

de permettre une mobilisation de l'expertise, un questionnement nouveau dont la fraîcheur permet de sortir du trop traditionnel « débats d'experts ». Son but ultime n'est pas d'arriver à une « meilleure solution » mais de contribuer à ce que les éléments majeurs de la controverse passent dans la société ». En définissant de manière large l'acceptable, les problèmes environnementaux et les risques qui leur sont associés seraient mieux perçus, compris et donc sources de moins de peur et d'inquiétudes. On se dirige vers une nouvelle appréhension des problèmes d'environnement où chacun des acteurs, scientifique, expert, société participent à leur compréhension voire définition. Cette journée même si elle n'a pas fait le tour de la question soulevée au début, aura le mérite d'avoir contribué à mettre en valeur la nécessité de cette démarche.

Cependant pour conclure, nous aimerions émettre deux critiques à l'encontre de ce colloque. Malgré la richesse de ce débat, on a pu y observer deux lacunes. La première est celle de la faible représentation des sciences humaines, ce qu'on appelle vulgairement les sciences molles. Tout apparaît comme si ces sciences n'avaient pas droit d'expression que ce soit dans le cercle des sciences ou celui de l'expertise. Pourtant, l'homme est au cœur des problèmes d'environnement. Enfin la deuxième lacune est celle du côté franco-français de ce colloque. Pas de scientifiques, ni d'experts étrangers, ne serait-ce qu'européens. Un tel débat aurait mérité de dépasser les frontières de l'hexagone, tant les problèmes d'environnement se manifestent à l'échelle planétaire. Gageons que cette journée n'était qu'une étape, et laissera place à d'autres.

## Social-ecological research – Conceptual framework for a new funding policy

### Synopsis of the Report for the German Federal Ministry of Education and Research

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### Why is a new direction in research funding policy needed?

Social-ecological research has, over the last few years, developed into a new, interdisciplinary and integrative research perspective. This has taken place in reaction to deficits in previous, discipline-bound environmental research, and to environmental policies that tend to be comprised of unrelated individual measures. While previous forms of research have assumed that there are such things as individual environmental problems, to which supposedly there are corresponding isolated solutions, social-ecological research analyzes holistically and systemically organized clusters of social-ecological problems. It investigates the complex patterns of relations existing among human beings, society and nature, as well as the possibility of their transformation. It takes into account the diverse set of factors – biological, chemical/physical, climatic, economic and social-political – that together continually affect the relationship between nature and society. And it begins with the changes that are currently taking place in all these factors when it seeks paths towards a sustainable development.

The complex patterns of relations existing among human beings, society and nature, structuring social-ecological problem clusters, are marked by conflicts. These conflicts have been the subject of public discussion for the last two decades. The evaluation of these conflicts, as well as proposed or practiced solution strategies, are politically controversial. A dynamically developing political field of action and discourse, with many different social actors and speakers – ecology movements, environmental organizations, government agencies, and so on – has taken shape. This is also a field of scientific activity.

The *scientific task* consists in linking the results of the natural and social sciences in the area of environmental research, which still remain for the most part disconnected, and then integrating them, both theoretically and methodologically, in sets of practical goals.

“Social ecology is the science that studies the relationships between people and their natural and social environment. Social-ecological research probes the existing forms of these relationships, and the possibility of transforming them, by means of a perspective that is not bound to any one discipline. The goal of this research is to generate knowledge that can serve as a resource for social actors, increasing their capacity to guarantee the reproduction and development of their society and the natural conditions of their lives.”

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This task cannot avoid current political and social development. It has been demonstrated over the years that environmental policy can only be carried out in a sustainable manner when what is needed to be done is seen in its relations of interaction to all other fields of policy (i.e., economic, social, transportation, research and technology policies). These diverse relations of interaction are the starting point of social-ecological research – practically, methodologically and theoretically.

## Societal context

Over the last three decades, the perception, understanding and evaluation of environmental problems has changed dramatically. If at first it was a question of dangers to local biotopes – land, water, air – later more complex patterns of damage – dying forests, damage to the ozone layer, green house effect – became the center of attention and of public action. The causes, however, of environmental problems were still seen to lie in isolated factors – traffic, industry, agriculture. Correspondingly, only isolated solutions were discussed and adopted.

