

Research on tools for the sustainable, far-sighted management of natural resources – an important aspect of Global Change Research

Dr. Martin Rieland
Federal Ministry of Education and Research (BMBF)

Deutscher Tropentag 2003 in Göttingen, October 2003

1. Introduction

Living conditions are changing on the global scale. Various global indicators exist for non – sustainability development, such as

- shortages of clean and accessible water
- degradation of terrestrial and aquatic ecosystems
- increases in soil erosion
- loss of biodiversity
- changes in the atmospheric chemistry
- possible significant climate changes

It is not unusual for living conditions to change, but there is evidence that future generations, especially in less developed countries, will become increasingly susceptible to man-made and natural changes in the earth habitat. Important strongly related factors are the population growth and the increasing use of natural resources.

The Federal Ministry of Education and Research (BMBF) has focused its funding activities in this field, the field of Global Change. Global Change means changing conditions for human life in the future. Global Change Research therefore is research for sustainable development. This paper describes the background and concept of BMBF funding efforts with regard to Global Change. This aspect of Global Change will be part of the new BMBF research program dealing with concepts for sustainability, which will replace the research program on environmental aspects in 2004.

2. General objectives of Global Change Research

Only joint international efforts will help to adapt to global changes in living conditions. By signing various international conventions, e.g. the UN conventions on

- sustainable development (CSD),
- combating desertification (CCD),
- biological diversity (CBD) and
- climate change (FCC).

Germany has committed itself to research into the causes and impacts of Global Change as well as to research on the prospects of possible adaptation and mitigation measures. Highly developed industrial nations bear special responsibility in this connection. At least in some cases they are more responsible for changes rather than that they suffer from them, and at the same time they have greater potential for adaptation and greater research capacities. Therefore, countries like Germany should contribute to fostering close research cooperation with high-risk countries, in order to help developing systems for sustainable management and use. In addition, the research capacity building in the respective countries may be supported by transfer of know-how and educational measures.

On the other hand, industrialized countries have also a vital interest in this kind of research, not only, because they need independent advice capacity for assessing the relevance of global change phenomena. They are interested in the sustainable use of natural resources as well, especially in times of increasing economical globalization and related interdependencies. Furthermore, the development of

new kind of instruments and tools for a far-sighted management based on a comprehensive knowledge of the overall global environmental system, including possible future development patterns, is of decisive importance for action, that is, action beyond disaster management. People must permanently adapt to new conditions; at the same time, they should take action which ensure greater sustainability in the process of Global Change. The possibilities of shaping courses of action is of strategic advantage, especially when thinking of the development and application of new technologies which may enable a future-oriented and sustainable use of natural resources.

The German Federal Minister of Education and Research Edelgard Bulmahn considers worldwide sustainable growth a central theme for research funding by her ministry, the BMBF. She commented on this as follows: "It cannot be that industrialized countries cultivate a form of affluence which, if adopted by the rest of the world, would make the planet uninhabitable. We want to develop products and production processes which can be applied worldwide. This is a task for which industrialized countries share responsibility. We are furthermore responsible for organizing a knowledge and technology transfer which respects the interests of other countries. A large number of scientific collaborations in the area of environmental research and technology are required to support these countries in developing necessary innovations within their own research culture, so that they come to understand environmental problems and assume responsibility for solving them even in the early stages of emerging industrialization. This is a great challenge for our scientists and engineers."

3. Requirements for Global Change Research

Strategies for promoting sustainability should rely on a comprehensive knowledge of the functioning and dynamism of both natural and man-made systems. Research should provide new instruments for the development and assessment of such strategies. That means in particular, that instruments are needed which allow thinking in advance, because foresight is a very crucial issue for sustainable development.

Global environmental changes in particular show highly complex, mainly long-term cause-and-effect structures which vary between regions and which require special research methods and tools as well as early-warning and planning tools. Owing to their complexity, the processes involved pose a great challenge to science, as interactions go beyond the traditional borders of disciplines, sectors and environmental media. A broad spectrum of scales is involved. Therefore, there is the general need to increase the interdisciplinary and transdisciplinary dimension. The latter approach is called stakeholder participation. It should begin already when a new program or project is planned.

And last but not least, more international cooperation is needed. Therefore, the new general research strategy in the field of Global Change should be embedded in a broad international Global Change Research Network. International Global Change umbrella programs exist, in some cases already for more than 20 years. Considerable efforts have been made over the past five years to encourage demand-oriented research and to establish closer links between research activities in individual disciplines. For example, the four major Global Change programs, that is, the World Climate Research Programme WCRP, the International Geosphere Biosphere Programme IGBP, the International Human Dimension Programme IHDP and the international biodiversity research programme DIVERSITAS have been combined to form the Earth System Science Partnership ESSP. This partnership is now conducting joint research programs, for example in the areas of water (GWSP, see below), nutrition and health.

4. Examples of recent BMBF funding activities

The division Global Change within the BMBF is currently funding projects on

- chemical and dynamical processes within the atmosphere,
- the field of climate change, prediction, scenarios and impacts, as well as on
- concepts of sustainable use of natural resources.

