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**FINAL REPORT
TO THE EUROPEAN PARLIAMENT AND TO THE COUNCIL**

**according to Article 8 of the Council Decision (94/78/CE, Euratom) establishing a
multiannual programme for the development of Community statistics on research,
development and innovation**

(presented by the Commission)

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0. SUMMARY

On 24 January 1994 a Council Decision establishing a multiannual programme for the development of Community statistics on research, development and innovation (94/78/EC, Euratom) was adopted. Article 8(b) of this Decision stipulates that a report must be presented by the Commission. In May 1998 the present report was submitted to the Member states and adopted by the Statistical Programme Committee. An addendum to this report on the state of community science, technology and innovation statistics covering the period 1998-2000 is also attached.

This report calls for two main conclusions.

The comparison of the to-day situation with what was the state of the European statistical information system on R&D and Innovation five years ago shows impressive improvements:

- user needs have been systematically reviewed;
- the methodological framework has been improved or extended, in domains like regional statistics, government appropriation in R&D, innovation statistics and the measurement of Human Resources in Science and Technology (HRST);
- more comparable data is available at the European level: regional information on R&D personnel and expenditure, results of the first CIS, regional information on patent applications to mention some of the main achievements;
- pilot surveys have been launched in numerous domains; some have prepared the grounds for further data collections: measurement of the stock of HRST, measurement of employment in high-tech. sectors, technological infrastructure; others have underlined difficulties which will call for further investigation: measure of technological infrastructure, higher education; and finally some are still ongoing: intangible, innovation in SMEs, longitudinal approach of innovation;
- new publications like the European Report on Science and Technology Indicators have been broadly disseminated and well received.

These progresses were only possible because of co-ordinated actions of the Member States and international organisations propelled by the Council decision.

However, in spite of all these efforts and achievements, the current state of availability of statistics at the European level is not yet sufficient to meet the demand and to back decision making:

- Some domains are unexplored from a statistical viewpoint: measurement of impact of R&D on the public sector, on the citizen, measurement of the quality or the importance of innovations, study of indirect funding of R&D through grants, fiscal measures, to mention a few

- Available data are incomplete: 46% of regional data are missing at NUTS 2 digit level for employment, 48% for R&D expenditure for instance¹. Even in a domain like GBAORD which is one of the first ones to be harmonised at the European level in 1969 (revised in 1975, 1983 and 1992), 42% of the data are not given at the NABS 2 digit level².
- Timeliness is still poor: regional data are typically available 1.5-2.5 years after the end of the reference year, innovation data took 3-4 years to be put at the disposal of the users.

The Commission considers that the efforts stimulated by the Council decision should be continued. The main axis of the developments to be carried out are the following:

- broader use of administrative sources (which has proved promising in the study of patent applications);
- better co-ordination between R&D and innovation aspects in existing data collection (as started in the structural business statistics regulation);
- measurement and improvement of the quality of the available data.

To achieve these objectives, a legal frame seems to be necessary: it will foster national efforts and guarantee the provision of the needed resources.

This legal framework should ideally take the form of a regulation which will consolidate the existing data production at the European level in the areas of funding, performance and output measurement of R&D.

If a regulation does not prove possible or desirable, a new Council decision on the improvement and completion of R&D and Innovation statistics should be taken. This decision would push forward the developments mentioned above.

¹ Weighted by population and giving equal weights to BES, HES, GOV and total.

² Weighted by population.

1. INTRODUCTION

1.1 Aim and structure of this report

In order to develop and implement a European statistical information system for research, development and innovation, the Council adopted on 24 January 1994 Decision 94/78/EC, Euratom, establishing a multiannual programme for the development of Community statistics on these fields.

The objectives of the programme, which are contained in Article 3 of the Decision, are as follows:

- a) to set out a Community reference framework for statistics on research, development and innovation defining the most appropriate concepts and methods for supporting the corresponding Community policies, and for satisfying the needs of national, regional and local administrations, international organisations, economic operators, professional associations and the general public;
- b) to establish a Community statistical information system for research, development and innovation;
- c) to promote and support harmonisation of statistics on research, development and innovation in the Member States;
- d) to facilitate the dissemination of comparable information.

In line with the Article 8 (b) of the Decision this report was submitted to the Member states and adopted by the Statistical Programme Committee in May 1998.

The present document constitutes the report referred to above. It is structured as follows. In the first introductory chapter, the origins of the report are explained: its aims and structure, its political background; then there is a subchapter on the organisation of work. In the second chapter the objectives of the council decision are presented, followed by a series of sub-chapters showing the current situation. The third chapter summarises the achievements and points out the shortcomings. The fourth chapter is devoted to the plans for the period after the Council Decision. The fifth chapter draws conclusions from the previous chapters.

1.2 Brief summary of the political background and the programme's statistical antecedents

The Treaty on European Union states that the Community shall have the objective of strengthening the competitiveness of its industry and encouraging research and technological development. In order to design, implement, monitor and evaluate policies in this field, the European Union must have statistical information at its disposal. The 4th framework programme of Community activities in the field of research and technological development (1994-98), the management of the structural funds, the promotion of technological innovation and the co-ordination of national R&D policies are examples of programmes which require statistical information providing a sound basis for comparison between Member States, their regions and between the European Union and its trading partners.

On 22 July 1993, the Council adopted Decision 93/464/EEC on the framework programme for priority actions in the field of statistical information 1993 to 1997, which it intended as a response to the demand for statistical information in general. Decision 94/78/EC, Euratom focuses more particularly on statistics relating to research, development and innovation, and is part of the overall framework defined in Decision 93/464. In the framework programme for 1998-2002 the need for statistics of R&D, technological innovation and science and technology in general is repeated.

The Commission has a long history of compiling statistics on research, development and innovation. It has been collecting information on the public funding of research in the EU for more than 25 years. At the end of the 1980s, the Scientific and Technical Research Committee (CREST) drew the Commission's attention to certain weaknesses in Community R&D statistics. Eurostat responded by taking measures in a number of areas:

- revision of the Nomenclature for the analysis and comparison of science budgets and programmes (NABS);
- the regionalisation of certain indicators;
- information on human resources in the field of science and technology;
- information on technological innovation.

Since the adoption of Decision 94/78/EC, Euratom, other improvements (described later on in this document) have been made to the Community information system on research, development and innovation. These include new methodological developments, new analyses, and the publication of the first and second European Reports on Science and Technology Indicators (1994, 1997/8). A part of these developments have already been reported to the Council in the interim report that the Council Decision called for. In the mean time more progress has been made. For the sake of completeness all principal changes since the Council Decision will be identified below.

In the light of the results of the above measures and of a systematic analysis of user needs, the present document formulates new proposals which it is hoped will help to strengthen the existing system.

1.3 Organisation of work

The programme can only be implemented successfully if the Commission department responsible for carrying it out co-operates extremely closely with all the parties involved inside and outside the Commission. So far this principle has been strictly adhered to. All the activities to date have been carried out in close co-operation with the Member States of the European Economic Area, other countries, international organisations and other Commission departments. Also activities have taken place on the basis of contracts with private and public institutions for the European Report on Science and Technology Indicators.

