

ECONOMIC AND SOCIAL COMMITTEE  
OF THE EUROPEAN COMMUNITIES

**Objectives and Priorities  
for a Common Research  
and Development Policy**

**STUDY**

Brussels 1976

*At its 139th Plenary Session, held under the chairmanship of Mr Henri Canonge, chairman of the Committee for the term 1974/1976, on 25 and 26 May 1976, the Economic and Social Committee of the European Communities approved the above Study.*

*The Committee's work had been prepared by its Section for Energy and Nuclear Questions. The Section Chairman was Mr W.G.N. Miller and the Rapporteur was Mr P.H. Noordwal.*

**THE ECONOMIC AND SOCIAL COMMITTEE**  
Press and information division

Rue Ravenstein, 2  
1000 BRUSSELS

Tel. 512 39 20  
513 95 95

Telegrams : ECOSEUR  
Telex : 25 983 CESEUR

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**Printed in Belgium**

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## 1. INTRODUCTION

1.1. Towards the end of the last century it was seriously considered closing the Royal Patent Office in the United Kingdom on the grounds that all major inventions possible had been made and that there would therefore be no further patent applications! Yet since then many innovations have been made. Indeed, technological developments in the last forty years have been greater than in the entire previous span of mankind's existence. Forty years ago, nylon, radar, the computer, the pill, the tape recorder, television or jet aircraft did not exist. These changes have not only been rapid, but the speed at which they have taken place has been increasing. Technical knowledge in some fields now has a 'doubling time' only four or five years. The time-lag between discovery and application has been steadily decreasing:

camera	112 years (1727 - 1839)
telephone	56 years (1820 - 1876)
radio	35 years (1867 - 1902)
radar	15 years (1925 - 1940)
television	12 years (1922 - 1934)
transistor	5 years (1948 - 1953)

Enormous progress has been made in the efficiency and scale of agricultural production, industrial output, transport systems and energy. Significant advances have been made in bio-medicine, the social sciences, education and environmental studies. However, the benefits of such changes have not always been evenly felt. For many, particularly in the Community and other industrialized countries, the changes have meant higher living standards, greater leisure and longer life expectancy. For many others, especially in the developing countries, technological change has not yet responded sufficiently to basic requirements or has not yet been matched by a similar pace of social progress.

1.2. This rate of change is not some uncontrolled factor fortuitously affecting economic and social growth. It is directly determined by the amount of effort made to obtain new and better materials, techniques, methods and systems and by the speed with which these, once found, are applied. The entire process is defined as 'research and development' (R & D). It is not just some abstract concept related to science and technology. It influences every material aspect of our present-day existence. More significantly, perhaps, it has led to a deeper understanding of the forces which condition the way we live. It also provides the means of exercising control over those forces. R & D is therefore one of the most powerful tools that we possess to influence the society in which we and future generations will live. On the one hand, it offers the Community the means of preserving its independence in the field of technology. On the other hand, it offers the developing countries key assistance in mastering the problems which beset them.

1.3. The world's annual expenditure on R & D is substantial. In the Community, some 20 000 million u.a. was spent on R & D in 1975. Of the total, approximately

10 600 million u.a., or 1% of GDP, was spent by the public authorities of the Member States, some 100 million u.a. in the form of joint projects run under the aegis of the Community. R & D expenditure in the United States, despite certain difficulties of statistical comparison, presents a broadly similar picture. The corresponding figure for the United States' public R & D expenditure in 1975 (i.e. the Federal Budget for both civil and military R & D) was approximately 13 900 million u.a. As in the case of the Community, public expenditure in the US represents about 50% of total R & D outlay. *Per capita*, the United States spent 65 u.a. on public R & D as against 41 u.a. in the Community. This represents a considerable narrowing of the gap. In 1970, the corresponding figures were 75 u.a. and 24 u.a. respectively. A more detailed statistical analysis of public R & D expenditure is provided in Annex I.

