

STI OUTLOOK 2002 – COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**CZECH REPUBLIC****1. General framework and trends in science, technology and industry policy****1.1 Overview and assessment of policies for science, technology, and industry**

At present the area of state support of science and technology is ruled by the *Act No 300/1992 of Col. On the State Support of Research and Development* in the reading of later decrees. The act defines very generally the basic terms, rights and duties of recipients, ways and conditions of granting the subsidy, status of *the Council of the Czech Republic for Research and Development* and *Grant Agency of the CR*. Newly accepted implementation provision to the Act No.300/1992 of col. (Governmental provision No 88/2201 of Col) organises the area of target-oriented subsidy and transfer of data to central registration of research and development projects. The mode and scope of the provision is to a great extent limited by the wording of the Act. The sphere of the institutional subsidy is not dealt with in any legislation, it is only outlined in government approved rules binding only for providers. The *National Research and Development Policy of the Czech Republic* was approved by the Government of the Czech Republic on 5th January 2000. The version of this document was formulated by the Ministry of Education, Youth and Sport and the Research and Development Council of the Czech Republic in co-operation with representatives of the state administrative bodies, Academy of Sciences of the Czech Republic, Grant Agency of the Czech Republic, Council of Czech Universities, Czech Rectors' Conference, Association of Research Organisations and Confederation of Industry of the Czech Republic. The preliminary version of this National R&D Policy was analysed and discussed by a scientific community and also by general public.

The presentation of the National R&D Policy clarified the Government's intentions about Research and Development. The Government, as a part of its responsibilities in R&D, presented the in the National R&D Policy the efforts and results of R&D in close co-operation with scientific community, enterprises and users. This National R&D Policy includes primarily the following:

- The specification of priorities of industrial R&D, oriented on the most efficient disciplines supporting the export of goods, technologies and services and also on such fields which form a base for the long-term economic evolution with respect to ecological problems.
- The financial support of disciplines having international standards, mostly at the universities. Such policy will cultivate the culture, health and security of a nation together with other basic needs.
- The support of a transference of scientific and technological knowledge.

- The harmonisation of a system and legislation of a state R&D support with those of OECD countries and the European Union by formulation and implementation of a new *R&D Act* and creation of respective conditions for its functioning.

Together with the approval of National R&D Policy the Government also accepted a proposal of respective measures for its realisation.

In the course of 2001 new *R&D Act* was presented. After the approval, the new *R&D Act* will define not only its mandate but also mandates of other R&D authorities and bodies. New *R&D Act* will specify their role in the system of state support of R&D, relation between the institutional and target-oriented financing, regulations of public tenders, diffusion of information in R&D and mode of transformation of existing R&D organisations.

In the first half of 2002 new proposal of a *National Programme of the oriented research and development* will be presented to the Government.

The Government of the Czech Republic imposed an important task upon the respective ministers, heads of other central state authorities, presidents of the Academy of Sciences and the Grant Agency of the Czech Republic. They formulated the ideas and drafts of the advancement of R&D system in their fields of activities. These ideas appeared in the proposal of the state budget for R&D for the year 2001.

The Government also addressed the whole R&D community, R&D institutions, users of R&D results and other subjects active in this field and recommended them to incorporate the theses of the National R&D Policy into their activities, mainly its respective parts concerning the ethics, management of R&D and public relations.

The important source document for the elaboration of the National R&D Policy was the *Analysis of previous trends and existing state of research and development in the Czech republic and a comparison with the situation abroad* from May 1999.

1.2. Changes in the nature and process of policy evaluation

The institutional and organisational arrangement of R&D, its focus, and the regulations of the state R&D support might not remain unchanged during a longer period of time. The success and the efficiency of R&D in the Czech Republic will be monitored and evaluated during its implementation (including the internal and external conditions of its development) and changes of the policy, together with instruments for their realisation, will be proposed in time. The realisation of the S&T policy will be implemented in a transparent way. The suggested and the realised provisions will be always properly substantiated. The authorities and organisations sharing the policy implementation will endeavour to inform, and to get involved both the scientific and general public.

