.
In his dissent, Judge Zupančič heavily criticized the ECtHR for the overly formalistic “classical causal approach”, which “does not know the concept of uncertainty.” Later he also emphasized that: “(i)t is disappointing that the European Court of Human Rights remains (...) in the (...) not so enlightened perception of what cause and effect in law is – in a situation in which the environmental pollution is at least one of the major contributing factors to problems that led the plaintiff to the Court.”

As is demonstrated by the case of Brincat and Others v. Malta, even when the ECtHR finds a breach, it avoids evaluating uncertain scientific proof of causation. This case concerned liability for a State’s omission that resulted in health injuries. The ECtHR “accepted the link between the medical conditions affecting the relevant applicants and their exposure to asbestos”, but did not provide any reasoning for its causal findings. This stance is interesting because the underlying facts were far from being entirely clear and the Court has a high threshold for accepting scientific claims. Thus, the finding of a causal link would certainly have deserved a more in-depth discussion.

The medical certificate of the deceased worker only indicated that the death was “likely to be a result of asbestos exposure” (emphasis added). Also, the National Cancer Institute held that whether asbestos-related diseases develop depends on a number of factors, among others, smoking. This is especially important, given that some of the applicants were smokers. However, instead of weighing the contradictory evidence, the ECtHR found Malta liable for endangering the lives of the applicants on the grounds that, on account of its ILO membership, the government “knew or ought to have known” about the dangers of asbestos. This statement implies that the Court was convinced that the asbestos was the cause of the harm sustained, although not primarily on the basis of the expert evidence, but on account of widely held views on the toxic nature of asbestos.

The ad hoc weighing of non-scientific evidence is objectionable from a doctrinal point of view, as it obfuscates the evidentiary requirements of the ECtHR. Liability for a State’s omission that allegedly resulted in health injuries simply cannot

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1036 Zupančič, ‘Causation in Cases of Environmental Degradation’, 122.
1037 Tătar v. Romania, para. 150.
1038 Tătar v. Romania, para. 75.
1039 Tătar v. Romania, para. 76.
1040 Tătar v. Romania, para 12.
1041 Tătar v. Romania, paras. 105-106.
be decided without considering the evidence on causality. This is not to say that the outcome of the judgment could not have been justified from a moral and even from a scientific point of view; nevertheless, it illustrates well the Court’s ambivalent approach towards scientific evidence.

1.2 Probabilistic evidence – rare and exceptional acceptance

The ECtHR famously considered the possibility to “engage in probabilistic reasoning” in *Tatar*; though ultimately it decided not to find a causal link based on the statistical evidence submitted to it.\(^{1042}\) In contrast, two more recent decisions suggest that the Court is moving to the laudable direction of assessing probabilistic scientific evidence.

The Court accepted a probabilistic proof of causation for the first time in *Vilnes and Others v. Norway*. Despite the lapse of time between the applicants’ diving and the manifestation of their health impairments, during which many possible competing causes could have emerged, the Court found “a strong likelihood that the applicant’s health had significantly deteriorated as a result of decompression sickness”.\(^{1043}\) (emphasis added) This time, the likelihood provided a sufficient basis for the Court to find a violation. It should be noted, however, that much of the credit for the ECtHR’s turn in this instance belongs to the domestic court. The Court only reiterated the relatively straightforward statement of the Norwegian High Court, which acknowledged the existence of a causal link between the too rapid decompression tables and the victims’ health injuries.\(^{1044}\) Nevertheless, this case might also be an indication of the ECtHR’s growing understanding of the true nature of probabilistic scientific evidence.

2. Fact-finding of the Inter-American Court in toxic exposure cases

Scientific facts of petitions are first considered by the Inter-American Commission for Human Rights. Some of the Commission’s inquiries are highly empirical. In its 1997 country report concerning Ecuador\(^{1045}\) the Commission

\(^{1042}\) Tătar v. Romania, para. 105.


\(^{1044}\) *Id.*, para. 139.

investigated alleged violations on account of oil exploitation activities. Local people alleged that they “suffered from skin diseases, rashes, chronic infection” due to groundwater contamination. A striking feature of the Commission’s report is that it cites several studies conducted by NGOs and expert bodies measuring the level of contamination and the extent of adverse health impacts among the population.1046 Yet the Commission usually does not venture into detailed factual assessment of the scientific studies it is inclined to accept. In the Ecuador report, it summarily concluded that: “[t]he information received and analyzed by the Commission, as well as the data and insights gathered during its on site observation, have largely substantiated” the grievances of the petitioners. Also, in the very early Yanomami case, the Commission found a violation by noting in passing that there were “sufficient background information and evidence to conclude that ... the failure of the Government of Brazil ... has resulted in ... injury to them [Yanomami People]”.1047 Similarly brief fact-finding occurs when the Commission decides about the admissibility of the claim. In such cases, it conducts only a prima facie investigation examining “whether the complaint shows valid evidence of an apparent or potential violation of a right guaranteed by the American Declaration -- not to establish whether a violation exists”.1048 As to the scientific fact-finding of the IACtHR, its Procedural Rules allow for hearing expert evidence offered by the parties and requesting additional documents from the parties or from expert bodies, and also for summoning on its own motion any experts whose opinion is relevant.1049 The Court extensively uses such powers, although so far only experts on social sciences were summoned. In the Awas Tingni v. Nicaragua case,1050 the IACtHR allocated three days1051 for hearing extensive testimonies from four expert witnesses in the field of ethnography, anthropology and

1046 It explicitly states that „the study concluded that Oriente residents are exposed to levels of oil-related contaminants far in excess of internationally recognized guidelines, and that human ingestion of water or fish from the waters sampled poses a significantly increased risk of serious health effects including cancer, neurological and reproductive problems”.
1047 Resolution Nº 12/85, Case Nº 7615, Brazil, March 5, 1985.
1049 Article 47 of Rules of Court.
1050 Inter-American Court of Human Rights, Case of the Mayagna (Sumo) Awas Tingni Community v. Nicaragua, Judgment of August 31, 2001 (Merits, Reparations and Costs) (“Awas Tingni case”).
sociology, and placed other expert opinions on the case file as well as summoned one expert witness on its own motion.

From a scientific fact-finding point of view, the most interesting judgment was handed down in the *Saramaka* case,\(^{1052}\) where the IACtHR was confronting the issue of ecological damage valuation. Having heard expert opinions on the logging habits of the Saramakas, the Court concluded that "the evidence shows that the logging concessions awarded by the State caused significant property damage to the territory traditionally occupied and used by the Saramakas".\(^ {1053}\) In this vein, the IACtHR awarded USD 75,000,000 as material damage, which was criticized\(^ {1054}\) for being of a too low quantum in light of the expert evidence attesting "traumatic"\(^ {1055}\) environmental impact of the logging concessions on the Saramaka’s ancient land. When it comes to the exact methodology, the judgment saliently "lacks detailed analysis on valuation",\(^ {1056}\) which well-depicts the IACtHR’s somewhat haphazard approach to scientific fact-finding.

3. Fact-finding of African courts

The *SERAP* case, decided in 2012 is perhaps the most illustrative of the ECOWAS Court’s scientific fact-finding. The claim concerned massive oil pollution caused by Texaco that was left unabated by Nigeria. The judgment bespeaks an empirical approach to scientific fact-finding. The ECOWAS Court declared admissible the report of Amnesty International. Though it ruled that the report alone could not be regarded as conclusive evidence on the harmful environmental impacts of oil pollution, it found that the report’s findings were corroborated by well-known facts and thus, accepted them as established.\(^ {1057}\) The Court also noted that it was inclined to "uphold[s] as decisive and convincing the facts on which there [was]

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\(^{1053}\) Inter-American Court of Human Rights Case of the Saramaka People v. Suriname, Judgment of November 28, 2007 (Preliminary Objections, Merits, Reparations, and Costs), para. 199. ("Saramaka case").


\(^{1055}\) *Saramaka* case, Judgment, para. 151.

\(^{1056}\) Orellana, ‘Saramaka People v. Suriname’, 847.

\(^{1057}\) *SERAP* case, Judgment, para. 94.
agreement among the parties.”" Similarly, the ACtHPR hears expert evidence, though its jurisprudence also shows that the court is only inclined to rely on uncontested facts. This raises doubts as to the efficiency of African human rights courts in deciding cases involving more subtle pollution where conflicting evidence may arise.

In the Ogiek case, the petition sought monetary compensation for all the damage suffered, including the Ogiek’s loss of property and natural resources. The ACtHPR deferred deciding on compensation to a separate judgment, hence we shall wait to see how natural resource damage valuation, a particularly science-intensive aspect of the dispute, will be handled by the court.

Lastly, it is to be noted that locus standi criteria appear to be decisive for the intensity of scientific fact-finding in human rights adjudication. The African regime is known for its liberal rules allowing various NGOs to bring claims before the ECOWAS Court or the African Commission on Human and Peoples’ Rights, which may later refer them to the ACtHPR. Given that victims of environmental human rights violation often belong to the most vulnerable and marginalized groups, affected petitioners themselves would be in complete lack of resources to produce meaningful evidence. NGOs, on the other hand can effectively plead their cases, as proven by their successful track record in environmental pollution cases.

IV. Standard of review in human rights adjudication: deference and margin of appreciation

1. The Strasbourg system: the margin of appreciation doctrine

Deferential review is markedly present in the Strasbourg Court’s jurisprudences. The ECtHR famously grants a wide margin of appreciation to States in terms of forming their environmental policies and balancing competing

\[\text{1058} \text{ Ibid.}\]
\[\text{1059} \text{ Ogiek case, para. 183.}\]
\[\text{1060} \text{ For cases brought by NGOs see for instance: the Ogoniland case (African Commission on Human and Peoples’ Rights: Social and Economic Rights Action Centre (SERAC) and Another / Nigeria (2001) AHRLR 60 (ACHPR 2001), the SERAP case, and the Ogiek case, where the Centre for Minority Rights Development (CEMIRIDE) and Minority Rights Group International (MRGI) brought the original complaint to the Commission.}\]

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environmental and economic interests. In terms of the negative obligations\textsuperscript{1061} of States, a breach of domestic law in terms of States’ negative obligations would necessarily lead to a finding of a violation.\textsuperscript{1062} In contrast, domestic legality of a regulatory measure complained of is not a conclusive test for complying with positive obligations,\textsuperscript{1063} a breach of a given domestic law does not automatically trigger a violation of the Convention. In terms of such positive obligations, the ECtHR reviews States’ action by using the test whether national authorities have struck a fair balance between the individual’s right and the interest of the community as a whole in furthering economic development.

The ECtHR’s role in reviewing environmental policies is subsidiary and is only exercised in exceptional circumstances, when national authorities commit “manifest error” in balancing competing interests.\textsuperscript{1064} A manifest error is generally found in case of gross negligence by national authorities, when they fail to address or mitigate significant pollution exceeding domestic safety standards. For instance, persistent air pollution almost five times higher than domestic safety standards\textsuperscript{1065} and an enduring noise pollution 15% above the safety standards\textsuperscript{1066} both amounted to a violation.

The margin of appreciation doctrine, as described above, means a deferential review of domestic policy choices. At the same time, the ECtHR appears to be equally deferential towards the scientific assessments of national authorities. Hence, as a flip side of the superficial evidentiary assessment conducted by the Strasbourg Court, a wide margin of discretion is afforded to States in making scientific claims.

\textbf{2. The Inter-American and African systems: measure of deference}

The margin of appreciation doctrine was famously not accepted overseas in terms of allowing wide latitude for States in balancing competing rights and interests

\textsuperscript{1061} Article 8 (2) provides that „there shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of (…) the economic wellbeing of the country…”
\textsuperscript{1062} Fadeyeva v Russia, para 95.
\textsuperscript{1063} Fadeyeva v. Russia, para 98.
\textsuperscript{1064} Fadeyeva v. Russia, para 105.
\textsuperscript{1065} Fadeyeva v. Russia, para. 32.
\textsuperscript{1066} Deés v. Hungary, app.no. 2345/06, 2010, para. 23.
in realizing human rights guarantees. This does not mean however that deference towards the factual findings of States is not present in the African or Inter-American regional regimes. Deferential standard of review is reflected in the fact-finding techniques of the ECOWAS Court and the ACtHPR, which are both unwilling to base findings on scientific evidence that is contested by the State party in question.

V. Interim conclusion

A closer examination of the environmental jurisprudence of regional human rights courts has revealed some shared challenges in adjudicating science-intensive claims in the context of human rights.

1. Causality in human rights claims

Causal nexus is an often-overlooked aspect of human rights claims, though they are subtly underlying every claim of health injuries caused by environmental destruction or pollution that may amount to human rights violation. Causality has just been placed in the spotlight by the recent Advisory Opinion of IACtHR, which posits a new, causation-based link for establishing jurisdiction of States failing to prevent causing transboundary harm over extraterritorial victims.

The Strasbourg Court frames its causal analysis by circumventing the scientific aspects and relying on non-scientific proxies of cause. This proxy-based method yields inconsistent case-law by leading to different outcomes in factually similar cases. By avoiding factual causal inquiries, the ECtHR sacrifices nuanced judicial decision-making and due to the fact that it distances itself from the scientific facts of the case its reasoning becomes vulnerable to empirical criticism.

2. Scientific fact-finding in human rights adjudication

The Strasbourg Court also refuses to revisit the evidence already on the case-file and neither it uses its evidentiary powers to request for expert advice itself. These

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shortcomings, if left unaddressed, could undermine the ECtHR’s reputation of being a leading advocate\textsuperscript{1068} of environmental protection based on human rights. Even though from a doctrinal point of view it is promising that the IACtHR as well as the ECOWAS Court and the IACtHPR often hear expert evidence on its own motion or following the parties’ submissions, they are reluctant to base findings on conflicting evidence, which casts doubts as to the efficiency of their scientific engagement.

\textsuperscript{1068}The ECtHR has the oldest and most extensive case law on human right violations caused by environmental pollution. A. Boyle, ‘Human Rights or Environmental Rights? A Reassessment’ (2007) XVIII Fordham Envtl. L. Rev. 471–511 at 484.
Chapter 6
Judicial engagement with science in the practice of the Court of Justice of the European Union

“It is not for the Court to assess the merits of either of the scientific points of view argued before it... the Court nevertheless finds that ... the Community institutions could reasonably take the view that they had a proper scientific basis for a possible link.”

CFI, Pfizer case

I. Introduction: Science appears before the EU Courts

This chapter analyzes decisions of EU Courts (the General Court, the predecessor of which was the Court of First Instance (“CFI”), and the Court of Justice (“CJEU”)1070 taken together), in which Member States (“MS”) or EU institutions raise scientific arguments. This is the case typically in proceedings entertaining issues on the protection of environment, food safety or public health. The EU judiciary is tasked with ensuring the uniform interpretation of EU law, examining the legality of EU measures, and observing the proper application and implementation of EU law.1071 EU Courts are famous for adopting an activist and even “creative”1072 approach to interpreting EU environmental laws, which makes EU case-law an apt subject to the analysis on using scientific arguments in a legal setting. This chapter examines and critically assesses the extent and methods of judicial engagement with science developed in the practice of EU Courts.

At the outset it is worth reviewing the diverse proceedings in which scientific questions become relevant in legal disputes brought before the EU judiciary:

(i) The perhaps most general entry point of science is when scientific arguments bear relevance to interpreting rules and definitions of EU environmental

1070 The predecessor of the CJEU was the European Court of Justice (“ECJ”).
1071 Article 19 TEU.
regulations and directives. As directives and regulations become increasingly technical in nature, they often embed “purely scientific criteria” in legal rules. This implies that scientific considerations inevitably enter the sphere of judicial review to a growing extent. As the Court acknowledged for instance in Monsanto, the notion of ‘substantial equivalence’ is a concept of Community law, the understanding of which though calls for scientific assessment;

(ii) In infringement cases initiated against MSs for the failure to comply with provisions of EU law, the question of compliance with EU law may wholly or partially turn on scientific arguments;

(iii) The judicial review of risk regulation decisions made by MSs or EU institutions under directives and regulations normally warrants science-intensive inquiry into the risk assessment procedures. Hence annulment proceedings sometimes entail science-intensive judicial inquiry;

(iv) MS may invoke scientific arguments for restricting the free movement of goods within the internal market, in the absence of approximation of laws, under Article 36 TFEU, which could be challenged before the judiciary;

(v) MS may justify their derogation from EU harmonization measures based on “new scientific evidence” under Article 114 TFEU, which again could be subject to judicial review;


E.g. EC Regulation 1907/2006 (REACH) exempts polymers from registration while imposing such obligation for monomer substances that build such polymers. The interpretation of such provisions, even in case of a judicial review of limited scope, entails a need to consider scientific definitions. In Case C-558/07 S.P.C.M. and Others v. Secretary of State for the Environment, the Court was faced with the question of whether reacted or unreacted monomers should be regarded as monomer substances ought to be registered under the Regulation.

T-74/00 Artegodan case, para. 207: „It is important to note that the criterion is not a legal criterion which supplements or modifies the efficacy criterion set out in Article 11 of Directive 65/65 but a purely scientific criterion relating specifically to the assessment in the treatment of obesity.”

Case C236/01 Monsanto and Others v. Presidenza del Consiglio dei Ministri, paras. 73, 79.

Article 36 TFEU: “The provisions of Articles 34 and 35 shall not preclude prohibitions or restrictions on imports, exports or goods in transit justified on grounds of public morality, public policy or public security; the protection of health and life of humans, animals or plants; the protection of national treasures possessing artistic, historic or archaeological value; or the protection of industrial and commercial property. Such prohibitions or restrictions shall not, however, constitute a means of arbitrary discrimination or a disguised restriction on trade between Member States.”

Article 114 TFEU: (4) If, after the adoption of a harmonization measure by the European Parliament and the Council, by the Council or by the Commission, a Member State deems it necessary to maintain national provisions on grounds of major needs referred to in Article 36, or relating to the protection of the environment or the working environment, it shall notify the Commission of these provisions as well as the grounds for maintaining them.
(vi) Safeguard clauses included in certain EU regulations and directives\textsuperscript{1079} allow for the withdrawal of certain products from the market if they impose health or environmental risks. Such protective measures of MSs may be subject to judicial review; and

(vii) Reviewing EU harmonization measures made under Article 95 (3) TEU\textsuperscript{1080} may require decisions to be taken “in the light of current scientific and technical knowledge”.

EU law illustrates perhaps most vividly the gap between the role assigned to scientific evidence in policy-making and in adjudication. The eminence of scientific evidence in EU environmental policy making is reflected in primary legislation\textsuperscript{1081} and also clearly advocated for by the Commission. The Juncker Commission is particularly committed to evidence-based policy-making as reflected in its position paper entitled ‘Strengthening Evidence-Based Policy-Making through Scientific Advice’.\textsuperscript{1082} In contrast to that, with respect to the judicial review of measures, “the extent to which legality hinges on scientific support for the measure [is] more nuanced and complex than a straightforward endorsement of the importance of scientific expertise.”\textsuperscript{1083}

This chapter will argue that one may divide the EU Courts’ case-law into two groups based on the techniques of judicial engagement with science and the context in which science enters the judicial process. To the first group belong the cases where

\textsuperscript{1079} E.g. Article 12, EC Regulation No. 258/97 on novel foods and novel food ingredients; Article 16, EC Directive No. 90/220 on the deliberate release into the environment of genetically modified organisms.

\textsuperscript{1080} Article 95(3) TEU: “The Commission, in its proposals envisaged in paragraph 1 concerning health, safety, environmental protection and consumer protection, will take as a base a high level of protection, taking account in particular of any new development based on scientific facts. Within their respective powers, the European Parliament and the Council will also seek to achieve this objective.”

\textsuperscript{1081} E.g. Article 191 (3) TFEU provides that „in preparing its policy on the environment, the Union shall take account of ... available science and technical data...”


questions of science arise before EU judicature in the context of deciding whether EU organisms or Member States have remained in the ambit of their discretionary powers in making science-based policy decisions, typically risk regulation (e.g. allowing or banning a potentially harmful product within the internal market). These cases will be addressed in Section II.

In the judicial review of risk assessment decisions, scientific arguments are reviewed in order to assess whether a given policy measure is, in the CJEU’s words, “manifestly inappropriate having regard to the objective, which the competent institution is seeking to pursue”. In this type of cases, EU Courts adopt a deferential approach towards MS and EU institutions, even though they are becoming more and more willing to scrutinize the informational basis of scientific risk assessments. The task of EU Courts is to review whether EU institutions and MS respectively have remained in the legitimate ambit of their discretion. Accordingly, EU Courts engage with science indirectly, when they assess whether the risk assessor could legitimately arrive to the given conclusion based on scientific assessments in light of the discretion they enjoy in making choices when faced with complex scientific facts. As a general rule, competing scientific facts are examined by the risk assessors themselves, i.e. MS or EU institutions, and not by EU Courts, since the latter should refrain from substituting its own view on the risks for the scientific risk assessment.

In contrast to that, the second group consists of cases where scientific arguments are raised by the EU Commission to challenge the appropriateness of MS’ implementation measures and compliance with EU law obligations. These cases will be examined in Section III. In these cases, science indicates whether national harmonization measures are insufficient to reach the goals set by EU directives. Thus, here scientific evidence may serve as a proof of a breach of EU law. In such cases, judicial engagement with science is more direct than in the first group, since EU Courts should decide on the validity of scientific arguments themselves, instead of reviewing the permissibility of MS’s reading the scientific input. Given that here science serves as a tool for the CJEU to expand the scope obligations of MSs, it is not very surprising that the Court is willing to engage with science while it closely scrutinizes the science-based arguments raised by the MS in defense of its measures.

1084 Case C-331/88, The Queen v Minister of Agriculture, Fisheries and Food and Secretary of State for Health, ex parte: Fedesa and others, para. 14.
Scientific considerations are also relevant in terms of evidentiary matters. Questions of adequate scientific proof of causation were typically raised in preliminary ruling procedures. Given the vast number of such proceedings, this chapter cannot strive to provide a comprehensive review of the CJEU’s preliminary ruling judgments, rather it assesses only the most important decisions that comment on questions of acceptable causal proofs under certain EU directives. These aspects will be dealt with in Section IV.

Concerning the ways in which scientific arguments appear before EU Courts, most well researched is perhaps the application of the precautionary principle,1085 which is one of the distinctive principles of EU environmental law. This chapter will also address this principle in the context of judicial review. However, the analysis purposefully seeks to encompass uses of scientific arguments also beyond the terrain of precautionary justifications invoked in risk assessment procedures.

This chapter will review a non-exhaustive list of decisions to discuss different aspects of judicial engagement with science in the case-law of EU Courts. First, it will examine the ways in which science enters the judicial analysis of EU Courts and will set out an analytic framework, where judicial engagement with science is examined separately with regard to the judicial review of risk regulation and the review of implementation measures. As to the first group, changing standards of deference will be analyzed with a focus on how EU Courts draw the boundary between judicial review of regulatory decisions, which they are willing to engage in, and scientific (re)assessment, which they ought not to do. As to the second line of cases, the analysis will focus on the extent to which uncertain causal links may expand MS’ discretion to transpose and implement environmental directives. As the third aspect of this chapter’s inquiry, scientific fact-finding techniques of EU Courts will be addressed. Predominantly, causal proof requirements will be examined in light of some preliminary ruling proceedings. With a view to the fact that the majority of EU Courts judgments are brought in such preliminary ruling procedures, this dissertation cannot aspire to provide an in-depth analysis of all such decisions. Rather, it will flag some preliminary ruling judgments that focused on causal proof requirements.

II. Judicial engagement with science in reviewing risk regulation

This line of cases represents judicial decisions where EU Courts review the scientific basis of regulatory decisions made by EU institutions or Member States. Risk assessment and risk regulation is prevalent not only in environmental policy-making narrowly defined but also in closely related fields, such as food safety, the protection of human health, and pharmaceutical product liability. In this vein, several EU directives and regulations entail risk assessment obligations prior adopting regulatory measures.¹⁰⁸⁶

In this group of cases, EU Courts should decide on the acceptable and legitimate scope of exercising discretion in making policy choices on the basis of complex and often contradicting scientific facts. In terms of such annulment procedures, regulators, i.e. both MSs and EU institutions enjoy a “broad discretion”¹⁰⁸⁷ in making policy choices.

EU Courts are faced with an essentially three-fold challenge while reviewing risk regulation cases¹⁰⁸⁸: (i) they need to consider the complex and technical factual background of the regulatory decision; (ii) they should weigh divergent normative and policy objectives, most importantly, the precautionary principle; and (iii) they need to


¹⁰⁸⁷ Case C-333/08 EU Commission v France, para. 86, Case T-257/07 France v Commission, para. 84, Case C-405/07 P Netherlands v Commission, para. 54. Case C-157/96 National Farmers’ Union and Others, para. 39 refers to “whether such discretion is vitiated by a manifest error or a misuse of powers or whether the Commission did not clearly exceed the bounds of its discretion.”

account for the fact that MS and EU institutions enjoy a wide measure of discretion to make such risk regulation decision.

Emphatically, EU law cannot and does not set an obligation of result for the process of regulatory decision-making by demanding environmental policies that satisfy certain scientific standards of ‘safety’ or ‘appropriateness’. Such an approach would impose an impossible criterion as the requirement of ‘safety’ inherently involves a judgment call and, therefore, it cannot be regarded as a question of science alone. This is well reflected in the scholarly consensus, which regards environmental policy-making as a “scientifically informed value judgment”.¹⁰⁸⁹ As a commentator has described the same idea from a different angle: “[s]cience can help determine whether things are the same and can identify the ways in which they differ. Science cannot, however, tell us whether that sameness matters from a legal perspective”.¹⁰⁹⁰

Given the lack of obligation of result, EU Courts currently use procedural benchmarks in the judicial review of risk regulation to assess whether the given EU institution or MS was in a position to “properly find” the lack or the existence of a risk warranting a regulation. Importantly, a given measure is not assessed against the entirety of scientific facts available at the time, but only with respect to those that are already on the case-file. EU judicature refrains from reassessing such scientific evidence, as it only evaluates the “internal consistency” of the risk assessment reasoning.

EU Courts, however, were not always inclined to conduct such a science-intensive consistency review. The following sections will detail how the Court has changed its initial deferential approach to a more thorough review. Before delving into this question, a short introduction follows on the role of the precautionary principle in the judicial review of risk regulation cases to better reveal the overall context of judicial review of risk regulation.

¹⁰⁹¹ Case T-13/99, para 401-402.
¹⁰⁹² Cases T-74/00, T-76/00, T-83/00 to T-85/00, T-132/00, T-137/00 and T-141/000 Artegodan GmbH and others v. Commission, para. 200.
1. Risk regulation: precautionary principle, regulatory discretion, and judicial review

The precautionary principle, being a fundamental principle of EU law\textsuperscript{1093} has a transformational role in the making and functioning of EU environmental law.\textsuperscript{1094} The precautionary principle is not defined in TFEU itself,\textsuperscript{1095} therefore the most elaborate rules regarding its content and application is set forth by the Commission in its Communication.\textsuperscript{1096} The Communication stresses that the principle is only triggered in case of “potential risk” and can in no way be construed as justifying arbitrary decision-making. This implies that it does not absolve MS from identifying and using the best available science to corroborate the existence of risks.\textsuperscript{1097} The principle belongs to the realm of risk management, which must be preceded by a proper risk assessment, during which risk assessors must take due regard to the (often uncertain) scientific facts of the case.

The precautionary principle is ubiquitous in risk governance decisions and EU judiciary closely scrutinizes its application during its judicial review. Requiring scientific justifications for derogating from the free movement of goods was instituted for defeating national protectionism and did not serve primarily environmental or safety concerns.\textsuperscript{1098} It is for this reason not very surprising that EU Courts are held to be more sympathetic to precautionary justifications of EU organs than that of the MSs.\textsuperscript{1099} Commentators note the extreme rarity of cases, when EU Courts are willing to annul an EU measure “for not being scientifically justified”.\textsuperscript{1100}

EU Courts stress that the principle does not give a \emph{carte blanche} to legislatures, since they ought first to ascertain in a fact-intensive inquiry whether there is a risk

\textsuperscript{1093} Enshrined in Article 191 (2) TFEU.
\textsuperscript{1094} The principle is not effective only with regard to EU environmental policy, but is integrated into other policies as well, see: Case T-70/99 Alpharma Inc v. Council of the European Communities, para. 135. (declaring that the precautionary principle is to be integrated into the Community’s common agricultural policy). The Commission’s Communication from the Commission on the precautionary principle, para. 3 provides: „its scope is much wider, and specifically where preliminary objective scientific evaluation, indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen for the Community.”
\textsuperscript{1095} Case T-70/99 Alpharma Inc v. Council of the European Communities, para. 138.
\textsuperscript{1096} Communication from the Commission on the precautionary principle (COM/2000/0001 final).
\textsuperscript{1097} Kingston, Heyvaert, and Cavoski, European Environmental Law, p. 35.
\textsuperscript{1098} Alemanno, ‘EU Risk Regulation and Science The Role of Experts in Decision-making and Judicial Review’, p. 39.
\textsuperscript{1099} Peel, Science and Risk Regulation in International Law, pp. 143-46.
\textsuperscript{1100} Kingston, Heyvaert, and Cavoski, European Environmental Law, p. 36.
that is more than a hypothetical hazard. In the phase of risk assessment, legislatures must determine the level of risk deemed acceptable to society and then they must conduct a scientific risk assessment. In this respect, they enjoy a measure of discretion, though its exercise is not immune to judicial review. As a general rule, a measure cannot be upheld with precautionary justifications if it is not based on a risk assessment, where the legislature was provided with “sufficiently cogent information to allow it to understand the ramifications of the scientific questions raised and decide upon a policy in full knowledge of the facts”.

The precautionary principle in some cases entails a wide measure of deference to EU or national legislatures by allowing for judicial annulment of precautionary measures only in case of finding a manifest error. Manifest errors occur if the risk assessor does not evaluate the scientific evidence thoroughly but makes an arbitrary decision regarding underlying environmental or health risks. This was the case in International Cadmium Association v. Commission, where the General Court annulled the Commission’s decision restricting the use of certain cadmium pigments, by stressing that “the Commission must ensure that any measures that it takes, even preventive measures, are based on as thorough a scientific evaluation of the risks as possible, account being taken of the particular circumstances of the case at issue.” The Court further added that “arbitrary measures ... cannot in any circumstances be rendered legitimate by the precautionary principle.” In the material case, since the European Union risk assessment report did not deal specifically with cadmium pigments, only with related substances, the Court found that the Commission committed a manifest error of assessment. This leads some commentators to suggest that EU Courts are sometimes willing to „exercice a robust judicial review of the limits of the precautionary principle”.

1103 Case C-434/09 Afton Chemical Limited v. Secretary of State for Transport, para. 28.
1105 Case C-77/09 Gowan v. Minister della Salute, para. 79.: „In the light of this evidence which tends to demonstrate that there was still some scientific uncertainty regarding the assessment of the effects on the endocrine system of substances such as fenarimol, the Commission cannot be considered to have applied the precautionary principle in a manifestly erroneous manner in attaching restrictions on use to the authorisation of that substance.”
1109 Kingston, Heyvaert, and Cavoski, European Environmental Law, p. 98.
On balance, the EU judiciary is “seemingly vacillating between the importance of expertise on the one hand, and discretion on the other.” For this reason, EU Courts adopt diverse approaches to respect for legislatures’ discretion. They either conduct a deferential or formalistic review, where they almost automatically approve the scientific reasons provided by the legislature. Or they may be willing to have a closer look at the scientific facts and the reasoning upon which risk assessors have based their decisions, and at the procedure in which the legislature reached its risk assessment decision. The following section reveals that EU Courts have adopted both of these approaches. More recently, there have been occasions when EU Courts abandoned their initial automatically deferential approach and scrutinized scientific justifications offered by risk assessors. The shifting attitude of EU judiciary is addressed in the following section.

2. Standard of reviewing risk assessments: changing attitude of EU Courts

EU Courts have always emphasized that MSs and EU legislature enjoy a wide discretion “as to the assessment of highly complex scientific and technical facts in order to determine the nature and scope of the measures, which it adopts”. However, such discretion is not immune from judicial review, since EU Courts would check whether there had been a “manifest error of appraisal or a misuse of powers”. Emphatically, the judicature is not entitled to substitute the assessment of scientific facts conducted by EU organs with its own assessment.

2.1 Initial deferential review

Initially, EU Courts accorded a quasi-automatic deference to techno-scientific assessments of EU institutions or MS in relatively short judgments in cases, where contested decisions or legislations were based on complex scientific data. E.g. Case C-180/96, UK v. Commission of the European Communities and Council of the European Union, Case C-331/88 The Queen and the Minister for Agriculture, Fisheries and Food and the Secretary of State for Health, ex parte Fedesa and Others; Case C-405/92 Mondiet SA v. Armement Islais SARL.

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1110 Kingston, Heyvaert, and Cavoski, European Environmental Law, p. 35.
1111 Case C-434/09 Afton Chemical Limited v. Secretary of State for Transport, para. 28.
1112 Case C-434/09 Afton Chemical Limited v. Secretary of State for Transport, para. 28.
1113 Case C-434/09 Afton Chemical Limited v. Secretary of State for Transport, para. 28.
1114 E.g. Case C-180/96, UK v. Commission of the European Communities and Council of the European Union, Case C-331/88 The Queen and the Minister for Agriculture, Fisheries and Food and the Secretary of State for Health, ex parte Fedesa and Others; Case C-405/92 Mondiet SA v. Armement Islais SARL.
and more recently Dabrowska-Klosinska conducted a comprehensive review on the treatment of science in the case-law of EU Courts, with a focus on risk assessment procedures conducted in environmental, pharmaceutical and food safety cases. They both argued that EU Courts were long known for according deference to regulatory measures involving complex scientific evidence on environmental and health risks. However, since the beginning of 2000s, EU Courts started to develop a more thorough approach to reviewing the validity of scientific arguments.

Technische Universität München is often referred to as the turning point in the case-law, when the referring national court has invited the ECJ to depart from its deferential approach. Although Advocate General Jacobs suggested that the contested decision could not survive even a limited review, the Court has broadened the scope of its assessment and did not refrain from scrutinizing the composition of the expert body that made the scientific evaluation underlying the contested decision. In the material case, University of München was denied customs exception for importing an electronic microscope from Japan, because the Commission was of the view that an apparatus of equivalent scientific value was produced in the EU. The Commission has arrived at the disputed conclusion after consulting a group of experts, the qualifications of whom for such assessment were found to be insufficient by the Court.

It was in this context that the CJEU articulated the much-cited formula according to which EU institutions have a duty “to examine carefully and impartially all the relevant aspects of the individual case, the right of the person concerned to make his views known and to have an adequately reasoned decision.” It ruled that the Commission has exceeded the limits of its discretion when it found scientific equivalence of the microscopes based on insufficient expertise. With this decision, EU Courts started to scrutinize whether risk assessors have exercised due care in

\[1115\] Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’.
\[1116\] Dąbrowska-Klosinska, ‘Risk, Precaution and Scientific Complexity before the Court of Justice of the European Union’.
\[1118\] Case C-269/90, Technische Universität München case.
\[1119\] Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 149.
\[1120\] Case C-269/90, Technische Universität München, Opinion of Advocate General Jacobs, para. 48.
\[1121\] Case C-269/90, Technische Universität München case, para. 14.
understanding and appraising the risks involved (the so-called ‘principle of care and diligence’).

2.2 More intrusive review: requirement of ‘consistent reasoning’

The shift in the approach of EU Courts became even more salient in the landmark Pfizer and Alpharma cases delivered on the same day by the same Chamber of the CFI. In both cases the court, though still spoke in deferential language, was nevertheless willing to have a closer look at the informational basis on which the Commission has made its assessment. Both cases concerned challenges against the validity of an EC Regulation withdrawing market authorization of certain antibiotics, which were used as growth promoters in animal feedingstuffs. The withdrawal was motivated out of fears that such use may develop antibiotics resistance, which later can be transferred from animals that are fed with the growth promoter to humans. The existence of a link between the use of antibiotics in feedingstuffs and the development of resistance in humans to those drugs was to a large extent recognized by the scientific community. However, the transfer of such resistance from animals to humans with respect to the specific type of antibiotics in question was presumed but had not yet been scientifically established.

In Pfizer, the Commission’s expert body, the so-called SCAN concluded that the use of virginiamycin, a product of Pfizer, did not constitute an immediate risk to public health. However, this was countered by reports of the House of Lords, WHO, and risk assessments made by Sweden and Denmark. SCAN also disagreed with these latter reports as to the significance of new scientific evidence that showed in vivo transfer of resistance in live laboratory rats. SCAN disputed the relevance of this piece of evidence, but the Commission nevertheless recommended the withdrawal of virginiamycin, and the Council acted accordingly.

In its judgment, the CFI had to rule on the permissibility of the Commission’s interpretation of the expert advice contained in the SCAN report. The plaintiffs

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1122 Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 151.
1125 Pfizer case, paras. 166-169.
1126 Pfizer case, para. 35.
1127 Pfizer case, para. 41.
1128 Pfizer case, para. 54.
alleged that the Commission made errors as to finding a real risk to human health and distorted the expert findings that were submitted to it. In order to evaluate these allegations, the Court had to look at the scientific facts contained in the experts’ report and had to assess whether EU institutions could legitimately make their findings on the given factual bases.

Even during such a “more interventionist”¹¹²⁹ review, the CFI focused on essentially procedural benchmarks to review whether the limits of the Commission’s exercise of its discretion have been exceeded. It emphasized that Community institutions are not bound to accept the conclusion reached in the opinion of its expert consultant bodies.¹¹³⁰ If it were to rely on the opinion, the Commission must “assess the probative value of the [expert] opinion delivered” in which regard it must ensure that “the reasoning in the opinion is full, consistent and relevant.”¹¹³¹ However, should the Commission disregard the expert opinion, it must provide specific reasons for doing so and “its statement of reasons must be of a scientific level at least commensurate with that of the opinion in question”.¹¹³²

The CFI also required Community institutions to show that there is “an objective scientific basis” of the finding of a risk to human health warranting the decision.¹¹³³ Through this requirement, the CFI arguably extended the scope of judicial review to the underlying science as well. Since Pfizer, EU Courts set certain criteria regarding the scientific reasoning of the risk assessor, which will be discussed later. However, as it will be argued below, this still does not mean that the CFI would be ready or willing to rule on the validity of competing scientific claims, thereby taking up the role of a super-expert. Nevertheless, it does mark a significant departure from the court’s deferential approach.

2.3 The consistency requirement: hybrid standard of review

The Court has introduced a notable new benchmark to its judicial review, namely, the requirement of consistency between the scientific opinions and risk regulation measures enacted by legislatures. In my reading, this is probably the most

¹¹²⁹ Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 145.
¹¹³⁰ Pfizer case, para. 196.
¹¹³¹ Pfizer case, para. 198.
¹¹³² Pfizer case, para. 199.
¹¹³³ Pfizer case, para. 165.
consequential element of the CFI’s reasoning in Pfizer, because the concept of consistency is positioned right on the boundary of legal and the scientific assessment. It is submitted that the question whether a certain legal measure is logically consistent with the underlying science, cannot be decided based on solely non-scientific criteria, and therefore, it prompts judges to engage with scientific arguments to a certain extent. I will argue that such an engagement is beneficial in the judicial review of increasingly complex regulations of techno-scientific matters.

The Pfizer judgment well illustrates the interlinked nature of assessing the logical consistency of a scientific opinion and the scientific merits of the case. Pfizer, the producer of virginiamycin claimed that the Council breached its obligation to state reasons since the contested regulation incorrectly summarized the SCAN opinion and was based on an erroneous interpretation. In order to assess these allegations, the Court had to look at the scientific findings of the SCAN report and evaluate whether the Council had adequately accounted for these findings. This engendered a 35-paragraph long assessment on the logical consistency of the SCAN report and the contested regulation’s preamble, which necessarily included looking at the scientific subject matter of the evaluation. The CFI thus ended up carefully meandering on the border of law and science in order not to substitute its own view for the experts’ assessment on the hazards involved, since such decision is emphatically reserved for the legislatures.

This judicial approach resulted in a surprisingly science-intensive judicial inquiry. For instance, the CFI had to decide whether the Council correctly interpreted the SCAN report’s findings that “resistance to pristinamycin amongst staphylococci remains low at around 5% of isolates” and the fact that from “1000 MRSA collected from hospitals, 98.5% were found susceptible to both pristinamycin and Synercid”,\(^{1134}\) can be correctly interpreted as “virginiamycin-resistance enterococci and staphylococci isolated from poultry and pigs all had cross-resistance to pristinamycin used in human medicine”.\(^{1135}\) It may not warrant further illustration that such a legal assessment on consistency requires a basic understanding of science and the process of scientific research. It is submitted that the logical and scientific consistency are closely tied aspects of the analysis, therefore, the dividing line between logical

\(^{1134}\) Pfizer case, para. 240.
\(^{1135}\) Pfizer case, para. 237.
consistency (which the CFI says it is reviewing) and scientific consistency (which the Courts emphatically does not want to review) in fact often becomes blurred.

Where did such an expanded judicial review lead the Court? I believe the Court marked the outer boundaries of its review to assessing whether Community institutions were provided with scientific evidence “sufficiently reliable and cogent for enabling them to conclude that there was a risk.”\textsuperscript{1136} At a first glance, this test appears warranting a science-intensive inquiry, however, at this point the CFI relied on the precautionary principle, which enabled it to affirm the Council’s decision without assessing the scientific merits of the expert opinions it relied on.\textsuperscript{1137}

The consistency analysis was further elaborated in \textit{Artegodan},\textsuperscript{1138} shortly after \textit{Pfizer}. This case concerned an application to annul a Commission decision to withdraw the authorization of an anti-obesity drug with reference to an emerging medical consensus that the potential risks of the pharmaceutical product do not outweigh therapeutic benefits anymore. The CFI ultimately annulled the decision because the underlying Directive required “\textit{new medical evidence}” for withdrawing a drug’s authorization, which it did not find established in the present case.\textsuperscript{1139}

The CFI reinforced that its task only encompassed reviewing “\textit{the internal consistency of the opinion and the statement of reasons contained therein}.”\textsuperscript{1140} The Court is only empowered to examine “\textit{whether the opinion contains a statement of reasons from which it is possible to ascertain the considerations on which the opinion is based, and whether it establishes a comprehensible link between the medical and/or scientific findings and its conclusions}.”\textsuperscript{1141} As alluded to above, the Court could hardly form an opinion on the existence of a comprehensible link between scientific facts and risk assessors’ conclusion without engaging to a certain extent with the underlying science. Such a judicial engagement with science is a welcome development as will be shown later in more detail.

\textsuperscript{1136} \textit{Pfizer} case, para. 322.
\textsuperscript{1137} \textit{Pfizer} case, paras. 382-385.
\textsuperscript{1138} Case T-74/00 \textit{Artegodan GmbH and Others v. Commission of the European Communities} (delivered on 26 November 2002 by the Second Chamber of the Court of First Instance).
\textsuperscript{1139} Case T-74/00 \textit{Artegodan GmbH and Others v. Commission of the European Communities}, para. 211.
\textsuperscript{1140} Case T-74/00 \textit{Artegodan GmbH and Others v. Commission of the European Communities}, para. 200.
\textsuperscript{1141} Case T-74/00 \textit{Artegodan GmbH and Others v. Commission of the European Communities}, para. 200.
These cases demonstrate how EU Courts have become less and less inclined to accord automatic deference to the legislature. This more activist judicial approach is evidenced by the fact that EU Courts are now increasingly willing to introduce new criteria for the judicial assessment, which touch upon “the adequacy and quality of the informational basis of science-based measures.”

2.4 Intrusive evidentiary requirements for science-based decision-making

EU Courts have further narrowed down the scope of discretion accorded to MS and EU institutions in complex technical assessments by setting requirements as to the factual basis of science-based decisions. In Case C-405/97 P Netherlands v Commission the Court had to rule on appeal against a judgment of the CFI in which it dismissed the claim for annulment of a Commission’s decision concerning draft national provisions notified by the Kingdom of the Netherlands seeking derogation from complying with standards prescribed for emissions of particulate matter by diesel-powered vehicles under Article 95(5) EC (current Article 114 TFEU). The CJEU on appeal assessed whether the Commission has taken all relevant data into account when it made its finding as to the lack of a specific problem in the Netherlands’ air quality, which would have justified national derogation measures. The Netherlands accused the Commission of not considering specific air quality data when it made its decision.

The Court emphasized that discretion in complex scientific evaluation can only be exercised if „the evidence relied on is factually accurate, reliable and consistent”. Moreover, Community judicature also scrutinized whether the evidence „contain[ed] all the information which must be taken into account in order to assess a complex situation and whether it [was] capable of substantiating the conclusions drawn from it.”

By adding such requirements, EU Courts now also review whether science-based regulatory decisions are made on a complete set of information, and whether scientific findings considered are capable of supporting the conclusion reached by MS

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1142 Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 144.
1143 Case C-405/07 P Netherlands v Commission, para. 55.
1144 Case C-405/07 P Netherlands v Commission, para. 55.
authorities or EU institutions. This can be viewed as a substantial expansion of the scope of the formerly deferential judicial review.\textsuperscript{1145}

The table below summarizes the benchmarks that can be discerned from the case-law of EU Courts used for an increasingly intrusive review of risk regulation decisions.

<table>
<thead>
<tr>
<th>Benchmark of judicial review of risk governance decisions</th>
<th>Case-law</th>
</tr>
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<tbody>
<tr>
<td>- duty of care to be taken by the risk assessor</td>
<td>Case C-269/90 Technische Universität München</td>
</tr>
<tr>
<td>- “obligation to give reasons that operate on a scientific level commensurate with the opinion”</td>
<td>Case T-13/99 Pfizer Animal Health S.A. v. Council of the European Union</td>
</tr>
<tr>
<td>- “the Commission must ensure that the expert opinion is full, consistent and relevant”</td>
<td>Case T-13/99 Pfizer Animal Health S.A. v. Council of the European Union</td>
</tr>
<tr>
<td>- internal consistency: The Court examines whether “expert opinion establishes a comprehensible link between the medical and/or scientific findings and its conclusions”</td>
<td>Cases T-74/00 Artegodan GmbH and Others v. Commission</td>
</tr>
<tr>
<td>- “the factual basis of the decision must be factually accurate, reliable and consistent”</td>
<td>Case C-405/07 P Netherlands v. Commission</td>
</tr>
</tbody>
</table>

*Table 3: Benchmarks developed in case-law to assess the informational basis of scientific risk regulatory decisions of EU Courts*

2.5 Post-Pfizer case-law: where do EU Courts stand on deference?

Fifteen years have elapsed since the landmark *Pfizer* judgment, and notwithstanding the various benchmarks the EU judiciary developed, a review of the

\textsuperscript{1145} Dąbrowska-Kłosińska, ‘Risk, Precaution and Scientific Complexity before the Court of Justice of the European Union’, p. 200.
post-Pfizer case law\textsuperscript{1146} suggests that the apparent willingness of EU Courts to have a closer look at the informational basis of regulatory decisions may occasionally still tolerate a rather limited and superficial review. There were a number of occasions, where EU Courts have contented themselves with a formalistic review, where they affirmed risk assessments without assessing the procedural steps taken by the legislatures\textsuperscript{1147} even in cases, where the scientific claims were rather vague or otherwise contested.

In \textit{Afion}, even though it was established by the Court that the Parliament’s Committee that recommended banning the use of methycyclopentadienyl manganese tricarbonyl (“MMT”) as a fuel additive, the legislature did not state the scientific basis for its opinion in which it advocated for the ban on grounds of health and environmental concerns.\textsuperscript{1148} Yet the Court did not find a manifest error in the assessment of risks. It firmly ascertained that certain studies were submitted to the risk assessors, the Council and the Parliament, which instituted the ban. This fact led the Court to conclude that nothing proves that those scientific documents ”\textit{were not taken into account during the legislative procedure}”,\textsuperscript{1149} and therefore, it ruled that the risk assessors were found to be within the limits of their discretion.

Also, notwithstanding the evidentiary requirements set in Case C-405/07 P \textit{Netherlands v Commission}, EU Courts still set a high threshold for challenging a risk regulation decisions. As the Court emphasized in a more recent BSE-related case, where applicants sought the annulment of a decision that introduced measures for the prevention and eradication of transmissible spongiform encephalopathies in bovine and caprine population, „\textit{in order to establish that that institution committed a manifest error in assessing complex facts such as to justify the annulment of that act, the evidence adduced by the applicant must be sufficient to make the factual assessments used in the act implausible}.”\textsuperscript{1150} Since the allegations of the applicant failed to meet the high threshold of implausibility, the Commission’s Regulation was upheld by the Court.

\textsuperscript{1146} E.g. Case C-236/01 \textit{Monsanto Agricoltura Italia SpA and Others v. Presidenza del Consiglio dei Ministri}; Case T-75/06, \textit{Bayer CropScience AG and Others v. EU Commission}; Case C-77/09 \textit{Gowan v. Minister della Salute}.

\textsuperscript{1147} Janssen and Rosenstock, ‘Handling Uncertain Risks’, 152.

\textsuperscript{1148} Case C-434/09 \textit{Afion Chemical Limited v. Secretary of State for Transport} para. 35.

\textsuperscript{1149} Case C-434/09 \textit{Afion Chemical Limited v. Secretary of State for Transport}, para. 40.

\textsuperscript{1150} Case T-257/07 \textit{France v. Commission}, para. 86.
These all suggest that it may be more appropriate to regard Pfizer as a unique decision, which EU Courts are not willing to follow in every risk assessment case brought before them. However, Pfizer, Alpharma and Artegodan do signal that if needed, EU Courts will have a closer scrutiny over scientific risk assessment procedure and the underlying facts, since automatic deference will not suffice in the face of growing scientific and normative complexities.

2.6 Are EU Courts too activist in reviewing scientific assessments?

Many commentators dismiss the CFI’s approach in Pfizer, arguing that it was too proactive in reviewing the scientific assessment as it essentially took up the role of a super-expert. The following section will seek to counter these concerns and show instead that, in fact, CFI firmly refrained from re-assessing scientific evidence in Pfizer, and it remained confined to the legitimate scope of judicial function. In this reading, the benchmarks with which EU Courts assess the thoroughness of MS’ risk assessment are used only for the legal assessment of the risks and not to the scientific evaluation of the underlying scientific facts. Indeed, the CFI adopted a more thorough approach in scrutinizing the risk assessor’s science-based argumentation, but in my view, it is a judicial approach that is wholly justified, it is in harmony with the EU Courts’ mandate, and, what is more, is even warranted in times of growing scientific complexities.

The CFI firmly emphasized in Pfizer that “scientific legitimacy is not a sufficient basis for the exercise of public authority.” Against this background, one may legitimately pose a reciprocal question, namely, to what extent scientific legitimacy is severable from public legitimacy? In other words, can public authority legitimately favor scientifically not valid opinions? This research suggests that EU Courts’ reasoning fall short of answering this question. Despite the increasing number of procedural benchmarks used by the Courts to assess the adequacy of a risk assessment procedure, scientific validity of the underlying expert opinions are not investigated by judges.

This holds true even for judgments that contain a surprisingly heavy load of scientific concepts and analysis. Suffice it to refer to Pfizer, where the CFI essentially

1152 Pfizer case, para. 201.
provides an introduction to bacteriology\textsuperscript{1153} before discussing the impact of expert findings on potential transfer of resistance on the legitimacy of Community institutions’ decisions reached on the basis of such expert opinions. However, even if it is rather unusual to read in a legal analysis a detailed account on infection mechanisms of zoonotic bacteria and those of enterococci and staphylococci, a closer look reveals that these scientific concepts are always analyzed within their legal settings and the validity or credibility of such scientific opinions have never been assessed by the Court. Therefore, the CFI does not encroach upon the traditional functions of an expert.

EU Courts are mandated to conduct a limited scope of judicial review, which is confined to assess whether regulators had a reasonable basis to take a certain position in light of the scientific facts.\textsuperscript{1154} By doing so, EU Courts have drawn a firm line between resolving legal disputes – which task they are willing to undertake – and deciding scientific disagreements of the parties – which they are not. Hence, they refrain from ruling on issues that “do not relate to an issue of interpretation of Community law, but exclusively concerns the scope of a scientific concept.”\textsuperscript{1155} EU Courts also clearly distinguish substance from procedure, by emphasizing that their review is confined to ensuring compliance with procedural guarantees,\textsuperscript{1156} which admittedly tolerates differing views on the scientific substance of the dispute.\textsuperscript{1157}

EU Courts, thus, avoid choosing between competing scientific claims even when the legal controversy can be traced back to competing interpretations of uncertain and ambiguous scientific data. As the Court noted in Bayer CropScience, “there is obvious disagreement between the parties as regards the scientific findings in the applicants’ studies”,\textsuperscript{1158} though it refrained from any further elaboration on this aspect of the case. Instead, it reviewed the Commission’s decision not to include the applicant’s product, Endosulfan in the list of safe and marketable chemicals by solely

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\textsuperscript{1153} Pfizer case, paras. 318-319. “In that regard, it is clear from the documents before the Court that, for a transfer of antimicrobial resistance from animals to humans to take place, resistant bacteria must first move physically from animals to humans. It is thought that the transfer could take place either via direct human contact with meat excrement or with water contaminated with those bacteria, or via the food chain, which could happen if meat is contaminated with resistant bacteria when an animal is slaughtered in unhygienic conditions...”
\textsuperscript{1154} Pfizer case, para. 393.
\textsuperscript{1155} Case C-236/01, Monsanto and Presidenza del Consiglio dei Ministri and Others, para. 52.
\textsuperscript{1156} Dąbrowska-Kłosińska argues for the same position, see Dąbrowska-Kłosińska, ‘Risk, Precaution and Scientific Complexity before the Court of Justice of the European Union’, p. 201.
\textsuperscript{1157} Case T-75/06, Bayer CropScience AG and Others v. EU Commission, para. 257.
\textsuperscript{1158} Case T-75/06, Bayer CropScience AG and Others v. EU Commission, para. 138.
\end{flushright}
reviewing the procedure in which such decision was made, without commenting on substantive scientific findings.

The invocation of the precautionary principle may also result in a review where the Court distances itself from science-intensive inquiry. It is sufficient for the Court to ascertain the existence of scientific uncertainty, which gives rise to the application of the precautionary principle, and thereby the Court may immediately conclude its legal assessment. This becomes problematic when EU Courts find scientific uncertainty established by a rather low threshold. Jansen and Rosenstock note that EU Courts sometime deem the mere presence of divergent scientific opinions as a proof of scientific uncertainty.\textsuperscript{1159} Preceding discussion in Chapter 2 shows that scientific uncertainty is a more fine-grained and complex phenomenon than the sole divergence of expert opinions, which is a ubiquitous feature of scientific discourse. Such quasi-automatic invocation of the precautionary principle also results in a ‘low-science’ inquiry on part of the judiciary, which falls short of investigating the fulfillment of procedural criteria, and therefore should be avoided.

2.7 Broadening the extent of judicial review: what is the proper role of EU Courts in the judicial review?

There is an emerging consensus among notable commentators of the field that the traditional deferential approach of the EU judiciary is no longer maintainable.\textsuperscript{1160} However, there is no unified view on the desirable extent of EU Courts’ engagement with science in scrutinizing risk regulation cases. Ellen Vos concludes that “judges should remain judges”,\textsuperscript{1161} without, however, distilling the practical requirements flowing from the truism. She warns about the risks of the Courts being too activist by assuming the role of a “super-expert”.\textsuperscript{1162} In contrast, Alemanno as well as Janssen and Rosenstock fear that EU Courts lower the standard of judicial scrutiny by not reviewing all the procedural steps developed in earlier case-law.\textsuperscript{1163}

\textsuperscript{1159} Janssen and Rosenstock, ‘Handling Uncertain Risks’, 146.
\textsuperscript{1160} Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 155.
\textsuperscript{1161} Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 164.
\textsuperscript{1162} Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 158.
\textsuperscript{1163} Janssen and Rosenstock, ‘Handling Uncertain Risks’, 152.
This research disagrees with the first position and partly shares the concerns raised by the latter group of scholars. It is submitted that touching upon scientific assessment to the necessary extent is consistent with the role of EU Courts in the complex governance system that emerged within the European Union. The EU judiciary is ultimately tasked with the role of managing and allocating decision-making authority among the various actors within a complex structure of regulatory competences. They have an important role as being “catalysts”, a term coined by Scott and Sturm to describe a new function for courts. They argue that by conducting an intrusive judicial review of risk regulation cases, EU courts “prompt responsible actors to engage in effective problem solving” and thereby serve as “informational catalysts”.

In the foregoing discussion, it was shown that for fulfilling the newly emerging “informational catalyst” role of EU Courts, it is necessary for them to push the boundaries of judicial engagement with underlying scientific facts to a certain extent. I regard the consistency analysis as the proper balance struck between the Court’s limited scope of review and the increasingly technical nature of risk governance. Being an informational catalyst calls for a proper understanding of the factual background, and necessitates a heightened judicial engagement with science, while also preserving the traditional terrains and functions of expert evidence. In my view, EU Courts could and should assess the internal consistency of science-based reasoning. This constitutes the proper exercise of the judicial function in times when the legislature is tasked with making complex techno-scientific assessments. This also means that courts must gain a deeper understanding of the scientific context in which the contested risk assessment was made. In so doing, the EU judiciary would be well equipped to evaluate the logical consistency of the underlying expert opinion and the legal decision that was built upon it.

This is of course not to suggest that EU judges should themselves decide on the acceptable level of risks by conducting their own scientific assessment. There is still considerable room for enforcing procedural safeguards to ensure a proper and sufficient informational basis of regulatory decisions without the need to resolve

1166 This term was coined by Ellen Vos, see Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 152.
scientific disputes. Also, formalistic deference to EU and MS institutions needs to be limited to the minimum extent. Quasi-automatically granted deference tolerates less nuanced risk assessments on part of the regulators, and therefore, disincentivizes conducting in depth (though cumbersome) assessments.

In sum, this chapter argues that the judicial task should be comparable to those of the risk assessor legislatures. If market innovations and our growing understanding of potential risks warrant regulations that involve balancing highly technical risks against interests by legislatures, then the judicial task cannot remain any less complex or less science-intensive. In the judicial review of risk governance decisions mandated by EU law, EU Courts must be ready and willing to fulfill their judicial task, which undoubtedly becomes more and more complex and science-intensive.

As shown above, the mandate of EU Courts does not permit them to deal with scientific issues on the merits. Put differently, they ought not to choose between competing scientific claims in order to render their legal opinion. Nevertheless, the increasing scientific complexity addressed by EU environmental regulations and directives makes the EU judicature confronting with ever more complex risk assessment scenarios even within such a more confined mandate.

III. Beyond risk assessments: judicial engagement with science in reviewing MS’ compliance with EU law

There is another thread of proceedings, in which EU Courts confront science, namely, infringement procedures. Here EU Courts use scientific arguments to limit the scope of MS’ discretion in interpreting EU law. Science in these cases may typically serve as an independent benchmark of effectiveness against which EU Courts can measure the legality of national transposition and implementation of directives. Scientific arguments typically arise in the context of debating the causal role of certain activities that MS do not intend to regulate under a specific directive.
1. Science intensive causal inquiry

Complex causal scenarios become contested between MS and the EU Commission in infringement proceedings. The underlying controversy is that uncertain causal links might potentially relieve MS from certain obligations under EU law if the environmental nuisance targeted by the given EU directive may be a result of natural phenomena unrelated to the MS’ conduct.

1.1 Uncertain causation does not justify judicial paralysis in infringement proceedings

EU Courts tend to block efforts that call for a judicial ‘paralysis’ in the face of uncertain causal claims. A list of cases will follow showcasing instances when EU Courts prevented MS from referring to the uncertain nature of causal link as a valid excuse for regulatory omission or adjudicatory inaction. This resonates well with the pro-active stance of EU policy-making, which advocates for taking action even when one “cannot fully understand all aspects of complex systems” at the time of decision-making by using „what we have“.1167

In case C-258/00 Commission v. France, the Commission launched an infringement procedure against France for failing to take appropriate steps to identify waters affected by nitrate pollution and, consequently, to designate corresponding vulnerable zones, in accordance with Council Directive 91/676/EEC concerning the protection of waters against nitrate pollution caused by agricultural sources (“Nitrates Directive”). France contested the causal role of nitrates in engendering eutrophication in brack waters by emphasizing that in such waters the presence of phosphorus is, in fact, the key factor that drives eutrophication.1168 With reference to that, it refused to designate the Seine bay as a vulnerable zone, even though there was admittedly

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1168 The French Ministerial circular suggested that „The present state of knowledge, still imprecise and incomplete owing to the complexity of the factors and phenomena in question, suggests that it is highly likely that nitrogen is the controlling factor in the eutrophication of saline waters (coastal) and shallow stagnant, brackish waters (lagoons). It has been established that this is not the case for flowing brackish waters (estuaries) or hard freshwaters, both stagnant and flowing, where, to the contrary, it is phosphorus which plays that role.”. Cited by judgment in case C-258/00 Commission v. France, para. 12.
nitrogen enrichment from compounds of agricultural origin, and as a result, the bay experienced an accelerated growth of algae.\footnote{\textsuperscript{1169}}

The Court found that despite considerable scientific uncertainties surrounding the causal role of nitrates in engendering eutrophication in brack waters,\footnote{\textsuperscript{1170}} France is not entitled to exercise its discretion so as to leave large portions of water outside the scope of the Nitrates Directive.\footnote{\textsuperscript{1171}} Although the Court has noted the considerable uncertainties regarding the causal role of nitrates in engendering eutrophication in brack waters, it did not, however, construe such uncertainties as an obstacle to the obligation of France under the Directive to designate brack waters as vulnerable zones:

„According to that circular.... excessive growth of aquatic plant life thus appears to be the result of the complex and subtle interplay between a number of diverse and variable factors. To establish a relationship of cause and effect from its appearance, its nature, its intensity and its frequency is an extremely difficult task, precisely because of that complexity and subtlety of interactions.

50. None the less, taking account of that complexity and of the fact that, as is clear from the circular of 5 November 1992, understanding of the subject is still imprecise and incomplete, it is incompatible with the logic and objective of the Directive to exclude a priori from its scope major classes of waters, such as those mentioned in that circular. Notwithstanding the role that phosphorus may play in eutrophication, plant species whose growth is accelerated by nitrogen may appear in such waters, giving rise to a disturbance of the balance between the different organisms which are present there."\footnote{\textsuperscript{1172}}

It is to be noted, however, that such an interpretation is underpinned by the preamble of the Nitrates Directive, which explicitly recognizes “the main cause of pollution from diffuse sources affecting the Community's waters is nitrates from agricultural sources”. Against this background, the Court’s reasoning can be seen more as a result of teleological interpretation than as an example of proactive judicial approach to uncertain science.

Nevertheless, the Court reinforced its commitment to relaxed causal tests in the later Commission v. Spain case, another infringement procedure concerning the Nitrates Directive. The CJEU expressly recognized that for triggering designation of

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\item \textsuperscript{1169} Case C-258/00 \textit{Commission v. France}, para. 64.
\item \textsuperscript{1170} Case C-258/00 \textit{Commission v. France}, para. 50.
\item \textsuperscript{1171} Case C-258/00 \textit{Commission v. France}, para. 54.
\item \textsuperscript{1172} Case C-258/00 \textit{Commission v. France}, paras. 49-50.
\end{itemize}
\end{footnotesize}
waters under the Directive, agricultural activity needs to contribute significantly to the nitrate pollution of the area.\textsuperscript{1173}

The same judicial approach towards contributory causes has been reinforced under Directive 91/271/EEC on urban waste water treatment („Urban Waste Water Directive”) as well. In \textit{Commission v. Finland}\textsuperscript{1174} the CJEU reiterated that polluting discharges ought only to be targeted by MS if they contribute significantly to the eutrophication of sensitive areas. The threshold of significance has been set by the Court at 10% of the total flow of polluting agents,\textsuperscript{1175} hence any contribution to the pollution below this threshold need not to be abated by MS. In the material case, the nitrogen originating from Finnish urban waste water treatment plants was shown to amount only to 1.2% of the total nitrogen discharge, hence Finland did not need to reduce its contribution to eutrophication by enacting tertiary treatment of urban waste waters.\textsuperscript{1176}

The CJEU adopts an even stricter approach towards Member States’ non-compliance with ambient air quality standards under Directive 1999/30. In Case C-68/11 \textit{Commission v Italy}, the CJEU refused to accept Italy’s argument that its non-compliance with PM\textsubscript{10} limit values should be excused because the complexity of the process of PM\textsubscript{10} formation and the insufficient technical knowledge of the process of PM\textsubscript{10} formation prevented it from combatting this environmental nuisance.\textsuperscript{1177} However, in infringement proceedings only the high standard of force majeure may relieve a non-complying MS from being in breach,\textsuperscript{1178} therefore this argument failed Italy in the case at hand.

