Christine Katz
Leonhard Hennen
Bettina-Johanna Krings

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TAB

Research and technology policy for a sustainable development

Summary

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SUMMARY

A lifestyle and form of economic activity committed to the concept of sustainable development requires technological and social innovation. Science and technology are widely accepted as having a key role in operationalising and implementing this concept. As a result, demands on scientific research and technological development – and hence on research and technology policy as well – are heavy. TAB was commissioned in September 1995 to investigate under a monitoring project what contribution German research and technology policy can make towards operationalising and implementing innovation-oriented sustainable development, how its current goals, concepts and instruments rate in these terms, and what requirements for research and technology policy can be derived from these conclusions. The present report summarises the results of this monitoring project. The work of TAB on this issue is currently being continued as a TA project.

CRITERIA FOR A RESEARCH AND TECHNOLOGY POLICY AIMING AT SUSTAINABILITY

In operationalising the goal of sustainable development, a major aspect to be taken into account is that sustainable development is not a process directed towards a clearly defined goal, but something which has to include new scientific discoveries, changing social values and frame conditions in an open-ended process of goal formulation.

It can be assumed that a research and technology policy based on the concept of sustainability can generally only meet these needs if it is linked with innovative methodological research approaches – for example, greater promotion of interdisciplinary and problem-oriented studies or a systematic study of the options for action by social actors and the integration of such options into research work. The following general criteria can thus be formulated for a research and technology policy aimed at sustainable development: problem-oriented, interdisciplinary

> combining fundamental and theoretical research with an orientation towards application and design
> oriented towards the long term and towards the assessment of technology impacts (TA)
> combining regional and global levels of analysis

> oriented towards social needs
> actor-oriented.

These criteria provide a general framework for designing methods, concepts and institutions of a sustainable research policy, and can accordingly promote implementation of goals and a process-oriented approach in a context of »sustainable« research and technological development. At the same time the criteria make it possible to evaluate whether and how far the issues, methodology and concepts of current research and technology policy are oriented towards sustainable development.

Overall, this set of criteria point to strong involvement of science and technological development in the socio-political process of discussion about goals and prospects for sustainable development activities. The role of science (and hence also of research and technology policy) is in line with a trend frequently noted by sociology: faced by increasingly complex social structures and the growing complexity of the effects of science and technology – with resulting unclear situations for political decision-making – research and development are increasingly focusing on socially defined problems. A research and technology policy aiming at sustainability must accept the difficulties of decision-oriented science and coping with knowledge which is uncertain (because it is concerned with handling future tasks), with disputes between experts and criticism from experts. However, such a policy will also have to support the contribution that science and technological development make in the (political) operationalisation process of the goal of sustainable development and assist in organising the debate between science and society. The entire political process of defining problems, developing indicators for sustainable development, setting goals for sustainability and deciding on appropriate measures demands constant feedback from the state-of-the-art of science and technology – ranging from discoveries in fundamental research on anthropogenic changes in ecosystems through to supporting research on implementing sustainable technologies or social innovations.

GOALS AND MODELS OF THE GERMAN FEDERAL MINISTRY OF EDUCATION, RESEARCH AND TECHNOLOGY'S RESEARCH AND TECHNOLOGY POLICY

The most important, overarching goal for German Federal Ministry of Education, Research and Technology's research and technology policy is seen as promoting scientific and technological innovations to secure economic and tech-

nological competitiveness. Under current research and technology policy, the growing importance of technological innovation for the competitiveness of German industry is leading to strong emphasis on cooperation between science and industry to assist in translating scientific knowledge into mature products, and generally to accelerate innovation processes by better tapping the innovative potential in the research and technology landscape through greater competition, cooperative use of knowhow, promotion of science and technology transfer and interdisciplinary approaches. These emphases can well be linked to the orientation of research and technology policy towards the model of sustainable development. The following aspects deserve emphasis in terms of linking the model of sustainable development to current trends in the German Federal Ministry of Education, Research and Technology's research and technology policy:

> The orientation towards social problems and areas (particularly environment, health and transport) already plays an important role in setting priorities for research policy
> The shift in emphasis in research and technology policy from purely fundamental research to applications-oriented fundamental research and product-oriented applied research is very much in line with the needs of a research and technology policy aimed at sustainability (see the list of criteria above).
> The key projects introduced as a new instrument of promotional policy, with their stress on interdisciplinarity and applications orientation, have a design which is suitable for integrating aspects such as actor-orientation, problem-oriented interdisciplinarity and orientation towards needs. »Key projects are intended to combine demanding tasks with a concrete applications perspective and bring together different disciplines and applications. They should be proposed and formulated in a bottom up approach by partners willing to cooperate« (German Federal Ministry of Education, Research and Technology, 1996e, p. 29).
> Sustainable development is already acting as a model in the fields of environmental and energy research and adjoining areas. However, the concept of sustainable development has so far been limited to an environmental policy or ecological approach, or at most to resource economics.

