



# **Understanding – Evaluating – Shaping. Transdisciplinary Knowledge for a Sustainable Society**

Memorandum on the Development of  
Social-Ecological Research in Germany

June 2012

## Summary

Solving global problems such as climate change, environmental degradation or food security requires fundamental transformations of our society. To cope with these new and existential challenges we need new knowledge – about the origins of the problems, about which solutions to aim for and about how to implement these solutions. Transdisciplinary social-ecological research has been developed with the goal of producing this knowledge. Innovative and practically oriented, transdisciplinary social-ecological research has three goals: understanding, evaluating, shaping. These three goals are interconnected: complex problems must be understood; the knowledge produced to achieve this understanding must be evaluated; and the knowledge thus evaluated must be used to shape options for action. As producer of the new kind of knowledge needed to tackle the new kinds of problems facing society, social-ecological research has assumed a pioneering role within environment and sustainability research in Germany and has presented groundbreaking studies of, for example, energy, mobility and transformations in food systems.

The Federal Ministry of Education and Research (*BMBF*) supported research in this research area for the first time in 2000 in the form of a Funding Priority Program for Social-Ecological Research (*SOEF*). By 2012 various collaborative and individual projects had been supported, including research into issues involving the environment, nutrition and health, as well as the development of long-term strategies to promote sustainable consumption and to deal with the social dimensions of climate protection and climate change. This support has proven successful: research projects in support of transformative action are now on the agenda of policymakers and society at large. And science itself has become more open to social-ecological questions and methods.

This memorandum is meant to contribute to a thoroughgoing deepening and widening of the substantive, organizational and institutional base of social-ecological research in the coming years. To this end the memorandum makes recommendations with respect to funding topic areas and measures for structural development.

## Recommended Topic Areas

During a new *SOEF* funding period research topics should be funded that address serious societal problems, that are well connected to the already in place social-ecological knowledge base and that can be expected to make transdisciplinary contributions to sustainable development. The following are representative of the topics that should be funded:

- Co-transformation of social-ecological supply systems
- Risk assessment and preventive orientation with respect to sustainable innovation
- Social-ecological transformations of consumption patterns
- Businesses in social-ecological change

## Recommended institutional and organizational strengthening

Research content and research infrastructure cannot be separated in social-ecological research. For that reason strengthening the content of the research must be accompanied by a focused development of structures that encompasses all sectors of the scientific system. Among others, the memorandum proposes the following measures for structural development:

- Funding for the training of junior researchers and for the teaching of social-ecological research
- Anchorage of social-ecological research in the higher education system
- Funding of independent, non-university, social-ecologically oriented research institutes
- Funding of cross-sectoral networking and cooperation

## Preamble <sup>1</sup>

Major global challenges such as climate change, environmental degradation, land degradation, loss of biodiversity and food security can only be met by measures involving fundamental transformations in all spheres of society. In light of these challenges science is faced with new types of questions. Since the 1980's social-ecological research has been dealing with these new questions in an innovative manner. This has involved the development of transdisciplinary research approaches – at first mainly in non-university institutes with a critical science tradition – in which the processes of understanding, evaluating and shaping are closely linked. In this way proposals for dealing with pressing social-ecological problems arising at the intersection of nature and society have been worked out, proposals that have achieved advances in both scientific and practical societal knowledge. Basic research in the areas of transformations in energy, mobility and food systems, as well as transformations in water supply and sanitation are proof of the success of the research undertaken so far. Transdisciplinary social-ecological research has thus assumed a pioneering role within environment and sustainability research in Germany.

Since 2000 the *BMBF's* Funding Priority Program for Social-Ecological Research (*SOEF*) has succeeded in putting research projects that aim at a better understanding and a conscious shaping of social-ecological transformation processes on the agenda of both policymakers and society at large. Through its successful projects social-ecological research has brought about changes not only in societal practices but also in scientific theory and practice which have been of benefit not only to social-ecological research itself. These changes have affected in particular those scientific fields that view research questions as basic and methodological issues in a manner similar to social-ecological research.

Current sustainability research is still too focused on a technology dependent approach. This can be seen clearly in the example of the discussion of a new energy policy where just as before technical issues such as network infrastructure dominate, while issues concerning efficiency and the social, legal and practical embedding of technical measures are neglected. Looking ahead, then, it is important that the basis of social-ecological research be deepened and widened – substantively, organizationally and institutionally – and the results disseminated throughout all sectors of the German scientific community.