- One of the main aspects of the programme is the provision of comparable data, not only for the Member States of the European Economic Area but also for other countries, particularly the main trading partners of the European Union such as the United States of America and Canada and other European countries such as Switzerland or the countries of Central and Eastern Europe, including those of the former USSR. This means that the activities also have to be co-ordinated with these countries, whether under the aegis of international organisations like the OECD or bilaterally. Remarkable successes have been achieved in this connection also. Agreement has been reached with major OECD countries outside the European Economic Area (United States, Canada and Australia) on a regular exchange of documents of meetings such as Eurostat working party meetings. Switzerland and a majority of the countries of Central and Eastern Europe, including Russia, attend the working party meetings more or less regularly as observers. Also representatives from non-European OECD countries have been observers on several occasions. In addition, a joint project has been implemented with Russia under the Commission's TACIS Programme. It integrated the system of R&D and innovation statistics inherited from the USSR with Western (OECD, Eurostat) standards without, however, completely disregarding the special features of the Russian system. The project has been successful, making Russia methodologically one of the most advanced players in the international field of R&D statistics.
- During the preparation of the programme some Member States expressed the concern that it might in practice overlap certain activities of international organisations, particularly the OECD, one of the results of which would be additional burdens on the Member States. All parties involved took this warning to heart and avoided these pitfalls. In practice the co-operation is cordial and productive. It has among others led to two joint methodological manuals: the Canberra manual on human resources in Science and Technology and the second edition of the Oslo Manual on innovation.
- The fourth group of partners in the implementation of the programme is made up of the other Commission departments for which statistics on R&D and innovation are important in one way or another. Directorates-General Enterprise, Research, Information Society, and Regional Policy are obvious cases in point, but the analysis of user needs (see section 2.2.1 below) has shown that there is demand for statistics on R&D and innovation in quite a number of other Directorates-General. Of particular importance in this domain has been the creation of a specific unit in DG Research, dealing with competitiveness, economic analysis and indicators. This unit, whose origins date back to the First European Report on S&T Indicators and which was responsible for the second such report, is a regular and heavy user of science and technology indicators.

Furthermore, an aspect which has always been and still is particularly important is co-operation within Eurostat, whether in business, regional or education statistics, classifications or other fields. As has already been done with the Member States of the European Economic Area, relations with users within the Commission have also been formalised. To this end, regular meetings of the group of users of R&D and innovation statistics in the Commission (group of users of statistics - R&D and Innovation statistics (GUS-REDIS) as a sub-group of the “Comité directeur de l’information statistique” (CDIS)) are held, usually in the context of working party meetings with the Member States. The agendas of both groups are largely the same, so that the other Commission departments are as well informed as the Member States. It goes without saying that interested colleagues from other departments can attend working

party meetings with the Member States at any time, and many of them avail themselves of this opportunity.

2. IMPLEMENTATION OF THE ACTION PLAN

2.1 Objectives and conditions

The objectives of the programme and the work to be carried out by the Commission to achieve them are clearly laid down in the Council Decision in Articles 3 (objectives; see section 1.1 of this report for details) and 4 (tasks). The specific work to be "carried out by the Commission, in co-operation with the Member States" (Article 4, first sentence) is as follows:

- a) analysis and evaluation of user demand, subject to its feasibility and based on cost efficiency, in order to define actions and priorities, for statistics on research, development and innovation;
- b) improvement, where necessary, of the existing methodological framework;
- c) identification of existing statistical information on research, development and innovation;
- d) setting up the organisational and technical components of a Community statistical information system for research, development and innovation, including statistics of Community-funded research and development activities;
- e) carrying out pilot surveys;
- f) developing basic statistical tools.

Details of this work are given in an action plan contained in the annex to the Council Decision.

All the activities have been carried out subject to specific overall conditions, some of which are specified in the Council Decision itself and some of which are implicit in the system. The second sentence of Article 4 of Council Decision 94/78/EC, Euratom stipulates that "the Commission shall make use of existing sources of information, instruments and procedures, including the work and existing data of the OECD, UNESCO and other international organisations". This condition means that existing instruments and procedures are not to be developed again and that data already available elsewhere are not to be collected again. In its activities so far, Eurostat has adhered strictly to this requirement. Wherever the necessary methodology was already available at international level, it was used as a basis for all the actions. Examples of this are the Frascati and Oslo Manuals drawn up by the OECD³, which were used as a basis for both developing the regional indicators and carrying out the pilot survey on technological innovation.

³ The Oslo Manual was eventually revised as a joint OECD-Eurostat exercise.

In addition to these conditions specific to this programme, all the activities carried out so far under this programme have been based on other, general conditions like the principle of subsidiarity, the principle of minimising the burden on respondents and the principle of catering for the user. All actions so far have been co-ordinated with the Member States. Each year, during the working party meetings, Eurostat has presented the Member States with, for example, a detailed work programme for statistics on R&D and innovation, on which the Member States were able to give their opinion in the ensuing discussion. In addition, the programme of work was co-ordinated at the ECE level. The few pilot surveys carried out so far have also complied strictly with the principle of subsidiarity. For example, the national innovation surveys carried out by the Member States on their own account were preceded by detailed methodological consultations in order not only to ensure the comparability of most of the subsequent results but also to allow sufficient scope for specific national features, e.g. regarding the traditional survey procedures used.

With regard to the burden on respondents in surveys, it should be stated at the outset that the only ones were those on technological innovation: the 1993 pilot study and the 1997 survey. It is not disputed that both the size of the questionnaires and the number of survey units placed to some extent a considerable burden on the respondents. At the same time, however, it should be pointed out that in some cases specific national factors (inclusion of additional questions in the harmonised questionnaire, conducting of full surveys) further increased this burden. All the other actions so far have not led to any excessive burdens on the survey units such as enterprises.

The main concern in all the activities so far has been to meet as far as possible the existing needs of users. It fairly soon became apparent that in some cases the users themselves were not completely clear about what their actual requirements were. As a result of the analysis and evaluation of user demand, which is stipulated in the programme and has already been carried out, this situation has improved

2.2 Present situation

2.2.1 Analysis and evaluation of user demand

The interim report presented the outcomes of the analysis of user demand. These and a few additional findings are presented in the annex.

2.2.2 Improvement of the existing methodological framework

The only way of obtaining comparable data at the international level is to use a generally recognised methodology. The methodological framework currently used for R&D and innovation statistics was almost totally developed by the OECD (Frascati Manual, Oslo Manual, manuals on the use of data on patents and technological balance of payments). However, this methodological framework is not complete, and even the existing manuals must be constantly revised so that the methods take account of current developments.

In line with this argument, one of the Commission's tasks set out in the Council Decision is to improve, where necessary, the existing methodological framework (see Article 4(b)). This task is described in greater detail in the Annex to the Council Decision, which states that "further development of the methodology will take place in close collaboration with the OECD and within the framework provided by it, in order to take advantage of what has already been done by that institution ..." (Annex to the Council Decision, third sentence of section (b)). Only "where an adequate or adoptable methodology does not already exist, the

Commission shall take the lead and initiative in developing the framework to cater for the special needs of the Community" (idem, fourth sentence). "The further methodology development will be formulated in manuals which will be adopted at Community level." (idem, sixth sentence).