The need to continue in the transformation of the system of the state R&D support resulted from the prepared *Analysis of previous trends and existing state of research and development in the Czech republic and a comparison with the situation abroad*, approved by the Government. The main goals are:

- To increase the efficiency and the outcome of R&D, it means to increase first of all the contribution to economy and the society.
- To ensure more complex links of the R&D policy with other policies of the Government of the Czech Republic.

- To concentrate the state support on less number of efficiently co-ordinated programmes and projects.
- To improve the legislation of the state R&D support.
- To increase demands on the complete area of R&D, including the more significant differentiation of the quality of reached outcomes.
- To increase the objectivity and the transparency of the distribution of financial means.

The policy also formulates the main requirements on the new R&D Act, it starts the process of selection of priorities of oriented research and their implementation in the form of a national programme (National Programme of Oriented Research), and it also establishes the ways of increasing the quality and efficiency of the state administration in R&D.

2. Public sector research and public research organisations

2.1. Policy changes related to public sector R&D

The difference between the Czech Republic and other OECD countries in the structure of the utilisation of the resources dedicated to research and development is being gradually reduced. The expenditures in the sector of universities are quickly rising. This helps to well balance the differences between universities and other public research institutions (mainly the institutes of the Academy of Sciences of CR). Further resources can be allocated only in accordance with potentiality of their employment.

The proportions between target-oriented and institutional financing rose until 1998. The volume of target-oriented financing was higher than that of institutional financing. Desirable turn towards the increase of institutional financial support was ensured by the *Rules for Evaluation of Research Plans and Results of R&D Organisations*, approved by Government in 1999. The bulk of the R&D resources is expended by Academy of Sciences of CR, Ministry of Education, Youth and Sports (R&D national and international programmes), Grant Agency of CR and Ministry of Trade and Industry.

According to the National R&D Policy the state R&D support will be focussed mainly on the long term activities (basic research), on the activities of a higher risk (in the applied R&D), and on the activities whose results will be utilised by small and medium enterprises without own R&D capacities.

The public and non-governmental R&D means must be interrelated. R&D is one of the addressees of the public support, which is controlled in order to avoid twisting of the environment of competition. The shares of both the state and non governmental means in R&D, which decrease from the basic research to the development, are established by the following conditions of shared financing of research and development:

- 1) There is the basic research, the applied research, and the pre-competitive development recognised during the establishment of the maximal possible level of the contribution coming from public funds:
 - a) The basic research - up to 100% of the costs.
 - b) The applied research - up to 50% of the costs.
 - c) The development - up to 25% of the costs.

- 2) In case of the common projects of enterprises and the organisations supported from public funds, the allowed contribution is calculated both from the direct support of the project and from the relevant part of the institutional support.
- 3) The maximal possible level of the contribution from public funds might be increased, when some prerequisites are fulfilled, by:
 - a) 10%, when the contribution is determined for a small or medium enterprise.
 - b) 10%, when the research relates to a region with an extraordinary low living standard, or with high unemployment rate.
 - c) 10%, when the research relates to the economic sector supported by the Government or to the region, unless it leads to a change in the commercial conditions there.
 - d) 15%, when the project contributes to reaching the goals of some of the programmes or projects of the EU Framework Programme.
- 4) The accumulated contributions from public funds must not, in any case, exceed:
 - a) 75% of the full costs, in the case of the applied research.
 - b) 50% of the full costs, in the case of the development.

The given rules on limited shares of the state support of co-financing of R&D will be all the time consistently applied and checked. In the case of applied research the strategy of synergetic effects will be aimed especially where the higher support from public funds evokes immediate increase of support from private funds ("matching funds").

The Government is ready to support projects of industrial development results of which are intended for single user only by loans with preferential or zero interest.

The state R&D support will try to ensure a balanced share ratio of different kinds of financing - from the institutionally supported main research plans of organisations, through the purposefully financed grants for individuals or small teams, to the targeted R&D projects fulfilling the existing declared programmes of R&D.