Contested causal claims arise in the field of nature conservation as well. In case C-3/96 \textit{Commission v. Netherlands} case, the Court had to decide whether the Netherlands applied Council Directive 79/409/EEC on the conservation of wild birds (“Birds Directive”) in a proper way. The Commission submitted that the Netherlands designated an insufficient number of Special Protection Areas (“SPA”) required under the Directive, which has lead to a decline by over 50% in two bird species’ population. The Court relied on ornithological scientific publications as evidence that numerous further territories were suitable for SPA designation due to the presence of

\textsuperscript{1173} Case C-416/02 \textit{Commission v. Spain}, paras. 68-69.
\textsuperscript{1174} Case C-335/07 \textit{Commission v. Finland}.
\textsuperscript{1175} Case C-335/07 \textit{Commission v. Finland}, para. 77.
\textsuperscript{1176} Case C-335/07 \textit{Commission v. Finland}, para. 78.
\textsuperscript{1177} Case C-68/11 \textit{Commission v Italy}, para. 41.
\textsuperscript{1178} Case C-68/11 \textit{Commission v Italy}, para. 65.
birds. The Netherlands claimed that the reasons for declining bird population were unrelated to the number of designated SPAs. That was the context in which scientific arguments entered the discourse. The Court found that although Member States had a certain margin of discretion in the choice of SPAs, the classification of those areas was nevertheless subject to scientific, ornithological criteria determined by the Directive. The Court ruled that the Netherlands exceeded the limits of its margin of discretion when it did not designate all territories as SPAs that satisfied relevant scientific criteria. Hence, science was used in this case to measure the effectiveness of implementation of a Directive, and it constrained the discretion of the Netherlands in designing its national implementation measure.

Similarly, in Case C-38/99 Commission v. France the Court had to declare the limits of MS discretion under the Birds Directive in setting closing dates for hunting in SPAs. France allowed for hunting of certain bird species up until 10 to 30 days later than the commencement of their pre-mating migration. The Commission argued that such method defeated the “complete protection of the species”, an objective set by the Directive. The Court announced that MS had no such discretion in implementing the Directive unless they adduced scientific evidence proving that such staggering date did not impede the complete protection of species. Similarly to the previous example, science has served in this case as a factor limiting MS’ discretion.

The most recent Polish Białowieża forest logging case concerned the Polish government’s controversial measures allowing intensified logging in the Bialowieża forest, a Natura 2000 site which was also under UNESCO World Heritage protection. The Bialowieża forest is one of the best preserved and untamed natural forests in Europe, the unparalleled ecological value of which is mainly due to the large quantity of dead wood and ancient trees, some of which are centuries old. The Polish government started to implement an active forest management plan, which now allows intensified logging and the removal of dead wood, with reference to an outbreak of spruce bark beetle. Poland submitted that the spread of this pest must be

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1180 Case C-3/96 Commission v. Netherlands, para. 54.
1184 Case C-38/99, Commission v. France, para. 43.
1185 Case C-441/2017, Commission v Republic of Poland.
contained, and the absence of active management would risk causing serious damage to the forest.\textsuperscript{1186}

The EU Commission launched an infringement procedure against Poland for an alleged failure to comply with the Habitats Directive, as it was of the view that the logging causes serious damage to the Natura 2000 site and infringes the Habitats Directive. The Commission submitted that under Article 6(3) Poland should have ascertained “in accordance with the best scientific knowledge in the field, that [active forest management operations] would not adversely affect the integrity”\textsuperscript{1187} of the forest. The Court confirmed that under Article 6(3) a MS could only authorize a plan – in the material case, the active forest management plan – if it was certain that the plan would not have lasting adverse effects on the site. In that regard, the Court imposed the burden of scientific uncertainty on MS authorities permitting such projects, because the Court expressly stated that the above criteria would only be met “where no reasonable scientific doubt remain[ed] as to the absence of such effects.”\textsuperscript{1188}

The scientific crux of the 
Białowieża dispute concerns whether the spruce bark beetle can be regarded as imposing a threat to the integrity of the forest. According to the Commission, scientific studies suggest that it is not desirable to actively fight against the beetle, which is a part of the natural cycle of old forests,\textsuperscript{1189} and the spread in fact is beneficial to the abundance of protected woodpecker species.\textsuperscript{1190} Poland, however, cites contrary scientific opinions based on data obtained in the Białowieża forest, which support the removal of the trees.\textsuperscript{1191} The government argues that the removal of dead trees has a positive impact on the habitat of certain protected beetles,\textsuperscript{1192} and fiercely attacks scientific opinions voicing concerns against


\textsuperscript{1188} Order issued on 20 November 2017, in Case C-441/2017 R, \textit{Commission v Republic of Poland}, para. 40. This has been the established practice of the Court see C-258/11 Sweetman and Others, para. 40; C-387/15 and C-388/15 Orleans and Others, para. 50.


\textsuperscript{1190} Opinion of the Advocate General in Case C-441/17, para. 123.


\textsuperscript{1192} Opinion of the Advocate General in Case C-441/17, para. 108.
intensified logging.\textsuperscript{1193} Lastly, the Commission and Poland disagree as to whether the removal of trees on 5% of the Natura 2000 site is capable of adversely affecting the population of protected species.\textsuperscript{1194}

The Court has escaped ruling on these science-intensive aspects of the case in the interim relief procedure by firmly stating that this stage is “\textit{not designed to establish the truth of complex facts}”\textsuperscript{1195} and therefore left open that question. In July 2017, the CJEU issued an interim measure ordering the cessation of ongoing deforestation on a precautionary basis.\textsuperscript{1196}

The Court had to confront scientific facts later in the proceedings as well. In a subsequent hearing, the Commission presented satellite images along with a report of the Joint Research Centre as evidence to the Court on the continued logging.\textsuperscript{1197} Poland has reportedly dismissed these satellite images as “\textit{having no value as evidence given their poor quality},”\textsuperscript{1198} nonetheless the Court was persuaded that the evidence was sufficient to raise doubts as to Poland’s compliance with earlier interim measures.\textsuperscript{1199} This led to a second order issued on 20 November 2017, in which the CJEU ordered again the immediate cessation of logging and stated that in case of Poland’s non-compliance, it would impose considerable penalty payment on a daily basis.\textsuperscript{1200}

The Advocate General’s Opinion, issued in February 2018, proposed the CJEU to find against Poland. Yves Bot submitted that “\textit{scientific controversy}”\textsuperscript{1201} surrounding causal mechanisms of effectively managing the spread of the spruce bark beetle should not be used by Poland as a justification for engaging in measures, which

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\textsuperscript{1193} See e.g. Guardian, May 18, 2016: https://www.theguardian.com/environment/2016/may/18/last-stand-for-europes-remaining-ancient-forest-as-loggers-prepare-to-move-in-bialowieza
\textsuperscript{1194} Opinion of the Advocate General in Case C-441/17, para. 126.
\textsuperscript{1195} Order issued on 20 November 2017, in Case C-441/2017 R, \textit{Commission v Republic of Poland}, para. 54.
\textsuperscript{1196} Order of the Court in Case C-441/17 R, issued on 27 July 2017.
\textsuperscript{1197} Order issued on 20 November 2017, in Case C-441/2017 R, \textit{Commission v Republic of Poland}, para. 89.
\textsuperscript{1198} “Poland rejects EU evidence on primeval forest dispute”, Article published on phys.org, on September 29, 2017, available here: https://phys.org/news/2017-09-poland-eu-evidence-primeval-forest.html
\textsuperscript{1199} Order issued on 20 November 2017, in Case C-441/2017 R, \textit{Commission v Republic of Poland}, para. 112.
\textsuperscript{1200} Order of the Court, in Case C-441/17 R, issued on 20 November 2017. The order explicitly mentions a €100 000 per day fine.
\textsuperscript{1201} Opinion of the Advocate General in Case C-441/17, para. 145.
\end{flushleft}
allegedly served remedying the site, though in fact resulted in the loss of forest and therefore, the deterioration of the integrity of the Natura 2000 site.\textsuperscript{1202}

In the final judgment issued in April 2018, the Court indeed ruled against Poland and found infringement of Articles 6(1), 6(3), Art 12(1) of the Habitats Directive and Article 5(b) of the Bird Directive. It firmly based its reasoning on the precautionary principle, which the Court found to be integrated into Article 6(3) of the Habitats Directive.\textsuperscript{1203} This provision provides that any plan or project that is likely to have a significant impact on the Natura 2000 site can only be authorized if it will not adversely affect the integrity of the site. The Court noted that due to the prevailing precautionary stance, the Commission “\textit{does not have to prove a causal relationship between the active forest management operations at issue and the adverse effect ... it being sufficient for it to establish the existence of a probability or risk that that those operations may give rise to such an effect.}” \textsuperscript{1204}

By way of this reasoning, the Court essentially eliminated from its inquiry the intricate causality issue that was used by Poland to challenge the Commission’s position. The CJEU found sufficient to establish the possibility of adverse effects on the site’s integrity. This was met by identifying inconsistencies and disproportionate measures in the active forest management plan authorizing the felling of trees.\textsuperscript{1205} Interestingly, despite having declared unnecessary to prove a causal link between the forest management operation and its harmful effects, the Court went on to list several reasons why the alleged causal relation between the operations and stopping the spread of the spruce bark beetle can be refuted.\textsuperscript{1206} This part of the reasoning seriously undermined Poland’s claims regarding the beetles’ alleged causal role in deteriorating the ecological integrity of Bialowieza. The judgment for instance highlighted that the beetle was not listed as a threat to the forest by Polish authorities in 2015, and no link could be identified between the spread of the beetle and the volume of harvestable timber.\textsuperscript{1207} Arguably, such specific reasons alone might have been sufficient to discredit Poland’s position without the invocation of the precautionary principle. The strategic benefit of relying on the precautionary principle might be that it insulated the Court’s findings from technical challenges.

\textsuperscript{1202} Opinion of the Advocate General in Case C-441/17, paras. 143-178.
\textsuperscript{1203} C-441/17 \textit{Commission v Poland}, Judgment, para. 158.
\textsuperscript{1204} C-441/17 \textit{Commission v Poland}, Judgment, para. 158.
\textsuperscript{1205} C-441/17 \textit{Commission v Poland}, Judgment, paras. 159-169.
\textsuperscript{1206} C-441/17 \textit{Commission v Poland}, Judgment, paras. 173 – 188.
The foregoing discussion aimed to show that in infringement procedures, EU Courts assess scientific arguments of the parties without investigating the scientific validity of such arguments. Scientific considerations are built into the texts of the directives as independent or objective criteria for assessing the lawfulness of MS’ application of EU law. Thus far, claims of uncertain causation and overall complexity of scientific mechanisms causing environmental destruction did not lead the Court to accord a restrictive interpretation to the scope of obligations flowing from EU environmental directives. On the contrary, the CJEU was ready to require prompt implementation of EU directives despite MS’ claims of competing causes as long as the required measure would contribute (significantly) to abating the environmental problem targeted by EU law.

IV. Scientific fact-finding of EU Courts

1. Allowing uncertain proof of causal claims when applied by national authorities

Besides infringement proceedings, scientific issues also arise in the context of preliminary rulings, where national courts refer preliminary references to CJEU interrogating appropriate causal proofs required under certain directives. The question of evidentiary standards for scientific proofs arose under two seemingly dissimilar directives: the directive 2004/35 of the European Parliament and of the Council on environmental liability with regard to the prevention and remediying of environmental damage („ELD“) and the directive 85/374/EEC on liability for defective products („product liability directive“). Both of the directives triggered questions as to how national courts ought to treat causal evidence that is burdened with scientific uncertainty, meaning that the state of relevant scientific knowledge is ambiguous or scarce. EU Courts in both cases mandated a proactive approach and thereby promote the acceptance of uncertain scientific evidence by national authorities.
1.1 Liability for pollution under the Environmental Liability Directive

Questions of causality based on scientific facts are most prevalent under the ELD. Articles 3(2) and 4(5) of ELD require a causal link to be established between an environmental damage, or an imminent threat of such damage, and the operations of an industrial actor. The ELD itself acknowledges that liability is not an appropriate solution for remedying diffuse pollution that cannot be traced back to an act or an omission of a certain actor.\textsuperscript{1208} In this vein, the lack of requisite causal link may relieve an operator from its liability to cover the costs of remedial measures, if it can prove that the pollution at hand was caused by a third party.\textsuperscript{1209} Importantly, establishing exact causal tests for attributing pollution to certain industrial actor is intentionally left to national laws;\textsuperscript{1210} and contamination that cannot be causally linked to an operator are governed by national laws.\textsuperscript{1211}

In \textit{Raffinerie Mediterranee (ERG)} case, the CJEU had to rule on the permissibility of the practice of Italian authorities, which used a presumption of causality to link pollution to certain undertakings that have long been engaged in hazardous activities in the contaminated area. The basis of the presumption was the location of the operator and the chemical similarity between the agent found and that of used by operators. If an undertaking had installation in the proximity of the contamination site, it was deemed to have caused the respective pollution.\textsuperscript{1212} The Court found that the polluter pays principle allowed MS to establish a causal link through a causal presumption, as long as it was rebuttable and the authorities had plausible evidence capable of justifying its invocation.\textsuperscript{1213} The CJEU ruled that presumptions might be invoked to establish a causal link between a polluter and a given contamination based on the proximity of location (between the defendant’s site

\begin{itemize}
\item \textsuperscript{1208}Preamble to ELD, recital 13.
\item \textsuperscript{1209}Article 8 (3) a) of ELD.
\item \textsuperscript{1210}L. Bergkamp and B. Goldsmith (eds.), \textit{The EU Environmental Liability Directive A Commentary} (Oxford University Press, 2013) p. 70.
\item \textsuperscript{1211}Article 4, ELD
\item \textsuperscript{1212}Case C-378/08 \textit{Raffinerie Mediterranee (ERG) v. Ministero dello Sviluppo economico}, paras. 28-30, 70.
\item \textsuperscript{1213}Case C-378/08 \textit{Raffinerie Mediterranee (ERG) v. Ministero dello Sviluppo economico}, paras. 57-58.
\end{itemize}
and the contaminated site) and the chemical correlation between the substances used by the operator and the contamination. 1214

The causal presumption of Italian law is based on two specific proxies: the proxy of location and that of chemical similarity. The distinctive feature of such proxies is that they both relate to the scientific realities of the pollution at hand. Despite the inherent difficulties of ‘fingerprinting’ the polluting agent to a specific source, these proxies nevertheless try to establish a causal link. The use of causal proxies has been discussed and criticized in detail in Chapter 5 in relation to the proxy-based practice of the European Court of Human Rights. In contrast, the proxies applied by Italian courts can arguably be seen as legitimate responses to uncertain causation. The reason being that these proxies try to approximate the legal requirements to scientific realities of causation to the extent possible by requiring chemical similarity between the polluting agent found and the polluter. Hence, this proxy-based causal test requires fulfilling general (biological or chemical) causation in order to hold an operator liable for a given pollution. If such general causation is met, specific causation need not be met, which is a necessary relaxation of causal requirements with regard to scientific uncertainty.

By according such an interpretation to ELD and the polluter pays principle, CJEU was proactively responsive to uncertain causation. Notably, the ELD itself is silent on evidentiary rules and does not give guidance as to how authorities should assess causal proofs. 1215

In the ERG case, and in a later essentially similar Buzzi Unicem case 1216 the CJEU construed the causal requirement under ELD broadly and refused to narrow down the scope of its application as was suggested by the industrial player in the underlying case before the Italian referring court. By confirming the compatibility with principles of EU environmental law of such innovative solutions that bridge the gap in scientific knowledge of causal relations in complex pollution cases, the Court conveys a supportive message to other MS to enact similar national laws. 1217 These

1214 Case C-378/08 Raffinerie Mediterranee (ERG) v. Ministero dello Sviluppo economico, paras. 54-59.
1216 Joined Cases C-478/08 and C-479/08, Buzzi Unicem and Others v Ministero dello Sviluppo economico and Others and Dow Italia Divisione Commerciale v Ministero Ambiente e Tutela del Territorio e del Mare and Others, Order of 9 March 2010.
1217 It is to be noted that U.S. law adopts a similar approach to claims of uncertain causation in clean-up operations. In U.S. v. Monsanto Co., federal U.S. courts interpreted the Comprehensive Environmental
decisions illustrate that the EU judiciary seeks to accommodate the challenges imposed by scientific uncertainty on causation.

1.2 Causal proof in product liability cases for defective vaccinations

The CJEU took a similarly progressive stance regarding causal proof requirements in product liability cases. Plaintiffs typically seek compensation for adverse health effects caused by defective vaccines. A recent example is Case C-621/15, 1218 decided in June 2017, a preliminary ruling referred by the French Cour de cassation regarding the causal requirements of the Product Liability Directive.

The main proceedings was launched by family members of Mr W, who had been vaccinated against hepatitis B with a vaccine produced by Sanofi Pasteur and within a year developed multiple sclerosis, in which he died a couple of years later. The Cour de cassation had a consistent practice as to the evidentiary requirements in such cases to allow using causal presumption as requisite proof. According to this, “a proof of a causal link between the defect in product and the damage suffered by the person injured can be derived from serious, specific and consistent presumptions.” 1219 In the established practice of the Cour de cassation, such presumption can be based on a combination of certain proxies, such as the lapse of time between the administration of the vaccine and the manifestation of the disease, the injured person’s lack of any personal or family history of the disease at hand. 1220

The Product Liability Directive imposes the burden of proof on the victim of injury regarding the damage, the defect in the vaccination, and the causal link between the two. 1221 The first instance court found these proxies established and upheld the action, however, higher courts overturned this decision with reference to contradicting scientific evidence. 1222 Higher courts argued first that there was no scientific or medical consensus on the causal role of vaccines in multiple sclerosis cases and the aetiology of the disease was unknown. Second, epidemiological study

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1218 Case C-621/15 N.W. and Others v Sanofi Pasteur, 21 June 2017.
1219 Case C-621/15 N.W. and Others v Sanofi Pasteur, 21 June 2017, para. 12.
1220 Case C-621/15 N.W. and Others v Sanofi Pasteur, 21 June 2017, para. 13.
1221 Article 4, Product Liability Directive
1222 Case C-621/15 N.W. and Others v Sanofi Pasteur, 21 June 2017, para. 16.
showed that 92 to 95% of persons with multiple sclerosis had no antecedent of the disease in their family, which refuted one of factors on which the presumption was based. Third, a recent publication suggested that the disease development starts many months or years earlier than the time of first manifesting the symptoms. Against this background, the Cour de cassation essentially asked the CJEU whether the proxy-based domestic evidentiary requirements were compatible with EU law.

The CJEU answered in the positive. It ruled that the Product Liability Directive allowed national laws using serious, specific and consistent presumptions as causal proof of vaccine-related health damage notwithstanding that medical research neither establishes nor rules out the existence of a causal link between the vaccination and disease development. However, the CJEU did not accept evidentiary rules that established a causal link solely and automatically on the basis of the occurrence of certain predetermined, causation-related factual evidence. Similarly, the Court also refused to approve evidentiary laws that required a too high evidentiary standard by accepting only those causal proofs that were based on medical research. Yet, the CJEU confirmed that the burden of proof still had to rest with the applicant and such flexible rules were designed for cases where there was a lack of medical consensus (i.e. scientific uncertainty) as to the causes of disease development.

The CJEU’s decision triggered harsh criticism in the U.S. and the UK from those who read anti-vaccination sentiments into it. They claimed that the decision invited spurious claims of health injuries, which could succeed without scientific evidence. An article published in the preeminent scientific journal *Nature* refuted these charges, and emphasized that courts still ought to deny weak, or let alone unfounded, scientific claims. Indeed, this judgment relaxes the high threshold of proof only in cases where the irreducible gap in current state of scientific knowledge would bar any health damage claims to succeed. The CJEU argues that in

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1223 Case C-621/15 *N.W. and Others v Sanofi Pasteur*, 21 June 2017, paras. 52-57.
1224 Case C-621/15 *N.W. and Others v Sanofi Pasteur*, 21 June 2017, para. 31.
1225 Case C-621/15 *N.W. and Others v Sanofi Pasteur*, 21 June 2017, para. 57.
such cases, the principle of effectiveness of liability regime provided under the directive warrants relaxing traditional causal requirements.\textsuperscript{1229}

In case of “\textit{a lack of scientific consensus}”,\textsuperscript{1230} the Luxembourg Court still allows claims for health damages to succeed despite inherent evidentiary difficulties of scientific proofs. It is argued here that such a judicial approach can be viewed as properly accommodating the peculiarities of scientific input. In lack of conclusive evidence, certain causal proxies can close the gap between scientific uncertainty and the required threshold of proof.

It is to be noted, however, that in the material case the EU judiciary ruled only on questions of law, therefore, it was not itself faced with competing scientific results, it only confirmed the flexible approach of domestic courts. For this reason, much of the credit for the innovative causal inquiry should in fact be given to the Cour de cassation, which was willing to accept serious, specific and consistent presumption, based on causal proxies, as a proof of a causal link.

\section*{2. Reluctance of CJEU to hear expert evidence}

Under the Statute and the Rules of Procedure, EU Courts do have the power to use external expertise,\textsuperscript{1231} or to request for information and production of documents.\textsuperscript{1232} They may even ask from MS or EU institutions to supply all information that is deemed necessary by the Courts.\textsuperscript{1233} Despite the quite elaborate rules of evidentiary proceedings, the EU judiciary thus far nonetheless has remained reluctant to use such powers.\textsuperscript{1234} There have been only a handful of cases where the EU judiciary asked for expert opinions, and they did so in competition law cases and employment related claims, but not in environmental law cases.\textsuperscript{1235}

\begin{footnotesize}
\begin{enumerate}
\item \textsuperscript{1229} Case C-621/15 \textit{N.W. and Others v Sanofi Pasteur}, 21 June 2017, para. 27.
\item \textsuperscript{1230} Court of Justice of the European Union, Press Release no. 66/2017, 21 June 2017, Judgment in Case C-621/15 \textit{N. W and Others v Sanofi Pasteur MSD and Others}.
\item \textsuperscript{1231} Article 70 of the Rules of Procedure of the Court of Justice.
\item \textsuperscript{1232} Article 21 of the Statute of the Court.
\item \textsuperscript{1233} K. Lenaerts, I. Maselis, and K. Gutman, \textit{EU Procedural Law} (Oxford University Press, 2014) p. 771.
\item \textsuperscript{1234} Alemanno, ‘EU Risk Regulation and Science The Role of Experts in Decision-making and Judicial Review’, p. 63.
\item \textsuperscript{1235} Case T-20/00 \textit{OP Commission v Ivo Camacho-Fernandes} and Case T-90/95 \textit{Walter Gill v Commission} concerned claims of former employees of Community institutions and alleged health damage in relation to their employment, Case C-89/85 \textit{Ahlström and Others v Commission} features competition law claims.
\end{enumerate}
\end{footnotesize}
EU organs are currently facing objective limitations as to their scientific fact-finding capabilities. The Commission has long been advocating for enhanced inspection powers in infringement proceedings, which would be consequential also in the judicial stage of such proceedings. Currently, the Commission may only rely on facts provided by national authorities that are often ambiguous and unreliable,\textsuperscript{1236} impeding the effective investigation of the facts of the case. Also, several attempts at empowering the European Environment Agency with independent investigatory powers into environmental affairs have remained futile.\textsuperscript{1237} More recently in 2013, the Seventh EU Environmental Action Programme put the idea of environmental inspections back to the top of the agenda. It emphasized that \textit{“the Union will extend requirements relating to inspections and surveillance to the wider body of Union environment law, and further develop inspection support capacity at Union level.”}\textsuperscript{1238} Indeed, the absence of timely, relevant, and reliable facts in infringement proceedings significantly hinders the possibilities of thorough scientific fact-finding of not only the EU Commission, but ultimately that of the CJEU as well.

V. Interim conclusion

1. Rejecting judicial paralysis in case of uncertain causation

EU Courts do not allow MS to escape thorough implementation of directives with reference to possible alternative causes for the environmentally harmful processes that the directive aims to abate. In such cases, no MS could successfully refer to scientific uncertainties regarding the underlying causal mechanisms, which means that in this respect, EU Courts are willing to account for uncertain science in the causal inquiry.

\begin{flushright}
\footnotesize\textsuperscript{1236} Hedemann-Robinson, \textit{Enforcement of European Union Environmental Law}, p. 200.
\footnotesize\textsuperscript{1237} Hedemann-Robinson, \textit{Enforcement of European Union Environmental Law}, p. 201.
\footnotesize\textsuperscript{1238} Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 ‘Living well, within the limits of our planet’, para. 60.
\end{flushright}
2. Scientific fact-finding

The EU judiciary is on the one hand adopts proactive approach towards scientific evidence as it accepts causal proxies as proof of uncertain causal links under certain directives. Importantly, EU Courts use non-scientific proxies to allow environmental or health related claims to proceed despite the uncertainty that burdens underlying science. On the other hand, however, the evidentiary standards of EU Courts are only progressive when mandated to national courts, since in terms of their own evidentiary proceedings, EU Courts considerably distance themselves from science by not hearing expert evidence.

3. Standard and extent of judicial review

EU Courts have largely abandoned their former deferential approach and since the beginning of the 2000s, they are willing to conduct a more intrusive review of the scientific basis of risk regulatory decisions, with a special focus on the quality and coherence of reasoning provided by risk assessors.

<table>
<thead>
<tr>
<th>Discretion of MS/EU</th>
<th>Judicial review of risk regulation cases in annulment proceedings</th>
<th>Judicial review of MS implementation/application of EU law in infringement cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MS and EU institutions both enjoy a (wide measure of) discretion in assessing complex scientific facts in policy decisions</td>
<td>MS have discretion in implementing EU directives</td>
</tr>
<tr>
<td>Deference afforded by EU Courts</td>
<td>As a general rule deference is granted, to a larger extent to EU institutions than to MS. More recently, judicial scrutiny is typical despite stressing deferential standards.</td>
<td>Not typical, MS scientific claims are often dismissed</td>
</tr>
<tr>
<td>Function of scientific arguments</td>
<td>Challenging the validity of a risk assessment of a MS or EU institution</td>
<td>Using science as an objective benchmark limiting MS’ discretion in implementing EU directives or applying EU law</td>
</tr>
<tr>
<td>Standard of judicial review</td>
<td>Tests developed to check due diligence of risk assessor, the internal consistency of reasoning, and the plausibility of evidence</td>
<td>EU Courts rely on scientific studies directly, though without interrogating their scientific validity</td>
</tr>
</tbody>
</table>

*Table 4: Comparison of the main legal techniques of judicial engagement with science with respect to the two main groups of EU Courts’ environmental decisions.*
The above table summarizes the ways in which scientific arguments appear in legal disputes, and the judicial tools with which they are evaluated by EU judiciary. EU Courts have become less willing to grant automatic deference to risk assessors and they increasingly apply various procedural benchmarks to assess the quality of the decision-making process and inter alia the consistency of risk assessors’ reasoning. Hence EU Courts expanded the extent of their review and occasionally conduct a more in-depth assessment of science-based decisions through hybrid standards of review. As argued above, this is a laudable approach as it does more justice to the scientific complexity of the case by expanding the boundaries of judicial evaluation warranted in science-based legal disputes. It has been argued that the complexity of the judicial task in reviewing risk regulation cases should be commensurate with that of the primary risk assessors. If market innovations and our growing understanding of potential risks warrant regulations that involve balancing highly technical risks against potential benefits by legislatures, then the judicial task cannot remain any less complex and less science-intensive. In the judicial review of risk governance decisions mandated by EU law, EU Courts must be ready and willing to fulfill a more complex judicial task.
Chapter 7
Scientific claims before the WTO

“It was not the Panel’s task ... to determine whether there is an appreciable risk of cancer arising from the consumption of meat from cattle treated with oestradiol–17β. Instead, the Panel was called upon to review the European Communities’ risk assessment.”

WTO AB

I. Introduction: Science in the context of WTO law

This chapter reviews the quasi-judicial\textsuperscript{1240} case practice of the WTO dispute settlement system, consisting of WTO panels and the Appellate Body (“AB”). The analysis will center on those decisions, in which assessing the consistency of measures with provisions of WTO law brought engagement with science into the forefront of adjudicatory analysis. This assessment therefore focuses on a certain portion of WTO law, which entertain scrutiny of “scientific criterion of legality.”\textsuperscript{1241} These are certain aspects of Article XX of GATT, the Agreement on the Application of Sanitary and Phytosanitary Measures (“SPS Agreement”) as well as the Agreement on Technical Barriers to Trade (“TBT Agreement”). For an analysis of adjudicatory engagement with science, decisions brought under these provisions are the most relevant. As a corollary of the narrow scope of the inquiry not every WTO decision relevant for environmental and public health considerations will be addressed here, only those where the treatment of scientific evidence influenced the scope of

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\textsuperscript{1241} Pauwelyn, ‘Expert Advice in WTO Dispute Settlement’, p. 235.
adjudicatory inquiry or where the weighing of scientific arguments impacted the outcome of the case.

The treatment of science in the jurisprudence of the WTO’s compulsory dispute settlement mechanism is remarkable not only due to abundant case-practice, but also because WTO dispute settlement bodies developed perhaps the most elaborate standard of review with respect to scientific claims and the most diverse fact-finding procedures to engage with scientific expertise. For this very reason, it is not uncommon that other tribunals and even judges of the ICJ refer to fact-finding methods of WTO panels as a judicial “best practice”. Scholars also frequently cite WTO solutions as a possible remedy to the apparent deficiencies in the scientific engagement of other international adjudicatory bodies.

Reports of WTO panels and the AB bespeak the many varieties of scientific engagement. The most remarkable techniques are the numerous ways in which scientific evidence are taken and evaluated by the panels and the standard of review applicable to scrutinize scientific claims. Last but not least, WTO decisions display solutions for providing persuasive legal reasoning in science-based analyses. Before turning to the in-depth discussion on these features of WTO jurisprudence, a brief introductory overview is due on the applicable WTO law and the ways in which scientific risk assessments of WTO Members become legally relevant in WTO disputes.

1. Applicable WTO law: from ‘likeness’ assessment to the SPS and TBT Agreements

There are four different legal contexts in which science and scientific evidence become legally relevant as to the outcome of a WTO dispute.

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1243 Judges Al-Khasawneh and Simma in their Joint Dissenting Opinion in the Pulp Mills case, para. 16. state that “It is perhaps the World Trade Organization, however, which has most contributed to the development of a best practice of readily con- sulting outside sources in order better to evaluate the evidence submitted to it”; Judge Owada in his Dissenting Opinion attached to the Whaling case referred to the WTO jurisprudence as a „useful point of reference for this Court in the present case”. Dissenting Opinion of Judge Owada, para. 37; J. Harrison, ‘Addressing the Procedural Challenges of Environmental Litigation in the Context of Investor-State Arbitration’ in Y. Levas, T. Lambooy, I. Dekker (eds.), Bridging the Gap between International Investment Law and the Environment, (Eleven Publishing, 2015), pp. 87–113 p. 96.

Scientific arguments first can be raised in the ‘likeness’ assessment conducted under provisions of the General Agreement of Tariffs and Trade 1994 (“GATT”). Under the GATT system, importing States must not discriminate against ‘like’ products of other Members and shall accord such products all advantage that are granted to domestic products (requirement of National Treatment). All the privileges accorded to products of one Member must also be given to products of all other Members (the so-called Most-Favored Nation treatment). In **EC – Asbestos**, the AB ruled that it is appropriate to take into consideration the health risks of a given product in the ‘likeness’ assessment.\textsuperscript{1245} Hence, it is in this context in which scientific arguments may enter a WTO dispute in the first place. It is to be noted, however, that health risks are no way the sole or decisive factor in the ‘likeness’ assessment, given that the end-use of the respective products, and consumers’ willingness to treat them as interchangeable products are also considered to be relevant.\textsuperscript{1246}

Second, scientific arguments may be weighed in the necessity analysis under Article XX of the GATT. Article XX b) provides for an exemption, under which restricting international trade of like products is deemed justifiable if the measure in question was “necessary to protect human, animal or plant life or health”. Furthermore, Article XX paragraph g) allows trade restrictive measures that are necessary to protect exhaustible natural resources. Importantly, claims under paragraph b) and g) must also satisfy the chapeau of Article XX, which requires such measures to constitute arbitrary or unjustifiable discrimination, or a disguised restriction on international trade.

Under Article XX of GATT scientific information may be relevant for evidencing that a measure falls within the scope of Article XX, *i.e.* that it relates to the protection of human, animal or plant life or health. Taking an early example, the GATT panel in **Thailand – Cigarettes** noted based on WHO expert evidence that “smoking constituted a serious risk to human health and that consequently measures designed to reduce the consumption of cigarettes fell within the scope of Article XX(b).”\textsuperscript{1247} In a similar vein, “modern biological sciences” served as a proof that

\textsuperscript{1247} **Thailand – Cigarettes**, Report of the Panel, DS10/R - 378/200, para. 73.
“living resources are just as ‘finite’ as petroleum”\textsuperscript{1248} and therefore measures in relation to endangered species also falls into the scope of Article XX g).

Importantly, measures under Article XX must also qualify as ‘necessary’ to be considered justified under WTO law. The test of necessity is only met if no reasonably available alternative measures exist that would be less trade restrictive.\textsuperscript{1249} The availability of such solutions is also often a matter of expert evaluation. In \textit{EC – Asbestos}, the AB approved the panel’s finding that, based on the scientific evidence submitted, the “controlled use” of asbestos-containing products did not qualify as an alternative for France to achieve its chosen level of health protection against asbestos-related health risks.\textsuperscript{1250} In this assessment, the panel evaluated various scientific evidence submitted by France.\textsuperscript{1251} Similarly, in \textit{Brazil – Retreaded Tyres}, the panel evaluated expert evidence as to examining the alternative measures to the landfill disposal of waste tyres, the adverse health risks of which have been adequately demonstrated by scientific evidence.\textsuperscript{1252}

As a third, and perhaps most significant way in which scientific arguments are raised in WTO disputes is related to the SPS Agreement. This Agreement sets out the detailed rules of introducing specific measures sought to protect human, animal and plant life, the so-called SPS measures.\textsuperscript{1253} Scientific requirements in the Agreement function as an express mechanism guarding against that SPS measures serve disguised protectionism. Members therefore shall demonstrate that contested SPS measures were backed up by adequate scientific evidence.

\textit{Alan O. Sykes} refers to the elaborate risk assessment criteria of WTO law as “scientific evidentiary requirements”.\textsuperscript{1254} Such scientific evidentiary requirements are most stringent under the SPS Agreement;\textsuperscript{1255} they operate as legality criteria to

\textsuperscript{1248} US – Shrimp, WT/DS58/AB/R, para. 128.
\textsuperscript{1253} For the exact definition on SPS measures see Annex A (1) of SPS Agreement.
distinguish consistent and inconsistent measures. As a matter of principle, Members have a right to set the appropriate level of protection (“ALOP”) and indicate a maximum level of risk they are willing to tolerate. The Agreement nevertheless urges Members to harmonize their SPS measures by basing them on international standards, guidelines and recommendations (“SGR”, Article 3.1.). However, Article 3 allows Members to aim for a higher level of protection compared to what is ensured by international SGR provided that “there is scientific justification” for divergence from international standards (Article 3.3).

The SPS Agreement sets several scientific criteria with the objective of limiting the impact of such measures on international trade. Article 5.1 of SPS Agreement requires SPS measures “be based on” a risk assessment that, according to Article 5.2, shall take into account “available scientific evidence”. Article 5.1 mandates that such measures are to be applied only to the extent that (i) they are necessary to protect human, animal or plant life, (ii) are based on “scientific principles”, and (iii) are not maintained without “sufficient scientific evidence”. Article 5.7 creates a possibility for Members to act even in cases where relevant scientific evidence is insufficient to perform risk assessment, in which cases they may adopt provisional SPS measures on the basis of „available pertinent information”.

More recently, Article 6 of SPS Agreement has also become contested in disputes. The provision requires that SPS measures are adapted to the sanitary or phytosanitary characteristics of the areas from which the product is originated and to which it is destined. Members shall also recognize disease-free areas and areas of low pest or disease prevalence, the determination of which shall be based on relevant scientific factors, such as that of geography and epidemiology.

Scientific information could carry legal weight also under the TBT Agreement. Article 2.2 stipulates that technical regulations of Members shall not be more trade-restrictive than necessary to fulfil a legitimate objective, taking account of the risks non-fulfilment would create. Amongst such legitimate objectives, the

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1257 6th recital of SPS Agreement confirms this by adding that nothing in the Agreement would require “Members to change their appropriate level of protection of human, animal or plant life or health”. For more details see Gruszczynski, ‘Standard of Review of health and environmental regulations by WTO panels’, p. 738.
protection of human health, animal or plant life or health, as provided under Article 2.1., are explicitly listed. Article 2.2 further provides that in assessing such risks, relevant elements of consideration are, *inter alia*, the available scientific and technical information, related processing technology or intended end-uses of products. For instance, in the *US – Tuna II (Mexico)* dispute, the U.S. set forth several scientific publications in an attempt to prove that its „dolphin-safe” labelling for tuna products was not more trade restrictive than necessary.1259

Lastly, scientific engagement becomes relevant when panels determine their standard of review with respect to the scientific facts of the case. Parties may directly challenge the objectivity of the panel’s assessment under Article 11 of the WTO’s Understanding on Rules and Procedures Governing the Settlement of Disputes (“DSU”), which requires panels to make an “objectively assess the matter before it, including an objective assessment of the facts”. Obviously, what takes to be ‘objective’ assessment is subject to legal interpretation. The AB discerned more exact procedural and substantive requirements.1260 However, it accorded quite extensive discretion to panels in their evidentiary assessments by pronouncing that as long as a panel does not “’deliberately disregard’, ‘refuse to consider’, ‘wilfully distort’, or ‘misinterpret’ the evidence”, 1261 the objectivity of its assessment cannot be successfully challenged.

2. Adjudication of science: legality requirements for scientific risk assessments

Various references to ‘science’ are built in an elaborate manner in the very text of WTO provisions and, therefore, WTO panels and the AB could not escape engaging with interlinked scientific and legal determinations given the mandates expressly built in the SPS Agreement.

Saliently, the SPS Agreement aims to “domesticate” science by providing for exact definitions under which scientific claims are permissible in an SPS dispute. For instance, the Agreement stresses that only those ‘scientific justifications’ are relevant under the Agreement, which are formed “on the basis of examination and evaluation

1259 In the material case, the panel did not find *US – Tuna II (Mexico)*, Report of the AB, WT/DS381/AB/R, paras. 19, 22.
1261 *Australia – Measures Affecting Importation of Salmon*, WT/DS18/AB/R, para. 266.
of available scientific evidence in conformity with the relevant provisions of this Agreement." (emphasis added) Such a definition arguably serves to preclude vague references to science from having decisive force in a WTO dispute. By stipulating compliance with provisions of the Agreement, the text provides a legal framework for scientific claims and hence allows WTO adjudicators to assess such claims against legal benchmarks of the Agreement.

In this vein, the SPS Agreement also provides criteria for a ‘valid’ scientific risk assessment. The notion of risk assessment is key as Article 5.1 mandates SPS measures be “based on” risk assessment. The AB mandates that risk assessments are also to be “based on” scientific principles and not to be maintained without sufficient scientific evidence, on account of Article 2.2. It went on to discern a substantive criterion, namely, that “a rational relationship” must exist “between the measure and the risk assessment”. Later a WTO panel clarified this requirement by mandating that an SPS measure “must be sufficiently warranted or reasonably supported by a risk assessment”. The AB also stressed that such a rational relationship presupposes a “situation that persists and is observable between an SPS measure and a risk assessment.”

Moreover, Annex A, section 4 of the SPS Agreement explicitly provides for obligatory elements of a risk assessment: the identification of the disease targeted, and the evaluation of the likelihood of entry, establishment or spread of that disease together with its potential adverse effects. The actual content of the ‘evaluation of likelihood’ has also been subject to dispute. In Australia – Salmon the AB stressed that it is “not sufficient that a risk assessment conclude that there is a possibility of entry”, as it “must evaluate the ‘likelihood’”, either “quantitatively or qualitatively”. There are certain procedural requirements for conducting risk assessments. SPS measures that were based on “scientific principles” and various scientific studies, without conducting a risk assessment would be found inconsistent with Article 5 of SPS Agreement. In the recent US – Poultry dispute, the U.S. imposed a ban on

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1262 Note 2 attached to Article 3.3 SPS Agreement.
1266 EC – Hormones, AB report, para. 189.
poultry imported from China with reference to various academic studies and evidences on China’s food safety crisis. Among others, the US cited statements of the Chinese Ministry of Health, who addressed “high risks” regarding food security in China.① By finding the measure inconsistent with the SPS Agreement, the panel signaled that the scientific requirements built in the text function as legal and procedural criteria, which cannot be swept away by wholesale reference to scientific studies.

The AB also emphasized that the SPS measure does not necessarily have to square with majority scientific opinions. As explained in the EC – Hormones case, responsible governments “may act in good faith on the basis of what, at a given time, may be a divergent opinion coming form qualified and respected sources”.② Hence, minority scientific opinions may legitimately form the basis of SPS measures, if they are regarded as being from “qualified and respected” scientific opinions.

The above criteria undoubtedly set elaborate requirements as to the scientific basis of SPS measures. An important caveat is due here regarding the role of science in this respect. First, despite repeated references to science in the text, Jacqueline Peel rightly notes that “science would be a necessary, rather than decisive, input into SPS risk assessment”,③ given that additional socio-economic considerations are also mandated by the agreement.④ Also, on a more general level, Reid cautions against perceiving risk assessments as a purely scientific exercise for it includes normative value choices on part of the risk assessor in determining the level of risk it deems acceptable.⑤ This approach recognizes that “conclusions based upon science may need to be qualified by reference to other legitimate factors”.⑥ Indeed, States do consider a wider range of factors than solely scientific issues in their risk assessments.⑦ The level of acceptable risk is determined through deliberative procedures within domestic policy, in which scientific and other factors are at

③ Peel, Science and Risk Regulation in International Law, p. 184.
④ Articles 5.4-5.6 of SPS Agreement stipulates further requirements to minimize negative trade impacts and to account for technical and economic feasibility in designing an SPS measure.
⑦ Reid, ‘Risk Assessment, Science and Deliberation: Managing Regulatory Diversity under the SPS Agreement’, 541–43.
play. Such a view is buttressed by the wider context of risk assessment, that is, environmental policy-making. It has long been recognized among scholars of the field that environmental policy-making is, in fact, a “scientically informed”. These important limitations of the reach of scientific references in SPS disputes have to be borne in mind in appraising panelists’ engagement with science.

II. Scientific fact-finding in the WTO: practices of using scientific expertise

WTO dispute settlement bodies have become known for extensively using scientific expertise. Panelists and member of the AB are trade law specialists traditionally having a governmental background, and hence, scientific expert arbitrators are alien to WTO jurisprudence. Nevertheless, there are several ways of garnering external expertise. WTO panels and the AB not only allow party-appointed experts but also often rely on independent experts and appeal to the expertise of relevant international organizations. Highly technical disputes brought before the WTO prompted adjudicators to develop novel procedures for expert consultations, for which they gained reputation as front-runners of adjudicatory scientific fact-finding. The AB reminds that WTO panels have “significant investigative powers”, however, they are not entitled “to rule in favor of a complaining party which has not established a prima facie inconsistency based on specific legal claims asserted by it”. In this vein, Pauwelyn observes, that the powers of panels are limited in as much as they cannot establish a violation solely on a basis of expert evidence with respect to something that was not claimed and proved by the party. A brief discussion shall follow on the procedure applicable to expert consultations, then I will

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1276 Reid, ‘Risk Assessment, Science and Deliberation: Managing Regulatory Diversity under the SPS Agreement’, 543–44.
1279 Pauwelyn, ‘The WTO 20 Years On: ‘Global Governance by Judiciary’ or, Rather, Member-driven Settlement of (Some) Trade Disputes between (Some) WTO Members?’, 1125.
1280 Foster, Science and the Precautionary Principle in International Courts and Tribunals, p. 114.
1281 Japan – Measures Affecting Agricultural Products (Varietals), WT/DS76/AB/R, para. 129.
address an additional evidentiary practice of WTO panels, i.e. the use of standards of international organizations.

1. Expert consultations: party-appointed and independent experts

Whenever scientific expertise has been requested, WTO panels will adopt their Working Procedures for the consultation of experts on a case-by-case basis, in which regard they enjoy large measure of discretion in tailoring procedural rules to the circumstances of a particular case. The expert consultation process normally comprises a written and an oral phase, and it begins with the selection of experts. The parties are invited to put comment on the questionnaire submitted to the experts and to suggest further questions, and they are also asked to submit written observations as to the replies of experts.

In SPS cases, panels are even obliged to rely on expert evidence, for which reason individual experts are appointed to assist the panel. Tribunal-appointed experts are usually consulted not to “make their own conclusions but to evaluate” the scientific evidence put forward by the parties. The panel may ask for an agreed list of experts from the parties or the panel may seek assistance of a competent international organization in selecting the most appropriate experts in the relevant fields. To take an example, in Russia – Pigs, the panel chose individual experts from the list provided by World Organization for Animal Health and FAO.

The parties retain considerable control over the selection of experts as they may express their views on the profiles of experts relevant to the case, and can object to experts suggested by the other party, and even to those recommended by an international organization. They do so usually on the basis of conflict of

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1285 Australia – Apples, Report of the Panel, para. 1.34.
1288 Russia – Pigs, Report of the Panel, para. 1.21.
1289 Russia – Pigs, Report of the Panel, para. 1.23.
1290 Russia – Pigs, Report of the Panel, para. 1.19.
interest. In the same vein, parties may also object to a person serving on the expert
dellegation speaking on behalf of an international organization.\textsuperscript{1293}

As a regular procedure, panels ask for the parties’ views regarding the need
for consultation with individual experts. Perhaps unsurprisingly, on many occasions
parties discourage panels from seeking independent experts’ advice. Parties in \textit{US--Animals}, and the EU\textsuperscript{1294} in \textit{Russia--Pigs} suggested that “\textit{they did not consider it}
necessary for the panel to consult with individual experts},\textsuperscript{1295} and the US also
contested the usefulness for the panel to consult with international organizations
regarding the scientific aspects.\textsuperscript{1296} Yet, since WTO panels are not bound by
the parties’ views, in both cases they had nevertheless recourse to expert advice from
both individual experts and international organizations.

During the oral phase of taking expert evidence, the panel holds joint meeting
among the parties, their experts, and its own experts, which is usually held between
the two rounds of substantive oral hearings.\textsuperscript{1297} The main aim of joint meetings with
experts is to answer further questions of the panel and not to “\textit{elicit consensus}” or
“\textit{put a deal together}” as was pointed out by as \textit{Caroline E. Foster}.\textsuperscript{1298}

Transcripts of joint meetings, along with the written responses of experts are
annexed to the panel’s report. In highly technical cases, expert statements not
infrequently amount to several hundreds of pages. To take the \textit{EC--Biotech} case as
an apposite example, only the written replies of experts alone amounted to 256 pages
and taken together with the transcript of the meeting and the parties’ observations as
to the expert replies, the discussion of strict sense scientific factual issues totaled in
slightly more than 600 pages, excluding the extremely fact-intensive legal evaluation
contained in the report itself.\textsuperscript{1299}

Lastly, some novel developments aiming to ensure transparency in expert
consultation shall be mentioned. Procedural rules of DSU only requires
confidentiality as to the panels’ deliberations,\textsuperscript{1300} but are silent as to other phases of
the procedure. With the increasing role scientific issues have started to bear not only

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{1293} \textit{US--Animals}, Report of the Panel, WT/DS447/R, para. 1.22.
\item \textsuperscript{1294} \textit{Russia--Pigs}, Report of the Panel, WT/DS475/R, para. 1.18.
\item \textsuperscript{1295} \textit{US--Animals}, Report of the Panel, para. 1.13.
\item \textsuperscript{1296} \textit{US--Animals}, Report of the Panel, para. 1.13.
\item \textsuperscript{1297} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, pp. 115–16.
\item \textsuperscript{1298} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 117.
\item \textsuperscript{1299} See Annex H, I and J of the panel report in \textit{EC--Biotech}.
\item \textsuperscript{1300} See Article 14 DSU.
\end{itemize}
\end{footnotesize}
with respect to the parties, but also to the wider international community by ruling on the permissibility of national scientific risk assessments, WTO panels confronted with a need for opening up the procedure of scientific fact-finding to the public. For the first time in GATT/WTO history, the Panel hearing the *Continued Suspension of Obligations* cases decided to open the Panel hearings to the public through a closed-circuit broadcast. This extended only to sessions with the parties, and the joint meeting with experts as not all third parties had agreed to open their session to the public, which therefore remained confidential.\(^{1302}\)

2. Standards of international organizations

The AB often refers to standards of international organizations to support its positions as to scientific claims. As early as in 1990 in *Thailand – Cigarettes*, the GATT panel consulted with the WHO regarding the adverse health risks of cigarettes.\(^{1303}\) Later, in *EC – Asbestos*, the WTO panel cited opinions of the WHO and other international bodies to the effect of acknowledging the carcinogenic risks associated with asbestos.\(^{1304}\) There is a continuing trend in that respect evidenced by the more recent *US – Animals*, which featured consultation with the World Organization for Animal Health.\(^{1305}\)

The more complex the factual background of a case is, the more diverse sources of expertise are garnered by WTO panels. For instance in *Continued Suspension of Obligations*, alongside 6 individual experts, the panel asked for written advice from the Codex Alimentarius Commission, the Joint FAO/WHO Expert Committee on Food Additives, and the International Agency for Research on Cancer.\(^{1306}\)

\(^{1301}\) *US – Continued Suspension of Obligations*, Report of the Panel, para. 7.43.

\(^{1302}\) *US – Continued Suspension of Obligations*, Report of the Panel, para. 7.40.

\(^{1303}\) *Thailand – Cigarettes*, Report of the Panel, DS10/R - 378/200, para. 27.


\(^{1306}\) *US – Continued Suspension of Obligations*, Report of the Panel, para. 1.7.
III. Changing canons of deference: standard of review of scientific claims

The preceding section dealt with the various ways in which WTO panels request and make use of scientific evidence. Another major issue in scientific engagement of panels is the degree of deference accorded to States in reviewing their scientific claims. There is no specific statutory standard of review mandated to the scrutiny of health or environmental regulations of WTO Members.\textsuperscript{1307} There is only one specific standard enshrined in Article 17.6 of the Agreement of Anti-Dumping, apart from that, the general standard of review applies under Article 11 of DSU, which will be discussed below.

A fundamental tension in the WTO jurisprudence stems from the need to reconcile two opposing interests: respect for Members’ sovereign regulatory power on the one hand, and prevention of disguised protectionism on the other hand. While the former calls for a deferential approach towards Members’ scientific risk assessments, the latter necessitates meaningful scrutiny of scientific claims. The applicable standard of review used by panels and the AB is thus determined by the sum of these opposing forces. \textit{Alan O. Sykes} points out the fundamental challenge these tensions cause for setting scientific evidentiary criteria, namely, that the WTO must choose between “essentially eviscerat[ing] \[those criteria\] and defer to national judgments about ‘science’”, and according “an interpretation that gives them real bite at the expense of the capacity of national regulators to choose the level of risk that they will tolerate”.\textsuperscript{1308} These policy considerations lay behind the varying degree of deference that WTO panels accord to Members’ scientific claims.

There are three different contexts\textsuperscript{1309} in which standard of review, and the corresponding degree of discretion, may be defined and examined in WTO jurisprudence. First, dispute settlement bodies apply a certain standard for reviewing factual determinations of Members in scientific matters. In this context the possible intensity of the review ranges between \textit{de novo} scrutiny and total deference.\textsuperscript{1310} Second, the extent of discretion also applies to panels and the AB, which both have

\textsuperscript{1310} For more details see Chapter 2 above.
latitude in their legal interpretation being not bound by the parties’ legal determinations. Third, panels enjoy wide discretion in their evidentiary assessments, given that the AB’s review is rather limited in this respect.\textsuperscript{1311} This latter discretion finds its roots in Article 11 DSU, which mandates that panels shall make an “objective assessment of the facts”. The AB reads this provision by allowing a large room for manoeuvre for the fact-finding of panels given that only egregious “disregard”, “distortion”, or “misinterpretation”\textsuperscript{1312} of the evidence would amount to a “bad faith”\textsuperscript{1313} evaluation of the evidence, which would mark that a panel exceeded the limits of its discretion. Importantly, in the practice of the AB, any mistakes on part of the panel in accurately interpreting expert evidence do not constitute ‘deliberate disregard of evidence’.\textsuperscript{1314}

The focus of attention in this section will be the evolving standards of review applicable to Member’s scientific determinations under the SPS Agreement. SPS disputes attracted the most in-depth considerations by panels and the AB in terms of standards of review. Ever since the first impression decision concerning the SPS Agreement was issued in the EC – Hormones case, the WTO AB has been consistent in reiterating that the appropriate standard of review is “neither de novo review, nor “total deference”, but rather the “objective assessments of facts”.”\textsuperscript{1315} A case-by-case review further elucidates the exact requirements flowing from the ‘objective assessment’ obligation. As shall be seen below, the application of the standard, and indeed the standard itself, has been far from being uniform and has undergone some significant evolution over time. To observe the changing canons of deference afforded to WTO Members’ scientific arguments, it is worth overviewing the relevant case-law first.

1. Bordering \textit{de novo} review in early SPS cases: from \textit{Hormones} to the panel report in \textit{Continued Suspension of Obligations}

As discussed above, the critical requirement for introducing valid SPS measures is the existence of a “rational relationship” between the risk assessment and

\textsuperscript{1311} EC – Asbestos, Report of the AB, para. 161.
\textsuperscript{1312} EC – Hormones, Report of the AB, para. 132.
\textsuperscript{1313} EC – Hormones, Report of the AB, para. 138.
\textsuperscript{1314} EC – Hormones, Report of the AB, paras. 138-139.
the measure. It follows that the crucial issue on which the legality of a SPS measure hinges is the extent of judicial scrutiny in reviewing the ‘rationality’ of the risk assessment. The key question is whether the panel may revisit the scientific evidence and formulate its own appreciation of scientific determinations, or instead, it is precluded from substituting its own assessment for Members’ scientific conclusions.

In the initial decisions, the AB answered that question by allowing panels to “put risk assessments under a microscope”\(^{1316}\) and evaluate them quite closely.

This question arose for the first time in the EC – Hormones case, where the contested measure was an import ban instituted by the EC on meat and meat products derived from cattle to which certain natural hormones were administered for growth promoter purposes. The EC took action with reference to the risk of carcinogenic effect on consumers of hormone-treated beef meat.

In the material case, the panel and AB both found that the scientific research cited by the European Communities was too general, and therefore the EC measure was inconsistent with the SPS Agreement.\(^{1317}\) Although the AB itself acknowledged that risk assessment decisions could have a rational relationship with divergent (even minority) scholarly opinions that are at odds with mainstream scientific opinions prevailing at the time,\(^{1318}\) and thus could be in conformity with the SPS Agreement. It, however, ruled that the facts of the material case did not fulfill this theoretical possibility.

The scientific reports relied on by the EC all concluded that the consumption of meat, to which growth hormones were administered is “safe”, albeit studies indeed “show[ed] the existence of a general risk of cancer”\(^{1319}\) in case of use of large doses of growth hormones. However, these studies did not specifically address the risks imposed by hormone residues that can be found in meet derived from cattle to which hormones had been administered.\(^{1320}\) The AB stressed that a measure banning the use of certain hormones used as growth promoters would not have a requisite “rational relationship”\(^{1321}\) with scientific opinions describing carcinogenic risks of growth

promoters, if the latter were not “sufficiently specific to the case at hand”. The fundamental problem with the EC reports at hand might be that they identified carcinogenic risks only in cases involving much higher dosages of hormones than what were likely to be present in meat as residues.

As to the standard of review, the panel and the AB did not accept the deferential “reasonableness standard” set forth by the EC. Instead, the AB held that the panel adopted a “useful” approach when it “examin[ed] the scientific conclusions implicit in the SPS measure ... and the scientific conclusions yielded by a risk assessment”. This language implies that the AB encourages the panel’s in-depth scientific engagement. In the material case, the scrutiny of the scientific evidence allowed the panel to develop its ‘specificity’ requirement, which proved to be a device for conducting intrusive review based on which SPS measures can be invalidated.

It is also true, however, that the language of the AB’s report made some significant gestures towards sovereign regulatory power. For instance, it indisputably allowed taking minority scientific views into account, and acknowledged that apart from risks that can be measured inside laboratories, there are ‘real world’ risks, generated by the application of the hormones, which also had to be considered by prudent governments. While some regard these as a sign of a deferential standard of review, others are of the view that the AB simply “tipped its hat” towards WTO Members’ sovereignty. Judging by the outcome of the case, that the EC measure was found to be inconsistent with the SPS Agreement, it is argued here that the lasting effect of the Hormones decision is that it paved the way for an intrusive review.

In the same year, the decision in the Australia – Salmon case followed. Australia instituted a ban on importing ocean-caught Pacific salmon with reference to

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the risk that new diseases would be introduced to its domestic fish population. In face of the Canadian challenge, Australia sought to defend its import ban by claiming “due deference” for its findings in matters of fact.1330 The AB rejected again to automatically accept factual allegations of Members,1331 and emphasized that panels “are not required to accord to factual evidence of the parties the meaning and weight as do the parties.”1332 This again confirms the rather intrusive approach of the AB towards scientific determinations of Members.

A similar approach is reflected in the Japan – Apples (2003) decision, where a Japanese prohibition on importation of apples from the U.S. was subject to review. Japan introduced this ban as an SPS measure to counter risks of transmission of a disease called fire blight, which was absent from its territories but was present in the U.S. The panel reviewed the scientific evidence and concluded that the evidence suggests “a negligible risk of possible transmission through apple fruit”,1333 and ruled that the importation ban was “clearly disproportionate”1334 to that risk, and thus lacked a rational relationship with the evidence. In its appeal, Japan again argued for granting “a certain degree of discretion” towards the ways in which importing States’ weigh and evaluate scientific evidence.1335 Albeit, the AB again rejected to deviate from the “objective” assessment it has been advocating for ever since the Hormones dispute.1336

In the EC – Biotech dispute, the U.S. and Canada challenged two pieces of EC secondary legislation1337 regarding approval procedures of deliberate release of biotech products into the environment and concerning novel food ingredients by submitting that they constituted SPS measures incompatible with the SPS Agreement. The complainants also challenged some EC Member States’ safeguard measures that were adopted on the basis of the contested EC secondary legislation to prohibit the import of biotech products.

1337 EC Directive 2001/18 governing the “deliberate release into the environment of generically modified organisms” and EC Regulation 258/96 regulating novel foods and food ingredients.
The more than 2400-pages long decision deals with extremely science-intensive questions, where the panel had to evaluate among others, the (in)sufficiency of the available scientific information regarding the adverse risks of GMO products to assess whether EC Member States could legitimately adopt their safeguard measures under Article 5.7 of SPS Agreement. The panel consulted six individual experts who, unsurprisingly, did not come to a consensus in all questions. Therefore adjudicators had to choose between competing scientific claims and occasionally, they even formed an opinion against what seemed to be a majority view among the experts. For instance, to the question whether the evidence was sufficient for France to carry out a risk assessment concerning seed production of a GMO oilseed rape, all three experts seemed to agree that between 1998-2002, there was not sufficient information available. This position was strengthened by the report of the French Biomolecular Engineering Committee as well. Still, the panel firmly concluded that it agrees with the position of the complainants that “the body of available scientific evidence permitted the performance of a risk assessment” for France without providing any detailed evidentiary explanations.

As a sequel to the EC – Hormones dispute, the US and Canada imposed duties on imports from EC Member States. The EC brought a WTO complaint challenging the continued suspension of concessions, resulting a case commonly referred to as the Continued Suspension of Obligations dispute. The dispute had another prong in which US and Canada claimed the inconsistency of the revised SPS measure of the EC. The EC adopted these measures upon funding several research projects and seeking seventeen scientific opinions. The new EC directive equally excluded U.S. and Canadian hormone-treated meat products from the EC market on a provisional basis, claiming that the available pertinent scientific information was insufficient to conduct a risk assessment.

1338 Including all the addenda.
1340 See the written answers of experts (Dr. Snow, Dr, Squire and Dr. Andow) EC – Biotech, Report of the Panel, Addendum no. 7., WT/DS239/R/Add.7., paras. 99-101.
1341 See the written answers of experts (Dr. Snow, Dr, Squire and Dr. Andow) EC – Biotech, Report of the Panel, Addendum no. 7., WT/DS239/R/Add.7., para. 104
1342 EC – Biotech, Report of the Panel, WT/DS291/R, para. 7.3300
1344 Peel, Science and Risk Regulation in International Law, p. 191.
1345 Directive 2003/74/EC.
In terms of intrusiveness of judicial scrutiny, the high-water mark was undoubtedly the panel’s decision in the *US – Continued Suspension of Obligations* case, where the panel explicitly acknowledged that it would effectively substitute its own view for the EC’s risk assessment:

“While, on some occasions, we followed the majority of experts expressing concurrent views, in some others the divergence of views were such that we could not follow that approach and decided to accept the position(s) which appeared, in our view, to be the most specific in relation to the question at issue and to be best supported by arguments and evidence.”\(^{1346}\)

Even though the panel repeated the mantra according to which it is not well-suited to conduct a de novo review, what it did came in fact very close to a de novo appraisal of the risks.

The main scientific question of the case was whether there were sufficient scientific evidence proving the genotoxic potential of oestradiol, one of the hormones used as feed additives, in the concentrations that were designed for use as growth promoters. The EC submitted evidence demonstrating that the hormone did have carcinogenic effects, but these results were related to much higher concentrations, sufficient to stimulate cell division through receptor mediated processes.\(^{1347}\) However, if administered properly, the hormone were to be present in “exponentially smaller levels”, only as residues, in the meat fit for human consumption, and with respect to such concentrations, the EC could not provide evidence as to carcinogenic effects.\(^{1348}\) The EC argued on a more pragmatic level with ‘real life’ risks of using the growth hormone in excess amounts by farmers. The U.S. claimed that the EC could not substantiate such a claim as it “ignore[d] actual regulatory processes” existing in place preventing farmers from excessive use of hormones.\(^{1349}\)

The panel defined its task as to assessing whether “the scientific evidence supports the conclusions” of the EC expert body’s risk assessment.\(^{1350}\) Regarding the scientific controversy, it heard all the experts who gave divergent answers to the question of oestradiol’s in vivo the genotoxic potential if administered in small concentrations. The panel seemingly remained perplexed by the opinions received and

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arrived at a rather contradicting conclusion, namely, that “the link, if any, between cancer and consumption of hormone-treated meat [could not], at present, be confirmed nor refuted” (emphasis added), but nevertheless concluded that “the science [did] not support the conclusions in the [EC] Opinions.” The logic behind the panel’s finding is quite problematic if one considers that the panel itself acknowledged that scientific evidence was too ambiguous and incomplete to support a finding of the absence of health risks. Still the panel effectively imposed the burden of ambiguity on importing States. This choice not only appears to be arbitrary, but it also goes against the ordinary burden of proof under the SPS Agreement, where by default the complaining party shall prove the incompatibility of an SPS measure.

By finding that the evidence did not support the conclusions it reached in its risk assessment (i.e. the existence of an increased risk of cancer), the panel ruled that measures of the EC were inconsistent with Article 5.1 of SPS Agreement for it failed to prepare a risk assessment “appropriate to the circumstances.”

Despite the fact that the AB constantly reiterates that the appropriate standard is neither de novo, nor total deference, in the initial line of cases one notices that the scrutiny of the panels and the AB effectively comes close to a “quasi de novo” review.

