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# INNOVATION PERFORMANCE AND CHALLENGES TO THE BULGARIAN INNOVATION POLICY

*Innovation is the main driver of knowledge based growth of modern economy. That is why the improvement of innovation performance becomes a core of economic policy.*
*On the base of benchmarking innovation performance of the Bulgarian economy using the European innovation scoreboard data the paper identifies main challenges to the national innovation policy. Among them are: to foster the overall R&D funding base; to initiate a recovery of R&D in the business enterprise sector; to strengthen the human resource base; to enhance the interactions between the actors of the science, technology and innovation system. In this respect the following questions, concerning innovation policy mix are discussed: What are the main objectives and priorities of R&D policy in the country? Is there a gap between the challenges and the main objectives and priorities? Which policy instruments are in place today aiming at affecting R&D activities in the private and in the public sector? What are the instruments outside the R&D domain which are of particular relevance to R&D activities and the development of R&D expenditures? Is there a gap between the main policy objectives and priorities, and the instruments in place? What are the most important policy instruments that affect R&D expenditures? How does the governance of the system of R&D policy instruments take place, and is there a form of co-ordination between R&D policy and policy instruments from outside the R&D domain? Is there any evidence for interactions among the policy instruments in place with respect to affect R&D expenditure?*
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## 1. Innovation Performance of the Bulgarian Economy

The innovation performance of the Bulgarian economy relative to the average of European Union countries innovative performance is not satisfying. Based on the Summary Innovation Index, Bulgaria ranks in 26th place out of 33 countries. Improving the innovation performance becomes crucial problem in the process of the European economic integration. For identification of the challenges to the innovation policy the European trend chart methodology (2005)[2], is appropriate to be applied. This methodology was created as a practical tool for development of a policy towards European strategy, defined in Lisbon, 2000. In the frame of this methodology indicators are grouped in five categories according to the understanding for the key characteristics of innovation not as a lineal, but as a complex process. These categories of indicators are as follow:

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[2] www.cordis.lu/trendchart. There are tree stages in development of this methodology – 2001, 2003 and 2005.

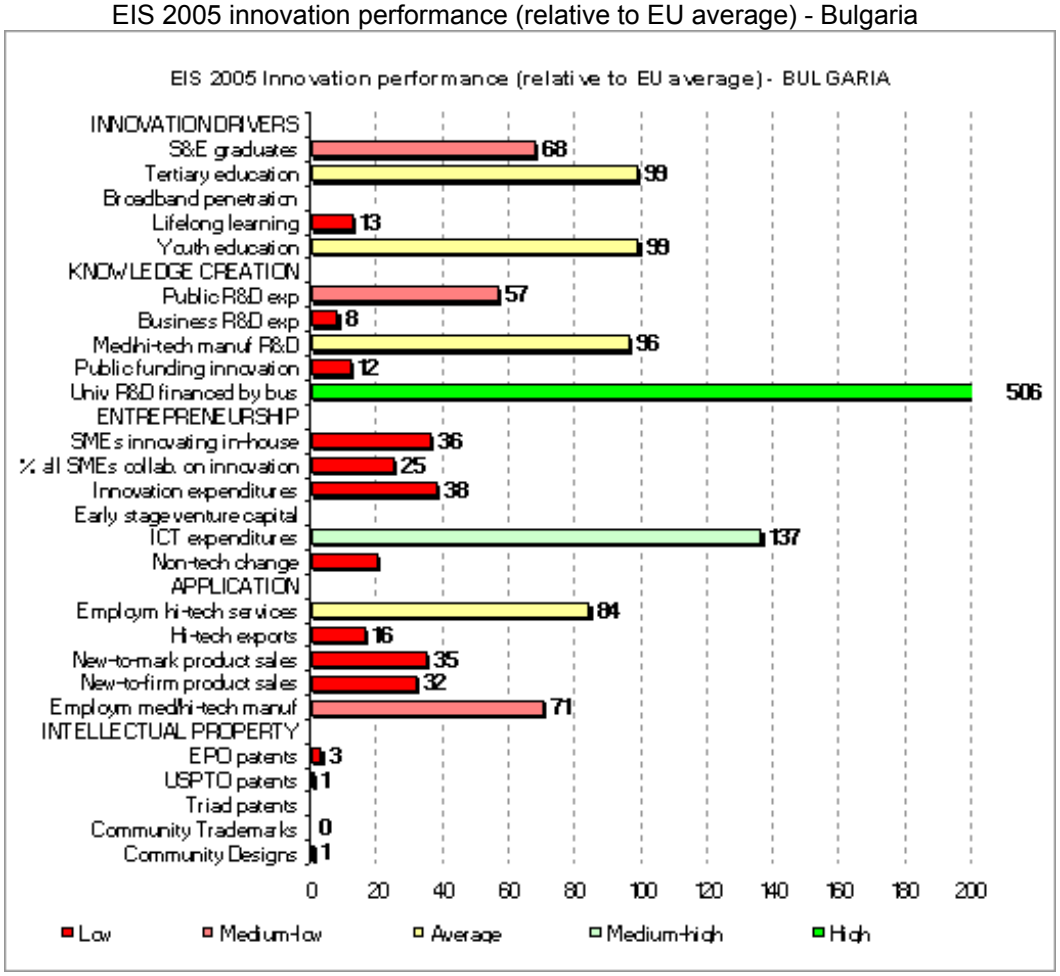
- Innovation drivers;
- Knowledge creation;
- Entrepreneurship;
- Application;
- Intellectual property.

This methodology positions science, technology and innovation indicators as indicators for input and output performance. The innovation input is constructed by sixteen indicators, grouped in three groups: innovation drivers, knowledge creation and entrepreneurship. The innovation output is constructed by ten indicators, grouped in two groups: application and intellectual property indicators.

On the base of the European trend chart 2005 methodology and data presented in the Fig. 1 further an evaluation of the innovation input and output performance of the country is presented.

Figure 1

EIS 2005 innovation performance (relative to EU average) - Bulgaria




Source: EIS 2005

*1.1. Innovation input performance of the Bulgarian economy*

The evaluation of the *innovation drivers* which characterize the structural conditions for innovation is possible to be presented for 4 of 5 European innovation scoreboard (EIS) indicators. Comparatively good is country performance according to population with tertiary education - the share of the population with M.A. degree for the age group 25-64 for 2004. Its level of 21.7% is 99% relative to EU average. The equal (99% of EU average) is the innovation potential of the country according to the youth education attainment level. The share of the population in the age group of 20-24 with secondary degree of education is 76%. Considerably lower is the country innovation potential according to the level of the science and engineering (S&E) graduates in the age group 20-29. It is 8.3 % in 2003 and performs 68% of the EU-average level. On the extremely low level is the share of the population of the age group 25 - 64 participating in the long-life learning – only 1.3%, which is 13% of the EU average.

*Knowledge creation* performs low level of innovation input in Bulgarian economy. It is evaluated as: level of public and business research and development (R&D); investment share of medium and high technology investment in R&D and as enterprises receiving public funding.