The latter topic started in 2000 and concentrate on the natural resources biodiversity and water. Here, a special focus is lying on international projects. Bilateral and multilateral projects are selected from among the proposals submitted under thematically focused open calls. The independent strongly interdisciplinary review process deals not only with the scientific quality and feasibility of the proposals, but also with the involvement of researchers and stakeholders in the host countries. BMBF spend some 20 Mio. € per year in the research on concepts of sustainable use of natural resources. In the following two sections recently started BMBF funding efforts in the fields of biodiversity and water availability are briefly introduced.

4. 1 Biodiversity

The great significance of biodiversity for the Earth ecosystem on the one hand and the necessary use of biological resources on the other indicate conflicting aims. Hardly any strategic solutions exist today in terms of sustainable development which takes into account the interests of the local population in particular. There is a considerable need for action, and especially for research. The goal of BMBF biodiversity research is to develop concepts and tools for

- sustainable using of endangered regions
- biodiversity monitoring
- economical assessments for biodiversity
- joint and cooperative examination and utilization of usable biological features

This BMBF research is mainly associated with Core Project I of the international umbrella program DIVERSITAS (Understanding, monitoring and predicting biodiversity changes), but has also connections to DIVERSITAS Core Project II (Assessing impacts of biodiversity changes) and III (Developing the science of conservation and sustainable use of biodiversity).

The BMBF launched its BIOLOG (Biodiversity and Global Change) program with an open call for proposals in April 1999. The overall goal of BIOLOG is to provide a scientific basis for the development of strategies and tools for the sustainable management of ecosystems and societies, especially with regard to global environmental change and varying socio-economic conditions. BIOLOG is Germany's most outstanding scientific response to the UN Convention on Biological Diversity and to the renewal process of the international DIVERSITAS program.

Priority has been given to projects which – besides being of convincing scientific quality – are based on a major degree of international integration and capacity building. In view of these requirements in particular, the first, of probably three, funding periods of BIOLOG concentrate on regions showing different levels of biodiversity, different levels of relevant knowledge and expertise, and different risks for biodiversity.

While one part of the BIOLOG program is dealing with changing biodiversity in Central Europe and in Germany in particular, the BMBF decided to support a new initiative for cooperative research on the African continent. Some 30 sub-projects combined in three major cluster projects which cover important regions of the African continent have been integrated into an umbrella project called **BIOTA** (Biodiversity Monitoring Transsect Analysis in Africa, www.biota-africa.org). The main objectives of BIOTA are

- assessment of existing biodiversity
- monitoring of changes of biodiversity
- understanding of drivers and mechanisms of change
- interventions: Management, restauration and conservation

Beside BIOLOG further BMBF funding activities in the field of biodiversity research exist:

- BioTeam (Biosphere Research – Integrative and application-oriented Model Projects)

- Mata Atlantica (Joint German – Brazilian Project)
- GBIF (Global Biodiversity Information Facility)

For further details see www.biolog-online.info.

4.2 Water Availability

The BMBF program GLOWA (Global Change in the Hydrological Cycle) focuses on the problem of water availability. The availability of water resources will become an increasingly pressing problem in the medium and long term, not only because the world population is constantly growing and excessive use is being made of water resources, but also as a result of global environmental changes.

The BMBF's GLOWA program is a remarkable initiative of high national and international standing which aims to provide suitable science-based tools and instruments for the sustainable, future-oriented management of large water reservoirs. GLOWA is taking the global environmental changes and the also changing socio-economic framework conditions into account. Its ideas especially with respect to the realization of interdisciplinary research and integrated modeling are being incorporated in new cross-cutting program initiatives within ESSP (Global Water Systems Project GWSP) as well as in UNESCO's International Hydrological Programme (Hydrology for Environment, Life and Policy HELP).

The BMBF announced GLOWA in December 1998. The main core themes of GLOWA are

- Variability of precipitation and their effect on the hydrological cycle
- Interactions between the hydrological cycle, the biosphere and land use
- Water availability and conflicting water uses

Four GLOWA projects were launched in 2000, two of them are addressing river catchments in Germany (Danube, Elbe), another two are dealing with water catchment areas in North and West Africa. The fifth project started in 2001; it deals with the Jordan River catchment area in the Near East and follows a multilateral approach.

For further details see also www.glowa.org.

5. Conclusion

Global environmental change has important impact on people's future living conditions. Therefore, Global Change Research is research for sustainable development. It is a major challenge for science with regard to the integration of natural and socioeconomic disciplines, integrated modelling, stakeholder involvement and international integration.

This new type of research field is still at the beginning of a learning process in which the plurality of methodological approaches in integrated and interdisciplinary research is a decisive factor. There is no guarantee for success; the process will take time and it may fail. What is crucial in this kind of research approach is whether the results can be applied. It must be demonstrated that Global Change Research can give answers which will allow decision-makers to actively shape Global Change in a future-oriented and sustainable way.