2. Turning towards a more deferential and nuanced standard: a ‘hybrid’ approach to scrutiny

The EC filed an appeal against the panel report in Continued Suspension of Obligations exactly for challenging the de novo review applied. Borrowing the words of the appellant’s submission, the panel “decided to become the jury on the correct science... by picking and choosing between conflicting and contradictory opinions of the experts in an arbitrary manner.” The EC also emphasized that there was

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1355 EC appellant’s submission, cited by the AB in US – Continued Suspension of Obligations, Report of the AB, para. 585.
“reputable support within the relevant scientific community”\textsuperscript{1356} for its position in the face of “genuine and legitimate scientific controversy”.\textsuperscript{1357} In this vein, it submitted that the appropriate standard of review had to assess whether there was “reasonable scientific basis for the SPS measure”.\textsuperscript{1358}

Considering the apparent contradiction in the panel’s reasoning, it is not very surprising that the AB on its appeal declared the panel’s fact-finding erroneous for not conducting an objective assessment of the facts,\textsuperscript{1359} and it also reversed the allocation of the burden of proof.\textsuperscript{1360} What was more unprecedented is that the AB also substantially modified the applicable standard in SPS cases turning towards a more deferential standard of review.

The AB though reiterated its first SPS decision where it declined to accept the deferential “reasonableness” standard as then put forward by the EC,\textsuperscript{1361} this time it proved to be more open to relax the standard of review and to slightly approximate the one, which the EC advocated for. The position of the AB is worthy of being reconstructed in full here, given that it has become the new rule governing the standard of review:

“Where a panel goes beyond this limited mandate and acts as a risk assessor it would be substituting its own scientific judgment for that of the risk assessor and making a de novo review and, consequently, would exceed its functions under Article 11 of DSU. Therefore, the review power of a panel is not to determine whether the risk assessment undertaken by a WTO Member is correct, but rather to determine whether that risk assessment is supported by coherent reasoning and respectable scientific evidence and is, in this sense, objectively justifiable.”\textsuperscript{1362}

The WTO AB also provides some benchmarks for assessing whether a certain scientific position comes from a “respected and qualified” source. It reiterated that the “correctness of the views need not have been accepted by the broader scientific community” but the views “must nevertheless have the necessary scientific

\textsuperscript{1356}EC appellant’s submission, cited by the AB in \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 585.
\textsuperscript{1357}EC appellant’s submission, cited by the AB in \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 585.
\textsuperscript{1358}EC appellant’s submission, cited by the AB in \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 585.
and methodological rigor to be considered reputable science,” and they must be considered “legitimate science according to the standards of the relevant scientific community.”

As is clear from the above, the AB first read the “objective assessment of the facts” requirement of Article 11 DSU as mandating a “rational relationship” between the evidence and the SPS measure, where science supports the conclusions of the risk assessment. Whereas later, the AB modified its reading, and emphasized instead that the legally decisive aspect was whether the risk assessor provided a “coherent reasoning” based on “respectable scientific evidence”. To put it simply, in order for an SPS measure to be consistent with WTO provisions the underlying risk assessment need not be “supported” by science, it is enough if it is “objectively justifiable” in light of science.

It may seem that the changing descriptions of the standard is merely a play with words. Yet the differently couched standards are consequential as they entail markedly different outcomes in a given case. If a panel adhered to the rather intrusive standard of review the AB has set in its initial decisions, it would find an SPS measure inconsistent when scientific facts cannot clearly support the conclusions an importing State reached in its risk assessment. In contrast to that, should a panel take a more deferential approach, it would only investigate whether the particular conclusion reached can be seen as ‘justifiable’ in light of the evidence. Importantly, under the deferential test several competing and even contradicting scientific conclusions may seem to be justifiable at the same time, especially, in case of ‘hard cases’, which involve persistent scientific uncertainty in the evidence.

In the material case, the AB emphasized that the panel should have determined whether the scientific evidence came from a respected and qualified source and should have assessed whether the reasoning of the EC was “objective and coherent so that the conclusions reached in the risk assessment sufficiently warrant the SPS measure.” Instead, the panel provided a “survey” of expert advice to find out whether “the majority of the experts … agreed with the conclusion” of the EC’s risk assessment. Since the AB’s review in the Continued Suspension of Obligations case, such a review is not acceptable. The AB itself was not able to

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complete the analysis regarding the compatibility of EC measures with the SPS Agreement because of the “numerous flaws” in the Panel’s factual findings.\textsuperscript{1366}

Hence, the fundamental change in the AB’s approach to allowing a more deferential review of factual determinations resulted in reversing the panel’s finding of inconsistency.

In sum, in contemporary stance of SPS law, panels are required not to discuss the expert evidence on a general level seeking to discern scientific opinions that are unanimously supported, but they ought to discuss the concrete evidence relied upon by the importing Member and interrogate whether it came from a ‘respected and qualified’ source.\textsuperscript{1367}

With this radical shift in its approach to the applicable standard of review, the AB mandated a two-fold requirement. Already in the \textit{Continued Suspension of Obligations} decision, it stressed that risk assessments (i) ought to be supported by coherent reasoning on the one hand, and (ii) should be justifiable in light of respectable scientific evidence, on the other hand.

This test has been further developed in later decisions of the AB, most eminently in the \textit{Australia – Apples} dispute.\textsuperscript{1368} The case concerned a ban instituted by Australia on apples imported from New Zealand with reference to the risk of the spread of three pests. The AB not only reiterated its deferential standard introduced in \textit{Continued Suspension of Obligations}, but at the same time it appeared to reclaim power to conduct intrusive reviews with regard to less science-intensive part of risk assessments, that is, the reasoning provided by the risk assessors. Such a nuanced approach seems to strike a fair balance between according deference to Members’ scientific determinations, while also maintaining the panels’ possibility to scrutinize risk assessment measures. Such a two-staged scrutiny will be dubbed here a ‘hybrid’ approach to the standard of review.

Under this new test, the AB distinguished two stages of the adjudicatory review, the first being the scrutiny of the underlying scientific bases, and the second being the assessment of the reasons of the risk assessor.\textsuperscript{1369} The AB affirms that as to

\textsuperscript{1366} \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 620.

\textsuperscript{1367} \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 603.

\textsuperscript{1368} For more details on the decision see L. Gruszczynski, ‘How Deep Should We Go - Searching for an Appropriate Standard of Review in the SPS Cases Case Notes’ (2011) 2 \textit{European Journal of Risk Regulation} 111–14.

the first phase, WTO panels have a limited role. Their review is confined to examine whether the scientific basis accepted by WTO Members constitutes legitimate science according to established standards of the scientific community. As to the second phase, panels should assess whether the reasoning of the risk assessor is objective and coherent, thus, whether the conclusions find sufficient support in the scientific evidence relied upon.\textsuperscript{1370} The AB stressed that the “manner of scrutinizing underlying scientific evidence differs from the manner of scrutinizing the reasoning of the risk assessor.”\textsuperscript{1371} In other words, intrusive review is still possible with respect to the reasoning of the risk assessor.

In the material case, the intrusive review of the coherence of the reasoning entailed that the panel could not only review the \textit{final conclusion} of the risk assessment, but could also assess whether the \textit{intermediate conclusions} “found sufficient support in the evidence”.\textsuperscript{1372} By doing so, it dismissed Australia’s submission, which advocated for a more relaxed standard that would have only required scrutiny of intermediate conclusions as to whether they were within a range of what could be considered legitimate science.\textsuperscript{1373}

The Panel introduced some important transparency requirements, which were confirmed by the AB. According to this, a panel was entitled to scrutinize whether the “\textit{use of expert judgment}” has been “\textit{sufficiently document[ed]}” in the risk assessment procedure.\textsuperscript{1374} Most importantly, a risk assessment document was also expected to “\textit{explain[ed] how it arrived at the expert judgments it made at intermediate steps.”}\textsuperscript{1375} This requirement stemmed from the international risk assessment standards of the International Plant Protection Convention, which set forth documentation and transparency criteria.\textsuperscript{1376}

One may argue that in the newly emerging practice, the AB only requires scrutiny as to the \textit{reasoning} of the risk assessor, \textit{i.e.} to interrogate whether Members “\textit{revealed the existence of an objective and rational link between the conclusions reached and the scientific evidence.”}\textsuperscript{1377} Yet a closer examination reveals that in

\begin{itemize}
  \item \textsuperscript{1370} \textit{Australia – Apples}, Report of the AB, para. 215.
  \item \textsuperscript{1371} \textit{Australia – Apples}, Report of the AB, para. 225.
  \item \textsuperscript{1372} \textit{Australia – Apples}, Report of the AB, para. 230.
  \item \textsuperscript{1373} \textit{Australia – Apples}, Report of the AB, paras. 230-231.
  \item \textsuperscript{1374} \textit{Australia – Apples}, Report of the AB, paras. 248.
  \item \textsuperscript{1375} \textit{Australia – Apples}, Report of the AB, para. 248.
  \item \textsuperscript{1376} \textit{Australia – Apples}, Report of the AB, para. 248.
  \item \textsuperscript{1377} \textit{Australia – Apples}, Report of the AB, para. 248.
\end{itemize}
terms of its practical consequences, this ‘new’ test much resembles the ‘old’ intrusive review mandated prior the AB’s report in the Continued Suspension of Obligation cases. At the end of the day, the AB made clear in Australia – Apples that a risk assessment reasoning will not be seen as ‘coherent and objective’ if it "did not rely on adequate scientific evidence".\(^\text{1378}\) In the material case, Australia’s SPS measure was found inconsistent with WTO provisions because the underlying risk assessment "had a tendency to overestimate the severity of the consequences" of the pest targeted.\(^\text{1379}\)

It is argued here that the new standard of review re-opened the door for panels to scrutinize the evidentiary bases of risk assessments, which was their main concern in the initial SPS cases under the expressly mandated intrusive review.

Scholarly opinions also underline that the newly mandated scrutiny of the reasoning enables a "relatively profound examination"\(^\text{1380}\) of the underlying scientific risk assessment, which creates opportunities for panels to "make [their] own evaluation and enquiry into the substance of evidence",\(^\text{1381}\) which again will come close to an "intrusive"\(^\text{1382}\) if not a “de novo review”.\(^\text{1383}\) Gruszczynski suggests that the reasoning in Australia – Apples may invite future panels "to assess the correctness of [such] reasoning".\(^\text{1384}\)

It is argued here that the AB ultimately designed a hybrid standard of review in SPS cases, which is suitable for appealing to deferential attitude with regard to the evidentiary basis of SPS measures, while preserving room for intensive adjudicatory scrutiny as to the reasoning provided by WTO Members. The reasoning of the risk assessor is more amenable to judicial scrutiny since in the AB’s words "it is through the reasoning of the risk assessor that it should be possible to understand whether the risk assessment is based on the scientific evidence and whether in turn the proposed measures are based on the scientific evidence and on the risk assessment".\(^\text{1385}\)

\(^{1378}\) Australia – Apples, Report of the AB, para. 254.
\(^{1379}\) Australia – Apples, Report of the AB, para. 254.
\(^{1380}\) Gruszczynski, ‘How Deep Should We Go - Searching for an Appropriate Standard of Review in the SPS Cases Case Notes’, 112.
\(^{1381}\) Gruszczynski, ‘How Deep Should We Go - Searching for an Appropriate Standard of Review in the SPS Cases Case Notes’, 114.
\(^{1382}\) Reid, ‘Risk Assessment, Science and Deliberation: Managing Regulatory Diversity under the SPS Agreement’, 540.
\(^{1383}\) Gruszczynski, ‘How Deep Should We Go - Searching for an Appropriate Standard of Review in the SPS Cases Case Notes’, 114.
\(^{1384}\) Gruszczynski, ‘Standard of Review of health and environmental regulations by WTO panels’, p. 754.
Through this hybrid scrutiny, the AB aims to analytically dissect the process of a scientific risk assessment in which law and science are interlocked. In so doing the AB seeks to avoid getting entangled in futile efforts to investigate the scientific correctness of an SPS measure while seeking to assess whether it was ‘supported’ by or ‘based on’ the scientific evidence. Moreover, due to the hybrid standard, panels need not focus only on whether intermediate conclusions are “legitimate according to the standards of the scientific community”. Consequently, they can move away from strictly speaking scientific justifications and can expand their inquiry to analyzing the “coherence and objectivity” of the reasoning, which is much more amenable to legal inquiry. The hybrid standard of review will have important ramifications as to the epistemic rationality with which the AB justifies its findings. This will be addressed separately later in section 4 below.

Recent WTO jurisprudence confirms that WTO panels adhere to the facially limited mandate the AB announced in the Continued Suspension of Obligations cases. In 2015, in US – Animals the panel reiterated the confines of its mandate, which is worthy of being reiterated in full here:

“we bear in mind that the Panel’s role is not to conduct its own risk assessment based on scientific evidence gathered by the Panel or submitted by the parties during the Panel proceedings. Similarly, the Panel will not impose its own scientific opinion on the United States. Our task is not to substitute our judgment for that of the United States or determine whether the science relied upon was actually “correct”. Instead, our task ... is to determine the following: (i) whether there is a risk assessment; (ii) if that risk assessment is “appropriate to the circumstances”; (iii) whether the science supports the conclusions in the risk assessment; (iv) whether the importing Member’s measures are based on that risk assessment.”

The deferential approach of panels to SPS measures was also upheld in the most recent Russia – Pigs dispute, in which the AB issued its report in 2017 concerning Russia’s ban on importing pork products. Russia banned import from EU Member States with reference to risks of spreading African swine fever, as outbreaks occurred in certain EU Member States. The dispute revolved around interpreting Article 6.3 of SPS Agreement, which requires exporting Members to provide the

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1386 Australia – Apples, Report of the AB, para. 231.
necessary evidence to importing States in order to claim their territories disease-free areas.

On appeal, Russia claimed that the panel ought to consider the importing Member’s “assessment and findings of the quality and credibility of the scientific and technical evidence relied upon by the importing Member”. The AB rejected such an explicit plea for a more intensive scientific scrutiny by the panel. The AB stressed that the panel is not “called upon to determine for itself, based on the evidence provided by the exporting Member, whether the relevant areas are, and are likely to remain pest-free” (emphasis added), given that “a panel’s review under Article 6.3 is limited to assessing whether the evidence provided by the exporting Member ... is of a nature, quantity and quality sufficient to enable the importing Member’s authorities ultimately to make a determination as to the pest or disease status of the areas”. The AB hence emphasized that the evaluation of the evidence is the task of importing States and not that of the panel.

3. Appraisal of changing standards

The changing standards of review have raised queries among scholars as to the reasons for the AB’s “ambiguous” practice in applying varying levels of scrutiny. Some commentators claim that the AB is more deferential to Members where matters of public health are at stake, in contrast to measures protecting plant health, where the standard tends to be more intrusive. This perception sounds reasonable if one considers the “devastating” consequence of erroneously outlawing health policies. The WTO’s apparent preference for “well-intentioned

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1388 Russia – Pigs, Report of the AB, WT/DS475/AB/R, para. 5.67.
1389 Russia – Pigs, Report of the AB, para. 5.72.
1390 Russia – Pigs, Report of the AB, para. 5.87.
health and safety measure” leads Palmeter even to suggest that the WTO bases its decision on a so-called “smell test”, i.e. on a rough assessment, if not gut feeling as to whether the defendant government has behaved correctly or incorrectly, in which balancing realities of risks and actual scientific evidence play little role.

Scholars also differ in terms of their preferred standard of review. Ioannidis argues that the extent of deference accorded to domestic measures should depend on the transparency of the procedure in which they had been brought, namely, those should deserve less deference that were “taken behind closed doors” as opposed to decisions where considerations of foreign interests were adequately considered. Whereas Fukunaga calls for a wholesale deferential approach by the WTO in acknowledgement of its inability to “discover a single universal truth to resolve the dispute.” Caroline E. Foster warns against a too deferential approach as it could enable “disguised protectionism to go unaddressed”.

In a similar vein, the hybrid approach to standard of review taken by the AB in Continued Suspension of Obligations and in Australia – Apples, which allows for an intrusive review of the consistency of the risk assessor’s reasoning also triggered criticism. Emily Reid raises the concern that “it is unclear how this review of the reasoning may be carried out without encroaching upon review of the substantive decision.” Gruszczynski points out that the deferential standard was necessary due to the “limited epistemic competence of a panel in scientific matters”, which challenge remains valid also with respect to the intrusive scrutiny included in the hybrid review. Caroline Foster offers a less critical reading of WTO case law and reminds that thus far WTO panels “have developed a track record of rising to the task of assessing complex cases involving technical evidence.”

The preceding analysis has sought to argue, however, that irrespective of these inevitable challenges inherent in scientific fact-finding, the hybrid standard of review, which provides room for both deference towards and scrutiny of science-based claims appears to be a necessary, and even appropriate, compromise. The explicitly intrusive standard has led panels to get entangled in strained speculations in an effort to garner sufficient scientific evidence in support of one of the competing scientific claims. The deficiencies from an epistemic and thus, a legitimacy point of view were aptly demonstrated by the panel’s report in *Continued Suspension of Obligations* case, where it ended up deciding the scientific correctness of the claims. However, shifting to an entirely deferential standard would have been equally problematic given that panels have a “*duty to engage with [the] evidence and with the discussion of [the] evidence*”\(^{1403}\).

It may very well be that the SPS Agreement showcases the most technical and science-intensive legal mandate among WTO provisions, hence it is no wonder adjudicators could not escape the delicate task of scrutinizing scientific justifications provided by importing States. It is argued here that the hybrid standard of review can be a suitable tool for fulfilling this task.

In leveling this analysis, it remains to be emphasized that the applicable standard of review guides the reasoning of the WTO panels, and thus, the main difference between intrusive, deferential, and hybrid standards lies in the corresponding ways of reasoning. The selected way of adjudicatory reasoning, in turn, is key for conferring legitimacy on the decision reached. I will seek to show that the hybrid standard enables WTO panels to construct a persuasive legalistic reasoning, while preserving the opportunity to engage with the underlying science that is not only a duty of the panels as trier of facts, but also a necessary requisite of crafting a persuasive decision in science-based cases. The next section explores the ramifications the different standards of review entail for the reasoning and rationality the WTO dispute settlement bodies use in their scientific-legal assessments.

\(^{1403}\) US – *Continued Suspension of Obligations*, AB Report, para. 553.
4. Choice of reasoning: relying on scientific standards or developing legal benchmarks?

The question whether adjudicatory tasks involve deciding about scientific controversies was settled relatively early compared to other international fora, in 2000, when a WTO panel ruled in EC – Asbestos that “it is not the function of the panel to settle a scientific debate”.

Having said this, the range of options for adjudicatory intervention is still quite broad, as it is duly reflected in the different standards of review set by adjudicators. A more deferential review would entail less intrusion to the scientific basis of measures, while less deference necessitates more in-depth adjudicatory engagement with science.

The closeness of scientific facts and legal concepts, which is ubiquitous in adjudicating science-based claims, has been already addressed in Chapter 2, hence this section will center specifically on how an “extraordinarily wide range of factual, scientific and legal issues” are raised in the context of WTO jurisprudence. The AB has pointed out succinctly the interlinkage, if not dialectic relationship, between issues of factual and legal assessment: “Determination of the credibility and weight properly to be ascribed to... a given piece of evidence is part and parcel of the fact finding process and is, in principle, left to the discretion of a panel as a trier of facts. The consistency or inconsistency of a given fact ... with the requirements of a given treaty provision is, however, a legal characterization issue.”

Legal characterization of science-based factual issues raises the question on what basis adjudicators could and should justify their choices. It may sound as truism that it is ultimately for the judicial body to assume responsibility for the decision reached. This simple-sounding rule however entails great difficulties in the practice of adjudicating science-intensive cases, and the WTO is no exception.

Panels need to reflect on the ample and often contradicting scientific evidence submitted by the parties or experts in accepting or rejecting their claims. In order to provide a persuasive argumentation for their choice, adjudicators need to choose whether they refer to scientific standards, and thus, appeal to the epistemic authority

of science, or instead develop legal criteria along which they could evaluate tightly
interlinked scientific and legal issues.

Several types of adjudicatory reasoning can be identified in WTO
jurisprudence. It will be argued that along with the changing standards of deference,
the AB also endorsed different types of reasoning and rationality. Even though some
scholars favor the use of radical epistemically deferent rationality,\textsuperscript{1408} I will seek to
show that the two-step scrutiny enables a hybrid reasoning, which provides thus far
the most advanced way of buttressing legitimacy of adjudicatory decisions.

4.1 Scientific standards: epistemic deference to science

\textit{D’Aspremont} and \textit{Mbengue} praise the WTO AB for deferring epistemically
to science by relying on scientific standards in scrutinizing expert opinions underlying
SPS risk assessments.\textsuperscript{1409} Ever since the more deferential standard of review was
announced in \textit{Continued Suspension of Obligations}, the AB requires panels to
scrutinize the scientific basis of risk assessment as to whether it can be \textit{“regarded as
legitimate science according to the standards of the relevant scientific community.”}\textsuperscript{1410}(emphasis added). The AB also relied on scientific criteria in examining whether
scientific bases of SPS measures have \textit{“the necessary scientific and methodological
rigor”}.\textsuperscript{1411}(emphasis added) This argumentation clearly evidences that adjudicators
use scientific benchmarks to evaluate whether the scientific evidentiary basis of an
SPS measure is acceptable for purposes of WTO law. Such reasoning is often dubbed
an appeal to \textit{“radical epistemically deferent rationality”},\textsuperscript{1412} as in such cases the
adjudicatory choice among competing claims is justified by scientific references.
Epistemic deference to science helps adjudicators remedy concerns about their lack of
\textit{“epistemic competence”}\textsuperscript{1413} in scientific matters.

\textsuperscript{1408} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in
International Adjudication’, 269.
\textsuperscript{1409} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in
International Adjudication’, 268.
\textsuperscript{1410} \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 591.
\textsuperscript{1411} \textit{US – Continued Suspension of Obligations}, Report of the AB, para. 591.
\textsuperscript{1412} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in
International Adjudication’, 268.
\textsuperscript{1413} Gruszczynski, ‘Standard of Review of health and environmental regulations by WTO panels’, p.
755.
Such scientifically deferential reasoning may be a corollary to intrusive standards of review, since in this case adjudicators are willing to interrogate the “correctness” of the scientific basis of measures, for which reference to scientific standards seems to be inevitable to preserve epistemic non-arbitrariness.

However, such a ‘scientific’ reasoning is not immune to weaknesses and indeed to corresponding criticism. D’Aspremont and Mbengue warn that epistemic deference to science “rests on an illusion of scientific objective validation”, and it does not wipe out concerns about inadvertent delegation of adjudicatory powers to non-elected experts, given the fact that under this rationality, adjudicators need to completely rely on the experts’ judgments, leaving them susceptible to experts’ good faith erroneous scientific evaluation, and even biased opinions. While such fears may be justified from an epistemic point of view, on a more practical level, the free assessment of evidence by adjudicators guards against inadvertent delegation.

Besides practices stemming from radical epistemic deference to science, WTO dispute resolution bodies appeal to various rationalities, which practices are usually not discussed in scholarly opinions. As will be seen below, the AB uses several non-scientific benchmarks to justify its conclusions regarding science-intensive claims. Therefore, even though the radical epistemically deferent reasoning is something the WTO has become known for, WTO reports also display further methods of reasoning.

4.2 Developing legal benchmarks: relying on international standards and semantic analysis

Facing apparent difficulties of evaluating incomplete, contradicting, and highly technical scientific data, WTO dispute settlement bodies seek to identify non-scientific benchmarks by virtue of which they can justify their choices between science-based claims.

One such legal benchmark is reference to scientific standards of international organizations. Panels and the AB often cite standards of international organizations to support its positions as to scientific claims. In EC – Asbestos, it cited the

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1415 For a detailed assessment of the relevant international organizations and their standard setting processes see Gruszczynski, Regulating Health and Environmental Risks under WTO Law: A Critical Analysis of the SPS Agreement, pp. 79–90.
prevailing opinions of the WHO and other international bodies to the effect of
acknowledging the carcinogenic risks associated with asbestos. Reference to
international organizations’ standards has the epistemic benefit of conferring
persuasiveness and legitimacy on a certain scientific knowledge claim. WTO panels
accept such standards on account of the reputation and perceived expertise of the
international organizations. This is well reflected in the fact that panels do not
interrogate the actual standard-setting process i.e. whether the standards in question
was accepted unanimously or only with a majority. It is for this reason provides a
quite convenient method of reasoning. However, from a practical point of view, the
practical efficiency of such reasoning is limited given the finite number of accepted
international guidelines as to suspected health risks. Also, the ever-expanding scope
of potentially toxic materials and food additives limit the reach of such standards as
point of reference in adjudication.

Another legal standard is readily available under the SPS Agreement. Article 3
of SPS Agreement encourages Members to base their SPS measures on international
standards, guidelines or recommendations, as far as possible. Strictly speaking, the
use of international standards in such cases is not a matter of judicial choice of
reasoning, as the standard is enshrined in the text of the governing substantive law.

There were a number of disputes concerning whether a certain measure was
indeed “based on” a relevant international standard under Article 3 of SPS
Agreement. In such cases, panels are usually preoccupied with the grammatical
interpretation of the rule. This altogether results in a highly semantic analysis,
where the scientific claims underlying the dispute become marginal.

The US – Animals can be taken as an example of WTO panel’s semantic
analysis. Argentina challenged a U.S. ban on importation of fresh beef and swine
products from its regions that were failed to be categorized as free from foot-and-
mouth disease. Argentina claimed that the measure was not “based on” relevant
international standards, the Terrestrial Code of the World Organization for Animal
Health. The US argued that its measure was “based on” the Terrestrial Code,

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though its higher level of desired protection required the import ban. The panel found the protocols of the Terrestrial Code did not mandate a ban, quite the opposite, allowed trade with beef alongside with mitigating protocols.\footnote{US – Animals, Report of the Panel, paras. 7.235-7.236.} The panel ruled that if a measure is “contradictory” to the standard, it could not be regarded as “based on” that standard.\footnote{US – Animals, Report of the Panel, para. 7.237.}

This case served to illustrate the importance of legal benchmarks in transforming scientific information into adjudicatory reasoning in a persuasive manner. Relying on international standards, WTO panels can reach their decisions through a ‘purely’ logical and grammatical reasoning, which circumvents problematic engagement with the scientific aspects of risks and risk assessment decisions. The advantage of such reasoning is that it does not navigate adjudicators to unchartered waters of scientific assessments, but provides for an essentially legalistic reasoning, one in which adjudicators may reach a legitimate conclusion in a completely comfortable way.

Theoretically, there would be a third argumentative choice available to adjudicators: weighing scientific facts similar to ordinary fact-finding, where the claim prevails if supported by the majority of the expert evidence submitted in the given dispute. Such an approach has triggered scholarly criticism for “hiding behind legal reasoning”\footnote{D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 253.} while trying to “shield itself from scientific controversies.”\footnote{D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 253.} The AB expressly declined the possibility of walking down this path in \textit{EC-Asbestos} where it stressed that a panel should not weigh competing scientific opinions according to ordinary rules of standard of proof that would have mandated the “preponderant” expert position to prevail.\footnote{EC - Asbestos, Report of the AB, para. 178.} Another indication of the WTO’s reluctance to equate scientific and ordinary fact-finding lies in the fact that Member States need not necessarily place their risk assessment decisions on the majority view of competing scientific theories in order to pass a lawful SPS measure fully consistent with WTO law. As long as the evidence relied on by a State “comes from a qualified
and respected source”, it can lawfully form the basis of a lawful SPS measure even if it is deemed, at the material time, to be “a divergent [scientific] opinion”.  

4.3 Developing a hybrid benchmark: scrutinizing the coherence of reasoning

There is yet another argumentative technique in WTO jurisprudence, which emerged simultaneously with the two-stage standard of review mandated by the AB since the Continued Suspension of Obligations cases. As discussed above, the prevailing standard of review of the AB is a rather deferential scrutiny as to the scientific basis of SPS measures, and a more intrusive review as to the coherence and objectivity of the reasoning of the risk assessor. From an analytical point of view the question arises: is the ‘coherence of reasoning’ analysis a scientific or a legal benchmark? One may encounter serious difficulties in trying to fit the ‘coherence analysis’ strictly within one of these categories. Hence it is suggested that the scrutiny of the coherence and objectivity of reasoning appeal to a hybrid rationality, which makes it possible for adjudicators to set forth an essentially legalistic reasoning, which at the same time, does not neglect the scientific controversies involved in the underlying facts. Importantly, this reasoning is neither purely legal, nor purely scientific. By having its focus on ‘coherent reasoning’ it is essentially a matter of legal judgment that is informed by the underlying science.

The ‘coherence analysis’ enables panellists to couch their reasoning in legal terms, given that they should emphatically not address the correctness of the underlying science, or resolve longstanding scientific controversies but to review whether the intermediate steps were revealed and adequately documented in a transparent and coherent manner in light of the scientific evidence. This yields two immediate benefits. One the one hand, not having to decide about the ‘correctness’ of scientific evidence or to apply scientific standards, the main concern of epistemic arbitrariness is eliminated. On the other hand, adjudicators can easily craft legal benchmarks to form a legitimate and non-arbitrary opinion as to the coherence of

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1428 The EC raised such argument in favor of a least intrusive review before the Panel in the Continued Suspension of Obligations cases. See: US – Continued Suspension of Obligations, Report of the Panel, para. 4.377.
reasoning. To name a few, requirements as to transparency and documentation can easily be established by panels. Moreover, ‘incoherent’ reasoning may be also detected from a legal point of view, in cases where inferences drawn are not logical, uncertainties are not revealed or neglected from the analysis, or where conclusions suffer from serious inconsistencies or gaps in the underlying facts.

The benefits of the coherence assessment are, thus, essentially two-fold. First, such a scrutiny provides the best epistemic fit for legally-trained adjudicators, since in this case adjudicators do not need to entirely substitute legal rationality for scientific rationality, as they are not investigating the correctness of scientific data directly. Second, this hybrid assessment does not preclude adjudicators from engaging with the scientific facts, which makes it possible to fulfill their mandate enshrined in the SPS Agreement and enforce the scientific evidentiary criteria provided therein.

The SPS Agreement may very well prove to creating one of the most science-intensive legal mandates to an adjudicatory body placing legal decision-makers in an extremely delicate and difficult position. Given the express scientific legality criteria in WTO provisions, and the obligations of panels to seek advice of experts they appoint in SPS disputes, adjudicating these facts is inevitable. One should also borne in mind the extremely delicate balance the SPS Agreement seeks to strike between national regulatory powers of WTO Members and the need to prevent disguised protectionism. The practical impossibility to reconcile both aims frustrates finding ‘the’ appropriate standard of review.

This section sought to demonstrate that the ways in which adjudicators use, evaluate, and reflect on scientific evidence impact the legitimacy of their decisions. It is suggested that adjudicators should choose a way of reasoning in which they can maximize the legitimacy of their decisions. It has also been submitted that a neither purely legalistic, nor a purely scientific argumentation lends suitable argumentation to adjudicators.

Fleshing out content of the coherence analysis may be also informed by the meaning accorded to the general standard of review under Article 11 of DSU in the context of the Safeguards Agreement Article 4.2(a). This requires panels to „review

1430 Article 11.2 of SPS Agreement
whether the authorities have provided a reasoned and adequate explanation of how the facts support their determination.” In US–Lambs, the AB explained that this requirement carry the following meaning:

„a panel can assess whether the competent authorities' explanation for its determination is reasoned and adequate only if the panel critically examines that explanation, in depth, and in the light of the facts before the panel. Panels must, therefore, review whether the competent authorities' explanation fully addresses the nature, and, especially, the complexities, of the data, and responds to other plausible interpretations of that data. A panel must find, in particular, that an explanation is not reasoned, or is not adequate, if some alternative explanation of the facts is plausible, and if the competent authorities' explanation does not seem adequate in the light of that alternative explanation.”

In SPS cases, which entertain policies set based on complex scientific determinations, such a reading of adequate explanation would entail a highly scientific assessment. Judging whether a given reasoning ‘responds to other plausible interpretations of the data’ entails a highly intrusive scrutiny. Such an interpretation also illustrates that the adequacy of reasoning cannot be detached from the scientific dimension of the case.

The aim of this overview on the benchmarks used by WTO panels cannot be to single out the one and most suitable epistemic rationality, as the rationality available for constructing a persuasive argument may differ from case to case. At a minimum, scholars call for ensuring transparency in the reasoning so that expert evidence is evaluated openly, inducing adjudicators to preserve the perception of non-arbitrariness in their reasoning, notwithstanding that “full transparency of legal argumentation” in all likelihood remains an ideal.

1433 US – Safeguard Measures on Imports of Fresh, Chilled or Frozen Lamb from New Zealand, Report of the AB, WT/DS177/AB/R, para. 1086
IV. Interim conclusion

WTO law provides for perhaps the most science-heavy legality criteria; therefore WTO jurisprudence reveals several lessons about adjudicatory engagement with science and the ways in which a panel of lawyers can evaluate extremely science-intensive claims.

1. Scientific fact-finding

Facing scientifically highly intensive claims, the WTO jurisprudence provides ample examples for procedures garnering expert evidence. Here again a strict separation between the role of experts and adjudicators is maintained as evidenced by a consistent pattern of appointing trade experts to decide WTO disputes who do not have scientific background. Nevertheless, by allowing the parties to submit various types of expert evidence and by engaging with science in their review, WTO jurisprudence is still one of the most science-intensive among international adjudicative fora.

2. Standard of review and judicial reasoning

A much-debated aspect of the WTO jurisprudence is whether panels are deferential enough towards Members’ science-based claims. Initially, WTO panels conducted an intrusive review investigating whether SPS measures were “supported” by scientific evidence. Later on, they have started to touch upon the scientific correctness of Members’ scientific claims as they sought to find the single correct scientific truth \(^{1438}\) among competing expert explanations. This marked a red line triggering the AB’s intervention to change the applicable standard of review towards a more deferential review.

The AB’s new two-stage scrutiny, which I argued being a ‘hybrid’ test, combines a deferential review towards the scientific basis of risk assessments and an intrusive inquiry into the coherence of the risk assessor’s reasoning. Although some prefer radical epistemic deference to science, in order to maintain a clear distinction

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between legal and scientific reasoning and thus, to preserve epistemic non-arbitrariness, it has been argued that it results in adjudicators’ dependence on experts and thus, runs the risk of inadvertent delegation of adjudicatory power. For this reason, adjudicatory inquiry into the ‘coherence of reasoning’ provided by risk assessors seems to be a necessary compromise for WTO panels, which cannot escape ruling on scientific legality criteria that are built in various provisions of the SPS Agreement.

Changing canons of standard of review trigger corresponding changes in the panel’s way of reasoning. The different methods of reasoning allow panels to strive for crafting a persuasive and legitimate adjudicatory decision in the given case. I sought to demonstrate that the hybrid standard of review enables WTO panels to construct a legalistic reasoning, while preserving the opportunity to engage with the underlying science that is not only a duty of the panels as trier of facts, but also a necessary requisite of crafting a persuasive decision in science-based cases. WTO jurisprudence altogether indicates that science has become a substantial factor in establishing the “internal legitimacy”\textsuperscript{1439} of states’ measures by scrutinizing whether they have adequate scientific basis. This underlies that proper scientific engagement of adjudicators will affect the legitimacy of their decisions on the long run.

Chapter 8
Handling science in Investor-State Dispute Settlement

"Because of the desirability of gaining a greater understanding of the particular area, the Tribunal agreed to ... a visit to the site on December 21-22, 2010. Surely, none of us will forget the spectacle of Playa Grande Beach, lit by a full moon at about 1:00 A.M. on December 22, where a large female leatherback ... finished digging her nest deposited some 50 soft eggs ... and began to cover them."\(^{1440}\)

Unglaube Tribunal

I. Environmental disputes brought before investment arbitral tribunals

This chapter addresses relevant Investor-State disputes (“ISDS”) settled under the aegis of the PCA, the World Bank’s International Center for Settlement of Investment Disputes (“ICSID”) and NAFTA Chapter 11 tribunals. Investment disputes are brought under International Investment Agreements, Bilateral Investment Treaties (“BIT”) and free trade agreements,\(^{1441}\) when an investor claims compensation for discriminative treatment\(^{1442}\) by the host State or for an alleged breach of specific investment rights guaranteed under the above agreements.\(^{1443}\) There are a steadily increasing number of investment disputes since the ‘90s;\(^{1444}\) among which a growing number of cases involve environmental components.\(^{1445}\) This dynamic field entertains a host of intriguing doctrinal questions,\(^{1446}\) among which this study will center on its narrowly-construed focus, the modalities of adjudicatory engagement with science.

\(^{1440}\) Marion Unglaube v. Costa Rica, Award, 16 May 2012, Case No. ARB/08/1, para. 165. ("Marion Unglaube case").


\(^{1442}\) E.g. by typically claiming that the host did not accord 'fair and equitable treatment' ("FET") to the investor, or denied 'most favoured nation' ("MFN") treatment or the 'legitimate expectations' of the investor. Moreover, investors can claim direct or indirect expropriation, which triggers state obligation to pay full compensation.

\(^{1443}\) Harrison, 'Addressing the Procedural Challenges of Environmental Litigation in the Context of Investor-State Arbitration', p. 89.


\(^{1445}\) While there were 9 pending proceedings between 1990 and 2000, there were more than forty between 2001 and 2013. Dupuy and Vinuales, International Environmental Law, p. 385.

\(^{1446}\) There are many ambiguities about the relationship of domestic environmental measures and international investment treaties, which affect the extent to which domestic environmental policy can
Although foreign investments can be in line with environmental protection goals, and may be even beneficial for such objectives, if capital is transferred into emerging green technology markets; albeit typically, investments create externalities for host States in the form of increased pollution, toxic waste disposal, destruction of biodiversity, etc. These adverse environmental impacts fuel an increasing number of ‘investment v. environment’ disputes.

Drawing on the extensive work of Pierre-Marie Dupuy and Jorge Vinuales, one may identify a marked group of ISDS decisions, which is characterized by the arbitrators’ suspicion towards environmental regulation suspecting protectionism behind environmental reasoning. In such cases, environmental objectives had to yield to investment protection that was deemed superior in times of conflict. However, recent arbitral decisions have became more inclined to regard environmental measures as genuine and legitimate exercise of police powers. Consequently, environmental or public health risks are increasingly deemed legitimate – and, thus, non-compensable – reasons for regulation.

The ways in which tribunals approach environmental regulations is particularly important, because unduly dismissive arbitral decisions with respect to sovereign regulatory power will have a considerable chilling effect on States’ willingness to enact environmental regulations, which constitutes one of the leading environmental concerns of incorporating ISDS provisions in major free trade agreements. First, not every investment treaty makes express reference to host state’s right to regulate environmental concerns. Second, arbitration clauses may explicitly carve out environmental disputes. (See A. Asteriti, ‘Environmental Law in Investment Arbitration: Procedural Means of Incorporation’ (2015) 16 The Journal of World Investment and Trade 248–73 at 254; M. Szabó, ‘Bilateral Investment Treaties from an Ecological Aspect: A Central and Eastern European Approach’ in Y. Levashova, T. Lamboooy, I. Dekker (eds.), Bridging the Gap between International Investment Law and the Environment, (Eleven Publishing, 2015), pp. 289–312. In this respect a notable development that CJEU just announced the incompatibility of intra-EU BITs with EU law in Case C-284/16, Slovakia v. Achmea BV, in March 2018.

1451 The extent of regulatory chill has become a subject of empirical studies see: G. Van Harten and D. Scott, Investment Treaties and the Internal Vetting of Regulatory Proposals: A Case Study from Canada (2015).
agreements. Notwithstanding these legitimacy concerns, recent use of ISDS provisions also suggests that investment disputes can be a vehicle to foster climate change mitigation measures or to compel governments to thoroughly enforce their environmental legislation.

1. Entry points for science in Investor-State environmental arbitration

Investment disputes involving environmental elements feature complex questions of policy and science. This survey will focus on the treatment and role of scientific arguments and will suggest that science may enter investment arbitration disputes in essentially six different ways.

The first way in which science may become relevant manifests when adjudicators ought to decide whether scientific facts indicate the existence of genuine environmental risks, which may in turn give rise to legitimate regulatory efforts on part of the host State. For instance, in the Methanex case, discussed below, a central scientific issue was whether the use of methyl tertiary butyl ether (“MTBE”) as fuel additive posed a significant risk of drinking water contamination in California.

Second, science may enter a dispute in assessing whether a given regulation was a reasonable response to the risk identified. This is often measured by proportionality analyses. Scientific arguments may thus be employed in distinguishing non-compensable genuine environmental regulation from indirect (regulatory) expropriation. At this stage host States may invoke the so-called

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1452 120 academics as well as the German Parliament voiced concerns about the ISDS provision of the TTIP, see IISD blog, 13 August, 2013  https://www.iisd.org/itn/2014/08/13/news-in-brief-16/ (last accessed at 27 July 2017).


1454 S. Lester, ‘What if ISDS Lawsuits Were Used to Fight Climate Change’ (Autumn 2016).


1456 Tecnicas Medioambientales Tecmed SA v United Mexican States, ICSID Case No. ARB(AF)/00/2, Award of 29 May 2003, („Tecmed case“), para. 122.

police powers doctrine\textsuperscript{1458} as a defense claiming that their measures that otherwise tantamount to expropriation are nevertheless non-compensable.

A third way of bringing scientific arguments to investment arbitration is by arguing that treating foreign investments differently is justifiable for scientific reasons.\textsuperscript{1459} An apt example for such entry point of science is the ‘like circumstances’ analysis under national treatment clauses.\textsuperscript{1460}

Marcos Orellana distinguishes a related fourth aspect, when science serves as a useful indicator to decide whether a BIT’s stabilization clause is untenable with a view to new scientific knowledge regarding previously unforeseen risks.\textsuperscript{1461} New scientific information may warrant regulation despite stabilization clauses of BITs. If the regulation at hand failed to meet this (science-based) test, it would qualify as indirect, and therefore compensable, expropriation.\textsuperscript{1462}

In the above scenarios, science is used as a ‘proxy’ for assessing host State’s motivation behind its regulation.\textsuperscript{1463} The epistemic value of employing scientific arguments is that science serves as a somewhat objective\textsuperscript{1464} yardstick, with which arbitrators could delineate the scope of reasonable, and thus, lawful exercise of police powers.

Science is not only relevant in the context of risk regulation, but also when environmental liability claims are filed with investment tribunals. A fifth entry point of science into legal disputes occurs in the clothes of host States’ counterclaims alleging environmental damage caused by the investor. Taking as an example, in the Perenco case, Ecuador filed an environmental counterclaim against Perenco, who was operating oil blocks in the Amazonian rainforest. The counterclaim centered on an oil

\textsuperscript{1459} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 145.
\textsuperscript{1460} Lévesque, ‘Science in the Hands of International Investment Tribunals: a Case for ‘Scientific Due Process’’, 264–65. Lévesque discusses the like circumstances analysis under NAFTA Chapter 11. In such cases, an investor may argue that a product ban instituted out of health or environmental considerations was arbitrary, if there are competing products that are not affected by the ban, but there are no scientifically valid reasons for treating these two products differently.
\textsuperscript{1461} Orellana, ‘The Role of Science in Investment Arbitrations Concerning Public Health and the Environment’, 62.
\textsuperscript{1462} Orellana, ‘The Role of Science in Investment Arbitrations Concerning Public Health and the Environment’, 62.
\textsuperscript{1463} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 144.
\textsuperscript{1464} Orellana, ‘The Role of Science in Investment Arbitrations Concerning Public Health and the Environment’, 72.
spill originating from the blocks causing serious ecological damage.\textsuperscript{1465} Ecuador also filed liability counterclaims against Burlington Resources Inc, alleging that it is jointly and severally liable with Perenco for the severe ecological harm caused by abandoning the oil blocks. In \textit{Burlington v. Ecuador}, the Tribunal awarded nearly USD 40,000,000 for remediation of environmental damage caused in the Amazonian region.\textsuperscript{1466} Such environmental counterclaims are noteworthy given that even general counterclaims are not yet common in investment arbitrations,\textsuperscript{1467} although they are increasingly filed with tribunals.\textsuperscript{1468}

A final, thus far exceptional, way for scientific arguments to enter ISDS is in the form of investors’ claims for a breach of an investment protection standard by the host State’s failure to enforce environmental laws.\textsuperscript{1469} The \textit{Peter Allard} and the \textit{Renco} arbitrations highlight two distinct ways in which such arguments can be raised under investment treaties.

In \textit{Peter Allard (Canada) v. Barbados},\textsuperscript{1470} the claimant, an owner of a bird sanctuary, alleged that inadequate actions of the host State caused or permitted environmental degradation to the swamp area, where his business was located. This allegedly has led to a decline in biodiversity, which in turn rendered his eco-resort unprofitable, thus it had to cease its operation. The claimant submitted that Barbados’ failure to enforce domestic environmental laws and to comply with international environmental legal obligations breached the Canadian-Barbados BIT.\textsuperscript{1471} The parties submitted ample scientific evidence on whether ecological degradation has indeed occurred, and if so, whether it was caused by actions or inactions of Barbados.

\textsuperscript{1465} E.g. \textit{Perenco Ecuador Limited v. The Republic of Ecuador}, ICSID Case No. ARB/08/6 (“Perenco case”), Interim Decision on the Environmental Counterclaim, para. 34.
\textsuperscript{1466} Decision on Counterclaims, Burlington Resources Inc v Republic of Ecuador, ICSID Case No. AARB/08/05, February 6, 2017, para. 1075.
\textsuperscript{1467} Filing environmental counterclaims may not always be possible. Their feasibility largely depends on the wording of the dispute settlement clause. Besides, there must be a direct factual and legal connection between the claim and the environmental counter-claim. See generally Asteriti, ‘Environmental Law in Investment Arbitration: Procedural Means of Incorporation’, 257.
\textsuperscript{1468} \textit{Marion Unglabe v. Costa Rica}, Award, 16 May 2012, Case No. ARB/08/1; \textit{Marvin Roy Feldman Karpa v Mexico}, Award, 16 December 2002, Case No. ARB(AF)/99/1. States have started to incorporate clauses explicitly allowing environmental counterclaims in their BITs. Asteriti, ‘Environmental Law in Investment Arbitration: Procedural Means of Incorporation’, 272.
\textsuperscript{1469} Vinuales, \textit{Foreign Investment and the Environment}, p. 89.
\textsuperscript{1470} \textit{Peter A. Allard v. Barbados}, PCA Case No. 2012-06., Award, June 27 2016 („Peter Allard v. Barbados case”).
\textsuperscript{1471} Notice of Dispute, filed by Peter A. Allard, Sept. 8, 2009, para. 14. Under the BIT, Barbados was obliged to „provide full protection and security to investment of Canadian investors”.

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In *Renco v. Peru* case, the investor operating the La Oroya mining operation filed a claim against Peru for breaching a provision of the investment treaty according to which the host State was ought to remediate existing contamination and to assume full liability for environmental claims of third parties arising before and after the sale of the mine. Since Peru refused to take responsibility for the lawsuits that were filed with U.S. courts on behalf of 1,000 individuals against Renco for alleged personal injuries caused by toxic substances released from the mine, Renco initiated an ICSID arbitration to show that these personal injury lawsuits fell under the scope of the investment treaty provision that retained Peru’s full liability for environmental damage claims.

Finally, it is to be noted that arbitrators do not necessarily confront with science in every case that involves environmental components. In a number of ‘environment vs. investment’ disputes, the legal inquiry does not reach the depth of underlying science. Such a framing of ISDS, which effectively carves out science from the scope of legally relevant questions, can be attributed either to the parties’ argumentative strategy, or to the choice of arbitrators, therefore such decisions are also relevant for the purposes of analyzing adjudicatory engagement with science. In the following, I review the peculiar ways in which participants of a dispute, in either side of the bench, use scientific arguments.

2. **Strategic use of scientific arguments on both sides of the bench**

Some of the initial Investor-State disputes, which concerned alleged expropriation by environmental regulations did not contain any meaningful scientific arguments, because host States merely claimed their right to regulate without providing any scientific arguments in favor of the respective environmental policies. In *Metalclad v. United Mexican States*, Mexico barred a hazardous waste landfill from operation by enacting an Ecological Decree. Even though the Town Council referred to *i.a. “environmental effect and impact on the site and surrounding communities”* among the reasons for denying the permit, it submitted no evidence on

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1472 *The Renco Group, Inc. v. The Republic of Peru*, ICSID Case No. UNCT/13/1 („Renco case”).
1473 *Renco* case, Claimant’s Memorial on Liability, Febr. 20, 2014, para. 3.
1475 *Metalclad Corporation v. United Mexican States* ICSID Case No. ARB(AF)/97/1, Award of Aug. 30, 2000 (“Metalclad case”).
this respect\(^{1476}\) and thus, the Tribunal found it as an act of expropriation.\(^{1477}\) Also, in \textit{Tecmed v. Mexico}\(^{1478}\) the host State refused to renew the permit of a hazardous waste landfill with reference to environmental safety reasons,\(^{1479}\) although again, Mexican authorities found no “evidence of any risk to health and the ecosystems” beforehand.\(^{1480}\)

There were occasions, when environmental regulations were enacted in order to create national park reserves to protect host States’ vulnerable ecosystems to the detriment of private real estate development. In \textit{Santa Elena v. Costa Rica}\(^{1481}\) and the later \textit{Unglaube v. Costa Rica}\(^{1482}\) arbitration, the investors did not contest the ecological justifications for state measures, and hence scientific results were not brought to the forefront of the dispute. The \textit{Santa Elena} tribunal emphasized that “[e]xpropriatory environmental measures – no matter how laudable and beneficial to society as a whole – are, in this respect, similar to any other expropriatory measures that a state may take in order to implement its policies.”\(^{1483}\)

The \textit{Unglaube v. Costa Rica} dispute centered on Mrs. Unglaube’s investment in the ecotourism industry in Playa Grande, a picturesque beach on Costa Rica’s Pacific coast, on which an endangered species, the Leatherback Turtles lay their eggs. Reduced numbers of females nesting at Playa Grande suggested a sharp decline in leatherback populations. Among the parties to the dispute there was “considerable debate, however, concerning the reasons for this decline.”\(^{1484}\) Bearing in mind Costa Rica’s well-known reputation as an eco-tourism destination, the government took steps to create a national park to protect this nesting habitat\(^{1485}\) and thereby suspended the construction permits of the investor.\(^{1486}\) The parties were in agreement concerning the worthiness of protecting the nesting area. However they disagreed as to the extent of rights available to owners of property in Costa Rica under Germany-Costa Rica BIT and as to the scope of the rights of the government to regulate the use

\(^{1476}\) \textit{Metalclad} case, Award, paras. 92-93.  
\(^{1477}\) \textit{Metalclad} case, Award, para. 104.  
\(^{1478}\) \textit{Tecmed} case.  
\(^{1479}\) \textit{Tecmed} case, Award, para. 36.  
\(^{1480}\) \textit{Tecmed} case, Award, para. 110.  
\(^{1481}\) \textit{Santa Elena} case, Award.  
\(^{1482}\) \textit{Marion Unglaube} case, Award.  
\(^{1483}\) \textit{Santa Elena} case, Award, para. 72.  
\(^{1484}\) \textit{Santa Elena} case, Award, para. 164.  
\(^{1485}\) \textit{Marion Unglaube} case, Award, para. 37.  
\(^{1486}\) \textit{Marion Unglaube} case, Award, para. 183
of investors’ property.\textsuperscript{1487} The Tribunal emphasized that "\textit{while the subject of the protection of endangered species is an important one, the Tribunal finds that the crucial elements of this dispute involve more mundane issues of fact and law as they relate to the legality of the actions in dispute between the Parties.}"\textsuperscript{1488} Hence, it ruled that the Costa Rican Government’s actions amounted to a de facto expropriation.\textsuperscript{1489}

In an attempt to better justify their environmentally induced injurious measures, governments have started to develop scientific arguments supporting their measures. In the following, some typical ways for raising scientific arguments are identified.

\textbf{2.1 Emphasizing due process: expanding room for police powers}

Scrutinizing procedural aspects of scientific research (\textit{e.g.} peer review, transparency, etc.) as benchmarks of acceptable scientific basis for regulation may be used by host States to expand their room for regulation. In this vein, as long as host States’ scientific conclusions are produced in a proper and transparent procedure, environmental regulations would withstand judicial scrutiny unless the results prove to be manifestly wrong. This position was clearly articulated by the U.S. in the \textit{Methanex} arbitration, where the U.S. promoted a confined scope for the tribunal’s review by stressing that "\textit{the question is not whether the scientific conclusions were right or whether they were wrong. Instead, the question before this Tribunal is whether the scientific conclusions were so wrong that they could only be viewed as a pretext.}"\textsuperscript{1490} If such argumentation prevails, science-based regulations would be safe from challenge as long as investors could not substantiate a manifest error in the process of producing underlying scientific reports.

\textbf{2.2 Emphasizing uncertainties and attacking scientific integrity}

Alluding to the political motivations behind scientific assessment could be an efficient way of depriving scientific arguments from their persuasive nature. The

\begin{itemize}
\item \textsuperscript{1487}Marion Ungalube case, Award, para. 39.
\item \textsuperscript{1488}Marion Ungalube case, Award, para. 167.
\item \textsuperscript{1489}Marion Ungalube case, Award, para. 209.
\item \textsuperscript{1490}Methanex Corp. v. U.S., Rejoinder of the Respondent United States of America (23 April 2004), para. 79.
\end{itemize}
Methanex arbitration is perhaps where such arguments were most fully advanced by the investor. Methanex, a methanol producer company challenged the science behind the Californian regulation phasing out MTBE based on alleged risks of drinking water contamination. Methanex argued that California’s policy is nothing more than a politically motivated “sham environmental protection”. It argued that the real cause of any water contamination is the poor enforcement of safety standards with regard to underground gasoline storage tanks; therefore, the ban is irrational and discriminatory against MTBE compared to other toxic fuel additives, which may also escape from the tanks, but are not targeted by the regulation.

Besides questioning the depth and consistency of the scientific report provided by University of California in support of the ban, Methanex also appealed to political arguments claiming undue influence of the "ethanol lobby" and "political corruption" behind the ban. These arguments ultimately did not suffice the panel to find a breach of NAFTA clauses, as will be discussed later.

Similarly, in Chemtura v. Canada, the claimant questioned the objectivity of the risk assessment, claimed “political pressures” on agency decision-making. By doing so, Chemtura did not question the actual effects of lindane, the ban of which was the harmful sanction complained of in the arbitration; rather, it focused its criticism on the review process itself, seeking to prove that it “was not a good faith scientific process.”

2.3 Claiming monopoly over fact-finding

A widely held view on the lack of scientific expertise on arbitral panels induces some parties to use it as leverage and to claim monopoly over fact-finding by contending a narrow scope for judicial fact-finding in adjudicating science-based investment disputes. Perenco v. Ecuador evidences such an approach, where the

147., Transcript Day 1.
1492 Methanex Corporation v. U.S, Final Award, Part II – Chapter D, para 24.
1493 Allegations of Methanex as cited in the Methanex Corporation v. U.S, Final Award, para. 21.
1495 Chemtura case, Award, para. 126.
1496 Chemtura case, Award, para. 133.
1497 Chemtura’s position cited in the Chemtura case, Award, para. 132.
investor submitted that the tribunal should not "take as its task picking and choosing between the experts on each issue one by one, cafeteria-style, to arrive at some hybrid approach." In the material case, the two sides submitted diametrically opposing scientific evidence regarding the underlying environmental damage, which explains the strategic benefits of persuading the panel in reducing its evidentiary assessment to an ‘either-or’ choice between the competing claims. The Perenco panel, however, dismissed both sides’ experts and rather asked for independent expert evidence.

2.4 Precautionary reasoning of States

States may refer to scientific uncertainties warranting a regulation and thereby justify their measures imposed on foreign investments on the basis of the precautionary principle. The success of such claims however appears to be limited. In Windstream Energy v Canada, the panel did not accept the precautionary reasoning with respect to risks of freshwater off shore wind power installations of Windstream Energy LLC on Lake Ontario. Canada halted the claimant’s wind installation project following a public consultation that showed an overwhelming opposition against the project. Canada referred to concerns about the limited knowledge regarding freshwater wind power stations’ environmental impacts. However, the panel found that the government “did relatively little to address the scientific uncertainty” surrounding environmental effects, and the lack of promised research seems to play a major role in the panel’s decision on finding a breach of the fair and equitable treatment standard of NAFTA.

In a still pending fracking related Lone Pine case, Canada withdrew the shale gas exploration license of Lone Pine Ltd. based on an act revoking exploration licenses located in the St. Lawrence River. Canada justifies its ban on hydrocarbon development in the maritime estuary basin with a need for “precaution that the

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1503 Award, paras. 369, 397.
1504 Windstream Energy case, Award, para. 378.
1505 Windstream Energy case, Award, para. 380.
1506 Lone Pine Resources Inc. v. Canada, ICSID Case No. UNCT/15/2.
Quebec government has determined in the light of the lack of knowledge and the conclusions of the studies”. It still remains to be seen whether the panel would allow the host government’s precautionary measures.

3. Carving out scientific aspects from the scope of judicial inquiry

The above examples described situations, when the parties’ arguments determined the amount of science entering an Investor-State dispute. However, there are instances, when the extent to which science plays a decisive role hinges on the panel’s approach towards the scientific dimension of the dispute. The first line of arbitral decisions gave outright precedence to investor’s rights over environmental protection. These cases therefore did not delve into the reasons for enacting environmental legislation, as panels regarded such State measures as inevitably infringing rights guaranteed under the respective investment treaty. Later, in Santa Elena v. Costa Rica the panel refused to address the reasons why Costa Rica created a natural reserve encompassing the investor’s environmentally unique Santa Elena beach side property, since it ruled that the measure constituted unlawful expropriation irrespective of the environmental motive. Alongside with possible justifications stemming from environmental protection, the scientific evidence offered was also irrelevant for the tribunal.

Importantly, however, arbitral tribunals now give due regard to the scientific arguments of the parties. This leads to further complications by raising the question of applicable extent of deference granted to States as well as the methods of garnering expert evidence.

1507 Lone Pine Resources Inc. v. Canada, ICSID Case No. UNCT/15/2, Counter-Memorial, July 24, 2015, para. 363. “The decision to prohibit oil and gas exploration and development activities in the St. Lawrence River testifies to the level of precaution that the Quebec government has determined in the light of the lack of knowledge and the conclusions of the studies at its disposition” (original in French, English translation by the author).
1508 Sands, Litigating Environmental Disputes: Courts, Tribunals and the Progressive Development of International Environmental Law, p. 10.
1509 Santa Elena case, Award.
1510 Santa Elena case, Award, para. 71.
1511 Costa Rica had an expert witness, Professor Daniel Janzen, who provided evidence as to the ecological features of the Santa Elena property. See Santa Elena case, Award, para. 46.
II. Standard and extent of adjudicatory review of scientific claims

1. Affording deference to host States

Investment-State arbitration generally favors setting a high bar for investors’ claims regarding alleged breaches of fair and equitable treatment and minimum standard of treatment clauses. As was highlighted in Waste Management II v Mexico, breaches can be supported by a showing of “lack of due process”, “complete lack of transparency and candour in an administrative process”. The Unglaube Tribunal further clarified that in order to establish a breach of fair and equitable treatment, “claimant must show more than mere legal error. Instead, as stated by the Saluka Tribunal, the evidence must establish actions or decisions which are ‘manifestly inconsistent, non-transparent, [or] unreasonable (i.e., unrelated to some rational policy)’. Furthermore, in Glamis v. US, the tribunal stressed that “[t]he idea of deference is found in the modifiers ‘manifest’ and ‘gross’ that make this standard a stringent one; it is found in the idea that a breach requires something greater than mere arbitrariness, something that is surprising, shocking, or exhibits a manifest lack of reasoning.” However, investment tribunals regularly acknowledge that such deference is not unlimited.

In this vein, tribunals generally opt for granting high degree of deference to States in terms of designing their environmental regulation. The first occasion, when a panel expressly referred to deference was in the S.D. Myers v. Canada case, a dispute under NAFTA Chapter 11. Canada banned exporting PCB waste, an environmentally hazardous chemical, with reference to its dangers to human health and the environment. The ban was instituted right after S.D. Myers obtained a license to import PCB waste to the U.S. in order to destroy the hazardous compounds there. The Tribunal concluded that the primary reason for the export ban was

1512 Waste Management Inc v. United Mexican States, ICSID, Award, 30 April 2004, Case No.ARB(AF)/00/3, para. 98.
1513 Marion Unglaube case. Award, para. 246.
1514 Glamis Gold Ltd. v. U.S.A, NAFTA/UNCITRAL, Award 16 May 2009, („Glamis Gold case”), para. 617
1515 Marion Unglaube case, Award, para. 247.
1517 S.D. Myers, Inc. v. Government of Canada, First Partial Award, para. 94.
protecting Canadian PCB disposal industry from competition,\textsuperscript{1519} since Canada only asserted such risks but never investigated them.\textsuperscript{1520} Nevertheless, the panel emphasized that in the context of NAFTA fair and equitable treatment clause (Article 1105) a “high measure of deference” must be accorded to host States in designing their domestic public policies.\textsuperscript{1521}

Similarly, in \textit{Chemtura v. Canada}\textsuperscript{1522} the Tribunal – composed of Professor Crawford, Prof. Kaufmann-Kohler and Mr. Brower – emphasized that it is beyond its task to “second-guess the correctness of the science-based decision-making of highly specialized national regulatory agencies.”\textsuperscript{1523} In the material case, Canada banned a pesticide, lindane after reviewing its environmental hazards. Such an adjudicatory approach therefore signals an implicit deference to the expertise and risk assessment of regulating host States.\textsuperscript{1524} The Chemtura Tribunal also rejected that minimum treatment standards would entail scientific legality criteria. The claimant argued that “a lack of sufficient evidence to support a decision and/or basing a decision on irrelevant considerations, resulting in a decision that is clearly improper and discreditable”\textsuperscript{1525} would amount to a breach of that standard. However, the Tribunal disagreed and emphasized that the regulatory procedure would only breach investment protection standards if it showed “\textit{bad faith or disingenuous conduct}” on part of the host State.\textsuperscript{1526}

Though these criteria do raise a high bar for investors’ challenge, the Chemtura Tribunal also emphasizes that “\textit{the assessment of the facts is an integral part of its review under Article 1105 of NAFTA. In assessing whether the treatment afforded to the Claimant's investment was in accordance with the international minimum standard, the Tribunal must take into account all the circumstances, including the fact that certain agencies manage highly specialized domains involving scientific and public policy determinations.}”\textsuperscript{1527} This opens the door to scrutinizing to some extent the way in which regulatory agencies formulate their scientific opinions.

\textsuperscript{1519} S.D. Myers, Inc. v. Government of Canada, First Partial Award, para. 162.
\textsuperscript{1520} S.D. Myers, Inc. v. Government of Canada, First Partial Award, para. 187.
\textsuperscript{1521} S.D. Myers, Inc. v. Government of Canada, First Partial Award, Nov. 13, 2000, para. 263.
\textsuperscript{1522} Chemtura case, Award.
\textsuperscript{1523} Chemtura case, Award, para. 134.
\textsuperscript{1524} Fukunaga, ‘Standard of Review and ‘Scientific Truths’ in the WTO Dispute Settlement System and Investment Arbitration’, 573.
\textsuperscript{1525} Chemtura case, Award, para. 112.
\textsuperscript{1526} Chemtura case, Award, para. 138.
\textsuperscript{1527} Chemtura case, Award, para. 123.
The deference of investment tribunals is also reflected in the fact that they do not require host States to base regulations on prevailing scientific views. The Chemtura Tribunal noted that “scientific divergence to which the Claimant referred cannot in and of itself serve as a basis for a finding of breach of Article 1105 of NAFTA”. Having ascertained that expert witness suggests that risk assessment conclusions of Respondent “were within acceptable scientific parameters”, it found no breach of investment protection standards for the phasing out of lindane.

In sum, investment jurisprudence tends to accord a high measure of deference to host States’ scientific claims, though such deference is not unlimited. This also implies that some benchmarks are needed to evaluate the acceptability of scientific claims, which issue I shall now turn to.

