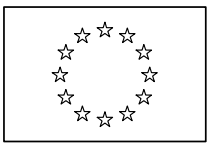

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REPORT FROM THE COMMISSION

Annual Report on research and technological development activities of the European Union in 2004

{SEC(2005) 1326}

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1. INTRODUCTION

This Annual Report covers developments and activities during 2004. It has been prepared pursuant to Article 7 of the Euratom Treaty[1] and Article 173 of the Treaty establishing the European Community[2], as well as Article 4 of the decision on the Sixth Framework Programme[3].

The report is accompanied by an annexed Commission Staff Working Document, which provides more detailed reporting and statistics. The main chapters are on the activities and results achieved in 2004 and on developments in research and technological development activities in the Member States of the European Union. The statistical tables are in a separate annex.

2. COMMUNITY RESEARCH AND TECHNOLOGICAL DEVELOPMENT ACTIVITIES

2.1. Implementation of the 6th Framework Programme

The implementation of the Sixth Framework programme (FP6) has been successful. It was launched in 2002 with a budget of 17,500 million euro for the period 2002-06, which was later increased with the enlargement of the Union to 19,200 million euro. Particular efforts were also made to encourage participation by the new Member States.

In 2004 almost 16,000 proposals were received with more than 84,400 participants. Almost 2,000 of these proposals were retained for funding (involving some 13,700 participants).

In total nearly 2,100 contracts were signed in 2004 with a total EC contribution of more than 4,200 million euro.

Under the heading of 'Integrating and Strengthening the ERA', more than 7,300 proposals were submitted of which almost 1,100 were selected for funding involving over 11,400 participations. The majority of these (some 4,200 proposals) were in the seven thematic

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1 "The Commission shall ensure that these programmes are carried out and shall submit an annual report thereon to the Council".

2 "At the beginning of each year the Commission shall send a report to the European Parliament and the Council. The report shall include information on research and technological development activities and the dissemination of results during the previous year, and the work programme for the current year."

3 Decision No 1513/2002/EC of 27 June 2002. Article 4 "In the context of the annual report to be submitted by the Commission pursuant to Article 173 of the Treaty, the Commission shall report in detail on progress with implementing the sixth framework programme, and in particular progress towards achieving its objectives and meeting its priorities…; information on financial aspects and the use of instruments shall also be included.

priorities of the 6th Framework Programme, and a significant number in the horizontal activities involving SMEs and the specific measures in support of international cooperation.

The new activities in FP6 on SSP (Scientific Support to Policy) and NEST (New and Emerging Science and Technology) have also proved to be successful with over 120 proposals selected for funding.

Under the heading 'Structuring the ERA' over 8 500 proposals were received in 2004, of which the vast majority (around 7,900 proposals) under the Human Resources and Mobility actions. More than 800 proposals were selected for funding, of which 90 % were for human resources and mobility; the others were for funding actions for Research and Innovation, Research Infrastructures and Science and Society.

From the proposals submitted in 2004, the new instruments integrated projects and networks of excellence accounted for some 900 proposals, of which some 150 were retained for funding. During 2004, 165 contracts for integrated projects were signed and 76 for networks of excellence.

The work programmes for the Specific Programmes of the 6th Framework Programme have been updated several times. By the end of 2004 the EC 'Integrating and strengthening the ERA' programme had been updated 14 times, the EC 'Structuring the ERA' programme eight times, and the work programme for the Euratom 'Fission and Fusion' programme twice. Each update generates the content for new calls for proposals and by the end of 2004 over 120 calls for proposals had been published under FP6.

A review of the effectiveness of the instruments of the 6th Framework Programme started at the end of 2003 by an independent high level panel led by Professor R. Marimón. The report of the panel[4] was submitted by the end of June 2004. The panel which assessed the new instruments (networks of excellence and integrated projects) endorsed the objectives addressed by these instruments, but proposed some adjustments in their implementation. The Commission gave an official reply to the report at the end of August 2004 and continued carrying out corrective measures as well as introducing an action plan for rationalisation and acceleration to improve the implementation of the framework programme.

A Five-Year Assessment for 1999-2003 was carried out by the panel of high-level experts chaired by Dr E. Ormala. The panel underlined the importance of the framework programmes in developing Europe's knowledge base and correcting the shortcomings in the European research landscape, particularly the networking of researchers and activities. The Panel's recommendations concerned both the 6th Framework Programme and future framework programmes, in particular the endorsement of a substantial increase in funds for research and the creation of the European Research Council and technology platforms. This evaluation was supported by a series of ex-post impact studies. The impact study concerning the 5th Framework Programme concluded that it had promoted research of strategic importance which would not have taken place without EU support.

[4] COM(2004) 574; SEC(2004) 1057, 27.8.2004.

