# B CORE TASKS OF THE NATIONAL RESEARCH AND INNOVATION POLICY

## Objectives of the research and innovation policy

National research and innovation policies are aimed at ensuring that research and innovation processes are of long-term public benefit and that advances can be achieved which are of importance for society. The focus of R&I policies is on the promotion of research and innovation and on the promulgation of research results and new technologies. R&I policies pursue a series of core tasks.

## Shaping the national research and innovation system

Research and innovation activities take place within a complex network of state and private institutions. R&I policies have to take into account specific national features. The core tasks include the long-term development of the national R&I system, and this involves various sub-tasks such as:

- The institutional and organisational shaping of public research and its promotion,
- The formation of interfaces between the private and public institutions and between the actors in the innovation system, including the formation of public-private partnerships,
- Specification of principles for the selection of instruments for the promotion of research and innovation, favouring a system of intermediaries, e. g. the German Research Foundation (DFG), and the inclusion of project organisers in the promotion set up,
- The examination of the effectiveness and efficiency of utilisation of funds in the R&I system, with the regular evaluation of promotional measures,
- The coordination of R&I policies with policies in the fields of education, economics, finances and other areas,
- The transfer of specific R&I topics to individual departments and the dynamic separation of department responsibilities in Germany,
- The coordination of national R&I policies with other political levels, in particular with the federal *laender* and the European Union.

## Reinforcing private stimuli for research and innovation

The majority of research and innovation in Germany is carried out by private entities (mostly business companies).[1] But because the associated knowledge often has the character of a public good, market forces alone cannot create suitable incentives for research and

BOX 01 Innovation and competition

The Expert Commission uses innovation in a broad sense to refer to all novel technological, organisational, social, and other developments which have been or are being implemented. It has to be more than just a 'good idea'. In a market economy, innovation involves the development and commercialisation of new products and services or the internal deployment of such innovations (process innovation). In public institutions, innovations involve the introduction of new methods, processes, and procedures.

Innovations can create long-term competitive advantages for the innovative companies. Successful innovators may be able to benefit for a long period from past successes and repeatedly achieve an advantage over competitors. In rare cases, innovations can lead regionally or nationally to the formation of completely new industries. New industries or new products may displace existing industries or existing products and in this way lead to a rejuvenation of the economy. The effect of these dynamic processes is sometimes referred to as 'creative destruction'.

BOX 02

Research and development (R&D)

The Frascati Manual of the OECD defines research and experimental development (R&D) as creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The Frascati Manual provides recommendations for the statistical registration of the R&D expenditures. R&D is only one component of the innovation processes. Innovation also includes above all the steps of marketing and commercialisation which are not included under R&D.

In order to make quantitative assessments of R&D activities, R&D intensities are calculated. When comparing companies, R&D expenditures are usually related to the turnover. For country comparisons, the entire national R&D expenditure of state and businesses is related to the gross domestic product. In 2006, Germany had an R&D intensity of 2.53 per cent. Six OECD member countries had higher R&D intensities (in some cases much higher): Sweden (3.82 per cent), Finland (3.45 per cent), Japan (3.33 per cent), Korea (2.98 per cent), Switzerland (2.90 per cent), and the USA (2.62 per cent).[2]

innovation. R&I policies can boost inadequate incentives by means of protected property rights (patents, utility model registration, copyrights, etc.) and thus partially correct market insufficiencies.

Innovation activities of private actors can also be promoted to their full extent or by selective financial support. An indirect, broadly-based system of support can be provided by state subsidies for R&D or by the creation of tax advantages which are linked to research activities. Such measures are not associated with specifically directed effects of taxation. However, by targeting resource allocations to individual institutions and actors or by linking these to individual activities in specific fields of technology, R&I policy-makers can intervene directly in the innovation system and steer developments. Balancing the advantages and disadvantages of these instruments and making the most appropriate choices are a crucially important aspect of R&I policies.

### Solving general social problems

The R&I policy gives a direction for innovation activities when these relate to overriding or general applications (e. g. in the field of nuclear fusion or space research). We also include aspects of sustainability (including the climate problem) as a general problem of society. Major social challenges can be tackled with what are often termed mission-oriented policies. Research and innovation in such cases are not only policy targets in their own right, but can be the means to an end, that is as a way of achieving clearly defined consequences (e. g. the reduction of $CO_2$ emissions).

### Opening up prospects for the future

Unlike almost any other area of policy-making, R&I policies have the task of opening up options for adding value and increasing knowledge. R&I policy-makers have to analyse new research findings and new social needs, and from these derive new priorities for promotional programmes. Market forces are not usually very well developed in the early phases of the development of new technologies, so that there is more scope for government action than in later phases. For example, in order to exploit the potential of nanotechnology there is a need for forward-looking R&I policies which ensure an adequate stimulus for the new technology long before this is mature enough for commercial utilisation. The R&I policies must also take into account that dominant players in business, science and public administration will not necessarily have much interest in supporting socially-beneficial paths to

innovation. Innovations can indeed threaten established positions of power, influence and profit – in the sense of 'creative destruction'. Therefore R&I policies must not be oriented solely in terms of the interests of the big groups of current actors – because the aim in the final analysis is to increase the benefits of research and innovation also for future generations. The unprejudiced consideration of future possibilities is imperative for effective R&I policies.

### Research and innovation policy as risk management

Accessing new innovation potential brings with it financial and other risks. The R&I policies must also reflect the importance of the social management of innovation risks. In some cases risks must be limited in order to protect general objectives such as public health and safety. But sensible R&I policies should not aim to avoid all risks at all costs. Anybody wishing to benefit from future innovations must also be prepared to bear the risks during their development, because private interests, encrusted institutional structures and cultural preconceptions can very well lead to highly exaggerated risk avoidance.

### Participation in innovation processes

Various options exist concerning the implementation of innovations in an economic system. The ways technologies are utilised is determined to a large extent by economic and social factors. Important decisions concerning the promotion of technologies and innovations are legitimised by parliamentary budget decisions, because the tax money which is allocated in this way will no longer be available for other purposes. R&I policy formulators should encourage public participation in shaping the content of innovation processes, because these can have far-reaching effects on the future of society. For example, instruments of evaluation and technology forecasting can target both scientific elites and the general public.

### Establishing stable conditions for the generation and use of knowledge

The discussions about the use of nuclear energy and more recently about the restrictions on the use of stem cells for scientific purposes have shown that decisions about R&I policies can lead to deep divisions in society. R&I policies must attempt to initiate social discourse on controversial ethical questions. In this way it can help to establish stable conditions for the creation and use of knowledge. In order to secure such framework conditions it is equally important that national R&I policies are coordinated with strategies within the European Union and at the regional level.