The public investments for R&D are insufficient. The R&D expenditures are only 0.39% of the GDP in 2003. This level is a result of stable tendency of a slow decline - from a level of 70% of EU – average in 1998, in 2003 the level of the public R&D becomes 57%. Even more unfavorable are conditions for knowledge creation, which depend on the business. The share of business R&D in GDP is 0.1, which is 8% of the EU-average. Approximately well Bulgarian economy is performed in respect to the share of R&D in medium and high-technology sectors – 85.9% in 2002, which is 96% of the EU – average. But this level does not mean that the innovation input is on high level in the country as the total R&D expenditures are on very low level. This fact has to be taken into account in commenting the high level of the business R&D investments in universities - 33.2%, which is 16 times higher then the EU level. In addition it has to be considered that the level of the total business expenditures for R&D as share of GDP is very low – only 8% of the EU - average.Very low is the share of enterprises, receiving public funding – 1%, which is only 12% of EU - average.

The *entrepreneurial input* is an important microeconomic characteristic of the innovation performance, but it is on very low level, taking into account available data for Bulgaria. The level of innovating in house Bulgaria SMEs is 36% relative to EU average. Only 2.3% of the SMEs cooperate for the purposes of reaching innovation output with others, which is 25% of the EU-average. Innovation expenditures are on the level of 38% of the EU – average. Only the level of information and communication expenditures is higher then EU – average – 137%. The SMEs using non technical change are 8.5%, for 2004 which is only 20% relative to EU – average.

*1.2. Innovation output performance*

The innovation output summarizes the evaluation of the innovation from the point of view of the application of new knowledge and intellectual property development.

The share of the employment in hi-tech services - 2.69%, as an innovation output is on a good level (84%) relative to EU – average. The share of the medium and high tech sectors is 4.66% of total, which is 71% of the EU- average. But the sales of the new to the market products as a share of the total is only 2.1%, which is only 35% relative to the EU – average. The sales of the new to the firm, but not to the market products are only 3.8%, which is 32% of the EU average. Unfavorable is the country performance according to the hi-tech export. Its share in the total export is only 2.9%, which is 16% of the EU average.

Very weak is the country innovation output performance in *intellectual property* development. The share of the new registered with European patent office Bulgarian patents for 1 billion of population is 3.7, which is 3% relative to the EU average. The share of the new registered with USPTO patents for 1 billion of population is 0.8, which is 1% of the EU – average. The registered new community trade marks on 1 billion of the population is 0.8, which is 0% of EU average, and Bulgarian new community designs on 1 billion of the population is 0.9, which is 1% relative to EU – average.

It could be assumed that Bulgaria is not well performed according to the levels and transformation of innovation input into innovation output. This state of the art defines the necessity of developing national innovation system capacity in order to overcome the unsatisfied innovation performance.

## 2. National innovation policy challenges

National strategy documents and mechanisms for innovation policy delivery have been elaborated, but nevertheless actual policy delivery and the provision of adequate resources remains relatively poor in Bulgaria. Hence, the measures proposed in strategy documents and draft laws are “either lacking the necessary resources or do is not supported by enough political will in the legislative process”.

Based on the review of national studies on the Bulgarian science, technology and innovation development, ERAWATCH country reports and the trendchart reports, at present the 4 main challenges for the National Innovation system of Bulgaria with respect to R&D intensity are as follows:

1. To foster the overall R&D funding base
2. To initiate a recovery of R&D in the business enterprise sector.
3. To strengthen the human resource base of the Bulgarian economy.
4. To enhance the interactions between the actors of the STI system.

### CHALLENGE 1: TO FOSTER THE R&D FUNDING BASE

R&D intensity (R&D/GDP) declined heavily after the transformation from a command to free market economy (See Figure 2.). The highest R&D intensity appeared in 1988, when the highest volume of the foreign trade turnover also took place. Figure shows the development of R&D intensity in Bulgaria compared with the EU-15 and the New Member States for the period 1990 – 2002. Until 1996 the dynamics of the R&D intensity is negative, and after that it is more or less stable with variations at levels of 0.5%.

Figure 2

R&D intensity (R&D/GDP) in Bulgaria for the period 1981-2000, %

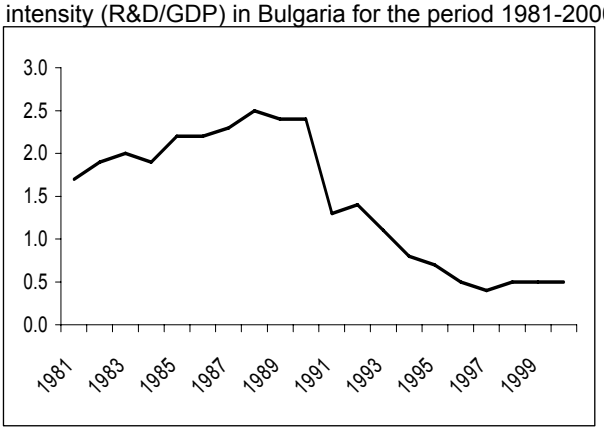
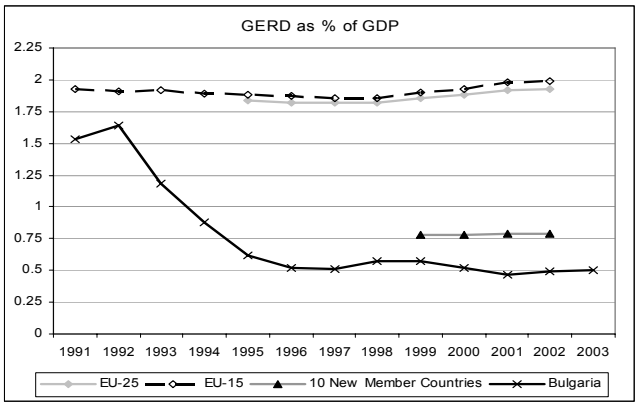



Figure 3

Dynamics of GERD/GDP (1990- 2002)




*Source:* National Statistical Institute – Bulgaria Eurostat

Table 1 presents a tendency of a slight decline of R&D intensity for the period 1996 till 2002, though an increase in the absolute sum of R&D expenditures appears, which points to the fact that the overall economic growth had a faster pace than R&D recovery.

Table 1

Total Gross Domestic Expenditures on R&D (GERD)

| Year | GERD | PPP ($) | GERD as % of GDP | GERD per capita (in PPP$) |
|---|---|---|---|---|
| 1996 | 9 148 000 (b) | 236 850 | 0,52% | 28,3 |
| 1997 | 88 591 000 | 221 769 | 0,51% | 26,7 |
| 1998 | 127 598 000 | 258 547 | 0,57% | 31,3 |
| 1999 | 134 449 (b,y) | 264 158 | 0,57% | 32,2 |
| 2000 | 131 098 | 249 386 | 0,49% | 30,5 |
| 2001 | 129 721 | 235 951 | 0,44% | 29,4 |
| 2002 | 158 327 | 278 313 | 0,49% | 34,9 |

PPP: Purchasing power parity, * b – break in series, y - denomination change
Source: Eurostat

It could be concluded that the main instrument for fostering the R&D funding base is to increase foreign demand for domestically based technologies, products and services.