An increase in the speed of R&D knowledge gaining expects a concentration of forces and means, including the utilisation of the international co-operation. A measure of the success lies in the utilisation of this knowledge on the international market of products, technologies, and services, in the publication of the results and their evaluation on the international level. No OECD country may realise R&D in full and resolve all problems of its R&D at once. There must be priorities decided on and the financial, personnel, material-technological, co-ordination, and other resources must be focussed on them.

The Czech Republic as a medium sized European country trying to be accepted into EU must understand these trends. The future indisputably depends on the ability to gain new knowledge fast and efficiently and to utilise it in products competitive on demanding markets. The Czech Republic, if it wants to participate in the competition well, must establish its priorities in the oriented research.

It is basically purposeful to differentiate between the systemic priorities, which remove obstacles and weak points of the individual R&D fields (the basic research, applied research, development and transfer of

knowledge) and improve the flexibility and efficiency of the R&D system as a whole, and the real (thematic) priorities.

The goal of the priorities selection is to increase the outcome and efficiency of R&D in the Czech Republic. The target-oriented means of the R&D programmes and the institutional means, granted on the basis of research plans, will be used for the financing of the priorities.

A part of disposable means must cover the problems which are not parts of the selected R&D priorities, for example, the activities of the non oriented research and the non specified research at universities, which should serve for development and innovation of scientific fields, for the free gaining of knowledge, for the opening of new problems, finding new methods and approaches of their resolve. To assure this the means of the Grant Agency of the Czech Republic and the internal grant agencies (as the Grant Agency of the Academy of Sciences of the Czech Republic) and the means for support of non specified research, organised at universities, will be used for the financing of this part of the research.

The Systemic Priorities

The common systemic priorities of individual fields and R&D as a whole are:

- a) The support of R&D development with the aim to increase its outcome and efficiency.
- b) Human resources, most of all the creation of conditions for attracting and involvement of young qualified experts and their development.
- c) The creation of conditions of co-operation in between individual sectors and organisations of R&D and in between R&D and other fields (*e.g.* between the basic research and the education at universities).
- d) The international co-operation, including an increase in international mobility of researchers involved in R&D in the Czech Republic, including the chances of the participation of workers abroad and of the returning Czech researchers.
- e) The respect of the regional needs of the R&D capacities' development.

Basic research

One of the main goals of the basic research is the contribution to the world-wide knowledge base. The basic research in the Czech Republic must accept and respect the proved processes of reaching top, globally recognised results, for example, the concentration of resources, involvement in international co-operation networks, removal of the mobility obstacles for researchers, etc.

The dominant sources of finance are the public means. There will be the research plans of the basic research workplaces supported which will have the prerequisites for reaching top, internationally recognised results, or which will create a knowledge base for the domestic applied research and development.

There will be supported also the participation of the workplaces of the basic research in both the domestic and international programmes of the oriented research.

A free and creative environment in the basic research is essential for the preparation of new specialists. One of the systemic priorities of the basic research is therefore also a further enforcement of its interconnection with the education at universities.

Applied research

An indisputable priority of this part of R&D is the fast and efficient removal of the shortcomings of the existing R&D programmes (the mutual non co-ordination of the programmes, the shortcomings in the management, the size of the projects, etc.) which accompany the realised applied R&D.

The public means, both target-oriented and institutional, are, and will be, for the applied research only the additional source of financing. With the exception of agriculture and forestry research the main source must be provided by the business sector. An additional exception is the applied research for the bodies of the state administration that is necessary for the outcome of their administration functions. This will be still financed from the public funds.

The only activities, which might be supported from the state budget, will be the ones in which a user's sector shows its interest and proves it with a partial financing from its own sources. The share coming from the state budget must not overreach the maximal possible level stated above.

An important systemic priority in this area of R&D will be support of the infrastructure development, mostly the information one, which has been specially strongly disrupted by the privatisation of the state research organisations.

Development and transfer

The R&D policy shows the interest of the state to support also this area. The support under the framework of the R&D policy must be co-ordinated with the general economic policy and with the policies of the relevant sectors in which the results of R&D should be utilised.

