Institute for
Social-Ecological
Research (ISOE)

Thomas Jahn

Understanding Social-Ecological Systems: Frontier Research for Sustainable Development. Implications for European Research Policy

Presentation at the conference "sustainable development – a challenge for European research", 26–28 May 2009, Brussels

First of all I wish to thank the organisers of the conference and the scientific committee for giving me the opportunity to share with you some thoughts on the challenges the imperative of sustainable development poses for European research. In my talk I will focus on the question: Which mode of research is most adequate for dealing with the specific structure of sustainability problems and how can this mode of research best be advanced by European research policy?

To start with the first question: Which mode of research is most adequate? The term *frontier research* was introduced a few years ago by the high level expert group of the European Commission that proposed the constitution of the European Research Council. The group defined Frontier Research as research that overcomes the traditional distinction between basic and applied research. The idea was to more closely relate the generation of fundamentally new knowledge with the provision of knowledge that is useful for societal progress. I believe it is correct to say that Frontier Research might be thought of as research that transcends disciplinary boundaries by starting from the originality, timeliness or urgency of a problem and not from something which might be called 'the interior logic of disciplinary scientific progress'.

Given this definition we can say, to begin with, that research for sustainable development is frontier research by its very nature. Now, SDR has had high priority since at least FP 5 and is now an inherent part of the EU research policy language. However, although it has been frequently pointed out that strengthening frontier research is crucial for maintaining the capacity to shape a desirable future, our argument is that the reality of European research funding and research practice still lags behind this preambulary rhetoric, aside some significant progress made in the last two years. Reasons for this deficit are numerous and complex. They can be found in the only weakly adaptive structures of research organisation, in the traditionally divided research communities and in the lack of quality criteria and peers.

There is yet another reason which is rarely given appropriate attention but which to our mind is crucial as it points to a genuine scientific challenge. This challenge is making the understanding of *social-ecological systems* the core cognitive interest of a problem-oriented and not merely technology-oriented SDR. Before I briefly explain to you what we actually mean by this let me anticipate our main argument. In order to meet this challenge we need two things: First we need a conceptual framework within which social-ecological systems can be analysed appropriately, and, second, we need the realisation of a specific *transdisciplinary* mode of research.

Later in my talk I will try to define in some more detail what I mean by this. For the moment you can think of transdisciplinarity as an extension of the more common multi- or interdisciplinary modes of research. Now what all of these approaches have in common is that they aim for a problem-driven integration of knowledge and methods. But whereas in the multi- or interdis-

ciplinary approach this integration is about dealing with *scientific* questions at the interface of different disciplines, the transdisciplinary approach concerns itself with integration at the interface of these scientific questions and *societal* problems. To put it briefly: Transdisciplinarity encompasses multi- or interdisciplinarity by incorporating the societal context of both – scientific and societal problem-solving, with the aim of practical applications of the results.

To sum up this introduction with a slogan: Advancing frontier research for sustainable development first of all means advancing transdisciplinary research! However, as we see it, current EU research policy is not adequately positioned for enabling and enforcing transdisciplinarity. I therefore will end my talk by proposing corresponding adjustments of selected EU research funding structures.

It is meanwhile a commonplace to declare that scientific endeavour and the emergent industrial revolution made humans the most impacting species on the planet earth – Nobel Prize winning chemist Paul Crutzen introduced the term *Anthropocene* for this new geological epoch we have entered. It is yet also a simple fact that at the same time human societies and globally interdependent economies increasingly depend on ecosystem services and the sustainable maintenance of their functions. If we take the idea of the Anthropocene literally, then we must recognize that a new epistemic constellation has emerged: In this constellation it is impossible to understand nature *without* society, and society *without* nature, that is, we need to make coupled *social-ecological* systems the core object of research for sustainable development.

