

# **Technology foresight Programme in the Czech Republic**

**Karel Klusacek**

Technology Centre AS CR, Czech Republic

## **Abstract**

The analysis performed during the preparation of the National Research and Development Policy of the Czech Republic in 1999 confirmed that there is a strong dominance of very small publicly funded R&D projects with very low budget. Excessive number of R&D projects financed from public resources resulting in their insufficient financing evidences too broad orientation of publicly funded research in the Czech Republic. To focus limited public resources on the reduced number of national research priorities, the first national technology foresight exercise was initiated in 2001. This paper brings brief information on the first technology foresight exercise conducted in the Czech Republic in the year 2001. Aim of the technology foresight was to identify priorities for the new National Research Programme (NRP) and to devise a suitable method of implementation and management of the new NRP. The proposed NRP consists of 5 thematic programmes, which are divided into 19 sub-programmes, which include 90 key research directions (key technologies). The NRP includes further 3 cross-cutting programmes which are divided into 19 cross-cutting sub-programmes (systemic measures). The results were achieved through a broad co-operation of several hundreds of leading representatives of research, industry, services, business, financing, state administration and other stakeholders who worked in panels and expert groups. An opening of a permanent national Technology Foresight Programme (TFP) is currently being considered in decision-making bodies. Strategic studies focused on research and technological priorities and their relations to and influence on the economic and social situation in the Czech Republic should be carried out under the TFP.

## **Introduction**

The Government of the Czech Republic approved in January 2000 the National Research and Development Policy. A substantial part of this strategic document deals with the definition, objectives and functions of the oriented research as the research aimed at support of a positive development of national economy and at improvement of the quality of citizen's life.

The Policy has been widely discussed in research community, industry and other important stakeholders. Generally, it has been concluded that research funded from limited public resources includes too many topics, therefore, the majority of research

projects are underfinanced as a consequence. The Ministry of Education, Youth and Sports of the Czech Republic (MEYS) was entrusted by the Government to initiate the first national foresight exercise, which should identify key research directions (national research priorities) having strong potential to contribute to a favourable economic development and to the fulfilment of social needs of the society while optimally using the public funds for research.

The Technology Centre AS CR was invited to manage in co-operation with the Czech Engineering Academy the foresight project, while MEYS acted as the contracting authority and the sponsor.

This paper brings brief information on methodology and results of the first technology foresight conducted in the Czech Republic in the year 2001 with additional information on summary of follow-up steps taken by the Government in preparation of National Research Programme (NRP) based on the results of foresight exercise.

## **State support to R&D in the Czech Republic**

In 2002, the research and development sector in the Czech Republic received from state the financial support of 12.5 billion CZK (Czech Crowns). Total R&D expenditures tend to grow in terms of % of GDP - from 1.1% GDP in 1995 to 1.29% GDP in 1999. The share of state in 1999 was 43%, the rest was provided primarily by the private sector. The decline of state R&D expenditures in last three years (0.6% GDP in 2000 to 0.54% GDP 2002) is the result of changing preferences of the government in favour of short-term measures with immediate social effects.

The main recipients of state R&D support are shown in Fig.1. Besides Ministry of Education (supporting research at universities), the major recipients are Academy of Sciences, Ministry of Industry, Czech Grant Agency (providing support to individual projects on competitive basis) and Ministry of Health.

Individual Ministries further distribute the received funding to research organisations in their respective sector through own specialised research programmes.

One of persisting problems in the state-funded research is strong dominance of very small projects with annual budget between 0.5 to 1.0 million CZK. State support is distributed to large amount of small projects, most of them are heavily underfinanced. This certainly permits a survival of many research teams but it is far from the optimum use of public funding. The situation has not changed substantially since 1995, the situation in 1998 and 2001 is illustrated in Fig.2.

Although there is a slight increase in favour of larger projects between years 1998 and 2002, the curve by far does not depict the desired distribution. Additionally, a large number of projects having the support up to CZK 100 thousand, where the costs on their assessment, control etc. do not differ from their annual budget, is alarming.