2. Standards of review: indicia of regulatory science’s credibility

Given that ISDS panels do not accord total deference to host States’ scientific claims, a corresponding question immediately arises as to what benchmarks are available against which arbitrators can measure the soundness of host States’ scientific claims? The answer necessitates a delicate balancing, given that international tribunals should “walk a fine line between adjudicating legal claims and deciding scientific disputes.”

Countering host States’ argument that “a high measure of deference to the facts and factual conclusions seems the only way to prevent investment tribunals from becoming science courts”, investment tribunals developed several tools to legally evaluate the ways in which host States’ use regulatory science without, however, becoming ensnared in evaluating validity of scientific opinions. The prevailing method is focusing on the process in which regulatory science has been produced and been accounted for. A more common sense approach views international regulatory trends as a reliable proxy for the credibility of scientific position on environmental risks.

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1528 Chemtura case, Award, para. 154.
1531 Glamis Gold case, Award, para. 594.
2.1 Using a procedural benchmark: transparency of the regulatory process

The Chemtura Tribunal stresses at the outset that “it is not its task to determine whether certain uses of lindane are dangerous”.\footnote{Chemtura case, Award, para. 134.} Also, judging “the correctness or adequacy of the scientific results” fell outside of arbitration panels’ jurisdiction.\footnote{Chemtura case, Award, para. 153.} In order to assess the adequacy of the scientific basis of risk assessment procedures, panels increasingly examine whether host States used credible scientific evidence in the regulatory process.\footnote{Orellana, ‘The Role of Science in Investment Arbitrations Concerning Public Health and the Environment’, 72.} This provides a convenient solution for laymen adjudicators to form an opinion on competing scientific claims without, however, needing to decide about the truth of scientific claims.

The Chemtura Tribunal conducted a detailed assessment focusing on the scientific review process leading to the ban on lindane. The award recalls minutes prepared on meetings, testimonies of experts and witnesses involved in the policy-making procedure.\footnote{Chemtura case, Award, para. 147 et seq.} The inquiry was based on a two-prong test. The Tribunal first determined “whether the Special Review was conducted in such a manner as to reflect bad faith”\footnote{Chemtura case, Award, para. 145.} on the part of the Respondent’s expert agency. Second, it interrogated whether “the review of lindane (even if in good faith), breached the due process rights of the Claimant. Such inquiry must take into account the review process as a whole.”\footnote{Chemtura case, Award, para. 145.}

A similar path has been taken by the Glamis Tribunal. The Glamis v. U.S. case concerned a refusal of permitting a pit mine to prevent adverse effects on the environment and on Indian tribes living nearby. The Tribunal opposed to make a definitive decision on the scientific truth claimed by the parties. Instead, it stressed that the panel “may assess only whether there was reasonable evidence, and this, the government’s reliance on such was not obviously and actionably misplaced.”\footnote{Glamis Gold case, Award, para. 786.} The panel’s inquiry into the risk assessment procedure was practically narrowed down to an assessment of transparency and non-arbitrariness, partly due to the fact that the
U.S. itself framed the legal issues focusing on these two features of its risk assessment throughout the proceedings.\textsuperscript{1539}

Using procedural benchmarks to evaluate the soundness of scientific risk assessments helps host States considerably in regulating environmental risks pervaded by extensive scientific uncertainties. The \textit{Methanex} arbitration is among the few judicial decisions, where express reference to pervasive uncertainties in the underlying regulatory science\textsuperscript{1540} did not bar adjudicators from finding in favor of the host State. The \textit{Methanex} Tribunal handed down an award, which was surprisingly pro-regulatory compared to previous ISDS decisions.\textsuperscript{1541}

Despite numerous challenges set forth by the investor, the panel ultimately found that California’s risk assessment on MTBE’s public health risks was “\textit{serious, objective and scientific}”.\textsuperscript{1542} The finding that the ban on MTBE was not arbitrary, was based on a review of procedural attributes, such as the “\textit{open and informed debate}” preceding the legislation and the prior conduct of a peer-review of relevant data.\textsuperscript{1543} The \textit{Methanex} Tribunal illustrates how the impartiality of the process of risk assessment becomes indicia of scientific credibility. This decision suggests that as long as arbitrators are ascertained that all procedural attributes of a good faith regulatory procedure has been fulfilled, uncertainties in science are not fatal to host States’ reasonable environmental regulations.

The \textit{Methanex} Tribunal defined a rather deferential standard for judicial review, by stressing that it would only find a breach where scientific conclusions claimed by the host State as a reason to regulate “\textit{were so faulty that the Tribunal may reasonably infer that the science merely provided a convenient excuse for}”\textsuperscript{1544} disguised protectionism. The arbitrators were investigating whether the scientific grounds for regulation were “\textit{scientifically incorrect}”,\textsuperscript{1545} rather than ascertaining whether they were ‘\textit{correct}’, which may be seen as granting a certain measure of deference to sovereign States by reversing the burden of scientific uncertainty from regulators to investors.

\begin{itemize}
\item \textsuperscript{1539} \textit{Glamis Gold} case, Award, para. 663.
\item \textsuperscript{1540} \textit{Glamis Gold} case, Final Award, Part III – Chapter A, para. 54.
\item \textsuperscript{1541} D. French, ‘Environmental Dispute Settlement: The First (Hesitant) Signs of Spring?’ (2006) 19 3–32 at 27.
\item \textsuperscript{1542} \textit{Glamis Gold} case, Final Award, Part III – Chapter A, para. 101.
\item \textsuperscript{1543} \textit{Glamis Gold} case, Final Award, Part III – Chapter A, para. 101.
\item \textsuperscript{1544} \textit{Glamis Gold} case, Final Award, Part IV – Chapter E para. 19.
\item \textsuperscript{1545} \textit{Glamis Gold} case, Final Award, Part III – Chapter A, para. 101.
\end{itemize}
The *Methanex* award garnered considerable applause from commentators. Both *Orellana*,¹⁵⁴⁶ *D’Aspremont* and *Mbengue*,¹⁵⁴⁷ and *Lévesque*¹⁵⁴⁸ set the award as a positive example of approaching science in a proper way. *Alemanno* praises the judgment for requiring peer review for scientific evidence to be relied on by adjudicators. He suggests that the peer review of scientific evidence might be a relatively easy procedural tool assisting judges in assessing the validity of certain scientific claims.¹⁵⁴⁹

### 2.2 Taking international regulatory trends as signs of credible scientific positions

The Chemtura Tribunal also attached significance to international regulatory trends.¹⁵⁵⁰ The fact that 20 States and the EU have banned or restricted the use of lindane seemed to be a decisive factor for the arbitrators to make their finding. Their wording is worthy of being reiterated in full here: “[i]respective of the state of the science, however, the Tribunal cannot ignore the fact that lindane has raised increasingly serious concerns both in other countries and at the international level since the 1970s. The Respondent has amply established the existence of such concerns, by referring”¹⁵⁵¹ to the practice of the international community.

Similarly, the conclusion of multilateral environmental treaties, such as the Aarhus Protocol to the LRTP Convention, the OSPAR Convention and the Stockholm Convention on Persistent Organic Pollutants, which all regarded lindane as a harmful substance,¹⁵⁵² seemed to inform the Tribunal’s view that Canada acted in good faith while banning lindane with reference to its health hazards.

*Jorge E. Vinuales*, who himself served as Secretary to the Tribunal dubbed this approach in a later scholarly writing an “*implicit*” appeal to “*common sense*”.¹⁵⁵³

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¹⁵⁵⁰ See the list of such countries banning the lindane in *Chemtura* case, Award, para. 135.
¹⁵⁵¹ *Chemtura* case, Award, para. 135.
¹⁵⁵² *Chemtura* case, Award, para. 137.
Attaching great significance to the widespread ban of a toxic compound casts doubts on whether the measure could have equally been justified, had Canada been the first State regulating lindane’s environmental hazards. This highlights one of the weaknesses of a deferential review, namely, that it is blind to newly emerging environmental risks.

Yet other tribunals refused to consider third States’ risk assessment relevant in deciding about the reasonableness of the host State’s risk regulation. The Methanex panel stressed that the fact that the EU did not ban the use of MTBE “sa[id] nothing about the legality or the appropriateness of California’s action” subject to the arbitration.

3. What is the appropriate extent of adjudicatory review?

Scholarly opinions are divergent as to the ideal way of handling scientific claims in Investor-State disputes.

Fukunaga calls for an explicit deferential review by international tribunals, so that arbitrators would only need to assess “the objectivity, coherence and reasonableness of the scientific truth” claimed by the regulating host State. This approach reserves a wide room for police powers of host States – which I regard as a legitimate policy choice considering a sovereign’s right to pursue legitimate environmental objectives – albeit, it carries some risks. The deferential approach can be a double-edge sword. Host States may advance minority scientific views supporting policies derogating from existing levels of environmental protection. In times of growing scientific skepticism, which sometimes even seems to tantamount to a “war on science”, one can readily think of circumstances where deference can be abused to serve de-regulatory purposes. While the relaxation of environmental standards harm investors only in exceptional cases, such a scenario may very well occur and being mindful of the adverse environmental (third-party) effects of such a

1554 Methanex case, US Rejoinder, para. 102.
1556 D. A. Farber, Escalating the War on Science (LegalPlanet, July 20, 2017).
deregulation, it appears advisable to argue for certain benchmarks that can limit host State’s discretion in evaluating scientific claims.

The prevailing view among commentators seems to be that tribunals should investigate the credibility of science used in the regulatory process, based on certain indicators, such as respect for “scientific due process” (as suggested by Céline Lévesque)\(^{1557}\) and for “scientific freedom” (proposed by Marcos Orellana),\(^{1558}\) since these would guard against biased decision-making on part of host states. Caroline E. Foster also supports the view that arbitrators should not be compelled to judge the scientific merits of the evidence.\(^{1559}\) Jorge E. Vinuales stresses specifically in the context of ISDS that “tribunals must not focus on the science but on the process.”\(^{1560}\) According to this view, the focus of scrutiny should be on the ways in which the given scientific result had been produced.\(^{1561}\) In particular, relevant factors would be whether principles of scientific research have been respected throughout the research process,\(^{1562}\) whether the chosen methodology was consistent with the dataset, and whether ambiguities in the results were revealed and adequately explained. These questions can be answered without deciding about the ‘true’ or ‘false’ nature of competing scientific claims.

While agreeing with the latest position, I propose that such a path should only be taken when scientific risk assessments have to be scrutinized. However, when questions of causality and environmental harm become relevant in the dispute a more in-depth engagement with scientific evidence cannot be avoided. Methods for in-depth engagement with scientific evidence will be discussed in the coming section.

\(^{1557}\) Lévesque, ‘Science in the Hands of International Investment Tribunals: a Case for ‘Scientific Due Process’’.
III. Scientific fact-finding techniques in ISDS

Experts are commonly used in investment arbitration.\(^{1563}\) Besides party appointed exerts, investment arbitral tribunals normally have the power of asking for expert consultants to help them reveal the scientific background of the case.\(^{1564}\) Yet they rarely avail themselves of such possibility.

1. ‘Partisan evidence’ vs. independent experts

Occasionally, the parties’ evidentiary submissions have been biased to such an extent that their meaningful scientific assessment was virtually impossible. In the Perenco case, the Tribunal rejected the scientific evidence presented by both sides’ experts as they “crossed the boundary between professional objective analysis and party representation”.\(^{1565}\) Based on the evidence, the Tribunal could ascertain that there was some contamination in the blocks for which it was likely that Perenco would be held liable,\(^{1566}\) however, it deferred the decision on the extent of contamination to a later stage after further fact-finding provided by an independent expert.\(^{1567}\) This shows that adjudicators expect good faith explanations from the parties regarding divergent scientific claims, and the failure of a party to do so would result in serious deficit in the credibility of the evidence. As the Perenco arbitration demonstrates, selecting between competing scientific claims based on a science-heavy review of their methodologies seems to be a difficult, though manageable task for arbitrators with the assistance of independent experts.

Having recourse to independent experts could help adjudicators in choosing between competing scientific claims. Enhancing the scientific literacy of arbitral tribunals by including arbitrators with special expertise also seems to be essential in order to equip panels with the necessary knowledge and willingness to deal with the scientific dimension of disputes. The use of independent experts may also be called

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\(^{1563}\) The respective rules on experts are provided in the tribunal’s specific rules of procedure, see e.g. ICSID Arbitration Rules, Rules 35, 36, UNCITRAL Arbitration Rules (2010), Article 28 (2). ICSID tribunals appoint experts even in the absence of express provisions in their procedural rules. Jacur, ‘Remarks on the Role of Ex Curia Scientific Experts in International Environmental Disputes’, p. 444.

\(^{1564}\) See ICC Arbitration Rules, Art. 25 (4), IVA Rules on the Taking of Evidence in International Arbitration, Art. 6 (May 29, 2010), UNCITRAL Arbitration Rules, Article 29.


\(^{1566}\) Perenco case, Interim Decision on the Environmental Counterclaim, para. 582.

\(^{1567}\) Perenco case, Interim Decision on the Environmental Counterclaim, paras. 585, 587.
for by a considerable public interest\textsuperscript{1568} involved in environmental investment arbitration. The public interest element\textsuperscript{1569} entails that the contours of States’ right to regulate environmental concerns should not be regarded as a strictly \textit{inter partes} matter.\textsuperscript{1570} Deciding on the extent to which States may impose environmental obligations on foreign investors has obvious repercussions for the well-being of citizens of host States. Such considerable third-party effects call for an approach, where panels can seek independent expert opinions in an unrestricted manner. Tribunal-appointed experts may properly account for the wider public interest. There are emerging trends signaling the awareness of investment tribunals regarding the importance of accounting for the public interest in their proceedings. For instance, ICSID tribunals increasingly admit or explicitly ask for amicus briefs from NGOs.\textsuperscript{1571} Yet frequent reliance on independent experts may run against deeply engrained features of party-driven arbitration, and hence would only be possible if currently debated\textsuperscript{1572} structural reforms in the ISDS system were eventually adopted.

2. Engaging with the scientific evidence: exceptional practice

The most ambitious fact-finding assessment among arbitral tribunals has been displayed by the \textit{Peter Allard v. Barbados} panel, which thoroughly reviewed party-adduced conflicting scientific evidence, investigated the cause of the alleged ecological degradation without having recourse to independent experts. The Tribunal critically singled out the evidence it found to be “\textit{speculative}” or “\textit{inapt}” due to

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\textsuperscript{1568} Fukunaga emphasizes that the public interest involved in the proceeding is a key difference between international commercial arbitration and ISDS. Fukunaga, ‘Standard of Review and ‘Scientific Truths’ in the WTO Dispute Settlement System and Investment Arbitration’, 570.
\textsuperscript{1569} Harrison, ‘Addressing the Procedural Challenges of Environmental Litigation in the Context of Investor-State Arbitration’, pp. 104–5. Harrison mainly regards this public interest aspect as a justification for allowing NGOs and other amici curiae submissions to investment tribunals.
\textsuperscript{1570} See in this respect Judge Weeramantry’s Separate Opinion in \textit{Gabčíkovo-Nagymaros} case, where he famously emphasizes that obligations regarding environmental protection is of \textit{erga omnes} nature. (para. 118). He stresses that “When we enter the arena of obligations which operate \textit{erga omnes} rather than inter partes, rules based on individual fairness and procedural compliance may be inadequate.” Though Judge Weeramantry wrote these in the context of estoppel, these considerations arguably equally apply to rules on fact-finding.
\textsuperscript{1571} The first such occasion was in \textit{Piero Foresti and others v. South Africa} (ICSID Case No. ARB(AF)/07/1), where four NGOs specialized in the field of human rights and environment respectively were explicitly asked by the panel to submit amicus briefs on the public interest aspects, even against the strong objections of the claimant. See more at http://www.ciel.org/news/tribunal-in-piero-foresti-laura-de-carli-and-others-v-the-republic-of-south-africa-grants-ciel-and-human-rights-organizations-access-to-documents-by-the-parties/ (last accessed on 25\textsuperscript{th} July, 2017).
\textsuperscript{1572} A. Roberts, UNCTRAL and ISDS Reform: Pluralism and the Plurilateral Investment Court (EJIL Talk!, Dec 12, 2017).
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methodological inconsistencies and ruled that the claimant could not prove that his property suffered ecological degradation in the relevant period. The arbitrators examined whether the data were consistent, whether seasonal variations were accounted for, whether data were collected in a sufficiently long period, whether alternative possible explanations for the same results were revealed, and whether data patterns were satisfactorily explained. Such questions are well beyond the scope of scientific fact-finding that investment tribunals are usually willing to undertake.

IV. Causal inquiry

Investment arbitral tribunals rarely conduct a thorough causal inquiry. A notable exception is the Peter Allard case, which raised the issue of competing causal claims. Surprisingly, the panel made findings on causality despite the fact that the investor failed to establish the harm, therefore, deciding on causality was superfluous. The claimant argued that a decrease in water salinity triggered the loss of biodiversity, which was due to Barbados’ failure to maintain a sluice gate ensuring seawater connections with the swamp that the investor developed. Whereas Barbados claimed that the sanctuary’s salinity is maintained through subsurface seawater exchange and not primarily through the gate. In the causal investigation the panel focused on whether the “gate was a significant component in maintaining the salinity of the Sanctuary Lake”, instead of seeking for “the” (but-for) cause of declining salinity.

This causal test is a laudable choice, since it pays due regard to the causal uncertainty inherent in causal mechanisms of ecosystem changes by not per se excluding the possibility to finding a causal link between Barbados’ action and the injury claimed. Nevertheless, in the material case the panel found no causal link

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1573 Peter Allard v. Barbados, Award, para. 94. E.g. the tribunal did not accept expert results if they did not account for seasonal variation of the data. (paras. 97-102).
1574 E.g. Peter Allard v. Barbados, Award, paras. 130, 121.
1577 E.g. Peter Allard v. Barbados, Award, para. 163.
1578 E.g. Peter Allard v. Barbados, Award, paras. 123, 125.
1579 Peter Allard v. Barbados, Award, para. 140.
1580 Peter Allard v. Barbados, Award, para. 157.
between the alleged mismanagement of the gate and the lake’s changing salinity with a view to a more probable competing theory on subsurface seawater exchange.1581

V. Interim conclusion

With regard to the ad hoc constitution of ISDS tribunals it is difficult to discern general trends in the scientific engagement of investment arbitration. Generally arbitral tribunals have become more open to consider science-based arguments and evidence in environmental disputes. They have recourse to divergent standards of review hence their case practice provides valuable examples for crafting adjudicatory reasoning on the basis of scientific and non-scientific benchmarks. Some tribunals regard international regulatory trends as indicia of credible scientific opinions, while others rather scrutinize, from a due process point of view, the transparency and the inclusiveness of the process of producing regulatory science.

1581 Peter Allard v. Barbados, Award, para. 158-164. The lack of the causal link was supported with a widely held scientific theory on subsurface seawater exchange that was not disproved by the claimant. The tribunal also cited proof on several occasions when the gate permitted water connection.
Chapter 9
Science before the International Tribunal for the Law of the Sea

“Considering that, although the Tribunal cannot conclusively assess the scientific evidence presented by the parties, it finds that measures should be taken as a matter of urgency to preserve the rights of the parties and to avert further deterioration of the southern bluefin tuna stock.”

ITLOS, 1999

I. Science enters disputes brought before ITLOS

ITLOS has jurisdiction over disputes arising under the UN Convention on the Law of the Sea (“UNCLOS”) as well as related international conventions seeking to govern the use and protection of marine living resources. For more than two decades, ITLOS has been hearing a good number of cases where the parties relied on scientific concepts and expert evidence. Its diverse case practice includes inter alia fisheries disputes, boundary delimitation cases, and prompt release cases, many of which are relevant for marine environmental protection. In order to fit in the comparative framework of this study only those decisions will be further elaborated on, where scientific arguments played a decisive role in the judicial inquiry in environmental disputes.

1582 Southern Bluefin Tuna Cases (New Zealand v. Japan; Australia v. Japan), List of cases: Nos. 3 and 4, („Southern Bluefin Tuna Cases”) Provisional Measures Order of 27 August 1999, para. 80.
1584 ITLOS has been functioning since 1996.
1585 E.g. Southern Bluefin Tuna Cases (New Zealand v. Japan; Australia v. Japan); Case Concerning the Conservation and Sustainable Exploitation of Swordfish Stocks in the South-Eastern Pacific Ocean (Chile/European Union), List of cases: No. 7, 2000 („Swordfish case”); The „Tomimiru” case (Japan v. Russian Federation).
1586 Dispute Concernning Delimitation of the Maritime Boundary between Bangladesh and Myanmar in the Bay of Bengal (Bangladesh v. Myanmar), List of cases: No. 16, Judgment of 14 March 2012 („Bay of Bengal case”).
1587 For instance Camouco case (Panama v France), Monte Confurco case (Seychelles v France), Juno Trader case (St Vincent and The Grenadines v Bissau), and Volga case (Russian Federation v. Australia).
As to the institutional structure of ITLOS it is to be noted that it includes a separate judicial body, the Seabed Dispute Chamber. The Tribunal may also form special chambers to deal with particular categories of disputes.\textsuperscript{1588} ITLOS was committed to “respond to the special challenges” \textsuperscript{1589} science-intensive environmental disputes entail, as evidenced by the establishment of the ‘Chamber for Marine Environmental Disputes’ in 2011. This Chamber is composed of seven members and “is available to deal with disputes concerning the interpretation or application of any relevant UNCLOS provision.”\textsuperscript{1590} The Chamber however has not yet been used and hence it did not yield any practical benefits for litigants, despite that the admitted motivation behind its creation was to render the tribunal more “user-friendly”.\textsuperscript{1591} Other types of Special Chambers have been established for the parties’ requests. For instance, the \textit{Swordfish dispute} was referred to an ad hoc Special Chamber consisting of five members.\textsuperscript{1592}

Parties to a dispute concerning UNCLOS provisions have the liberty to choose from four for a \textsuperscript{1593} to satisfy the compulsory dispute settlement requirement\textsuperscript{1594} of UNCLOS. Besides ITLOS, States may have recourse to the ICJ and international arbitration, the procedural rules of which are set out in Annex VII of UNCLOS. They may also submit their disputes to a special expert-led arbitral tribunal constituted under Annex VIII of UNCLOS. As Tim Stephens, a notable commentator of international environmental dispute settlement notes, the ITLOS has a reputation of being “considerably more promising from an environmental perspective” than the ICJ.\textsuperscript{1595} Based on the track record of UNCLOS disputes, ITLOS seems to be more popular than Annex VII arbitration, while numerous

\begin{footnotesize}
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\item[1588] Article 15 of the Statute of ITLOS.
\item[1589] Rothwell, ‘The Contribution of ITLOS to Oceans Governance Through Marine Environmental Dispute Resolution’, p. 1022.
\item[1590] ITLOS, Resolution on the Chamber for Marine Environment Disputes, ITLOS Doc. ITLOS/2011/Res. 2 (2011).
\item[1592] Case Concerning the Conservation and Sustainable Exploitation of Swordfish Stocks in the South-Eastern Pacific Ocean (Chile/European Union), List of cases: No. 7, Order of 2009.
\item[1593] Article 287 of UNCLOS.
\item[1594] See Article 282, 286 of UNCLOS providing for a compulsory dispute settlement procedure entailing a binding decision.
\end{itemize}
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disputes have been brought both to the Tribunal and arbitration, hence their relationship can be better viewed as one of “reciprocal complementation”.

As Tullio Treves observed, two main entry points of science readily emerge in disputes brought under UNCLOS. On the one hand, numerous provisions explicitly enshrine scientific concepts. On the other hand, scientific insights are also drawn into disputes concerning questions of causation, environmental harm, and risks even when scientific concepts of UNCLOS provisions are not disputed by the parties. Indeed, Part XII of UNCLOS setting out rules on protection and preservation of the marine environment includes provisions on “rare and fragile ecosystems”, “alien species”, and the obligation not to “transfer ... damage or hazards from one area to another”.

Article 117 makes reference to “the living resources of the high seas” and rules governing Exclusive Economic Zones include Article 67 on Catadromous species.

Moreover, terms of art concerning scientific methodologies are also enshrined in UNCLOS. Part XIII is dedicated to “marine scientific research”, the interpretation of which may require techno-scientific considerations. Article 119 requires basing conservation measures on “the best scientific evidence available” and the exchange of “scientific information ... relevant to the conservation of fish stocks”. Furthermore, Article 204 mandates analysis “by recognized scientific methods” and Article 201 requires inter-State cooperation “in establishing appropriate scientific criteria for the elaboration of rules”. The interpretation of these terms would also draw on scientific insights.

Lastly, Annex I of UNCLOS provides a list on ‘highly migratory species’ for purposes of Article 64 UNCLOS, which consists of a list of species and family names in Latin. Since the negotiators failed to agree on a ‘scientific’ definition, an enumeration was adopted instead. As a result, the inclusion of a certain species in the

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1596 From among the cases considered in this chapter, the Southern Bluefin Tuna Cases, the MOX Plant case and the Straits of Johor dispute was brought to both fora. Decisions of the arbitral tribunals will be addressed in Chapter 4.
1599 Article 194 (5).
1600 Article 196
1601 Article 195.
1602 Article 117.
1603 Article 119.
list is a matter of politics and not of science. Accordingly, there are a number of species that would qualify as highly migratory species from a scientific point of view though are still missing from the Annex. One may then suspect that the content of Annex is insulated from scientific arguments. However, the Commentary of UNCLOS mentions the hurdles arising from taxonomists’ decision to divide a species, *Thunnus thynnus*, included in the Annex, into two species (*Thunnus thynnus* and *Thunnus orientalis*). Regarding the material case the prevailing view is that both species are covered as the drafters regarded them as identical at the time of adopting the Annex.

UNCLOS functions as a framework convention in the terrain of the protection of marine environment; hence it has been substantiated and complemented by a number of multilateral environmental agreements. These international treaties also contain scientific concepts and thereby provide a door for bringing scientific arguments into future litigation.

A further entry point for scientific arguments lies in rules governing the provisional measure procedure of ITLOS, according to which interim measures may not only be ordered to preserve the rights of the parties, but also “to prevent serious harm to the marine environment.” This provision opens the door to scientific proof of harm and issues of causation in a given dispute.

The above only a selective illustration on provisions “contain[ing] elements of law and science” in the context of UNCLOS and ITLOS, the proper interpretation of which “requires both legal and scientific expertise”. Nevertheless, it is to be noted that thus far ITLOS has only experienced a limited number of disputes in which scientific notions have been relevant to the parties’ arguments. Examining the ITLOS jurisprudence in the comparative framework of this analysis provides relevant examples for framing environmental disputes, for methods of scientific fact-finding and corresponding techniques to decide disputes in a persuasive way. These aspects will now be addressed in turn.

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1609 Article 290 (1).
1610 *Bay of Bengal* case, Judgment, para. 411.
II. Framing of environmental disputes

In terms of framing science-intensive disputes, a number of approaches can be identified. The non-justiciability of science-heavy disputes was raised quite early on by State parties, however, ITLOS rejected such narrow construction of its judicial function. Nevertheless, the weight and reach of scientific arguments have remained somewhat limited before the ITLOS. Judge Tullio Treves, writing extra-judicially, revealed that “scientific information was never used by ITLOS as the decisive argument in a case in favour of one party.” Scientific evidence of environmental threat or imminent harm instead has been considered as a justification to adopt interim measures on a precautionary basis. It is also salient that science-intensive environmental disputes brought before ITLOS have been predominantly settled by the parties. The role of the Tribunal therefore can be best characterized as providing a “curial supervision of the settlement process”.

1. Science-intensive disputes are deemed justiciable

Parties to the Southern Bluefin Tuna saga had recourse also to ITLOS besides bringing this case to an UNCLOS Annex VII Arbitral Tribunal. The legal dispute concerned the total allowable catch (“TAC”) of the southern bluefin tuna under a regional regime established by the Convention for the Conservation of Southern Bluefin Tuna (“CCSBT”). The scientific heart of the parties’ disagreement lied in the interpretation of data on possible recovery of tuna stocks. In Japan's reading, the scientific evidence showed a recovery of stocks, which supported a higher TAC, while Australia and New Zealand maintained that evidence did not show any such recovery and any further increase in the catch would threaten with the collapse of the southern Bluefin tuna population. In an alleged effort to gather relevant data, Japan unilaterally launched an ‘experimental fishing programme’ to which the other two States objected. Australia and New Zealand applied for a provisional measure to

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1611 For Japan’s proposition that the “disputes are scientific rather than legal” see Southern Bluefin Tuna Cases, Provisional Measures Order of 27 August 1999, para. 42.
1614 The arbitral proceedings are examined in Chapter 4.
1615 See Southern Bluefin Tuna Cases, Provisional Measures Order, Separate Opinion of Judge ad hoc Shrear.
ITLOS. Japan notably argued that the case is a scientific dispute and therefore ought to be a non-justiciable issue.\textsuperscript{1616} The Tribunal however was of the view that "the differences between the parties also concern points of law."\textsuperscript{1617}

One commentator noted that this aspect of the decision was highly consequential at the time as it could be "construed as an encouragement to this and other tribunals to "intervene" in future fisheries conservation disputes that arise, at least in part, from disagreements within the scientific community."\textsuperscript{1618} Indeed, the Tribunal summarily rejected Japan’s attempt to carve out science-heavy claims from the purview of ITLOS, and such concerns have not surfaced ever since.

2. Issuing precautionary measures: ITLOS and uncertain environmental risks

ITLOS embraces the precautionary principle to the greatest extent among international fora.\textsuperscript{1619} This might be explained by the fact that fisheries law expressly and repetitiously mandates precautionary actions having experienced collapses of major fish stocks. The UNCLOS Commentary itself endorses a reading of Article 119 in line with the precautionary principle. The provision mandates using "the best scientific evidence available", but the Commentary emphasizes that "measures may be taken even before scientific proof exists of overfishing."\textsuperscript{1620} Such a reading of UNCLOS is in line with other multilateral fisheries agreements, e.g. the 1995 UN Fish Stock Agreement, which also explicitly incorporates the precautionary approach.\textsuperscript{1621}

The precautionary principle applies also in the context of conserving resources of the deep seabed. ITLOS Seabed Disputes Chamber issued an Advisory Opinion regarding the Responsibilities and Obligations of States Sponsoring Persons and Entities With Respect to Activities in the Area ("Responsibilities and Obligations of States Advisory Opinion"). The Chamber also confirmed the direct

\textsuperscript{1616} Southern Bluefin Tuna Cases, Provisional Measures Order, para. 42.
\textsuperscript{1617} Southern Bluefin Tuna Cases, Provisional Measures Order, para. 43.
\textsuperscript{1619} Stephens, International Courts and Environmental Protection, p. 226.
\textsuperscript{1621} Article 5 and Article 6 of the UN Agreement for the Implementation of the Provisions of the UNCLOS 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.
obligations of sponsoring States “to apply precautionary approach”. The Advisory Opinion interprets the underlying Nodules and Sulphides Regulations as transforming the “non-binding statement of the precautionary approach in the Rio Declaration into a binding obligation”.

Against this background it is perhaps more understandable why the Tribunal adopted a precautionary approach in the Southern Bluefin Tuna Cases dispute. In issuing interim measures, the Tribunal ordered the parties to “act with caution and urgency to ensure the effective conservation measures are taken to prevent serious harm to the stock”. Judge Treves in his Separate Opinion emphasized that the urgency requirement should not:

“concern the danger of a collapse of the stock in the months which will elapse between the reading of the Order and the time when the arbitral tribunal will be in a position to prescribe provisional measures. This event, in light of scientific evidence, is uncertain and unlikely. The urgency concerns the stopping of a trend towards such collapse. The measures prescribed by the Tribunal aim at stopping the deterioration in the southern bluefin tuna stock. Each step in such deterioration can be seen as "serious harm" because of its cumulative effect towards the collapse of the stock.”

Judge Treves also highlights that the precautionary approach is “hinted” in the Order prescribing the provisional measures. Scholarly commentary also points out that the Tribunal only implicitly and indirectly referred to the principle. Nevertheless, the fact remains that ITLOS has kept using such language in later cases as well. In the Case Concerning Land Reclamation by Singapore in and around the Straits of Johor (“Straits of Johor case”), ITLOS again required in its provisional measures that Malaysia and Singapore acted with “prudence and caution”. One commentator argues that by accepting the possibility of harm to the environment even in the absence of conclusive evidence, the Tribunal impliedly threatened the parties

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1622 Responsibilities and Obligations of States Sponsoring Persons and Entities With Respect to Activities in the Area, Advisory Opinion of the Seabed Disputes Chamber, 2011 (“Responsibilities and Obligations of States Advisory Opinion”), para. 122.
1623 Responsibilities and Obligations of States Advisory Opinion, para. 127.
1624 Southern Bluefin Tuna Cases, Provisional Measures Order, para. 77.
1625 Southern Bluefin Tuna Cases, Provisional Measures Order, Separate Opinion of Judge Treves, para. 8.
1626 Southern Bluefin Tuna Cases, Provisional Measures Order, Separate Opinion of Judge Treves, para. 8.
1628 Case Concerning Land Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore), List of cases: No. 12, Provisional Measures, Order of 2003, („Straits of Johor case”) para. 99.
with imposing a provisional measure not in line with the parties’ expectations.\textsuperscript{1629} That move arguably provided sufficient motivation for the parties to agree on some of the contested issues.

The MOX Plant saga has been appeared before various international courts and tribunals, as has been discussed in Chapter 4. ITLOS was approached by Ireland for provisional measures seeking the suspension of the commissioning of the MOX plant. The Tribunal again reiterated the need for acting “\textit{with prudence and caution}”,\textsuperscript{1630} however, the evidence was not found serious enough to establish the urgency of the situation and therefore justifying the measures sought.\textsuperscript{1631} As Tim Stephens points out, the Tribunal at this time seemed to reject the application of the precautionary principle,\textsuperscript{1632} as despite using this precautionary formula, it allowed for continued commissioning of the plant.

\textbf{3. Referring disputes to expert-led consultation of the parties}

The scientific dimensions of disputes are particularly decisive where the core disagreement of the parties concerns the likelihood of adverse impact on fish stocks, threatening with the collapse of commercially important stocks. States in such cases impose conservation measures to prevent overfishing which tend to have adverse effects on other States as well. The justifiability of such prohibitive measures depends on the well-founded nature of concerns for the collapse of stocks. This is the background to which scientific expertise becomes crucial for deciding the lawfulness of measures.

This was the case in the \textit{Swordfish dispute} between Chile and the EU. Chile implemented conservation measures within its EEZ due to the declining stocks of swordfish in the South Pacific. It also unilaterally introduced a prohibition to unload in its ports the swordfish caught in waters beyond its jurisdiction. The EU challenged such prohibitory measures, as it made the export of fish economically

\textsuperscript{1630} MOX Plant case (Ireland v. UK), Case No. 10, Order for Provisional Measures, (“MOX Plant case”) para. 84.
\textsuperscript{1631} MOX Plant case, Order for Provisional Measures, para. 81.
Their disagreement has lead to a WTO dispute and to a proceeding initiated before the Special Chamber of ITLOS. The parties first suspended both proceedings and instead engaged in negotiations. Their agreed solution was to adopt a mutually agreed Understanding to settle their case. The ITLOS ordered the discontinuance of the proceedings with regard to this agreement. The Understanding provides for establishing a Bilateral Scientific and Technical Committee with the tasks of exchanging data on catch and stock status, providing scientifically-based advice to fisheries stock managers to realize sustainable fishing activities.

In this instance, establishing an expert body was the adequate procedural device for setting up a flexible joint management regime, which ensured the continuous evaluation of the threats imposed on the fish stocks. Such scientific monitoring and science-based decision making guaranteed that neither parties take excessive and unjustified measures with referring to scientific reasons.

A similar approach has been taken in the Straits of Johor dispute, which concerned land reclamation carried out by Singapore, which was, according to Malaysia, threatening with harm to the marine and coastal environment in the vicinity of territorial waters claimed by Malaysia. The core of the disagreement was again the interpretation of scientific data on possible adverse effects of the infilling works aiming to create new habitable lands in Singapore. Singapore insisted that if “the evidence were to prove compelling” it would reconsider the suspension of works.

The Tribunal was not willing to rely in its order on the technical and scientific evidence submitted by the parties. Indeed, neither the Order nor separate opinions and declarations conduct any specific factual assessment showing why the urgency of the situation was regarded “less than self-evident”. However, when the parties’

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1634 Case DS193, Chile – Measures Affecting the Transit and Importation of Swordfish.
1635 Swordfish case, Order of 2009, para. 12. including the text of the Understanding, in which section 4 mandates establishing the Bilateral Scientific and Technical Committee.
1636 Diplomatic note of Singapore of 2 September 2003, reiterated in para. 85 of the Order.
1638 Straits of Johor case, Provisional Measures Order, Declaration of Judge Anderson, para. 3. For lack of any specific factual assessment substantiating the absence of urgent risks, see also the wording of the Order and Separate Opinion of Judge Cot in Straits of Johor case, Provisional Measures Order, Separate Opinion, para.1.
negotiations reached a stalemate, the Tribunal had a decisive role in compelling the parties’ cooperation in resolving “their differences on the basis of an objective study by independent experts.” As a result, Singapore finally accepted Malaysia’s proposal to “jointly fund a scientific study by independent experts on terms of reference to be agreed by the two sides.”

In this vein, the interim measure ordered the cooperation of the parties, specifically establishing a jointly selected group of independent experts with the mandate of conducting a study within a year to determine the effects of the works and the measures to deal with any adverse effects found.

The Straits of Johor seems to be illustrative of the overall approach of the Tribunal. Notably, scientific evidence has virtually never justified prescribing prohibitive provisional measures, as ITLOS only instituted procedures or mandated cooperation in its orders on a precautionary basis. The duty to cooperate hence appears as a common thread of the interim measures issued in the Southern Bluefin Tuna Cases, the MOX Plant case, as well as in the Straits of Johor dispute. As Judge Treves expressly notes in a scholarly article “this approach seems to correspond to the degree to which courts and tribunals, especially ITLOS, are ready to rely on scientific information submitted to them.”

In the material case, the expert panel prepared its final report, which both parties accepted and later formed the basis of the parties’ settlement. The Settlement Agreement was annexed to the Award on Agreed Terms issued by an international arbitral tribunal, which heard the case on the merits. The Agreement reiterates the recommendations of the Group of Experts, according to which Singapore among

\footnotesize{Parties clearly reached a „deadlock” in their negotiations, as noted by Judge Ndiaye in his Separate Opinion, Straits of Johor case, Provisional Measures Order, Separate Opinion, para. 9.\footnoteref{patel1} Patel, Law of the Sea International Tribunal for the Law of the Sea Jurisprudence: Case Commentary, Case-Law Digest and Reference Guide (1994-2014), p. 34.\footnoteref{patel2} Diplomatic note of Singapore of 2 September 2003, reiterated in para. 85 of the Straits of Johor case, Provisional Measures Order.\footnoteref{patel3} Straits of Johor case, Provisional Measures Order, Operative part section (a) paragraph (i).\footnoteref{patel4} The order in the Southern Bluefin Tuna cases may seem as the only possible exception, where precautionary justifications have led to Tribunal to prevent Japan from further engaging in the experimental fishing programme of tuna, however, fishing was still allowed up until each party’s national allocation. See paragraph c) and d) of the operative part of the Order.\footnoteref{patel5} Southern Bluefin Tuna Cases, Provisional Measures Order of 27 August 1999, Operative part, section (e).\footnoteref{patel6} MOX Plant case, Order for Interim Measures, Operative part Section (1).\footnoteref{patel7} Straits of Johor case, Order for Provisional Measures, para. 92 and Operative part section (1).\footnoteref{patel8} Treves, ‘Law and Science in the Interpretation of the Law of the Sea Convention’, 487.}
others had to “modify the final design of its shoreline of its land reclamation”. The Settlement Agreement also reveals that in this case the actual resolution of the legal dispute was entrusted to and effectively ensured by the Group of Experts.

The Straits of Johor decision hence evidences a specific framing technique of ITLOS, namely, to refer scientific questions and the final resolution of the dispute to the parties’ out of court consultation, which has to be guided by expert advice. This solution may seem similar to the path taken by the ICJ in Gabcikovo-Nagymaros, where the court referred science-intensive questions back to the parties’ negotiations. Yet the adjudicatory solution of ITLOS is much more efficient as the Tribunal retained control over the consultation of the parties by setting a short deadline and explicitly mandating the involvement of experts. For all these reasons, ITLOS appears to strike a fair balance between carving out science from the issues it is willing to cover in its binding and final judicial ruling on the one hand and retaining the judicial function on the other hand by a close supervision of the expert-led consultation. This peculiar way of framing the judicially relevant questions in a dispute showcases a strategic recourse to expert advice, which alleviates the adjudicatory burden of the Tribunal and at the same time preserves the ultimate control of ITLOS over the dispute resolution.

III. Causal inquiry

The issue of causation typically arises in the context of liability for causing environmental damage to the marine environment. UNCLOS provides two provisions on responsibility. First, under Article 235 States are responsible for “the fulfillment of their international obligations concerning the protection of the marine environment” in accordance with international law. Second, Article 139 enshrines a similar obligation with respect to the seabed and subsoil beyond national jurisdiction. In these areas States have to ensure that activities controlled by them comply with rules of UNCLOS. Article 139(2) prescribes the rules of liability in cases where States are sponsoring private entities for conducting explorations in these areas.

\[\text{1648} \quad \text{Part A paragraph (i) section 1 of the 2005 Settlement Agreement in the Case Concerning Land Reclamation by Singapore in and Around the Straits of Johor (Malaysia v. Singapore).}\]
This latter provision was extensively interpreted by the *Responsibilities and Obligations of States Advisory Opinion*. The Opinion touches upon the issue of requisite causal links in the context of liability of sponsoring States. It emphasizes that causality must be established at two separate stages in order to substantiate responsibility of the sponsoring State for damage caused by a contractor. The first causal nexus must be shown between the activity of the contractor and the resulting damage, and the second must be proven between the damage and the failure of the sponsoring State to carry out its own responsibilities, *i.e.* to exercise due diligence in securing compliance by the contractor. The Advisory Opinion firmly states that “there must be a causal link between the sponsoring State’s failure and the damage, and such a link cannot be presumed.” Yet the Opinion concludes its assessment at this point and provides no further clarification as to the requisite test of causality. Future case-law may be expected to give guidance as to the reach and weight of scientific evidence in establishing causality and therefore the ways in which ITLOS frames its causal assessment.

**IV. Scientific fact-finding techniques**

Given the often highly specific subject matter of UNCLOS provisions, relevant evidence in ITLOS proceedings is frequently of technical nature. In the oral hearings the parties may support their claims with “maps, tables, graphs, photographs, digital video” along with other documentary evidence. ITLOS has the power to call upon the parties to submit evidence on its own motion, though the Tribunal has not made any order to that effect. ITLOS typically relies on the parties’ initiative to submit evidence.

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1649 *Responsibilities and Obligations of States Advisory Opinion*.
1650 *Responsibilities and Obligations of States Advisory Opinion*, para. 181.
1651 *Responsibilities and Obligations of States Advisory Opinion*, para. 182.
1652 *Responsibilities and Obligations of States Advisory Opinion*, para. 119.
1653 *Responsibilities and Obligations of States Advisory Opinion*, para. 184.
1654 *Straits of Johor* case, Order for Provisional Measures, para. 19.
1. Ex parte scientific experts

The parties frequently submit scientific expert evidence to the Tribunal. Scientists may appear as witnesses or experts whom are included in the delegation of the parties. In the *Straits of Johor* case, they appeared before the Tribunal in the capacity of experts having made a solemn declaration to that effect under Article 79 of the Rules, which allowed their cross-examined by the other party. In the material case, hydraulic model calculations were found to be insufficient to substantiate the urgency of the situation regarding the risks claimed by Malaysia with respect to irreversible damage caused to the territorial sea by the land reclamation works. ITLOS denied prescribing provisional measures with subtle references to the short timeframe before an Annex VII arbitral tribunal would have heard the dispute.

Conflicting expert evidence seems to put the Tribunal in a difficult position. ITLOS explicitly referred to the significance of having uncontested scientific evidence in the *Bay of Bengal* judgment. The case concerned a maritime delimitation dispute in which science played a central issue. Interestingly enough, the parties agreed on scientific data describing the nature of the seabed, they differed on the interpretation of the term ‘natural prolongation’. The Tribunal openly acknowledged that “it would have been hesitant to proceed with the delimitation ... had it concluded that there was significant uncertainty as to the existence of a continental margin in the area”. This statement suggests that one ought not to expect a thorough evidentiary assessment from the Tribunal in case of conflicting scientific evidence. Differing expert statements are, however, the norm in science-intensive dispute, which raises doubts as to the efficiency of the Tribunal’s fact-finding techniques.

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1657 It occurred for instance in the Southern Bluefin Tuna cases.
1659 *Straits of Johor* case, Order for Provisional Measures, paras. 20-21.
1660 Ibid, para. 72.
1661 Ibid, paras. 77-73. The importance of the short timeframe was also stressed by Judge Rao in his *Separate Opinion, Straits of Johor* case, Order for Provisional Measures.
1662 *Bay of Bengal* case, Judgment, para. 411.
1663 *Bay of Bengal* case, Judgment, para. 412.
1664 *Bay of Bengal* case, Judgment, para. 443.
2. Scientific capacity-building of the Tribunal: missed opportunities

In contrast to ex curia experts, ITLOS has recourse to shadow experts, as it occasionally hires scientists as temporary registry staff members without consulting or even disclosing this fact to the parties. As noted earlier in the context of the ICJ’s practice of relying on ‘phantom experts’, such capacity-building method is objectionable from a transparency and due process point of view.

On a separate note, Article 289 of UNLCOS provides for a peculiar and innovative procedure to buttress the epistemic competence of any court or tribunal that is asked to decide cases including “scientific or technical matters” under UNCLOS. This provision allows for appointing “in consultation with the parties no fewer than two scientific or technical experts chosen preferably from the relevant list prepared in accordance with Annex VIII, article 2, to sit with the court or tribunal but without a right to vote”. Reading this Article in conjunction with other rules, which provides that such ex curia experts should also have legal expertise.

ITLOS, however, has not yet made avail itself of this procedural tool. Judge Treves openly attributes this to the possibility that the presence of such experts equipped with both scientific and legal background “may make the other judges or arbitrators ... uncomfortable”.1667

Another noteworthy aspect of ITLOS proceedings is the option for submitting science-intensive disputes to special arbitration under Chapter VIII of UNCLOS. Any party to a dispute concerning the interpretation or application of provisions relating to fisheries, protection of the marine environment, marine scientific research or navigation, including issues of pollution or dumping may submit the dispute to special arbitration.1668 The Commentary highlights that this type of arbitration envisages arbitration by a panel of scientists, acknowledging that the above four types of disputes “can be more appropriately and effectively addressed by specialists in these issues”.1669 A list of eligible expert is to be drawn up by competent

1668 Article 1 of Annex VIII, UNCLOS.
international organizations, such as the IMO, FAO, or the UNEP. Expert adjudicators would also need to be equipped with sufficient legal expertise. However, such special arbitration remains a mere theoretical possibility as has never been applied to date, and only eleven parties to UNCLOS indicated Annex VIII arbitration as being among their preferred mechanisms for dispute settlement. Compared to Annex VII arbitration, the distinctive feature of Annex VIII proceedings is that parties could entrust the panel with conducting a factual inquiry to establish the relevant scientific facts of the case with a binding force. Lastly, parties may also ask an Annex VIII tribunal to issue recommendations, which would form the basis for a review by the parties.

The solution of Annex VIII procedure is seen in the literature as an innovative, but “more radical” solution for integrating expert knowledge in adjudication. The reluctance of the parties to have recourse to such specialist-led arbitration squares well with the hesitant approach of international tribunals, including ITLOS itself, to incorporate scientific expertise in the bench by appointing *ex curia* experts.

3. Standard of proof

ITLOS had not elaborated on the burden of proof relating to uncertain scientific evidence in its orders or judgments in environmental disputes. The most detailed account is provided by Judge Lucky in his Separate Opinion in the *Straits of Johor* case. He first announced that in issuing binding provisional measures, the standard of proof is “relatively high”. He further adds that “applicants must show a very strong probability upon the facts that serious harm will accrue in the future. The degree of probability of future harm is not an absolute standard”. Interestingly, the majority found no possible harm in the given case without, however, any evaluation of the probabilities substantiated by the evidence. In

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1670 Article 2 (2) of Annex VIII, UNCLOS.
1671 Article 2 (3) of Annex VIII, UNCLOS.
1673 Article 5 (1)-(2) of Annex VIII, UNCLOS.
1674 Article 5 (3) of Annex VIII, UNCLOS.
1675 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 296.
1676 Separate Opinion of Judge Lucky, *Straits of Johor* case, para. 11.
contrast, Judge Lucky argued that the possibility of “serious harm to the environment and marine life has been sufficiently established”\textsuperscript{1678} even under this heightened standard of proof.

This decision seems to be in line with the overall jurisprudence of ITLOS. The Tribunal appears to adopt a high standard for accepting scientific risks and even in cases it is willing to find an urgent threat of harm, it does not reveal its evidentiary assessment.

V. Interim conclusion

ITLOS jurisprudence squares well with current trends of scientific engagement of international fora. Nevertheless, the survey of case-law highlights some important and peculiar techniques for framing science-intensive disputes as well as for scientific fact-finding.

1. Framing environmental disputes: from precautionary measures to mandating expert-driven cooperation

ITLOS jurisprudence demonstrates that justiciability of disputes involving closely linked scientific and legal aspects could be easily defended by international judges, who were willing to keep such disputes within their purview. The case-law also includes several instances where scientific evidence on uncertain, yet high-stake environmental risks were sufficient to trigger precautionary measures, even if they were procedural in nature and were enforcing good faith cooperation of State parties to resolve their conflict and jointly mitigate the environmental risks. The most peculiar aspect of the framing of the judicially relevant aspects of disputes is the ways in which the Tribunal refers entrenched science-heavy disputes to a group of scientists. Expertise in these instances has been successfully used as a basis for mandating inter-State cooperation driven and controlled by scientific expert advice.

\textsuperscript{1678} Separate Opinion of Judge Lucky, \textit{Straits of Johor} case, para. 17.
2. Fact-finding: various procedures for gathering expert advice

ITLOS predominantly relies on party-adduced evidence but it is only comfortable with relying on highly technical evidence when scientific data are uncontested by the parties. Although rules of UNCLOS and the Statute of the Tribunal comprise several innovative procedural avenues for incorporating scientific competence with the bench, the Tribunal has not yet had recourse to any of them. Such noteworthy possibilities are, on the one hand, appointing *ex curia* experts sitting with judges and, on the other hand, the option for submitting disputes to special arbitration under Chapter VIII, where the panel would consist of scientific experts. These scientific fact-finding procedures are unique even from an international comparative point of view. Despite these innovative though theoretical possibilities, in the practice of the Tribunal, uncertain scientific evidence normally fails to meet the high standard of proof.

In sum, the jurisprudence of ITLOS is seen as inducing “cooperative and science-based” solutions for disputes relating to the law of the sea. The Tribunal embraces a “facilitative” judicial function, almost by “assist[ing] the parties in resolving their dispute amicably”. This judicial approach was criticized by Judge ad hoc Shrearer, who powerfully argued against the Tribunal’s tendency to “shrink from the consequences of proven facts”. In any event, with the “speedy issuing” of binding provisional measures, and by its commitment to delve into the scientific dimensions of disputes by not construing scientific uncertainty as an obstacle to judicial decision-making, ITLOS certainly qualifies as an international forum with great relevance for resolving maritime disputes.

3. Causality

Causal tests have only been elaborated on as a matter of principle in an Advisory Opinion. The ITLOS stressed that causal links in the context of sponsoring States’ liability for harm caused by their contractors cannot be presumed. Causal

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1681 *Southern Bluefin Tuna Cases*, Provisional Measures Order, Separate Opinion of Judge ad hoc Shrearer.
links underlie all substantive obligations of not to harm the marine environment. The
ITLOS’s strict approach to establishing causality resonates well, on a more abstract
level, with its inclination of prioritizing the procedural obligations of States, e.g. that
of cooperation and negotiation, instead of investigating whether substantive
obligations have been breached in light of the evidence.
Chapter 10
Comparative assessment: To what extent and in what ways do international adjudicators engage with science?

“Is it the legal context or is it the scientific context that the Court claims to be engaged in?”
Judge Owada, 2014

I. Comparative framework: judicial techniques adjusting the level of science in adjudicatory assessments

This chapter summarizes and comparatively assesses the various judicial tools that have been identified in the previous chapters regarding each relevant international adjudicative body. The coming analysis centers on discerning some common patterns in the scientific engagement of such international fora. Two major trends emerge: some adjudicatory tools serve to engage with science and thereby accommodate scientific input in the legal reasoning; while others help adjudicators circumvent scientific input and thereby downplay the weight of scientific arguments in a legal dispute.

The extent to which science is allowed to penetrate the adjudicatory analysis is consequential for the judicial decision. The presence or the lack of scientific references impacts the way adjudicators may justify their choices and decisions in disputes with manifest scientific dimensions. Simply put, adjudicators need different argumentative practices to provide a persuasive reasoning when they choose to directly engage with scientific arguments, and when they choose not to.

As a framework for analysis, this comparative assessment will be anchored to the different aspects of adjudication that have been explored in previous chapters, namely, the framing of disputes, methods for scientific fact-finding, causal inquiry, and applicable standards of review. It is not the intention of this chapter to rehearse the content of the preceding substantive analyses or to categorize each judicial decision mentioned earlier. Indeed, such an effort would be futile and may even be strained as not every judicial tool impacts the role of science in adjudication, and

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1683 Whaling case, Dissenting Opinion of Judge Owada, para. 25.
certainly not every procedural choice in a complex legal case is taken with a deliberate intention to circumventing or accommodating scientific considerations.

Occasionally, the comparative analysis will also draw on potential judicial best practices of international claims commissions and even domestic courts to demonstrate the wide array of competing judicial methods that would arguably be available for international adjudicatory bodies as well.

The forthcoming analysis will identify trends and methods for adjusting the science-intensity of judicial inquiry along the adjudicative process. It will also discuss corresponding argumentative practices that can be discerned from the practice of international courts and tribunals. This discussion lays ground to the concluding remarks of the dissertation, set out in the final chapter, which seek to answer the question as to how the intrusion of science affects the persuasive nature and the legitimacy of adjudicatory decisions.

1. Downplaying science – and a corresponding need for non-scientific benchmarks

At each phase of the adjudicatory process, adjudicators make choices between different judicial tools determining the extent to which science is allowed to play a decisive role in their judicial decision-making. Certain adjudicatory techniques impede or even preclude the invasion of science into the legally relevant aspects of the case and thereby essentially downplay the weight attached to scientific input in adjudication. Emphatically, ‘downplaying’ in this context is not equal to situations, when adjudicators rule against science-backed environmental claims. Instead, whether science is ‘downplayed’ in the process of judicial decision-making is measured in light of the extent to which judges rely or reflect on scientific arguments in reaching their decisions. ‘Downplaying’, thus, refers to situations when science-based disputes are decided without engaging with the underlying science. Importantly, not every downplaying practice is detrimental to environmental claims, as there are occasions when a decision that is more favorable to environmental considerations may be more easily or more likely to be reached through the application of certain non-scientific standards, such as presumptions, or certain proxies.

Marginalizing the role of science in adjudicatory decision-making triggers a corresponding need for finding additional rationales, cognitively or intuitively
appealing principles that can justify their adjudicatory choices. The forthcoming analysis will enumerate the various non-scientific principles with which international adjudicators reach their final ruling in such cases.

2. Engaging with science in the judicial inquiry – and harnessing its cognitive authority

At the same time, an increasing number of legal tools can be identified in the international judicial practice that allow adjudicators to accommodate the particularities of uncertain and ambiguous scientific data in applying traditional legal doctrines. Incorporating science has the important benefit that adjudicators can harness the cognitive authority of science to buttress their findings. However, it also poses special challenges, as in such cases adjudicators need to enhance their scientific competence through appropriate fact-finding techniques in order to retain their adjudicatory power over the dispute, and not to delegate the judicial function entirely to scientific experts.

The comparative analysis will showcase many judicial tools from the case-law of international adjudicative fora as examples for successful accommodation of science in the judicial process. It will also identify the argumentative practices that appear as necessary corollary to such an in-depth scientific engagement. The analysis will be structured in four main parts, each dedicated to a different stage of the adjudicatory process.

II. Framing legal disputes – choosing relevant questions to decide

Framing of legal disputes, throughout this comparative study, has referred to deliberate choices of adjudicators to select aspects of a case that will be deemed legally relevant in resolving environmental disputes.
1. Adjudicatory techniques serving to downplay the role of science

1.1 Extreme solutions

In case of the most extreme avoidance strategies, international courts either find science-intensive cases inadmissible,\textsuperscript{1684} or they refer such questions to the merits phase that the dispute does not reach out of a judicial decision.\textsuperscript{1685} Such judicial framings that seek to exclude any scientific considerations have been typical of initial decisions. More recently, they appear only in minority judicial positions. In this respect, suffice it to refer to the dissenting opinions of Judge Xue, Owada, and Sebitudine in \textit{Whaling}, whom essentially argued for the non-justiciability of the interpretation of the term ‘scientific research’.\textsuperscript{1686}

More subtle ways of downplaying science are, however, widely present in the case-law. These will now be addressed together with the challenges of justifying adjudicatory decisions made without engaging with science.

1.2 Carving out science from relevant aspects of adjudicatory decisions

A common pattern in initial judicial reactions to science-intensive aspects of disputes was to simply carve those questions out from the main thread of judicial reasoning. A most salient example was the \textit{Iron Rhine Arbitration}, where the tribunal decided not to hear expert evidence offered by The Netherlands regarding the ecological justifications for the noise abating requirements demanded from Belgium. Belgium, in turn, contested the justifiable extent of such environmental protection requirements. The Tribunal regarded this controversy as being a purely legal dilemma in which scientific arguments have no say.

The most widely cited example from ICJ jurisprudence bespeaking a similar judicial strategy is the \textit{Gabčikovo-Nagymaros} case. Borrowing the words of notable commentators of judicial scientific fact-finding, the ICJ decided this case based “solely on the law, rather than making a full examination of the facts and the

\textsuperscript{1684} E.g. the early practice of the EctHR, for more details see Chapter 5. However the principle reason for the ECHR’s initial dismissive approach was arguably the fact that the ECHR did not provide an explicit protection against environmental nuisance.

\textsuperscript{1685} Nuclear Tests case, Judgment.

\textsuperscript{1686} Whaling case, Judgment, Dissenting Opinion of Judge Sebitudine, para. 9, Dissenting Opinion of Judge Owada, para. 24., Dissenting Opinion of Judge Xue, para. 15.
The judgment has become known for not resolving aspects of the dispute that were tainted with scientific complexities, namely, the allocation and sharing of freshwater resources in order not to impose excessive environmental risks and likely irreversible ecological damage. Jorge E. Vinuales aptly observes that the Court was actually “minimizing science” and although it took a stand on the scientific facts of the case openly, it did so in an implicit way, by “camouflaging” its factual evaluation. Scholarly hindsight regards the Gabcikovo-Nagymaros judgment as a proof of the Court’s “unwillingness or unsuitability” to deal with scientific aspects of disputes.

Another strategic framing of disputes emphasizes the infinite scientific complexity and the inescapable uncertainty of scientific evidence to justify a judicial choice not to decide a particularly fact-intensive aspect of a dispute. An apposite example of such judicial reasoning can be seen in the Pulp Mills judgment, where the ICJ summarily dismissed all eight accounts of lengthy scientific explanations offered by Argentina and found no violation of the no-harm rule with reference to the lack of sufficient and “clear evidence.” Similarly, in Gabcikovo-Nagymaros, the ICJ entirely omitted any consideration of the scientific evidence submitted, by famously holding that “it is not necessary [...] to determine which of those points of view is scientifically better founded.” As an even more extreme possibility, scholarly literature warns that such avoidance techniques may also permit judges “to evade judicial responsibilities.”

Such downplaying technique has disadvantages. Vinuales warns that the Court, by hiding its assessment behind general reference to uncertainty and long-term risks, runs the risk of acting in a rather “suspicious” manner. Commentators also pointed out how “strange that the Court was able to make a decision on the immediacy and gravity of the environmental peril without taking into account the

1687 Ridell and Plant, Evidence before the International Court of Justice, p. 353.
1690 Ridell and Plant, Evidence before the International Court of Justice, p. 348.
1691 Pulp Mills case, judgment, para. 254.
1692 Pulp Mills case, judgment, paras. 257, 259, “clear relationship” is mentioned in para. 262.
1693 Gabcikovo-Nagymaros case, Judgment, para. 54. see in more detail Chapter 3.
Indeed, carving out scientific input from the legal assessment of ecological necessity may pose challenges for crafting a persuasive judicial reasoning. Framing disputes in such a way is especially problematic in cases, when both parties clearly regard scientific facts decisive and submit an ample factual record for the scientific justification for their conduct. This was the case for instance in the *MOX Plant OSPAR Arbitration*,¹⁶⁹⁷ where judicial reasoning was geared towards issues that the parties did not even elaborate on in their submissions and oral statements. In such cases, it may be especially problematic to carve out science from the scope of the legal decision.

1.3 Mandating the parties negotiations regarding science-heavy aspects

The *Gabcikovo-Nagymaros* case illustrates a further judicial technique with which the adjudicatory assessment of science-intensive questions could be effectively circumvented. The Court repeatedly argued that "the Parties [had to] find an agreed solution"¹⁶⁹⁸ in all aspects of their dispute that could have only been decided by assessing the bulky scientific evidence. Notably, the question of compensation and the scheme of reasonable and equitable water allocation were all referred back to the parties' negotiations.

A serious shortcoming of such judicial framing of the scope of decision is that it proved to be saliently inefficient in resolving the underlying conflict. The *Gabcikovo-Nagymaros* judgment for instance has led to the parties' entrenched but entirely futile negotiations.¹⁶⁹⁹

1.4 Emphasizing procedural requirements over substantive obligations

International adjudicative fora are more willing to consider the procedural aspects of science-heavy environmental disputes, which may be labeled as a peculiar framing strategy. The importance of procedural requirements on the level of primary

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¹⁶⁹⁷ Dispute Concerning Access to Information Under Article 9 of the OSPAR Convention, Ireland v UK, PCA, July 2, 2003, 42 ILM 1118 (2003), in more details see Chapter 4, Section 1.
¹⁶⁹⁸ *Gabcikovo-Nagymaros*, Judgment, paras. 140 and 142.
norms of international environmental law manifests itself in several ways. Most eminently, the no-harm rule imposes an obligation of conduct upon States and not that of result. Due diligence obligations relating to the environment, together with obligations as to notification, consultation, cooperation and assessment of transboundary environmental impacts prior authorizing environmentally harmful practices have become of primary importance in interstate environmental obligations. Martti Koskenniemi traces the reasons for such “proceduralization” to some fundamental characteristics of environmental law. Namely, that in the absence of standalone qualitative standards as to the environmental quality to be protected, lawyers “have to rely on sovereignty as the focal point for addressing environmental disputes.” Against this background, procedural requirements are more suitable as they “do not prejudice any State’s substantive policy” choices. This may explain the prevalence of procedural obligations among primary rules of international environmental law, though it cannot justify the adjudicatory practice to marginalize existing substantive obligations.

With respect to the ICJ, Owen McIntyre pointed out that the Court “[being] faced with the intractability of real and current disputes and the bewildering complexity and uncertainty inherent to the substantive principles, has in recent years placed very considerable emphasis on the role of procedural requirements”. And indeed, breach of substantive aspect of the no-harm rule has never been found established by the ICJ, despite repeated claims by injured States, while a wide array of procedural obligations have been found to be breached in Pulp Mills, and the Certain Activities and the Construction of a Road cases. These all may evidence the Court’s willingness to find violations of procedural obligations rather than weighing contradicting scientific evidence describing alleged environmental

1701 Pulp Mills case, Judgment, para. 112.
1702 Pulp Mills case, Judgment, para. 143.
1703 Pulp Mills case, Judgment, para. 112.
1704 Pulp Mills case, Judgment, para. 205.
1710 Certain Activities and Construction of a Road cases, Judgment, para. 229 (6).
harm. A notably different approach is adopted by the PCA, which in the *South China Sea Arbitration* found a breach of substantive obligation of not to cause significant transboundary harm.  