I already mentioned that analysing social-ecological systems demands an appropriate conceptual frame. In the past years quite a few efforts have been made toward this end. Within the stipulated time for my talk I can't give all of them proper consideration – you may find some more details and references in our paper. What most conceptions of social-ecological systems have in common is that they are understood as units in the real world of spatial-temporal phenomena. We, however, prefer to understand them as models of knowledge *about* real-world phenomena. With this conception of social-ecological systems we can distinguish three possible types of system elements: natural, social and hybrid entities. Now, defining a system as a social-ecological system means describing the topological structure and patterns of relations between the system's elements – where networks, feedback loops or causal chains are frequently used as concepts that characterise these kinds of relations and dynamics. It is worthwhile to note that the three system elements I mentioned roughly correspond to what the natural sciences, the social sciences and human respective social ecology regard as their areas of competence.

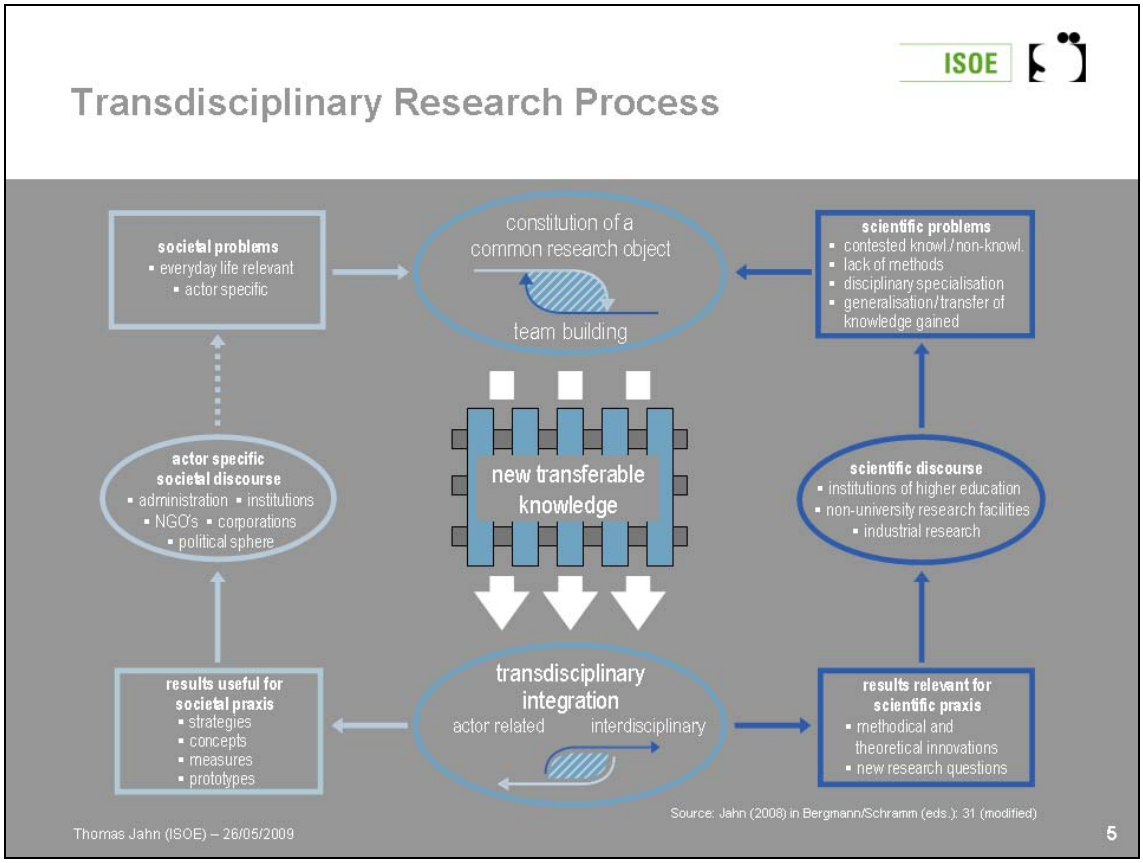
The concept of social-ecological systems has been developed in order to provide two things: scientific progress and an impact on problemsolvings with respect to the specific structure of sustainability problems. When you think about how this can be achieved you have to remember what it epistemologically means to make social-ecological systems the core object of research. It means that ignorance, uncertainty, or contested knowledge become decisive variables in the process of working on problem solutions, because the outcome of the evolution of a *complex* system can only be described with a limited degree of precision or the *set* of possible outcomes is not known at all.