The Commission has devoted special attention to this task in the past four years. The following work has been done on the methodological reference framework:

- The Commission was involved in the revision of the OECD's Frascati Manual, the fifth edition of which has been published by the OECD.
- In 1996 the Working Party Meeting on R&D and Innovation statistics accepted a set of recommendations on government appropriations in R&D (GBAORD) that aims to clarify some uncertainties in the Frascati Manual and solve a number of problems specific to the European Union. It is perfectly conceivable that at least some of the recommendations currently being prepared might be included in the next version of the Frascati Manual.
- For the first time in the history of international R&D and innovation statistics, the OECD and the Commission developed a joint methodological manual. The Canberra Manual contains recommendations on the collection and analysis of data on human resources for science and technology⁴. The first edition was published jointly by the OECD and Eurostat in July 1995.
- The Oslo Manual which lays the foundation for innovation statistics has been revised (1997). Since the co-operation between the OECD and Eurostat in the production of the Canberra Manual proved very fruitful, and because the Commission has acquired considerable international experience in the field of innovation statistics as the result of the first harmonised innovation survey (see 2.2.5 below), the Oslo Manual has also been jointly revised. The second edition of the Oslo Manual has also been published jointly by the OECD and the Commission (Eurostat and DG Research) just as the Canberra Manual.
- In addition to these joint activities with the OECD, the Commission has drawn up a methodological manual on the "Regional Dimension of R&D and Innovation Statistics". Parts of this manual could become an annex to the Frascati manual. In the working party meeting of 8 to 10 November 1995, this manual was approved by the EU Member States. The first version is available in all eleven Community languages.
- In addition recommendations have been formulated for the practice of collection of data on stocks of Human Resources in Science and Technology and for the collection of data on flows of HRST.

⁴ It goes without saying that the specific requirements of the Commission were taken into account in the development of the methodological framework.

2.2.3 Identification of the existing statistical information

Article 4, first sentence (c) of the Council Decision stipulates that the Commission is to identify "existing statistical information on research, development and innovation". The supplementary notes in the annex to the Council Decision specify that "this investigation is aimed at showing the extent of accessible data in the Member States and the differences between the Member States" (Annex to the Council Decision, second sentence of section (c)).

Of all the main tasks imposed on the Commission in connection with this Council Decision, this was the first to be completed. As long ago as March 1994 the Commission presented to the Member States the final report of a study, which was unanimously accepted in September of the same year. In this study, the Commission sought to collect and analyse data on the national R&D and innovation systems, on the availability and quality of data, broken down by subsectors⁵, their periodicity and the data users. The study was based on a uniform questionnaire which was used by the Commission's contractor, the Greek company Orco, in all the participating countries. A total of 17 Member States of the European Economic Area and Switzerland took part in this study, and it was only Liechtenstein for which no data could be obtained.

2.2.4 Setting up a European statistical information system⁶

The Commission's long-term objective is to set up a European statistical information system for research, development and innovation. Under the programme described in the Council Decision, the Commission has the task of carrying out the necessary organisational and technical preliminary work for achieving this objective. The relevant details are contained in section (d) of the Annex to the Council Decision, which states that the information system is to contain data on various input factors (public and private R&D funding, R&D personnel, R&D expenditure), and output factors (innovation, patents, trade in high-technology goods and services) of the R&D and innovation process, and these are to be further broken down by a number of variables (sector, branch of economic activity, region, socio-economic objective). If necessary, data on bibliometric indicators are to be added to this system. All available data are to be stored in data banks, irrespective of whether or not they are fully harmonised. These data banks are also to contain all the data directly collected by the Commission.

The Commission has already gone a long way towards completing this task. The following information is already available to Eurostat:

Government Budget Appropriations or Outlays on R&D

- Data on public R&D funding for the period to 1996, classified by socio-economic objectives. In addition to the data supplied to the Commission by the Member States and Directorate-General Research, Eurostat also calculates derived indicators such as public R&D funding as a percentage of gross domestic product at market prices or as a percentage of the total budget of general government⁷. The breakdown of the data on public R&D funding by socio-economic objectives is based on the "Nomenclature for the analysis and comparison of scientific programmes and budgets" (NABS),

⁵ Data were collected on the subsectors public R&D funding, R&D input factors, broken down by sector (economic sector, government, higher education, private non-profit organisations), innovation, technological balance of payments, patents, high technology, competitiveness and bibliometry.

⁶ The following considerations are restricted to the Commission's part of the system.

⁷ The data for the reference variables are obtained from other Eurostat databanks.

compiled by the Commission in the 1960s. In 1994 the Member States adopted the 1993 revision of this classification. Classifications must be revised every few years to bring them into line with current developments. The main differences between the present NABS and the 1983 version are amendments to sub-chapters in Chapter 1 (Exploration and exploitation of the Earth), 3 (Control and care of the environment), 5 (Production, distribution and rational utilisation of energy), 7 (Industrial production and technology), 10 (Research financed from General University Funds) and 11 (Non-oriented research), in which the branches of science used for the more detailed breakdown are more differentiated than in the 1983 version.

Not all the Member States (42% of the EU is not covered⁸) are able to supply data on public R&D funding at NABS sub-chapter level. This is the case for the new Member States Austria, Finland and Sweden and for Norway, since these countries have for many years used an OECD classification which does not provide for any further differentiation. The transition from one classification to another, even if they are largely identical at the highest level, requires time and resources. Other Member States do not have the necessary resources for the further differentiation of existing data or they fundamentally question the purpose of a detailed breakdown by socio-economic objectives. All Member States (but Luxembourg) provide NABS at the 1 digit level, though, and Eurostat publishes these.

Only half the Member States provide information on what part of GBAORD is meant for developing countries, and what parts involve information technology and biotechnology.

In 1997 for the first time, a Eurostat publication contained now/forecasts on GBAORD.

R&D personnel and expenditure

- Data on R&D personnel for the period 1985 to 1995, broken down by sector and, within the business enterprise sector, by branch of economic activity⁹, in each case according to the recommendations of the Frascati Manual, and by type of personnel and by region. Since Eurostat is anxious to provide these data in both Head Counts and full-time equivalents, it estimates any missing data in this field.

Eurostat attaches special importance to regional data, but their comparability is still limited. Further efforts at harmonisation are undertaken to improve the comparability of regional data on R&D personnel. Eurostat's manual entitled "The Regional Dimension of R&D and Innovation Statistics" (see 2.2.2 above) provides the basis for this. The regional coverage is still far from complete: 46% of regions are not covered at the NUTS-2 level¹⁰. In addition to the original data, Eurostat continues to publish derived indicators such as R&D personnel as a percentage of the labour force¹¹.

⁸ Weighted by population.

⁹ Data for the business enterprise sector broken down by branch of economy activity are only available for selected years.

¹⁰ Weighted by population and giving equal weights to BES, HES, GOV and total.

¹¹ Cf. footnote 9.

- Data on R&D expenditure for the period 1985 to 1995, broken down by sector and, within the business enterprise sector, by branch of economic activity¹² in each case according to the recommendations of the Frascati Manual, and by regions. The above comments on derived indicators and data quality in connection with regional R&D personnel data also apply here (48% of regions not covered at NUTS-2 level)¹³.
- In 1997 for the first time, a Eurostat publication contained now/forecasts on R&D personnel and expenditures. In the coming years, more detailed figures on R&D personnel and expenditure will become available because of the results of the Structural Business Statistics Regulation which demands data on these variables at the 4 digit NACE level.