This ruling, however, thus far marks the only occasion that such a breach was announced by an international adjudicatory forum.

Violations of procedural obligations can undoubtedly be established more easily, and hence proceduralization can be acknowledged for promoting the efficiency of holding States accountable for observing environmental law obligations. Yet downplaying substantive obligations contribute to ‘descientizing’ environmental adjudication. A further problematic point with such framing technique is that it is unable to adequately remedy environmental harm that may nevertheless occur.

1.5 Decoupling the concept of risk from science

The ICJ’s reluctance to discern any scientific minimum criteria for the EIA obligations of States illustrates an adjudicatory tendency to hollow out scientific criteria of environmental law obligations. Tying the obligation of EIA to “the presence of significant risk of harm”, as announced by the Court, is no more than an empty rhetoric, when in fact the Court decouples the meaning of ‘risk’ from the science of environmental risk assessment. The notion of ‘significant environmental risk’ remains essentially an extra-legal concept, which is elevated to a normative framework in the law on EIA, nevertheless remains a scientific concept. Treating scientific concepts as if they were legal constructs is problematic from the point of view of epistemic non-arbitrariness.

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1711 PCA Case No. 2013–19, The Republic of the Philippines v. The Peoples’ Republic of China, Award on the Merits (July 2016) (‘South China Sea arbitration”). For a more detailed analysis see Chapter 4.


1713 Certain Activities and Construction of a Road cases, Judgment, para. 155.

1714 Certain Activities and Construction of a Road joint cases, Judgment, para. 156.

1715 Lowe, *International Law*, pp. 98–99. Lowe explicitly mention sustainable development, equity and fairness among those extra-legal concepts that in fact exist outside the law, and thus, they are not legal norms though are used in the process of legal reasoning.
2. Incorporating science in the judicial inquiry – methods for harnessing its cognitive authority

Despite the above avoidance strategies designed to circumvent science, a growing body of case-law suggests that adjudicators seek to appreciate the scientific aspects of environmental decisions to a certain extent. Although scientific input poses some significant challenges in terms of fact-finding and judicial assessment, science may also lend itself to various strategic uses by adjudicators.

2.1 Mandating the parties’ expert-led consultation

The perceived objectivity of science may help adjudicators solve sensitive and entrenched inter-State disputes using scientific experts as neutral arbiter. In so doing adjudicators can harness the cognitive authority of science. The Trail Smelter Arbitration serves as an apposite example of neutralizing a harsh conflict between sovereign States through a decade-long and elaborate scientific fact-finding process, which ultimately uncovered, scientifically, the cause of the injury.\textsuperscript{1716} The final award even deferred future conflicts before a “Commission of Scientists”,\textsuperscript{1717} which is an even more articulate manifestation of the eminent role scientists played in the resolution of the dispute.

A more recent strategic usage of science can be found in ITLOS jurisprudence. The Straits of Johor decision\textsuperscript{1718} showed how international courts can escape a thorough fact-finding while still keeping science in arms-length distance by compelling the parties to jointly set up a body of experts to guide their consultation. In so doing, the Tribunal could benefit from the authority of science even though it outsourced the science-intensive part of dispute resolution. Importantly, ITLOS retained the ultimate judicial control over the dispute by setting a deadline and the specific mandate for the experts in the parties’ negotiations.

This solution is much more efficient than the path taken by the ICJ in the Gabcikovo-Nagymaros case, where the Court did not intend to have such a hands-on approach and neither it required the parties to pay due regard to the underlying science in negotiating a solution for their water allocation dispute. The difference

\textsuperscript{1716} See Chapter 4 for more details.
\textsuperscript{1717} Read, ‘The Trail Smelter Dispute (Abridged)’, p. 32.
\textsuperscript{1718} Straits of Johor case, Provisional Measures Order, for more details see discussion in Chapter 9.
between these judicial approaches also evident from an empirical point of view. In contrast to the failure of the ICJ to solve the underlying dispute, in *Straits of Johor*, the parties ultimately agreed the recommendations of the experts, which later formed the basis of their agreement to settle their dispute.\footnote{1719}

2.2 Challenges of active engagement with science

Whenever adjudicators would like to harness the persuasive force of scientific standards and concepts in order to buttress the authority of the judicial decision in a legal dispute, they ought to directly engage with science, for which they need considerable scientific support from experts. The fundamental trade-off here lies in the fact that science often appears as an appealing authority to turn to in deciding a dispute, but legal adjudicators may rarely have adequate knowledge to use such scientific standards. Adjudicators are in an even more difficult position when they need to choose between competing or conflicting scientific arguments or evidence. For doing so they need to gather expert advice to be equipped with requisite scientific competence. Available mechanisms for scientific fact-finding therefore become instrumental in performing scientific engagement. Even if a bench framed the legally relevant issues in a way as to touch upon scientific issues, the exact scientific fact-finding mechanism would limit the extent to which adjudicators could make use of the expert advice received. Divergent procedural avenues available in international adjudication for gathering expert evidence, which will be examined in the coming section.

III. Scientific fact-finding: engaging with the evidence to varying extent

In light of current fact-finding practices of international fora all scholarly commentaries point to the need for a greater involvement of adjudicators in scientific fact-finding.\footnote{1720} They only differ in terms of their preferred alternative as to the procedure in which courts and tribunals should garner expert advice. As alluded to above, scientific fact-finding is a procedural prerequisite of forming legitimate

\footnote{1719} For a more detailed analysis see Chapter 9. \footnote{1720} Foster, ‘The Consultation of Independent Experts by International Court and Tribunals in Health and Environmental Cases’, 392.
science-based decisions, therefore the different solutions are of key importance for any attempt at better integrating science in the adjudicatory process. The experts’ ideal role would be to put “scientific information into a form appropriate for legal application so that fair and well-reasoned decisions are the result.” The practice of scientific fact-finding reveals a more nuanced picture on the cooperation of judges and experts.

This section first discusses scientific fact-finding procedures that impede adjudicatory engagement with science. They will be followed by methods that ensure a closer engagement with scientific evidence either through court-appointed experts or by incorporating expertise within the bench through expert arbitrators. These latter adjudicatory techniques, as will be argued, result in decisions where scientific arguments are more properly accounted for.

1. Adjudicators distance themselves from scientific expertise

1.1 Disregarding scientific evidence

Several instances were discussed throughout this study where adjudicators sought to distance themselves from scientific evidence by being reluctant to hear or evaluate expert evidence. Suffice it to refer to the only recently improving evidentiary practice of the ICJ. Notably, early environmental disputes were decided without reference to the underlying facts, or based on expert opinions that were provided by ‘counsels’ precluding cross-examination and therefore meaningful judicial assessment of the scientific facts. The Gabcikovo-Nagymaros case has become famous for evidencing the “factual anxiety” of the Court, which drove judges not to even enter into the process of scientific fact-finding.

Another high-water mark of deciding science-based legal issues without garnering expert evidence is the ECtHR’s jurisprudence regarding individuals’ health injury claims caused by environmental pollution. The Strasbourg Court has been consistently reluctant to use its existing evidentiary powers to ask for expert opinions.

1722 Mangel, ‘Whales, science, and scientific whaling in the International Court of Justice’, 14526.
1723 Pulp Mills case, Judgment, para. 167.
in personal health injury claims neither was the expert evidence ever considered in-depth that has been already available on the case-file. Even in cases, where the ECtHR was willing to rule in favor of a claim that has been supported by scientific input, the evidentiary analysis remains hidden and opaque. Such a treatment of science fails to integrate and accommodate scientific input in the process of judicial decision-making.

1.2 Expertise from counsels and “partisan evidence”

“Partisan evidence”\textsuperscript{1726} poses many challenges for tribunals in evaluating the scientific and evidentiary value of the evidence in lengthy and intricate procedures. As was seen above in \textit{Perenco} investment arbitration, party-adduced expert evidence may be biased to such an extent that it is not suitable for providing basis for adjudicatory assessment.\textsuperscript{1727} In the material case, the tribunal dismissed all party-appointed expert evidence as both sides’ experts “\textit{crossed the boundary between professional objective analysis and party representation}”\textsuperscript{1728}. Instead the Tribunal asked for independent advice.

In \textit{Pulp Mills} the ICJ has been put in a similar situation but took a different path. The Court heard scientists appearing as counsels, taking part in the parties’ delegations.\textsuperscript{1729} Such a method of scientific fact-finding was expressly criticized in the judgment for it blurred the line between scientific advice and advocacy.\textsuperscript{1730} According to \textit{Judge Greenwood}, presenting scientific evidence by counsels is “\textit{unfair and unhelpful}”.\textsuperscript{1731} Yet the majority chose not to use the Court’s powers granted in its Statute.

To conclude, tainting expertise with advocacy diminishes the authority of scientific input and jeopardizes the function expertise could (and should) have in the process of adjudication. \textit{Ex curia} experts could assist amending such a shortcoming of

\textsuperscript{1726} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 80.
\textsuperscript{1728} \textit{Perenco case}, Interim Decision on the Environmental Counterclaim, para. 581.
\textsuperscript{1729} \textit{Pulp Mills} case, Judgment, para. 167.
\textsuperscript{1730} \textit{Pulp Mills} case, Judgment, para. 167.
\textsuperscript{1731} \textit{Pulp Mills} case, Separate Opinion of Judge Greenwood, para. 27.
fact-finding, however, in the practice of international courts and tribunals we still see a hesitation on part of many fora in having recourse to court-appointed experts.

1.3 Reluctance to require independent expert advice or using expert arbitrators

Relying on ex curia experts is not prevalent in international practice. A fear of delegating judicial function to non-accountable experts and the sense of unease over being “bound by the opinion” received are suspected to play a major role in recurring practice of international fora not to appoint independent experts.

The ICJ has consistently declined initiatives to appoint ex curia experts in environmental cases. Even though in Pulp Mills as many as five dissenting judges would have preferred such a solution, the Court has never used such powers in environmental disputes. Some are of the view that the limited use of scientific evidence, which has been characteristic for the most part of the ICJ’s environmental case-law, could not be easily changed, for it is “built in the Court’s DNA”. Others are of the view that “procedural innovations become increasingly likely”. Indeed the use of independent experts would be highly welcomed by many, who argue for the use of ex curia experts under Article 50 of the Statute of the Court.

The same tendency appears in the practice of other major international courts. The EU judiciary, the ECtHR although both would have the power to garner independent expert advise, they have never availed themselves of such procedural possibility. The ITLOS also has powers to appoint ex tribunal experts, which it has declined to do so far.

Although a scholarly opinion is calling for the inclusion of a scientist in WTO panels thus far it has not found its way into the practice of WTO dispute resolution. Though the parties have a role in selecting ad hoc panelists for hearing their case, however, DSU sets qualification criteria for potential members, according

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1732 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’, 272.
1733 Ridell and Plant, Evidence before the International Court of Justice, p. 334.
1734 Pulp Mills case, Joint Dissent of Judge Al-Khasawneh and Simma, Declaration of Judge Yusuf, Separate Opinion of Judge Cancado Trindade, Dissenting Opinion of Judge ad hoc Vinuesa.
1735 Peat, ‘The Use of Court-Appointed Experts by The International Court of Justice’.
1737 Foster, ‘New Clothes for the Emperor?’, 142.
1738 Ridell, ‘Scientific Evidence in the International Court of Justice - Problems and Possibilities’, 253; Foster, ‘New Clothes for the Emperor?’, 142.
to which they ought to have a trade law or trade policy background.\textsuperscript{1740} To date, panelists appointed all had a legal background.\textsuperscript{1741} Similarly, the AB has a permanent membership,\textsuperscript{1742} consisting of experts in international trade law.\textsuperscript{1743}

UNLCOS provides a special procedure under Chapter VIII where arbitrators could be appointed from a list of scientific experts whom are recommended by international organizations. Yet no dispute has ever been referred to this type of arbitration. ITLOS is also reluctant to avail itself of the possibility to appoint expert assessors, whom are equipped with legal background as well to sit with the tribunal without the right to vote.\textsuperscript{1744}

2. Engaging with scientific expertise

Proper engagement with the scientific evidence is directly relevant for the practices of crafting persuasive judicial decisions in science-intensive cases as “asking for advice only confirms the professionalism and legitimacy of the tribunal concerned and the decision it finally takes.”\textsuperscript{1745} If adjudicators exert visible efforts in their reasoning to make sense of complex scientific facts underlying the dispute, as it happened in the Kishenganga Arbitration, the decision finally reached may be seen as more legitimate and persuasive, even if adjudicators ultimately make a policy decision. Notably, the Kishenganga Tribunal although defined the ‘minimum environmental flow’ at 12 cumecs, which would have been necessary for avoiding environmental harm to occur, the panel balanced this against India’s industrial interests, and ultimately set the minimum flow requirement at 9 cumecs to take account for these economic interests.\textsuperscript{1746} Yet the award did not trigger scholarly criticism concerning its fact-finding technique comparable to the scholarly aftermath of the Pulp Mills or the Gabčíkovo-Nagymaros judgments. A possible reason for that arguably lies in the more thorough fact-finding inquiry of the tribunal.

\textsuperscript{1740} Article 8.1 of DSU.
\textsuperscript{1744} For more details see Chapter 9.
\textsuperscript{1745} Pauwelyn, ‘Expert Advice in WTO Dispute Settlement’, p. 252.
\textsuperscript{1746} \textit{Kishenganga Final Award}, para. 104. see in more detail Chapter 4.
It is also clear that judges should not regard the establishment of the scientific facts of a case as a matter of adversarial procedure,1747 where one party could win the case by outnumbering its counterpart by producing more abundant evidence. To ensure appropriate judicial control over party-adduced evidence, a possible solution is to appoint independent experts to assist adjudicators in evaluating the evidence.

2.1 Tribunal-appointed experts: PCA, WTO and the UN Compensation Commission

Tribunal-appointed experts facilitate a deeper understanding of scientific input and correspondingly, a more active engagement with science. They are particularly appropriate solutions when adjudicators confront with contradicting expert evidence, or suspect expert bias,1748 or need to have “a more direct access to experts”1749 for any other reasons. This procedural tool assists adjudicators in grasping the scientific dimensions of the underlying problem.

Arbitrations under the aegis of the PCA have become known for extensive use of tribunal-appointed experts, suffice it to refer to the South China Sea Arbitration, where the panel appointed its own experts to scrutinize the parties’ scientific evidence. The fundamental role ex curia experts played in reconstructing the extent of environmental damage led one commentator to suggest that the Tribunal even imposed the burden of proof on the experts.1750 Although this opinion appears to be valid more as a metaphor than in the procedural law sense of allocating the burden of proof, it is nevertheless true that the Tribunal appears to be strikingly “diligent”1751 in gathering and evaluating scientific evidence in a procedure as transparent as possible. Mbengue also draws1752 attention to the Tribunal’s express interest in gathering and understanding the “hard facts” of the case.1753 This all bespeak the panel’s intention

1748 Foster, ‘New Clothes for the Emperor?’, 143–44.
1749 Foster, ‘New Clothes for the Emperor?’, 144.
1753 South China Sea arbitration, Award, para. 847.
to formulate its own understanding of the scientific aspects of the case, which serves as a promising precedent in international environmental adjudication.

Any discussion on the use of independent experts would be incomplete without mentioning the expert consultation system of the WTO. In SPS cases, the use of experts is mandatory, and the experts are appointed by the panel after seeking the views of the parties on the persons to be consulted as experts. The expert consultations are rather informal and are designed to maximize learning opportunities for panelists “about the scientific subject matter of the dispute.”\textsuperscript{1754} The joint meeting with experts usually takes one to two days\textsuperscript{1755} allowing sufficient time for discussions. First, independent experts are given the floor to address the main points of disagreement between them, then are asked to comment of the parties’ written observations made on the written expert opinions, while they also ought to answer questions of the panel and of the parties.\textsuperscript{1756} The AB appoints independent experts only for assessing the credibility of party-adduced scientific evidence;\textsuperscript{1757} and it explicitly excludes the possibility that independent expert opinions would serve as the sole basis of ruling in favor of a party.\textsuperscript{1758}

Independent experts played a crucial role in the work of the UN Compensation Commission (“UNCC”) hearing claims arising out of the unlawful invasion of Kuwait by Iraq in the Gulf War. The UNCC was established by the UN Security Council and awarded the largest compensation in the history of international environmental damage claims.\textsuperscript{1759} Its evidentiary practice is for this reason highly relevant as a potential adjudicatory best practice. Before turning to presenting the ways in which independent experts were used by the so-called “F4” Panel, which was tasked with administering environmental claims, a brief discussion shall follow to discuss the mandate of the UNCC and the context in which it was operating.

The UNCC accepted various damage claims against Iraq on account of the harmful consequences of the Iraqi invasion. Security Council Resolution 687 (1991) affirmed Iraq’s responsibility under international law for “any direct loss, damage,

\textsuperscript{1754} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 116.
\textsuperscript{1755} Foster, \textit{Science and the Precautionary Principle in International Courts and Tribunals}, p. 115.
\textsuperscript{1757} Japan – Apples, Report of the AB, paras. 129-130.
\textsuperscript{1758} EC – Asbestos, Report of the AB, para. 8.81
including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations, as a result of Iraq’s unlawful invasion and occupation of Kuwait.” The application and interpretation of this seemingly clear jurisdictional basis resulted in a science-intensive claim procedure, which has set an important precedent for adjudicating environmental damage claims on the international level.

The UNCC was a political body tasked with essentially fact-finding function of “examining claims, verifying their validity, evaluating losses, assessing payments and resolving disputed claims”\(^{1761}\). Its principle organ was the Governing Council, consisting of representatives of the members of the UN Security Council,\(^{1762}\) which appointed a separate Panel of three international experts\(^{1763}\) (often called as “F4 Panel”) to deal with specified claims regarding environmental damage and depletion of natural resources (so called “F4” claims). Due to its administrative\(^{1764}\) and quasi-judicial\(^{1765}\) mandate, the Panel had to review the evidence and recommend compensation where it deemed appropriate.\(^{1766}\)

Overall, the “F4” Panel reviewed 170 claims,\(^{1767}\) which were submitted by regional\(^{1768}\) and non-regional claimants\(^{1769}\) in a total amount of approximately USD 85 billion,\(^{1770}\) out of which USD 5.26 billion\(^{1771}\) was finally recommended for

\(^{1760}\) UN SC Resolution 687 (1991), para. 16.


\(^{1767}\) Kazazi, ‘The UNCC Follow-up Programme for Environmental Awards’, p. 1109.


\(^{1770}\) Kazazi, ‘The UNCC Follow-up Programme for Environmental Awards’, p. 1109.

\(^{1771}\) P. H. Sand, ‘Environmental Dispute Settlement and the Experience of the UN Compensation Committee’ (2011) 54 Japanese YB Int’l L. 151 at 152.
compensation. The claims submitted to the F4 Panel were dealt with in five instalments.\textsuperscript{1772}

Given the science-intensive nature of the procedure, both the claimants and Iraq were assisted by a group of natural scientists to present or challenge respectively the proofs supporting the claims.\textsuperscript{1773} The “F4” Panel itself had recourse to scientific “expert consultants” of its own, representing an impressively diverse expertise \textit{i.a.} desert ecology, botany, biology, agriculture, forestry, plant pathology, soil fauna, landscape ecology, terrestrial and marine remediation techniques, marine biology, coastal ecology, geology, hydrogeology, water quality, chemistry, civil engineering, veterinary toxicology, natural resource damage assessment, ecological and risk assessment, economics, statistics, remote sensing, modeling of the transport of airborne pollutants, epidemiology, toxicology, demography, internal medicine, endocrinology, reproductive health, mental health, surgery, oncology, psychiatry.\textsuperscript{1774}

\textsuperscript{1772} The first instalment consisted of claims regarding expenses of monitoring and assessment of the damage allegedly resulting from air pollution, depletion of water resources, damage to groundwater resources and coastlines, oil pollution, damage to fisheries, forestry, wetlands and rangelands, agriculture and livestock triggered by actions of war. 107 such claims were submitted, out of which 67 were deemed compensable. The second instalment concerned claims for costs of taking preventive measures against further environmental damage and those of providing assistance to injured States in abating the damage. Except for one, all such claims were accepted, though with reduced amounts. The third instalment featured claims on recovering the costs of remediation measures. All but one claims were accepted, though reduced. The fourth instalment also concerned expenses of remediation measures of environmental damage caused by damaged oil wells, oil spills into land and waters, oil well fires, mines, and movement of refugees. The fifth instalment dealt with compensation claims resulting from damage to or depletion of natural resources. Diverse heads of damages belong to this category. First, there were public health claims seeking compensation for costs of various medical treatments of refugees and the general public, reduced quality of life on account of pollution, or costs of monitoring public health risks. Second, there were claims for expenses of “compensatory projects” aimed at replacing lost ecological services by establishing new habitats (e.g. creating new natural reserves that are capable of providing roughly equivalent services). Lastly, there were compensation claims for recovering the monetary value of ecosystem service loss due to massive oil pollution or remnants of war (which is also called as ‘pure ecological damage’ claims). These claims concerned \textit{i.a.} reduced crop quality or decrease in catch of fisheries and were only deemed compensable if uncompensated losses remained following the compensatory projects. For a more detailed analysis see: P. Gautier, ‘Environmental Damage and the United Nations Claim Commission: New Directions for Future International Environmental Cases?’ in T. M. Ndiaye, R. Wolfrum (eds.), Law of the Sea, Environmental Law and Settlement of Disputes Liber Amicorum Judge Thomas A Mensah, (Leiden/Boston: Martinus Nijhoff Publishers, 2007), pp. 177–214 p. 187.


Moreover, the Panel was further assisted by international organizations\textsuperscript{1775} such as United Nations Environmental Programme.\textsuperscript{1776}

To sum up, the “F4” Panel of the UNCC engaged with the scientific aspect of the claims to a noteworthy extent, by duly fulfilling its task to sort out acceptable scientific claims. Yet the “F4” Panel’s evidentiary proceeding is not immune to criticism. A major shortcoming is that the claims themselves and all the supplemental information and evidence have been kept confidential.\textsuperscript{1777} Hence, even though the use of independent experts may be set as an example for adjudicatory bodies, the UNCC model should only be employed in as much as adequate transparency requirements are respected.

\textbf{2.2 Shadow experts}

In contrast to court-appointed experts both the ICJ and ITLOS have a regular practice of hiring scientists as temporary staff members to buttress the scientific competence of the registry. Although this fact-finding method may be seen as a necessary compromise for supporting the Court on an ad hoc basis to ensure the parties’ that all aspects of their case will be duly considered, there are serious transparency concerns attached to such shadow experts. For this reason, their use could not be seen as the best possible solution for incorporating scientific knowledge with international courts.

\textbf{2.3 The use of expert arbitrators}

Appointing expert arbitrators ensures the closest incorporation of scientific expertise within a bench or panel. Such a possibility is explicitly provided for in the Optional Rules of Arbitration of Disputes Relating to Natural Resources and/or the Environment, which has been utilized in the practice of the PCA, for instance in the


\textsuperscript{1776} A UNEP Working Group of Experts on Liability and Compensation for Environmental Damage Arising from Military Activities was established soon after the UNCC to provide it with expert advice, Report of the Working Group of Experts on Liability and Compensation for Environmental Damage Arising from Military Activity, Third Meeting, London 14-17 May 1996, section 4.

Kishenganga Arbitration. Thus far the PCA is the only permanent international adjudicative body that uses such an option. Such fact-finding method seems to strike a fair balance in disputes, where scientific facts go to the crux of the controversies.

IV. Causal inquiry: the role of science in the causal assessments

International courts and tribunals generally do not conduct consistent causal inquiries. The following section will briefly reiterate the causal techniques of international fora, will identify the main trends that can be discerned from causal inquiries, and will highlight the shortcomings of respective judicial tools. Before turning to discussing the diverse causal jurisprudence, I shall briefly make some general observations on the nature of causation in international law.

Factual causal mechanisms differ quite remarkably from the legal notion of causation, and therefore legal causality does not simply hinge on a factual causal inquiry, but are much influenced by the subjective decisions of adjudicators. This gap manifests itself in the various legal requirements of demonstrating a ‘clear’, ‘direct’, ‘proximate’ or at least ‘not too remote’ causal link in order to legally establish a causal claim. Support for this proposition may be drawn also from positions of tort law scholars, who assert that certain policy considerations do influence judges’ causal analyses.

Eminent commentators, including the then Rapporteur James Crawford and Dinah Shelton emphasize that causal requirements are “not necessarily the same in relation to every breach”, but may vary among the fields of international law. Yet it is somewhat striking that international adjudicatory bodies impose quite different causal requirements within the same branch of law and even with respect to scientifically and factually similar injury claims. The preceding chapters have canvassed the great variety of causal tests and causal inquiries in the practice of international courts and tribunals. The analysis also suggests that the prospects of a

1778 Special Rapporteur Mr. James Crawford makes such an argument in the context of state responsibility. See Third report on State responsibility, by Mr. James Crawford, Special Rapporteur, Document A/CN.4/507 and Add. 1-4, para. 27.
1780 Crawford, The International Law Commission’s Articles on State Responsibility, pp. 204–5.
1782 Crawford, The International Law Commission’s Articles on State Responsibility, pp. 204–5.
science-based causal claim are depending on the willingness of the given international judicial body to engage with scientific aspects of the claim. In this sense, setting scientific requirements for establishing causality is for a large measure a policy decision.

In this section, we shall overview the divergence between the causal requirements of the various international adjudicatory fora. First, I review those adjudicatory practices that handle the uncertainty and ambiguity of scientific facts as an insurmountable obstacle to establish causation. Then I will briefly discuss the judicial practices attempting to integrate scientific input into the adjudicatory process by bridging the gap between law’s constant strive for certainty and ever-uncertain scientific evidence. Lastly, I will offer some analytical remarks on the present state of causal inquiry in science-intensive international adjudication.

1. Causal inquiry that disregards science

1.1 Circumventing science in causal inquiry: proxy-based causality

Science disrupts the causal inquiry of the Strasbourg Court in an idiosyncratic way. The ECtHR refuses to consider scientific evidence adduced regarding the causal role of toxic exposure in the emerging health injuries. Rather, it develops certain non-scientific proxies with which it conducts a rough assessment on whether the alleged pollution could be regarded as a cause of the injury. The ECtHR, as has been argued, relies on proxies based on *inter alia* (i) the distance between the polluter and the applicant’s home, (ii) the occurrence of prior accidents producing large scale pollution, (iii) the lawfulness of the toxic emission under domestic law, (iv) the ongoing nature of the polluting activity, and (v) the egregiousness of the overall factual circumstances of the case.\(^\text{1783}\) These causal proxies are non-scientific factors that do not necessarily have genuine causal role in bringing about the injury complained of.

The assessment of the ECtHR as to whether to find of a casual link established between the pollution and the violation of the right to private and family life hinges on the above proxies. However, these proxies are often under inclusive by allowing causally relevant pollution escape from legal scrutiny.\(^\text{1784}\) Also, in many cases they

\(^{1783}\) For a more detailed discussion on the use of proxies see Chapter 5.

\(^{1784}\) For a more detailed discussion on the use of proxies see Chapter 5.
yield different results in factually comparable situations, which results in an inconsistent case-law with regard to the environmental aspect of Article 8 of the ECHR. For all these reasons, the tendency of the ECtHR of not to look at the factual evidence already on the case-file, from which real causal factors of injuries may be revealed with greater accuracy, appears to be problematic.\textsuperscript{1785}

1.2 Causal tests requiring clear science-based causal links

Another technique with which international courts may disregard science in their causal assessment is imposing a criterion that scientific facts would almost never be able to meet, that is, to demonstrate ‘clear’ or ‘certain’ causal links. The preceding analytical chapters have seen various instances where adjudicators insisted on having a clear causal nexus, for instance in the case-law of the IACtHR in the context of compensation\textsuperscript{1786} or in the \textit{Pulp Mills} judgment of the ICJ.\textsuperscript{1787} These tests intuitively seem to be justifiable in light of the need for procedural fairness, according to which the liability of a wrongdoer needs to be sufficiently established and not to be presumed lightly. However, equally valid is the point that considering the ever-uncertain nature of scientific evidence, insistence on traditionally strict causal tests may be unduly dismissive towards science-based environmental claims. In order to level the playing field for science-backed claims, a more flexible causal policy seems to be justifiable. Being mindful of the fact that certain sources of uncertainty can never be fully eliminated from scientific evidence, such a solution may seem to pay due regard to the fairness considerations while approximating scientific realities.

1.3 Restrictive approach: high standard of proof and refusal of probabilistic causal proof

In environmental disputes parties often submit large amount of scientific evidence containing model results, probabilities of harm, risk assessment, and technical details.\textsuperscript{1788} The evidentiary value attached to such probabilities varies in international jurisprudence. In certain jurisdictions, the threshold of proof is set so

\textsuperscript{1786} IACtHR, \textit{Saramaka} case, Judgment, para. 199.
\textsuperscript{1787} \textit{Pulp Mills} case, Judgment, paras. 240, 250, 254.
\textsuperscript{1788} \textit{Gabcikovo-Nagymaros} case, Judgment para. 54.
high that probabilistic evidence could never meet it, which would again result in a causal inquiry where scientific proof of causation would not be considered by judges.

Probabilistic scientific evidence was submitted to the ICJ in several cases, most importantly in Gabcikovo-Nagymaros, in Pulp Mills and in Certain Activities and the Construction of a Road cases, but the ICJ dismissed all pieces of evidence for various reasons. These all bespeak a de facto high standard of proof with the Court in scientific disputes, even though in principle, the applicable standard of proof would be the balance of probabilities, i.e. the preponderance of the evidence standard.1789

The criticism for the ICJ’s dominant approach towards probabilistic scientific evidence was most succinctly set forth by Judge ad hoc Vinuesa in his Dissenting Opinion in Pulp Mills:

“In various key passages, the Court reaches conclusions on alleged substantial violations while acknowledging the lack of scientific certainty underpinning those findings: “Argentina has not convincingly demonstrated that Uruguay” (Judgment, para. 189); “the Court is not in a position to conclude that Uruguay” (ibid., para. 228); it has “not been established to the satisfaction of the Court” (ibid., para. 250); “there is insufficient evidence” (ibid., para. 254); “there is no clear evidence to link” (ibid., para. 259); “a clear relationship has not been established” (ibid., para. 262); “the record does not show any clear evidence” (ibid., para. 264).”1790

And indeed, the Pulp Mill judgment has revealed that the ICJ was not willing to accommodate science in his causal inquiry. The Court’s adamant insistence on the need for ‘certain’ and ‘clear’ scientific proof has been attributed to its frustration of being left alone in a “scientific vacuum”.1791

The practice of the ECtHR bears resemblance to the evidentiary findings of the ICJ in as much as its standard of proof is generally the beyond reasonable doubt standard,1792 which is met by “the coexistence of sufficiently strong, clear and concordant inferences or of similar unrebutted presumptions of fact”.1793 While the ECtHR emphasized that it allowed flexibility in the standard of proof with regard to the evidentiary difficulties involved,1794 in its practice, it rarely accepted probabilistic evidence. Suffice it to refer to Tatar v Romania, in which the Court refused to engage

1790 Judge ad hoc Vinuesa in his Dissenting Opinion in the Pulp Mills case, para. 70.
1794 Fadeyeva v. Russia, para. 79.
in “probabilistic reasoning”, and instead required causal claims that are “accompanied by sufficient and convincing statistics”.

Moreover, even when the Strasbourg Court finds a science-based causal claim established, it does not expose its evidentiary assessment and reasoning. This hides the Court’s stance as to the persuasive force attributed to the scientific evidence submitted. Notably, both in Brincat and Others v. Malta and the Vilnes v. Norway judgments, the Court deemed likely that there was a causal link between the applicant’s health deterioration and the working conditions tolerated by respective States, however, the reasoning did not discuss the scientific evidence submitted.

The Strasbourg Court has altogether applied a rather strict approach to scientific evidence and proof of causation respectively and tended not to rely explicitly on statistical probabilities. Judges of ITLOS endorse a similar approach towards probabilistic evidence. As Judge Lucky stressed: “applicants must show a very strong probability upon the facts that serious harm will accrue in the future.”

The success of environmental damage claims is particularly impeded by adjudicators’ dismissive approach to probabilistic evidence. Tellingly, compensation has only been awarded for environmental harm when the facts of the case were exceptionally egregious, as it happened in the South China Sea arbitration, or when the parties did not dispute the occurrence of ecological harm.

2. Practices facilitating science-based causal claims: presumptions and relaxed causal tests

International environmental adjudication also features some legal techniques that aim to facilitate finding a causal link established either by relaxing causal tests, or by devising legal tools that allow establishing causality despite uncertain scientific facts. Apposite examples can be drawn not only from the case-law of international courts and tribunals, but also from practice of international claims tribunals, domestic climate change litigation, and U.S. toxic tort litigation. The latter state practice merits

1796 Tătar v. Romania, para. 105.
1798 Separate Opinion of Judge Lucky, Straits of Johor case, para. 13.
1799 For more details see Chapter 8.
1800 Certain Activities case, Judgment on Compensation, 2018, see in more detail in Chapter 3.
special attention given that U.S. courts are widely renowned for their innovative judicial solutions for assessing highly technical scientific evidence in adversarial proceedings. These adjudicatory practices will now be addressed in turn.

2.1 Using causal presumptions to allow environmental claims

Presumptions are usually regarded as “established tools of reasoning”¹ in international adjudication. Relying on causal presumptions would equip adjudicators with an efficient legal device to render a legal judgment under uncertainty. Yet presumptions are still exceptional in the context of bridging the gaps of uncertain scientific evidence to establish legal liability for harm that is supported by only ambiguous evidence.

Presumptions are in a certain regard similar to the proxy-based method of the ECtHR mentioned above, in as much as both tools provide for courses of action when scientific assessment of causal relations seem to be exceedingly intricate for adjudicators. However, they are different in an important respect. Simply put, proxies are used to relieve the ECtHR of considering scientific evidence under all circumstances, while evidentiary presumption is normally only a second-best option, and does not relieve adjudicators of assessing scientific evidence relevant as fully as possible to reconstruct the factual realities of the case.

Three judicial fora apply causal presumptions, which will be detailed in turn below. First, the case-law of an international claims tribunal is to be addressed, which administered health injury claims arising out of nuclear tests. Second, a specific presumption will be addressed that has been established by the Strasbourg Court in claims involving massive air pollution, and lastly, a presumption allowed by the EU Courts will be discussed.

² Jorge E Vinuales also mentions the use of proxies as a fourth characteristic approach international courts take to make science-based findings. Vinuales, ‘Observations sur le traitement des motifs scientifiques dans le contentieux environmental international’, pp. 122–23.
2.1.1 U.S. – Marshall Islands Nuclear Claims Tribunal

Between 1946 and 1958 the U.S. used the territory of the Marshall Islands as detonation sites for its Nuclear Testing Program, which caused extensive damage to property, health, and environment especially on the Bikini and Enewetak Atoll.\(^{1803}\) The U.S. assumed responsibility for the resulting damage, which led to the set up of the Nuclear Claims Tribunal in 1988 to handle compensation claims procedures.\(^{1804}\) For purposes of the present analysis the relevant aspect of the Tribunal’s practice is the way in which it awarded compensation for personal health injuries.

The Tribunal employed an irrefutable presumption on the causal link between 25 medical conditions and nuclear exposure\(^{1805}\) modeled after the technique used in a domestic nuclear exposure compensation program of the U.S.\(^{1806}\) The list of diseases triggering the presumption was provided in the Tribunal’s Regulation. They were all conditions for which several pieces of expert evidence showed a “significant statistical relationship” between exposure and disease development.\(^{1807}\) Victims manifesting these conditions did not need to prove specific causation regarding their health injury. Diseases not included in the list were also compensable if the claimant could adduce sufficient evidence on causality in her individual case.\(^{1808}\) The panel also established different compensation standards for smokers and non-smokers with respect to certain types of cancer that can be equally caused by the victim’s lifestyle, \textit{i.e.} factors unrelated to the exposure.\(^{1809}\) The list was updated annually, and in fact

\(^{1803}\) The Claims Tribunal awarded compensations in total USD563,315,500 (to victims of Bikini Atoll) and USD341,049,311 (for victims of Enewetak Atoll). For more on the proceedings see Louka, \textit{International Environmental Law Fairness, Effectiveness, and World Order}, pp. 469–70.

\(^{1804}\) 1983 Compact of Free Associations between the United States and the Marshall Islands.


was amended by ten diseases, in order to keep pace with increasing knowledge of medical sciences into the effects of nuclear radiation.\textsuperscript{1810} The Tribunal was particularly lenient in terms of establishing causation given that it has based its findings on statistical probabilities of general causation without any requirement of proof of specific causation. In so doing, it did not bar compensation in case of competing causal factors. The Tribunal justified its approach with an overriding need for “\textit{an efficient, simple, and cost-effective payment program}”, which alleviated the burden of “\textit{difficulties of proof of causation}” resting with victims.\textsuperscript{1811} These can be seen as explicit policy considerations shaping the causal requirements of the Tribunal.

The case practice of the Tribunal shows a much more generous approach than the jurisprudence of ECtHR, which applied stricter causal standards in nuclear exposure claims. The divergent judicial practice concerning the causal role of nuclear exposure in generating health injuries, notably carcinogenic effects, provides perhaps the most vivid example of the fragmentation of causal requirements in international law. In contrast to the practice of the U.S. – Marshall Islands Nuclear Claims Tribunal, the Strasbourg Court in the \textit{L.C.B. v UK} case\textsuperscript{1812} refused to find a causal link established between a nuclear exposure and trans-generational carcinogenic effects. The applicant submitted a report commissioned by an Independent Advisory Board in the UK to investigate the health effects of the Sellafield nuclear facility, which found “\textit{statistical association between the incidence of leukaemia in children}”,\textsuperscript{1813} whose fathers were exposed to radiation prior to their conception. The ECtHR nonetheless concluded: “[\textit{h}aving examined the expert evidence submitted to it, the Court is not satisfied that there is a causal link between the exposure of a father to radiation and leukaemia in a child subsequently conceived.”\textsuperscript{1814} This proves to be a more restrictive approach to establishing causal proof compared to the evidentiary standards set by the Claims Tribunal. This serves as an illustration for the proposition that the success of

\textsuperscript{1812} \textit{L.C.B. v. UK}, App. no. 14/1997/798/1001, Judgment.
\textsuperscript{1813} \textit{L.C.B. v. UK}, para. 17.
\textsuperscript{1814} \textit{L.C.B. v. UK}, para. 39.
science-based health injury claims is largely hinges on the policy considerations of judges, which are reflected in their causal requirements.

2.1.2 Causal presumption used by the ECtHR

There has been one extraordinary occasion in the practice of the ECtHR, which signalled the Court’s willingness to devise legal techniques to allow claims of health injuries to proceed. In the famous Fadeyeva case, the Strasbourg Court has established a causal presumption in cases where pollution significantly exceeded domestic safety levels. The Court held that pollution “becomes potentially harmful to the health and well-being of those exposed to it. This is a presumption, which may not be true in a particular case.” Applying the presumption, the Strasbourg Court found that “the applicant’s health deteriorated as a result of her prolonged exposure to the industrial emissions”. Notably, the Fadeyeva case featured individuals’ complaints of air pollution generated by one of the largest steel plants in Russia, with certain air pollutants being twenty to fifty times higher than the maximum permissible limits under domestic law. Medical reports confirmed a roughly three-fold increase in respiratory diseases among children and a decree noted the causal role of atmospheric pollution in the increase in various diseases. It was against this background, that the Court was inclined to find a causal link established between the functioning of the steel plant and the individual’s claims of health injuries based on a “strong combination of indirect evidence and presumptions”.

The noteworthy aspect of the judgment, as Vinuales has also pointed out, is that the ECtHR this time “did not seek to circumvent the scientific question”. Indeed, it was ready to find causality by invoking the presumption despite the fact that the applicant herself could only submit one medical report, which “did not substantiate any causal link” between her illness and the pollution. Although in light of later case-law, it is apparent that the presumption may be triggered only in the

1815 Fadeyeva v. Russia, para. 87.
1816 Id. para. 88.
1817 Fadeyeva v. Russia, para. 15.
1818 Fadeyeva v. Russia, para. 15.
1819 Fadeyeva v. Russia, para. 88.
most severe pollution cases, and not by pollution that only slightly exceeds statutory limits, which is often the case.\textsuperscript{1822} Hence the practical reach of this judicial tool is relatively limited in the ECtHR’s case-law.

2.1.3 Causal presumptions in the practice of EU Courts

The last example in this line of adjudicatory practices is drawn from EU Courts’ jurisprudence. EU Courts affirmed the evidentiary practice of the French Cour de cassation under the Product Liability Directive in cases concerning health injuries caused by defective vaccinations. Without rehearsing the detailed analysis on the \textit{N.W. and Others v Sanofi Pasteur} case set forth in Chapter 6,\textsuperscript{1823} suffice it to recall that EU Courts allowed a causal presumption only when domestic courts have ascertained that there was no scientific consensus on the causal role of the vaccine in triggering diseases as side effects. Only in such cases could the proof of a causal link between the health damage and the defective vaccination be “\textit{derived from serious, specific and consistent presumptions}”.\textsuperscript{1824} Such a presumption may arise from a combination of certain causally-relevant proxies, such as the lapse of time between the administration of the vaccine and the manifestation of the health deterioration, or family disease history. Importantly, the CJEU emphasized that such presumption cannot be applied automatically, without first revisiting thoroughly the applicable scientific evidence submitted by the parties. This ensures that scientific evidence have a decisive role whenever it is available at the time of the judicial proceeding. For this reason, the causal proxy of CJEU is markedly different from the proxy-based approach of the Strasbourg Court, as the latter would not in any case consider the scientific evidence that is on the case-file.

This important difference, namely, that the use of proxies is confined to scenarios when persistent scientific and medical uncertainty arises, renders the CJEU’s approach legitimate both from the perspectives of legal certainty and procedural fairness, while its also respects epistemic non-arbitrariness. By applying this presumption, the CJEU arguably comes as close as possible to discharging the judicial function in science-intensive cases, which is, in the words of ICJ judges “\textit{not}

\textsuperscript{1822} See, e.g., \textit{Martínez Martínez and Pino Manzano v. Spain}, App. No. 61654/08, 3 July 2012.
\textsuperscript{1823} For more details please refer to Chapter 6, Section 3.1.
\textsuperscript{1824} Case C-621/15 \textit{N.W. and Others v Sanofi Pasteur}, 21 June 2017, para. 12.
to give a scientific assessment of what has happened, but to evaluate the claims of parties before [a court of law] and whether such claims are sufficiently well-founded so as to constitute evidence of a breach of a legal obligation.”

A further proxy-based causal proof requirement was announced in the context of environmental liability. The proxies also served to relieve victims of pollution from excessive evidentiary burden. In the ERG case, the CJEU’s proxy-based causal theory allowed proving a causal nexus between an operator and a given contamination if the operator was acting in the proximity of the polluted area and if there was chemical similarity between the polluting agent found in the area and the chemicals used in the processes of the operator.1826 These proxies therefore adequately reflect on the scientific realities of contamination while making it possible for claimants to meet the causal proof requirements. Importantly, by requiring chemical similarity, the EU judiciary ensures that polluters who could not possible engender the pollution would not be hold liable for the contamination. At the same time, such causal proof requirement does not compel fingerprinting of the polluting agent, i.e. a definite identification of the actual source of the chemicals. Providing such evidence would normally be simply impossible if there are possible competing sources emitting the same type of pollution. The chemical similarity proxy therefore adequate approximates scientific realities, while also respects procedural fairness.

2.2 Domestic law innovations: causal tests facilitating causal links in climate change litigation and U.S. toxic tort law

A rising number of domestic court decisions have started to approximate legal standards of causation to what scientific facts can actually deliver with respect to causal relations. A leading example of such domestic law innovations in this respect can be found in U.S. toxic tort litigation, which developed several nuanced tests to accommodate uncertain scientific causal proofs. Another source of novel solutions is the emerging field of climate change litigation, where domestic courts tend to relax traditional causal requirements in order to find a claim established.

1825 Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, in Pulp Mills case, para. 4.
1826 Case C-378/08 ERG case, for more details see Chapter 6.
It has been previously argued in detail that causation in international law is relatively underdeveloped compared to domestic legal systems. The latter have produced elaborate causal tests and scenarios that are comparable to the complexity of real life causal processes.\textsuperscript{1827} It is for this reason apt and useful to examine some innovations of domestic legal systems as to causal tests in scientific disputes. Being persuasive decisions of domestic courts, they may inform the evolution of international adjudication as well.\textsuperscript{1828}

This brief outlook as to domestic law solutions serves putting international courts’ causal inquiry into a wider context and, consequently, in a different light. It is of course not suggested here that every domestic law solution would be readily transferrable into international adjudication. However, these examples do serve to underline that a more proactive judicial engagement with science can fit neatly within the judicial function and, thus, uncertain scientific facts ought not necessarily be construed as a final obstacle to adjudicating legal claims. Judicial dialogue between domestic and international fora can be particularly enriching with respect to the treatment of similar challenges, such as causation.\textsuperscript{1829}

\textbf{2.2.1 Innovative domestic law solutions: causal tests in U.S. toxic tort law}

Toxic tort cases involve claims of personal injury, such as physical or psychological harm caused by exposure to a hazardous substance,\textsuperscript{1830} which can include a variety of causal agents, from pathogens to chemicals and radiation.\textsuperscript{1831} In order to keep pace with the advancement of science and technology, traditional U.S. tort law theories adapted to the peculiarities of toxic exposure. They provide remedies for an expanding scope of ‘harm’ under the theory of trespass, negligence, public and private nuisance, strict liability and product liability.\textsuperscript{1832} In toxic tort cases U.S. courts award damages for physical harm, increased risk of disease, medical monitoring, and also for psychological distress such as fear of future harm.\textsuperscript{1833}

\begin{flushleft}\textsuperscript{1827} See Chapter 2 and Chapter 3 for more details in causal theories in international adjudication.\textsuperscript{1828} Statute of the International Court of Justice, Article 38. (1) d).\textsuperscript{1829} J. Peel, ‘Issues in Climate Change Litigation’ (2011) 1 15–24 at 24.\textsuperscript{1830} Foerster and Gregorski Rolph, Toxic Tort Litigation, p. 3. Environmental torts allow recovery for natural resources damages see Foerster and Gregorski Rolph, Toxic Tort Litigation, p. 47. These will be not addressed in detail as they fall out of the scope of this research.\textsuperscript{1831} Foerster and Gregorski Rolph, Toxic Tort Litigation, p. 139.\textsuperscript{1832} Foerster and Gregorski Rolph, Toxic Tort Litigation, p. 5.\textsuperscript{1833} Foerster and Gregorski Rolph, Toxic Tort Litigation, p. 35.\end{flushleft}
Perhaps the most salient way in which scientific evidence modifies traditional causal inquiry is the emergence of two distinct elements: general and specific causation. Courts first assess general causation, i.e. whether the causal agent at hand is capable of causing the harm complained of. Normally, the inquiry only reaches the question of specific causation if the factfinder is satisfied that the test of general causation has been met. Two caveats apply here. First, when group-based data are unavailable, the two analytic steps merge into one. Second, in case of well-known signature diseases, courts generally find causation if the exposure and the manifestation of the disease are both established.

If general causation is found to be established the court investigates specific causation, i.e. whether the causal agent did actually cause the plaintiff’s harm. In this respect, courts should examine whether the plaintiff: 1) was indeed exposed to a dose at least comparable to that for which general causation is established; 2) was exposed to other potential causal agents; and 3) has individual genetic or behavioral characteristics that might present a background risk of the harm that occurred.

The primary test of tort law causation is the but-for (sine qua non or factual) causal test. However, all tort law systems acknowledge certain exceptions from this general causation theory. The Third Restatement endorses the substantial factor test in case of multiple sufficient causal sets, i.e. when none of the causal sets on its own would be a but-for cause. The substantial factor test can also be used for ruling out causal agents that only have a de minimis causal contribution. Moreover, courts employ the substantial factor test in enhanced-injury cases, when only the extent of the harm that has been caused by a given defendant is uncertain.

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1834 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26 Comment g.
1835 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26 Comment g.
1837 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 c.(1).
1838 Gold, ‘The More We Know, the Less Intelligent We Are?’, 401.
1839 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26 Comment g.
1840 Id. at §28 Comment on Subsection (a)c.(3).
1841 Steel, Proof of Causation in Tort Law, p. 16.
1842 Steel, Proof of Causation in Tort Law, p. 17. Steel surveys the tort law systems of Germany, France and the UK.
1843 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §26, Comment j.
such cases, the plaintiff needs only to establish that the tortfeasor’s conduct was a substantial factor in the enhanced harm.\textsuperscript{1845}

The Third Restatement repudiated a wider scope for the application of the substantial factor test;\textsuperscript{1846} which some courts employ it in cases involving dose-sensitive exposures (\textit{e.g.} asbestos when causing asbestosis\textsuperscript{1847}).

U.S. toxic tort law had to accommodate several challenges to make legal sense of scientific facts. Perhaps the most pervasive problem in toxic exposure cases is that the same injury might have been caused by numerous possible causal agents. In some cases, it is virtually impossible to identify the actual cause, a situation that is called the defendant indeterminacy problem. In other instances, the tortfeasors are identifiable, but their contributions cannot be measured precisely, only estimated based on disease development models. Further complications arise when multiple causal agents have synergistic effects. The innovative legal methods to cope with all these scenarios in toxic tort litigation are addressed below.

A) **Defendant indeterminacy: alternative liability, market-share liability**

In cases where it is not possible to prove which one of the defendants’ identical conducts was the actual cause of injury,\textsuperscript{1848} tort law applies alternative liability.\textsuperscript{1849} This test has been recognized in US tort law ever since the two hunters’ dilemma was entertained in \textit{Summers v. Tice}.\textsuperscript{1850} In the toxic tort context, the textbook example of defendant indeterminacy is the flood of litigation related to a miscarriage prevention drug containing diethylstilbestrol („DES”), the harmful effects of which were only manifested in the daughters of the women who took the drug during pregnancy.\textsuperscript{1851}

\textsuperscript{1845} The American Law Institute, \textit{Third Restatement of the Law of Torts for Physical and Emotional Harm}, p. §26, Comment j.
\textsuperscript{1846} The American Law Institute, \textit{Third Restatement of the Law of Torts for Physical and Emotional Harm}, p. §26 Comment j.
\textsuperscript{1847} It is to be noted, however, that only asbestosis is described with the threshold model among asbestos related diseases, while mechanisms of mesothelioma and lung cancer are more explained with the one-hit exposure model.
\textsuperscript{1850} \textit{Summers v. Tice}, 33 Cal.2d 80 (Cal. 1948). The Californian Supreme Court reversed the burden of proof so that the defendants had to bear the burden of the virtually impossible task of proving which one of them caused the actual health impairment to the plaintiff, given that both used the same type of gun and the same bullets.
In *Sindell v. Abbott Laboratories* the California Supreme Court applied alternative liability and reversed the burden of proof so that plaintiffs did not need to prove which specific defendant’s drug they had taken, since adducing such evidence on specific causation would have been virtually impossible due to the lapse of time.\(^{1852}\) As there were hundreds of manufacturers who produced drugs containing DES, the California Supreme Court had to devise a new rule in order to allocate liability and not allow exculpation for the manufacturers. The method it used became known as ‘market-share liability’, since the court imposed liability on the defendants according to their respective market shares.\(^{1853}\)

B) **Multiple exposures: dose-dependent (threshold) disease development and one-hit exposure theory**

A ubiquitous challenge in toxic exposure cases is identifying which causal agent was ‘the’ cause of injury when the victim was exposed to many agents, each of which is known to have been capable of causing the injury.\(^{1854}\) The toxic tort solution for this problem is to distinguish among the evidentiary requirements for different models of disease development.\(^{1855}\) Science differentiates between two main types of disease development: the threshold model, which describes dose-dependent diseases that manifest only above a certain threshold of exposure and whose severity is correlated with the exposure level (*e.g.* asbestosis),\(^{1856}\) and the one-hit exposure model, applicable for non dose-dependent illnesses (*e.g.* certain forms of cancer).\(^{1857}\)

Under the one-hit exposure theory, each exposure imposes distinct risks of developing the non dose-dependent disease and, thus, each exposure is a separate cause of the

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\(^{1852}\) *Sindell v. Abbott Lab.*, 607 P.2d 924, 937 (Cal.1980)

\(^{1853}\) For more details on the market-share liability see *Steel*, *Proof of Causation in Tort Law*, pp. 165–67. Even though market-share liability was an innovative and exceptionally useful tool to solve the specific problems posed by the DES cases, the Third Restatement warns that it will be of limited use in the future,\(^{1853}\) since it is only applicable to cases, where the manufacturers of the drug are unknown. This is exceptionally rare under present day circumstances, when pharmaceutical products are normally protected by patents, thus, the manufacturers are known. Moreover, market-share liability is only operational where all toxic products pose equivalent risks. *Third Restatement of the Law of Torts for Physical and Emotional Harm*, 1:§28 Comment on Subsection (a)


\(^{1855}\) *Id.* at §28 Reporters’ Note, Comment c.(5).

\(^{1856}\) *Id.*

\(^{1857}\) *Id.*
The threshold model implies that each dose of exposure creates a marginal additional harm.

For dose-dependent illnesses, the traditional rule of causation requires the plaintiff to show which of the multiple exposures was the actual cause of the disease (i.e. resulted in reaching the threshold). However, to ease the evidentiary requirements for demonstrating the cause of such diseases, courts started to apply the so-called Lohrmann test in asbestos litigation. This test requires the plaintiff to adduce “evidence of exposure to a specific product on a regular basis over some extended period of time in proximity to where the plaintiff actually worked.” If the three-fold requirement of frequency, regularity, and proximity is met, courts are willing to regard the exposure as a “substantial cause” of the harm.

Similarly, in Rutherford v. Owens-Illinois, Inc., the plaintiff had to demonstrate that the defendant’s product was “a substantial factor in causing or contributing to his risk of developing cancer” but he did not need to “prove (...) that fibers from a particular defendant’s asbestos-containing products were those (...) that actually began the cellular process of malignancy.” This alternative causal test, thus, allows the plaintiff to prove that each of the multiple exposures was a cause-in-fact of the disease. The Third Restatement promotes the adoption of this test in all cases when the exact disease development mechanism is unknown, as this is the best way of “adapting proof requirements to the available scientific knowledge”.

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1858 Id.
1859 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28, Comment on Subsection (a)c.(5).
1861 Lohrmann v. Pittsburgh Corning Corp., 782 F.2d 1156, 1163 (4th Cir. 1986).
1862 Foerster and Gregorski Rolph, Toxic Tort Litigation, pp. 148–49.
1864 Id.
1865 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 Comment on Subsection (a)c.(5).
1866 Id.
C) Synergistic effects of multiple causes

Causal agents can have synergistic effects in developing a harm. The Third Restatement provides that ‘[i]f the synergetic effect is sufficiently large, the excess incidence of disease due to synergetic effect will be greater than the excess incidence due to each of the agents separately.’ In such cases the factfinder is allowed to rule that the combined synergistic exposure was the cause of the harm. Courts usually allow harm to be apportioned in cases of synergetic effects between toxic exposure and causes inherent in lifestyle, such as smoking. The plaintiff’s genetic background risk of disease does not preclude the liability of a negligent actor if his conduct was a cause of the disease.

The above innovative causal doctrines show that multiple causal agents can fit well into the causal requirements of tort law and that tort law judges do not shy away from adjusting proof requirements to the available scientific knowledge.

2.2.2 Relaxing causal requirements in climate change damage litigation

One cannot escape noticing a new wave of successful climate change lawsuits. Scholars have long discussed the prospects and desirability of climate change litigation claims, but it is only more recently that we witness a surge in actual court decisions, many finding in favor of climate change lawsuits. Climate change litigation is an umbrella concept uniting claims filed against governments in an attempt to force (more ambitious) climate mitigation policies and claims for climate change damages against sources of greenhouse gas (“GHG”) emission. It is well beyond the scope of this study to discuss all intriguing legal questions that arise along

1867 Id.
1868 Id.
1869 The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 Reporters’ Note, Comment c.(5).
1870 Id.
1871 Id.
the way of a rising number of claims filed with domestic, regional and international fora. The present discussion confines itself to the analysis of causal inquiries of domestic climate change damage claims. Lawsuits seeking to enforce domestic climate policy-making and ambitious implementation have resulted in remarkable domestic judgments.

International judicial fora have not yet rendered judgments concerning climate change damage claims, where complex causal relations of GHG emissions and adverse consequences could be entertained. Although it is likely be only a matter of time, the first signs of spring have already appeared on the stage of international adjudication. Tellingly, a group of small island nation States has requested the UN General Assembly to seek an Advisory Opinion of the International Court of Justice on the legal responsibility of States for allowing corporations on their territory to cause transboundary environmental damage. Although this request has not been granted, we have witnessed significant steps towards international climate litigation cases.

Initial claims on the international level were couched as human rights claims. In 2005, the Inuit Circumpolar Conference filed a petition with the Inter-American Commission of Human Rights against the United States for its failure to address GHG emissions adequately and thereby violating rights enshrined in the American Declaration of the Rights and Duties of Man. Although the Commission declined to process the 167-page long petition, it signaled the possibility that climate change issues might be brought before international adjudicatory fora. Since 2004 petitions are also filed with the World Heritage Convention in order to seek protection

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1875 Voigt, ‘Climate Change and Damages’, p. 466.

1876 Voigt, ‘Climate Change and Damages’, p. 466.


for World Heritage sites threatened by climate change impacts. EU Courts have ruled on claims relating to the implementation of the 2003/87 Council Directive, which established a scheme for GHG emission allowance trading (“ETS Directive”). These cases can be largely characterized as belonging to a specific branch of climate change litigation.

Simultaneously with the expansion of case-practice worldwide, scholarly support is also growing for international courts’ involvement in deciding claims arising out of adverse consequences of climate change. Potential legal bases for filing climate change damage claims under international law are also increasingly discussed. Even though the 2015 UN Paris Agreement on Climate Change firmly rejects construing the ‘loss and damage’ concept as giving rise to liability or claims for reparation, it is widely recognized that such claims could arise under customary international law. This is signaled by scholarly commentaries and also by the declarations of a group of small-island States that were deposited to the UN Framework Convention on Climate Change at the time of ratification, expressly reinforcing that the Convention “shall in no way constitute a renunciation of any rights under international law concerning State responsibility for the adverse effects of Climate Change”.

Climate change claims raise a plethora of difficulties in terms of establishing standing of applicants, delineating actionable types of damage, implications of due diligence nature of customary law obligations, setting the applicable threshold of

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1885 Voigt, ‘Climate Change and Damages’, pp. 475–83.

1886 Voigt, ‘State Responsibility for Climate Change Damages’, 9–12.
harm, dealing with claims of contributory negligence and, last but not least, with respect to the troubling questions of proof and causation.

In terms of causation, at least four major challenges arise. First, scientific results can only speak in probabilistic terms, even though the most recent report of the International Panel on Climate Change has declared that “it is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together.”

Notwithstanding this straightforward finding, international courts may still face difficulties in establishing causality between human (corporate and/or State) actions and the adverse affects of climate change. Second, metaphorically speaking, adverse impacts of climate change arise like a “death by a thousand cuts”, that is to say, out of the synergetic and cumulative effects of myriads of GHG emitters. Third, causally attributing specific climate change damage to a particular emitter is simply impossible, as no ‘fingerprinting’ is possible with regard to each GHG molecule. Although it may alleviate such difficulties if one considers that “there is a causal link between each ton of greenhouse gas emitted and the change in radiative forcing”, which then could provide a basis for apportioning the damage with respect to the gross GHG emissions of the respondent State at hand. Still, the apportionment of harm caused to a certain respondent would be a highly controversial and contested step in the judicial analysis. The fourth problem is posed by the extremely long and complex causal ‘chains’, which could “break” quite easily. This begs the question as to what adverse impacts of climate change were foreseeable, and therefore ‘direct enough’ consequences of a defendant’s conduct so as to find causality established.

1887 Voigt, ‘Climate Change and Damages’, pp. 471–73.
1888 Voigt, ‘Climate Change and Damages’, pp. 486–89.
1894 Voigt, ‘Climate Change and Damages’, p. 485.
1895 Voigt, ‘State Responsibility for Climate Change Damages’, 17.
Against the backdrop of the above causal conundrum, the surprising nature of the judgment of the U.S. Supreme Court in the *Massachusetts v. EPA* case would all the more be appreciated. This landmark judgment arose out of the claim of the State of Massachusetts, complaining of its loss of territory due to climate change induced sea-level rise. The coastal State attributed its harm to the failure of the federal government to regulate carbon-dioxide emission from new motor vehicles under the federal Clean Air Act, which mandates rule-making for the Environmental Protection Agency (“EPA”) regarding all air pollutants that may cause or contribute to air pollution that endangers public health. The EPA of the Bush Administration notably denied a rule-making petition of private organization asking for regulation of GHG gases as ‘air pollutants’, by stating that the Clean Air Act does not authorize addressing climate change concerns. The petitioners and intervening States have challenged the denial of EPA and brought the case before the Court of Appeals for the District of Columbia Circuit, which found that the EPA properly exercised its discretion to deny the petition.

As the case reached the Supreme Court of the United States, the judges had to decide first whether Massachusetts had standing to bring the claim. Under rules of US constitutional law, petitioners had to satisfy the three-fold requirement of Article III standing, which is (i) a concrete and particularized injury, which is actual or imminent, (ii) that is traceable to the defendant (causation requirement), and (iii) that a favorable decision would redress the injury suffered. As to the causality criterion, the EPA referred to a report of the National Research Council, commissioned in 2001, which was of the view that a causal link between anthropogenic emissions and the rise of surface temperature “cannot be unequivocally established.”

In this standing analysis the US Supreme Court had to ultimately decide whether GHG emission of the new motor vehicle fleet of the U.S. was the ‘cause’ of climate change, which led to global warming entailing sea-level rise, which ultimately decreased the territory of the State of Massachusetts.

The Supreme Court solved the ‘Gordian knot’ of the causation challenge by providing an unexpected reasoning. As to the ‘thousands cut problem’, it ruled that it

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is an “erroneous assumption that a small incremental step, because it is incremental, can never be attacked” in such a lawsuit. The remarkable nature of such a causal finding does not diminish if one considers the reference made by the Court to the fact that US transportation sector alone would rank as “the third-largest emitter of carbon dioxide in the world, outpaced only the European Union and China.” As to the problem of too long causal chains, it firmly found that “[t]he risk of catastrophic harm, though remote, is nevertheless real.”

The Mass v. EPA judgment was a landmark and quite unexpected victory for climate change litigation claims not only within the U.S. but also world-wide. The world-renowned and highly respected U.S. Supreme Court found a causal link established amidst highly politicized debates surrounding the uncertainty inherent in climate science.

With respect to the causal inquiry Mass v. EPA serves as an apposite example of innovative judicial decision recognizing the existence of a causal link for the purposes of their legal analysis even if it is based on uncertain science. This is proven by the floodgate of litigation filed since then with domestic courts to enforce more ambitious climate action on the part of the government. On 24 June 2015, The Hague District Court ruled against the Dutch Government in the Urgenda case and ordered the government to curb its emissions by at least 25% by the end of 2002 compared to 1990 levels. The court easily found a “sufficient causal link” between Dutch emissions, global climate change and the possibility of adverse impacts. Only a few months later, the Pakistani Lahore High Court Green Bench enforced judicially the implementation of the national climate change policy framework in the Leghari case. In its reasoning, it repeatedly noted adverse climate change effects

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1900 Supreme Court of the United States, Mass. v. EPA, Judgment, 22.
1901 Supreme Court of the United States, Mass. v. EPA, Judgment, 23.
1902 Similar lawsuits have been filed since then to federal courts. A recent example is a decision issued in November 2016 by a U.S. District Court Judge in Oregon, who allowed public trust claims to proceed that were brought by a group of children and James Hansen, a renowned climate scientist acting as a guardian for future generations. The lawsuit alleges that the U.S. federal government, by permitting, authorizing, and subsidizing the exploitation, production, transport, and burning of fossil fuels played a significant role in creating the current climate crisis that would “significantly endanger plaintiffs, with the damage persisting for millennia.” See Kelsey Cascadia Rose Juliana et al. v. United States of America, et al., No. 6:15-cv-1517, No. 6:15-cv-01517-TC (D. Or. Nov. 10, 2016).
1904 Urgenda case, Judgment, para. 4.90.
1905 Asghar Leghari v. Federation of Pakistan (W.P. No. 25501/2015).
that are causal upon expected changes, such as changes in river flows and shortening of growing seasons.  