**CHALLENGE 2: TO INITIATE A RECOVERY OF R&D IN THE BUSINESS ENTERPRISE SECTOR**

But not only R&D intensity declined dramatically, similar to other transition economies also in Bulgaria a shift in the sources of R&D funding along with a change of R&D performance by sectors occurred.

The most striking result in this respect is the collapse of R&D performance in the business enterprise sector. By 1999 its share had dropped by about a factor of three since the early 1990s. The long-term development of business R&D is shown in Figure 4, reinforcing the notion of an especially sharp decline in 1997. As compared with the common tendencies for Central and Eastern European (CEE) transition countries, perhaps the only surprising fact is that the share of business R&D remained at levels of 50% to 60% of GERD until 1996.

As the share of higher education has not changed much and the share of NGOs is negligible, the other side of this coin is the rising share of the state sector in carrying out R&D. A big shift in R&D performance occurred in 1997, when inflation and a redirection of macro policy hit the country and a sharp decline in total R&D expenditures occurred.

Since then, questions concerning the efficacy of relying increasingly on the state sector for pursuing R&D continue to arise, especially as privatisation and marketisation are key policy issues. It is expected, that the drastic decline in business R&D expenditures will have serious consequences for technological accumulation over the longer term.

Table 2

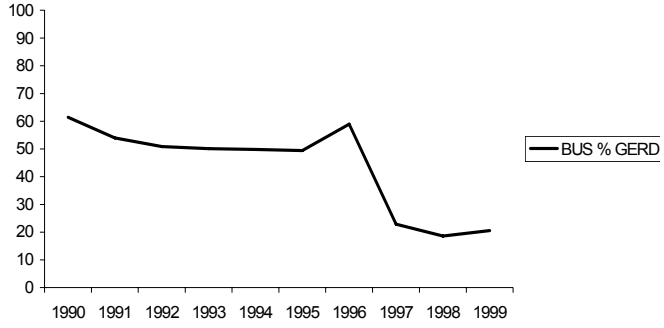
Sources of funds for R&D in Bulgaria

| Years | Business Enterprise % | | Government % | | Higher education % | | Private non-profit % | | Funds from abroad % | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1996 | 60,4% | B | 35,1% | b | 3,8% | B | 0,4% | b | 0,3% | b |
| 1997 | 23,3% | | 67,8% | | 2,4% | | 0,9% | | 5,7% | |
| 1998 | 23,6% | | 69,7% | | 2,7% | | 0,2% | | 3,8% | |
| 1999 | 22,8% | B | 69,7% | b | 3,2% | b | 0,2% | b | 4,1% | b |
| 2000 | 24,4% | | 69,2% | | 0,9% | | 0,3% | | 5,3% | |
| 2001 | 27,1% | | 66,2% | | 0,7% | | 0,3% | | 5,7% | |
| 2002 | 24,8% | | 69,8% | | 0,2% | | 0,2% | | 5,0% | |

Source: Eurostat, b – break in series

Figure 4

Share of business enterprises performing R&D, Bulgaria, 1990/1999




Source: Calculations by Chobanova, based on unpublished data supplied by the NSI

## CHALLENGE 3: TO STRENGTHEN THE HUMAN RESOURCE BASE IN THE ECONOMY

Since 1990 the total number of R&D personnel has declined by a factor of about 6. The data in the table 5 cover the period from 1996 until 2003. In this period the number of total R&D personnel declined by approximately 40%, the number of researchers by about 35%.

Table 3

Human resources in R&D

| Year | Total R&D Personnel FTE | Female R&D | Researchers FTE | Female Researchers | Technicians and equivalent staff FTE | Female Technicians | Other supporting staff FTE |
|---|---|---|---|---|---|---|---|
| 1996 | 26 158 | 13 788 | 14 751 | 6 114 | 8 169 | 5 462 | 3 238 |
| 1997 | 18 625 | 10 078 | 11 980 | 5 431 | 4 550 | 3 166 | 2 095 |
| 1998 | 19 116 | 10 148 | 11 972 | 5 321 | 4 862 | 3 295 | 2 282 |
| 1999 | 16 087 | 8 374 | 10 580 | 4 656 | 3 829 | 2 578 | 1 678 |
| 2000 | 15 259 | 8 106 | 9 479 | 4 354 | 3 833 | 2 441 | 1 947 |
| 2001 | 14 949 | 7 907 | 9 217 | 4 247 | 3 786 | 2 355 | 1 946 |
| 2002 | 15 029 | 8 106 | 9 223 | 4 353 | 3 713 | 2 374 | 2 093 |
| 2003 | 15 453 | ... | 9 589 | ... | ... | ... | ... |

Source: EUROSTAT

The full time employed R&D personnel is 15 453 in 2003. Women represent approximately half of the total R&D personnel, taking a higher share in technicians and equivalent and supporting staff than in researchers. The decline of the human resources in S&T in Bulgaria is confirmed by table 3 also.

There is a very strong process of brain drain from the R&D sector in Bulgaria. A lack of a clear strategy for transformation of the Bulgarian S&T sector and its European and international integration has especially affected adversely higher educated and skilled personnel. Since 1992-1993 the share of Bulgarian higher educated (HE) emigration has started to increase. The major factor motivating this emigration is a higher living standard and possibilities for better professional and personal realization abroad. Better social relations are another important factor affecting this tendency.

A first survey on emigration (1991)[3], covering the beginning of the transformation period, shows that the main direction of Bulgarian HE emigration is Europe – mainly Germany, but the second one, covering the period of 1995/1996 shows that the USA have become the main direction for HE emigration. Furthermore an increasing share of young people emigrating characterises Bulgarian emigration.

According to a feasibility study on the immigration of higher educated people, immigrant flows are to be neglected comparatively to the emigration phenomenon and mainly connected with personal reasons. The country lost one small town of 55-60 000 of its higher educated and skilled population each year during the last decade. However, a lack of data availability is burdening the detailed analysis of this process. In this respect it is extremely important to launch a survey on this topic in order to collect much more facts on flows.

[3] COST project (1997), Brain drain from Central and Eastern Europe; Калчев, Й. (2001) Външната миграция на населението в България, Дунав Прес АД.