Patents

- Data on patent applications to the European Patent Office for the period from 1989 to 1995, broken down by region and sub-class of the International Patent Classification (IPC). These data are based on a special analysis of the data banks of the European Patent Office, according to the recommendations as given in the regional manual. Patent applications are allocated to the individual regions on the basis of the inventor's private address (contained in the patent document). In order to make this allocation, it was first necessary to provide a key for converting between national post codes and the regional classification of the European Union, NUTS. The Commission has developed appropriate software for this purpose for all EU Member States except Denmark¹⁴, Ireland¹⁵ and Luxembourg¹⁶. To maintain and improve the quality of regional data on European patent applications the conversion key has to be updated regularly. A first update has been implemented in 1997. Additionally, in co-operation with the EPO, improvements of the data processing are under way.

The breakdown of patent applications by sub-section of the International Patent Classification is not at all the best solution from the point of view of economic analysis. It would be far better to allocate them to the branches of economic activity in which the patents are ultimately used. There are, however, fundamental problems in breaking down patent applications by the branches of economic activity which will ultimately benefit from them, since at the time of application to the patent office it is possible only in rare cases to predict with certainty the branch in which the patents will ultimately be put to economic use. Despite these fundamental difficulties, Eurostat has launched a joint project with the European Patent Office in order to develop a key for converting between the International Patent Classification and NACE.

Furthermore, another breakdown is also highly needed by the Commission services and generally by external users of patent data. This breakdown concerns the split of patents into technology fields which are analytically more meaningful than those currently available through the IPC classification.

¹² Data for the business enterprise sector broken down by branch of economic activity are only available for selected years.

¹³ Weighted by population and giving equal weights to BES, HES, GOV and total.

¹⁴ This conversion key cannot be obtained without a key for converting between postcodes and the national regional classification, which does not exist for Denmark.

¹⁵ Ireland only has postcodes for the Dublin and Cork areas.

¹⁶ Since the data are recorded at NUTS-3 level and Luxembourg itself is a NUTS-3 region, no conversion key was necessary for this Member State.

Innovation

- Data from the first pilot survey on innovation have been processed and disseminated by Eurostat (see 2.2.5 below). This survey has supplied Eurostat with more than 40 000 individual sets of data from enterprises giving information on information sources, objectives, inhibiting factors, costs and effects of innovations, R&D activities, and purchase and sale of technologies, and general information on the enterprises concerned. The first CIS may only partially be called a success. It was a first effort to collect harmonised data at an international level and it failed in a number of respects. Among others, the questionnaires were not as similar as possible and the sampling methodologies differed widely.
- Since these innovation data are confidential, only a few members of Eurostat's staff have direct access to the results of this pilot survey, in accordance with Council Regulation (Euratom, EEC) No 1588/90. In an aggregated form the data have been made available. Tables were published in a statistics in focus, in the green paper on innovation and on a CD-ROM with in total approximately 7000 tables. Micro-aggregated data have been transferred to researcher working for the INNOVATION Programme and to various other researchers. In each case a written agreement was a condition for the use of those data.
- Data from the second Community Innovation Survey have started to arrive in the last months of 1997. In principle these are treated the same way as those of the first CIS: the micro data are confidential. Tables from the second CIS will, however, be made on Eurostat databases as well.

Human Resources in Science and Technology

- Data from the first HRST stock collection survey (on the basis of the methodological recommendations of the Canberra Manual (see 2.2.2 above)) are available. This survey has been carried out delivering data on HRST for EEA Member States. Basic indicators have so far been developed which measure the total stock of HRST broken down by age group, gender, field of study and sector of economic activity where possible. Further work has been carried out on measuring the flows of HRST, looking at migration and inflows from the education system. The OECD secretariat has carried out the same survey for the non-common member countries.

Community R&D

- Preliminary data on the details of the R&D and Innovation programmes funded by the Commission have become available. The aim is to later collect data for these indicators within and, where necessary, outside the Commission. This project is currently in its initial phase. However, data on Community R&D have been collected for other purposes, in particular for the annual report on the Union RTD activities (related to the article 173 of the Treaty), for the annual reports on 5 year assessment and annual monitoring of Community RTD programmes and for the two European Reports on Science and Technology Indicators. These data collection exercises have already improved the concerned systems inside the Commission.

Other indicators

- Regionalised data on employment in high technology sectors have been collected since a feasibility study has been done for Eurostat. For regions it is measured which part of the labour force is employed in NACE classes that are classified as “high technology”. These data are extracted from the Community Labour Force Survey and measure the total employment in the R&D intensive sectors and not only the research occupations like the R&D personnel data.
- A wide range of secondary S&T indicators have been assembled for the statistical annex of the second REIST report and for its analysis, graphs and figures.

The above-mentioned data, except the results of the pilot survey on innovation, are available in various data banks, some of which are accessible to Eurostat staff only but most of which, e.g. the REGIO data bank, are generally accessible. The main R&D data from these data banks are also made available in paper form in the annual publication "Research and Development - Annual Statistics" and in summarising Eurostat publications. Eurostat also publishes once a year, in connection with "Research and Development - Annual Statistics", twice a year data on the progress of the programme in the form of REDIS-NEWS, and at irregular intervals brief information ("Statistics in focus") on special projects such as the innovation survey, HRST etc.

In addition to special Eurostat publications, the data available at Eurostat on R&D and innovation are an important input for further Commission publications. The main case in point is the "European Report on Science and Technology Indicators", which was first issued by Directorate-General Research in 1994, Eurostat being a major contributor to its statistical annex and then again in 1997/98.

In addition to the above-mentioned activities involving the collection and to a certain extent harmonisation of data, Eurostat has already launched other projects in order to fill existing gaps in the data

2.2.5 Pilot surveys

When new or supplementary surveys are being prepared, their feasibility must be checked by means of pilot surveys. In its Decision, the Council referred expressly to the need for pilot studies "in order to test the feasibility of some data collection exercises" (first sentence of section (e) of the Annex to the Council Decision).

The Commission has so far taken advantage of the opportunity to carry out pilot studies chiefly in the field of innovation statistics. Jointly with Directorate-General Enterprise, the INNOVATION Programme, Eurostat decided at the end of 1991/beginning of 1992 to carry out pilot innovation surveys in a small number of Member States. At that time the basis was the new methodology developed by the OECD on the statistical measurement of technological innovation (OSLO Manual). This project was so favourably received that finally all the old EU Member States and Norway took part in the harmonised Community Innovation Survey (CIS). Since then, directly comparable surveys have been held in other countries. The methodology used for them is either the same (e.g. Iceland) or largely the same (e.g. United States, Russia, Australia, Canada).

A total of 15 independent surveys were carried out in the 13 EEA Member States which took part in the CIS¹⁷. The principle of subsidiarity was strictly adhered to. The responsibility for carrying out all the surveys lay with national institutions, which were financially assisted by the Commission in all the participating countries except France and Norway. All the national surveys were based on a harmonised questionnaire¹⁸ drawn up by the Commission in co-operation with the OECD and the Member States, methodological recommendations for conducting the national surveys, and other technical documents. Despite enormous efforts by all the participants, it did not prove possible to achieve the degree of harmonisation aimed at in this large-scale pilot survey. There are a number of reasons for this, most of which are described in greater detail in the first evaluation report already submitted¹⁹. The main reasons were the respondents' unfamiliarity with the new subject, the length of the questionnaire, which was a compromise between different interests and to which many Member States even added extra questions, and the methodological recommendations drawn up by Eurostat, which were not detailed enough and yet, because they were merely recommendations, were not followed in every respect by all the participating countries. Based on these observations, the evaluators of the first part of the CIS evaluation strongly recommended to set up a legal basis for future innovation surveys.