2.2. Other actions towards the creation of a European Research Area

In addition to the Framework Programme, the European Union took a number of other important steps towards the creation of a European Research Area, a major objective of the Research DG.

The 'Investing in research' action plan, currently under way, has already come up with its first concrete results, such as the creation of some 25 Technology Platforms. Many of these Technology Platforms are already well advanced in developing Strategic Research Agendas. The coordination of national research policies through the so called Open Method of Coordination (OMC) involving CREST is also being implemented (see Section 3.1 below).

Initiatives were carried out with a view to attracting the best researchers in Europe and improving their career prospects, such as: visas for third-country researchers'[5]; the preparation of a proposal for a recommendation for a European Researchers Charter and for a code for conduct for the recruitment of researchers; the ERA-link network linking European researchers working in the United States; and the ERA-MORE network between mobility centres for European researchers.

The Communication 'Towards a European strategy for nanotechnology'[6] triggered a political debate on this key 21st-century technology, which seeks to develop products, techniques and systems on an atomic and molecular scale which will make life easier and can be applied in numerous areas such as health, environment and security.

To contribute to establishing an independent European satellite observation and remote sensing capacity, the Commission presented a plan for implementing the second phase (2004-2008) of the Global Monitoring for Environment and Security initiative (GMES)[7] in close collaboration with the European Space Agency. Together with the highly strategic navigation satellite project GALILEO, this initiative will form an integral part of the European space programme which is in preparation.

The Group on Earth Observations (GEO), which seeks to develop by February 2005 a 10-year implementation plan for a comprehensive, coordinated and sustained Global Earth Observation System of Systems (GEOSS), is co-chaired by the European Commission, United States, Japan and South Africa. Of the 55 GEO member countries, 20 % are from Europe. The Commission closely supports the preparation of the GEOSS implementation plan and coordinates the European position.

The European Union worked to secure a consensus between the parties on the geographical location of the ITER (International Thermonuclear Experimental Reactor) project at the Cadarache (France) site, chosen unanimously by the Council, and on the complementary activities to ITER. The ITER project is aimed at constructing a nuclear fusion reactor in partnership between the European Union, Japan, the United States, China, South Korea and Russia. Demonstrating the viability of such a non-polluting energy source would be an essential step towards meeting growing energy needs.

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5 COM(2004) 178, 16.3. 2004.
6 COM(2004) 338, 12.5.2004.
7 COM(2004) 65, 3.2.2004.

The new preparatory action on security research[8] seeks to foster the development of a strategic research agenda to plug the gap between civil research supported by the Community framework programmes and national and intergovernmental initiatives.

The signing of Scientific and Technological Agreements with Brazil and Mexico, and ratification of agreements with Tunisia and Morocco in 2004 furthered the international dimension of the European Research Area.

The Communication entitled "Europe and basic research"[9] was presented in early 2004, identifying the need for a new support mechanism for basic research based solely on criteria of scientific excellence, i.e. through a European Research Council. The debate on this Communication also contributed to the preparation of the proposal for the Seventh Framework Programme.

3. DEVELOPMENTS IN MEMBER STATES AND APPLICATION OF THE OPEN METHOD OF COORDINATION

3.1. The Open Method of Coordination in support of reaching the Barcelona objectives

The Open Method of Coordination (OMC) is a Community response to contribute to policy learning and policy integration by encouraging and facilitating mutual exchange of knowledge and best practice. In 2004 a first cycle of application of the OMC to research policy was concluded successfully. The CREST report on this first cycle of the implementation of the OMC to the 3% Action Plan was adopted in October and submitted to the Council and the Commission. It contains 30 policy recommendations. The added value of the OMC applied to research was acknowledged by Member States and the Council. Subsequently a second cycle was launched.

There was some criticism in the first cycle of the information requirements on Member States being relatively heavy. Consequently, the second cycle was launched in early 2005 with clearer and lighter procedures. It focuses on the following five topics:

- Encourage the reform of public research centres and universities, in particular to promote technology transfer to society and industry;
- Design measures to promote the growth of young research-intensive SMEs;
- Design and evaluation of the fiscal measures to promote business research, development and innovation;
- Improve the design and implementation of national policy mixes; and
- IPR ownership regimes in the public sector.

The themes were defined in the light of the results of the first cycle, which they will extend and deepen the analysis. The groups working on the themes will report to CREST, which

[8] COM(2004) 72, 3.2.2004.
[9] COM(2004) 9, 14.1.2004.

maintains its particular role in reporting both to the Commission and to the Council. It is expected that a report on the second cycle will be adopted by CREST in March 2006.