Table 4

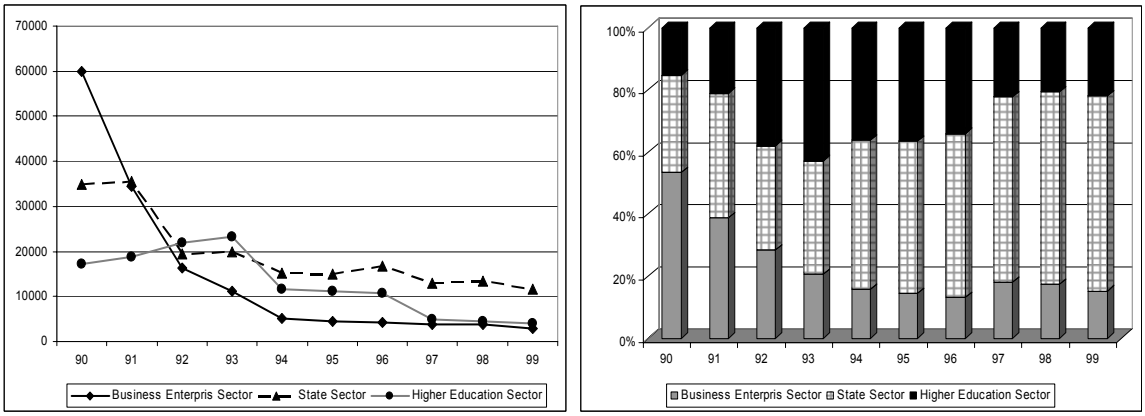
Human resources in R&D - indicators

| *Years* | *Researchers (FTE) per million inhabitants* | *Technicians (FTE) per million inhabitants* | *Total Personnel % Female* | *R&D Researchers (FTE) % Female* |
|---|---|---|---|---|
| 1996 | 1 765 | 978 | 52,7% | 41,4% |
| 1997 | 1 441 | 547 | 54,1% | 45,3% |
| 1998 | 1 450 | 589 | 53,1% | 44,4% |
| 1999 | 1 289 | 466 | 52,1% | 44,0% |
| 2000 | 1 160 | 469 | 53,1% | 45,9% |
| 2001 | 1 149 | 472 | 52,9% | 46,1% |
| 2002 | 1 158 | 466 | 53,9% | 47,2% |

Source: Eurostat

Figure 5

R&D personnel by performance sectors (levels and shares of total)




Source: Calculations by Chobanova, based on unpublished data supplied by the National Statistical Institute.

The absolute numbers show a very sharp drop in personnel in business-enterprise R&D until 1994, then a slower decline. Personnel in government R&D also dropped but less sharply, mostly in 1992. Personnel in the higher-education sector rose somewhat until 1993, but then fell very sharply until about 1997. The right panel of the Figure shows proportions in each of these performing sectors. It is clear the solvent demand for tacit knowledge is lower then the existing supply.

**CHALLENGE 4: TO ENHANCE THE INTERACTIONS BETWEEN THE DIFFERENT ACTORS OF THE STI SYSTEM**

The Bulgarian STI system has a well-developed STI institutional system but with not enough mature interactions between the state/higher education R&D system and the business sector in Bulgaria. This hampers speeding the innovation processes in the country.

As stated in the Trendchart report, the innovation governance system is currently better developed in terms of structure, better established in terms of legislation and better coordinated than it was just a few years ago. Nevertheless, there are still weak horizontal and coordinational mechanisms between the main NIS institutions on central level.

Challenges both for policy and economic actors in the present situation and in the future could be summarised as follow:

- Increasing internal demand for domestic R&D activities and outcomes, mainly the business demand
- Increasing foreign demand for domestic R&D activities and outcomes
- Increasing the quality of R&D potential and quantity of R&D personnel
- Fostering domestic and international innovation networks alignment
- Increasing R&D in industry.

In this respect the definition of the priority dimensions for public support for research and innovation projects based on precise definition of the state of the art and tendencies of demand and supply of knowledge in a country is a problem of increasing significance.

The institutions play a basic role for meeting the innovation policy challenges. The main Bulgarian institutions in the field of innovation remain quite stable and there is a clear division of responsibilities between them according to the Trendchart report. Table 1 displays the results of the SWOT analysis of the Bulgarian innovation system as performed in the Trendchart 2005 report.

Table 1

SWOT Table of the Bulgarian Innovation system

| **Strengths** | **Weaknesses** |
|---|---|
| • Adequate network of institutions;<br>• National Innovation Strategy in place;<br>• Progress in implementing measures set in the Strategy (National Innovation Fund started in March 2005);<br>• Involvement of main stakeholders in policy making and policy consultation;<br>• Evaluation process for internationally financed projects. | • Weak horizontal links and coordination mechanisms between the main NIGS institutions on central level;<br>• Slow implementation of measures in National Innovation Strategy because of insufficient resources;<br>• Involvement of stakeholders rather formal;<br>• Lack of stakeholder Involvement in delivering measures;<br>• Lack of political will to encourage venture capital enterprises;<br>• Evaluation process is not systematic and transparent;<br>• Slow legislative process;<br>• Slow implementation of the positive measures set in the laws and in National Innovation Strategy;<br>• Lack of vertical coordination between central and local priorities (and especially in innovation). |
| **Opportunities** | **Threats** |
| • Improved efforts for communication between stakeholders;<br>• Debate on 0% corporate profit tax rate on reinvestment of profit and on flat tax introduction going on;<br>• Some demand side measures in place (faster depreciation for PCs and software);<br>• Pilot foresight initiatives launched by NGOs. | • No policy to foster high-tech employment;<br>• Further delay in delivering regional innovation strategy initiatives;<br>• Further delay in PPP rules and regulations adoption, which delays stakeholder involvement on delivery level. |

Source: Trendchart Report Bulgaria 2004-2005

It could be assumed that the proper answer to the question whether the challenges to innovation policy will meet adequate reaction from the nationals innovation system depends on the objectives and priorities of the national research and development (R&D) policy.

## 1. Objectives and priorities of R&D policy

The objectives and priorities of R&D policy are defined in several official documents. The Law on stimulating R&D activities, which has passed the Parliament in October 2003, declares the R&D is a national priority and that they have strategic influence to the country's development. In September 2004 the Government has approved the strategy for science, technology and innovation. The document is based on comprehensive analysis[4] of the current situation in Bulgaria and expertise of countries with good management practices in the area of innovation.

The National strategy formulates a policy mix, consisting of financial and non-financial measures. Among them are to upgrade the science and technology (S&T) sector; to upgrade existing companies; to generate new knowledge intensive economic activities; financing innovation.

One of the main financial measures to encourage innovation has already been implemented namely National Innovation Fund. It is the first proactive purely innovation related enhancement policy measure in transition history of Bulgaria. Although it is a huge step forward in policy making and implementation its initial 2005 budget of BGN 5 million (euro 2.5 million) is not likely to contribute significantly to the innovation performance of the economy. However, on the positive side, its annual budget is scheduled to increase to about BGN 101 million (euro 50 million) by 2013.

Among the most important innovation policy objectives are:

Encouragement of the employment of young specialists in SMEs;

Cluster development;

Attracting foreign direct investment in R&D activities;

Setting up and encouraging of existing technology parks.