In order to prepare for the inclusion of service sector enterprises in the innovation survey, a pilot study has been done in Sweden and Italy in 1996. This study tested the appropriateness of many of the manufacturing industry survey concepts for the services.

Another area in which pilot surveys are an important tool is that of regional indicators. The currently available regional R&D data are not fully adequate for providing a relevant description of the regional R&D and innovation systems. Methodologies must be developed for further indicators, and these should then be tested in practice. The methodological development of these indicators has been begun in connection with the manual on the regional dimension of R&D and innovation indicators; the feasibility test has not yet been carried out. However, current knowledge is not yet sufficient to conduct pilot surveys in this field. Therefore the Commission has confined itself so far to carrying out feasibility studies of potential indicators such as those on regional technological balance of payments or on technology infrastructure. Data have also been collected on the regional indicator system in Canada.

2.2.6 Development of basic statistical tools

Under Article 4, first sentence (f) of the Council Decision, developing basic statistical tools is given as the last group of tasks to be carried out by the Commission under this programme. According to the Annex to the Council Decision (see section (f), second sentence), these include registers, electronic data interchange (EDI) techniques, classification systems, sampling, questionnaires, survey processing tools and data analysis systems, in order "to simplify as far as possible data collection procedures for suppliers..." (*idem*, first sentence).

¹⁷ Owing to its federal structure, Belgium carried out three surveys.

¹⁸ See section 2.2.4 for a description of the content of the questionnaire.

¹⁹ A copy of this report may be obtained on request.

There are differences in the extent to which the above-mentioned tools have so far been developed/used:

- The compilation of uniform registers both in the EU Member States and in the other Member States of the EEA is currently under way (see also Council Regulation (EEC) No 2186/93 of 22 July 1993 on Community co-ordination in drawing up business registers for statistical purposes, OJ L 196 of 5.8.1993, p.1, and the Council Regulation 696/93 on statistical unit).
- New ways of collecting data and of sharing information with the member States are currently being developed in the DSIS (Distributed Statistical Information Service), Teler, Sert and Datamed (automated data reporting) projects. The system STATEL is used by Eurostat in some domains to collect electronically data from national statistical services, but not yet for S&T statistics.
- All the classifications needed for carrying out the activities are available in usable form. However, not all of the classifications are fully up-to-date, owing to the long time it takes to revise them at international level. The NABS classification developed by the Commission (see 2.2.2 above) has recently been amended to take account of the changes in socio-economic objectives. In addition, first actions have been started to revise the COFOG (Classification of Functions of Government) with respect to public funding of R&D activities.
- Relatively great efforts have already been made to develop suitable tools for processing and securing the data sent to Eurostat by the Member States. These include standard routines for checking the data on public R&D funding, regional R&D expenditure and regional R&D personnel, the definition of internal procedures to protect the confidentiality (including a secure environment), but also specially developed programmes for checking the results of the pilot surveys on innovation. Additional work was necessary to process the results of these pilot surveys. This involved the use and to some extent also the development of methods for estimating missing values and for micro-aggregation, a set of procedures to make it impossible to re-identify the results of individual survey units, in this case enterprises, although the individual results generally undergo only very minor changes.
- Data are available on the Eurostat databases FAME, for production and New Cronos, for dissemination within the Commission and to selected users outside (e.g. the national statistical institutes). New Cronos contains data on GBAORD (by NABS) , on R&D personnel and expenditures (regionalised) and on patents (regionalised). New Cronos is also accessible to outside paying users.
- Analysis of innovation data was carried out by external contractors. A seminar presenting the results was organised in Luxembourg in May 1996.

The thinking behind the tasks mentioned in (f) in the first sentence of Article 4 of the Council Decision is to provide as much information as possible without placing an excessive burden on data suppliers. In the Commission's view, there are ways of achieving this aim which, although not mentioned in the Council Decision, seem very promising, and so the Commission has already begun activities in this field. Among them is the development of methods for filling gaps in current data ("nowcasting"). Data users are particularly interested in up-to-date information, e.g. in 1998 they are interested in R&D expenditure in 1997 or at least in 1996. Current data survey practice in many Member States makes it impossible to

provide such up-to-date information for all the Member States. Additional surveys would have to be carried out, but this would run counter to the above-mentioned principle. The solution might be short-term forecasts for these most recent years ("nowcasts"). Eurostat has already started initial work on the systematic analysis of suitable procedures in the field of R&D statistics.

Another field became apparent during the planning of the collection of HRST data. After the methodology developed (Canberra Manual, see 2.2.2. above), the resulting need for data and the information actually available at present had been thoroughly analysed, the conclusion was drawn that the gaps in the data can only be filled by co-ordinated large-scale additional surveys, unless it proves possible to estimate at least a proportion of the requisite data. The thinking here is based on the idea that it might be sufficient to survey only the data for basic information (e.g. marginal distributions) and to estimate all the other information on the basis of incomplete data from a wide range of sources by means of suitable methods which may still have to be developed. Eurostat will pursue this idea in connection with the need for HRST data.

3. ACHIEVEMENTS AND SHORTCOMINGS

In the following chapter we shall attempt to show what the progress has been in the various area's of interest. For almost each area there has been at least some advancement but there are still shortcomings.

- The data on R&D personnel and expenditures existed from the start (provided without legal requirement by the Member States on the basis of OECD methodology). In both halves of the duration of the Council Decision the regional coverage increased so that by now only for Luxembourg (no data what so ever) and for the Netherlands no regionalised data exist. Overall only just over half the regions at NUTS-2 level are covered. Over the course of the past 4 years, the Regional Manual has been adopted and an inventory has been made about the differences in methods among the Member States. This inventory suggests that the comparability is not complete. Now/forecasts have been published on R&D personnel and expenditures. In the course of time it will become clear how accurate and how useful these now/forecasts are.
- The data on government appropriations (GBAORD) have not substantially improved in terms of breakdowns. A recommendation has been adopted which - if implemented - will improve the comparability of the data further. Still half the member States fail to provide 2 digit NABS data and data on development aid, biotechnology and information technology. Now/forecasts have been published on GBAORD.
- Data on Community R&D have existed from before the Council Decision being mostly GBAORD data. In the course of time, data have become available thanks to the regular exercises of monitoring and assessment of Community RTD, to the annual report on the Union RTD activities (related to the article 173 of the Treaty), and to the European Reports on Science and Technology Indicators. More data are then becoming available, but their comparability is probably incomplete.