This kind of problem solving can lead to new problems. The "tall smokestacks along the Rhine" are a classical example of the spatial displacement of local environmental problems, with the ecology tax being a more current one. It has become clear that such measures, even where they more or less achieve their stated purpose, lead to undesired consequences and side effects in other areas of society and the environment. For this reason, we can speak of *second-order* problems, which arise from apparently successful solutions to societal or ecological first-order problems.

Moreover, political disagreements arise, motivated by divergent goals (e.g., protecting the environment vs. protecting jobs; satisfying consumer wishes vs. avoiding refuse). Current and long-term consequences of environmental changes, therefore, must be viewed in the context of inter-societal conflicts. And the more so when it comes to changes that alter life in (industrial) societies globally, as can be observed in the case of the complex clusters of factors named by such buzzwords as information society, "computer revolution," structural unemployment, globalization of markets, and development of take-off countries.

From this we can conclude that, for practical reasons alone, what is needed instead of single issue oriented solutions is an integrative problem solving strategy. Here it is a question of bringing about goal-oriented changes within *patterns of relations between society and nature* that have become problematic in a complex and dynamic way. Social-ecological transformations can be driven forward either by means of evolutionary processes that are almost entirely closed to intentional direction (such as the process of globalization or the changes due to the introduction of informational technology) or by means of the deliberate introduction of innovations. But if these innovations are not introduced in connection with real societal developments they will hardly be sustainable. It is a

question, then, of influencing processes through the deliberate introduction of innovations in such a way that they remain within a "corridor" of sustainable development. Then opportunities for new developments can be seized – assuming social acceptance and political majorities can be won for them.

## The scientific challenge

Environmental research within the natural sciences has traditionally viewed environmental problems as disturbances among natural processes. Now, however, they have begun increasingly to include anthropogenic eco-systems in their research. With this they have become more open to perspectives drawn from the social sciences and economics. However, a theoretically and methodologically convincing integration has in many cases not yet been achieved.

At the same time, numerous forms of environmental research within the social sciences have taken shape. Here, socially caused changes in natural relationships are investigated from the perspective of the different social sciences. This has led to the emergence of different environment-oriented sub-disciplines: environmental law, environmental economics, environmental policy, and so on. However, researchers in the social sciences rarely cooperate with those in the natural sciences.

Since the 1980's several innovative research directions have been developed in Germany ("applied ecology," "integrative environmental research," etc.), above all in independent research institutes outside the universities. These institutes have often developed in a close relationship to citizens' initiatives and/or environmental policy agencies. Out of this complex background, and in cooperation with researchers in the natural sciences working on environmental issues and/or those in the social sciences working on similar problems, the core of what has come to be called social-ecological research has been developed.

What the different approaches within social-ecological research share in common is the fundamental belief that environmental problems must be grasped as (complex) societal problems that can neither be understood nor dealt with without the aid of well-founded analyses drawn from the social sciences. Here, too, it is a case of interaction: the manner of viewing problems in the social sciences is broadened to include an ecological perspective, while the way of seeing problems in the ecological/natural sciences is widened by adding a social scientific point of view (*figure 1*). A defining characteristic of this approach to research is the notion of *integration*: the attempt to bring together methods and stocks of knowledge from the natural sciences, technical fields, economics and the social sciences.

At the center of social-ecological research, therefore, one finds a complex manner of posing issues: the interactions occurring among human beings, society and environment should be put to use in pursuit of goals aimed at enabling and encouraging sustainable development. It is not that this manner of

seeing things is unknown within the field of research, but only, so far, in an uncoordinated manner within scattered projects; and often, in addition, treated as marginal topic.

In order to establish a framework for orienting sustainable development, we have to know how the ecological, economical, social, and political dimensions of development can be integrated. This is a matter of constructing models in which the diverse interactions, consequences and side effects of existing and proposed transformations can be represented and conceptualized. Here it is a question of constructing not only "scientific" models but also models of the forms of communication, negotiation and mutual influence used by existing social actors.

Whenever it is a matter of shaping the conditions of practical action, then, divergent interests must be reconciled, while at the same time scientific knowledge must be linked to the everyday practical experience of different social actors in their respective social-cultural contexts.

Whenever it is a matter of shaping technical solutions, then these must be embedded in social structures and in the social and ecological consequences of technical innovations.