A number of changes were introduced recently to research legislation in Bulgaria, namely in the Law on Trademarks and Geographical symbols (State Gazette, issue 94 from the 25th November 2005), the Law on Copyright and Neighboring Rights (State Gazette, issue 99 from the 9th December 2005) and Law on Genetically modified organisms (State Gazette, issue 99 from the 9th December 2005). Those changes aim at raising the level of harmonization of Bulgarian with European legislation.

In April 2006, the National Strategic Reference framework for the period 2007-2013 was adopted by the Bulgarian government. The Framework identifies the majour tasks for Bulgaria for achieving cohesion with the EU through the use of Structural Funds' assistance and includes tasks for developing the Lisbon strategy in Bulgaria - increasing R&D funding, including business R&D funding, improvement of educational services, increasing the market orientation of research etc.

The National Scientific Fund has announced its updated requirements for participation in its research programmes.

[4] http://www.mi.government.bg/doc_pdf/Position%20Paper%2009%2020002.doc

## 2. Coherence between national innovation system challenges and R&D objectives and priorities

It could be concluded, that there is well-developed structure for governing Bulgaria's science, technology and innovation development, but nevertheless actual policy delivery and the provision of adequate resources remains relatively poor. More concretely – there is a gap between the R&D development objectives and R&D funding base; between fostering innovation aim and slow recovery of R&D in business enterprises; between strengthening the human R&D resource base in economy objective and level of R&D personnel salaries and of funding R&D activities. The insufficient foreign and domestic solvent demand for domestically based R&D activities and results leads to further decline of their supply.

The National strategy for scientific research for the period 2007-2013 defines as challenge that the 3% Barcelona target has not been taken fully into account by the Government. The few measures it has adopted in this direction are inappropriate and / or ineffective.

It could be concluded that the coherence between national innovation system challenges and research and development objective and priorities is not satisfied.

## 3. Composition of the policy mix for R&D

The strategy on Science, technology and innovation (STI) outlines numerous actions to be taken to upgrade STI in Bulgaria. The science and technology foundations play a significant role in this respect.

Scientific and educational institutes in Bulgaria are financed directly by the government (input financing). In Bulgaria, input financing gradually is replaced by output financing. Such a system should is designed in general terms while specific instruments (2 research foundations) are set up. The set of priorities and assign projects are defined on the basis of competitions. The foundations invite proposals from scientific institutes and they select the best proposal after which the project is granted.

The *Bulgarian Science Foundation* receives funds from the state with the purpose of performing mainly fundamental scientific research. The evaluation of proposals is based on the quality of such proposals.

The *Bulgarian Innovation Foundation* receives funds from the state with the purpose of performing projects in technological development. The foundation invites proposals from teams of scientific institutes and companies. A condition for granting funds is that the company contributes financially to the project. The selection of projects is based on scientific quality as well as potential utility.

Another action to upgrade S&T sector is development of the scientific or technological institutes that have the potential to compete for R&D projects on the international market and should be equipped with tools for marketing and acquisition. Competence centres are located at universities and encourage and facilitate research-based co-operation between universities and the business sector. The management of each centre is governed by a board, which is jointly appointed by the parties concerned, i.e. the university, the companies and a representative of the National Innovation Council.

The next action to to improve the knowledge base in small companies is development of placement scheme for graduates in small companies. So called

‘placement schemes’ can be found all over Europe, e.g., the UK Teaching Company Scheme and the Dutch KIM scheme. These schemes mostly involve subsidised placement of graduates in existing, non-innovative SMEs. Addressing the mobility of human resources with such placement schemes is one of the most direct ways to improve the knowledge base in industry. It is the preferred policy to improve the knowledge base of small companies that do not have the financial and human resources to perform research and development activities. Moreover, in the case of Bulgaria, such a placement scheme would enhance the demand for highly educated labour, which could serve to put a hold to the ‘brain-drain’ problem.As a concrete action it is suggested to adopt a financial incentive scheme to subsidise the labour costs of the first engineer or scientist in a company smaller than 100 workers by 50% for two years. A placement fund as suggested here will stimulate innovation efforts of small companies and is preferred over giving tax incentives for R&D because tax incentives are not deemed effective for companies that make little or no profit, and R&D expenses have to be pre-financed, which means that reimbursement comes only after the expenses have been made.

The diffusion of the knowledge and innovation in the food and agricultural sector plays an important role in the composition of the policy mix for R&D. The technology transfer mechanisms are a very effective way to enhance innovativeness in farms and companies. To bridge the gap between public sector scientific researchers and entrepreneurs the policy solution throughout Europe has been for many years to strengthen the intermediary infrastructure. In addition to private knowledge, business services and collective public/private initiatives like branch-organisations, public intermediates like regional development agencies and innovation relay centres fulfill an important role in promoting innovation in SMEs. Technology transfer institutions are often established to serve particular branches of industry or industry clusters, hence the name ‘cluster-based diffusion’.

Despite many recent initiatives, the present intermediate innovation infrastructure in Bulgaria is still rather weak. It is proposed to strengthen this intermediate infrastructure, amongst others by establishing Innovation Transfer Institutes that provide (individual and collective) innovation services to (preferably clustered) SMEs with innovation potential. The cluster-platform and clients will contribute financially to the operation at an annually increasing rate. Such institutes should be established with priority in the agricultural and food sector; when more experience is available the need for such institutes in other sectors should be investigated.

The innovation transfer institutes should comprise different public and private actors and should serve to promote innovation in companies and innovative relationships between actors within the cluster. Main tasks of an innovation transfer institute are to: advise companies within the cluster on matters relating to innovation; transfer know how from research and education institutes, either by its own initiative or by specific requests from companies of the cluster; organise demonstration events, workshops, lectures, company-visits etc.; collect know how gaps in the cluster and defines R&D projects to fill these gaps. The Transfer Institute could also be given the task of the international marketing of the cluster activities in order to attract foreign capital or ‘jobbing’ deals from foreign customers. According to the strategy an interesting option would be to develop an Innovation Transfer Institute for the agri-food cluster in the region of Plovdiv, including actors

like the University of Plovdiv, Institute for Horticulture and Canned Foods, the National Agricultural Advisory Service, and others.

A very important direction of acting to upgrade the scientific and technology sector is addressed to the established innovative firms. In order to increase the involvement of innovative companies (which somehow already have a relationship with universities) into the National Innovation System two channels of innovative interaction are important: science-industry relationships and inter-firm relationships. Based on the experience that other firms are the most important external source of innovation it is important to stimulate inter-firm interaction. Moreover, as it is well documented in the literature, innovative relationships are mostly based on informal networking.

The Bulgarian innovation strategy therefore proposes to promote the formation of an Association of Innovating Companies (AIC). An additional advantage of the Association as proposed is that it can function as a communication channel with the government. As 'Good practice' examples the activities of Syntens in the Netherlands, and the Association of Innovative Enterprise - active in the Czech Republic for a number of years now - forming a network of industrial companies, universities, and science and technology parks, are mentioned.