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<sup>1</sup> This memorandum was presented at the BMBF Agenda Conference, “Social-Ecological Research for a Sustainable Society,” on 19th and 20th March 2012 by a group of experts: Rainer Grießhammer, Thomas Jahn, Thomas Korburn, R. Andreas Kraemer, Claus Leggewie, Ortwin Renn, Uwe Scheidewind and Angelika Zahrnt. It was revised in light of the conference results.

## 1 Social-Ecological Research – An Innovative Research Approach

The development of social-ecological research took place as part of a broad debate about changes in the science system. The discipline bound sciences have been increasingly supplemented by transdisciplinary research. The latter focuses on societal problems, involves the integration of various forms of scientific and practical knowledge and produces robust societally relevant knowledge – a type of knowledge that is generated and evaluated in a participatory process. As a result of these developments, social-ecological research is being perceived differently and has been given a new role within the transformation of the science systems and the relation between science and society.

This change in the discussion of social-ecological research was noted in the German Advisory Council on Global Change's flagship report, "World in Transition – A Social Contract for Sustainability." The report recommends to the council that "transformation research and transformative research" – that is, research aimed at concretely describing transformation processes (transformation research) and ways of consciously shaping these to further a sustainable society (transformative research) – be targeted for strengthening. To this end the report recommends a significant expansion of transdisciplinary research approaches, as for example was done by funding social-ecological research to develop it further, methodologically and theoretically. The Council in this way honored the role played by social-ecological research as an important catalyzing actor. This pioneering role has been expanded continuously from the beginning by the following achievements:

- Development of a new scientific field in which interaction between social action and ecological effects is investigated (project examples: Food change – Transformations in Environment, Food and Health; Product Sustainability Assessment – PROSA; Joint Emission Trading as a Social-Ecological Transformation – JET-SET).
- Development of a method-based transdisciplinary research approach, as well as independent quality standards and evaluation criteria (project examples: Transdisciplinary Research Methods – tdPrax; Evaluation Network for Transdisciplinary Research – Evalunet).
- Transdisciplinary collaboration among different disciplines, faculty cultures and research institutions, on the one hand, and between these scientific actors and societal actors in their daily practice, on the other (project examples: Transformation Management for a Sustainable Water Infrastructure – netWORKS; Sustainable Energy Consumption in Residential Buildings – SECO@home; Analysis of the Coexistence of Agriculture with and without Genetically Modified Plants – GeneRisk).
- Qualification of young researchers (project examples: Global Governance and Climate Change; Transformation and Innovation in Power Systems – TIPS; Interconnected Cause and Effect Networks among Demographic Developments, Needs and Supply Systems – demons; Reduction of Energy Consumption through Target Group-oriented Mobility Services MOBILANZ; Social Learning and Sustainability – GELENA; Conflicts of the New Agricultural Policy – AgChange).

The systematic integration of the gender dimension and with this a broader look at processes of social differentiation and exclusion was included in the majority of the projects during the analysis of problems and the development of intervention options.

### **SOEF – A Short Overview** <sup>2</sup>

The Funding Priority Program for Social-Ecological Research (*SOEF*) was established in 2001 with a first call for proposals for a research project on “Sustainable Development in the Interconnected Field of ‘Environment, Food, Health’ – Long-Term Strategies for Sustainable Consumption.” The first call for proposals in the area of promoting structure building measures went out in summer 2000; the first call for proposals in the area of developing junior researchers in spring 2001

This was preceded by the development of a framework concept which was based on an initiative of the *ökoforum*, a coalition of non-university, non-profit research institutes. The concept was developed by a group of institutions under the leadership of the Institute for Social-Ecological Research (ISOE) in cooperation with the promoter (gsf) and the *BMBF*, and released in 1999. Overall about 100 scientists from the natural sciences, engineering sciences, social sciences and economics were involved in the development of the concept, both by answering surveys and participating in workshops. In 2005 exploratory studies were initiated to assess concrete funding priority projects in terms of their suitability with respect to the concept. In 2005 the funding priorities were positively evaluated.

Numerous funded programs have been based on core theoretical and methodological concepts for interdisciplinary and transdisciplinary research developed primarily in the course of social-ecological research. In collaborative project work, in which research and practice partners work together in a problem-oriented and interdisciplinary manner, models, development paths and scenarios have been developed which have led to a concrete decision-making basis and action options for the different actors involved in transformative processes, as well as to new scientific discoveries such as interdisciplinary methods.

