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Social-Ecological Research – a new mode of knowledge

“Social ecology is the science that studies the relationship 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.”

Introduction

Since the eighties a new type of research has emerged in Germany mostly in opposition and to some extent complementary to mainstream academia. We call it *Social-Ecological Research*. By now the field is stabilized to some extent, and a new funding policy of the German federal government will strengthen interdisciplinary research groups and establish a new knowledge base for policy, regulation and management of social-ecological problems. The evolution of this field of research is a good example for the conflicting interactions inside science and between science and politics, acted out by different groups of experts, counterexperts and laymen in arenas of discourse.

Social-Ecological Research is still a science in *status nascendi*. It has

- a genuine *subject*: the relationships between human beings and their natural and social environment – in other words: complex social-ecological systems,
- a genuine scientific *problematic*: a) the regulation and transformation of societal relationships to nature and b) the problem-oriented integration of commitments and interests, patterns of action, problem-perception, and forms of knowledge of different actors.

- a genuine *purpose*: generate new knowledge that can serve as a source for social actors, increasing their capacity to guarantee the reproduction and development of their society and the natural conditions of life.
- a broad spectrum of *methods*: problem and systems analysis, life-cycle analysis.

From the viewpoint of Social-Ecology a knowledge society can be justified only if the societal development follows a sustainable path in the social, economic and ecological dimension. Sustainability therefore builds up a frame of reference for both the knowledge society and for Social-Ecology. In short words: social-ecological-research tries to improve the knowledge base for a sustainable knowledge society. But for an understanding of this new type of knowledge we need some information about its social and scientific context.

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 – finally became the center of attention and 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 for the spatial displacement of local environmental problems, the ecology tax being a more current one. It has become clear that such measures lead to undesired consequences and side effects in other areas of society and the environment - even where they more or

less achieve their stated purpose. For this reason, we can speak of *second-order problems*, which arise from apparently successful solutions to societal or ecological *first-order problems*. Second-order problems move more and more into the center of awareness within social-ecological research.

Moreover, political disagreements arise, motivated by divergent goals (like protecting the environment vs. protecting jobs; satisfying consumer wishes vs. avoiding waste and trash). Current and long-term consequences of environmental changes, therefore, must be viewed in the context of inter-societal conflicts. And even more, when it comes to global changes produced by complex clusters of factors - named by such buzzwords as knowledge society, computer revolution, networking, structural unemployment or globalization of markets.

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* – based on solid and robust knowledge. But how can we gain this new mode of knowledge?

The scientific context

Environmental research within the natural sciences has traditionally viewed environmental problems as perturbations of natural systems and processes. Now, however, they have begun increasingly to include anthropogenic eco-systems (like agriculture systems) into 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 in Germany several innovative research directions have been developed ("applied ecology," "integrative environmental research," etc.) - above all in independent research institutes outside the universities. Partly in the role of counter-experts these institutes have often developed in a close relationship to citizens' initiatives or environmental policy agencies. Out of this complex background, the core of what has come to be called *social-ecological research* has evolved. From the early beginning a cooperation with researchers in the natural sciences working on environmental issues and those in the social sciences working on similar problems was crucial for the increasing recognition of social ecology within academia.

What the different approaches within social-ecological research share in common is the fundamental assumption that environmental problems must be grasped as (complex) societal caused problems which can neither be understood nor dealt 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 within the social sciences is broadened by including an ecological perspective, while the way of seeing problems in the natural sciences is widened by adding a social scientific point of view. 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.

Public awareness, scientific understanding and the structure of human economic activity have evolved considerably in the last 25 years. Policies and approaches that were accepted as adequate then are now obsolete. „The relationship between fundamental natural systems and human cultural, technological, and economic systems is increasingly recognized as far more complex and profound than allowed for the initial, naive policy responses. Environmental perturbations such as global climate change, loss of habitat and biodiversity, and degradation of soil, water and air resources are not mitigated by localized clean-up mandates. Rather, they arise from intimate networks of connections between two sets of complex systems, those predominately natural and predominately human.

Human and natural systems have co-evolved not for 25 years, or even in the centuries since the beginning of the Industrial Revolution, but for thousands of years. At this point, they are profoundly interwoven, even though we continue to treat them as separate systems for reasons of disciplinary boundaries, academic convenience, or psychology.“(Allenby 1999: XI)

Social Ecology investigates the complex patterns of relations existing among human beings, society and nature, as well as the possibility of their *transformation*. The dynamic of the strongly coupled complex natural and human systems leads to organized *clusters of social-ecological* problems. They are affected by diverse sets of factors – physical chemical, biological, climatic, economic, cultural, political. And all this factors are changing in different ways. In this jungle of complex phenomena the researcher has to find out 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 – environmental activists, citizens initiatives, government agencies, and so on – has taken shape. This is also a field of scientific activity.