- Before the Council Decision there were no data on Human Resources in Science and Technology. In the first half of the period, the methodology has been developed (jointly with the OECD secretariat). In the second half stock data have been collected. These were of mixed quality. A second HRST stock survey has been prepared and data collection on HRST flows has started.
- Before the Council Decision there were no data on patent applications in Eurostat. During the second half of the period the European Patent Office provided the data which were broken down by IPC class and region. The regional break down has become better over time (improved postal code - NUTS relation) but is still problematic for some countries (Greece, Portugal, Finland, UK).
- Before the Council Decision no harmonised data on innovation were available. During the first half of the period the data on the first CIS arrived at Eurostat which were processed in the course of the following years. The comparability of the data was far from complete. In 1997 the second CIS was launched of which the first data have arrived. Probably the methods used will require further improvement and harmonisation.
- Data on a number of variables have become available especially through the data collection exercise for the first and second REIST reports: technological balance of payments data; data on trade in and production of high technology goods and services; student graduation rates; employment in high technology sectors.

4. PLANS FOR THE PERIOD AFTER THE COUNCIL DECISION

In the coming years a number of tracks will be followed to improve the supply of statistics on Science and Technology. As outlined above, the width of the domain is more or less covered. There is no apparent need for different indicators, but those measuring the impact and output. Apart from these, the focus of the work will be on an increased quality of the data and on an increased usefulness of the S&T information system.

The quality of the data can be improved in a number of ways. Firstly, the data should be made available more rapidly. This is partly a task of the Member States (the processing of data from survey) and partly one of Eurostat (the processing of data for publications). In addition Eurostat provides now/forecasts to fill the gap between the need for timely data and the necessary delay due to the length of the production. Secondly, the regional coverage should be extended (for the variables where this is applicable). The regionalisation is far from complete. Ideally the EU will be described at the NUTS-2 level. This is a huge task for it concerns the data on R&D personnel and expenditure, on patents, on some other variables and eventually maybe also on innovation. Thirdly, the comparability of the data must increase. This will require an analysis of domains of data collection (such as regional personnel and expenditure data), followed by the implementation of recommendations based on that analysis. This type of exercise will probably reappear regularly because new phenomena show up that the Member States will deal with in different ways. In order to prevent the methodologies from gradually drifting apart, harmonisation will be a continuous activity. Systematic measurement of these aspects of quality will assure a permanent attention for them and consequently, a pressure on those responsible to improve.

These aspects of the quality of the data will all be served by two more generic actions: the extended use of administrative sources of data and an improved integration of R&D and innovation aspects in existing data collection.

In the context of the Fifth Framework Programme for RTD, in the specific programme on “Improving the Human Research Potential and the Socio-economic Knowledge Base”, an activity is foreseen to establish a common European base of science, technology and innovation indicators. This activity will involve primarily DG Research, Eurostat and a number of research institutes working together and will involve compiling and making available a relevant, coherent and comparable set of indicators with a view to supporting the design, co-ordination and assessment of RTD strategies in Europe.

It is crucial that the future activities are founded on a legal basis. This could take the form of a Council Decision or a Council Regulation. The former solution would effectively be a continuation of the 1993-1997 Council Decision, adopted to the present state of affairs. A Council Decision would be an endorsement of the continuation of current activities. The Member States will continue to co-operate with the Commission and with each other on the basis of a gentlemen’s agreement: a co-operation on a voluntary basis that has proved to be fairly effective, but which might not overcome the many shortcomings of the previous chapter. A Council Regulation, on the other hand, would be a far more effective tool for harmonising activities in the field. It would be demanding for a number of Member States to adapt their methods.

Finally, Eurostat will continue its close co-operation with the OECD secretariat as well as with other OECD (non-EU) member countries. This co-operation is becoming more and more important for the EU within the frame of the different benchmarking exercises launched in 2000 by the Commission. Benchmarking the EU against its major competitors, namely USA and Japan, needs a common methodology and the availability of harmonised indicators.

5. GENERAL CONCLUSIONS

This report has made clear what has been achieved in the previous years and what is left to be attained in the future. The narrow origins of Research & Development and Innovation statistics before the Council Decision period give an impression of considerable progress, but there are many gaps to be filled before the area is more or less complete. This will demand a serious effort from both the Commission and the Member States, ideally reinforced by some sort of legal instrument to help co-ordinate the participants’ actions.

ANNEX

Analysis of User Needs For Community Statistics on Research, Development and Innovation

Analysis of User Needs

Following the Council Decision 94/78/CE, Euratom of 24 January 1994, the Commission organised a survey to find out more about the user needs. The analysis of user needs has taken place early in the period of the Council Decision and has been reported in the interim report to the Council. A short summary is presented below. A small fraction of the users only responded after the appearance of the interim report. Their answers are dealt with as well.

1. Summary of the finding of the interim report

Apart from the need for comparability, accuracy and timeliness, the following needs are identified.

Indicators on R&D inputs

The need for break down by performing sector (e.g. by NACE), region, scientific field, socio-economic objective.

Indicators on R&D outputs

The need for indicators of patent applications and patents granted and bibliometric indicators.

Indicators on R&D impact

The need for indicators on technological balance of payments and trade in high-technology products.

Innovation indicators

Indicators on sources, objectives, barriers, expenditure breakdowns, R&D co-operation, transfer of technology, patent applications and impact.

Other R&D and innovation Indicators

Indicators on the stocks and flows of Human Resources in Science and Technology.

Other related indicators

Various issues in the area of knowledge and knowledge accumulation by enterprises.

For details, see Annex II of the interim report to the Council.

2. Recent answers to the user needs survey.

UNESCO, the Icelandic Research Council and the Nordic Council of Ministers have replied to the user needs survey since the appearance of the interim report. Their answers are in line with earlier expressed needs. UNESCO expresses the wish to see UNESCO and OECD/Eurostat statistics to be comparable.

ADDENDUM

Addendum to the final report

Community S&T and Innovation Statistics
Progress Report for the period 1998 – 2000

This report describes the state of S&T and Innovation statistics in the European Union for the time after 1997 and lays out the need for a new legal base for this statistical domain. Several new initiatives and policies in the area of S&T and Innovation that have been recently launched by the Council and the Commission lead to an urgent need of new data collections and the production of statistical indicators at more frequent intervals.

At the Lisbon Summit last year, the European Council set a clear strategic objective for Europe for the next decade: *to become the most competitive and dynamic knowledge-based economy capable of sustainable economic growth with more and better jobs and greater social cohesion*. The measurement of harmonised inputs, outputs and the socio-economic impacts of the so-called Knowledge-Based Economy is very high on the European research agenda, and has become a major challenge for the European Statistical System. The proposed legal base will lay the ground for future collections of high-quality, harmonised and comparable data.

Latest Research and Innovation policies and statistical needs (in chronological order)

Gender statistics and “Women in Science”: Establishing equal opportunities in scientific careers and the promotion of women in research have become one of the priorities of the Commission and the Member States in recent years. The Commission presented on 19 February 1999 a communication on this subject²⁰, which was followed by a Council resolution²¹ on women in science. Both documents lamented the lack of comparable statistical information on “women in science” and expressed a clear need for the statistical measurement of such phenomena.

European Research Area (ERA): In January 2000, the European Commission issued the communication “Towards a European Research Area”²², which contains a number of actions and policy orientations for a better integration of the European Research Area. It essentially aims at creating the conditions that make it possible to increase the impact of European research efforts by strengthening the coherence of research policies and activities in Europe. This document and the October 2000 Communication “Making a reality of the European Research Area: Guidelines for EU research activities (2000-2006)”²³ can be regarded as laying the fundament for the next Framework programme for RTD.