Establishment and the initial part of activities of independent subjects for transfer of technologies will be supported by target-oriented financial means and these subjects might be founded even within universities and large research organisations funded institutionally.

The support of the state, even with the utilisation of indirect tools, will be oriented mostly towards small and medium enterprises, which do not have enough of their own capacities to transfer the results of R&D, and towards the development of new products, technologies, and services.

The support will be granted on the basis of public competitions and the support of the consulting in the field of the development and transfer is also assumed. The state support must not overreach the limits, which are allowed in this field by the regulations of EU, because of the preservation of the conditions of a free market.

The transfer&Dissemination of the R&D results will require a clear adjustment of the intellectual property rights in regard of the ownership of the R&D results and their providing supply.

Human resources

The R&D system cannot be successful without the continuous renewal and support of motivation, abilities, and capacities of its participants.

The continuously increasing average age of the R&D workers in the Czech Republic must be resolved in a complex way. The priorities include: to increase the interest of youth in R&D and in the activities in this area - the interest must be made and developed from the earliest courses of the school attendance; to solve the material situation of young R&D workers which has been unsatisfactory so far; to improve the possibilities of the career of young talented students and scientists by an increase in their mobility (both the domestic and international), and by an increased support of talented young workers from the funds of grant agencies, and by a support of team creation around perspective young scientists.

The R&D institutions and organisations must pay their extraordinary attention to the renewal and development of their sources of personnel in their conceptions and strategies.

The international co-operation, the involvement into international networks, and the preparation of highly qualified R&D specialists cannot be organised without a satisfactory mobility and its support by the state. The international programmes of mobility will be supported by domestic provisions (help in the organisation of stays in top foreign laboratories, help after the return into the Czech Republic, and an active gaining of new researchers from abroad). The relevant EU programmes will be also utilised.

Obstacles for the study and work stays of foreign researchers in the workplaces in the Czech Republic will be removed and suitable conditions will be created for them.

The authorities responsible for the R&D policy realisation will endeavour to develop progressively the processes of equalising the chances of men and women in all R&D programmes supported by the state and in all grant agencies distributing the public R&D funds. The state expects that the R&D institutions and organisations will apply similar processes in their conceptions, statuses, organisational regulations, and common life.

The cross-sectoral co-operation

The co-operation within individual R&D sectors, the institutes of the Academy of Sciences of the Czech Republic, universities, resort independent R&D organisations and private and enterprises research must be, in spite of all improvements, still considered unsatisfactory. It is the co-operation in resolving larger R&D projects and also the co-operation in the preparation of young R&D researchers. Mainly the obstacles for the joining of capacities of universities, the Academy of Sciences of the Czech Republic, and other officially supported research organisations for the training of postgraduates, *e.g.* in the framework of *National research centres* are to be removed.

The future period of an increasing competition and continuous globalisation requires an increase of the speed and efficiency of gaining new R&D results, their utilisation and dissemination. This might be reached only by the concentration of resources and by the inter- and trans-disciplinary approaches to the R&D tasks' solution.

The programme *National research centres*, which was launched in 2001, will be an important tool for the improvement of the cross-sectoral co-operation, according to National R&D Policy. The criterion for the selection was mainly the anticipation of the establishment of the centre in places with high special abilities of R&D knowledge producers and with the real interest of partners in the co-operation, but also with the extraordinary organisational and management prerequisites. In case of the *National centres of the applied*

research there was also the requirement of the preparedness of the users to utilise the knowledge gained by the centre.

In case of the centres of the top basic research it is also necessary to require their involvement in international research networks and their high respectability abroad, which would show, beside other things, a proved high interest of researchers in study or work stays in them.

Regional aspects

A substantial part of the R&D capacities is centred in the Czech Republic in several larger cities and few large traditional universities. The R&D participation in solving perspective needs of people and the society, including the economy, requires a wider spread of the R&D capacities' division.

This is specially felt in regions, in which a wide restructuring of the industry takes, and will take, place.

The provisions for the support of the transfer of R&D results will be proposed in such a way that they will influence the situation in the regions efficiently.