Figure 1: Main recipients of public R&D funding in the Czech Republic (12.2 billion Czech Crowns in 2002, 97% of public funding)

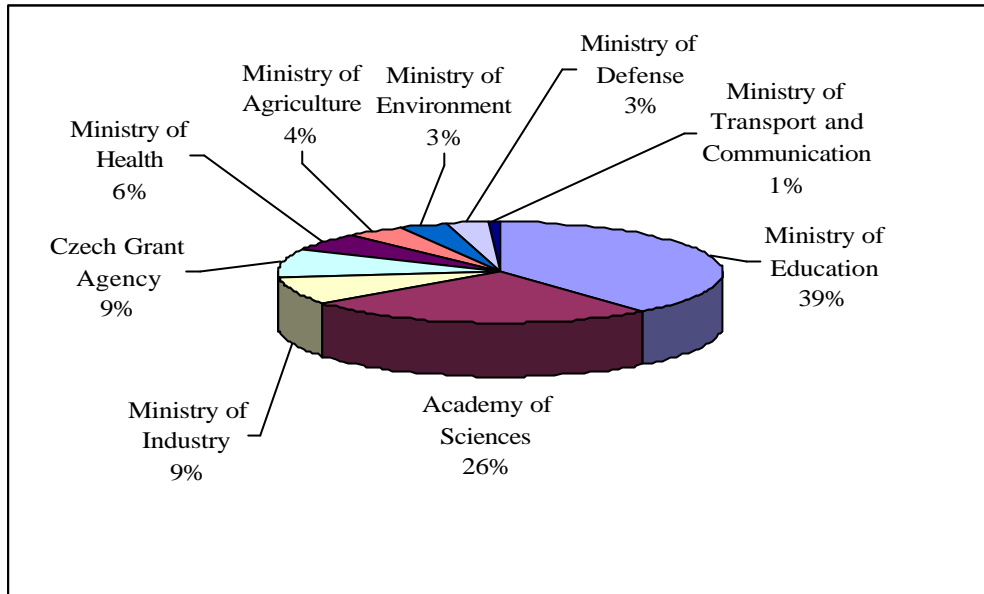
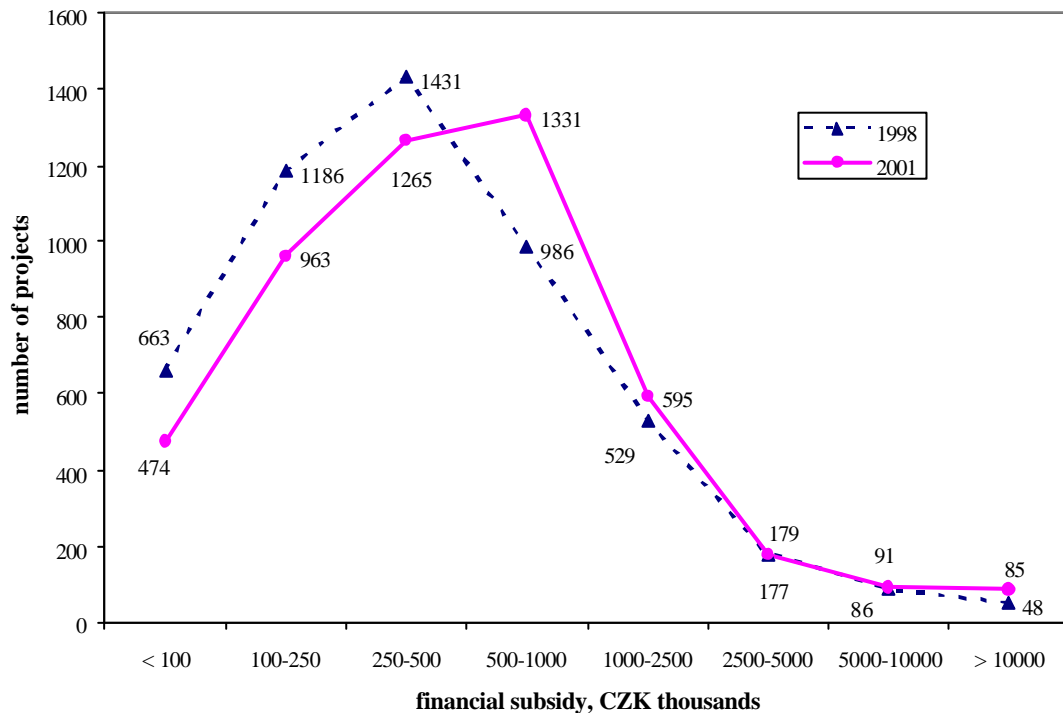