Now as soon as the limits of knowledge come into play, deciding which issues are problematical is not a matter of objective scientific criteria alone; rather, interests, needs and values also play a role. What a society, or part of a society, treats or views as problematic depends on how the knowledge about a given issue is evaluated by different societal actors, and how accessible

such knowledge is for them. Here different kinds of knowledge have to be considered: *systems knowledge*, the knowledge involved in the understanding of an issue; *orientation knowledge*, the knowledge involved in determining the possibilities and boundaries of decision-making; and *transformation knowledge*, the knowledge of the ways and means of practically realising such decisions.

Given this I think it becomes clear what is needed to both advance scientific progress – that is system knowledge! – and to strengthen the capacity of societies to cope with the challenges of sustainable development – that is orientation and transformation knowledge: It is a *modus operandi* of research that ensures results that are more than just the sum of the contributing parts. We call these kinds of results *integrative results*. They are the ultimate goal of transdisciplinary research.

Now let me come back to the question what characterises transdisciplinary research? There is broad spectrum of literature on this question – which I am not able to do justice to here – but so far no single answer has emerged. Before giving you *our* answer – which, I believe, reflects a growing consensus among scholars working on the issue – let me briefly draw your attention to an important epistemic aspect. When using the systemic approach one must keep in mind that both the scientists and societal stakeholders involved have to be regarded as elements of the social-ecological system in question. In other words: Drawing the system's boundaries, which is essential to transforming societal problems into scientifically treatable problems, is a process of inclusion and exclusion of actors perspective and agency, and thus decides issues of representation, participation and co-determination. This setting is the starting point for a transdisciplinary mode of research for sustainable development. Or, referring to the introductory terminology, it is the problem oriented concretisation of the idea of frontier research.



In the scheme displayed on the slide the transdisciplinary research process is shown in the form of an idealised model. In this model, the contribution to solving sustainability problems for societal actors and the contribution to scientific progress are understood as the essential and interlinked paths of the dynamic research process. These paths are characterized by integration problems – epistemological, social, communicative and technological – and participative research arrangements, that is, the inclusion of those affected, of users or of stakeholders, which, together with the collaborating scientists, all engage in a process of *mutual learning*.

I have not enough time to go in detail through this model, let me just emphasise one crucial point. As I already mentioned, the transdisciplinary research process always needs to start with a transformation of the societal problem it addresses into scientifically valid questions. This transformation ideally takes place in the course of a structured exchange between the involved scientists and stakeholders. You may consider it as *the* prerequisite for determining *ex ante* to which degree research can at all contribute to solving the problem at hand. By defining research goals in such a way the problem transformation also helps to identify the aspects of the problem that appear to be essential for examination. It thus provides researchers with their object of scientific investigation in the first place. Summarising, in this understanding transdisciplinarity means configuring and organising research as a methodologically based, mutual learning process that involves both society and science – a process that proceeds reflexively employing scientific criteria.

I will now draw some conclusions as to what all this means for European research policy. Advanced problem-oriented frontier research for sustainable development as transdisciplinary research means to comply with the following requirements: First, clear expectations as regards the topical focus of research have to be formulated; second, the assessment of project proposals and research activities must be carried out with respect to these expectations; and, finally, this kind of transdisciplinary endeavour must be explicitly appreciated by the European Commission and other relevant institutions and actors within the European Research Area.