The above examples from climate change litigation show that policy considerations may relax the causal link in cases where traditional causal concepts of law would fail to identify the 'cause' of an apparent injury. The rapidly increasing number of such climate change lawsuits may on the long run impact the causal doctrines of international litigation as well. Although climate change litigation claims are even more "wicked" than other types of environmental harm, and this may paradoxically work against adopting similarly flexible causal tests in case of non-climate related environmental damage claims. In any event, the above domestic law examples confirm that national law concepts of causation are currently undergoing considerable changes, which can have some repercussions on international legal doctrine as well.

2.3 Accepting mathematical models as causal proof in the Gulf War reparation claims

Given that SC Resolution 687 (1991) formally declared the Iraqi government’s liability under international law for the invasion and its direct harmful consequences, the key question for the scope of Iraq’s liability – the amount of compensation due – was the existence of a direct causal link. Since the claims thus have “turned on questions of evidence”, the review procedure required very high level of scientific literacy from Commissioners. Benefitting from expert advice, as detailed above, the UNCC Commissioners were able to rely on and accept mathematical models and statistical evidence as proof of causal claims.

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1908 Paragraph 16 of UNSC Res. 687 (1990): „Iraq, without prejudice to the debts and obligations of Iraq arising prior to 2 August 1990, which will be addressed through the normal mechanisms, is liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations, as a result of Iraq’s unlawful invasion and occupation of Kuwait.”
1909 In order for a claim to be deemed compensable there was no need to show that the loss of resource directly resulting from the unlawful occupation exceeded the threshold of ‘significant harm’, or that the State in question has breached any standard of care applicable to the obligation of preventing such environmental harm.
UNCC Commissioners did not shy away from conducting a thorough causal analysis based on statistical scientific evidence and advanced computer-modeling techniques. Despite deficiencies in the transparency of the evaluation of the evidence, one must appreciate the innovative and even brave approach taken by the Panel, especially if one considers the immaturity of rules of international environmental liability at the time. Hence, many aspects of UNCC’s fact finding can be regarded as positive point of reference for establishing international liability for environmental harm, notwithstanding that these procedures formed a special regime derogating from rules of customary international law in many respects. The many innovations of the UNCC proceedings, that were responsive to scientific inputs led some commentators to regard it as a possible model for the ever debated International Environmental Court.

The “F4” Panel has been applauded for its “pro-active” approach to engaging with scientific evidence. There were numerous instances, when the Panel openly evaluated the evidence, criticized the underlying scientific methodology and sometimes proposed even modifications to models, parameters of a model, or to remedial measures. The Panel accepted certain computer models as appropriate proof by stressing that despite all uncertainties inherent in models, “potential difficulties are [not] sufficient reasons for a wholesale rejection of these methodologies.” Similarly, the Panel was open to accept statistical evidence, by

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1911 Despite the Panel’s overall laudable approach, however, there were still quite a few occasions, when the exact reasons for dismissing proofs on alleged causal links were not revealed, conflicting evidentiary statements were not contrasted, but dismissed or affirmed with vague statements. E.g. “evidence available from a variety of sources supports the conclusion that…” without specifying the sources, see: UN Compensation Commission Governing Council, ‘Report and Recommendations made by the Panel of Commissioners Concerning the Third Instalment of ‘F4’ Claims’, para. 176.


1914 Sand, ‘Environmental Dispute Settlement and the Experience of the UN Compensation Committee’, 171.

1915 E.g. UN Compensation Commission Governing Council, ‘Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of ‘F4’ Claims’, para. 115.


1917 E.g. UN Compensation Commission Governing Council, ‘Report and Recommendations made by the Panel of Commissioners Concerning the Third Instalment of ‘F4’ Claims’, para. 104.

1918 UN Compensation Commission Governing Council, ‘Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of ‘F4’ Claims’, para. 439.

1919 UN Compensation Commission Governing Council, ‘Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of ‘F4’ Claims’, paras 80–81. While doing so, the Panel cited the Trail Smelter arbitral award, which stated that, where the wrongful act “itself is
refuting Iraq’s assertion that such evidence should not be regarded as adequate proof. Importantly, statistical evidence was not immune to scrutiny despite being reviewed by a panel of expert lawyers. The Panel confidently dismissed certain evidence if it were of the view that the scientific methodologies applied were flawed.

2.4 Innovations of domestic courts: U.S. toxic tort litigation’s solutions for accepting statistical evidence as proof of uncertain causation

U.S. tort law has also been struggling with establishing causation, especially in tort law claims that were based on health injury claims due to toxic exposure. It comes as no surprise that tort law scholars dub the evidence of causation the “holy grail of toxic torts.” U.S. toxic tort law is also known for the widespread acceptance of and reliance on probabilistic proof of causation. The Third Restatement of Torts is aware of the need for adapting traditional tort rules of proof “to a greater uncertainty inherent in agent-disease causation and the specialized types of evidence.”

The Third Restatement is mindful that all causal inquiries presuppose inferential reasoning and only allows reasonable inferences and not impermissible speculations. Within these confines, courts should make causal inferences on a case-by-case basis. The preponderance rule and the use of naked statistical evidence, along with the doubling of relative risk standard, are important US toxic tort law tools that enable reliance on uncertain scientific evidence.

The burden of proof is normally borne by the plaintiff; however, special rules accommodate the challenges of toxic tort cases. As one exception, in alternative-defendants situations, the burden of proof is reversed for the benefit of the plaintiff in

UN Compensation Commission Governing Council, ‘Report and Recommendations Made by the Panel of Commissioners Concerning the Fifth Instalment of ‘F4’ Claims’, para. 77.


The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28, Reporters’ Note, Comment c.(1).

The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 Comment on Subsection (a) b.
certain jurisdictions. There are no generally accepted rules on the burden of proof where preexisting conditions contribute to the harm, as the nature of these conditions varies considerably and influences the imposition of the burden. In this respect, courts generally consider whether the preexisting condition was a result of innocent forces, such as the plaintiff’s genetic heritage, or involved a conscious choice, e.g. one of lifestyle, and whether the plaintiff was contributorily negligent.

2.4.1 The ‘more likely than not’ standard – and even less likely than 50 percent?

The Third Restatement generally requires that the plaintiff prove the causal link with the preponderance of the evidence, meaning that the factor was more likely than not to be the cause of the injury. The preponderance rule entails an “all-or-nothing” liability. If the plaintiff can prove the causal link on the balance of probability, the defendant is held liable for the entirety of the harm. The strong version of the preponderance rule allows for pure mathematical probabilities to meet the ‘more likely than not’ standard; while the weak version requires an actual belief on the part of the factfinder to meet that standard.

Some scholars suggest that the preponderance rule can be abandoned and replaced by proportional liability, based on the probability of causation. This would mean that a causal link could be established if there were less than 50 percent probability of causation, and the defendant would be held liable to the extent of that probability. Critics of proportional liability argue that it will result in excess damages, due to the subjective judgments needed from scientists to interpret statistical data on probabilities.
2.4.2 Relying on statistical evidence

To use group-based, statistical epidemiological evidence\textsuperscript{1934} for proving general causation, courts must ascertain whether the association of data indeed reflects causal connection and not just spurious association. For this purpose, courts rely on the Bradford Hill criteria,\textsuperscript{1935} which were developed and originally used by scientists. A legion of case-law demonstrates courts’ willingness to accept epidemiological data as proof of general causation.\textsuperscript{1936} However, statistical evidence alone is not always treated as adequate proof of specific causation.\textsuperscript{1937} In certain cases, biological-mechanism evidence combined with differential diagnosis may be also regarded as persuasive proof of causation, if the differential diagnosis rules out all other known causes, and general causation is established, as well as if there is a short latency period or an acute disease development.\textsuperscript{1938}

A certain type of statistical data gained special importance in U.S. toxic torts, namely, epidemiological data showing the doubling of relative risk (often referred to by the shorthand reference of RR>2) as proof of causation.\textsuperscript{1939} The computation of the doubling of relative risk is illustrated by Professor Gold through the following example: “if 5% of smokers get lung cancer, but only 1% of non-smokers do, the relative risk of smoker for lung cancer would be five, implying that smoking explains four of every five cases of lung cancer in smokers.”\textsuperscript{1940}

\textsuperscript{1934} Gold, ‘The More We Know, the Less Intelligent We Are?’, 373. Epidemiological studies either compare the rate of disease occurrence in populations exposed to the causal agent to those populations not exposed; or they examine the rate of exposure to the casual agent in populations where the disease is manifest to those populations which do not manifest the disease. Id.

\textsuperscript{1935} Hill, ‘The environment and disease’.

\textsuperscript{1936} The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 Reporters’ Note, Comment c (3).

\textsuperscript{1937} The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, n. §28 Reporters’ Note, comment c. (3). In such cases, case reports on instances of an individual’s disease and biological mechanism evidence can serve as additional proof. Id.

\textsuperscript{1938} The American Law Institute, Third Restatement of the Law of Torts for Physical and Emotional Harm, p. §28 Comment on Subsection (a) c.(4).


\textsuperscript{1940} Gold, ‘The More We Know, the Less Intelligent We Are?’, 373. Professor Gold suggests that the threshold of more than doubling the relative risk reflects the preponderance test, since a relative risk of two describes a case when the incidence of the disease in the exposed population is exactly the double than that in the exposed population, where the disease is attributable to background risks. In such a case, a randomly selected individual from the exposed group of the population who manifests the disease is equally likely to be either harmed due to the exposure or having developed the disease due to background causes. Gold, ‘The More We Know, the Less Intelligent We Are?’, 376.
Toxic tort jurisprudence is split over whether courts should regard the doubling of relative risk as a proof of general or specific causation. Understandably, many courts find it troublesome to infer specific causation from group-based data that, in fact, provide no proof of an actual causal link to a specific individual’s disease. The Third Restatement allows for the use of RR\textgreater{}2 as a proof of specific causation as well. However, it stresses that it is “usually inappropriate” to require demonstrating RR\textgreater{}2 when other types of evidence are available and general causation is established. Nevertheless, the use of the ‘doubling of relative risk’ standard shows courts’ willingness to accept naked statistical evidence to establish causation in toxic torts.

Importantly, RR\textgreater{}2 is not a general panacea for every problem that arises in the “black-box” of uncertain causation. It is blind to the distinction of whether but-for the exposure, the disease would have not occurred at all or would have occurred only later in the plaintiff’s life. Hence, the RR\textgreater{}2 standard can be misused, as it systematically underestimates the probability of causation in cases when the exposure only accelerates the disease. Another possible misinterpretation of the RR\textgreater{}2 standard is that relative risk might vary depending on the genetic heritage of a given individual.

By and large, the judicial use of the ‘doubling of relative risk’ standard stands as a laudable example of accepting irreducible uncertainty in scientific results. As the court noted in *Merrell Dow Pharmaceuticals Inc v. Havner*, “[t]he use of scientifically reliable epidemiological studies and the requirement of more than a doubling of the risk strikes a balance between the needs of our legal system and the

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\textsuperscript{1941} The American Law Institute, *Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §28 Reporters’ Note, Comment c.(3).


\textsuperscript{1943} Gold, ‘The More We Know, the Less Intelligent We Are’?, 374.

\textsuperscript{1944} The American Law Institute, *Third Restatement of the Law of Torts for Physical and Emotional Harm*, p. §28 comment c. (4).


\textsuperscript{1947} Greenland, ‘Relation of probability of causation to relative risk and doubling dose’, 1166.


\textsuperscript{1949} Gold, ‘The More We Know, the Less Intelligent We Are’?, 390. He drew attention to some studies showing dramatic changes in relative risk of developing breast cancer among smoking women depending whether they carried the protective allele or not.
Indeed, the standard appears to be a useful tool for establishing causation when the evidence inevitably falls short of the traditional requirement of certainty. Being able to measure the doubling of relative risk and then attaching probative force to it undoubtedly marks a great leap forward in bridging the gap between uncertain science and society’s legitimate need for a tort law system based on the theory of corrective justice.

As evidenced by the above discussion, toxic tort case law has successfully adapted to the various challenges posed by the proof of uncertain causation. U.S. courts increasingly accept naked statistical evidence produced by epidemiology when the circumstances of the case make it impossible to obtain particularized evidence. This trend represents considerable progress compared to the 1980’s, when a number of tort law scholars condemned U.S. courts for being too dismissive towards probabilistic evidence. By now, U.S. courts have developed a thorough approach to evaluating the probative force of scientific evidence and have become quite successful in integrating uncertain scientific results into legal theories of causation.

3. Assessing the role of science in the causal policies of international courts

The above comparative overview suggests that the causal inquiries of international courts and tribunals vary greatly, just like their tendencies to find a causal claim established based on scientific evidence. Two opposing trends emerge from this comparative assessment: certain fora are dismissive towards scientific facts and see the uncertain nature of scientific evidence as an insurmountable obstacle to establish science-based causal links; whereas others proved to be willing to modify traditional causal tests and standards of proof in order to accommodate science in their causal inquiry. Regarding the overall policy landscape of causation in the practice of international adjudicative fora the following analytical remarks can be offered.

First, adjudicators can justify their causal findings with or without reference to science. International courts and tribunals can only conduct science-intensive causal inquiry if they are adequately equipped with fact-finding capabilities. It is no coincidence that every judicial body that accommodates science in its causal inquiry,

notably, the UNCC, PCA, certain investment tribunals, and domestic courts have benefited from independent expert advice or the presence of expert arbitrators in conducting their causal assessments. Also, there are sporadic causal techniques, which aim to close the gap between scientific and legal concepts of causation by relying on presumptions. The justification for applying such solutions ultimately rests on legal (and policy) considerations though are triggered by an awareness of what science can and cannot deliver in a legal dispute.

Alternatively, adjudicators may downplay or circumvent science in assessing causal claims. In such cases their causal assessment would be built on traditional understanding of legal doctrines or intuitive rule-of-thumb balancing of the causal role of a certain factor. However, the lower the engagement with underlying facts, the more vulnerable the reasoning will be to criticism. Suffice it to refer to the various dissenting opinions in *Pulp Mills*, criticizing the majority’s complete disregard for scientific realities. Causal assessments that circumvent the underlying science could also be criticized from an empirical point of view given that the intuitive assessment can often run against scientific realities. The less extent adjudicators are willing to consider science in their causal analysis, the more would they need to rely on other policy considerations. We shall return to some concrete examples on that later.

Second, international courts and tribunals generally tend to obfuscate their causal analysis. They often conflate the two distinct steps of causal inquiry, namely the stages of general and specific causation. This is all aggravated by the fact that normally international adjudicative bodies do not even expressly discuss the causal test they deem appropriate to apply. The Eritrea-Ethiopia Claims Commission was a notable exception in this respect, since it introduced a foreseeability criterion in its causal inquiry. The Commission administered claims arising out of an armed conflict between Eritrea and Ethiopia. It awarded compensation to Ethiopia for losses to which Eritrea’s invasion was a proximate cause. Also, the UNCC which administered monetary compensation claims that were deemed ‘directly’ arising from

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the unlawful invasion of Kuwait. Yet even the UNCC Governing Council remained silent on the applicable causal test. Similarly, the ICJ also refrained from announcing “its own criteria for the sufficiency of the causal nexus” in environmental damage claims.

The survey of causal inquiry of international adjudicative bodies confirms that causality is an often-overlooked aspect of the judicial analysis. This seems to be no coincidence but rather a strategic choice of courts and tribunals to retain their control over inescapably uncertain facts. In the compensation judgment rendered in the Certain Activities case, the ICJ stressed that “it is for the Court to decide whether there is a sufficient causal nexus between the wrongful act and the injury suffered”. It did not reveal, however, what would be seen as ‘sufficient’ in a causal analysis. Hence States (and scholars) were left again without any test or yardstick for making such a determination.

Third, when international courts do clarify their causal requirements, they tend to require ‘clear’ and ‘direct’ causal links. This necessitates a high level of certainty with respect to the underlying scientific facts, which would often be problematic if not impossible in light of the many forms of scientific uncertainty burdening expert evidence. Due to the opaque causal assessments of courts and tribunals, it is often not clear whether they require but-for causes or contributory causes would also be sufficient to qualify as a legally relevant cause. The Peter Allard case is a notable exception, where the investment arbitral tribunal expressly articulated that it deemed a factor to be a ‘cause’ of the injury even though it had only a “significant component” in realizing the harmful effect.

Fourth, the majority of jurisdictions tends to be dismissive towards probabilistic proof of causal links, which can be explained by the salient gap between scientific and legal concepts of causation and adequate proof. Some international

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1956 Paragraph 16 of UNSC Res. 687 (1990): „Iraq, without prejudice to the debts and obligations of Iraq arising prior to 2 August 1990, which will be addressed through the normal mechanisms, is liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations, as a result of Iraq’s unlawful invasion and occupation of Kuwait.”
1959 Certain Activities case, Judgment on Compensation, 2 February 2018, para. 34.
1960 Peter Allard v Barbados case, Award, para. 157.

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courts are reluctance to allow causal presumptions to close such gaps caused by inevitable uncertainties of causal evidence.

There are some notable exceptions when national or international adjudicative bodies have been inclined to accept probability calculations as proof of a causal nexus. On the international level, the case-practice of the UNCC offers a notable example, whereas on the national level, the practice of U.S. courts in toxic tort litigation offers some innovative solutions in this respect. These judicial best practices may prove to be too confrontational and fact-intensive for the more deferential international courts and tribunals, the chief function of which is to induce States to have recourse to peaceful means of dispute settlement, keeping in mind the sensitivities of the sovereigns involved.

Fifth, among influential policy considerations we shall flag the role of certain moral judgments. Considerations on the responsibility of the ‘wrongdoer’ State and more intuitive judgments, such as moral blame appear to play a decisive role in the causal policy of international fora. Scholars have long emphasized the role of judges’ subjective judgments in setting causal tests in a given case. Evidence of similar trends can be discerned from contemporary international case-law. Notably, causal claims leading to environmental damage were only found established on two occasions. First, by the UNCC, which assessed causality and the quantum of damages for the harmful consequences of the Iraqi invasion, for which act the international responsibility of Iraq had already been established by the Security Council. The other instance of awarding environmental damage claims occurred in the South China Sea Arbitration. In this instance, the compensation was arguably owed to the exceptional gravity of the environmental destruction caused by China’s artificial island-building activity. Hence, in both cases, science-based causal claims were not adjudicated in a vacuum. Quite the opposite, the international ‘climate’ was favorable towards both environmental damage claims, which arguably played a considerable role in the inclination of the respective adjudicative bodies to find causality established.

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1962 These relate only to cases where causality was disputed in the case. In the compensation judgment in Certain Activities case, compensation was awarded for ecological damage, however, causation was not disputed by the respondent. See for more details in Chapter 3.
1963 See Chapter 4 for more discussion.
Sixth, policy considerations of international adjudicators in setting causal requirements are also manifest in the divergent causal tests set by different fora in factually similar cases. One may find divergent evidentiary and causal standards with regard to scientifically (medically) similar injury claims in the practice of the U.S. – Marshall Islands Claims Tribunal as well as the ECtHR. Both fora heard health injury claims allegedly caused by nuclear exposure. While the Claims Tribunal adopted relaxed evidentiary and causal standards and awarded damages, the ECtHR has never found requisite causal nexus established.

In sum, the prevailing approach of international courts and tribunals towards causation appears to be a mixture of uncertain facts and opaque policy. This obscurity confirms that causality, especially when it is based on scientific facts, is a neglected aspect of current jurisprudence and is very much still in its infancy. The inconsistent application of causal standards suggests that causation is still treated as a second-class citizen in international adjudication: causal requirements are omitted from the reasoning, or treated in an opaque way, and causal links are only found established if other relevant aspects of the case, such as formerly announced responsibility of the State, or the overall egregious factual circumstances so require. Hence there is still considerable room for improvement both in terms of clarifying applicable causal tests and with respect to thorough scientific fact-finding.

Despite the unprivileged status of causal inquiry in contemporary international jurisprudence, causal claims are increasingly filed with international courts. Causality, in express or in more subtle ways, has been found relevant for every international judicial body that hears environmental claims. In some jurisdiction, causality is just about to gain even more importance. For instance, it has recently been put in the center of the IACtHR’s analysis regarding extraterritorial victims’ claims regarding environmental pollution. Although it is true that the IACtHR announced its new causality-based link for extraterritorial jurisdiction without specifying the applicable causal requirements; yet it would be difficult for the IACtHR to escape a more open causal inquiry on the long run when such extraterritorial claims would be actually filed with the court.  

1964 The extraterritorial application of human rights standards will first generate human rights claims within respective States, for which analysis causality will also be relevant.
One also witnesses a growing number of critical dissenting opinions targeting obscure causal analysis provided by majority decisions. This can be a hesitant sign of a changing judicial attitude. Recently this is accompanied by a heightened academic awareness about causal requirements in specific regimes of international law. Whether these may gather momentum for a shift in judicial attitude towards causal inquiry may be too early to say. Nevertheless, these tendencies suggest that international courts will be more frequently asked for clarifying their causal tests and analysis.

The outcome of this survey on the various causal policies of international adjudicators suggests that accommodating scientific input in the causal inquiry, despite all of its practical intricacies, appears to be warranted. At a time when growing scientific knowledge allows us to better understand scientific realities of complex natural processes, adjudicatory solutions that distance the courts from the scientific aspects of causation run the risk of being detached from reality and, in turn, of losing legitimacy. Fortunately, international courts do have the power to close the gap between the law and the science of causation by embracing uncertain evidence to the extent possible and by translating probabilistic proof of causation into legal doctrines. The task of setting causal requirements ultimately rests with judges, since there is no universal causal principle that would “relieve the courts of the burden of discretion or creative choice”.

V. Standard and extent of judicial review

The issue of choosing a standard of review arises predominantly in cases involving judicial review of the legality of scientific risk assessments, for instance in the practice of the WTO and EU Courts. States also refer to environmental and

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1965 E.g. dissenting opinion of Judge Zupancic in Tatar v. Romania (for more details see Chapter 5), and the Joint Dissenting Opinion of Judge Al-Khasawneh and Simma as well as the Dissenting Opinion of Judge Vinuesa in the Pulp Mills case (for more details see Chapter 3).
1967 Hart and Honoré, Causation in the Law, p. 130.
1968 See Section 3 in Chapter 7.
1969 See Section 2.2 in Chapter 6.
health risks as a basis for regulation, which may be challenged in investment arbitration proceedings.\textsuperscript{1970} Lastly, scientific claims of States may be legally relevant under certain multilateral treaty regimes that contain reference to scientific concepts, as was illustrated by the \textit{Whaling} judgment.\textsuperscript{1971} In all these cases, adjudicators ought to judge science-intensive claims through different standards of review. The various standards incorporate different benchmarks with which adjudicators can justify the outcome of their judicial review, \textit{i.e.} whether to uphold or reject a particular risk assessment or find an appeal to scientific authority acceptable or invalid. Such reasoning can be built on various argumentative practices. They may either refer to scientific standards or rely on non-scientific rationality such as various legal and hybrid benchmarks.

This section is structured in three parts. Section 1 summarizes the competing judicial and scholarly views regarding the desirable extent of judicial review in interpreting and adjudging science-intensive concepts. Section 2 maps current adjudicatory landscape regarding the extent of deference international fora afford to sovereigns’ scientific claims. Given that virtually every relevant forum has by now become reluctant to grant total and automatic deference to such claims, adjudicators must select a benchmark to review scientific claims. Section 3 therefore reviews the various benchmarks in light of which the legality of scientific claims is scrutinized. The exact argumentative practices will now be addressed.

1. Extent of judicial review – settled and still unsettled questions of the adjudicatory task

The survey of international case practice evidences that initially, when adjudicators first started to hear science-based environmental claims, the parties have put forward rather extreme suggestions as to the task of adjudicators. Japan for instance argued in \textit{Southern Bluefin Tuna} arbitration that the issue at hand is “purely a scientific dispute over questions of scientific judgment”,\textsuperscript{1972} and such questions are “\textit{not justiciable}”.\textsuperscript{1973} The opposite extreme end of possible adjudicatory involvement was argued for by Russia in a WTO dispute. According to whom, WTO panels were

\textsuperscript{1970} See Sections 4.2 -4.3 in Chapter 8.
\textsuperscript{1971} See Chapter 2.
\textsuperscript{1972} \textit{Southern Bluefin Tuna Cases}, Award, para. 41, section c).
\textsuperscript{1973} \textit{Southern Bluefin Tuna Cases}, Award, para. 40, section a).
required to assess "the quality and credibility of the scientific and technical evidence relied upon by the importing Member." A similar conception of the judicial task was echoed in the Dissenting Opinion of Judge ad hoc Vinuesa, who criticized the majority’s position in the Pulp Mills case for not exercising what, in his view, would have been the proper judicial function in scientific disputes:

“throughout this overview of the evidence, there is no discussion about the scientific integrity of the scientific methodologies applied. There is also no discussion about the scientific integrity of the results. This silence on the important issue of credibility of scientific submissions … underscores the Court’s lack of scientific competence and throws doubt on the Court’s ability to determine whether the date is scientifically viable or credible.”

However, neither of these extreme positions was followed by adjudicators, and such arguments have largely been abandoned by the parties in contemporary disputes. By now it has become widely accepted that science-based disputes are matters falling within the judicial purview. Scholarly consensus now holds that adjudicators do not need to decide about the validity of scientific evidence, or to decide the scientific controversy involved. In other words, adjudicators are not supposed to act as “science courts” by deciding the underlying scientific controversy, or by giving a scientific judgment on a claim’s validity, or by deciding whether the alleged risk is indeed established from a scientific point of view.

The judicial task does, however, necessitate answering the underlying legal questions. As was straightforwardly presented by Judge Al-Khasawneh and Judge Simma: “This is surely uncontroversial: the task of a court of justice is not to give a scientific assessment of what has happened, but to evaluate the claims of parties before it and whether such claims are sufficiently well-founded so as to constitute evidence of a breach of a legal obligation.” For all these reasons, adjudicators ought to engage closely with the underlying science “in so far as this is required in order to reach [their] legal findings.”

Having said that, there is still a wide room for manoeuvre for international courts and tribunals in designing the boundaries of their judicial review. Some

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1976 This has been suggested by the respondent in Glamis Gold v US, Award, para. 617.
conduct a more intrusive review, while others are still quite deferential towards States’ scientific claims. I shall now turn to analyze the nuanced tendencies in this respect.

2. Balancing between deferential and intrusive review

An interesting pattern can be discerned from the changing standards of deference afforded to States’ scientific claims. These issues were discussed in detail with regard to EU Courts, WTO panels, ISDS and the jurisprudence of the ICJ and it is not the intension of this section to repeat the content of these chapters, but to underline some of the converging, or diverging trends with respect to the degree of deference. What is at stake in such cases is the extent of regulatory autonomy granted to States by adjudicators in making scientific claims.

The ICJ announced its standard of review in the Whaling case, where it had to scrutinize whether Japan could legitimately claim that it was pursuing ‘scientific whaling’ under the special permit procedure of the ICRW in JARPA II. The Court had to devise a tool to distinguish claims of ‘genuine science’ from ‘non-science’. The Court consciously avoided to provide a general definition on ‘science’, instead it announced an objective test of reasonableness to assess whether JARPA’s ‘design and implementation [were] reasonable in relation to its stated scientific objectives’. The ICJ’s substantive assessment amounted to an 80-paragraph long inquiry into the research items of JARPA II, its stated objectives and its implementation scheme, which can surely be seen as an in-depth, substantive and, by certain accounts, even a “de novo” review.

Within EU jurisprudence the issue of standard of review surfaced in the context of the judicial review of risk assessments carried out by Member States or EU institutions. The EU judiciary in its initial judgments automatically granted deference

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1982 See Chapter 8
1986 Judge Owada described the Court’s approach as “making a de novo assessment”, though he criticized the Court for this, see Whaling case, Dissenting Opinion of Judge Owada, para. 38.
to risk assessors’ scientific claims. However, the landmark Pfizer judgment\textsuperscript{1987} proved to mark a new wave of judgments, where EU Courts have been willing to amend their ‘soft’ deferential language with ‘hard’ requirements as to the reasoning of the risk assessors and as to the evidentiary basis accepted by regulators. Such more interventionist review triggered developing numerous benchmarks with which the EU judiciary was willing to touch upon “the adequacy and quality of the informational basis of science-based measures”.\textsuperscript{1988}

Interestingly, WTO jurisprudence manifests an opposing trend in changing the standards of review. WTO panels first embarked on the task of scrutinizing whether a science-based measure was “sufficiently supported or reasonably warranted”\textsuperscript{1989} by scientific evidence, which became highly problematic and controversial in cases tainted with irreducible scientific uncertainty. In such earlier cases, an intrusive review resulted in a finding of inconsistency regarding the SPS measure at hand. This occurred in the sequel to the EC – Hormones dispute, in the Continued Suspension of Obligations case, where the AB had to step in in order to mandate a more deferential approach towards WTO Members’ regulatory autonomy in cases of “genuine and legitimate scientific controversy”.\textsuperscript{1990} The standard of review became, as has been argued, a hybrid one, comprising two stages: (i) the first being a scrutiny as to the underlying scientific basis of SPS measures. This is a more deferential review as scientific evidence must only come from a legitimate scientific source but may represent a minority view within the scientific community. Whereas (ii) the second stage is a scrutiny as to the reasons provided by the risk assessor. This means an assessment as to whether the reasoning “is objective and coherent in which the conclusions find sufficient support in the evidence”.\textsuperscript{1991} As it is clear from the wording of this second arm of the review, WTO panels retain the possibility of conducting an intrusive review, even though the standard indeed became more deferential in nature compared to its initial practice.

\textsuperscript{1987} Pfizer case, judgment. \\
\textsuperscript{1988} Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 144. \\
\textsuperscript{1989} EC – Hormones, Report of the AB, para. 186. \\
\textsuperscript{1990} EC’s appellant submission, cited by the AB in US – Continued Suspension of Obligations case, Report of the AB, para. 585. \\
On balance, investment arbitration and WTO jurisprudence tend to accord a high measure of deference to host States’ scientific claims, which is usually attributed to three main characteristics of investment arbitration. The first concerns the lack of epistemic competence of adjudicators to compare and assess scientific claims. The second factor is that regulating health and safety risks belongs to the core functions of sovereign States; and the third being the fact that risk assessment is not a purely scientific task, but presupposes social and policy considerations, which is again a terrain of sovereign choices.

With regard to investment arbitration, the conceptual foundation of deference is usually traced back to the large extent to which arbitration may “penetrate into the domestic legal sphere”, which necessitates “reinjecting legitimacy” into ISDS systems. It is for this reason not very surprising that investment arbitration provides perhaps the most deferential approach to host States’ scientific claims. The deferential approach is perhaps best illustrated by the Methanex award, in which the arbitrators stressed that a breach of investment protection standards was only possible where scientific conclusions claimed by host States “were so faulty that the Tribunal may reasonably infer that the science merely provided a convenient excuse for” disguised protectionism.

To segue to the next topic of discussion, it is to be recalled that ‘deference’ is not a monolithic concept as it may bring about considerably divergent reviews. Schill suggests that even though investment tribunals use deference “as a mantra”, they do not reveal the exact scheme for “allocating power between states and tribunals”. Indeed, save for the two extremes of the spectrum, which are total deference (i.e. automatic acceptance of the claim) and de novo scrutiny (i.e. conducting its own assessment regarding the scientific issue at hand), a deferential approach can, in fact, cover a host of legal and semi-legal benchmarks with which

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1996 Methanex case, Final Award, Part IV – Chapter E, para. 19.
adjudicators review scientific claims of States. The coming section will detail the various legal tests corresponding to different standards of review.

3. Benchmarks for scrutinizing scientific claims

There are many possible ways of evaluating the acceptability of a scientific claim from a legal point of view. Adjudicators may either rely on scientific standards, or decide not to engage with science and design some non-scientific benchmarks instead. Hence, one option is when adjudicators completely rely on standards of the scientific community to decide whether a scientific claim is acceptable for purposes of a judicial review. Another possibility is to focus on the procedure in which the scientific data has been produced and they look for evidence of a transparent and inclusive scientific process, which may best guard against nurturing biased scientific opinions. A yet another option is to look at the substantive outcome of a risk assessment procedure and develop hybrid benchmarks for scrutinizing the science-based reasoning after which judges can decide whether to accept the given claim. A fourth way is to accept those scientific claims as valid and credible that are backed up by standards or guidelines of international organizations or resonate with established international regulatory trends. A last possible judicial argumentative practice is to engage in a semantic analysis, which focuses on the textual and grammatical context of the scientific element embedded in the legal rule in question. This would open the door to an interpretative exercise, which justifies adjudicatory choices between competing scientific arguments with reference to rules of grammar and logic.

3.1 Taking the standards of the scientific community as a benchmark for credible science

The invocation of science’s own rules and standards as a means to select legally acceptable scientific claims has been most clearly applied in the WTO jurisprudence. The WTO AB announced that the legitimacy of science used as a basis for SPS measures will be assessed “according to the standards of the relevant scientific community”,\(^{1999}\) and that scientific bases will be scrutinized whether they

have “the necessary scientific and methodological rigor”. The AB initially even required panelists to determine whether a scientific fact “is sufficiently supported or reasonably warranted” by a given evidence. In all these instances, for answering these questions adjudicators would need to explicitly refer to scientific standards.

In terms of evidentiary proceedings, accepting mathematical models as proof of causation or for damage calculations also reflects deference to scientific authority and in this sense, such adjudicatory tools also rely on scientific benchmarks. A related issue is the acceptance of probabilistic evidence and adjudicators’ choice to lower the threshold of required proof in order to find a legal claim established, even if was based on uncertain science. Here again, adjudicators justify altering traditional legal doctrines with a reference to the need to accommodate scientific ‘truths’, which they regard as valid and legitimate.

3.2 Scrutiny of the process of scientific knowledge production: “Scientific Due Process” theory

Without the need to engage in-depth with the scientific aspects of the case, adjudicators may still decide about the acceptability of scientific claims by scrutinizing the procedure in which respective scientific results have been produced. Putting “emphasis on the process by which the scientific enterprise has been conducted, rather than on absolute scientific validities” has the salient advantage that adjudicators need not become “ensnared in deciding over truth of scientific claims, especially in situations of scientific uncertainty”.

Against this backdrop, Céline Lévesque proposed the framework of “scientific due process” in which tribunals ought to decide about the acceptability of scientific arguments by scrutinizing the procedure of scientific decision-making “without deciding whether the scientific conclusions or results themselves were ‘right’ or ‘wrong’.” Scientific due process theory scrutinizes the following procedural

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aspects of the regulatory process: (i) the observance of international practices and guidelines; (ii) the inclusive and open nature of the process, particularly, whether public participation has been ensured; (iii) the elimination of potential conflict of interests on part of the experts involved; (iv) and whether the scientific results used were subject to peer-reviewed.\textsuperscript{2005}

The comparative analysis revealed that several international fora employ similar procedural benchmarks in their scientific assessments. Investment tribunals focus on the procedure in which scientific evidence and risk assessments have been created. In \textit{Chemtura v Canada}, the Tribunal made it clear that its review centers on whether “\textit{the review of lindane [...] breached the due process rights of the Claimant. Such inquiry must take into account the review process as a whole.”}\textsuperscript{2006} The Methanex Tribunal added scientific peer-review to the procedural elements that indicate the credibility of scientific evidence. It explicitly reasoned that “[i]n particular, the UC Report was subjected at the time to public hearings, testimony and peer-review; and its emergence as a serious scientific work from such an open and informed debate is the best evidence that it was not the product of a political sham”, but is to be regarded as a credible scientific opinion.\textsuperscript{2007}

EU judiciary developed a similar principle, that of “\textit{due care and diligence}”.\textsuperscript{2008} This interrogates whether EU institutions have ensured that the competent expert body that adopted a science-based decision was in fact furnished with sufficient and appropriate expertise.\textsuperscript{2009}

When courts and tribunals use such procedural benchmarks their conclusions ultimately rest on non-scientific rationality. The criteria ‘scientific due process’ theory are not scientific in their essence as the inclusive nature of the risk assessment process, the adequacy of public participation guarantees and of transparency measures can be judged solely by non-scientific standards. Even when adjudicators take peer-review as a yardstick of ‘legitimate science’, they rely on the authority of scientists and not that of science indirectly. Simply put, peer-review means a referee system, where reviewers scrutinize and evaluate scientific results before accepting or rejecting

\textsuperscript{2006} \textit{Chemtura Corporation v Canada}, Award, para. 145.
\textsuperscript{2007} \textit{Methanex} case, Award, Part II – Chapter A – 51, para. 101.
\textsuperscript{2008} Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 151.
\textsuperscript{2009} See C-269/90 \textit{Technische Universität München} case, judgment, and its analysis in Chapter 6.
them for publication in a scientific journal. Peer-review is a convention of the scientific community for validating the results of one another. It has become a widely accepted practice since its first appearance, which is traced back to the foundation of the British Royal Society’s official scientific journal in the seventeenth century.\footnote{Royal Society: \textit{Philosophical Transactions}: 350 years of publishing at the royal society (1665 – 2015), available: \url{https://royalsociety.org/~media/publishing350/publishing350-exhibition-catalogue.pdf} (last accessed on 24 June 2018).}

When adjudicators use peer-review systems as a rubberstamp of certified scientific knowledge,\footnote{Jasanoff, \textit{The Fifth Branch}, p. 61.} they in fact defer to the judgment of a community of anonymous scientists. In this sense, the adjudicatory reasoning draws on the reputation of renowned scientists and, even more so, on that of scientific journals. Notably, such a judicial reasoning does not require adjudicators’ engagement with science, as it functions as a checklist criterion. Whether the given evidence was subject to peer-review or not is a binary question, which legal adjudicators could answer on their own without the need for actually understanding the subject-matter or the outcome of the peer-review process.

### 3.3 Hybrid benchmarks for scrutinizing science-based decisions: ‘consistence’, ‘coherence’ and ‘reasonableness’ assessment

There are a growing number of instances when adjudicators do not confine themselves to assessing scientific due process criteria while accepting or rejecting a science-based claim. It may occur either when the facts of the case do not lend themselves to such an inquiry, or when adjudicators decide to depart from a strictly procedural assessment. This was the case arguably in the \textit{Whaling} judgment, where the ICJ did not opt for scrutinizing the ‘scientific’ process underlying the JARPA II program. Though the Court reviewed the process of implementation, but it introduced the substantive requirement of ‘reasonableness’.\footnote{Whaling case, Judgment, para. 67. for a more detailed discussion see in Chapter 3.}

It is argued here that international adjudication has recently seen the use of three slightly different, though essentially similar, hybrid benchmarks that allow adjudicators to assess scientific claims from a substantive point of view. These are the consistency assessment of EU Courts, the reasonableness standards of the ICJ, as well as the coherence analysis of WTO law. These tests have two major features in
common. First, all three provide more than a strictly procedural review of scientific claims submitted. Second, they are all ‘hybrid’ concepts situated on the boundary of legal and scientific parlance, and therefore enable adjudicators to provide a legal reasoning, essentially based on legal rationality, while they are also not avoiding or omitting the underlying science from the scope of inquiry but do enable engagement with them to the extent necessary.

Chronologically first in line, it was the Court of First Instance that announced a hybrid test in *Pfizer* in 2012. According to the test of judicial review, the CFI scrutinized whether the expert opinion relied on by MS was "consistent".2013 Shortly after in *Artegodan*, the CFI clarified that its consistency review encompasses a scrutiny as to whether the risk assessor’s reasoning “established a comprehensible link between the ... scientific findings and its conclusions.”2014 In 2008, the report of the WTO AB followed suit in the *Continued Suspension of Obligations* case, in which it applied the ‘coherence of reasoning’ test.2015 Lastly, the ICJ announced its reasonableness assessment in 2014 in the *Whaling* judgment.

Interestingly, investment arbitration tribunals remain more conservative in this respect and confine their inquiry solely to the “quality of the regulatory process”.2016 They also refrain from reviewing the “internal (scientific) legitimacy of measures”.2017 Instead, they choose to focus exclusively on the procedure in which scientific evidence was produced, and they do not interrogate the coherence or consistency of risk assessments and scientific claims. This can be partly explained by the applicable law.2018 Notably, no express scientific legality criteria are enshrined in investment treaties, whereas they are ubiquitous under WTO law. Also, the legitimacy deficit of investment tribunals is undoubtedly relevant with respect to their evasive attitude towards intrusive scrutiny of States’ regulatory science and science-based decisions. Lastly, out of the many possible entry points for science provided in ISDS, the judicial review of host States’ risk assessment is only one possibility, which does

2013 *Pfizer* case, Judgment, para. 198.
2014 Case T-74/00 *Artegodan GmbH and Others v. Commission of the European Communities*, para. 200.
not occur frequently in practice. This may also explain why such hybrid tests have not emerged so far in the practice of investment tribunals.

After briefly recalling the main characteristics of each hybrid benchmark identified in international adjudication, I will argue that they represent essentially similar solutions for the common challenge of science-intensive judicial review and provide similar answers to these challenges though they have been tailored to the specificities of each adjudicatory body’s mandate, and to the applicable law.

3.3.1 CJEU: reviewing internal consistency of expert opinions

The Court of First Instance in Pfizer announced that if risk assessors were to rely on an expert opinion, they had to “assess the probative value of the [expert] opinion delivered” in which regard they had to ensure that “the reasoning in the opinion is full, consistent and relevant.” The CFI in Artegodan reinforced that its judicial review has been confined to reviewing “the internal consistency of the opinion and the statement of reasons contained therein”. EU judiciary is therefore only empowered to examine “whether the opinion contains a statement of reasons from which it is possible to ascertain the considerations on which the opinion is based, and whether it establishes a comprehensible link between the medical and/or scientific findings and its conclusions.” The CFI also requires risk assessors to show that there is “an objective scientific basis” of the finding of a risk to human health warranting the decision.

The consistency review is submitted to be a hybrid test, because assessing the logical consistency of an expert report necessarily includes looking at the scientific subject matter of evaluation. At the same time, it interrogates the logical consistency of the reasoning, the interpretation of which is not at all alien to the judicial mind. In conducting such analysis, the CFI is carefully meandering on the border of law and science in order not to substitute the experts’ assessment with its own view on the

2019 Pfizer case, judgment, para. 198.
2021 Case T-74/00 Artegodan GmbH and Others v. Commission of the European Communities, para. 200.
2022 Pfizer case, judgment, para. 165.
hazards involved, since such decision is emphatically reserved for primary risk assessors.

3.3.2 WTO: coherent and objective reasoning, which relies on adequate scientific evidence

According to the WTO AB’s prevailing standard of review, WTO panels ought to determine whether a risk assessment is supported by “coherent reasoning and respectable scientific evidence and is, in this sense, objectively justifiable.”

This scrutiny of the coherence and objectivity of reasoning appeals to a hybrid rationality. By way of the coherence assessment, WTO panelists can set forth an essentially legalistic reasoning, which at the same time allows them to appreciate the scientific controversies involved in the underlying facts. On balance, the ‘coherence of the reasoning’ review is a matter of legal judgment that is informed by science. For instance, ‘incoherent’ reasoning may also be detected from a legal point of view, in cases where the inferences drawn are not logical, the uncertainties are not revealed or neglected from the analysis, or where conclusions suffer from serious inconsistencies or gaps in the underlying facts. Adjudicators may craft other legal benchmarks too, such as requirements as to transparency and documentation of intermediate conclusions.

This ‘coherence analysis’, as emerges in the WTO practice, yields two important benefits. First, it respects epistemic non-arbitrariness, since in this case adjudicators do not need to entirely substitute legal rationality for scientific rationality as they are not investigating the correctness of scientific data. Second, this hybrid assessment does not preclude adjudicators from engaging with the scientific facts. Thereby they can fulfill their mandate to check whether adequate scientific evidence has been garnered by the WTO Member to show that the contested trade measure had indeed responded to genuine scientific risks.

The ICJ crafted a standard of review that is essentially similar to the former ones from an analytical point of view. The majority’s reasoning required a reasonable connection between the stated research objectives of JARPA II whaling program and its design and implementation. In practical terms, the ICJ compared the sample sizes and the stated research objectives of JARPA and JARPA II, and found that sample sizes approximately doubled,\textsuperscript{2024} while the objectives and methods used “appear to have much in common”.\textsuperscript{2025} It followed in the Court’s assessment that the substantially increased sample sizes could not be ‘reasonable’.\textsuperscript{2026} The judgment listed several factors deemed relevant to decide whether the use of lethal methods were ‘reasonable’, such as the scale of lethal sampling, the methodology to select such sample sizes, the program’s scientific output, and the extent of international scientific co-operation in the program.\textsuperscript{2027} The very fact that these factors largely overlap with the objective criteria of ‘scientific research’ as were offered by Australia’s scientific expert, confirms that the reasonableness test closely touches upon relevant scientific facts. Emphatically, however, ‘reasonableness’ is not a scientific standard. The concept presupposes an act of balancing, which is akin to legal inquiry but is rather alien to scientific mindset.

The hybrid nature of the reasonableness concept was implicitly recognized by Judge Owada in his dissenting opinion in \textit{Whaling}: “[i]s it the legal context or is it the scientific context that the Court claims to be engaged in?”\textsuperscript{2028} His rhetorical question arguably intends to point out a characteristic of the reasonableness test, which was, in his reading, a sign of weakness, or even absurdity. However, as will be argued in the next section, such hybrid reviews seem to offer a persuasive argumentative technique enabling courts and tribunals to effectively adjudicate closely linked scientific and legal concepts. Hence it hybridity should be seen as a virtue rather than a vice.

\textsuperscript{2024} \textit{Whaling} case, Judgment, paras. 146-151.
\textsuperscript{2025} \textit{Whaling} case, Judgment, paras. 153-155.
\textsuperscript{2026} \textit{Whaling} case, Judgment, para. 224.
\textsuperscript{2027} \textit{Whaling} case, Judgment, para. 88.
\textsuperscript{2028} \textit{Whaling} case, Dissenting Opinion of Judge Owada, para. 25.
3.3.4 Convergent solutions for the judicial review of intertwined scientific and legal questions

The above legal tests, though are couched a bit differently, bear resemblance to an extent that one may wonder whether they were modeled after each other, or are results of convergent evolution. There is no express indication in the case-law regarding any coordination or cross-fertilization between these fora, however, adjudicators must have been cognizant of the argumentative solutions of other judicial bodies dealing with similar dilemmas in the judicial review of scientific arguments. The consistency analysis of EU Courts and the WTO’s coherence analysis are essentially similar in as much as both apply a two-tier review: a scrutiny as to the risk assessor’s reasoning and a review of the scientific evidentiary basis of expert opinions used by risk assessors. The declaration of Judge Keith reveals a similarity between the ICJ’s reasonableness assessment and the coherence analysis of the WTO: “[The ICJ] does have the role of assessing [...] the evidence to see whether it demonstrates coherent scientific reasoning supporting central features of the programme.” Such a wording suggests that the reasonableness standard of review in fact comes close to the coherence review announced by the WTO. The internal deliberations of the ICJ also confirm that the Court was considering the coherence review, as it was explicitly advocated by one of the parties.

These hybrid benchmarks share some fundamental characteristics. First, they are all located on the border of scientific and legal parlance. These hybrid benchmarks are rooted in the underlying scientific facts, but their primary focus is the reasoning of the risk assessor, or that of the State appealing to the authority of science. In this way adjudicators can provide a persuasive legal argumentation in legal controversies stemming from interlinked issues of science and law.

Second, all of these tests enable to form a legal opinion without judging the scientific validity of the scientific evidence, hence adjudicators would not be forced to act as super-experts. Simply put, adjudicators would not decide whether the scientific claim is ‘the’ correct answer to the scientific controversy, only to ascertain that the respective claim can be regarded, for purposes of deciding the legal dispute, as ‘a’ legitimate answer in light of the scientific evidence submitted. Accordingly, by

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2029 Whaling case, Declaration of Judge Keith, para. 8.
2030 For more details on that see Chapter 3.
using such hybrid benchmarks, adjudicators would not decide scientific disputes, as doing so would clearly fall outside the scope of adjudicatory task. Therefore, these hybrid standards of review also ensure meeting the requirement of epistemic non-arbitrariness, as scientific evidence will not be judged by legal rationality.

Third, these tests facilitate in-depth engagement with underlying science. An adjudicatory body can hardly form a solid opinion on the existence of comprehensible link between scientific facts and risk assessors’ conclusions, or on the reasonableness of a research scheme’s implementation, without engaging to certain extent with the underlying science. Hybrid tests inevitably necessitate that adjudicators “improve their overall level of understanding of the science at play in the given case.”\textsuperscript{2031} Such scientific engagement is warranted and welcome as it is scaffolding the legitimacy of a judicial decision. It has been argued that science-intensive questions cannot be persuasively decided without having a view to relevant science itself. Certainly, there are limits to adjudicators’ capacity to engage with the evidence, even if they are benefitting from experts’ assistance. However, such hybrid concepts seem to fall within the appropriate scope of the judicial task.

Lastly, it is argued that using such hybrid reasoning is not only possible and useful, but is also legitimate for courts of law. Even judges, who otherwise prefer construing a limited judicial purview in assessing scientific concepts, acknowledge that “there may be certain elements” in scientific concepts “that the Court may legitimately and usefully offer as salient from the viewpoint of legal analysis.”\textsuperscript{2032} It is suggested here that the use of hybrid standards of review facilitate an in-depth engagement with science, while still preserving the essence of judicial function for adjudicators as the ultimate rationality they would appeal to under such hybrid standards is legal in nature.

\subsection*{3.4 Non-scientific proxies of scientific credibility: international organizations’ standards and regulatory trends of other States}

One may witness an increasing reliance on non-scientific indications of legitimate scientific authority. The most articulate form of such a strategy is seen in WTO law. A specific feature of WTO law is that it seeks to facilitate the

\begin{footnotesize}
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  \item \textsuperscript{2031} \textit{Pulp Mills} case, Joint Dissenting Opinion of Judge Al-Khasawneh and Simma, para. 16.
  \item \textsuperscript{2032} \textit{Whaling} case, Dissenting Opinion of Judge Owada, para. 24.
\end{itemize}
\end{footnotesize}
harmonization of WTO Members’ scientific risk assessments by creating a presumption of consistency for SPS measures that “conform to” standards, guidelines or recommendations of competent international organization under the Article 3.1 of the SPS Agreement. WTO panels and the AB have therefore, an express mandate to consider international standards as indicia of credible scientific opinions regarding environmental and health hazards. It comes as no surprise then that the most marked use of international standards can be found in WTO jurisprudence.\textsuperscript{2033}

The express scientific legality criteria provided under various provisions of the SPS Agreement also set limits to more vague or general references to scientific findings. Article 5 requires SPS measures be “based on” a risk assessment in which techniques developed by relevant international organizations should also be considered. In \textit{US – Poultry} this provision was interpreted by the WTO panel as not permitting references to scientific publications that did not formally constitute part of a risk assessment.\textsuperscript{2034}

There are adjudicatory references to standards of international organization also outside the scope of the SPS Agreement. To take an example, the GATT panel deciding \textit{Thailand – Cigarettes} dispute under Article XX of GATT cited the opinion of the WHO as evidence of health hazards of smoking.\textsuperscript{2035} Also, in \textit{US – Shrimp}, a vague reference to “modern biological sciences” served as a justification for finding that species may constitute “a finite natural resource”.\textsuperscript{2036}

Other international fora do not have express mandate to regard international standards and regulatory trends as persuasive evidence of legitimate scientific claims. Nevertheless, one may find subtle references to international standards in their case-law. A widely cited such example is the \textit{Chemtura} investment arbitration, where the Tribunal famously regarded the international regulatory trend banning lindane as a persuasive indicia of genuine health risks.\textsuperscript{2037} The Tribunal was of the view that the host State’s scientific evidence as to the seriousness of environmental risks was “somewhat ambiguous.”\textsuperscript{2038} However, it famously concluded that “irrespective of the state of the science”\textsuperscript{2039} the science-based regulatory action is deemed legitimate

\begin{itemize}
  \item \textsuperscript{2033} See \textit{inter alia} the WTO panel’s report in \textit{US – Animals}.
  \item \textsuperscript{2035} \textit{Thailand – Cigarettes}, Report of the Panel, DS10/R - 378/200, para. 27.
  \item \textsuperscript{2036} \textit{US – Shrimp}, Report of the AB, WT/DS58/AB/R, para. 128.
  \item \textsuperscript{2037} \textit{Chemtura Corporation v. Government of Canada}, Award, Aug 2, 2010, para. 135.
  \item \textsuperscript{2038} \textit{Chemtura Corporation v. Government of Canada}, Award, Aug 2, 2010,133. cikk
  \item \textsuperscript{2039} \textit{Chemtura Corporation v. Government of Canada}, Award, Aug 2, 2010,135. cikk
\end{itemize}
given that an increasing number of States regulate the chemical with a view to its risks on human health and the environment.

However, the practice of investment tribunals is not homogeneous in this respect. For instance the Methanex Tribunal stressed that the fact that the EU did not ban the use of MTBE “[said] nothing about the legality or the appropriateness of” California’s ban on the chemical, and thus, refused to regard other States’ opinions decisive as to legitimate scientific views. This signals that such external standards cannot entirely replace science-intensive inquiry.

Nevertheless, references to regulatory trends and standards issued by international organizations are ubiquitous in case-law of international adjudicatory bodies. Such references are ranging from detailed analysis to passing notes in *obiter dicta* observations. The ECtHR referred to opinions of the WHO and ILO in *Brincat and Others v. Malta*, as evidence of awareness of the health dangers of asbestos, which supported the application that sought redress to health injuries suffered from asbestos exposure. However, international standards can cut both ways. In *Fägerskiöld v. Sweden*, the ECtHR found an application inadmissible in relation to noise pollution, because it did not meet the threshold that was regarded by the WHO as dangerous in its Guidelines for Community Noise.

### 3.5 Semantic analysis

A fifth possible argumentative practice to judge the acceptability of a scientific claim is to engage in a semantic analysis. In such cases adjudicators zero in on the contextual interpretation of the legal rule in which a scientific notion is embedded. Two such examples of judicial engagement of science are apparent in the practice of relevant fora.

The first is from WTO jurisprudence, where semantic analysis is deployed in cases, where panels are assessing whether a certain SPS measure is “conform to” international standards or has been “based on” a risk assessment. In such cases, the semantic reasoning flows from the mandate provided in the text of the SPS

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Agreement. The primary rule provides a convenient basis for panels to decide on the acceptability of a science-based SPS measure by not interrogating its scientific basis. Instead, WTO panels only focus on whether the circumstances of the case allow an inference that the measure “conforms to” such standards, or the risk assessment is “based on” that standard. Such analysis entails examination of the grammatical meaning of such phrases enshrined in the SPS Agreement.

To take a few examples, in *EC – Sardines*, the AB remarked that "there must be a very strong and very close relationship between two things in order to be able to say that one is 'the basis for' the other". Similarly, in *EC – Hormones*, the AB was also concerned with the grammatical meaning of the terms involved, when it stated that "[a] thing is commonly said to be 'based on' another thing when the former 'stands' or is 'founded' or 'built' upon or 'is supported by' the latter". The AB also considered that, to be "based on" an international standard, a measure "may adopt some, not necessarily all, of the elements of the international standard". With such a reasoning, the AB could conveniently decide the contested issue whether the EC was entitled to institute a ban on hormone-treated meat, while the relevant international standard, the Codex Alimentarius only mandated maximum acceptable daily intakes and maximum residue limits for hormones in the meat.

The second example is drawn from the ICJ’s case-law, particularly from the *Whaling* judgment. Here the Court instead of focusing on the content and meaning of ‘scientific research’, took a different argumentative path and mainly expounded the context in which this notion was embedded, namely, Article VIII of the ICRW. The relevant paragraph 1 of Article VIII reads as follows: “… any Contracting Government may grant to any of its nationals a special permit authorizing that national to kill, take and treat whales for purposes of scientific research... ”.

As has been discussed earlier, while the parties focused primarily on competing definitions of ‘scientific research’, the ICJ mainly dealt with interpreting the ‘for purposes of’ part of the rule, and discerned the test of reasonableness from this phrase. It did so arguably by way of a grammatical and logical interpretation, though the reasoning of the Court in this respect has remained opaque. This semantic

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2046 The Codex Alimentarius is a collection of internationally adopted food standards presented in a uniform manner, see para. II.12. of the Panel Report in *EC – Hormones*, WT/DS26/R/USA.
analysis nevertheless enabled the ICJ to provide a persuasive reasoning still speaking in the language of a legal (or even a simple grammatical) assessment. The Court itself proclaimed that it “need not pass judgment on the scientific merit or importance of those [research] objectives in order to assess the purpose of the killing of whales”.

In such cases, when adjudicators focus on the textual interpretation of ordinary phrases surrounding a scientific concept in a legal rule, decisions are justified by a purely logical reasoning, which appeals to everyday (intuitive) rationality.

VI. Interim conclusion

The above discussion classified the wide variety of judicial tools of international fora serving to adjust the level of science that may enter the different stages of adjudication. While certain methods serve to impede the intrusion of science into the legally relevant aspects of judicial inquiry, others aim to integrate scientific input in the adjudicatory process.

This comparative study suggests that one may distinguish between ‘ready’ and more ‘reluctant’ fora with respect to engaging with science. The most readily active in scientific engagement are undoubtedly those adjudicative bodies, whose underlying legal texts explicitly incorporate scientific notions and technical references, and even express scientific legality criteria such as the case in WTO law. Also, those courts are usually more eager to engage with science, whose mandate is construed broadly so that they are ready to closely scrutinize the parties’ scientific claims, as is arguably the case with EU Courts. Whereas those fora are more reluctant to conduct in-depth scientific inquiries, which were taken almost by surprise when respective parties had started to submit science-heavy arguments and bulky, highly technical evidence. The most illustrative to such behavior is perhaps the slowly evolving scientific engagement of the ICJ, which initially was highly reluctant to consider scientific evidence, yet it gradually grew to be somewhat more open towards science in recent decisions. Similarly, courts and tribunals with specialized mandate tend to suffer from legitimacy deficit, which discourages them from digging deep into the highly technical scientific arguments of States, such as it is the case with investment arbitration tribunals.

2048 Whaling case, Judgment, para. 88.
The table below provides a summary of the exact adjudicatory techniques that represent these two major trends in international adjudicative practice.

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<tr>
<th>Different adjudicatory stages</th>
<th>Judicial techniques requiring engagement with science</th>
<th>Judicial techniques downplaying science</th>
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</table>
| Framing of disputes           | - treating science-intensive questions as justiciable issues  
                                - treating scientific evidence as relevant  
                                - giving proper weight to substantive obligations and willingness to find such breaches established (PCA)  
                                - mandating expert-led consultations (ITLOS) | - deferring science-intensive aspects of disputes to the merits phase, which will not be reached due to an adjudicatory choice  
                                - carving out science from the relevant aspects of adjudicatory decision  
                                - referring science-intensive questions back to the parties’ negotiation (ICJ)  
                                - prioritizing procedural obligations over substantive obligations  
                                - decoupling ‘risk’ from science (ICJ) |
| Scientific fact-finding       | - ex curia experts (PCA, WTO)  
                                - independent experts (UNCC)  
                                - expert arbitrators (PCA, ITLOS)  
                                - shadow experts (ICJ, ITLOS) | - not asking for expert advice (ICJ, ad hoc tribunal)  
                                - experts as counsels (ICJ)  
                                - letting partisan evidence go unchecked (ISDS)  
                                - not using existing powers to appoint independent experts (ITLOS, ICJ, ECtHR, CJEU) |
| Causal inquiry                | - causal presumption (Marshall Island Claims Tribunal, ECtHR, CJEU)  
                                - relaxing causal tests (climate change litigation, U.S. tort law)  
                                - accepting probabilistic causal proof, use of mathematical models (UNCC, US tort law)  
                                - causal proxies (CJEU, ECtHR) | - too high standard of proof, refuting probabilistic evidence (ECtHR, Pulp Mills)  
                                - causal proxies (ECtHR) |
| Standard of review            | - two-stage review allowing for scrutiny (WTO, CJEU, ICJ, ISDS)  
                                - hybrid benchmarks: coherence, reasonableness, consistency analysis | - total deference (CJEU initially)  
                                - international standards and regulatory trends as indicia of scientific credibility (ISDS, WTO)  
                                - scientific due process (ISDS)  
                                - semantic analysis (WTO, ICJ) |

*Table 5: Adjudicatory techniques to downplay the role of science or serving to engage with them on different stages of the adjudicatory process*
This comparative survey also shows that adjudicators apply different argumentative techniques to build their reasoning in cases with substantial scientific dimensions, depending on the extent to which they are willing to engage with science in their assessment. This brings us to the concluding chapter, which will discuss in a systematic way, the benefits, risks, trade-offs, and applicable remedies of using different scientific and non-scientific benchmarks with respect to crafting legitimate judicial reasoning in science-intensive cases.
Chapter 11

Conclusions: Science, legitimacy, and persuasive adjudicatory reasoning

“Troposphere, whatever. I told you before I’m not a scientist. That’s why I don’t want to deal with global warming, to tell you the truth”  
Justice Antonin Scalia

“The Court cannot shy away from technical questions and must in an appropriate case be prepared to resolve such questions”.  
Advocate General Jacobs

I. How can courts craft legitimate reasoning in science-intensive cases? Some recommendations

The ultimate question this comparative study seeks to answer is how environmental disputes that are closely tied to scientific facts can be legitimately and persuasively decided with or without engaging deeply with underlying science. The above analysis revealed the many ways in which the intrusion of scientific facts and arguments impacts the adjudicatory process. We have seen how international courts adjust the science-intensity of their assessments through traditional adjudicatory techniques, such as the framing of disputes, scientific fact-finding, causal inquiry and the standard of judicial review. This study offered an overview on diverse argumentative practices with which adjudicators may justify their choices between science-intensive arguments while seeking to resolve disputes involving closely intertwined scientific and legal concepts. These reasoning techniques are markedly different in terms of their underlying rationality depending on whether the given judicial body aims to integrate or downplay the role and weight of science in its legal assessment. The forthcoming analysis will center on how the level of science that is incorporated in the judicial reasoning impacts the persuasiveness and legitimacy of the decision and will draw some practical implications.

The dissertation concludes with some recommendations for international adjudicators as to how to engage with science in order to harness the cognitive authority of science to the maximum extent possible so that judges can provide

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2050 Opinion of Mr. Advocate General Jacobs, Case C-269/90, para. 13.
persuasive and legitimate decisions. Integrating scientific input into legal decisions undoubtedly poses challenges to adjudicators, but science may also prove to be an important ally, which, if treated properly, provides cognitive authority to well-reasoned judgments. In contrast, science would haunt adjudicators if they chose to dispose of it quickly by vague, inconsistent, or opaque reasoning.

Then how exactly a court of law is supposed to answer a legal question put before it, once that question tends to be inextricably linked to, or even stemming from, uncertain scientific facts? How adjudicators can best comply with the simple-sounding task of deciding whether a breach has taken place, while they also preserve epistemic non-arbitrariness and, therefore, secure persuasiveness and legitimacy of their decisions? I shall now seek to provide some answers to these questions.

1. Appealing to scientific, legal, hybrid, and intuitive benchmarks

As were seen in previous chapters, international adjudication has showcased varied practices for transforming scientific input into persuasive adjudicatory reasoning. In so doing, courts and tribunals can reflect on the scientific dimension of disputes by using various scientific and non-scientific benchmarks each having its own benefits and trade-offs in terms of factual accuracy, epistemic non-arbitrariness, and practical feasibility. Now I shall turn to address those through the lens of some specific examples.

1.1 Benefits and trade-offs of relying on scientific standards

Adjudicatory decisions may draw on the cognitive power of science to justify a particular choice between competing scientific claims with reference to certain scientific standards or methods. In such cases, it will be scientific authority that buttresses the persuasiveness of adjudicatory assessment. These adjudicatory techniques are epistemically deferential to science, as science provides the ultimate benchmark against which the parties’ claims would be measured.