Figure 2: Annual budget of state-supported R&D projects (Source: Central Evidence of R&D Projects in the Czech Republic)



Excessive number of R&D projects financed from public resources resulting in their insufficient financing evidences too broad orientation of publicly funded research in the Czech Republic. To achieve a better use of limited public resources, national research priorities have to be identified as a basis for new National Research Programme (NRP). This was the main reason for initiation of the first national technology foresight in the Czech Republic in 2001. Additionally, the concentration of public financial means into one NRP should avoid duplicities in research programmes of individual Ministries.

## **National Technology Foresight Exercise**

This section summarises the basic objectives and it outlines main methodical principles of the foresight exercise. More detailed information on the method is available in the literature [1].

### *Objectives*

Generally, the basic objective of the national foresight exercise was to identify the most important technologies (research priorities) likely to be demanded by the Czech industry and the service sector over the next 10-year period (till the year 2010). Research conducted in defined priority areas should contribute to the achievement of strategic goals in the key sectors important for the national wealth creation and for the improvement of the quality of life.

The principal objectives of the project may be summarized as follows:

- a) To propose the structure of the National Research Programme (NRP) of the Czech Republic, including:
  - specification of main thematic and cross-cutting programmes of the NRP;
  - proposal of the internal structure of thematic and cross-cutting programmes – definition of sub-programmes;
  - identification of key research directions (national research priorities) and their allocation to individual sub-programmes.
- b) To propose a system of management and supervision of the NRP

The MEYS further required respecting a set of conditions in the foresight exercise:

- the results must be achieved under a broad consensus of a wide spectrum of experts and relevant institutions;
- the sphere of knowledge production (research) and the sphere of its utilisation (industry, health care, services, ...) must equally participate in the project;
- the results of the project must stem from the needs of the society and from available research capacities and financial means;
- the results should include a quantitative and transparent information enabling, if necessary, to narrow down the set of selected research priorities during the preparation of the proposal of the NRP for the approval by the Government of the Czech Republic.

### *Method*

Extensive research on methods used in similar projects carried out abroad was performed first to collect background information for preparing the method used in the foresight exercise. The information collected served as a basis for the creation of own method (a sequence of project phases) that corresponded best to the objectives of the project and was suitable for the national conditions and environment.

As a result, the project consisted of six consecutive phases:

- preparatory phase:
  - establishment of the managerial, executive and advisory structure of the project;
  - location of national experts (names and characteristics of more than 800 experts were collected);
- collection of supporting documents for the work of panels:
  - interviewing the application sphere (286 managers of industrial and service companies were interviewed to estimate their demand for key research priorities in their particular sector in the next ten years);
  - desk research (acquisition of national statistical data, collection of strategic conceptions of individual ministries, information on research investments from public and private resources);
  - sectoral development scenarios and SWOT analyses (prepared by leading national experts for 13 application sectors with the time horizon 2010);
- work of panels (18 panels, in average 15-20 experts, balanced representation of the research and utilisation sphere):
  - elaboration of brief development scenarios (time horizon 2010);
  - identification of “important” research directions;
  - first prioritisation procedure – selection of “key” research directions;
  - discussion of cross-cutting issues and suggestion of priorities;
  - proposal of the NRP management and implementation;
  - final reports of panels;
- activity of the working group (established of the chairmen and secretaries of panels and other experts):
  - identification of interdisciplinary topics;
  - second prioritisation procedure – further reduction of the set of “key” technologies selected by panels;
  - detailed proposal of the NRP structure (thematic and cross-cutting sub-programmes), implementation and management principles;
  - grouping of sub-programmes into thematic and cross-cutting programmes
- final synthesis of results:
  - workshop – publication of preliminary results, feedback from researchers, industry and other stakeholders;
  - final report to the sponsor (MEYS);
- dissemination of results:

- national conference;
- information brochures;
- special website.

### *Results*

The main results of the foresight project are based on the work of panels (development scenarios, first set of key research directions), which was followed by the activity of the working group (thematic and cross-cutting sub-programmes, final set of key research directions, allocation of key research directions to sub-programmes, grouping of sub-programmes into thematic and cross-cutting programmes).