International co-operation

The criterion for the international R&D co-operation must be shown in benefits for the society, the economy, but also for the R&D system (connecting to networks, better quality of the preparation of young researchers, etc.), the more efficient creation of basic research results, etc. Documents from abroad, including the EU materials, speak about this criterion under the name of "added value". The self-purpose of the international co-operation, or the co-operation only because of the foreign policies' reasons are mostly refused.

Real Thematic Priorities

The objective, thematic priorities will be prepared and utilised for the individual R&D types in a different way.

In case of the non oriented research in the Czech Republic, the selection of the themes, processes and methodologies will be left, the same way as abroad, on the initiative of the workers in the field.

In the wide area of the oriented research and development, the priorities will be established in the Czech Republic, similarly as abroad, on the basis of perspective needs of citizens, the society, and the Czech economy as well as of the offer and the interests of R&D representatives corresponding with the demands and interests of the users of R&D results.

The selection of the priorities must be realised in transparent processes and it must be properly supported with facts. The public must know about the selection in order to see the purpose of the use of public funds and in order not to worry about negative impacts of the R&D results' realisation.

The focus of the non-oriented research

In this part of the basic research, the state will not influence the selection of the research themes and processes in any way. The research in this area must respect only the internationally recognised moral and ethic principles.

The state expects that the scientific public, institutions and organisations involved in the basic research will consider in the selection of the themes, processes, and during the distribution of funds, which will be provided for this research by the state, the following:

- a) The results of regular, objective, and independent evaluation of the research.
- b) The facts that the success in the solution of some problems requires a certain concentration of resources (of the personnel, the material and technological and financial means) and that the disposable resources should not be spread over a large number of activities.
- c) The fact that the goal of this part of the research should help to increase the prestige of the Czech science resulting from its contribution to the general world knowledge, but also to create perspective possibilities for the relating R&D fields.

The real thematic priorities in the oriented research

The selection of the priorities of the oriented research, which includes also a part of the basic research, will be based on:

- a) The anticipated needs of people and the society which the oriented research in the Czech Republic, together with the utilisation of international co-operation, might help to satisfy and for which a support of the public might be ensured.
- b) The requirements of the development of human, knowledge, and material potential in the Czech Republic.
- c) The requirements of the R&D capacities' development in the Czech Republic.

The priorities will be organised in the form of richly structured and uniformly co-ordinated national R&D programme and in the form of research plans. Foreign experience shows the benefit of the programmes' division into the thematic and horizontal programmes. The thematic programmes help to satisfy individual basic needs. The horizontal programmes increase the success and efficiency of the programmes as sets also in helping to enforce the systemic R&D priorities. The thematic and horizontal programmes create the basic structure that is realised in partial programmes (directions).

The selection of the priorities of oriented research is a complex process requiring time and finance. This process will take place in several stages and at several levels:

- a) Stage I - The R&D policy establishes a limited number of priorities, groups of expected needs of people, the society, and R&D which make up the basic structure of the national R&D programme in the form of thematic and horizontal programmes.
- b) Stage II - The establishment of pregnant and concrete criteria of evaluation and decision making during the selection of suitable partial programmes (directions), the selection of suitable projects for the reaching of the partial programmes' goals, and for the evaluation of the results of projects, partial

programmes, and the national programme as a whole. It is highly purposeful to ensure that the criteria remain unchanged from the time of a programme's preparations until its realisation. The same criteria should be also valid for the evaluations of research plans of organisations.

- c) Stage III - The selection of partial programmes (directions), which could help to fulfil the priorities of the Stage I for the fulfilment of the perspective needs of people and the society in the Czech Republic, while the criteria of the Stage II are respected.

The following priorities of the national programme of the oriented research are established on the basis of the needs of the society and the economy in the Czech Republic:

Thematic programmes:

- The quality of life.
- The information society.
- The competitiveness.
- Energy for the economy and the society.
- The societal transformation.

Horizontal programmes:

- Human resources for R&D.
- The integrated R&D.
- The regional and international co-operation in R&D.