European Council summit in Lisbon: In March 2000, the European Council set a clear strategic objective for Europe towards economic competitiveness and a dynamic knowledge-based economy. One of the conclusions of the Lisbon Summit is to benchmark national RTD policies within the European Union, and against the main competitors, the U.S. and Japan. This decision will have major implications for related data collection exercises, and the development of several new statistical indicators that will have to be co-ordinated by the Commission. Furthermore, future objectives of the education and training system were

²⁰ COM(1999)76, 17.02.1999.

²¹ 1999/C 201/01.

²² European Commission “Towards a European Research Area”. COM(2000)6.

²³ COM(2000) 612 final.

discussed in Lisbon, which should be taken into account when further developing and linking education and training statistics to scientific and technological objectives of the EU.

Follow-up of the conclusions of the March 2000 Lisbon-summit:

- **Benchmarking of national research policies:** In June 2000, the Research Council approved a resolution calling on the Commission to present a full set of indicators and a methodology for benchmarking the following four themes:

- Human resources in RTD, including the attractiveness of S&T professions,
- Public and private investments in RTD,
- Scientific and technological productivity,
- Impact of RTD on economic competitiveness and employment,

as well as other issues that are essential to the understanding of the impact of RTD policies such as the promotion of RTD culture, the public understanding of science, and overall convergence and balances of RTD within the European Union. A list of 20 indicators²⁴ was set up jointly by the Commission and the Member States and welcomed by the Research Council in November 2000.

- **Communication on Innovation:** The Commission has started to implement the Lisbon summit requests with the Communication “Innovation in a knowledge-driven economy”²⁵, setting up the broad policy guidelines to support innovation in Europe. In this communication a first draft of the European Innovation Scoreboard was included, focussing on the following four themes: “human resources”, “creation of new knowledge”, “transmission and application of knowledge” and “innovation finance, outputs and markets”. Eurostat provided most of the data. Several indicators from the Community Innovation Survey were selected for the Innovation Scoreboard.

An updated version of the first European Innovation Scoreboard has to be submitted to the Council in June 2001.

European Council summit in Stockholm: In March 2001 the conclusions of the Stockholm-summit pursued the objectives targeted in Lisbon and have reiterated the need for Europe to improve its competitiveness and social cohesion. Among these conclusions statistical aspects were enclosed notably in §24 “*Member States and the Commission are requested to improve the quality, timeliness and availability of statistical information necessary for benchmarking in commonly agreed areas of crucial importance for enterprise policy. Moreover, the Commission is invited to reflect on the use of quantitative targets in enterprise policy*”.

Statistical needs: All recent R&D and Innovation policies call for timely and harmonised data, the collection of which will have to be negotiated with the Member States and co-ordinated by Eurostat. The new benchmarking exercises will need regular updates of the data but also further improvements in terms of quality, comparability and dis-aggregation. Several new indicators will also have to be developed for the RTD benchmarking exercise. Annual update of the Innovation scoreboard will require the launching of more frequent, though

²⁴ SEC(2000)1842, 3.11.2000.

²⁵ COM(2000)567, 20.09.2000.

smaller-scale, Innovation Surveys in the Member States as well as quality improvement, better timeliness and better coverage of other indicators. The European Statistical System must produce S&T statistics by gender in order to provide policy makers with the necessary data to assess the effectiveness of related community policies.

Eurostat has initiated several statistical activities to meet the high priority needs in benchmarking accorded by the Council. Eurostat participates regularly in the meetings of the High Level Group, which has proposed a set of 20 indicators to benchmark R&D policies in the Member States. A special meeting of the S&T and Innovation WP was organized last April, and a second meeting of this kind is planned for September 2001. Colleagues from DG RTD and DG ENTR presented the policy objectives of their DGs and discussed with the national statisticians alternative strategies to respond to the requests put forward by the Council. A specific Task Force was created to develop 5 new indicators and to examine possible improvements of the other 15 indicators. The national statistical institutes have also been requested to validate and complete data for the benchmarking exercise via a specially designed questionnaire. Another Task Force was created to elaborate the different options for annual updates of the main innovation indicators.

Development of S&T and Innovation statistics after 1997

Despite the lack of a specific legal basis for the development of community S&T and Innovation statistics, Eurostat has pursued the data collection, dissemination, harmonisation, development and improvement of existing statistics for this domain. This has been done in co-operation with the Member States on the basis of gentlemen agreements.

Co-ordination and co-operation activities

Legally based on Eurostat's statistical Work Programme 1998-2002, regular working party meetings and task forces on "R&D and Innovation statistics" were held in Luxembourg with the full participation of the Member States, the Candidate countries, the OECD secretariat, UNESCO, USA, Canada, the Russian Federation and the Directorates General of the Commission that are most interested in this field (DG Research, DG Enterprise, DG Regional). These meetings allowed Eurostat to co-ordinate statistical activities of the Member States in R&D and Innovation. They also gave the Commission services an opportunity to express their specific needs in this area. The participation of Candidate Countries is particularly important as it gives them an opportunity to follow closely the discussion and the decision making process within the European Statistical System.

Eurostat and the OECD maintained a close co-operation through mutual participation in their respective general meetings with their Member States, as well as through regular bilateral meetings to achieve a better co-ordination of related activities.

R&D data collection and dissemination

Eurostat co-ordinated the annual R&D data collections with the Member States, Iceland and Norway. These data concerned: Government Budget Appropriations or Outlay on R&D (GBAORD) by NABS, R&D personnel and expenditure by institutional sector and by Region (NUTS 2). The R&D statistics were disseminated through various means: Eurostat R&D Annual Publication, short publications in the Eurostat collection "Statistics in Focus" under theme 9, in NewCronos, the reference database of Eurostat and on other electronic media. In March 2001 Eurostat published "Statistics on Science and Technology in Europe" as a special report in the Panorama series.

In order to respond to the increasing need for statistical information on Candidate countries, Eurostat launched in 1998 a new project aiming at the data collection on R&D and Innovation activities of Candidate countries and the Russian Federation. The project was carried out thanks to the support of 3 statisticians from the National Statistical Institutes of Slovenia, Bulgaria and the Slovak Republic. Statistics were disseminated both on paper and via Eurostat's reference database NewCronos. The methodology of collecting R&D data in these countries shifted to international standards (Frascati Manual) beginning to mid nineties. Whenever possible series from 1990 to 1998 are available in NewCronos.

Statistics on Patents

The collaboration with the European Patent Office (EPO) was consolidated. The EPO provided Eurostat with standardised data sets of European patent applications. Eurostat improved the methodology to construct regional patent statistics from these data sets, in particular after the change of the NUTS classification in 1999. The method was extended to the USA, Canada and Japan. Jointly with R&D Statistics regional patents data were regularly published via the same means.

In 1999, Eurostat consulted the European Commission services on their specific statistical needs on patents. Several DGs expressed a variety of needs, which are taken on board by Eurostat in the negotiations with the OECD on the creation of a statistical patent database, covering the European (EPO and national patents offices), American (USPTO) and Japanese (JPO) patenting systems.