The aim of the *SOEF* programs in the years 2000 to 2012 was to study societal transformation processes and to develop knowledge that would help in steering these processes in a sustainable direction. It thus contributed to the development of environment research from a primarily natural science and technology dominated orientation to a transdisciplinary mode of sustainability research. In the funding years 2000 to 2011 the following funded programs were carried out:

#### ***Thematic Priorities***

Sustainable Development in the Field of ‘Environment, Nutrition, Health’	2002 – 2005
Political Strategies for Coping with Global Environmental Problems	2002 – 2006
Social-ecological Transformation in Supply and Disposal Systems	2002 – 2006
Social-ecological Transformation in Urban and Rural Areas	2003 – 2007
Strategies for Coping with Systemic Risks	2005 – 2011
From Knowledge to Action – New Paths to Sustainable Consumption	2008 – 2011
Social Dimensions of Climate Protection and Climate Change	2010 – 2013
	<b>29 collaborative research groups and 9 individual projects</b>
<b><i>Funding Measures</i></b>	
Infrastructure Funding Phases I and II	2001 – 2011 <b>20 individual projects</b>
Training Junior Researchers Funding Phases I and II	2002 – 2013 <b>11 collaborative research groups and 10 individual projects</b>

<sup>2</sup> Information on the project can be obtained at <http://www.sozial-oekologische-forschung.org/index.php>

## 2 Social-Ecological Research – Transdisciplinarity as a Mode of Research

The challenges arising from the need for fundamental societal transformations do not only concern knowledge; they also involve value conflicts. Examples of these include issue of the resilience and transformation capacity of the economy and society, the question of the responsibility and competence of various social actors, the importance of existing gender relations, and the democratization of social processes. Societal problems, in which contested knowledge and strong disagreement on values are both present, play a central role in the social-ecological research approach. To solve such problems system-knowledge of the processes which led to the problem and which could negatively affect future developments is necessary. At the same time, orientation-knowledge is required which allows actors to decide which goals and purposes can be justified. Finally, transformation-knowledge is needed in order to be able to change framework conditions in a way that leads to the goals desired.

Because of the link between knowledge and value questions a strong orientation toward practice and application is essential to social-ecological research. Targeted societal actors must participate in the production of the knowledge needed to shape the approaching fundamental transformation processes in order that such transformations are effective in practice. The joint formulation of social problems and related research needs by science and society is the first step in this process. This first step should be followed by appropriate formats for participation in the research processes that follow and in the transfer of the knowledge generated by the processes. Societal actors should be involved in such processes as knowledge-bearers and as equal partners, and won over for the transfer of the research findings into practice. This time-consuming kind of social participation in the research process differs from round table or mediation procedures. Participation in social-ecological research is not just for the pacification of social conflicts. Rather, it means participation in the understanding and shaping of transformation processes.

Transdisciplinary research's most innovative aspect is its use of integration. It is consistently applied – from the formulation of the problem, through the combining of disciplinary methods, to the implementation of the results in both society and science. From this perspective transdisciplinary research does not stand opposed to disciplinary excellence. Rather, transdisciplinary research builds on and extends the traditional quality standards by including questions of interdisciplinary integration and societal relevance. Transdisciplinary research thus differs from disciplinary, interdisciplinary and applied research.

### 3 Social-Ecological Research Topic Fields

The topics studied by social-ecological research in its first phase were characterized, on the one hand, by an explicit and programmatic link between the natural and social sciences (for example, in the funding program, “Social Dimensions of Climate Protection and Climate Change”). On the other hand, funding priorities were focused directly on issues of sustainability in everyday life (such as the funding program, “From Knowledge to Action – New Paths toward Sustainable Consumption”) and the connection between everyday life and supply systems (as in “Transition Management for a Sustainable Water Management”). Here the economic sciences were continually involved in the studies. In fact, the economic sciences were temporarily funded in their own program, Economics for Sustainability (WIN, in the German acronym), whose research questions would later be taken up during the further development of the *SOEF* program. Furthermore, one can find social-ecological issues being inputted in the meantime into other *BMBF* programs (for example “Integrated Water Resources Management” or “Sustainable Land Management”).

The topic fields presented in the following are particular worthy of funding during a new *SOEF* funding period. Not only do they plug into the already existing social-ecological knowledge base perfectly but they also address issues that, in the context of transdisciplinary research for sustainable development, point to the future.

#### 3.1 Co-Transformation of Social-Ecological Supply Systems

Social-ecological supply systems satisfy basic needs such as water and energy, mobility, food and health. The resilience of our society is largely determined by these systems, systems now caught up in transformation processes. In order that these systems can continue to fulfill their role of supplying goods in sufficient amount and quality in the future they must be made sustainable. The prerequisite for this is an analysis of numerous networked processes in their interaction. These so-called co-transformations have both a material-technical side and a societal-cultural side, and take place on different spatial, temporal and social scales.