In addition to the work of the first cycle, the revised Lisbon Strategy has introduced streamlined national reporting on the Lisbon Strategy. In particular Member States adopt National Reform Programmes, which are presented to the Commission. The National Reform Programmes will integrate reporting on most OMC's including the OMC 3% applied to research.

Regarding OMC applied to Human Resources in research, the Steering Group for the Implementation of the Mobility Strategy has been active since 2002. The Steering Group is composed of representatives from Member States and its work has led to very concrete results in improving the environment for the mobility of researchers, as reported on a yearly basis in so-called implementation reports and to CREST in the frame of the implementation of the 3% Action Plan. It has been a very positive experience, both for Member States and for the Commission services.

3.2. Trends in research investment

The overall trend of R&D intensity in the EU 25 in the period 2000-2003 is close to stagnation[10]. This weak growth performance is mainly caused by the low growth rate of R&D intensity in the three largest R&D spending countries Germany, France and the UK, which represent around two thirds of the total R&D expenditure in the EU-25.

The annual growth rate in R&D intensity of 0,7% (average annual growth between 2000 and 2003) is far from sufficient to reach the 3% objective by 2010. If this trend remains unchanged (*i.e.* assuming a linear forecast applied on the 2000-2003 trend), the EU's R&D intensity will be some 2,20% in 2010. The EU's R&D intensity, however, grew at a higher rate than that of the US, where private spending on R&D has been significantly decreasing since 2000. As a result, the EU-25 as a whole is slowly catching up with the US. The growth of R&D intensity is higher in Japan than in both the EU and the US, although this seemingly good performance can be partially explained by the low growth rate of Japan's GDP (denominator) over recent years.

At EU-25 level, the share of R&D expenditure (GERD) funded by the private sector is significantly lower than in the US and Japan. The contribution of the private sector to the financing of research has even been reduced over recent years in both the EU and the US, although the reduction was of a larger magnitude in the US. Conversely, the share of R&D expenditure funded by the business enterprise sector has been increasing in Japan.

It has frequently been pointed out that the Lisbon 3% target is not simply an expenditure target. It implies a significant increase in numbers of researchers in Europe, and this in turn requires a real expansion of researcher training and a growth in the availability of attractive research careers. It has been estimated that to fulfil the Lisbon/Barcelona targets an extra 1.2 million researchers are needed: 500,000 for renewal of the research labour force (to replace

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[10] R&D intensity is the relation of Gross Expenditures for Research & Development (GERD) to Gross Domestic Product (GDP). All indicators are extracted from the *Key Figures 2005 on Science, Technology and Innovation. Towards a European Knowledge Area*' (to be published in 2005). These figures are based on the latest available time series from OECD (MSTI-2005-1) and EUROSTAT.

retirees) and 700,000 net new researchers. The number of researchers has been growing from 1997 to 2002 by 22,5% (or 105.000 full time equivalents).

At EU level, the number of post-graduate students (which includes future PhD holders) and of diplomas awarded every year in science and engineering, allows for a continuation of the increase of the number of research personnel at the pace observed since 1997. From 1998 to 2001 the average annual number of PhD level graduates was 76,750, 44% of which were in Science and Engineering. In recent years research graduates in Europe as a whole have been increasing at approximately 4% per year, although a few countries have seen a decline in specific fields such as chemistry and physics.

In terms of the availability of human resource in research the evidence is mixed. Poor career prospects in scientific occupations are often cited as one of the main reasons behind the decline in scientific studies among young people, but across the EU there is little evidence of strong upward pressure on wages for S&T professionals yet. The problems appear to be rather on the demand side than the supply side. The EU would be on track with the Barcelona target if about 60% of science and engineering graduates enter research as a career. However, recent survey figures reveal that only 40% of PhD graduates working in the UK are performing research activities either in academia (22%) or outside academia (18%). This signals profound changes in the labour market for researchers. The sources of demand are more varied than before (with demand emanating from services, transnational firms, and start-ups, for example). Knowledge-intensive services, including sectors of activity such as education, health and social work, employ most of these highly qualified people.

The increased international mobility of researchers and the increased competition to attract the 'top performers' will exert an additional pressure on the management of human resources for R&D in Member States.

3.3. Trends in research policy

Although public funding of R&D has experienced significant pressure from overall budget constraints, common trends in upgrading the policy mixes and governance structures for research in line with the Lisbon agenda are clearly observable. The precise array of measures and instruments varies significantly across countries, as does the relative 'weight' of the policies, but they share a growing awareness of the need for improved coherence and integration of policies.

A first trend is the *convergence of conceptual approaches to RTD policy* across the MS towards the so-called 'systems' framework. This policy framework is explicitly adopted in policy making in countries such as Finland, Germany, Sweden and the Netherlands. It focuses on the overall 'system' of institutions and organisations – specific for each country - that foster research and innovation and condition linkages between actors, and stresses the interconnectedness between different types of policies.