Whenever it is a matter of the production and ordering of new knowledge, then data, methods and theories drawn from the various natural sciences, technical disciplines and social sciences must be integrated.

The question of how such integration processes can be introduced and stabilized stands at the center of funding for social-ecological research.

## Areas and goals of funding

Social-ecological problem clusters are being examined in their individual aspects by numerous disciplines, using very heterogeneous methods, concepts and modes of modelling. These heterogeneous research activities form the scientific context of social-ecological research. At the same time, it refers to all-embracing social and ecological contexts, to spatial-temporal structures that range from the local to the global level, and which also include long-term temporal perspectives (as in the case, for example, of climate changes).

Social-ecological research is a comparatively new direction within research. As a result, to the extent that the research "infrastructure" necessary for such a complex, integrative approach is there at all, it is so only in an undeveloped form. In addition, there is a lack of young researchers entering the field, endangering future development. Investment in both infrastructure and support for young scientists is therefore necessary.

This is the justification for a new direction in funding policy called, "social-ecological research."

Such a new policy has the following goals:

– An increase in society's ability to act in the face of new, difficult to understand clusters of social-ecological problems by creating a new knowledge base. The emphasis must, accordingly, lie on research oriented

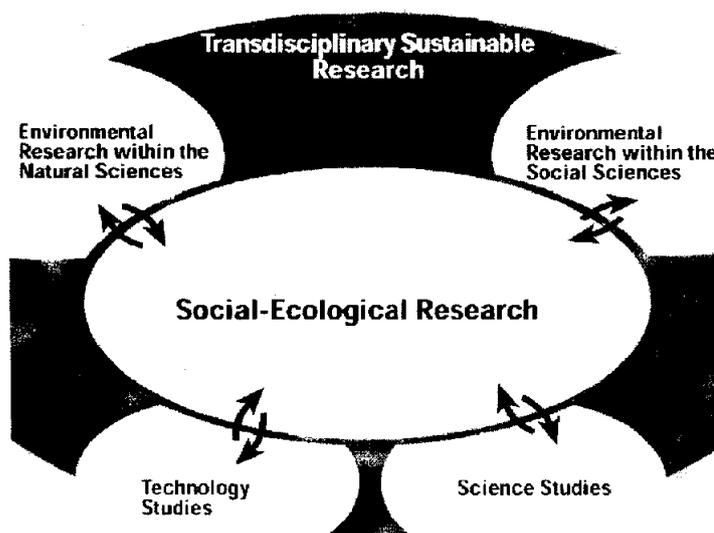


Figure 1. Social-ecological research in the context of transdisciplinary sustainability research.

towards transformative action and its corresponding social actors.

- The expansion and qualitative development of research capacities in selected social-ecological problem clusters and areas of conflict by funding specific projects.
- The safeguarding and strengthening of already existing research facilities with a potential for integrated environmental research through capacity building projects on research infrastructure and communication facilities serving already existing institutions. Here the emphasis should be on non-governmental, independent research institutions that can be seen as the "third sector" of environmental and sustainability research.
- The development, and long-term safeguarding, of research capacities by investing in the development of young researchers in all sectors of sustainability research and integrated environmental research. Here the emphasis should be on higher education.

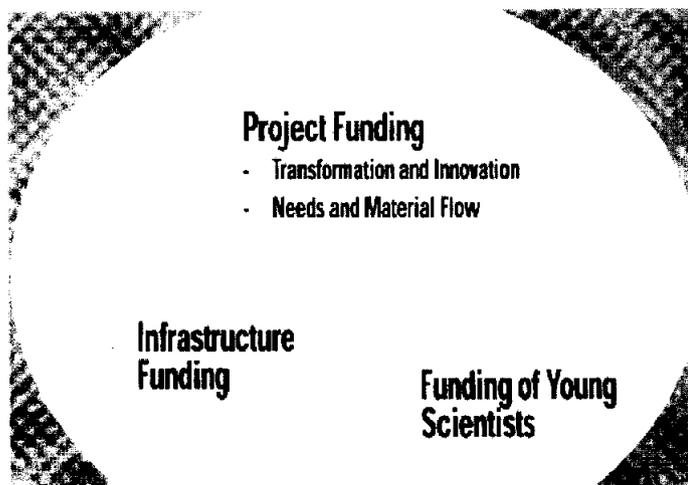


Figure 2. Funding areas.