#### 3.2 Risk Assessment and Preventive Orientation in Sustainable Innovation

The conventional form of risk assessment assumes that the effects of the technologies, materials or actions to be assessed are known. In the case of innovations, however, there is often a great deal of uncertainty as far as risk assessment is concerned. In this context it is necessary to research the role that the precautionary principle can play in the transformation to a sustainable society. Here it is above all a matter of developing preventive practices in various areas of societal action and of considering the question of how to deal with uncertainty and non-knowledge.

#### 3.3 Social-Ecological Transformations of Consumption Patterns

Despite high environmental awareness and demands for socially responsible and ecologically produced products in recent years there has been no clear trend toward sustainable consumption patterns. Economic studies involving consumers from socially disadvantaged sections of the population in particular could provide critical information in this respect. In addition, research is needed on barriers to sustainable innovation (so-called “transformation blocks”), on information deficits, and on

market penetration and the use of sustainable products. The development of education concepts for sustainable consumption patterns is also needed.

### **3.4 Biodiversity and Ecosystem Services in Social-Ecological Systems**

Transformations in social-ecological systems for supplying food and energy are closely linked to maintenance and change in biodiversity and related ecosystem services. Here the focus is on interactions among land use, demographic changes (shrinking and growing populations, migration), changes in the management of ecosystems and biodiversity conservation measures. In this context the need arises for transformation strategies that cover multiple supply systems comprehensively – specifically, strategies that take into account the need for comprehensible business cycles, a better coupling of animal and plant production, as well as synergies between sustainable use and the protection of biodiversity. Of particular importance here are global relationships and regional effects.

### **3.5 Transformation of Urban Space**

Increasing urbanization is major driver of energy demand. In order to achieve a sustainable transformation of society concepts for a climate-friendly urbanization must be developed and implemented. This includes both the conversion of existing urban areas as well as new urban construction. This also requires the development of a new conceptual basis that goes beyond purely technical approaches. Moreover, cities can serve as “real world laboratories” for society wide developments, with the knowledge gained from projects being “scaled up” for use society wide. In particular focus here are urban-rural relationships with their specific interdependencies in terms of sustainability (mobility, residential development, jobs location, etc.).

### **3.6 Decoupling of Economic Development Dynamics from the Growth Paradigm**

The current crises are also a consequence of the forced and unsustainable growth of recent decades. Taking growth in the gross domestic product (GDP) as the sole measure of growth in welfare is being called into question more and more. Future oriented strategies are called for. The goal is to study how – outside the paradigm of growth – a greater independence, stability and resilience can be achieved within the economy and society, while at the same time preserving the quality of life of different population groups, or even improving it.

### **3.7 Businesses within Social-Ecological Transformation**

Businesses play a central role in economic and social change. First, as market actors they shape production and consumption patterns. And second, they act on the social and political process as political agents; and, indeed, they do so globally. Research is needed to better understand entrepreneurial and value creation processes in order to identify starting points and success criteria for social-ecological transformations.

### **3.8 Democracy in Transformation**

The transformation to a sustainable society is a crosscutting set of issues and raises new demands in relation to political culture, which, given higher general levels of education, global media and interactive communication technologies, is itself taking on new forms. In response to these new demands



new approaches to democratic decision-making are needed, including new forms of legitimizing decisions, improved forms of direct involvement on the part of those affected by decisions and a new contract between science and a society characterized by pluralization and individualization. In this context it is necessary to explore new methods for a democratically legitimated transfer of knowledge.

### 3.9 Gender and Environment

Gender relations determine to a great degree how society regulates and symbolizes its relations to nature. At the same time they are continually reproduced (or transformed) in interactions within social situations. Both views of gender relations are relevant in order to understand how to provide for an operationalization of gender relations as a cross-cutting issue within social-ecological research. The transdisciplinary integration of scientific and everyday knowledge makes it possible to bring together the categories of everyday practice, gender and needs.