The increasing *complexity of the policy mixes* is a second trend. The range of long standing policies for research funding (R&D subsidies, technology transfer) is expanded with additional financial instruments (including venture capital operations) and a wide variety of complementary policies related to education and researcher training and mobility, research infrastructures, clustering policies, collaboration and cooperation programmes, IPR regimes, regulatory policies, the role of the public sector as a user of RTD, company formation,

sustainable development etc. This 'horizontalisation' of RTD policy has blurred the border line with other policies and argues in favour of greater policy integration.

The growing importance of *coordination issues* has become a third trend that impacts all countries to different degrees. The Finish experience with the Science and Technology Policy Council has been emulated by a number of countries (e.g. The Netherlands). However, research systems in many countries are too 'fragmented' and there is a need for closer integration of the strategies of the different agencies and institutions.

The '*Europeanisation*' of Member States research policies is in line with the growing awareness of interdependencies and of the effects of the new stage in globalisation on the restructuring of the research systems. In several countries the debate on the internationalisation of the research system is on the agenda. In all Member States the Lisbon process implicitly supports their modernisation policies, in line with the different actions of the 3% Action Plan. The adoption of R&D investment targets in line with the 3% objective in many Member States constitutes also an explicit reference to the 3% Action Plan.

4. OUTLOOK FOR THE FUTURE

The leading role of research in the knowledge-based society and in competitiveness and growth in Europe was acknowledged and substantiated by a doubling of the funds for research in the Commission's proposals on the Union's financial perspectives for the period 2007-13.[11]

In June 2004 the Communication "Science and technology, the key to Europe's future"[12] started a political debate on the guidelines for future European research policy and activities. Initiating in this way the preparation of the 7th framework programmes, it proposes to strengthen European research efforts and increase the impact of the Union's action by organising it around six major objectives: creating centres of excellence through collaborative research; launching major European technological initiatives; stimulating basic research (and creating a European Research Council); making Europe more attractive to the best researchers; developing research infrastructures of European interest; and improving the coordination of national research programmes.

Two major consultations of stakeholders followed after the Communication, one on general guidelines for the way ahead and the other on future thematic priorities. An impact study and ex ante assessment of the seventh framework programmes was prepared, with particular regard to the programmes' economic, social and environmental impact and to integrating the socioeconomic and forecasting aspects into the priorities.

Following this debate, the Commission presented its proposals for the 7th Framework programme[13] at the beginning of April 2005.

These proposals are complemented by the Commission's proposals for the next generation of Structural Funds programmes, which also emphasize investment in research and innovation as a souce of economic growth.

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11 COM(2004) 101, 10.2.2004; COM (2004) 487, 14.7.2004.
12 COM(2004) 353, 16. 6.2004.
13 COM(2005) 119 final, 6.4.2004.

5. SOURCES OF FURTHER INFORMATION

More details are included in the Commission Working Document that accompanies this Report. For further information, the following are publicly available:

- Annual Monitoring Reports for the Framework Programme and Specific Programmes, which provide a concise, independent summary of the progress and quality of the measures taken to implement the programmes.

- Five-year Assessment Reports which examine implementation and achievements of Community research activities over the five previous years.

- The European Report on Science and Technology Indicators, which contains descriptions, statistics and detailed analyses of European and national RTD activities in the world context.

- Key Figures reports published each year, providing a set of indicators to take stock of Europe's position in science, technology and innovation.

- Statistics on Science and Technology, produced by Eurostat on R&D, innovation, Human resources on science and technology, patents and high tech industries (available on free of charge on the Eurostat webpage – see address below - under the domain "Science and technology").

- Statistics on Science and Technology in Europe, published as part of the "Panorama of the European Union" collection (DG Research/Eurostat).

- Studies and analyses published in connection with the Community RTD programmes and addressing issues specific to the fields of RTD which they cover.

Most of these documents can be obtained or ordered from the Commission's Internet sites:

- The Commission's general EUROPA site: http://europa.eu.int/

- The CORDIS site containing comprehensive information on the RTD Framework Programme: http://www.cordis.lu

- The site of the Commission's Directorate-General for Research: http://europa.eu.int/comm/research

- The site of the Commission's Directorate-General for the Information Society: http://europa.eu.int/information_society/index_en.htm

- The site of the Commission's Directorate-General for Enterprise: http://europa.eu.int/comm/dgs/enterprise/

- The site of the Commission's Directorate-General for Energy and Transport: http://europa.eu.int/comm/dgs/energy_transport/index.html

- The Joint Research Centre (JRC) site: http://www.jrc.cec.eu.int/

- The Eurostat site: http://epp.eurostat.cec.eu.int