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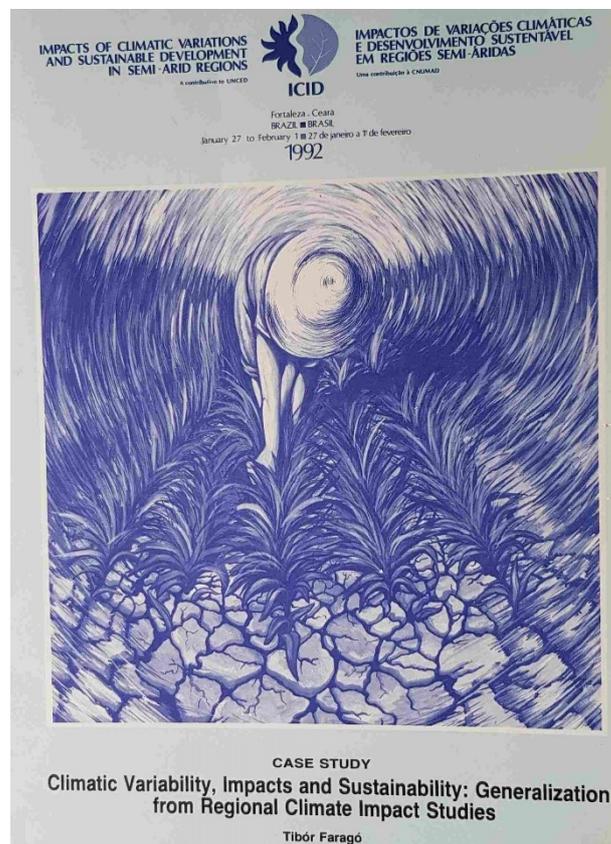
Summary, Contents, Conclusions

Climatic variability, impacts and sustainability: generalizations from regional climate impact studies

SUMMARY

The climatic variations mean determining factors of adjustment of societies and ecosystems to the environmental conditions, the atmosphere and its climatic characteristics provide resources for certain socio-economic activities and particular climatic phenomena and processes may endanger some of these activities.

The vulnerability to climatic variations is especially critical in regions of significant water deficits, that is, under arid and semiarid conditions. In the analysis of varying climatic factors, special emphasis is given to considerable climatic anomalies and extreme climatic events. Of the extreme events, the significance of drought studies is emphasized. Problems of identification of systematic shifts in observational series are discussed which appear as trends in the global or regional data and which can also affect the climatic variability.



Beside the common conceptual and methodological elements of the analysis of natural and anthropogenic climate forcing mechanisms and the climate impact studies, the region-specific analysis is essential for strengthening the local perception of these problems, for better understanding of needs for environmentally sound socio-economic behavior and for proper determination of targets and tasks of the environmental and related policies. The principal elements and results of case studies of regional climatic impacts are reviewed.

The concept of sustainability is considered in light of climatic variability and the hazard of climate change. This principle is evaluated in several perspectives, namely, in terms of stability of the climatic system, the sustainable development of societies and the long-term consistency of the “coupled system” of man and environment.

Conclusions are drawn from the conceptual analysis and the regional climate impact studies as concerns the further tasks of integrated environmental monitoring, analysis of climatic anomalies, extremes and their impacts, elaboration of policy options to control the climate modification and the climatic impacts to meet the requirements of sustainability as applied to environment and social development.

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Conceptual questions and region-specific elements of climate impact analysis are reviewed and illustrated by relevant results from the case studies accomplished for Hungary. The principal conclusions based on this overview are as follows:

At present, the monitoring of regional climatic conditions and the related components of environment does not provide adequate data for the identification or early detection of long-term variations and shifts in the climate whatever their causes are. For the same reason, regional observations usually do not meet the requirements for the large scale monitoring of global variations because of the close interference of the possible local/regional and global influences on the observed data.

The analysis of regional climatic anomalies and their socioeconomic consequences on annual/interannual or decadal scales assist in better understanding of range and the nature of climatic variations and impacts. By means of such studies, effective relational analysis can be achieved. On the other hand, the evaluation of individual large and/or persistent anomalies and extreme (extraordinary) events can reveal the weaknesses of the socioeconomic systems to cope with these climatic hazards and to assess the present limits of resilience. The Hungarian case studies indicate that the climatic information on the variation and threshold events of particular climatic characteristics is usually not applied or not properly used in the corresponding design problems and formulation of long-term response policies.

Our studies revealed the importance of the recurring, significant climatic anomalies for other reasons, too. These events appear also as actual indicators of the limits of natural climatic variability and as the potential indicators of the underlying "slow-rate" changes in the climate. Moreover, these events serve also as catalysts to concrete actions in the process of societal adjustment to the climatic variations.

The possibilities of adjustment to climatic variations in general and to particular climatic hazards, the effectiveness of such responses can be best evaluated by collection and analysis of data on past climatic events and societal responses including both the elements of mitigative and adaptive responses. In Hungary, for the last decades, intense research has been devoted to the reconstructions of the past climatic variations, however, the relevant impact and "policy" issues have not been addressed with similar care. Of course, contemporary cases are especially important in the course of such comprehensive investigation because of the changing non-climatic factors.

The need for integrated monitoring and impact analysis is emphasized. By present, typically the effects of certain climatic hazards (accumulated precipitation deficits, recurrent frost events etc.) or individual shocks (e.g., severe droughts) have been studied in Hungary. There is also a lack of regular simultaneous assessment of climatic data and the characteristics or outputs of climate-sensitive components of the environment and the socio-economic activities. The consideration of the first, second and further impacts and the assessment of the interacting environmental and other (non-climatic) factors would result in more adequate estimates of the overall climatic effects and the formulation of rational short- and long-term responses of primary importance which take into account the combined or integrated implications.