## 4 Funding and Strengthening Social-Ecological Research

Content and infrastructure cannot be separated in social-ecological research. Therefore, to strengthen social-ecological research substantively requires targeted structural development of all sectors of the science system. This means that creating instruments targeted to infrastructure development is one of the central tasks of a sustainable development related science and research policy. Here not only is action on the part of the *BMBF* required. Individual science foundations and the *DFG* (German Research Foundation) must also participate. The *SOEF*'s already established scientific skills and institutional capacities must be expanded in the direction of capacity development. This applies to the training of junior researchers, the anchoring of social-ecological research in universities, the funding of non-university research institutes as well as better cooperation and increased ease of movement between these areas. This requires the creation of new funding instruments and the further development of existing ones. The development of such instruments should be oriented toward the following basic requirements:

- *Anchor core profile:* Social-ecological research is more than a funding priority. It combines a transdisciplinary research mode with a new analytical approach to understanding, evaluating and shaping societal problems. Social-ecological research can therefore function as an effective link between basic research and very concrete issues of application. However, to achieve this the search for reliable knowledge must be linked to normative models, and to divergent values, attitudes and preferences, in a manner that is practical for research and relevant to society. This core profile of social-ecological research is not recognized clearly enough by funding and research institutions. As a result relevant courses are offered at too few institutions of higher education.
- *Strengthen structure building:* Interdisciplinary, department-spanning research structures must be supported and the anchoring of social-ecological content in academic teaching needs to be promoted. Developments must be strengthened at institutions of higher education and publicly funded research institutes which do not just provide departmental or disciplinary basic training but also take into account the experience of transdisciplinary researchers within the natural, engineering and social sciences, and the humanities. Non-university institutions not funded by federal-state initiatives have been the driving force behind the development of the conceptual basis of the funding priority, the methods and research approaches of *SOEF* and the implementation of

research results into practice. Such independent research institutes will also be important in the future for the further development of this basis. They should therefore be strengthened by receiving a base funding on the model of the funding of the Fraunhofer Society institutes.

- *Enable interdisciplinary and transdisciplinary career paths:* The funding instrument for training junior researchers by financing junior research groups must be further developed and supplemented by BA and MA programs, as well as by the establishment of social-ecological professorships. This will, among other things, support the establishment and long-term stabilization of interdisciplinary and transdisciplinary training structures and career opportunities.
- *Promote cross-sectoral networking and cooperation:* Research constellations that span disciplines and different science sectors still face major substantive and institutional barriers in conducting their research practice. They should therefore be more strongly supported, both substantively and structurally. International networking and connectivity should be strengthened by supporting social-ecological research in international research programs and partnerships – above all in the EU. Analogous to disciplinary associations, a social-ecological scientific community is in the process of creation. This process should be systematically supported.

Although *SOEF* as a research funding concept cannot address all these issues directly crucial decisions must be made now. With this in mind the following proposals for concrete measures in two funding areas during the next *SOEF* funding period are made:

### **Funding Area Collaborative Research**

- Funding of transdisciplinary collaborative research projects studying the topics noted above; the extra effort required by the necessary participation of societal practice partners should be financially supported.
- Funding of learning and experimental projects – with sufficient time and resource budgets.
- Funding of projects that are dedicated to the development of conceptual, theoretical and methodological foundations, as well as to strengthening the sustainability research quality standards.

### **Funding Area Structure Building Measures**

- Funding of long-term structure building measures at universities, for example, for establishing interdisciplinary faculties and graduate schools or for initiating transdisciplinary project-oriented curricula.
- Funding structure building activities in the areas of research and training for institutes not receiving base funding, with a focus on the stabilization of long-term lines of research, the development of methods and knowledge transfer.
- Funding of junior research groups and a structured doctoral program within a framework of collaborative projects, as well as fixed-term research fellowships and doctoral research projects.
- Funding of transdisciplinary post-doctoral positions and the establishment of temporary social-ecological professorships (pilot projects).
- Funding of visiting fellowships for scientists as well as for societal actors at social-ecological research institutions.
- Development of flexible funding instruments appropriate to transdisciplinary modes of research as an important prerequisite for promoting particularly innovative research approaches and topics.

- Funding of a research center for transdisciplinary sustainability research and teaching.
- Support for participation by German research institutions in international research networks, especially within the EU Framework Programs.
- Support for networking activities in social-ecological research, including by initiating field specific conferences and journals.

Moreover, in principle an attempt should be made to incorporate social-ecological research with its particular combination of transformation research and transformative research in other *BMBF* programs (such as top cluster funding, E-mobility research and networks in energy research).

## 5 Conclusion

Social-ecological research has already influenced the science system and has highlighted the importance of transdisciplinary research. It is gradually entering into all phases of university teaching and is a stimulus for national and international research networks studying broad, comprehensive topics. The call for transdisciplinary, science-as-it-is challenging research that is at the same time practically relevant to a transformation toward sustainable development is becoming louder and louder. In this context, the important scientific innovations in research and teaching that are occurring are taking place in the practice of social-ecological research. And this means the role of social-ecological research will become even more important in the future.

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