This new direction in funding can be divided into three areas: project funding, infrastructure funding and funding of young scientists (figure 2).

### Project funding

Funding should be made in two general project areas with the emphasis on:

- Social-ecological transformations and social innovations. Here it is a matter of investigating current changes in the relationship, nature-society, in order to determine what potential there is for moving in the direction of sustainable development.
- Societal needs and flows of materials, energy and information. Here it is a matter of investigating transformations in (global and local) social-economic processes, since these also contain potentials for sustainable development.

### Infrastructure funding

There are in Germany a considerable number of small, independent research institutes possessing the competencies needed, particularly in the area of integration. These can be strengthened by investments in infrastructure aimed at supporting exchange programs (e.g., guest scientist programs, international exchanges, etc.), knowledge management, method development and knowledge transfers.

### Funding of young scientists

In order to strengthen the development of future researchers in the field of social-ecological research, interdisciplinary groups of young researchers should be supported at institutions of higher education, and a prize awarded for outstanding performance in the area of social-ecological research in connection with degree theses and dissertations.

## Topic areas and problem dimensions

The topic areas emphasized, and the structure of these areas, are determined by the concentration of research on the interaction between the natural and social conditions of life used (and, at the same time, endangered) by human beings and the (prevailing) patterns of societal action.

The abundance of individual topics currently being researched, which are nearly impossible to keep track of, requires, if this knowledge is to be put to use in a sustainable way, models of integration. Additive data banks cannot do the job, for it is a question of interactions. Nor is it enough to "widen" research in the natural sciences by adding a social scientific dimension (or vice versa). Social needs and attitudes have immediate effects where it is a question of flows of materials and energy, the traditional field study of environmental research and management. And the opposite is

also true: changes in the streams of materials, energy and information play a decisive (and not yet sufficiently investigated) role for processes of social change and their prognosis, the field of study of social science oriented environmental research. An environmental management receiving only technical, natural scientific advice must remain blind, for it fails to include social processes of transformation; and the management of social conflicts will not be able to go beyond appeals ("tighten your belts"), so long as it conceptualizes changes in flows of materials, energy and above all information as nothing more than "externalities."

Two general topic areas serve as the starting point for constructing routes leading to a problem oriented integration of research approaches that have so far been isolated from one another. This integrated approach will enable and encourage forms of sustainable environmental policy and action that are actor and group oriented.

### Topic area 1: social-ecological transformation and social innovation

Processes of change at the local, regional and global level can be described as a form of social-ecological transformation. The economic, technical, social and ecological processes woven together within these transformations have so far been described only sketchily within the sciences; their connections and interactions barely conceptualized. One can see this in particular in the difficulties faced in anticipating the possible social-ecological conflicts connected with foreseeable innovation waves, e.g., in the areas of communication or health.

It is this (still present) blindness that explains why government intervention has only a limited effect steering social-ecological transformation processes. Social regulation of such transformation processes is only possible in association with comprehensive decision-making and learning processes that draw in a diversity of social actors. Social-ecological research can make a contribution here by investigating the middle- and long-term consequences of such regulation, and in this way increasing the reflexive capability of social decision-making processes, while encouraging self-organization.

Technical-material structures such as transportation systems, supply systems, waste disposal systems or information and communication networks have a decisive effect on the practical possibilities of regulating society's relations to nature. Existing infrastructure systems contribute massively to the pollution of the environment; at the same time they are reaching the limits of social acceptance and of the capacity of governments to finance them. At present, reforms are taking place exclusively at the economic and institutional levels ("privatization").

Social-ecological research seeks to investigate how infrastructure systems shape in advance the possibilities of reforming society's relation to nature, and how these systems themselves can be reformed in accordance with criteria of sustainability.

## Topic area 2: social needs and material, energy and information flows

The analysis and management of material flows with the aim of reducing these are classic themes of environmental research. However, even the functional relationship between material flows and energy needs has barely been researched. Individual and group needs, and the forms of meeting and satisfying these found in society (consumption patterns, lifestyles, etc.), shape the nature and extent of environmental problems. They influence the intensity and spatial-temporal course of the flow of material, energy and information.