Based on a study of three areas for promotion which are relevant to an orientation towards sustainable development (environmental and climatic research, transport research and materials research) the report reaches the following conclusions on the prospects for an overarching orientation of research and technology policy to the model of sustainable development.

With regard to the instruments of research promotion, a research policy oriented towards sustainability requires consistent development of problem-oriented, interdisciplinary, group research. In this, specialisations in the natural sciences, engineering, economics and sociology should cooperate on an equal footing right from the problem definition phase. One opening for action here is provided by the group projects developed in the field of environmental research, which work with defined geographical reference and involve all the actors relevant to implementing results. A problem-oriented approach in the key projects could also help orient research and technology policy towards sustainability.

Considerations of sustainability suggest breaking down the programme of research promotion more strongly in the medium term between areas of needs and demands. Independent of this, consideration should be given to strengthening the key points for promotion already addressing sustainable development and combining these to form a separate »sustainable development« programme.

Sustainable development is opening up new long-term time scales for research and technological development. Accordingly, it requires the development and use of innovative, future-oriented processes in research and technology policy. In the interests of achieving a quasi »real time« evaluation of research programmes to ensure that research can adapt more flexibly to new scientific discoveries or changing social problems, it is important to develop new forms of social evaluation and design of technologies or to strengthen and develop existing approaches.

In its structure, the research landscape in the Federal Republic of Germany has so far been insufficiently oriented towards the goals and methodologies of sustainable development. In contrast to current practice, the design of new research facilities should allow them to be flexibly configured and hence inherently open to the future. In addition, sustainable development requires considered and methodical communication, transfer and intermediation of knowledge and perceptions of problems between the fields of science, industry, politics and society as a whole.

RESEARCH GOALS AND CONTENT, PROMOTIONAL STRATEGIES AND INSTRUMENTS: AN INTERNATIONAL COMPARISON

An investigation carried out as part of the preliminary study into how the idea of sustainable development has affected research policy to date at the international level shows that in all the countries studied (the USA, Japan, the Netherlands,

Sweden) introduction of the term »sustainable development« has by no means always been accompanied by an actual change in policy, or that policy has failed to embrace the approach in its full dimension. The only effect observed in the countries studied of the intensive discussion about sustainable development in the wake of the Rio Conference is an intensification of existing research and technology policy approaches, particularly in the areas of developing "eco-friendly" forms of energy and increasing energy efficiency and developing additive, rehabilitative and integrated environmental technologies.

No definition of sustainability goals as criteria for promotion of R&D approaches appears in any official document in any of the countries studied. Only the Netherlands and Sweden set quantitative reduction goals with a binding timetable which (in the Netherlands at least) are derived from an operationalisation of the sustainable development model.

Ecosystem research is well established in every country, and every country now can look back over 20 years of developing technological solutions to avoid, reduce and/or clean up environmental pollution as a core area in research and technology policy. Developments in the direction of integrated environmental technology were intensified or initiated at the beginning of the Nineties.

Closing the circuit of materials flow as a means of increasing resource efficiency and hence contributing towards sustainable development is on the research and technology policy agenda in all the countries studied, with political statements on this issue taking their most binding form in the Netherlands and Sweden.

There are clear differences between the countries when considering research into the social, economic and political conditions causing environmental problems and affecting their solution, and the social conditions for shifting to a sustainable lifestyle and form of economic activity. Here the Netherlands occupies a special position with its approach to needs analysis under the Sustainable Technology Development (STD) programme. This programme in combination with the national environmental policy plan (NEPP) is particularly innovative in terms of developing research policy for sustainable development. It reflects particularly the requirements stated by the German Bundestag Study Commission on »Protection of humankind and the environment« for sustainable development of research and technology policy: orientation towards needs and processes and interdisciplinarity.

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TAB

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at the German Bundestag

Büro für Technikfolgen-Abschätzung
beim Deutschen Bundestag
Neue Schönhauser Str. 10 · 10178 Berlin
Telefon: 0 30 / 28 49 10
Telefax: 0 30 / 28 49 11 19
e-mail: buero@tab.fzk.de
Internet: www.tab.fzk.de