The follow-up works, which have been required in the resolution of the Government, will:

- Establish the criteria for the evaluation and decision-making in the Stage II.
- Select partial programmes (directions) for the optimal realisation of the thematic and horizontal programmes in the Stage III.

The selection of partial programmes (directions) of individual thematic programmes will be realised with the utilisation of foresight process (the probability prediction of future directions in the technological development).

The National Programme of the Oriented Research was announced during 2001 year and the solution of the first selected projects will start in the first half of 2002.

The unfinished projects of existing programmes in the oriented research which are co-ordinated by individual sectors will be included, if they observe the established criteria, into the relevant thematic or horizontal programmes. The program of *National research centres* will become a part of the horizontal program "Integrated R&D".

The research plans as a form of realisation of the National R&D Policy can be considered part of oriented research. Unlike the programmes announced by the Government, the objectives of individual research plans formulated by research institutions themselves and they should correspond to the statute of these institutions are formulated by research institutions themselves watching the priorities of the National R&D policy and purposes of their own establishment.

2.2. *Reforming the organisation and governance of universities and other public research organisations*

All independent research organisations, most of all institutes of the Academy of Sciences of the Czech Republic and a part of the resort research institutes, must be transformed on the basis of the same principles according to which the transformation of universities - from the contributory organisations to public educational corporations - took place. The new R&D Act will create the necessary legal environment for that.

The transformation of the existing independent state R&D organisations will take place in two steps. The organisations will be legally transformed into state organisations at the first step realised by the general laws, which are in an advanced stage of preparation (the budgetary regulations of the Czech Republic and the law of the Czech Republic about assets and the role of the state in legal relations).

The R&D organisations, which consider R&D as their main subject of activities or which support its infrastructure, will be legally transformed into public research corporations at the second step, realised by the new research and development Act. This transformation will take place basically in the same way as it took place at universities.

3. *Government support for private-sector R&D and innovation*

3.1. *Enhancing the effectiveness of policy instruments used to provide public support for private sector R&D and innovation*

In the Czech Republic, in spite of high taxation, the indirect R&D support is an exception (there is only the customs free import for R&D in case of the academic research existing and the possibility to depreciate the costs of R&D at the level of 2% in the net income used for the calculation of the income tax).

Direct public funding of business R&D and innovation must observe the maximal possible level stated above in section 2.1.

There are two programmes of public/private partnership. Ministry of Trade and Industry administrates program KONSORCIA, Ministry of Education, Youth and Sports administrates program "National Centres of Applied Research". The objective of the KONSORCIA programme is to support the activities of purpose-built group consisting of researchers from Academy of Sciences of the CR (public sector), universities or other public laboratories and researchers from business sector towards the solving of a concrete R&D project and transfer of results in practise.

3.2. *Changes in the balance and/or priority of public support of business R&D and innovation*

Programmes to support R&D and innovation in SMEs are managed mainly by Ministry of Trade and Industry of CR with the aim to implement the National R&D policy. The most important program

TECHNOS focuses on the establishment and development of science and technology parks, that fulfil the function of entrepreneurs' incubators for start-up of small innovative firms.

4. Enhancing collaboration and networking among innovating organisations

The whole mechanism of the provision of the state support of research and development will be adjusted in a new R&D Act. A special attention will be paid to the legislative delimitation of the rights and obligations of both parties, including their reflection in the data required by the state and in the progressive unification of these data at individual bodies.

The new R&D Act will resolve, among other matters, also the problems of contractual relations and the delimitation of liabilities overreaching the time of the projects' solution, the problems of costs, the contractual delimitation of the utilisation of the results reached in the applied R&D taking place still at the time of the research. The Act will provide for the fixed limits of the cases in which there is a limited access of the state to the R&D supported by it, it will establish the sanctions and the ways of inspecting as well as the relations with other legislation (on the public support, on the state assets, on the state budget, etc.).

6. International co-operation and globalisation

Prepared new R&D Act takes into account the accessibility of R&D subjects from the member countries of the European Union to National Research Programme.