Regional statistics and regionalisation methods

Starting in 1997 Eurostat put more emphasis on the methodological improvements of existing regional indicators (R&D expenditure and personnel, patents). A review of the different methods used by the Member States was launched in 1999 with the goal to identify best practices, which would eventually provide important input for the next revision of the Regional Manual. Some of earlier findings from this review will already be incorporated in the ongoing revision of the Frascati Manual in order to introduce some guidelines on the regionalisation of R&D statistics.

Further regional S&T indicators are also needed for the support of EU regional policies but also by the regional authorities and policy-makers. To give a concrete example: Eurostat started to produce regional statistics on Employment in High Technology sectors and Knowledge Intensive Services at NUTS2 level (whenever statistically significant). Another example was the attempt to measure the number and inputs/outputs of Institutions of Technological Infrastructure at the regional level.

Human Resources in Science and Technology (HRST)

The measurement of HRST is based on the guidelines and the methodology of the so-called "Canberra Manual". Since 1998, Eurostat has engaged in the development of HRST indicators using data from the Community Labour Force Survey (CLFS). Various studies and papers were presented at Eurostat and OECD meetings showing the relevance of the approach chosen. Eurostat proposed recently to the NESTI (National Experts of Science, Technology and Innovation Statistics) group a revision of the Canberra Manual. A new domain in NewCronos was set up with HRST indicators (stocks and flows).

Jointly with OECD, Eurostat performed a feasibility study for the construction of indicators on internal mobility of highly qualified workers. The results were published and are now part of the regular production of Eurostat.

Statistics on High Technology sectors and products

High technology plays an important role in the global economic development of nations and regions. The measurement of the socio-economic impacts of high tech is requested by policy-makers as high tech can be seen as an important output factor of research activities.

Based on the OECD classification of high tech products and sectors Eurostat launched a project which aims to give an answer to the above questions using existing statistics in Eurostat (National Accounts, Structural Business, Labour Force Survey, External Trade, Innovation, Patents, etc.).

Innovation statistics

In most Member States the second Community Innovation Survey (CIS2) was launched in 1997 with reference year 1996. While for CIS1 the major problem was the lack of harmonisation between the Member States, which in turn affected very negatively the comparability of results, an important goal for CIS2 was to improve the comparability of a number of aspects: common core questionnaire, reference period and timing, target population, statistical unit, coverage of economic sectors, survey methodology and procedures for consistency checks/controls and estimation methods.

Already the first evaluations of CIS2 showed that there were big improvements with regard to these features, but there were still problems of comparability for some variables, for instance the share of innovating firms. The translation of the core questionnaire into the national languages, the sequence of questions, and additional national questions can cause different interpretations of the concepts and definitions.

The first preliminary results from CIS2 were published in May 1999 and final results were available in NewCronos in June 2000. The analytical publication 'Statistics on Innovation in Europe' in the Panorama series was issued in March 2001. Some of the CIS-data have also been used for the first version of the Innovation Scoreboard, which was developed after the Lisbon summit 2000.

CIS2 data has also been analysed in a number of studies funded by DG Enterprise (ex-DGXIII). The contractors were supposed to have access to micro-aggregated data for all countries, but in the end several Member States did not give Eurostat the permission to provide the contractors with the micro-aggregated data. Thus, the final processing had to be done by Eurostat-staff for several of the studies. This caused practical problems and serious delays. Eurostat, in co-operation with the national statistical institutes, is preparing a legal basis that will govern access to confidential data for research purposes. The negotiations with the Member States are progressing well, and it is hoped that the future framework will allow in-depth research at European scale with the data collected while safeguarding the confidentiality requirements of the European Statistical System.

The preparation for the third round of this survey started in 2000 and CIS3 will be launched in the Member States in 2001. The new survey design is based on the evaluation of CIS2 and the lessons learnt. The main goal was to further improve the comparability between Member States, while at the same time keeping as much as possible the comparability with CIS2. In particular much attention has been given to the definition of “technological” innovation. In addition the survey has been extended to some new service sectors.

The more extensive use of the data has also triggered the need for more frequent data collections. Innovation surveys every 4th year only are not satisfactory for the main users, in particular for the use for the Innovation Scoreboard. For the 2001 scoreboard no updated figures will be available. A project with the aim of having annual updates of the main innovation indicators has been initiated. The Member States are aware of their responsibility to provide the European Commission with timely statistics, but at the same time the national statistical institutes point out that increasing the frequency of reliable and comparable indicators is difficult for mainly two reasons: lack of resources in the statistical services and the growing reluctance of the enterprises to respond to statistical surveys.

Methodological improvements

To achieve a better comparability of R&D and Innovation statistics further harmonisation and improvement of existing methodologies are needed. Some concrete examples: Eurostat has played a major role in the preparation of the third wave of the Community Innovation Survey. Eurostat is currently reviewing the regionalisation methods used by the Member States and participates also in the ongoing revision of the Frascati Manual. Nevertheless there are several other domains where such methodological improvements and developments are urgently needed: human Capital, intangibles, revision of the NABS nomenclature, patents, etc.

Joint activities with the Research DG under FP5

The fifth RTD Framework Programme covers the period 1998-2002. Under the specific programme “Improving Human Research Potential” one can find an action that aims at the development of S&T and Innovation Indicators. This action is called “Common Basis for Science, Technology and Innovation Indicators” (CBSTII). Eurostat is fully involved in these activities and the following actions have been undertaken: Development of a statistical database on S&T and Innovation Indicators covering 50 countries, launching of more than 10 studies on different domains (brain drain, bibliometrics, patents, gender dimension, public research policies,...). Jointly with DG Research, statistical information has been disseminated through the S&T and Innovation Indicators booklet which has been yearly published since 1998. The third edition of the European Report on S&T and Innovation Indicators is planned for 2001.

In the conference “Women in Science” held by the European Commission in Brussels in April 1998, the need has been identified to better evaluate the career paths of female scientists. A joint project with DG Research has been launched to collect data by gender on students and researchers by field of science. The project has shown also the limitation of existing data sources that many gaps in the data-sets exist and demonstrates the urgent need for a further development of a harmonised set of S&T statistics by gender.

Why is a new legal basis needed?

Even though a lot has been achieved in this field without any legal base, there is an urgent need for such a base. This will strengthen the role of Eurostat as the co-ordinator of the European Statistical System in order to provide timely, high-quality, harmonised and comparable Community S&T and Innovation statistics and to launch new projects for the improvement of the statistical methodology.

More specific:

To respond to the needs of the European Union in the context of benchmarking; up-to-date, timely and comparable statistics and development of new indicators.

To achieve timeliness in the dissemination of R&D statistics, it is necessary to have a clear binding time table for the transmission of R&D data by the Member States to Eurostat.

To respond to the needs of the European Union for a new generation of patent statistics that will allow comparisons of technological performance with Europe's main competitors.

To improve the methodology and to develop more S&T regional indicators in support of Regional EU policies (structural funds).

To meet the growing demand for more statistics on the human capital factor; more information on highly qualified workers included researchers, their international mobility, the gap between offer and demand of highly skilled personnel in several economic sectors and S&T fields and disciplines.

To harmonise the innovation statistics; concepts and definitions of variables, economic sectors to be covered, the periodicity and the timing of the surveys in all Member States. Furthermore, it will facilitate national funding of the innovation surveys.

To develop S&T statistics by gender.

To revise and improve the definition of high technology sectors and products and knowledge intensive services and to provide data according to these classifications.