*D’Aspremont* and *Mbengue* see the merit of such a reasoning especially in the fact that it observes the requirement of epistemic non-arbitrariness, *i.e.* it does not mix
legal and scientific rationality.\textsuperscript{2051} Indeed, by using such criteria adjudicators clearly delineate those questions, in which they would epistemically defer to the assessment of scientific experts. The question of whether a certain source is considered ‘legitimate’ would be a matter of expert evaluation in light of ‘\textit{standards of relevant scientific community}'.\textsuperscript{2052} In such cases, adjudicators would not formulate their own opinion regarding these standards, but would rely on expert advice and thus, this method observes the criterion of epistemic non-arbitrariness.

This virtue, however, may become a vice as it opens the door to concerns about inadvertent delegation, or even abdication\textsuperscript{2053}, of adjudicatory powers to non-elected experts, who are in possession of the scientific (epistemic) competence necessary to evaluate the scientific benchmark at hand. A related challenge is posed by partisan evidence, \textit{i.e.} when the parties submit highly distorted data under the guise of science, and thereby abuse the cognitive authority of science. Such occasions have been identified in the practice of investment arbitration\textsuperscript{2054} and inter-State litigation\textsuperscript{2055} as well.

Such epistemically radically deferent rationality has a further limitation. In many cases, \textit{“[d]eferring to science ... cannot solve the relevant legal question, although it can produce a wealth of impressive sounding information.”}\textsuperscript{2056} This is especially true for scientific risk assessments, which are mixed questions of value judgments and scientific factual determinations. But also in evidentiary procedures, it is ultimately the task of the adjudicators to be ascertained about the facts of the case, even if they defer to expert opinions. Hence, deference to scientific standards is not the end of judicial inquiry.

A further possible problem is that if adjudicators provide only lousy evidentiary findings, they would not be able to harness the cognitive authority of science for their judgments. Vinuales points out that international adjudicators, when

\begin{footnotesize}
\textsuperscript{2051} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 268.
\textsuperscript{2052} \textit{US – Continued Suspension of Obligations} case, Report of the AB, para. 591.
\textsuperscript{2053} Mbengue, ‘The South China Sea Arbitration: Innovations in Marine Environmental Fact-Finding and Due Diligence Obligations’, 289.
\textsuperscript{2054} See \textit{e.g. Perenco} case, where the panel expressed its discontent with expert, who “crossed the boundary between professional objective analysis and party representation.” \textit{Award}, para. 581.
\textsuperscript{2055} See \textit{e.g. Pulp Mills} case, where scientists appeared as counsels, which solution was criticized by the Court. \textit{Judgment}, para. 167.
\textsuperscript{2056} Feldman, \textit{The Role of Science in Law}, p. 42.
\end{footnotesize}
decide to accept and evaluate scientific evidence all too often “camouflage” their findings with rough assessments of the scientific information. This altogether erodes the persuasiveness of the adjudicatory decision. This is typically the case, when the judicial reasoning as to the weighing of evidence does not even remotely resemble the level of detail in which the experts submitted their scientific evidence. Suffice it to refer to the Pulp Mills case, where lengthy evidence was summarily dismissed in one sentence, without elaborating on the exact reasons for the dismissal. The ICJ merely kept repeating that causality and adequate proof “has not [...] been established to the satisfaction of the Court”. EU Courts also face such problems. They explicitly ruled that should the EU Commission disregard an expert opinion, it must provide specific reasons for that, which “must be of a scientific level at least commensurate with that of the opinion.”

To remedy the risks of eroding the legitimacy of decisions based on scientific standards, epistemic capabilities of adjudicators should be buttressed. Yet some are quite skeptical about international judges’ capabilities to cope with the scientific dimension of disputes. Others are more optimistic and suggest that scientific capacity building and training for judges in natural sciences may be an appropriate tool to improve their ability to engage with scientific evidence.

The fact-finding capabilities of international courts can be easily supported by having recourse to independent experts, or expert arbitrators. These practices can support adjudicators’ ability to make their own understanding of the scientific dimension of the dispute and to make their findings as to the acceptability of such claims. Also, using legal/hybrid benchmarks may foster judicial engagement with science, and they do not even require scientific capacity-building. These solutions will be addressed below.

2059 Pulp Mills case, Judgment, para. 250.
2061 Sands argues that international judges are “in no better position than you or I to decide on the relative merits of a scientific claim” Sands, ‘International Environmental Litigation and Its Future’, 1638.
2062 Bruce, ‘The Project for an International Environmental Court’, p. 146.
1.2 Benefits and trade-offs of relying on legal benchmarks

When adjudicators do not directly rely on scientific knowledge to make their findings, there is a wide array of possible tools to justify their choices among competing scientific claims with reference to standards that are deemed authoritative by virtue of legal reasoning. These yardsticks can ultimately also be traced back to scientific knowledge, but their use does not necessitate scientific competence, and therefore, they function as non-scientific benchmarks. Simply put, adjudicators can legitimately and persuasively rely on legal standards without the need to judge scientific questions in which they lack scientific competence and training. The use of such benchmarks is justified through legal argumentation.

These techniques were all discussed in detail in previous chapters; hence here they will only be briefly reiterated, with a main focus on the advantages and trade-offs of each argumentative practice in terms of ensuring epistemic non-arbitrariness and the persuasive force of the reasoning.

1.2.1 Standards of international organizations and international regulatory trends

Adjudicators may have recourse to international organizations’ standards or international regulatory trends to justify their choice whether to accept a scientific claim or evidence as representing legitimate science. These benchmarks operate as legal standards, because the authority of the scientific claim represented by the standard is detached from the epistemic authority of science itself. Rather, their persuasive force is rooted in the authority of the organization issuing the relevant standard. Indeed, adjudicators rely on the perceived competence and prestige of these institutions to accept the scientific evidence matching these standards as reflecting valid science. The scientific content and methodology of the results represented in the given standard need not to be judged by adjudicators, which preserves the epistemic non-arbitrariness of their legal reasoning.

This technique is a convenient judicial tool for minimizing risk of expert bias underlying scientific propositions offered by the parties. Moreover, relying on such standards undoubtedly benefits litigants, who could overcome considerable hardship
in producing persuasive scientific evidence by referring to international standards.\footnote{Standards may be most useful in climate change litigation claims where IPCC standards are highly authoritative and elaborate scientific standards.} Vinuales dubs international standards “external”\footnote{Vinuales, ‘Observations sur le traitement des motifs scientifiques dans le contentieux environmental international’, p. 117.} references in making legal judgments about the soundness of scientific claims. He draws attention to a specific advantage of using such standards, namely, that they were not intended for a specific legal dispute,\footnote{Vinuales, ‘Observations sur le traitement des motifs scientifiques dans le contentieux environmental international’, p. 117.} but were issued as general summaries of relevant scientific knowledge. The fact that international organization’s guidelines, MEAs, and international regulatory trends reflect scientific consensus that was reached irrespective of the parties’ legal conflict boosts the credibility and the persuasive force of such external references in the eyes of adjudicators.

Possible drawbacks are, however, the finite number of environmental hazards and chemicals in relation to which international standards are available, which predetermines the scope of cases in which they may be invoked. Even if there were international recommendations relevant to the environmental risk involved in a given dispute, the applicable standard may still fall short of the required level of specificity to provide a persuasive account on the environmental hazards at hand. Lastly, a blind spot of relying on international regulatory trends is the ‘first regulator’ problem, as such standards and trends are simply not available when a State faces emerging or newly-discovered risks.

Notwithstanding the above, when such guidelines are available and closely speak to the heart of the scientific controversy, together with international regulatory trends, may be appropriate tools to assess science-based claims. Their use hence should be encouraged whenever they are available.

1.2.2 Scientific due process criteria

Yet another possible judicial reasoning focuses on ‘scientific due process’ criteria. According to that, judges ought to rely on procedural benchmarks to scrutinize attributes of an ideal process of scientific knowledge production. Scientific due process argumentation entails that those scientific results are accepted as credible
and legitimate that has been produced in a transparent and participatory process, preferably also including a peer-review.

Such procedural yardsticks may relieve adjudicators from being entangled in substantive analysis of the evidence; however, this method also has some blind spots. It is important to note that the objectivity of scientific research is established through a range of social practices and therefore, is a culturally embedded phenomenon, which may carry various meanings across different cultures.\textsuperscript{2066} Hence practices that are deemed ensuring objectivity of scientific research may vary among States. This should be borne in mind by international adjudicators, when they scrutinize the adequacy of a scientific risk assessment procedure conducted on the national level.

Nevertheless, scholars have been generally supportive of decisions where adjudicators focused their review on the procedure of scientific knowledge production.\textsuperscript{2067} A benefit of such review is seen in the fact that it respects epistemic non-arbitrariness.\textsuperscript{2068} Scholarly opinion also supports the use of peer-review as a benchmark for legitimate science.\textsuperscript{2069} Yet a closer look reveals that peer-review is not a failsafe method of finding ‘valid’ science. STS literature provides a lengthy list of imperfections that can cast serious doubt as to the integrity of the peer-review process, and therefore, on its usefulness as a legal benchmark. These pitfalls are stemming from psycho-sociological factors, ranging from personal and systematic bias favoring accomplished scientists or methods in line with the reviewer’s personal preference, to empirical surveys on reevaluation processes showing a high ratio of reversals compared to the first round of reviews.\textsuperscript{2070} If one adds to the picture the rare, though significant, scandals involving intentional fraud and plagiarism in connection with the referee system of even prestigious scientific journals,\textsuperscript{2071} the peer-review seems less to be an ideal panacea for adjudicators. Scientists have a more realistic

\begin{footnotesize}
\begin{enumerate}
\item D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 271.
\item Jasanoff, The Fifth Branch, pp. 61–79.
\end{enumerate}
\end{footnotesize}
account of what peer-review can actually deliver. They stress that "peer review per se provides only a minimal assurance of quality, and that the public conception of peer review as a stamp of authentication is far from the truth." In light of this, one may view peer-review as perhaps a necessary, but no way sufficient benchmark for scrutinizing the integrity and credibility of scientific results.

1.2.3 Causal presumptions

A further legal benchmark is used in causal inquiry. Adjudicators often establish causal presumptions to allow science-based environmental claims to proceed. Here the adjudicatory decision to accept a causal claim is made in the explicit acknowledgement that science is unable to provide a definite answer on the existence of a causal link. In other words, authority for the judicial reasoning is not created because of science, but rather in spite of it. It is the presumption, a genuine legal construction, that confers legitimacy on finding the causal nexus. Similarly, when traditional causal requirements are relaxed for the sake of establishing science-based causal links, as happens in climate change litigation, the judicial choice as to allow a causal claim to proceed stems from legal causal theories, and hence, they are crafted through legal reasoning.

In the practice of EU Courts we have seen a relaxed causal proof requirement that allows a series of consistent presumptions to prove a causal nexus, when medical science can provide no explanation for the disease development mechanism. In that case, the explicit justification for allowing such a presumption in the absence of reliable medical evidence, was rooted in procedural fairness consideration, which is a genuine legal principle.

These practices seem to be justifiable means of bridging the gap between scientific and legal concepts of certainty and causation. Importantly, both such tools are used only as ultima ratio solutions in absence of adequate scientific evidence.

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2073 See in more detail in Chapter 10 Section IV.
1.2.4 Substituting legal fact-finding for scientific evaluation

*D’Aspremont* and *Mbengue* point out that adjudicators may also justify their choices to rule in favor of a party’s scientific evidence by applying ordinary rules of standard and burden of proof, according to which the party will prevail, who submit more abundant scientific evidence.\(^{2074}\) Indeed, ruling in favor of a certain factual claim according to rules on burden of proof is perfectly legitimate in a legal discourse. While it may be logically possible to craft such a reasoning, it has not been applied in environmental cases. The WTO AB explicitly rejected the possibility to rule in favor of a party, who adduced more evidence and thereby to allow the ‘preponderant’ expert position to prevail.\(^{2075}\) This is a laudable approach, as deciding on scientific claims cannot be a matter of a quantitative balancing as to which party could generate more pieces of scientific evidence.

1.3 Benefits and tradeoffs of relying on intuitive rationality

1.3.1 Proxy-based causal assessment

The proxy-based causal inquiry of the ECtHR, where non-scientific proxies substitute for a thorough scientific evidence-based causal assessment relies on a rough assessment of all factual circumstances can be largely traced back to intuitive rationality. The overwhelming majority of these proxies cannot be justified scientifically, because they are necessarily simplified proxies of the underlying scientific causal processes leading from toxic pollution to health injuries.\(^{2076}\) These proxies are either under-inclusive or over-inclusive in the sense that they are not capable of singling out with precision those sources of pollution that had, scientifically speaking, a causal role in bringing about the health injury.

For this reason, the persuasive force of such proxies in the majority of the cases cannot be traced back to scientific authority, quite the contrary, scientific research often clearly contradicts many of these proxies. For instance, the distance proxy in the Strasbourg Court’s case-law suggests that only those emitters are

\(^{2074}\) *D’Aspremont* and *Mbengue*, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 266–67.

\(^{2075}\) *EC-Asbestos*, Report of the AB, para. 178.

\(^{2076}\) For a more detailed discussion on the proxies and their drawbacks see Chapter 5 sections 2.2 and 2.3.
regarded as ‘cause’ of the injury that are located in the close proximity of the applicant’s home, which goes clearly against scientific consensus that certain pollutants may travel long-range without losing their toxic potential. These proxies could only be explained through intuitive rationality. The inherent risk being that common sense considerations may justify refuting of a causal link, even if it could be established based on scientific evidence on toxicity.

Therefore, the main risk of the proxy-based approach is that it may all too often be at odds with scientific knowledge and factual realities of the case. Consequently, such judicial reasoning runs the risk of losing legitimacy in light of developing scientific research.

1.3.2 Semantic analysis

Adjudicators may have recourse to semantic analysis and reasoning, in cases when the scientific legality criterion to be interpreted is embedded in an elaborate legal rule. For instance, in WTO law, where a certain science-based argument is regarded as being “based on” certain international standards, adjudicators frequently use semantic analysis to justify their reasoning. Similarly, the ICJ also used such technique to interpret the text of the ICRW in the Whaling case, when it had to decide whether a certain whaling program was to be regarded as conducted “for purposes of scientific research”.

In such cases, the basis of the authority of judicial argumentation ultimately stems from grammatical interpretation. Grammatical interpretation fits neatly within the epistemic competence and mandate of international judges, and hence, this argumentative technique yields a persuasive reasoning. It also observes the requirement of epistemic non-arbitrariness as arbitrators need not to decide about validity of a certain scientific position.

The only downside of this convenient argumentative technique is rooted in its limited availability. It may only be relevant where express scientific legality criteria are enshrined in the legal text subject to adjudicatory review. It is true that MEAs, EU law, and WTO law commonly provide elaborate legal rules incorporating scientific

2077 See related discussion in Chapter 7.
2078 Whaling case, Judgment, para. 30, see in more detail Chapter 3.
2079 See Article 31 of VCLT, which mandates textual interpretation for international treaties to international courts and tribunals.
notions, where semantic analysis may be a useful judicial tool. However, science often enters the process of adjudication is less formalized manner, when it is not couched or embedded in express legal rules, and in such cases this type of reasoning would not be available.

1.3.3 Risks common to legal and intuitive rationality

There are some risks common to using solely legal benchmarks in adjudicatory reasoning. First, if the reasoning is too opaque and offers only vague justification, they can easily be perceived as concealing arbitrary judgments. In the WTO context, one commentator explicitly referred to the use of “smell test”,\(^{2080}\) signaling decisions that are seemingly based on a rough assessment with no adequate references to the underlying facts.\(^ {2081}\) Such balancing in which the actual scientific evidence plays saliently little role may easily be regarded as illegitimate.

Although there is no general panacea to remedy the risks of using legal and intuitive benchmarks, and they carry different trade-offs in terms of persuasiveness, some solutions may still be offered. From a legitimacy point of view, the use of legal benchmarks appears to be more appropriate if they are only used as a complementary or even auxiliary means of justification, when scientific benchmarks are not available. In that way, adjudicators can ensure that they first try to engage with science substantively, and only if that were not possible, would they have recourse to legal benchmarks. To take an example, the presumptions allowed by EU Courts in terms of causal proof, and the presumption introduced in the Fadeyeva case by ECtHR, are triggered only if engaging with primary scientific evidence is not possible for some reason. In contrast to that, the proxy-based causal assessment of the Strasbourg Court is used by default, even when scientific evidence would be available on the case-file. This latter practice undermines the consistency and factual accuracy of decisions and, thus, the legitimacy of such reasoning.

2. Benefits and tradeoffs of using hybrid benchmarks

This research suggests that a fourth way of reasoning may be distinguished among the types of adjudicatory reasoning. Adjudicatory bodies carrying out judicial review of risk assessment have developed reasoning techniques that are essentially legal in nature though they are informed by science. These yardsticks are located on the interface of science and law, and therefore they provide basis for scrutiny falling within adjudicators’ epistemic competence, while they also relate to and reflect on the scientific substance. The dissertation argued that assessing the coherence of a risk assessor’s reasoning in WTO jurisprudence, and the consistency review of risk assessors’ opinions by EU Courts, as well as the reasonableness standard of the ICJ all necessitate basic understanding of the scientific evidence on part of adjudicators, however, they do not require them to judge the validity of the scientific input. Such techniques have been dubbed here ‘hybrid’ benchmarks to describe tests that neither purely legal nor purely scientific in nature.

On balance, these hybrid benchmarks are suggested to lend themselves to legal evaluation, while they are closely informed by the underlying science as well. Through devising hybrid benchmarks that are capable of being rooted in scientific evidence, judges can provide persuasive legal argumentation even in cases concerning scientific facts. Certainly, such a judicial engagement inevitably necessitates that judges “improve their overall level of understanding of the science at play in the given case.”

Conversely, hybrid benchmarks pressures scientists to pronounce their findings in a way that are accessible to non-scientists as well. These two implications are seen as perhaps the most beneficial features of the hybrid tests.

<table>
<thead>
<tr>
<th>Benchmarks/ standards</th>
<th>Adjudicatory techniques</th>
<th>Relevant fora</th>
<th>Trade-offs, Risks</th>
<th>Remedy/ Solutions</th>
</tr>
</thead>
</table>
| **Scientific standards** | - request for expert evidence  
- using independent experts, expert arbitrators,  
- accepting mathematical models as proof | - virtually all  
- WTO, PCA, UNCC  
- PCA  
- UNCC, toxic tort law | - inadvertent delegation of judicial task  
- partisan evidence | - capacity building in science  
- training  
- ex curia experts  
- expert |

2082 *Pulp Mills* case, Joint Dissenting Opinion of Judges Al-Khasawneh and Simma, para. 16.
- accepting probabilistic evidence
  - almost de novo inquiry
  - evidence must meet scientific and methodological rigor

Hybrid standards
- coherence
- consistency
- reasonableness
  - standard of review
  - WTO
  - EU Courts
  - ICJ

Legal standards
- international organizations’ standards
- international regulatory trends
- scientific due process requirements
- causal presumptions
- relaxing causal tests
  - WTO, ISDS
  - ECtHR, ISDS
  - ISDS
  - CJEU, ECtHR
  - climate change litigation, toxic torts
  - ECtHR

Intuitive rationality
- causal proxies
- semantic analysis
  - WTO
  - ICJ, WTO

Table 6: Different scientific, hybrid, legal, and intuitive benchmarks used by international adjudicatory fora

3. Guidance for selecting the appropriate benchmark

The most appropriate way of reasoning and the possible extent of engaging with science may vary from case to case and across jurisdictions. As was seen in the previous section, all types of benchmarks and corresponding adjudicatory reasoning have their own preconditions, trade-offs, and generate idiosyncratic risks in

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terms of epistemic non-arbitrariness, persuasiveness, feasibility, and preserving the judicial monopoly over adjudicatory function. Hence, there is no abstract hierarchy between legal, hybrid, intuitive and scientific standards used in adjudicatory reasoning. However, with respect to concrete cases and contexts, some methods do appear to be more preferable than others.

3.1 When we do need more science

Scientific benchmarks better legitimize adjudicatory conclusions in cases when the parties themselves regard scientific aspects relevant to their dispute. In such a dispute, not evaluating scientific evidence would easily undermine the adjudicatory decision that is made without considering the scientific submissions. Equally vulnerable to legitimacy concerns are those decisions that provide only superficial and opaque, ‘overall’ assessment as to why they accept or reject a given scientific claim. A precondition for a more thorough and consistent scientific engagement is that adjudicatory fora be equipped with advanced scientific fact-finding capacities. This also warrants more extensive use of independent experts by thus far reluctant courts and tribunals.

Probabilistic and uncertain nature of scientific input should not be regarded as an insurmountable obstacle to international environmental adjudication. Various forms of uncertainty have been ubiquitous in legal adjudication, which have always called for appropriate judicial solutions. The survey of international jurisprudence confirms that some adjudicative bodies have been able to integrate uncertain scientific input in their legal analysis and to render legitimate decisions while not using the peculiarities of science as an excuse for judicial paralysis. This may suggest that such solutions may be adopted by more reluctant fora as well.

We ought to be mindful of the fact that factors conferring legitimacy on a decision are culturally embedded and are closely tied to social practices, imaginaries, and expectations of a given community. Consequently, such factors are changing over time. At times like this when science and technology pervades almost every side of modern existence, scientific aspects of disputes ought to be sufficiently addressed and accommodated by adjudicators in order to render factually correct, epistemically non-arbitrary, and altogether persuasive decisions.

With a recurring metaphor, the dissertation compared international adjudicators to King Solomon, just to readily distinguish them from one another. Ever since the Biblical story, the judgment of Solomon has been regarded as the archetypal example of rendering wise decisions in factually wicked cases, where the judge’s common-sense wisdom brings about justice. In our case, the comparison is rooted in the fact that King Solomon settled a dispute concerning contested biological motherhood, which in fact also was, or would have been, an extremely science-intensive case. Given that King Solomon obviously had no access to DNA evidence assisting him in making his judgment, the case was, understandably, decided without a view to the (nowadays apparent) scientific dimensions. I argued that previously wise, hence legitimate, decisions could be successfully made with sole reference to legal, ethical, or common-sense principles by paying regard only to the non-scientific aspects of cases. Yet such a judicial technique will not suffice today. At present, such ‘Solomonic’ judgments would fail to confer legitimacy on adjudicatory decisions when techno-scientific progress outpaces imagination and has stunning repercussions on the life of human societies. Hence, the dissertation challenged the conception that contemporary science-intensive disputes can be decided in a legitimate way without properly investigating, evaluating, and reflecting somehow on the underlying scientific facts.

It may be timely to recall the fundamental ways in which technology has been, and is, changing basic social institutions. Not only the way people born, think, sense the world, rebuild parts and functions of the human body, but also how they feel belonging to communities, perceive basic ethical rights and

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2086 The social effects of innovation was first analytically assessed by Ogburn, right after WWII, when post-war industrial innovations triggered a globalized economy and society. W. F. Ogburn, ‘How Technology Changes Society’ (1947) 249 The Annals of the American Academy of Political and Social Science 81–88.
2087 See e.g. assisted reproductive technologies, such as in vitro fertilization.
wrongs, monitor and hold accountable sovereign powers, construe privacy, and last, but perhaps most relevantly to our narrow topic, how they accept a football referee’s judgment legitimate in case of conflicting results from video referees. Arguably, international adjudication, on the long run, can be no exception to such techno-scientific intrusion. Since the second half of the 20th century international law itself “is becoming a more and more complex and many-sided subject”, and international adjudication must follow suit.

Scientific complexity is not a matter of choice, neither an inconvenience that one can neglect or disregard in the long run. Uncertainty and ambiguity remains inherent in science and, therefore, law as well as legal adjudication must desing ways of interacting with it meaningfully.

3.2 When we need a hybrid approach

Hybrid benchmarks, such as the consistency or coherence analyses of WTO law or EU law, seem to be particularly apt tools for promoting the “informational catalyst” role of courts. By reviewing whether primary decision-makers provided explanations that fully accounted for the complexities of the data, and other plausible

2092 Such e.g. sense of equality, equal opportunity, and corresponding rigths and obligations. Gender equality movements started off after WWI, when war time industry made women workforce acceptable and desirable. This later led to equal pay demands. Access to technology is a precondition for, and often important symbol of, gender equality, see Margret Coker: „Saudi Women Can Now Drive. Overcoming Beliefs on Gender Will Be Harder.”, New York Times, June 24, 2018, available: https://www.nytimes.com/2018/06/24/world/middleeast/saudi-women-drivers.html, (last accessed on June 25, 2018).


2095 „What is VAR, what are the rules, and how is it being used at World Cup 2018?”, Daily Telegraph, June 26, 2018, available: https://www.telegraph.co.uk/world-cup/0/var-rules-used-world-cup-2018/ (last accessed on June 26, 2018).


2097 This term was coined by Ellen Vos, see Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 152.
interpretations of it, judges in fact seek to ensure that the competent authorities discharge their obligations to carefully examine complex scientific matters. Such an exercise of judicial function may advance better scientific regulations without the need to act themselves as science courts. Many authors argue that adjudicators should touch upon the scientific aspects of disputes in order to “prompt responsible actors to engage in effective problem solving.” Hence even though adjudicators themselves ought not to resolve scientific controversies, it is argued that the judicial task cannot remain any less complex or less science-intensive than the task of risk assessors.

Such a re-conceptualization of the adjudicatory task is arguably warranted even on a more general level in relation to all types of adjudicatory engagement with science in international adjudication. This dissertation argues that the judicial task and role should inevitably become more complex as market innovations and our growing understanding of potential risks warrant regulations that involve balancing highly technical risks against societal interests.

3.3 When we cannot have more science

Nothing of the above discussion should be read as suggesting that science alone is always capable of providing the ultimate, factually correct answer to the questions of adjudicators. There will be (many) instances when uncertainty and ambiguity will be insurmountable and pervasive, coupled with time and budgetary constraints due to which interrogating the scientific aspects would be impossible in an adjudicatory setting. In such cases, legal or even intuitive benchmarks may provide satisfactory solutions and can be very useful tools in closing the science – law gap when no other options are available. Moreover, non-scientific principles, such as equity or good faith may be crucial for settling the respective dispute. Nothing in this dissertation implies that deciding legal controversies solely on the basis of scientific results would be desirable. One ought to be mindful of the fact that excluding value choices and normative considerations from a legal dispute would be undesirable from a societal point of view.

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2099 Scott and Sturm, ‘Courts as Catalysts: Re-Thinking the Judicial Role in New Governance’, 575.
2100 András Sajó argues that society, which consists of interest and power-laden structures, prefers law-based dispute resolution (as opposed to science-based adjudication) to be able to accommodate such interests in the process of dispute resolution. Sajó, Kritikai értekezés a jogtudományról, pp. 190–92.
II. Summary of the main findings of the dissertation

This research suggests that the entering of science into the adjudicatory process fundamentally impacts the ways in which adjudicatory reasoning can be crafted in a persuasive way. In this respect, this dissertation identified various legal, scientific, intuitive, and hybrid benchmarks with which adjudicators seek to justify whether a certain scientific claim can be legitimately accepted as the factual basis of their adjudicatory findings.

The point of departure of the analysis has been that adjudicators are necessarily “active borrower[s]”\footnote{Faigman, ‘Where Law and Science (and Religion) Meet’, 1662.} of scientific findings in deciding science-based environmental disputes. Chapter 2 described that scientific evidence and scientific arguments do not lend themselves to straightforward judicial appraisal for many reasons. The causes stem from fundamental differences in the ways in which law and science conceive concepts of ‘cause’ and ‘causation’, and the criteria for persuasive evidence. Science and law have also different levels of tolerance towards probabilistic evidence and ambiguity. While adjudicators search for objectively verifiable facts to be ascertained about legally relevant aspects of the case, scientists are perfectly comfortable with facts that remain inherently probabilistic and therefore uncertain. This chapter presented in detail the sources of scientific uncertainty, which are flowing in part from the process of scientific knowledge production and from the very nature of scientific facts themselves.

This research centered on analyzing judicial reactions to the entering of science into adjudication with respect to four stages of the adjudicatory process, namely, the framing of disputes, practices of scientific fact-finding, causal inquiry and the extent and standard of judicial review of scientific claims. The dissertation surveyed judicial tools with which judges as gatekeepers can control science’s intrusion into their reasoning. Analytic chapters (Chapters 3-9) were dedicated to the practice of eight international adjudicatory fora that hear environmental disputes. The chapters first reviewed the contexts in which scientific arguments become legally relevant in the adjudicatory analysis of the respective adjudicatory body. These chapters went on to identify the judicial techniques and tools with which adjudicators translate scientific arguments into legal findings.
With respect to the ICJ, Chapter 3 analyzed an evolving trend in judicial engagement with science, which has started with the marginalization of scientific evidence, continued with lousy evidentiary assessments, but ultimately demonstrated an increasing willingness to engage with science. Hesitant signs of spring are some decisions in which the Court monetized ecosystem services to award compensation for their loss, and the Whaling judgment, in which the ICJ scrutinized whether a whaling program has been indeed conducted for “scientific” purposes. This chapter portrayed that causality is relevant at three stages of the judicial inquiry about international responsibility and liability for environmental harm. Scientific uncertainty generates specific problems for establishing legally appreciable causal links at each of such stages.

The practice of international arbitral tribunals was detailed in Chapter 4. It shows a varied picture in terms of engaging with the scientific dimensions of disputes. Some tribunals were forerunners in making use of independent expertise or incorporating scientific competence within the panel. While others have carved out scientific insights from the relevant aspects of the case and, instead, had recourse to astute justifications to deliver purely legal argumentation in science-based disputes.

Chapter 5 examined the relevant practice of regional human rights courts, namely, the Strasbourg Court, the IACtHR, and from the African regime the ACtHPR and the ECOWAS Court. The focus of analysis was the causal inquiry and fact-finding methods in cases involving claims for health injuries caused by toxic exposure. The chapter analyzes how the Strasbourg Court employs non-scientific proxies to substitute for a thorough science-based inquiry into claims of health injuries allegedly caused by environmental pollution. The use of proxies effectively downplays the role of scientific evidence in adjudication; accordingly, scientific evidence rarely plays any meaningful role in judges’ deliberations. With respect to the IACtHR, the recent Advisory Opinion was examined with a focus on possible implications for the causal inquiry of IACtHR. The SERAP case of the ECOWAS Court and the Ogiek case of ACtHRP were analyzed in more detail.

The EU judiciary, examined in Chapter 6, in contrast to the Strasbourg Court is actively engaged in scrutinizing scientific claims underlying risk assessment decisions. Furthermore, EU Courts do not allow MS to escape thorough implementation of environmental directives even when respective State measures may only be a contributing factor to the environmental harm targeted and not the sine qua non.
Changing standards of deference are examined in detail with special emphasis on the consistency analysis that EU Court developed in the judicial review of scientific risk assessments. It has been argued that it constitutes a hybrid test, which facilitates active engagement with science. Lastly, EU Courts confirm innovative causal proof requirements of domestic authorities, such as causal presumptions, in applying EU directives. Yet EU Courts themselves have been reluctant to use their evidentiary powers provided under their Rules of Procedure.

The WTO jurisprudence, addressed in *Chapter 7*, showcases perhaps the most elaborate adjudicatory engagement with science. WTO law contains several scientific legality criteria, especially the SPS Agreement, therefore WTO panels and the AB should thoroughly evaluate expert evidence. Initially, they employed a rather intrusive review, which became slightly more deferential, though the AB still mandates a close scrutiny of the coherence of the risk assessors’ reasoning. It has been argued that the coherence analysis also mandates a hybrid review.

*Chapter 8* first identified five entry points for science in investment arbitration dispute settlement processes. Investment arbitration showcased varied scientific fact-finding practices. Certain tribunals fell prey to partisan evidence, which did not allow meaningful scientific assessment, while others made better use of independent expertise. Disputes that involved causal inquiry suggested that investment tribunals might be willing to relax traditional causal requirements in order to allow science-based claims. Lastly, arbitral tribunals were largely deferential in their standard of reviewing scientific claims, and when they were willing to scrutinize scientific claims, they adopted a proceduralist approach focusing on transparency and integrity of the process of scientific knowledge production.

*Chapter 9* examined the environmental jurisprudence of ITLOS. It starts with the procedures and the numerous provisions in UNCLOS and other applicable treaties, which may drag scientific concepts into disputes. Many framing techniques are identified ranging from precautionary justifications to mandating the parties’ expert-led cooperation and negotiation in science-intensive cases. ITLOS primarily relies on party-adduced evidence, though it has the legal power of asking for independent expert advice. Available avenues for appointing experts sitting with judges have not yet been used, neither the special arbitration consisting of expert panelists. The causal inquiry is not articulate, causal tests have only been announced
as a matter of principle, in the *Obligations and Responsibilities of States Advisory Opinion*.

In the comparative analysis, set forth in Chapter 10, the dissertation evaluated the different adjudicatory approaches and tools of scientific engagement that emerge in the practice of international adjudicatory bodies. It investigated four separate stages of adjudication: (i) the framing of disputes, (ii) scientific fact-finding, (iii) causal inquiry, and (iv) the extent and standard of review. The chapter distinguished judicial practices that downplay the role of science with respect to the above four stages of the adjudicatory process, and examined the intrusion of science and corresponding adjudicatory argumentative technique to evaluate scientific input from the perspective of the legal analysis.

As to scientific fact-finding, Chapter 10 also examined the practice of the UNCC administering environmental damage claims after the Gulf War, and innovative fact-finding techniques of US toxic tort litigation. In the comparative assessment of causal inquiry, case-law of US courts in toxic tort litigation, climate change litigation and the case-practice of the US – Marshall Islands Nuclear Claims Tribunal were also discussed. Such judicial decisions may serve as a source of inspiration for international courts and tribunals should they find those techniques persuasive decisions.

Chapter 10 also argued that causal inquiry of international courts and tribunals appeared to be a mixture of uncertain facts and opaque policy, which is also evidenced by the divergent causal tests used by courts and tribunals in adjudicating causal claims based on scientifically similar facts. As to the standard of review, the dissertation mapped the various standards employed by international adjudication, ranging from deferential to more intrusive reviews and identified corresponding benchmarks that are used as standards of review. The chapter distinguished scientific, legal, hybrid, and intuitive benchmarks and identified relevant examples for each of these types in international jurisprudence.

The concluding Chapter 11 analyzed the benefits, risks, and trade-offs of using different benchmarks in a systematic way. Each benchmark has its own advantages and disadvantages in terms of factual accuracy, epistemic non-arbitrariness, practical feasibility, and preserving the judicial monopoly over adjudicatory function. It concluded with offering some recommendations for selecting the appropriate standard in different contexts.
This dissertation showcased several adjudicatory attempts at better engaging with the scientific dimension of disputes. This suggests an undoubtedly laudable trend, even though it is far from being uniform across every international jurisdictions, resulting in a piecemeal approach to scientific engagement. This contribution problematized the scientific engagement of international fora hoping that scholarly and judicial awareness provides further impetus to develop persuasive tools for bridging the science – law divide in adjudicating environmental claims on the international level.
SCIENTIFIC ENGAGEMENT OF INTERNATIONAL COURTS AND TRIBUNALS IN ENVIRONMENTAL DISPUTES

SCIENCE AND THE LEGITIMACY OF ADJUDICATORY REASONING

Ph.D. DISSERTATION

Theses

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Budapest
2018
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IV. List of relevant publications
I. Summary of the research

Science-intensive disputes, in which parties submit scientific evidence or otherwise invoke scientifically-backed arguments are gradually becoming the norm in environmental adjudication. At the same time, we witness an increasing number of judicial fora hearing and deciding disputes with environmental relevance. The International Court of Justice, the Permanent Court of Arbitration, the EU judiciary, human rights courts, the International Tribunal for the Law of the Sea, the WTO dispute settlement bodies as well as investor-State arbitral tribunals all increasingly confront science in their jurisprudence. These international adjudicatory fora differ in their approaches to scientific facts, which tend to be uncertain, probabilistic and ambiguous. While some of them hesitate to decide cases based on highly technical, scientific evidence on the grounds of their lack of expertise, others go to great lengths to evaluate scientific inputs and decide such cases on the merits.

Science inevitably underlies disputes concerning natural resource allocation, environmental liability, risk assessment requirements, violations of human right to a safe and clean environment, and those relating to States’ right to regulate environmental risks to the detriment of foreign investments or international trade. Science may enter the course of adjudication in a myriad of ways. Sometimes scientific facts are embedded in the primary rule upon which the controversy rests, such as in the case of disputes revolving around environmental harm and causality. In other cases, scientific results become relevant to the interpretation of concepts in which law and science are closely interwoven. Notions of ‘genuine environmental risks’ become crucial to appraise the legality of a risk assessment measures and the exercise of States’ regulatory powers over international trade and foreign investment.

This would intuitively warrant a significant role for scientific arguments in the resolution of environmental disputes. Yet a closer look at international environmental decisions reveals that scientific input is often marginalized or addressed only minimally by judges. Those adjudicatory fora that are willing to engage with the underlying science adopt diverse techniques to justify their choices among competing scientific claims.

The role of science in environmental adjudication requires special attention considering its strategic importance in the judicial process. Science enters adjudication as a source of objective, extra-legal cognitive authority, to which the parties appeal supporting their arguments. Its strategic value distinguishes scientific arguments from various other types of factual, policy and legal arguments raised by the parties in litigation. While scientific references may lend considerable persuasive force to the parties’ argument, science normally falls within the blind spot of international adjudicators. Judge Cancado Trindade summarized the ambivalent role science plays in adjudication: “conflicting evidence seems to make the paradise of lawyers and practitioners at national and international levels. It seems to make, likewise, the purgatory of judges and fact-finders, at national and international levels.”

Yet science could also be an important ally of international adjudicators, which if treated properly, can lend persuasive force to their judgments. The persuasiveness of adjudicatory decisions is for the large part a result of proper argumentation, and therefore, this survey will focus on different types of adjudicatory reasoning, with which adjudicators may justify their choices in science-intensive cases.

Against this background, the judicial treatment of science is well worth its own inquiry, dedicated specifically to revealing the weight and impact of scientific arguments on adjudication. Yet surprisingly little scholarly work has been dedicated to the various forms of adjudicatory treatment of scientific disputes. Earlier scholarly works have dealt mainly with the use of expert evidence, or scientific fact-finding more generally, or addressed the scientific engagement of specific judicial fora. Thus far only a couple of articles have sought to survey relevant judicial methods across multiple jurisdictions. This dissertation strives to provide a comprehensive taxonomy of international environmental adjudication using judicial techniques for

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2106 Payne, ‘Mastering the evidence’.
2107 Lévesque, ‘Science in the Hands of International Investment Tribunals: a Case for ‘Scientific Due Process’”.
scientific engagement as a benchmark. Understanding the limits of judicial engagement with science and portraying the different argumentative tools through which persuasive and legitimate legal decisions may be brought in science-intensive cases constitute the main objectives of this research.

II. Methodological approach of the dissertation

This dissertation examines the ways in which different international courts and tribunals engage with scientific arguments and evidence in adjudicating environmental disputes. It focuses primarily on different argumentative techniques with which adjudicators can craft legitimate reasoning in science-heavy disputes.

1. Scope of research: international environmental disputes

This dissertation builds on the rather broad definition of international environmental dispute, provided by Jorge E. Vinuales, which encompasses all international disputes having an environmental component. Hence this research encompasses not only the disputes, which entertain environmental law obligations, but also those that concern questions of environmental protection or environmental management, assessing environmental or health risks, as well as where a party’s conduct or the exercise of his alleged rights adversely impact or harm the environment.

International environmental disputes, as understood above, appear before a growing “patchwork of jurisdictions” 2109, i.e. a wide array of international adjudicatory bodies that confront environmental and thus, science-based claims in various contexts. As environmental considerations have markedly permeated into other branches of international law, such as regimes of trade law, investment protection and human rights law, specialized courts and tribunals of these fields have emerged as “borrowed fora” 2110 for bringing environmental claims. As a result, a number of fora shall be included in this analysis. The dissertation will analyze in detail the judgments of the International Court of Justice (Chapter 3), the arbitral awards issued in inter-state environmental disputes under the aegis of the Permanent

Court of Arbitration or ad hoc panels (Chapter 4), the judgments of the regional human rights court in cases involving exposure to toxic pollution, hence those of the European Court of Human Rights, the Inter-American Court of Human Rights, the African Court of Human and Peoples’ Rights and the ECOWAS Court (Chapter 5), the case-law of the judiciary of the European Union (Chapter 6), the decisions of the World Trade Organization’s panels and the Appellate Body (Chapter 7), the awards of arbitral tribunals handed down in investor-State dispute settlements (Chapter 8), as well as the decisions of the International Tribunal for the Law of the Sea (Chapter 9).

The analysis will also discuss the practice of certain international claims commissions and domestic courts to the extent that they may serve as sources of inspiration for international fora to better engage with science. These judicial best practices are discerned from the case-practice of the UN Compensation Commission, which administered environmental damage claims arising from the Gulf War, the decisions of the US–Marshall Island Nuclear Claims Tribunal, as well as the case law of U.S. courts in toxic tort cases and climate change litigation.

This research focuses on legal adjudication, hence decisions resulting from diplomatic means of dispute settlement, and various non-compliance procedures will not be analyzed. Adjudication in this context stands for the legal proceedings of international courts and tribunals aiming to decide environmental disputes through a binding decision. Therefore, non-binding recommendations of non-judicial organs are excluded from the scope of this research. The research centers on adjudicatory reasoning techniques, therefore those disputes will not be subject to further study, which were settled out of court. I will also not examine decisions that were handed down by domestic courts on the basis of international environmental conventions.
2. Comparative framework: judicial engagement with science

The presence of scientific arguments impacts the dynamics of adjudication in many ways: it necessitates asking for and weighing expert evidence, it impacts causal inquiry, as causal claims in environmental disputes are normally built upon uncertain scientific facts, as well as it calls for devising a standard of review to give guidance as to what appeals to ‘science’ will be accepted as a valid ‘scientific’ position.

Throughout the dissertation judicial engagement with science will be used to describe judicial reactions to the entering of science into adjudication. The research sees adjudicators as gatekeepers, who can adjust the level of science that is allowed to enter their deliberations at several stages of the adjudicatory process. Throughout the dissertation, scientific engagement of international courts and tribunals will refer to a host of practices with which adjudicators assess, interact, and occasionally investigate the scientific dimension of legal disputes.

To make this concept less abstract and more amenable to a fine-grained comparative analysis, judicial engagement with science will be measured at four distinctive aspects of the adjudicatory process. This research will identify and comparatively assess the judicial techniques serving for engaging with science specifically at the following stages of adjudication:

(v) *Framing legally relevant issues to decide* – that is to what extent judicial bodies focus exclusively on non-scientific aspects of the case while deciding the dispute. Framing represents a strategic choice of adjudicators, which allows them not to regard scientific arguments as having compelling force in resolving environmental disputes, since doing so would tie their hands in terms of the adjudicatory outcome. With framing techniques they may also use the cognitive power of science for neutralizing conflict;

(vi) *Scientific fact-finding* – that is the extent to which courts request and rely on expert evidence in reaching their decisions, and the procedures in which judges handle and weigh expert opinions. Different methods of taking expert evidence will also be discussed;

(vii) *Causal inquiry* – the dissertation investigates (i) whether courts are willing to conduct a thorough, science-intensive causal inquiry with appropriate causal tests or they rather circumvent or substitute science in reaching their decision;
and examines (ii) whether courts are willing to consider uncertain, probabilistic scientific proof of causation and establish a causal link thereon.;

(viii) Extent and standard of judicial review – that is the willingness and the techniques of courts to assess the credibility and validity of scientific arguments put forward by expert opinions. The standard of review chosen by adjudicators describes the degree of deference they accord to legislators, who make policy choices based on complex scientific evidence. Margin of discretion and margin of appreciation are also used to describe related phenomena.

As an important caveat, the above categories are not mutually exclusive in the sense that certain judicial techniques may operate on more than one stage of the adjudicatory process. The classification serves as an analytical framework to identify and comparatively assess the different adjudicatory tools courts and tribunals employ in environmental disputes.

As to its methodology, this dissertation conducts a comparative case-law analysis, with a strong focus on analyzing the judicial reasoning employed in environmental cases. Each chapter (Chapters 3-9) analyzes the above four aspects of adjudicatory engagement with science in the practice of a given international forum. Chapter 10 provides a comparative assessment of the judicial tools identified in the preceding substantive analysis and describes some main trends in judicial engagement of science. This chapter provides an overview on how international adjudicators can justify their choices between science-intensive arguments. Chapter 11 draws classifies the different benchmarks with which adjudicators craft their reasoning, and offers some concluding remarks.

3. Interdisciplinary insights

As to its theoretical foundations, the dissertation heavily draws on interdisciplinary insights. First and foremost, on natural science literature, which extensively deals with the problem of scientific uncertainty – a central concept of this research. Second, insights of the philosophy of sciences, especially Science and Technology Studies (“STS”) will be cited to inform legal debates surrounding the appropriate boundaries of judicial purview in science-heavy disputes. STS scholarship
focuses on the interrelations of legitimacy, public authority, and accountability of both science and law. Insights from STS can help better understand the difficulties of reconciling scientific and legal authority in legal adjudication. Accounts on the philosophy of science may inform the legal analysis as to the extent of deference that is justifiably accorded by adjudicators to expert evaluations in selecting the standard of review.

4. Science and the legitimacy of adjudicatory reasoning

Throughout this research, judicial engagement with science will be analyzed with a view to legitimacy, more specifically, to explore how the different methods for scientific engagement affects the legitimacy of adjudicatory decisions. Many have written about the legitimacy of a given international adjudicative body or that of international courts in general. However, none of them were specifically interrogating how the presence of science, as a source of epistemic authority, may impact the legitimacy of adjudicatory authority. Do cognitively authoritative scientific arguments in a legal dispute constitute obstacles to efficient legal dispute resolution? Or are they an asset, or even a necessary element? Is scientific legitimacy a prerequisite to legal legitimacy? Or legal legitimacy can be constructed irrespective of scientific facts? This research is dedicated to uncover these overlooked aspects of legitimacy with regard to international adjudicatory reasoning in science-heavy cases.

The dissertation offers many reasons due to which the treatment of science in adjudication is crucial for the legitimacy of adjudicatory decisions. It argues that adjudicators have to engage with science in a proper way in order to harness the cognitive authority of science in crafting persuasive and legitimate reasoning. The central yardstick in this respect is not that using more science would necessarily result in better-reasoned judgments. Rather, the crucial question on which the legitimacy of a science-intensive judgment hinges is how adjudicators reflect on the scientific aspects of disputes in their reasoning. Among the many angels from which the legitimacy of adjudicatory decisions can be measured this research takes epistemic


\[2112\] Grossman, ‘Legitimacy and International Adjudicative Bodies’.
non-arbitrariness\textsuperscript{2113} as its yardstick. Epistemic non-arbitrariness stands for a proposition that a given knowledge claim ought not to be judged “based on standards alien to it”\textsuperscript{2114}. In this vein, in order for adjudicators to appeal to argumentative persuasiveness, they ought not to apply legalistic logic to scientific claims, but must understand “the cognitive aims and methods of science”\textsuperscript{2115} in case they make decisions involving scientific facts.

III. Main research findings and their possible applications

The dissertation is structured in three main analytic parts. The first part is set out in Chapter 2 and it addresses the main theoretical and practical challenges of using scientific inputs in a legal setting. The second main part consists of 6 analytical chapters (Chapters 3 – 9), which are dedicated to each of the international adjudicatory bodies to analyze their scientific engagement with respect to the four stages of the adjudicatory process. The third main part consists of Chapters 10 and 11, which provide a comparative assessment of the adjudicatory tools identified in the practice of the relevant fora, and provides a classification on the different types of benchmarks that are used in adjudicatory reasoning to decide science-intensive cases.

1. Findings as to the challenges of adjudicatory engagement with science in international environmental adjudication (pp. 23 – 71)

The point of departure of the analysis has been that adjudicators are necessarily “active borrower[s]”\textsuperscript{2116} of scientific findings in deciding science-based environmental disputes. Chapter 2 described that scientific evidence and scientific arguments do not lend themselves to straightforward judicial appraisal for many reasons. The causes stem from fundamental differences in the ways in which law and science conceive concepts of ‘cause’ and ‘causation’, and the criteria for persuasive evidence. Science and law have also different levels of tolerance towards probabilistic

\textsuperscript{2113} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 270.

\textsuperscript{2114} D’Aspremont and Mbengue, ‘Strategies of Engagement with Scientific Fact-finding in International Adjudication’, 268.

\textsuperscript{2115} Brewer, ‘Scientific Expert Testimony and Intellectual Due Process’, 1539.

\textsuperscript{2116} Faigman, ‘Where Law and Science (and Religion) Meet’, 1662.
While adjudicators search for objectively verifiable facts to be *ascertained* about legally relevant aspects of the case, scientists are perfectly comfortable with facts that remain inherently probabilistic and therefore *uncertain*. This chapter presented in detail the sources of scientific uncertainty, which are flowing in part from the process of scientific knowledge production and from the very nature of scientific facts themselves. It argues that scientific uncertainty is not a monolithic concept but has at least eight different sources, some of which cannot be eliminated from scientific research even despite constant scientific progress.

As a theoretical foundation for the legal assessment, this chapter summarizes the epistemic difficulties of using science in a legal setting and addresses and the theoretical debates concerning the appropriate division of competences between adjudicators and experts, with a special emphasis on the dangers of inadvertent delegation of adjudicatory function to non-elected experts. It concludes by summarizing current scholarly criticism of adjudicatory engagement with science and sets out the analytic framework of the dissertation with which it seeks to contribute to the scholarly commentary.

2. **Findings as to the scientific engagement of the International Court of Justice**
   **(Chapter 3: pp. 72 – 126)**

   With respect to the ICJ, *Chapter 3* identified an evolving trend in judicial engagement with science, which has started with the marginalization of scientific evidence, continued with lousy evidentiary assessments, but ultimately demonstrated an increasing willingness to engage with science.

   *Ad (i) Framing of legally relevant aspects*

   The Court had a tendency to avoid deciding science-intensive aspects of such disputes and it rather referred such questions back to the parties’ negotiations. The *Gabcikovo-Nagymaros* judgment evidences this, where the Court chose not to evaluate the bulky scientific evidence offered by the parties. Another aspect of strategic framing of disputes manifests in the prevalence of finding breaches of procedural rules, rather than that of substantive rules. The substantive aspect of the no-harm rule has never been found established by the ICJ in environmental disputes, despite repeated claims by injured States, while a wide array of procedural obligations
have been found to be breached. Similarly, the ICJ has repeatedly avoided discerning substantive (scientific) minimum criteria of preparing a valid EIA.

**Ad (ii) Scientific fact-finding**

The Court’s fact-finding technique has undergone considerable evolution. In *Pulp Mills* the parties chose to present scientific arguments by including scientific experts in their team of counsels, which was found by the judgment as a less helpful solution compared to the option of having scientists acting as expert witnesses. Arguably, the *Whaling* case has seen thus far the most effective judicial use of scientific expertise, where expert witnesses were cross-examined by the parties and were questioned by the bench for the first time in the Court’s history. Thus far the ICJ has never appointed ex curia experts in environmental disputes. Nevertheless, the Court is still known for consulting with ‘phantom experts’, *i.e.* temporary registry staff members, whom are unknown to the parties, and whose opinions are not disclosed.

The complexity and depth of the Court’s evidentiary assessment also evolved over the years. In *Gabcikovo-Nagymaros*, the ICJ did not even consider the scientific evidence. Later in *Pulp Mills* it summarily dismissed the lengthy evidence without elaborating on the exact reasons for dismissal. Probabilistic scientific evidence was submitted to the ICJ in several cases, but it dismissed all pieces of evidence for various reasons. These all bespeak a *de facto* high standard of proof with the Court in scientific disputes, even though in principle, the applicable standard of proof would be the balance of probabilities standard. When the ICJ opts for accepting a certain piece of scientific evidence, it declares its methodology to be an “overall assessment”, which provides only a rather obscure scientific reasoning. This was most salient in the compensation judgment issued in the *Certain Activities* case.

**Ad (iii) Causal inquiry**

As to the Court’s causal inquiry, the chapter identifies that causality is relevant at three stages of the judicial inquiry about international responsibility and liability for environmental harm. Scientific uncertainty causes specific problems at all three stages. The causal analysis of the Court also evidences the Court’s struggle with establishing the requisite proof of causation in cases involving environmental harm.
and the difficulties adjudicators have in adequately accommodating the various problems stemming from uncertain causation.

*Ad (iv) Extent and standard of review*

The ICJ used the term ‘standard of review’ for the first time in the Whaling judgment. It had to scrutinize whether Japan’s whaling program was conducted “for purposes of scientific research”. The Court decided to examine whether “the programme’s design and implementation [were] reasonable in relation to achieving its stated objectives.” Though many scholars have criticized the Court for not providing a legal definition on what constitutes ‘scientific research’, the dissertation defends the Court’s choice based on insights from STS literature. The dissertation also argues that the reasonableness standard can be viewed as an ambitious standard, which yields a rather intrusive standard of review, which enabled the Court to reject Japan’s appeal to ‘science’ in justifying its whaling program.

As to the Court’s argumentative technique it is noteworthy that while the parties offered competing definitions of “scientific research”, the ICJ mainly dealt with interpreting the “for purposes of” part of the rule, and discerned the test of reasonableness from this phrase. It did so by way of a grammatical and logical interpretation, which the dissertation identifies as a „semantic analysis”.

3. Findings as to the scientific engagement of international arbitral tribunals in inter-State environmental arbitrations (Chapter 4: pp. 127 – 156)

The practice of international arbitral tribunals shows a varied picture in terms of engaging with the scientific dimensions of disputes. The dissertation discusses the practice of ad hoc inter-State tribunals as well as those established under the aegis of the Permanent Court of Arbitration.

*Ad (i) Framing of legally relevant aspects of disputes*

In some cases, arbitrators regarded scientific arguments as decisive to the case at hand, such as the Lake Lanoux panel, which expressly noted that techno-scientific arguments could have saved Spain from losing the case. Yet, the MOX Plant

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Arbitration panel disregarded the parties’ substantive arguments regarding the possibility of adverse effects; instead, the majority treated those aspects to be decisive that were not addressed in the parties’ submissions.

The Iron Rhine Tribunal refused to consider scientific arguments let alone expert opinions in deciding about the extent of environmental protection measures deemed appropriate to be demanded by the Netherlands from Belgium. By doing so it eliminated the scientific dimension of the dispute, and handled the issue of appropriateness as a purely legal question.

Ad (ii) Scientific fact-finding

The Trail Smelter Arbitration was a high water mark for engaging with the evidence submitted, since the panel provided a legal assessment that was bordering scientific evaluation. Similar engagement with science was only reproduced quite recently in Kishenganga, where the arbitrators were able to identify the environmentally induced minimum flow on the basis of scientific evidence. The Kishenganga tribunal also comprised an expert arbitrator. The South China Sea panel appointed ex curia experts, which has remained thus far a unique fact-finding method in international adjudication.

Ad (iii) Causal inquiry

With respect to causal inquiry, international arbitral tribunals generally do not adopt elaborate approaches. Suffice it to refer to the MOX Plant case, where the causal assessment was firmly concluded with finding a lack of serious harm caused to the marine environment. The rare instances when a causal claim of environmental harm succeeded, as it did in the South China Sea Arbitration, was arguably owed to the egregiousness of the environmental destruction at hand.

4. Findings as to the scientific engagement of regional human rights courts
   (Chapter 5: pp. 157 – 199)

Chapter 5 examined the relevant practice of regional human rights courts, namely, the Strasbourg Court, the IACtHR, and from the African regime the ACtHPR and the ECOWAS Court. The analysis centers on comparable cases from their jurisprudence, namely, where human rights claims concern health injuries allegedly
caused by toxic exposure. The focus of analysis was the causal inquiry and fact-finding methods in cases involving claims for health injuries caused by toxic exposure.

Ad (i) Causal inquiry

The chapter analyzes how the Strasbourg Court employs non-scientific proxies to substitute for a thorough science-based inquiry into claims of health injuries allegedly caused by environmental pollution. The use of proxies effectively downplays the role of scientific evidence in adjudication. These proxies, such as the vicinity of the polluter to the victim’s home often runs against scientific knowledge about the polluting agent’s toxicity and its capacity to travel long-range. Moreover, these proxies are either under- or overinclusive in the sense that they cannot identify those factors that indeed had a causal role in violating victim’s right to privacy. This proxy-based method results in a case-law, where victims of toxic pollution rarely win such claims.

There has been one instance in the case-law, which signaled the Court’s willingness to devise legal techniques to allow claims of health injuries to proceed. In the famous Fadeyeva case, the ECtHR has established a causal presumption in cases where pollution significantly exceeded domestic safety levels. Overall, however, the dissertation argues that the practice of the ECtHR showcases a sophisticated avoidance technique of engaging with underlying science.

With respect to the IACtHR, the focus of analysis was the recent Advisory Opinion, which created a new causality-based link for extraterritorial jurisdiction for States causing transboundary environmental harm.

From the African system, the SERAP case of the ECOWAS Court and the Ogiek case of ACtHRP were analyzed in more detail.

Ad (ii) Scientific fact-finding

The analysis first shows that the ECtHR’s standard of proof is generally high even though the Court emphasized that it allows flexibility with regard to the evidentiary difficulties involved. Albeit, in fact, it rarely accepts probabilistic proof of causation. Even when the ECtHR finds a breach, it avoids evaluating uncertain scientific proof of causation.
In the Inter-American system fact-intensive toxic tort cases are currently heard by the Inter-American Commission. They were all found to be admissible and therefore may eventually reach the IACtHR as well.

The African courts usually hear experts, though in environmental cases so far no scientific experts were summoned.

5. Findings as to the scientific engagement of the Court of Justice of the European Union (Chapter 6: pp. 200 – 238)

The dissertation identifies seven procedures in which scientific arguments gain legal relevance in disputes brought before the EU judiciary. It argues that the EU Courts’ case-law can be divided into two groups based on the techniques of judicial engagement with science. To the first group belong those cases where questions of science arise before the EU Courts in the context of judicial scrutiny of risk assessments. In such cases the task of EU Courts is to review whether EU institutions or Member States (“MS”) have remained in the legitimate ambit of their discretion they enjoy in regulating complex scientific risks.

The second group consists of cases where scientific arguments are raised by the EU Commission to challenge the appropriateness of MS’ implementation measures and their compliance with EU law obligations. Here science indicates whether national harmonization measures are insufficient to reach the goals set by EU law, thus, may serve as a proof of a breach.

Ad (i) Standard of review in the judicial review of risk assessments

Initially, EU Courts accorded a quasi-automatic deference to techno-scientific assessments of EU institutions or MS. The shift in the approach of EU Courts became most salient in the landmark Pfizer and Alpharma cases, where the Court of First Instance was willing to closely scrutinize the scientific basis of a risk assessment and did not grant total deference to the Commission. Since Pfizer, EU Courts have developed several criteria regarding the scientific reasoning of the risk assessor. The dissertation identifies and analyzes four of such tests. The dissertation regards the consistency assessment to be the most consequential. By adding the consistency requirement EU Courts now also scrutinize whether the expert opinion, relied on by the risk assessor, establishes a comprehensible link between the scientific findings
and its conclusion. The dissertation argues that this benchmarks yields a hybrid assessment, where EU Courts provide an essentially legalistic assessment though have to have a closer look at the underlying can be viewed as a substantial expansion of the scope of the formerly deferential judicial review.

Ad (ii) Scientific fact-findings

EU Courts themselves have been reluctant to use their evidentiary powers provided under their Rules of Procedure. Albeit they confirmed innovative causal proof requirements of domestic authorities, such as causal presumptions under EU directives.

Ad (iii) Causal inquiry

EU Courts do not allow Member States to escape from thorough implementation of environmental directives even when respective State measures may only be a contributing factor to the environmental harm targeted and not the *sine qua non* ‘cause’. Hence EU Courts do not accept causal uncertainty as a reason justifying judicial or regulatory paralysis.

6. Findings as to the scientific engagement of WTO dispute settlement bodies
   (Chapter 7: pp. 239 – 277)

The WTO jurisprudence showcases perhaps the most elaborate adjudicatory engagement with science. WTO law contains several express scientific legality criteria, especially the SPS Agreement, therefore WTO panels and the Appellate Body could not escape thoroughly evaluating expert evidence.

Ad (i) Scientific fact-finding

WTO panels have elaborate expert consultation system. In SPS cases, the use of experts is mandatory, and the experts are appointed by the panel after seeking the views of the parties on the persons to be consulted in such capacity. WTO dispute settlement bodies may seek the advise of competent international organizations. Lastly, WTO panels also frequently cite standards issued by international organizations to justify their scientific findings.
Ad (ii) Extent and standard of review

A much-debated aspect of the WTO jurisprudence is whether panels are deferential enough towards Members’ science-based claims. Initially, WTO panels conducted an intrusive review investigating whether SPS measures were supported by scientific evidence. Later on they have started to touch upon the scientific correctness of Members’ scientific claims as they sought to find the single correct scientific truth among competing expert explanations. This marked a red line triggering the Appellate Body’s intervention to change the applicable standard of review towards a more deferential one. The Appellate Body has recently adopted a new two-stage scrutiny, which the dissertation argues being a ‘hybrid’ test. This combines a deferential review towards the scientific basis of risk assessments with an intrusive inquiry into the coherence of the risk assessor’s reasoning.

7. Findings as to the scientific engagement of Investor–State Dispute Settlement tribunals (Chapter 8: pp. 278 – 300)

Chapter 8 first identifies five entry points for science in investor-State dispute settlement processes. Investment arbitration showcases varied scientific fact-finding practices: certain tribunals fall prey to partisan evidence, while others make better use of independent expertise. Disputes involving causal inquiry suggest that investment tribunals may be willing to relax traditional causal requirements in order to allow science-based claims. Arbitral tribunals are largely deferential in reviewing scientific claims. The dissertation identifies two types of benchmarks that tribunals rely on as indicia of credibility of regulatory science used in risk assessments. In this vein, investment tribunals either (i) adopt a proceduralist approach, in which they focus on the transparency and integrity of the process of scientific knowledge production, or (ii) they regard international regulatory trends as evidence of credible scientific positions.

8. Findings as to the scientific engagement of ITLOS (Chapter 9: pp. 301 – 318)

Many framing techniques are identified in ITLOS jurisprudence ranging from precautionary justifications to mandating the parties’ expert-led cooperation and negotiation in science-intensive cases. Scientific evidence thus far never justified
ruling in favor of any party before ITLOS, it only justified finding serious enough risks to issue precautionary measures. ITLOS primarily relies on party-adduced evidence, though it has the legal power of asking for independent expert advice. Available avenues for appointing experts sitting with judges have not yet been used, neither the special arbitration procedure consisting of expert panelists. The causal inquiry has not been articulate, causal tests have only been announced as a matter of principle, in the *Obligations and Responsibilities of States Advisory Opinion*. ITLOS has confirmed that causality is not be presumed.

9. **Findings as to the comparative assessment: trends in judicial engagement with science in international environmental adjudication** (Chapter 10: pp. 319 – 392)

   In its comparative part the dissertation evaluates the different adjudicatory approaches and tools of scientific engagement that emerge in the practice of the adjudicatory bodies examined. This analysis suggests that one may differentiate between “ready” and more “reluctant” fora with respect to engaging with science. The chapter distinguished judicial practices that downplay the role of science with respect to the above four stages of the adjudicatory process, and those that aim to incorporate and accommodate science in the legal analysis.

   As to scientific fact-finding, *Chapter 10* not only included the practice of fora that have been examined in the substantive chapters but also portrayed the practice of the UNCC administering environmental damage claims after the Gulf War, and innovative fact-finding techniques of US toxic tort litigation. In the comparative assessment of causal inquiry, case-law of US courts in toxic tort litigation, climate change litigation and the case-practice of the US – Marshall Islands Nuclear Claims Tribunal were also discussed. Such judicial decisions may serve as a source of inspiration for international courts and tribunals should they find those techniques persuasive decisions.