But the central *scientific task* arises from the necessity to understand in a comprehensive manner the dynamic of strongly coupled natural and human systems. Therefore in social-ecological research the results of different natural and social sciences must be linked. But in the area of environmental research they still remain for the most part disconnected. Integrating them, both theoretically and methodologically referring to practical goals is the central challenge. 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. These diverse relations of interaction are the starting point of social-ecological research – practically, methodologically and theoretically.

Problems of integration shape the methodological core problems of social-ecological research:

- 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.

A new knowledge base for the sustainable knowledge society

With the term *knowledge society* we describe a perspective of social and economic change. From the point of view of Social-Ecology a knowledge society can be justified only if the societal development follows a sustainable path in the social, economic and ecological dimension. That means: The potential for reproduction and development of society must be preserved and the natural and societal conditions of life for the present and future generations have to be maintained. Sustainability proves to be a paradox concept: How must societies *change* in order to *preserve* itself? We have to enlarge the view of a knowledge society by the normative, analytic and strategic ideas of sustainability. On the normative level the issue is *justice and equity*. Unjust societies cannot develop in a sustainable way.

A sustainable knowledge society needs a new knowledge base: Knowledge about justified goals, knowledge about the functioning and dynamics of complex systems, knowledge about the capacities and possibilities for action in behalf of sustainable development. This knowledge facilitates the integration of social, economic and ecological aspects of problems, ideas and solutions on a normative, analytic and strategic level. The interconnection between past, present and future on the one hand, the interrelations between natural and human systems on the other creates the hard core of a challenging scientific problematic beyond the academic disciplines. Social-ecological research claims to tackle this problematic.

A sustainable knowledge society would be a society which disposes the adequate amount of knowledge – adequate in terms of shaping and regulating societies' relationships to nature in an intelligent and conscious way. It is immediately clear that the sciences there had to hold a key position. In spheres like production and consumption, traffic and mobility, agriculture and food, energy and water supply we need a problem oriented and context bounded knowledge for regulation, management and policy. The knowledge created by environmental research about the perturbations of natural systems by human activities is still necessary but not sufficient anymore. Good will and ecological concern are important. But for an intelligent regulation we need profound knowledge about the dynamic of strongly coupled non-linear social-ecological systems. This stock of knowledge as well as the entirety of technical, economic and political potentials and means must be used to remain in the long term on a path of sustainable development. A sustainable knowledge society is always a *learning society*, which uses their possibilities for self-organisation and *democratic participation* fully. There is no such a society yet – but even with a sceptical look – it is possible.

The different research groups operating in the field of environmental research within the natural and social sciences, the research on global change and sustainability, technology and sciences studies describe how the attempts to regulate societal relationships to nature fall short. As much as they are taking this problem seriously they will be faced by two difficult questions:

1. What does it mean to make relationships to the subject of scientific investigation?
2. How can we think about and conceptualize interactions which can neither be classified as natural nor as societal?

These questions stake out also the theoretical problematic of social ecology. The first question opens up the possibility and necessity of mathematical modelling,

because relations and things are two different pair of shoe. Relations turn into patterns, structures and configurations, which – at least generally spoken – can be represented as mathematical objects. A pattern may appear within itself, but a thing cannot possibly exist within its own interior. The second question leads in the mined area of transdisciplinary – including all hardships which occur when knowledge of natural and social science wants to be compounded.

Treating the problems of regulation and transformation of societal relationships to nature seriously, concepts and methods are shifting:

- from things toward relations,
- from substances toward functions,
- from structures toward processes,
- from linear causality toward the dynamics of complex systems,
- from weak coupled systems toward strong coupling,
- from context free knowledge towards context bounded knowledge,
- from discipline orientation towards problem orientation.

Through these shifts slowly a new mode of knowledge arises. I hope that way society's ability to act properly in the face of new and difficultly understandable clusters of social-ecological problems will increase also. If we want to know, to what extent this will really happen, we should observe carefully the dark side of the claimed knowledge society: the uncertainties and risks, the foolishness and ignorance, the dominating short-term thinking – and last but not least: the entanglement between knowledge and power. Perhaps we discover there an old friend: the good old capitalism in new clothes.