The results were used for design of the National Research Programme, which consists of 5 thematic programmes which are further divided into 19 thematic sub-programmes which include 90 key research directions. The NRP further includes 3 cross-cutting programmes, which are divided into 19 cross-cutting sub-programmes (systemic measures). The structure of thematic and cross-cutting programmes is illustrated (up to level of sub-programmes) in the following table. The key research directions and their allocation to the individual sub-programmes are not presented in this concise paper, however, they are available at [www.foresight.cz](http://www.foresight.cz).

Table 1: The structure of thematic and cross-cutting programmes of the National Programme of research of the Czech Republic

THEMATIC PROGRAMME	(THEMATIC) SUB-PROGRAMME
Quality of Life	Human Health
	Quality and Safe Nourishment of Population Landscape and Settlements of the Future
Information Society	Environment and Protection of Natural Resources
	Intelligent Systems for Decision Making, Management and Diagnostics
	Management of Information and Knowledge
	Communication Infrastructure and Technology
Competitiveness at Sustainable Growth	Computer Modelling and Design of Systems and Processes
	Production Processes and Systems
	Safe and Economical Transport
	Structures and Constructions
	Advanced Materials
	Emerging Technologies
Energy for Economy and Society	Exploitation of Natural Resources
	Safe and Effective Nuclear Power Engineering
	Power- and Non-Power-Producing Utilization of Coal and Carbonaceous Raw Materials
	Rational Use of Energy and Renewable Energy Sources
Modern Society and Its Changes	Performance-Oriented, Safe and European-Integrated Society
	Social Cohesion, Social Differentiation and National Identity
CROSS-CUTTING PROGRAMME	(CROSS-CUTTING) SUB-PROGRAMME
Human Resources for R&D	Permanent discussion platform „Human Resources for R&D“
	Public tender in selected thematic fields (research work and labour market, brain drain, Czech science and human resources, grant systems and their influence on human resources, demographic and social structure of Czech R&D)
	Support Programme for the Development of Human Resources for R&D (children and youth, young scientists, top managing scientists)
	Principles of the national innovation policy
Integrated R&D	Legal framework for the cooperation of research and industry
	Integration of R&D
	Research centres
	Intellectual property rights
	Partnership of the public and private sectors
	SME participation in innovation processes
	Setting up technologically oriented enterprises
Research evaluation (R&D indicators)	
Regional and International Cooperation in R&D	Infrastructural measures
	Cooperation of weak and strong regions in R&D
	Technology transfer and innovation in weak regions
	Boosting R&D capacities in weak regions
	Integration of Czech R&D into the European Research Area

## Conclusions

The first national technology foresight in the Czech Republic was completed within one year. Rather limited time, provided by the sponsor for the project completion, permitted only relatively narrow agenda of the exercise. The project was strictly focused on 2 main objectives defined by the sponsor:

- to identify national priorities for the new National Research Programme (NRP);
- to devise a suitable method of implementation and management of the new Programme.

The results were prepared under co-operation of several hundreds of top Czech experts, the project course and its interim results were consulted with panel of foreign foresight practitioners.

The results of the project regarding the management and implementation of the NRP were modified to agree with new Act on Public Support to the Research and Development approved by the Czech Government in 2002. After expected approval of the NRP by the Czech Government in March 2003, the first calls of the new National Research Programme should be opened in January 2004.

It is assumed that NRP will gradually take over most of the research programmes operated by individual ministries (state departments) so far. In 2005-2006, the NRP should provide about 80% of total R&D public budget allocated to the project-type financing in the Czech Republic.

Additional important outcome of the project is raising interest of decision-making bodies in the Czech Republic in strategic studies in general and foresight activities in particular. Research and Development Council of the Government of the Czech Republic requested recently to prepare a study on launching permanent national foresight programme aimed at carrying complex strategic studies focused on research and technological priorities and their relations to and influence on the economic and social situation in the Czech Republic.

## Acknowledgement

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## References

- [1] Karel Klusacek: *Technology Foresight in the Czech Republic*, International Journal of Technology Management, submitted for publication, 2002.