We can, however, identify quite a few obstacles that hamper progress on the path toward this vision of a future European research for sustainable development. Let me highlight three of them – and I simply cite our paper here:

- Transdisciplinary research is a trigger for scientific innovations. The major European funding structures, however, have so far failed to fully appreciate this opportunity and the competitive advantage it brings. An unfortunate and momentous consequence of this neglect is the current lack of adequate, transparent and generally accepted quality criteria and evaluation methods for transdisciplinary research.
- Beyond that repeated requests by the research community for joint calls – for example between the Directorates *Environment* and *Socio-economic Sciences and Humanities* – or for cross-cutting research dedicated to ‘Sustainability’ did not receive enough institutional support by EU research policy. It is our assessment that cross- or transdisciplinary research is still treated as a horizontal activity – much in the same way as, for example, the promotion of small and medium sized enterprises. Transdisciplinary research thus is of downstream priority because the single Directorates are structured by topics or disciplines – structures which are mirrored in the budgets, the responsibilities of the scientific officers and the calls.

- Finally, the routine recruitment of referees for project proposals solely by disciplinary excellence disadvantages those which take the epistemic and integrative challenges of transdisciplinary research seriously – not to speak of the lack of explicit recognition of these challenges in the thematic calls.

Altogether we feel that transdisciplinary research to date has no appointed enough advocate and therefore no stake in everyday business of EU research policy. It appears as a rather isolated issue which finds its place in preambles but not in funding practice. In contrast, whenever there are more ambitious calls which almost *call* for a transdisciplinary approach, multi-disciplinary projects are preferred because the true challenges of integration are not *scored* properly – and that means not given their proper weight. We therefore think that appropriate policy measures have to be developed and implemented in order to overcome this structural deficit for the European Research Area. I would like to close by putting the following five policy measures up for discussion:

- Each directorate should have a person being responsible and promoting transdisciplinary SDR. These persons must become members of a cross-cutting working group that will be responsible for setting up a joint transdisciplinary research programme for sustainable development. We consider this to be a concrete appreciation of prominent community goals and a strong driver for the promotion of transdisciplinary research projects.
- Next, we propose that a certain share of the directorates' budgets should generally be allocated for calls with a pronounced transdisciplinary profile. In other words: Up to a defined share of the overall budget – say five per cent – there will be joint calls supported by several directorates. These calls may run under an overarching label – for example 'transdisciplinary research for sustainable development' – and should be advertised by the cross-cutting working group I just mentioned. A thematic focus of the joint calls should be the advancement of science in understanding social-ecological systems.
- Transdisciplinary research is a mode of research that evolves by practicing it. We therefore consider it important to foster dialogue among scholars and practitioners. The installation of discourse arenas on the European level for the further development and specification of transdisciplinary research approaches and methods would be an appropriate measure toward this end. Supporting summer schools and workshops on transdisciplinary research or offering simple funding procedures for capacity building within the European Research Area may serve as concrete examples.
- Of utmost importance – and probably the most difficult task – is the installation of common quality criteria for transdisciplinary research on the European level. As I have already pointed out, the integration of knowledge – and here in particular the adequate incorporation of practical knowledge – is generally regarded as the key challenge for transdisciplinary research. We therefore recommend issuing European guidance documents with respect to how transdisciplinary integration can be achieved – there is rich experience in several European countries which can be exploited for this task. Such guidance will support the European research community in actively engaging with transdisciplinary research and in coping with the accompanying methodical reorientation;
- Any ambitious and visionary endeavour needs a strong advocate who continuously pushes things forward. For this reason, we recommend as our final point, the installation of such an advocate for transdisciplinary research within the European research administration. In

analogy to the European Technology Platforms a Joint Platform for Social-Ecological Research could be established.

We consider it mandatory to implement these or similar policy measures in order to – and here I cite the conference programme – 'strengthen European Research in the perspective of sustainable development'. At the same time we of course acknowledge that current EU research policy has recognised the importance of advancing frontier research by establishing a specific research sub-programme within FP 7. However, its structure and main funding instruments – the individual researcher's grants – are not appropriate for meeting the requirements of transdisciplinary research. Therefore, European research policy to our mind does so far not reach out to problem oriented transdisciplinary research in the cooperation special programme of FP 7. If Europe strives to achieve a leadership role in research for sustainable development it is our opinion that it definitely will have to extend its funding instruments in this direction.