The needs of men and women, of the young and the elderly, as well as those of people from different milieus and with different lifestyles, are not the same. From this it follows that their "mode of exploiting nature," in particular their "consumption" of materials, energy and information, is different. Until now these different needs have been given appropriate consideration neither within economic approaches to material flows management, nor in the voluntary agreements reached between business and government. For this reason socially and culturally differentiated concepts of need must be developed for the management of material flows.

From the abundance of possible problem dimensions three in particular will be considered when working on individual topics within the two topic areas (figure 3):

### Problem dimension A: central problems and methodology development

In social-ecological research projects a well-founded understanding of the dynamic character of the complex system, human beings-nature, must be developed. As a part of this, viable methods of interdisciplinary cooperation must be included.

Until now, implicitly or explicitly, a model has been worked with in doing environmental research that begins by defining problems and their possible solutions in terms of the natural sciences, and then seeks to bring in the economic and social sciences when it is a matter of, respectively, the economic optimization of solutions or the pursuit of social acceptance. However, if we begin by assuming a need for all four of the "pillars" of sustainability (ecology, society, economy and government), then such a procedure shows itself to be inappropriate.

What is necessary is, on the one hand, the development and testing of new models of transdisciplinary research related to specific subject matters, and, on the other, a theoretical analysis and classification of these models.

### Problem dimension B: implementation problems and relation to practical issues

Social-ecological research aims at increasing the capability of social actors to take action, and in this way contributes to a sustainable development.

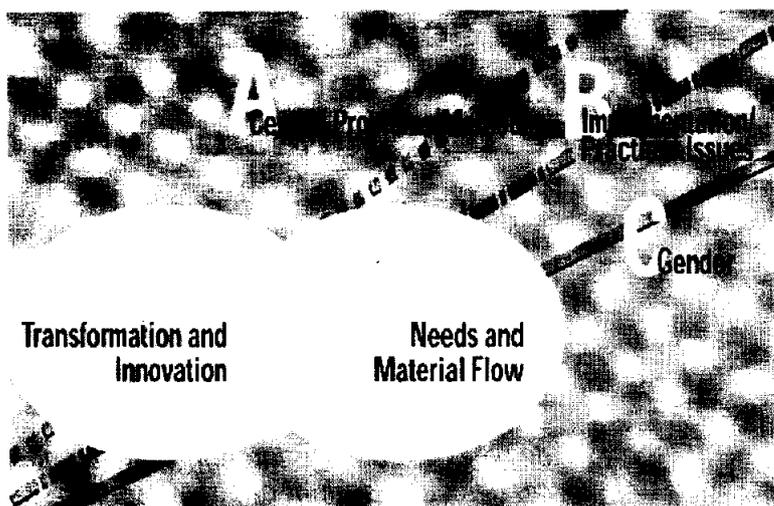


Figure 3. Topic areas and problem dimensions.

Scientifically produced knowledge must be transferred to patterns of practical action. Methods that have already been developed to accomplish this, as well as the problems associated with these, will be worked on within the individual projects, as well as separately.

The linking of research and practical implementation (e.g., within industrial workplaces) is based on an analysis of the political, social, economic and technical conditions of intervention and reform. Here, a central dimension of research includes democratic forms of regulation and the possibilities for participation of different actors. Individuals and groups dealing with practical issues who can act as partners for social-ecological research include: businesses, social or political institutions, social and environmental organizations, citizens' initiative and grassroots groups such as development policy groups and North-South groups.

### Problem dimension C: gender and environment

Social and cultural differences form a large "blind spot" within environmental research. Current changes in gender relations are an essential factor for processes of social transformation, which in turn are decisive for a sustainable environmental policy. Gender differences, considered as a fundamental structuring factor of the social world, have until now only been taken up and reflected upon in a sketchy way within environmental research. It is to be assumed, however, that every ecological problem, with respect to its social dimension, involves gender relations. For this reason, gender relations form a central problem dimension for social-ecological research. This dimension gains even more significance in that perception of gender specific asymmetries has meant that gender differences have become a paradigm case of social inequality. Therefore, gender differences open a perspective on possibilities of linking up with other characterizing differences; such as age, ethnic identity, social background, disabilities, etc.