Actions to generate new knowledge intensive economic activities are mainly connected with attracting appropriate foreign investments. The Bulgarian Foreign Investment Agency or BFIA is promoting international companies to invest and produce in Bulgaria with an immediate effect on Bulgaria's Gross Domestic Product. For Bulgaria Foreign Direct Investment (FDI) is also important in relation to innovation.

Although the activities of the BFIA should certainly not be limited to technology driven foreign investments, the emphasis of the Agency should shift into this direction and it should become equipped to act as a professional discussion partner of foreign technology driven companies. BFIA should become equipped with facilities and means to approach foreign technology companies directly and its authority to make contracts with foreign companies should be extended.The aim should be to attract investments in the sphere of production and distribution, as well as in research and development, either through the establishment of private foreign R&D institutes in Bulgaria (cf. the R&D institute of Nokia in Budapest – 2000 people) or through paid research contracts to Bulgarian R&D institutes. BFIA should approach foreign technology driven companies directly by teams of high standing national leaders and technological specialists who know what Bulgaria has to offer.

The issue of Technology Parks has already received considerable attention from the Bulgarian Government and the Phare Programme. Nevertheless, a proposition at this place is indicated, as Technology Parks are an integral part of STI Policy. The establishment of a Technology Park is a difficult issue as many authorities are concerned: the national government, local authorities, universities, the Academy of Science and perhaps others. It takes for all these parties to come to an agreement. The National Council on STI should take responsibility for the establishment of Technology Parks while funding can come from the National Innovation Fund or other sources.

Hence, an analysis of current situation and development of a feasibility study and project plan for a chosen location are intended.

According to the SME Report 2000 (ASME, 2001) the most important barrier to innovation in SMEs in Bulgaria is the lack of financing. There are several initiatives (public and private, national and international) to overcome this problem5, e.g., the programmes of the Encouragement Bank. However, more possibilities for obtaining credits are needed, including special credits for innovative activities. Such credits could in certain cases be used to supplement other financial schemes, such as the one of the EU.The recent initiatives to improve the access to finance for small firms should be evaluated, and improved accordingly. Especially, credits in relation to innovative activities should be enhanced. In this respect the National Innovation Council and its Fund could play a role in the evaluation, coordination, improvement and enlargement of the facilities.

**4. Coherence between main policy objectives and priorities, and policy instruments**

The Bulgarian research system is heavily influenced by the country' EU accession. It has a direct influence through the successful participation of Bulgarian research organisations in $4^{th}$, $5^{th}$,$6^{th}$ Framework programmes of the EU. Research priorities set at EU level are closely followed in Bulgaria and national research policy documents are often designed to accommodate in the fullest possible way the guideline provided at EU level.

It is expected that in 2007 Bulgaria will have access to EU structural funds, which would boost spending on research infrastructure and creation of intermediary organisations between business and research. The latter is expected to substantially increase the impact of the Bulgarian research system.

The number of nationally specific instruments in place in Bulgaria is very limited and they have not enough potential to cover the gap between challenges, objectives and priorities. The limitation of the set of R&D policy instrument is defined by the Currency Board regulations, being in force since 1997.

An open coordination of national and EU objectives, priorities, and instruments is the main challenge for achievement of higher levels of R&D investments and their efficacy.

**5. Policy mix instruments and target groups**

The state budget supported Bulgarian Academy of Sciences and National centre for agrarian sciences dominates the Bulgarian research system. Universities, which have been primarily educational institutions in the past, have increasingly embarked on research but still, have limited capacity. The system is primarily based on state budget support. Competitive research programmes though active since 1990, have increased their weight in the system only in pat 2-3 years. Private R&D expenditure is one of the lowest in Europe; while public expenditure is insufficient and spent by the oversized public research sector (e.g. Bulgaria has 43 universities on a population of less then 8 million).

**6. Balance within and emergence of new R&D policy mix**

The overall contribution of the policy instruments to volume/increase of R&D expenditures in Bulgaria is modest. The volume of R&D expenditures increases

[5] See EC (2001, p.4-6) "CC BEST Report, Volume II, Report on the Candidate Countries' Measures to promote Entrepreneurship and Competitiveness".

constantly. But the R&D intensity since 1997 is of level of 0.5% and, according to the National innovation strategy, it is not planed to increase.
The impact of the national policy instruments to the R&D performers is significant, as the state budget funding performs almost 80% of total.
In 2005/6 there is a significant step ahead toward attracting public attention/attention by policy makers, but still there is a lot to be done. But te importance of policy instruments to increase the volume of public funding involved is still modest.
The main beneficiary of a shift in public funding is SMEs.
The Bulgaria's EU accession plays the most significant role in developing the set of R&D instruments. The set of instruments is framed by the limitations of currency board.
The Bulgarian research system is heavily influenced by the country' EU accession. It has a direct influence through the successful participation of Bulgarian research organisations in 4th, 5th,6th Framework programmes of the EU. Research priorities set at EU level are closely followed in Bulgaria and national research policy documents are often designed to accommodate in the fullest possible way the guideline provided at EU level.
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An open coordination of national and EU objectives, priorities, and instruments is the main challenge for achievement of higher levels of R&D investments and their efficacy.

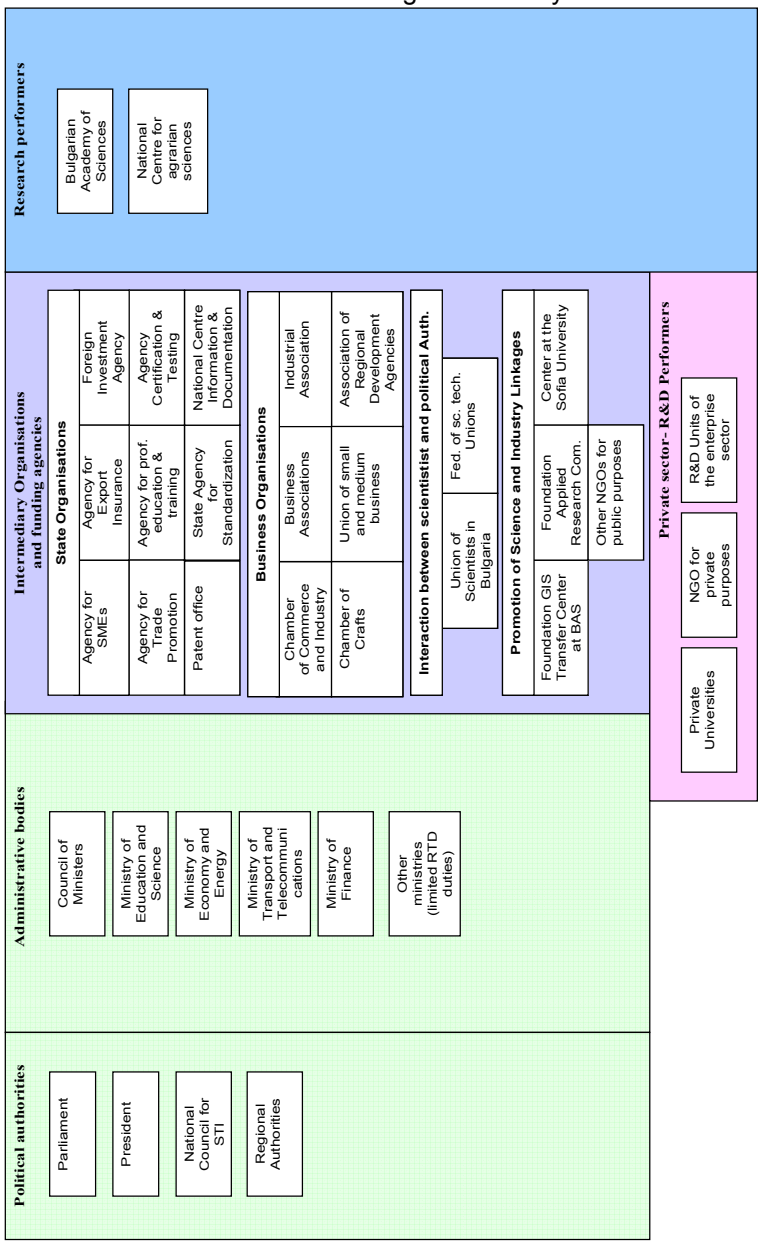
## 7. Governance of the policy mix and interactions between policy objectives and instruments