   (i) As to framing: no unified trend can be identified in the case-law as there are many practices that serve to carve out scientific aspects from the adjudicatory purview, while in other cases, science is strategically used by adjudicators to neutralize conflicts or mandate expert-led negotiations.
(ii) As to trends in scientific fact-finding: the dissertation shows that in contemporary jurisprudence the majority of fora do request scientific expertise in science-intensive cases, even though they are reluctant to gather independent expertise or to rely on ex curia experts. Expert arbitrators are also rarely appointed in practice. These suggest that adjudicators do fear of delegating their judicial power to experts by increased reliance on experts.

(iii) Causal inquiry: argued that causal inquiry of international courts and tribunals appeared to be a mixture of uncertain facts and opaque policy, which is also evidenced by the divergent causal tests used by courts and tribunals in adjudicating causal claims based on scientifically similar facts.

(iv) As to the standard of review: the dissertation maps the various standards of review employed by international adjudication, ranging from deferential to more intrusive reviews. When courts decide not to grant total deference to States’ scientific claims, they need to employ certain benchmarks to validate the scientific claims. One may find several such benchmarks in adjudicatory practice, functioning as different standards of review. The dissertation distinguishes scientific, legal, hybrid, and intuitive benchmarks that all serve to justify the choice of arbitrators to accept a scientific claim as valid. Scientific benchmarks are used in WTO law and are epistemically deferent to standards of the scientific community. Legal benchmarks can be found e.g. in the scientific due process criteria applied by ISDS. Hybrid benchmarks can be found in the practice of the WTO, EU Courts, and the ICJ. Finally, intuitive benchmarks are the semantic analysis (WTO, ICJ) and the proxy-based causal inquiry of ECtHR.

10. Findings as to the crafting of persuasive adjudicatory reasoning in science-intensive cases (Chapter 11: pp. 393 – 413)

The last issue this dissertation examines is the ways in which scientifically not trained judges can craft persuasive reasoning to justify their choices between competing, and often ambiguous, scientific or science-based arguments offered by the parties or experts in environmental disputes. The dissertation differentiates between legal, scientific, hybrid, and intuitive benchmarks. Each benchmark has its own advantages and disadvantages in terms of factual accuracy, epistemic non-arbitrariness, practical feasibility, and preserving the judicial monopoly over
adjudicatory function. The dissertation briefly discusses these possible remedies in case of each type of benchmark.

By using scientific benchmarks, adjudicators appeal to scientific rationality, and draw on the cognitive authority of science to justify a particular choice between competing science-based claims. Adjudicators may also rely on legal standards, which are deemed authoritative by virtue of legal reasoning. These yardsticks can ultimately also be traced back to scientific knowledge (e.g. standards of international organizations), but their use does not necessitate scientific competence, and therefore, they function as non-scientific benchmarks. The dissertation differentiates a third type of standard, hybrid benchmarks. These lend themselves to legal evaluation, but at the same time, their use ought to be informed by underlying science, which ensures that judges do not need to completely defer epistemically to scientific standards or to judge the scientific validity of the evidence. Lastly, intuitive benchmarks are based on common sense, and everyday knowledge, which is legitimately forms part of adjudicators’ argumentative practices, although it occasionally may run against scientific realities, when its use becomes problematic.

11. Possible application of the research findings

First and foremost this dissertation may have practical implications as to the process of environmental adjudication. It raises scholarly and judicial awareness of the challenges caused by the presence of scientific input in adjudication and also about the inevitable necessity to handle scientific arguments in a consistent and persuasive way.

It offers some insights as to how adjudicators can craft persuasive legal arguments in science-heavy cases. The dissertation identified various legal, scientific, hybrid, and intuitive benchmarks with which adjudicators seek to assess whether a certain scientific claim can be legitimately accepted as the factual basis of adjudicatory findings. With respect to each benchmark and argumentative practice, the dissertation identifies the trade-offs and risks in terms of epistemic non-arbitrariness, persuasiveness, and practical feasibility. The dissertation also offers possible solutions that may remedy these risks.

The most appropriate way of reasoning and the extent of engaging with science may vary from case to case and across jurisdictions. However, the dissertation
argues that in certain cases scientific benchmarks may better legitimize adjudicatory conclusions if the given fora have advanced capacities for scientific fact-finding methods. In turn, legal benchmarks may be more satisfactory if the scientific controversy is insurmountable, or if the given adjudicatory body lacks thorough scientific support from independent experts or expert arbitrators. Lastly, hybrid benchmarks, such as the consistency or coherence analyses of WTO law or EU law, seem to be particularly apt for promoting the “informational catalyst” role of courts. Epistemic non-arbitrariness suggests that relying on legal and intuitive benchmarks is the least controversial when they serve as complementary techniques in cases where scientific benchmarks are not available.

Proper scientific engagement of international courts and tribunals is also consequential due to the increasing competition between jurisdictions among proliferating international courts and tribunals. Omitting or marginalizing apparent scientific facts upon which a given dispute rests would not only run the risk of undermining the legitimacy of adjudicatory decisions, but ultimately could challenge the confidence placed in the given judicial body. This could in turn drive away potential claimants towards other jurisdictions. As more and more adjudicatory fora are available for parties, they will have recourse to those fora where they can trust that all relevant aspects of the case will be fully evaluated.

Furthermore, engaging with the scientific dimension of disputes and not to use lousy scientific findings to hide adjudicatory positions is also vital for preserving the legitimacy of international adjudicatory fora in the face of a rising global suspicion and backlash against globalization, and globalized institutions such as supranational adjudicatory bodies. Well-reasoned engagement with science ultimately supports the legitimacy of adjudicatory fora, which are facing heightened scrutiny and expectations for impartial and unbiased treatment of cases. International judges should be mindful of the fact that striking down sensitive policy choices of governments, such as environmental or health regulations in an unjustified way, could easily result in societal and political backlash against that institution. It is for this reason vital in the context of international adjudication not to issue arbitrary judgments in scientific disputes.

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2118 This term was coined by Ellen Vos, see Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 152.
This dissertation sought to raise awareness of the fact that integrating scientific input into legal decisions undoubtedly poses challenges to adjudicators, but science may also prove to be an ally, if treated properly, as it provides cognitive authority to well-reasoned judgments. In contrast, science would haunt adjudicators if they chose to dispose of it quickly by vague, inconsistent, or opaque reasoning. Downplaying science, although may very well simplify adjudicators’ task in the short run, it would create hurdles on the long-run as adjudication risks being detached from reflecting on scientific realities.

To conclude, the dissertation raises awareness of the fact that better engaging with science seems to be an inevitable necessity in modern adjudication in order to preserve the persuasive force of legal decisions brought in disputes. Practices conferring persuasive force and legitimacy on judicial decisions are changing over time. Previously, decisions were regarded as wise and legitimate even if they were based solely on legal principles, considering only the non-scientific aspects of cases. At present, however, such adjudicatory reasoning would fail to confer legitimacy on judicial decisions when techno-scientific progress outpaces imagination, and pervades all aspects of human life. At a time like this, scientific aspects of disputes ought to be sufficiently addressed and accommodated by adjudicators in order to render factually correct, epistemically non-arbitrary, and altogether persuasive decisions.
IV. List of relevant publications

NEMZETKÖZI BÍRÓI FÓRUMOK INTERAKCIÓJA A
TERMÉSZETTUDOMÁNYAL KÖRNYEZETI TÁRGYÚ JOGVITÁKBAN

A TUDOMÁNY ÉS A BÍRÓI ÉRVELÉS LEGITIMÁCIÓJA

Ph.D. értekezés

Tézisek

Témavezetők:

Prof. Dr. Kardos Gábor
Prof. Dr. Sonnevend Pál

Budapest
2018
TARTALOMJEGYZÉK

I. A kutatás összefoglalása

II. A kutatás módszertana

III. Főbb kutatási megállapítások és hasznosítási lehetőségeik

IV. Releváns publikációk listája
I. A kutatás összefoglalása

A környezeti tárgyú jogvitákban a természettudomány egyre nagyobb szerepet játszik, hiszen a felek egyre nagyobb számban, és egyre nagyobb mértékben támaszkodnak tudományos érvekre, illetve bizonyítékokra a bíróságok előtt. Ezzel párhuzamosan egyre több nemzetközi bírói fórum szembesül természettudományos kérdésekkel, mivel egyre bővül azon fórumok száma, amely tág értelemben vett környezeti tárgyú jogvitát tárgyal. Így a Nemzetközi Bíróság, az Állandó Nemzetközi Választottbíróság, az Európai Unió Bírósága, a regionális emberi jogi bíróságok, az ENSZ Tengerjogi Törvényszéke, a WTO vitarendezési mechanizmusa, valamint a befektetésvédelmi választottbíróságok elé is számos ilyen, jelentős természettudományos aspektussal bíró ügy kerül. E fórumok igen eltérő módon kezelik az ítélkezés során felmerülő természettudományos érveket, és a bizonytalan, valószínűségi kijelentéseket tartalmazó tudományos bizonyítékokat. Némelyikük a szakértelmük hiányára hivatkozással nem vállalkoznak arra, hogy a technikai aspektusokat jogi szempontból értelmezzék, mások viszont innovatív módszereket alkalmazva igyekeznek a jogvita természettudományos dimenzióira is reflektálni.

A természettudomány szinte megkerülhetetlen a környezeti tárgyú jogvitákban, hiszen azoknak tényleg a hátterét, így integráns részét képezi. Különösen jól látható ez azokban a jogvitákban, amelyek tárgya a természeti erőforrások használata, illetve megosztása, a környezeti kárhozásért való felelősség, a környezeti kockázatbecslési eljárások jogszerűsége, az egészséges környezethez fűződő emberi jogi garanciák megsértése, valamint egy adott állam szabályozási jogosultságának terjedelme a területén a nemzetközi kereskedelem, illetve külföldi befektetések folytán fellépő környezeti kockázatok felett. Az előzőek fényében intuitive azt hihetnénk, hogy a természettudományos érvek döntő szerepet játszanak e jogvitákban.

Azonban az ítélkezési gyakorlatot alaposabban megvizsgálva látható, hogy a természettudományos érveket a bíróságok sokszor igyekeznek leválasztani az ügy jogi lényegéről. Amikor mégis a jogvita érdemi részévé teszik a természettudományos érveket, illetve tényeket, akkor igen sokféle módszerrel igyekeznek megindokolni a versengő, természettudományos érvekkel alátámasztott pozíciók közötti bírói választást.

A természettudománynak az ítélkezésben betöltött szerepe azért is érdemel különös figyelmet, mert a természettudományos érvek az ítélkezési folyamatban
stratégiai jelentőséggel bírnak, amely következésképp megkülönbözteti ezeket az ítélekezés során hivatkozott egyéb jogi, illetve policy érvektől. Fontosságuk abban rejlik, hogy képesek objektívnek tűnő, jogon túli kognitív meggyőző erővel felruházni a félek érvelését. Ugyanakkor a bírák nem rendelkeznek megfelelő természettudományos ismeretekkel ezen érvek elbírálásához. Cancado Trindade bíró mutatott rá találóan a természettudomány ambivalens hatására az ítélkezés dinamikájában: “az ellentmondó bizonyítékok a félek és ügyvédeik számára a mennyországot jelentik, a nemzeti és nemzetközi bíróságok számára azonban, nagyon úgy tűnik, hogy magát a purgatóriumot.”

Ugyanakkor, ha megfelelően kezelik, a természettudomány a bírói döntéshozók fontos szövetségesévé is válhat, hiszen jelentős mértékben fokozhatja a bírói érvelés meggyőző erejét. Egy ítélet meggyőző ereje döntő részben a bírói okfejtés eredménye, ezért jelen joggyakorlat-elemzés a bírói érvelési technikákat fogja vizsgálni a természettudományi aspektussal rendelkező jogvitákban abból a célból, hogy feltárja a természettudomány és a bírói döntés meggyőző ereje közötti kapcsolatot.

A természettudományos érvek stratégiai fontossága fényében meglepően kevés azoknak a tanulmányoknak a száma, amelyek a természettudományos érveknek a bírói ítélekezésben betöltött szerepét átfogóan vizsgálták volna. Korábbi munkák csak a szakértői bizonyításra, vagy a tágabb értelemben vett tudományos tényfeltárásra fókuszáltak, illetve néhány bírói fórum természettudománnyal való kapcsolatát vizsgálták. Eddig csak két tanulmány vállalkozott több fórum gyakorlatának elemzésére e tekintetben. A disszertáció ezért az összes, környezeti jogviták szempontjából releváns bírói fórum gyakorlatának elemzését tűzte ki célul annak érdekében, hogy a természettudománnyal való bírói interakció módszereiről és nemzetközi trendjeiről átfogó képet nyújtsan. A vizsgálat középpontjában azok a bírói módszerek állnak, amelyek segítségével a természettudományos érveket és

2121 Payne, ‘Mastering the evidence’.
2122 Lévesque, ‘Science in the Hands of International Investment Tribunals: a Case for ‘Scientific Due Process’’.
bizonyítékokat a jogi elemzés részévé lehet tenni, és amelyek segítségével ezért a természettudományos érvekre is refelektáló, meggyőző és legitim bírói érvelés építhető.

II. A kutatás módszertana

A disszertáció a nemzetközi bíróságok és vitarendezési fórumok ítélkezési gyakorlatában vizsgálja a természettudományos érvek és bizonyítékok kezelésének, értelmezésének módszereit. Az elemzés középpontjában a bírói érvelés módszertana áll: annak lehetőségeit vizsgálja, hogy miként lehet egy természettudományos aspektusokkal rendelkező jogvitában a bírói okfejtés meggyőző, ezért legitim.

I. A kutatás tárgya: nemzetközi környezeti jogviták

A disszertáció a környezeti jogvitákat tágan értelmezi, Jorge E. Vinuales definíciójából kiindulva. E szerint környezeti jogvitának tekintünk minden olyan peres eljárást, amely környezeti elemet tartalmaz. Ilyen értelmében nemesak az minősül környezeti elemnek, amikor a felek egy környezeti kötelezettség teljesítését vitatják, hanem az is, amelyben jogilag releváns körülmény a környezet védelme, illetve használata, a környezeti kockázatok felmérése, illetve ahol az egyik fél állítólagos jogainak gyakorlása veszélyezteti vagy károsíta a természeti környezetet.

Tág értelemben vett környezeti jogvitát egyre több bírói fórum tárgyal, így egyre sokszínűbb kontextusban merül fel a természettudományos érvek és bizonyítékok bírói értelmezésének szükségessége. A közelmúltban a környezetvédelmi megfontolások jelentős mértékben “beszivárogtak” a nemzetközi jog specializált területeire, úgy mint a kereskedelmi jog, az emberi jogok, vagy a befektetésvédelem területeire. Önállósult környezetvédelmi bíróság hiányában e rezsimnek specializált bíróságai “kölcsönzött főrumként” szolgálnak a környezeti jogviták elbírálására, következésképp ezek gyakorlata képezi a kutatás tárgyát. Ilyen módon a disszertáció elemzi a Nemzetközi Bíróság (3. fejezet), a Nemzetközi Állandó Választottbíróság és ad hoc államközi választottbíróságok (4. fejezet), a regionális


emberi jogi bíróságok releváns gyakorlatát a környezetszennyezéssel okozott emberi jogi jogszerelemek tekintetében, így az Európai Emberi Jogí Bíróság (EJEB), az Amerika-közi Emberi Jogí Bíróság (AEJB), az Afrikai Emberi és Népek Jogainak Bírósága (AfENJB), valamint az ECOWAS Bíróságának ítéleteit (5. fejezet), valamint az Európai Unió Bírósága (6. fejezet), a WTO vitarendezési eljárása (7. fejezet), a befektetésvédelmi ad hoc választottbíróságok (8. fejezet), és az ENSZ Tengerjogi Törvényszékének (ITLOS) (9. fejezet) ítélekezi gyakorlatát.

A disszertáció kitér néhány nem nemzetközi, illetve nem szigorú értelemben vett bíróság döntéseire is, amennyiben azok innovatív megoldásai ítélekezi “jó gyakorlatként” szolgálhatnak a természettudománnyal való bírói interakció tekintetében. Ezért vizsgáloam az ENSZ Követelések Bizottsága (UNCC) döntéseit, amely az Öböl-háború utáni környezeti kárigényeket bíralta el, a Marshall-szigeteki Nukleáris Követelések Törvényszéke gyakorlatát, a tagállami bírósági gyakorlat közül a klimaváltozással kapcsolatos jogvitákat (climate change litigation) és az Egyesült Államok bíróságainak a környezetszennyezéssel okozott egészségkárosodásért való kárfelelősségre (toxic tort) vonatkozó joggyakorlatát.

2. Az összehasonlító elemzés fókusz: a természettudománnyal való bírói interakció

A természettudományos érvek megjelenése számos módon befolyásolja az az ítélekezés dinamikáját és menetét: szükségessé teszi szakértői bizonyítás igénybe vételét, a természettudományos bizonyítékok relevánsá válának az ok-okozati viszonyok feltérképezésében, illetve a tudományos érvek vizsgálatahoz bizonyítási mércét (standard of review) kell választani annak érdekében, hogy a bíróság el tudja dönteni, melyik természettudományos hivatkozást, érvet illetve bizonyítéket fogadja el a jogvita szempontjából érvényesnek.
A disszertáció a “természettudománnyal való bírói interakció” kifejezést azon folyamatok és bírói megoldások gyűjtőfogalmaként használja, amelyekkel a bírói döntéshozók a természettudományos érvek megjelenésére reagálnak. A kutatás a bírákra mint az ítélekezés és jogi mérlegelés autonómiájának örőjéként (gatekeepers) tekint. Ennek értelmében a bírák a természettudománnyal való interakciójuk révén végső soron azt határozzák meg, hogy a természettudomány milyen mértékben hatolhat be egy jogvitá jogilag releváns aspektusai közé. Az interakció az ítélekezés különféle szakaszai közötti elérő bírói eszközöket igényel. E bírói megoldások egyrészt meghatározzák a természettudomány “megengedett” mértékét, valamint lehetővé teszik, hogy a jogilag relevánsnak tekintett természettudományos aspektusokat a bírák feltárják és a jogi kérdés szempontjából értelmezzék.

Annak érdekében, hogy az interakció absztrakt fogalmát egy pontos összehasonlító vizsgálat tárgyavá tehesse, a disszertáció a természettudománnyal való bírói interakcióért az ítélekezés folyamatának négy szakaszában vizsgálja:

(ix) A jogvita jogilag releváns szempontjainak körülhatárolása (framing): ennek során egy bírói fórum eldönti, hogy milyen mértékben tekinti jogilag relevánsnak a környezeti jogvita természettudományos hátterét, alapjait. Ez stratégiai jelentőségű döntés, mivel a jogilag relevánsnak tekintett természettudományos kérdések megköthetik a bírák kezét a végső jogi döntés tekintetében. Ugyanakkor a természettudomány bevonása az ítélekezésbe előnyökkel is járhat: kognitív meggyőző erejével például semlegesítheti a felek konfliktusát, illetve autoritása segíti a felek jogvitájának eldöntését.

(x) A szakértői bizonyítás (scientific fact-finding): e tekintetben azt vizsgálat, hogy a bíróságok milyen kérdéseket tekintenek szakkérdéseknak, illetve kitérek a különféle eljárásokra, amelyekben szakértői közreműködés igénybe vehető.

(xi) Ok-okozatisság vizsgálata: ebben a szakaszban azt vizsgálat, hogy a környezeti károk okozati kapcsolatainak feltárása során a bíróságok mennyiben hajlandóak az ok-okozati kapcsolat megállapítása során természettudományos bizonyítékokra támaszkodni, vagy inkább alapvetően nem természettudományos eszközökkel döntenek egy okozati kapcsolat meglétéről illetve hiányáról; valamint megvizsgálom, hogy ennek során az okozatisság bizonyítékául mennyiben fogadják el a a valószínűségi természettudományos bizonyítékokat.
A bírói vizsgálati mércéje és terjedelme ("extent and standard of judicial review"): e szakasz tekintetében azt vizsgálom, hogy a bírói fórumok milyen mértékben és milyen módszerekkel hajlandóak (felül)vizsgálni a felek által képviselt természettudományos állításokat. Az első kapcsolódó kérdés a vizsgálat szigorúsága ("deference", “margin of appreciation"), tehát hogy mekkora mozgástekert ad a bíróság a szuverén állam számára a természettudományos álláspontjának kialakítása terén. E tekintetben a két szélsőérték az automatikus jóváhagyás, és a de novo, azaz teljes felülvizsgálat. Továbbá vizsgálom, hogy a bírói fórumok milyen konkrét szempontok alapján, milyen teszek segítségével döntenek a természettudományos álláspont jogi szempontból való megfeleléséről.

E vizsgálati keret szempontjából hangsúlyozandó, hogy a fenti négy itélkezési szakasz több esetben nem válik el élesen egymástól, illetve egy adott bírói technika több szakaszhoz is besorolható lehet. Ennek ellenére a szakaszok analitikus elkülönítése szükséges annak érdekében, hogy az összehasonlító elemzést minél pontosabban lehessen elvégezni.

A kutatás módszertana összehasonlító joggyakorlat elemzés, amelynek főkuszában a bírói érveléstechnika áll. Az analitikus fejezetek mindegyike (3-9 fejezetek) egy-egy nemzetközi bírói fórum természettudománnyal való interakcióját a fenti négy szakasz tükrében vizsgálja. A 10. fejezet összehasonlítja az egyes fórumok gyakorlatában azonosított eszközöket, és a bírói interakció nagyobb trendjeit elemzi.

Az összehasonlítás arra fókuszál, hogy hogyan indokolják meg a bíróságok a versengő természettudományos érve közötti választást. A 11. fejezet csoportosítja a választás alapjául szolgáló szempontokat, teszteket, majd néhány végkövetkeztetést von le azok alapján a meggyőző és legitim bírói érvelés lehetséges módszereire nézve.

3. A kutatás interdiszciplináris jellege

A kutatás jelentős mértékben interdiszciplináris jellegű. Részben természettudományos szakirodalomra támaszkodik, amely sokat foglalkozik a tudományos bizonytalanság jelenségével, amely a jelen kutatásnak is egyik központi fogalma. Másrészt tudományfilozófiai szempontokra is épít a kutatás, különösen
annak “Science and Technology Studies” (“STS”) területére. Az STS irodalom a
tekintély, a legitimítás, és meggyőző erő kérdéseivel foglalkozik a
természettudományos kutatás, a társadalom egyéb alrendszerei, a jog tekintetében,
valamint ezen alrendszerek kölcsönhatásában is. Az STS irodalom megállapításai
annak jobb megértését segítenek, hogy miként lehet gördülékenyebben ténni a társadalom
valamint e két nagy autoritásának, a jog és a természettudomány együttműködését. E
megfontolások különösen relevánsak a természettudományos érvek bírói
felülvizsgálatának kívánatos módszere és terjedelmé tekintetében.

4. A természettudomány és a bírói érvelés legitimítása

A kutatás a természettudománnyal való bírói interakciót az ítélet
legitimációjának szempontjából vizsgálja. Közelebbről meghatározva, a kutatás célja
annak megértése, hogy a természettudomány bírói kezelése hogyan hat vissza a bírói
érvvelés és döntés meggyőző erejére. Több szerző foglalkozott már egy-egy bírói
fórum legitimációjának kérdésével, illetve a nemzetközi bíróságok legitimációjával
általánosságban.2126 Azonban e munkák nem érintették azt a kérdést, hogy a
természettudomány, mint egy a jogtól független, azzal egyenértékű kognitív autoritás
jelenléte miként hat a bírói döntések legitimítására. A természettudományos érvek
vajon hírőltatják a környezeti jogviták hatékony bírói döntését? Vagy hasznos
eszközök, esetleg szükséges kellékek a bírói döntéshozatal során? A
természettudományos legitimítás a jogi legitimítás előfeltétele lenne? Vagy a jogi
legitimítás a természettudományos tényektől függetlenül létező, illetve elérhető
categória? A disszertáció ezekre az eddig mellőzött kérdésekre kíván választ adni.

A disszertáció számos indokot azonosít, amely azt támasztja alá, hogy a
természettudomány integrációja, illetve megfelelő bírói kezelése alapvető fontosságú
a természettudományos aspektussal bíró jogviták legitim eldöntéséhez. A disszertáció
amellett érvel, hogy a természettudomány kognitív erejének hasznosítása érdekében a
bírák itélkezésük során nem mellőzhetik teljes mértékben a természettudományos
aspektusokat. A zsinórmérték e tekintetben nem az, hogy több természettudomány
bírói “használat” szükségképpen jobb (legitimebb) döntéseket eredményez. Sokkal

‘Legitimacy and International Adjudicative Bodies’.
inkább az a döntő mozzanat, hogy a bírák *hogyan viszonyulnak, hogyan értelmezik* a természettudományos érveket, és hogyan építik be azokat a jogi okfejtésbe.

Egy bírói döntés legitimítása sokféle szempontból értékelhető, amelyek közül a jelen kutatás az episztemológiai (gnoszológiai) önkényesség kiküszöbölését veszi alapul. Ez azt az ismeretelméleti elvárást fogalmazza meg, hogy egy ismerethalmaz kijelentéseinek érvényességét ne ítéljék meg tőle idegen, azaz másik ismerethalmaz szabályrendszeré szerint. Ilyen értelemben ahhoz, hogy a jogi döntőshozók legitim érvelést nyújtsanak, a természettudományos érveket nem ítélné meg pusztán a jogi logika szabályai szerint, hanem bizonyos mértékig meg kell érteniük a természettudomány módszertanát és kijelentéseit is annak érdekében, hogy a jelentős természettudományos aspektussal rendelkező jogvitában legitim döntést hozhassanak.

**III. Főbb kutatási megállapítások és alkalmazhatósági lehetőségeik**

A disszertáció három fő szerkezeti egységre tagolódik. Az első rész (2. fejezet) a természettudomány bírói jogalkalmazásban való felhasználásának elméleti és dogmatikai nehézségeit mutatja be. Ez a fejezet nyújtja a disszertáció vizsgálatának elméleti megalapozását, valamint bemutatja a vizsgálat módszertanát. A második szerkezeti egység (3-9. fejezet) az egyes nemzetközi bírói fórumok gyakorlatát vizsgálja, az ítélezési folyamat négy relevánsnak tekintett szakasza tükrében. A harmadik szerkezeti egységben (10-11. fejezet) található a disszertáció összehasonlító elemzése a természettudománnyal való interakció jogi módszerei tekintetében. Ez a szerkezeti egység azonosítja és tipizálja a jogi érvelés alapjául szolgáló különféle teszteket, amelyekre meggyőző és legitim bírói érvelés alapítható.

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2127 Grossman, ‘Legitimacy and International Adjudicative Bodies’.
1. Megállapítások a természettudomány jogi kontextusban való alkalmazásának kihívásairól (23 – 71. oldalak)

A kutatás kiindulópontja az a megállapítás, hogy a környezeti jogvitákban a bírói fórumok szükségképpen a természettudomány „aktiv kölcsönzőivé”, 2131 használóiivá kell váljanak. A 2. fejezet feltárja azokat a tényezőket, amelyek miatt a természettudományos eredmények nehezen értékelhetők a bírói döntéshozatalban. A disszertáció arra a megállapításra jut, hogy a természettudomány és a jogtudomány között számos strukturális különbség feszül, így különböző módon definiálnak olyan alapvető fogalmakat, mint ok, okozatiság, és meggyőző bizonyíték. A természettudomány és a jog különbözik a bizonytalanság iránti toleranciájában is. Amíg a jogi döntéshozók objektíve igazolható tényeket keresnek, amelyek alapján megbizonyosodhatnak a tényállás elemeiről, addig a természettudósok valószínűségi kijelentéseikben fogalmazzák meg kutatási eredményeiket, és elfogadják, hogy érvényes és meggyőző kutatási eredményeik ilyen értelemben mindig bizonytalansággal terheltek. E fejezet számba veszi a tudományos bizonytalanságnak nevezett jelenség okait, és rámutat arra, hogy a bizonytalanság heterogén kategória, amely a természettudományos kutatás folyamatából, illetve a természet tényeiből inherensen módon fakad, és amelyet ezért teljes mértékben sosem lehet kiküszöbölni a természettudományos eredményekből, még a tudományos kutatás folyamatos fejlődése ellenére sem.

A fejezet számba veszi a természettudományos eredmények bírói felhasználásának ismeretelméleti nehézségeit is, valamint a bírák és a szakértők közötti munkamegosztást övező elméleti vitákat, így különösen a döntéshozói hatalom nem szándéktolt átruházásának, szakértőkre való delegálásának veszélyeit. A fejezet összegzi a természettudomány bírói kezelésével kapcsolatos alapvető jogintézményeket valamint a szakirodalmi kritikákat, amelyekhez a disszertáció hozzá kíván járulni az összehasonlító elemzéssel. A fejezet végül bemutatja a disszertáció vizsgálati keretének főbb elemeit.

2. A Nemzetközi Bíróság gyakorlatával kapcsolatos megállapítások (3. fejezet: 72 – 126. oldalak)

A Nemzetközi Bíróság (NB) tekintetében a 3. fejezet egy evolúciós folyamatot azonosít. Ennek elején a természettudományos aspektusok teljes negligálása áll, amelyet elnagyló és pontatlan bírói értékelés vált fel, majd a közelmúltban egyre növekvő hajlandóság tapasztalható az NB részéről a tekintetben, hogy a természettudományos aspektusokat érdemben feltárja.

Ad (i) A jogilag releváns aspektusok lehatárolása:

A Nemzetközi Bíróság kezdetben hajlamos volt a jogviták természettudományos vizsgálatot igénylő aspektusainak negligálására, így az ilyen jellegű vitás kérdéseket a felek tárgyalásaira utalta vissza. Ezt tükrözi a Bőş-Nagymaros-ügy is, ahol az NB szándékosan nem értékelte a felek által benyújtott hosszas szakvéleményeket, hanem a felek tárgyalását rendelte el az alapvetően természettudományos jellegű vízmegosztás kérdésében. Egy másik releváns tendencia az eljárási jellegű kötelezettségek előnyben részesítése a szubsztantív kötelezettségekkel szemben. Ennek egyik bizonyítéka, hogy a környezeti károkozástól való tartózkodás kötelezettségét még sosem állapította meg az NB a számos vonatkozó kereseti kérelmé ellenére, így a környezeti jogviták rendelte eljárási jellegű jogsértésekkel végződnek. Hasonlóképpen, az NB mindeddig tartózkodott attól, hogy a környezeti hatásvizsgálati kötelezettség tekintetében természettudományos minimumkövetelményt határozzon meg.

Ad (ii) Szakértői bizonyítási eljárás

A Nemzetközi Bíróság jogi és szakértői eljárása jelentős fejlődésen ment keresztül. A Papírmalmok-ügyben a felek a természettudósokat jogi képviselőként vették igénybe, amelyet az NB kevésbé talált optimális megoldásnak ahhoz képest, mintha szakértő tanúként álltak volna a bíróság rendelkezésére. Vélhetően a Bálnavadászati-ügyben volt az NB szakértői bizonyítási eljárása a leghatékonyabb. Ebben az ügyben a tudósokat szakértőként hallgatta meg, akiknek a fórum történetében először a bírák és a másik peres fél is kérdéseket tett fel (cross-examination). Környezeti ügyekben az NB sosem élt még azzal az eljárási lehetőségével, hogy független szakértőt rendeljen ki. Ezzel szemben az NB inkább ún. “fantom szakértőkkel” konzultál, akik
lényegében a titkárság személyi állományába ideiglenesen felvett munkatársak. E
személyek egy adott jogvita természettudományos kérdéseiben adnak tanácsot a
bíráknak, miközben személyük és véleményük nem ismert a felek előtt.

A szakértői bizonyítékok értékének mélysége és komplexitása jelentősen
fejlődött az évek során. A Bős-ítéletben az NB egyáltalán nem értékelte a benyújtott
bizonyítékokat. Később, a Papiralmok-ügyben bár elviekben figyelembe vette
azokat, ám az összes szakértői bizonyítékot lényegileg egy mondatos indokolással
utasította el. A felek több alkalommal nyújtottak már be valószínűségekkel terhelt
tudományos szakvéleményeket, azokat azonban az NB mindig elutasította. Ez
összességében azt sejteti, hogy az NB valójában magas bizonyítási mércét alkalmaz,
holott elvi síkon azt hangoztatja, hogy az alacsonyabb “inkább valószínű, mint nem”
standardot alkalmazza. Amikor az NB a legutóbbi, Bizonyos tevékenységek-ügy
(Costa Rica v. Nicaragua) kárterítési ítéletében elfogadott természettudományos
bizonyítékokat, saját bevallása szerinti is “átfogó módon” értékelte őket, miközben az
ítélet csupán meglehetősen homályos indokolást tartalmazott az egyes bizonyítékok
vonatkozásában.

Ad (iii) Az okozatság vizsgálata

A fejezet azonosítja, hogy a környezeti károkért való felelősség tekintetében
az ok-okozati kapcsolatok három elkülönült szinten is relevánsak. A tudományos
bizonytalanság mindhárom okozati kapcsolat tekintetében sajátos problémákat okoz.
Az NB okozatviszony vizsgálata tekintetében elmondható, hogy a bíróság elutasító a
bizonytalansággal terhelt szakértői bizonyítékokkal kapcsolatban, és azokat eddig
sosem fogadta el okozati összfüggés bizonyítékaként.

Ad (iv) A bírói vizsgálat mércéje és terjedelme

A vizsgálati mérc kifejezést az NB első alkalommal a Bálnavadászati-ügyben
alkalmazta, amikor azt kellett eldönteni, hogy Japán bálnavadászati programja
“tudományos célal folytatott” programnak minősül-e. Az NB mércéje szerint ennek
során azt kellett vizsgálnia, hogy a “program terve és annak megvalósítása észszerű-e
a programban kitűzött kutatási célok fényében”.2132 Bár sokan kritizálták a bíróságot,
amiért az ítéletében nem definiálta a “tudományos kutatás” fogalmát, a disszertáció

amellett érvel, hogy az STS irodalom fényében ez helyes és szükséges döntés volt. Továbbá rámutat arra, hogy az észszerűségi teszt igen ambiciózus jogi mérze, amely szigorú felülvizsgálatot tett lehetővé. Ennek eredményeképpen Japán nem tudott érvényesen “tudományos kutatásra” hivatkozni az NB előtt.

A disszertáció az NB érveléséből egy szemantikai elemzésnek elnevezett technikát azonosított. Ennek lényege, hogy a “tudományos kutatás céljából” folytatott bálnavadászat jogi fogalmának elemzésekor az NB alapvetően a “céljából” fordulat értelmezéséből indult ki, abból olvasztotta ki az észszerűségi tesztet. Ennek során a bíróság a természettudományos műsző szemantikai környezetének nyelvtani és logikai értelmezésre támaszkodott, amely révén meggyőző és legitim módon jutott arra az eredményre, hogy Japán programja nem minősült “tudományos célú” bálnavadáshatnak.

3. Megállapítások az államközi választottbíráskodás környezeti gyakorlatáról
(4. fejezet: 127 – 156. oldalak)

A választottbíráskodás változatos képet mutat a természettudomány kezelése tekintetében. A disszertáció a Nemzetközi Állandó Választottbíróság gyakorlatát, valamint az ad hoc választottbírósági eljárásokat elemzi.

Ad (i) Jogilag releváns aspektusok elhatárolása

Néhány eljárásban a természettudományos érvek döntő jelentőségűek voltak. Így a Lanoux-tó-ügyében eljáró panel kifejezetten megemlítette, hogy a tudományos-technikai érvek jobb kifejtése esetén Spanyolország feltehetően nem veszttette volna el a pert. Ugyanakkor a MOX–érőmű-ügyében a választottbíróság nem érintette a felek által benyújtott számos természettudományos bizonyítékokat, és az alapul fekvő jogvitát olyan jogi szempontok mentén döntötte el, amelyeket a felek nem is érintettek beadványukban.

Az Iron Rhine-ügyben eljáró testület szintén marginalizálta a természettudományos aspektusokat, amikor nem vette igénybe a Hollandia által felajánlott szakértőt annak eldöntésére, hogy egy védett természeti területen áthaladó vasútvonal engedélyezésével milyen mértékű zajvédelmi kötelezettségeket róhat Hollandia Belgiumra. Ezáltal a kérdést pusztán jogi szempontok szerint eldönthetőnek találta, és így eliminálta a kérdés természettudományos vonatkozásait.
Ad (ii) Szakértői bizonyítás

Az 1941-ben eldöntött Trail Smelter-ügyben zajlott az egyik legkomolyabb szakértői bizonyítás, amelynek során a bíróság már-már az alapul fekvő tudományos vitákban is állást foglalt. Hasonlóan alapos tényfeltárásra csak a közelmúltban, a Kishenganga-ügyben került sor, ahol a panel természettudományos modellek segítségével meg tudta határozni a környezetvédelmi célokóból szükséges minimális vízhozam mértékét. A Kishenganga-ügyben a bírói panel egyik tagja szakértői bíró volt. A Dél-kínai tenger-ügyében került először sor független szakértő kirendelésére, amely mindeddig egyedülálló bizonyítási eszköznek számít az államközi választottbírósági gyakorlatban.

Ad (iii) Okozatiság vizsgálata

A választottbíróságok rendszerint nem elemzik részletesen az okozatisági követelményeket, teszteket. A MOX-erőmű-ügyében például a szennyezés és az erőmű közötti okozati kapcsolatot különösebb indokolás, így a vonatkozó követelmények meghatározása nélkül utasította el a testület. Amikor kivételes jelleggel egy állam magatartása és a környezeti kár közötti ok-okozati kapcsolat megállapításra került, mint az történt eddig egyedül a Dél-kínai tenger-ügyében, az a disszertáció feltételezése szerint a kiugróan súlyos környezetpusztításra vezethető vissza alapvetően, így a kauzalitási követelményekkel a testület nem foglalkozott közelebbről.

4. A regionális emberi jogi bíróságok gyakorlatára vonatkozó megállapítások
(5. fejezet: 157 – 199. oldalak)

A fejezet az európai, az amerika-közi és az afrikai regionális rendszereket vizsgálja. A releváns fórumok gyakorlatából azokat az ügyeket hasonlítja össze, amelyeknél a környezetszennyezéssel okozott egészségkárosodások emberi jogi jogszerelemre vezethetnek. A vizsgálat középpontjában az ok-okozati kapcsolat megállapítására alkalmazott eszközök, valamint a szakértői bizonyítás módja áll.
Ad (i) Okozatiság vizsgálata

A fejezet bemutatja, hogy az EJEB az egészségkárosodás és a környezetszennyezés közötti ok-okozati összefüggés vizsgálata során a természettudományos bizonyítékok helyett olyan proxykat használ, amelyek csak közvetetten képesek megbecsülni egy szennyezés veszélyességét, és oksági szerepét a magánszféra megsértésében. E proxy-alapú vizsgálattal az EJEB hatékonyan megkerüli az egészségkárosodás valós okairól a kérelmező által benyújtott természettudományos bizonyítékok értékelését. E proxyk, mint például a szennyező és a kérelmező lakohely közötti távolság, azonban sokszor ellentmondanak a szennyező anyagok toxicitásáról és terjedőképességéről elérhető természettudományos ismereteknek. E proxyk bizonyos oksági szereppel bíró szennyezéseket nem azonosítanak, másokat pedig oknak tekinthetnek attól függetlenül, hogy valójában nem feltétlenül volt szerepük az egészségkárosodás előidézésében. Az EJEB az ilyen ügyek többségében nem állapította meg az okozati kapcsolat fennállását, és a kérelmezőket elutasította.

Az EJEB egy alkalommal alkalmazott olyan érvelési technikát, amellyel segítette a környezetszennyezéssel fennálló okozati kapcsolat bizonyítását természettudományos bizonyítékok bizonytalansága ellenére. A Fadeyeva-ügyben egy kauzalitási vélelmet állított fel az olyan szennyezések esetén, amelyek a belső jogban irányadó határértékeket jelentősen meghaladják. Ugyanakkor a vélelem alkalmazása kivételes esetekre szorítokiz, ezért az EJEB gyakorlatát alapvetően a természettudomány megkerülése jellemzi.

Az AEJB esetén a közelmúltbeli Tanácsadó Véleményt elemzi a disszertáció, amely egy új, kauzalitás alapú extraterritoriális joghatósági alapot állapít meg határokon átterjedő környezeti károkozás esetén. Az afrikai rendszerből pedig a SERAP és az Ogiek-ügyeket elemzi a disszertáció.

Ad (ii) Szakértői bizonyítás

Az EJEB bizonyítási mércéje magas annak ellenére, hogy a bíróság hangsúlyozta, hogy flexibilis mércét fog alkalmazni. Mégis, valószínűségi kijelentéseket tartalmazó szakvéleményeket szinte még sosem fogadott el az EJEB. Az Amerika-közi rendszerben a természettudományos aspektusokkal terhelt, környezetszennyezéssel kapcsolatos ügyek még a Bizottság előtt, a befogadhatóság vizsgálatának szakaszában vannak. Azok többségét a Bizottság elfogadhatónak
nyilvánította, így azok később az AEJB elé is kerülhetnek. Az afrikai bíróságok elemzésük során széles körben támaszkodnak a felek szakértőire, ám eddig még természettudományos szakértő meghallgatására nem került sor az ügyek természetéből fakadóan.

5. Az Európai Unió Bíróságának gyakorlatára vonatkozó megállapítások (6. fejezet: 200 – 238. oldalak)

A disszertáció hét olyan eljárástípust azonosít, amelyekben természettudományos érvek jogi relevanciát nyernek az EU Bírósága előtt. Ezeket két csoportra osztja a természettudománnyal való bírói interakció alapján. Az első csoportot a környezeti, illetve egészségügyi kockázatelemzések jogszerűségi felülvizsgálata képezi. Ezekben az esetekben a természettudományos érvek annak vizsgálata során válannak relevánsa, hogy a tagállamok, illetve az EU intézményei a környezeti kockázatokra hivatkozással hozott jogalkotói döntések során a mérlegelési szabadságuk keretei között maradtak-e.

Az eljárások második csoportjában a természettudomány a tagállami implementáció megfelelőségének mércéjéül szolgál. A természettudományos bizonyítékok a Bizottság számára ezen esetcsoportban a tagállami intézkedések hatékonytalanságát jelezhetik, és így az adott tagállam kötelezettségszegését támaszthatják alá.

Ad (i) Vizsgálati mérce a kockázatelemzések bírói felülvizsgálata során

Kezdetben az EU Bíróságok “udvarias” (deferential) felülvizsgálatra szorítóztak, amely során a tagállamoknak és az uniós intézményeknek tág mérlegelési szabadságot biztosítottak a természettudományos alapokon nyugvó döntések meghozatalában. A paradigmaváltás a Pfizer és az APharma ügyekkel jött el, ahol a bíróság tüzetesen megvizsgálta a Bizottság természettudományon alapuló érvelését, és nem adott annak automatikusan helyt. Azóta a Bíróság több mérccét is kidolgozott amelyből a disszertáció négyet azonosít. Közülük a legfontosabb az ún. konzisztencia vizsgálat, amely fényében az EU Bíróság vizsgálja, hogy a szabályozási döntésnél alapul vett tudományos szakvélemény végkövetkeztetése konzisztens-e az alapul fekvő tudományos bizonyítékokkal. A disszertáció amellett érvel, hogy ez a bírói felülvizsgálati mérce egy “hibrid” teszt, amely segítségével a bíróság alapvetően
jogi érvelést nyújthat a szakvélemény konzisztenciája tekintetében, de eközben reflektálnia kell a szakértői vélemény természettudományos megállapításaira is, ezáltal jelentősen tágítva a bírói felülvizsgálat korábban szokásos terjedelmét.

*Ad (ii) Szakértői bizonyítás*

Az EU Bírósága nem él szakértő kirendelésére lehetőséget adó jogkörével. Azonban a tagállami hatóságok számára bizonyos EU irányelvek értelmezése kapcsán előzetes döntéshozatali eljárások során jóváhagyta innovatív, okozatsági bizonyítást módszerek alkalmazását. Ezek révén a tagállami hatóságok tudományos bizonyosság hiányában is megállapíthatnak okozati kapcsolatokat mind környezetszennyezésért való felelösség, mind hibás oltóanyag okozta egészségkárosodás esetén.

*Ad (iii) Okozati vizsgálat*

Az EU Bíróság nem engedte meg a tagállamok számára, hogy az okozati kapcsolat bizonytalanságára elkerüljék a bizonyos környezetszennyezéssel szembeni fellépést egyes EU irányelvek átültetése során. Tehát attól függetlenül, hogy egy bizonyos tevékenység csak hozzájárul, de nem egyedüli oka egy káros környezeti folyamatnak, az adott tevékenységet a tagállamoknak szabályozniuk kell. Tehát az ok-okozati kapcsolat bizonytalanságát a Bíróság nem tekinti megfelelő oknak a szabályozói tétlenségre vagy a bírói felülvizsgálat alóli mentességre.


Ad (i) Szakértői bizonyítás

A WTO panelek bonyolult szakértői konzultációs eljárást folytatnak le. Az SPS Egyezmény alatt a szakértők igénybevétele kötelező, a panelek a felek véleményének kikérése után rendelik ki a szakértőket. Továbbá bármely nemzetközi szakértői intézmény véleményét is kikérhetik illetve széleskörben hivatkoznak nemzetközi szervezetek által kibocsátott iránymutatásokra, standardokra is annak érdekében, hogy természettudományos tényekre vonatkozó megállapításaikat alátámaszák.

Ad (ii) A vizsgálati mérce és annak terjedelme

A WTO joggyakorlat egyik sokat vitatott kérdése, hogy a WTO vitarendezési panelek vajon kellően enyhe (“udvarias”) módon vizsgálják-e felül a tagállamok természettudományos érveit. Kezdetben a WTO panelek szigorú (“intrusive”) módon vizsgálták felül, hogy egy tagállam SPS-intézkedése valóban természettudományos kockázatelemzésen alapult-e. Később ez a felülvizsgálat ahhoz vezetett, hogy a panelek már azt is vizsgálták, hogy mi lett volna a leghelyesebb intézkedés a természettudományos bizonyítékok tükrében. Ezen a ponton a Fellebbviteli Tanács közbelépett és egy megengedőbb felülvizsgálati mérctype tett kötelezővé a panelek számára. Eszerint a vizsgálati mérce kéttélepős, amelynek első lépcsője megengedő, a második lépcsője viszont továbbra is egy szigorú, “koherencia” vizsgálatot tesz kötelezővé. E szerint a paneleknek a kockázatelemző indokolásának koherenciáját is vizsgálniuk kell a jogszerűség értékelésekor. Ez a koherencia vizsgálat az elemzésem szerint egy “hibrid” bírói felülvizsgálatot valósít meg, amely érdemi interakciót kíván meg az alapul fekvő természettudományos érvekkel.

7. A befektetésvédelmi választobbíróságok gyakorlatával kapcsolatos megállapítások (8. fejezet: 278 – 300. oldalak)

A fejezet először öt olyan “belépési pontot” azonosít az államok és befektetők közötti (ISDS) jogvitákban, ahol a természettudományos érvek jogi relevanciával bírnak. A szakértői bizonyítási eljárások nem egységesek, némely választobbíróság nem képes kritikusan elemezni a felek túlzottan pártos és elfogult szakértőit, míg mások élnek azzal az eljárási lehetőséggel, hogy független szakértőt rendeljenek ki. Némely választobbíróság hajlandó a bonyolult okságú folyamatokra tekintettel a
kauzalitási követelményeket fellazítani annak érdekében, hogy a természettudományos valósághoz jobban közelítsse a környezeti károk okozati követelményeit. Az ISDS panelek alapvetően nem alkalmaznak szigorú mércéket az államok környezeti kockázatbecsléseinek felülvizsgálatára. A vizsgálat módszertanát tekintve a disszertáció két bírói érvelési típust azonosít. A panelek egyik része eljárási jellegű tesztekre támaszkodva azt vizsgálja, hogy a természettudományos kockázatok vizsgálatának folyamata kellően transzparens volt-e, és biztosították-e a részvételi, észrevételezési lehetőséget minden érintett számára (due process jellegű vizsgálat). Tehát a bírói felülvizsgálat ilyenkor a kutatási folyamat integritására fókuszál, és nem annak eredményére. Az ISDS panelek másik része a nemzetközi szabályozási trendeket tekinti a környezeti kockázatokra vonatkozó érvényes tudományos vélemények bizonyítékának.


Az ITLOS esetjogában a disszertáció többféle lehatárolási technikát azonosít. Egyrészt, az ITLOS a természettudományos kérdésekhez szorosan kapcsolódó kérdésekben a feleket szakértői testület felállítására kötelezte, és arra, hogy a vitás kérdésekre a tudományos alapokra építte teleljenek meg a konszenzusos megoldást. Tudományos bizonyíték önmagában azonban még sosem volt kellő alap az ITLOS számára ahhoz, hogy egy jogvitát az adott fél javára döntsé el. A természettudományos kockázatokat bemutató bizonyítékok csak arra voltak elegendőek, hogy az ITLOS elővigyázatossági intézkedésként a feleket konzultációra és tárgyalásokra kötelezze. A szakértői bizonyítási eljárás tekintetében az ITLOS alapvetően a felek által felajánlott bizonyítékokra támaskodik. Bár eljárási lehetősége biztosított lenne rá, a bíróság még nem élt független szakértő kinevezésének lehetőségével. Szintén nem került még sor szakértői bíró kinevezésére, valamint a speciális választóbírói eljárás igénybevételére, ahol a jogvitát egy kizárólag természettudományos szakértőkből álló testület bírálná el. A kauzalitási vizsgálat eddig csak elvi szinten merült fel, az Államok felelősségéről és kötelezettségéről szóló Tanácsadó Véleményben, ahol elvi jelleggel megerősítették, hogy a kauzalitást nem lehet véelmezni.

E fejezet rendszerezett áttekintést és összehasonlító elemzést nyújt azokról a bírói technikákról, amelyeket az előző fejezetek az egyes fórumok gyakorlatában azonosítottak. Az összehasonlítás eredményeképpen a disszertáció két nagy trended különböztet meg a természettudománnyal való bírói interakció tekintetében. Egyrészt azokat a módszereket, amelyek csökkentik a természettudománynak a jogi döntéshozatalban való szerepét és jogi relevanciáját az ítéletkezési folyamat négy szakasza során. Másrészt azokat, amelyek a tudományos érveket és eredményeket minél inkább igyekeznek integrálni a bírói érvelésbe. E módszerek elszórtan megtalálhatóak minden egyes fórumok gyakorlatában. Ugyanakkor a fórumok között végső soron különbséget lehet tenni a között, hogy gyakorlatukban található eszközök fényében a tudomány iránt inkább nyitottabbak, vagy attól inkább elzárkózóak.

A szakértői bizonyítás tekintetében e fejezet a 3-9. fejezetben tárgyalt bíróságok mellett feldolgozza a lehetséges bírói „jó gyakorlatokként” a UNCC esetében és néhány nemzeti bíróság megoldásait is. A kauzalitás vizsgálata tekintetében kitér az Egyesült Államok toxic tort ítéletkezési gyakorlatára és a Marshall-szigeteki Nukleáris Követelések Törvényszékének döntéseire is.

(i) Jogvita lehatárolása: nincs egységes tendencia a fórumok között, néhány fórum a természettudományos kérdéseket kivonja a bírói vizsgálódás köréből, mások viszont stratégiai célokra alkalmazzák a tudományos érveket.

(ii) Szakértői bizonyítás: a közelmúlt joggyakorlata alapján a fórumok többsége támaszkodik a felek által felajánlott szakértői bizonyítékokra, azonban a túlnyomó többség nem vesz igénybe független szakértőt. Szintén kivételes a szakértői választottbíró kinevezése. Mindezek azt sugallják, hogy a bírak továbbra is tartanak a döntéshozó autonómiajak erodálásától, szándékon túli delegálásától.

(iii) Kauzalitás: a nemzetközi fórumok gyakorlata azt sejteti, hogy a kauzalitás bírói megállapítása a környezeti jogvitákban leginkább bizonytalan tények és rendszertelen bírói megfontolások sajátos egyvelegének tűnik. A bírói kauzalitási policy megfontolások szerepét jelzi, hogy azok a fórumok, amelyek transzpárens kauzalitási vizsgálatot folytatnak, ténybelileg hasonló ügyekben nagyon eltérő kauzalitási, illetve bizonyítási követelményeket állítanak.
(iv) A vizsgálati mérce: a disszertáció számos vizsgálati mérccét azonosított a szigorúbbtól a megengedőbb felülvizsgálatig. A bíróságok különféle tesztekkel töltik meg a választott felülvizsgálati mércét tartalmát. A disszertáció természettudományos, jogi, hibrid, és intuitív teszteket különböztet meg, amelyek révén a bírói fórumok igazolják abbéli döntésüket, hogy miért fogadnak vagy utasítanak el egy természettudományra visszavezethető érvet. (1) Természettudományos teszt található a WTO gyakorlatában, amikor a panel teljes mértékben a tudományos közösség értékítéletére hagyatkozik jogi döntése meghozatalakor. (2) Ehhez képest a jogi tesztek tisztán jogi okfejtés alapján nyerik érvényességüket, ilyen például a tudományos “due process” szempontok vizsgálata az egyes ISDS paneleknél. (3) Hibrid tesztekkel azonosított a disszertáció a WTO, az EU és az NB esetjogában. (4) Végül intuitív tesztre vezethető vissza a szemantikai vizsgálat (WTO, NB) és az EJEB proxy-alapú okozatási vizsgálata.

10. A meggyőző és legitim bírói érvelési módszerekkel kapcsolatos megállapítások (11. fejezet: 393 – 413. old.)

A disszertáció végül azt vizsgálja, hogy egy természettudományban nem jártas bíró hogyan tud egy természettudományos vonatkozásokkal áthatott jogvitát meggyőző érveléssel eldönteni. A döntés során a bíróknak versengő természettudományos érve között kell választania, amelyeket ráadásul sokszor bizonytalan (valószínűségi) tudományos bizonyítékokkal támasztanak alá a szakértői vélemények. A bírói fórumok tudományos, jogi, hibrid és intuitív tesztekkel igazolhatják döntéseiket. Mindegyik sajátos előnyökkel, és kockázatokkal jár az érvelés episztemológiai önkényessége, meggyőző ereje, a bírói döntési autonómia, illetve az érvelés gyakorlati megvalósíthatósága tekintetében. A disszertáció ezeket részletesen elemzi, majd lehetséges megoldási javaslatokat ajánl a kockázatok csökkentésére.

(1) A természettudományos tesztek hátránya, hogy a bírák döntési autonómiája veszélybe kerülhet, mivel a tudományos közösség értékítéletére kell hagyatkoznik e tesztek alkalmazásakor. Előnyük azonban, hogy a tudomány kognitív meggyőző ereje megerősíti a bírói ítéletek legitimációját. (2) A jogi tesztek előnye, hogy azokat a bírák szabadon alkalmazhatják, kompetenciájuk immanens eszközei ezek a technikák (pl.: okozatási vélelmek felállítása). Bár e tesztek némelyike (pl.:
nemzetközi szervezetek tudományos standardjai) végső soron visszavezethetőek természettudományos eredményekre, mégsem azért tartja őket a bíróság meggyőzőnek, hanem a kibocsátó intézmény tekintélyénél fogva. Ilyen értelemben e tesztek alkalmazáshoz nem szükséges tudományos szakértelem a bíróság részéről. (3) A hibrid tesztek révén a bírák alapvetően jogi érvelést nyújtanak (pl.: konzisztencia, koherencia, észszerűségi vizsgálat, amely szempontok nem természettudományos kategóriák). Azonban ahhoz, hogy ezekről véleményt formáálhasson a jogalkalmazó, elkerülhetetlen, hogy az alapul fekvő természettudományos tények lényegét is megértse. A hibrid tesztek előnye, hogy a szakértői vélemények értékelése bírói mérlegelés körébe tartozik. (4) Végül, az intuitív tesztek logikai és grammatikai szabályokból nyerik érvényességüket, amelyek előnye, hogy azokat a bírák szintén önállóan tudják alkalmazni. Azonban e módszer hátránya, hogy nem minden esetben érhető el, illetve, hogy bizonyos esetekben a természettudományos realitásokkal ellentétesek lehet az intuitív megfontolásokra épített okfejtés, amely aláássa így az érvelés legitimitását.

11. A kutatási eredmények alkalmazhatósága

A disszertáció megállapításai a környezeti jogviták hatékonyabb eldöntését segítik, különös tekintettel a bírói érvelés tudatosabb felépítésére. A kutatás a természettudománynak az ítélezés során betöltött sajátos szerepére és egyedi problémáira hívja fel a kommentátorok valamint a bírói döntéshozók figyelmét. Rámutat arra, hogy a természettudomány érveinek kezelése kihat a bírói döntés meggyőző erejére, ezért kulcsfontosságú, hogy az ítélezési folyamatba mindinkább "beszivárgó" természettudományos érveket a bírói fórumok konzisztens és átlátható módon kezeljék. Ehhez a mostannál nagyobb bírói tudatosság szükséges a választott érvelési módszerek tekintetében.

A disszertáció praktikus tanácsokkal szolgál az egyes érvelési technikák lehetőségeire, előnyeire és veszélyeire nézve, valamint a kockázatok lehetséges mérsékëlésére is. Bár absztrakt hierarchia nem állítható fel az érvelési technikák között, a disszertáció amellett érvel, hogy adott kontextusban bizonyos tesztek alkalmazása megfelelőbbnek tűnik a többinél. A disszertáció ezekre nézve is tartalmaz ajánlásokat. E szerint a természettudományos standardok alkalmazása meggyőzőbb eredményre vezet, amennyiben az adott bírói fórum a tudományos
tényfeltárás érdekében hatékony szakértői eljárást folytat le (pl.: szakértői bírók vagy független szakértők közreműködésével). Ezzel szemben, amikor a tudományos bizonytalanság túl nagy mértékű, akkor a természettudományi tesztek nem igazán vezetnek meggyőző okfejtésre. Ilyen esetekben a jogi tesztek szolgálatnak meggyőző bírói érvelés alapjául. A hibrid tesztek alkalmazása a kockázatbecslések jogi felülvizsgálatánál mindenféleben előremutatóak, mivel a bíró természettudománnyal való interakcióját lehetővé, sőt szükségessé teszik. Mindez elősegíti, hogy a bíróságok egy új funkciót, az “információs katalizátor” szerepét töltsek be. Végül az épisztematológiai önkényesség elkerülése érdekében a legmegfelelőbb megoldásnak az tűnik, ha a természettudományos érvek megítélésére jogi vagy intuitív teszteket csak kisegítő jelleggel, tehát csak akkor alkalmaznak a bíróságok, ha természettudományi tesztek nem állnak rendelkezésre.

A jogviták természettudományos vonatkozásainak megfelelő bírói kezelése az egyre sokasodó bírói fórumok közötti növekvő verseny miatt is fontossá válik. Ugyanis a peres feleknek egy adott fórumba vetett bizalmát ássa alá végző soron, ha egy jogvita nyilvánvaló természettudományos aspektusait a bírák marginalizálják. Ez arra késztheti a leendő peres feleket, hogy olyan fórum elé vigyék ügyeiket, amely az adott jogvita minden aspektusát, így a tudományos érveket is, kellőképpen és a lehető legteljesebb mértékben értékelni fogja.

A tudományos érvek alapos és transzpárens értékelése különösen fontos a nemzetközi bíróságokra nehezedő növekvő antiglobalizációs törekvések miatt is. Miközben az államok egyre szorosabb figyelemmel követik, és egyre magasabb elvárásokat támasztanak a nemzetközi bírói fórumok működésével szemben, a meggyőző és legitim bírói érvelés megerősíti ezen intézmények legitimációját. A bíráknak figyelembe kell venniük, hogy a szenzitív gazdasági, vagy szakpolitikai döntések (mint pl. a környezetvédelmi, közegészségügyi szakpolitikák) elnagyolt bírói érveléssel történő feltülbírálata könnyen politikai támadásokat és bizalomvesztést válthat ki az érintett testülettel szemben. Mindezért létfontosságú, hogy a bírói érvelés ne tűnjön önkényesnek, és ebben a tudomány megfelelő kezelése stratégiai fontosságu ehet.

A disszertáció elvi éléle hangsúlyozza, hogy a természettudomány kezelésének minden kihívása ellenére a tudomány a bírak kulcsfontosságú szövetségesévé válhat,

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2133 This term was coined by Ellen Vos, see Vos, ‘The European Court of Justice in the face of scientific uncertainty and complexity’, p. 152.
ha azzal megfelelő módon lépnek interakcióba. Ilyen esetekben ugyanis a megfelelő bírói érvelés kognitív meggyőző eresét a tudomány tovább erősíti. Ezzel ellentétben, az elnagyolt, homályos érveléssel elutasított természettudományos érvek “kísértani fogják” a döntéshozókat, mivel a természettudomány teljes mellőzése negatívan hat vissza a döntés legitimitására.

A disszertáció végül arra is rámutat, hogy a bizonytalan tudományos eredményekkel való megfelelő bírói interakció napjainknak megkerülhetetlen feladattá vált. Egy döntés legitimítása az adott társadalmi kontextus függvénye, amelyek idővel szükségképpen változnak. Míg évezredeken át lehetett “bőles”, meggyőző és legitim jogi döntéseket hozni a természettudományos aspektusok teljes kizárásával is, ahogyan azt a biológiai anyaság kérdéséről döntő salamoni ítélet is mutatja, azonban ez a jelenkorban már nem mondható el. A nemzetközi bírói döntéshozatal sem állhat sokáig ellen a 21. századi folyamatoknak, amelyek révén a felgyorsult technológiai- tudományos fejlődés minden eddiginél alapvetőbb hatással van a társadalomra és annak intézményeire, végső soron pedig a legitim bírói döntésekkel szembeni társadalmi elvárásokra Ennek következtében a környezeti jogvitákban felmerülő természettudományos érveket megfelelőképpen fel kell tární és értelmezni kell annak érdekében, hogy a bíróságok tényszerűen helyes, episztemológiailag nem önkényes és így összességében meggyőző módon tudják e jogvitákat eldönteni.
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I. A doktori értekezés adatai
A szerző neve:…dr. Sulyok Katalin………………………………………………………
MTMT-azonosító: 10039787……………………………………………………
A doktori értekezés címé és alcímé:…Cím: Scientific engagement of international courts and tribunals in environmental disputes
DOI-azonosító: 10.15476/ELTE.2018.148
A doktori iskola neve:…ELTE ÁJK Jogtudományi Doktori Iskola
A doktori iskolán belüli doktori program neve:…
A témavezető neve és tudományos fokozata:…Prof. Dr. Kardos Gábor egyetemi tanár, Prof.
Dr. Sonnevend Pál egyetemi tanár
A témavezető munkahelye:…ELTE ÁJK……………………………………………

II. Nyilatkozatok
1. A doktori értekezés szerzőjeként
   a) hozzájárulok, hogy a doktori fokozat megszerzését követően a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az ELTE Digitális Intézményi Tudástárban. Felhatalmazom az ELTE ÁJK Jogtudományi Doktori Iskola hivatalának ügyintézőjét, Bencze Andreárt., hogy az értekezést és a téziseket feltöltse az ELTE Digitális Intézményi Tudástárba, és ennek során kitöltse a feltöltéshez szükséges nyilatkozatokat.
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   d) kérem, hogy a mű kiadására vonatkozó mellékelt kiadó szerződésre tekintettel a doktori értekezést a könyv megjelenéséig ne bocsássák nyilvánosságra az Egyetemi Könyvtárban, és az ELTE Digitális Intézményi Tudástárban csak a könyv bibliográfiai adatait tegyék közzé. Ha a könyv a fokozatszerzést követően egy évig nem jelenik meg, hozzájárulok, hogy a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban.
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2. A doktori értekezés szerzőjeként kijelentem, hogy
   a) az ELTE Digitális Intézményi Tudástárba feltöltendő doktori értekezés és a tézisek saját eredeti, önálló szellemi munkám és legjobb tudomásom szerint nem sértem vele senki szerzői jogait;
   b) a doktori értekezés és a tézisek nyomtatott változatai és az elektronikus adathordozón benyújtott tartalmak (szöveg és ábrák) mindenben megegyeznek.
3. A doktori értekezés szerzőjeként hozzájárulok a doktori értekezés és a tézisek szövegének plágiumkereső adatbázisba helyezéséhez és plágiumellenőrző vizsgálatok lefuttatásához.

Kelt: Budapest, 2018. 06. 29.

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