The Bulgarian Science and Technology system comprises research performers and policy making entities of the government sector, the research sector, the higher education sector, the business sector and non-profit organisations (See Fig. bellow).
The coordination between R&D policy instruments from outside the R&D domain could be improved. The effectively of their function with respect of the policy mix development is not on the needed level. The Ministry of economy and energy and the Ministry of education and science are the bodies where the gap in the policy system can be addressed, but the coordination between them and other ministries, from where innovation policy mix arrive also still need to be improved.
The policy instruments in place increase the absolute R&D expenditures and change their structure, but have neutral effects to the increase of the R&D intensity.
The interactions between direct and indirect R&D policy instruments are modest and they have not significant influence with respect to affect R&D expenditure.
This statement is valid also for the interactions between financial R&D policy instruments (grants, tax credits etc.) and non-financial R&D measures (IPR, reform of public research, incentives for co-operation, infrastructure provision etc.)

Instruments from other policy domains affect the R&D policy in Bulgaria. The Currency board introduced in 1997 leaded to closure of 36 funds for supporting R&D in specific economic sectors. The financial stabilisation and the average 5% annual growth has developed good environment for increasing R&D expenditures, but the insufficient foreign and domestic demand for domestically based R&D activities neglect the opportunities.

Figure 1

Main Actors of the Bulgarian STI System



NOTE
To: CREST delegations
Subject: "Lessons for R&D policies on the basis of the national reform programmes and the 2006 Progress Reports"
= CREST report on the mutual learning exercise

Delegations will find attached the CREST report on the results of the mutual learning exercise which was carried out during the 311th CREST meeting on 13-14 November 2006. This version of the report has been approved by CREST at the occasion of the 312th meeting on 1 December 2006.

## CREST REPORT

## LESSONS FOR R&D POLICIES ON THE BASIS OF THE NATIONAL REFORM PROGRAMMES AND THE 2006 PROGRESS REPORTS

### INTRODUCTION

The mutual learning exercise of CREST[6], carried out on 13 and 14 November 2006, responded to the request from the Competitiveness Council to make optimal use of CREST as an interface between the research polices of the Union and those of the Member States and as a platform for enriching national policy making through mutual learning informed by the research aspects of the National Reform Programmes[7]. The need for sharing and learning from the wealth of policies contained in the NRPs was further endorsed by the 23 - 24 March Spring European Council.

CREST has been given the task of monitoring the implementation of the Lisbon agenda on R&D, in particular with regard to the Barcelona target of 3% of GDP to be spent on research by 2010.

CREST has built its mutual learning exercise as a complement of the Open Method of Coordination in support of the 3% research investment objective that CREST has already used in three cycles on thematic or horizontal topics over the last years.

The conclusions of this CREST report on mutual learning in research policy come in time for the preparation of the European Commission's Annual Progress Report, due to be tabled on 13 December 2006.

This CREST report will be presented to the Competitiveness Council during the forthcoming German Council Presidency, while the Economic Policy Committee (EPC) is conducting a complementary exercise under the remit of the ECOFIN Council. In its work, the EPC refers to the four areas (R&D and innovation, labour market, energy, better regulation) that the 2006 Spring Council identified as priorities of the Lisbon agenda.

[6] Modus Operandi, Council document CREST 1208/06
[7] Contribution of the Competitiveness Council to the Spring European Council 2006 (Key Issues Paper)

Compared to the very useful, yet more general analysis undertaken by the EPC, the outcome of the CREST mutual learning exercise focused on more detailed information on European research policies and instruments.
The CREST R&D policy learning exercises were organised in five working groups, each with five Member States and two associated or candidate countries. Individual Member States presented their national research policy strategies and instruments, their relationships to Community research policy instruments, as well as issues in research policy governance and future challenges. The experience of individual Member States was reviewed by a discussant, which created a situation facilitating more profound dialogue, sharing and understanding of research policies and instruments among participants.

**Conclusions**

**KEY CHALLENGES IN R&D**

On the basis of the National Reform Programmes and the 2006 Progress Reports, CREST has discussed issues that will continue to be highly important in future R&D policy. In the light of this exchange of views, CREST

- **AFFIRMS** that increasing business expenditure on R&D requires a focus on designing a well balanced policy mix in a globalised context. However, there cannot be a general formula on optimal research policy mixes for the Member States because this also depends on linkages with other policies like education, employment and competition; each individual

country will continuously have to carry out tailor-made actions to promote favourable framework conditions for research and innovation in a globalised environment and will have to consider coordinated action with other Member States or at the EU level whenever appropriate. Member States are already using a variety of direct and indirect instruments such as tax credits and other financial mechanisms to foster risk capital and private equity, public-private partnerships, public procurement, cluster policy, training, specific research and innovation programmes etc. The quest for a well balanced *policy-mix* will be a revolving cycle of identifying strategic policy priorities, implementing policy measures, evaluating their impact, and adapting these activities in the light of new challenges.
**REINFORCES** its call for a coherent strategy in international R&D cooperation. Globalisation, the multilateral relations between the EU and other regions of the world, the role of Europe in international research organisations, neighbourhood policies in Europe, the global mobility of enterprises with regard to knowledge and resources, Member States' bilateral and multilateral relations, trans-border regional research activities, or research projects on a global scale such as ITER, provide ample reasons for an international strategy that puts Europe on an equal footing with its global partners. Within the EU, each Member State should strike a good balance between EU and national and/or regional research policies.
**NOTES** recent developments in some Member States to foster excellence in human resources and research activities, the latter with a clear focus on strengthening the knowledge base in highly competitive areas, e.g. the service sector, health care, energy supply and efficiency. Together with the European Commission, the Member States are defining the criteria for 'lead market' selection,

aiming to set clear objectives through co-operation with key stakeholders and designing coherence and coordination between relevant policies.

**ENCOURAGES** the Member States and the European Commission to continue their efforts in bridging the "cultural divide" between science and industry. All countries have already taken a broad range of measures to support inter-sectoral cooperation, e.g. through cluster
initiatives, tax credits for contractual research, direct support schemes, specific grants, the exchange of staff, or technology transfer activities. The common denominator of all these policy measures should be to stimulate higher private investment in research and innovation, and to create added value through new partnerships, new financial and intellectual resources, knowledge transfer, and a more market-friendly approach in academic institutions creating more leverage for private research.

**RECOGNISES** the need for public research organisations to pay more attention to an increasingly competitive and open environment in academic research, education and innovation. Universities and other public research institutions will only be able to react adequately to global competition and the need to commercialise their results if they develop a clear profile of their core competences, critical mass, quality of research training, and a sufficient degree of flexibility to adapt or modify their strategic goals over time.

**EMPHASISES** that public investment into the R&D system rarely shows immediate effects and these effects are not always tangible. Issues concerning the ability of national research systems to apply increased funding or respond to R&D incentives in an effective way can also arise. Member States will therefore have to carefully consider the *absorptive capacity* of their national innovation systems (and if necessary how best to enhance this factor) when determining their response to meeting the 3% objective.

**INVITES** the Member States and the European Commission to use their supportive instruments with a view to attracting the best and most talented people in the world to carry out research in Europe. The policy measures already in place need to be thoroughly evaluated with regard to their effectiveness in promoting *brain circulation* on a global market for researchers. Specific attention should be paid to policy measures that would intensify the mutual exchange of researchers between more R&D intensive countries and other CREST Member States as well as between the public and the private sector. Both within and between national innovation systems, further efforts need to be made to create or strengthen policy frameworks for career development of researchers which are coherent, open, flexible and merit based in order to ensure the fullest and most effective participation of talented people from all backgrounds, in particular younger researchers, women, and internationally or inter-sectorally mobile researchers.

**UNDERLINES** the importance of *setting priorities* in research and innovation policy. Given the budgetary constraints, the great variety of possible thematic focuses, instruments and target groups of specific measures holds the inherent danger of trying to satisfy all needs at once, which can easily lead to fragmentation of the national innovation system and reduced impact. The best way to counteract fragmentation is to set up a coherent policy strategy with clear overall objectives as well as strategic action lines with the appropriate corresponding milestones, resources and responsibility. When setting priorities, it will be crucial for the

acceptance of these policy decisions to involve the scientific community, the business sector and other stakeholders in the decision-making process.
**TAKES NOTE** of the fact that *Structural Funds* are seen as a powerful instrument for improving regional research and innovation policies, notably in many new Member States, but that other countries are also envisaging a more intensive use of Structural Funds - often for large-scale infrastructure projects. EU programmes and instruments need to be combined with adequate national and/or regional measures in order to unfold their full usefulness as R&D policy measures. The complementary national policies depend on the specific situation of that particular country. The diversity of Member States' technological specialisations and industrial structures and therefore also their research policies implies that the relative importance of EU level policy instruments and programmes differs between Member States. In one country, the Framework Programme may be more relevant, while in another country the Structural Funds are more important for research.
**OBSERVES** that the set of instruments developed in the context of the European Research Area (e.g. ERA-NET, ERA-NET plus, Article 169 initiatives, Technology Platforms, Joint Technology Initiatives) is increasingly relevant for Member States. The potential effect of these mechanisms will be to enhance the level of coordination and the creation of better competitive advantages for specific technologies by combining the efforts of public and private stakeholders, and the steady development of a more coherent European research policy framework.

**GOVERNANCE**

Having discussed the requirements for good governance of R&D policy in the National Reform Programmes, CREST
**ACKNOWLEDGES** the progress that Member States have made in coordinating the Lisbon agenda over the last two years. In research policy, specific internal *coordination mechanisms* in each Member State have proved to be appropriate for the required level of cooperation between politics and administration.
**EMPHASISES** the *sustained political commitment* that is needed to implement the Lisbon and Barcelona objectives in the field of R&D policy.
**INVITES** CREST Member States, together with the Commission, to further enhance their efforts to *involve stakeholders and the general public* in the preparation of future "Lisbon" policy measures in R&D. This means both opening up the consultation processes towards all parts of civic society that are potentially affected by new R&D policy actions, and increasing educational efforts, scientific and other relevant expertise.

- **ADVOCATES** an enhanced "evaluation culture" that would further improve the impact and efficiency of research policies. Evaluation is clearly not to be misunderstood as a simple means to criticise certain activities and decision-makers, but it should rather be used as an instrument to improve the efficiency, effectiveness, appropriateness and legitimation of policy measures. In that sense, a genuine evaluation framework would be beneficial to political decision-makers, the implementing administration and, most of all, to the researchers themselves.

## USEFULNESS OF THE CREST MUTUAL LEARNING EXERCISE

In the light of the experience gained in the course of the mutual learning exercise, CREST

- **STATES** that the mutual learning exercise proved useful already at the outset since participants had to prepare by studying policy documents from different countries beforehand. Through the Open Method of Coordination, CREST was able to take new expertise on board, thus enhancing the overall quality of the debate.
- **CONFIRMS** the very positive effects the mutual learning exercise offers because it opens up a space for real learning and substantial exchange of views among participants. The exchange of good practice between CREST Member States accelerates the learning curve for all countries as well as for the European Commission. Further information on individual country initiatives that have been considered good practice can be found on the ERAWATCH website.[8]
- **REPORTS** that with all CREST Member States having different economic situations and technological specialisations, these intensive dialogues and interactions between policy makers and/or administrators gave access to important tacit knowledge about research policies and instruments which could not have been acquired at a more general or abstract level.
- **STRESSES** the important role of the 3% objective that became evident in the course of discussions. It can be seen as a mobilising factor rather than a quantitative target for research policy, stimulating peer pressure and consensus, even if some Member States might not be able to achieve this objective in the near future.

## OUTLOOK

With a view to future developments in the context of the National Reform Programmes and the use of the Open Method of Coordination in research policy, CREST

**RECORDS** the key challenges identified through the mutual learning exercise, including the need to further strengthen the European Research Area, regarding them as a reservoir of possible future topics for 3% OMC.

- **CONCLUDES** that it will consider the need for another mutual learning exercise based on the usefulness of its inputs in the overall discussions of NRPs leading up to the Spring European Council. This should take into account the need for more in-depth debate on specific research aspects of the NRPs and the request for an extended time-frame for discussions.

**CALLS** on the Member States to continue to make *R&D and innovation policy a high priority* in National Reform Programmes beyond 2008, emphasising the key role of research as a generic promoter of growth, competitiveness and social cohesion in Europe in the long term.

[8] In the context of the five sub-groups of the CREST mutual learning exercise a number of good practice examples have been presented. The reports of the sub-groups are available on the CIRCA Net (IG CREST).