1.4. Until recently, R & D projects were selected, financed and carried out in a comparatively straightforward manner. R & D was synonymous with technological progress. And technological progress was accepted as being intrinsically good. Firms and public authorities were willing to back R & D work for economic and prestige reasons. R & D in general enjoyed a favoured financial position, buoyed up by sustained economic growth.

1.5. However as highlighted by the publication of studies, such as the Club of Rome Reports, there is a new awareness of the enormity of the problems which the world will face in the long run if it continues on its present course, namely: population, food, raw materials, the nature and size of economic growth, as well as the interrelationship between these problems. This has underlined a need to maintain the size of the long-term R & D effort and, at the same time, to re-direct it with optimum efficiency to tackle problems of a very different order to those which have been confronted up to now.

1.6. In the Community, R & D work is also coming under another type of pressure. In the current climate of lower growth and financial stringency, both firms and public authorities seek to obtain immediate returns for the expenditure to the detriment of longer-term investment in areas like R & D. The Committee deplores such an approach as being not only short-sighted but also self-defeating. It is only by actually stepping up R & D efforts that it is possible to find solutions to the new problems associated with recession, and to overcome recession itself.

1.7. The dual requirement for long-term solutions and short-term results means that R & D will come under increasingly close scrutiny. Public policy, in particular, takes on a new significance. Community involvement in R & D has also reached a crossroads. It was against this background that the Committee examined the two Communications prepared by the Commission in October 1975 entitled:

- Objectives, Priorities and Resources for a Common Research and Development Policy.<sup>1</sup>
- Overall Concept for the next Multiannual Research Programme of the Joint Research Centre.<sup>2</sup>

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<sup>1</sup> Doc. COM (75) 535 final.

<sup>2</sup> Doc. COM (75) 529 final.



On 16 December, the Committee's Bureau decided that the Committee should carry out the present study, assigning the preparatory work to its Section for Energy and Nuclear Questions. The Study was approved by the Section on 7 May 1976. It was unanimously adopted by the Committee on 25 May 1976 during the course of its 139th Plenary Session. The Study sets out to examine, in an overall context, the objectives and priorities for a Common Research and Development Policy for the European Communities with special reference to the two abovementioned working documents prepared by the Commission. It is also intended to prepare for subsequent referrals by the Council.

## **2. OBJECTIVES**

2.1. It is necessary to identify overall long-term economic and social objectives before a clear direction can be given to R & D policy. For the Community, this would mean carrying out long-term forward planning studies based on wide-ranging alternative assumptions. It is a difficult task, further complicated by the uncertainty surrounding some of the assumptions on which the conclusions depend. It would not be possible to include this work in the present study. Nor does the study attempt to do so. At the same time, it is essential that such analyses be carried out. The Commission should, therefore, as soon as possible, make proposals to the Council for the creation of a long-term forecasting instrument for the Community.

2.2. In drawing up these proposals, the Commission should take account of the recommendations recently set out in the Europe plus Thirty Report. The Commission may well favour a restricted task force concentrating largely on the coordination of Member States' activities in place of a sizeable multidisciplinary Community body carrying out a major proportion of the work 'in house'. The former, however, is an absolute minimum requirement. Studies undertaken by Member States which would not take full account of Community interrelationships, or which would be based on differing assumptions, would be meaningless. Thus, any coordination must at least ensure that all such studies work from a common base. In addition, the Commission must not define its responsibilities within too narrow limits. Its coordinating activities must include the right to carry out independent analyses and, where necessary, to make proposals for common action.

2.3. The long-term planning instrument must complement rather than duplicate the European Community institute for economic and social research and analysis. The Committee would here refer to its Opinion on the Council Proposal for a Regulation setting up a European Community Institute for Economic Analysis and Research.<sup>1</sup>

2.4. The Commission in its recent communication<sup>2</sup> acknowledges the absence of a long-term view of the Community's overall economic and social objectives, firstly,

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<sup>1</sup> Doc. CES 374/76.

<sup>2</sup> Doc. COM (75) 535 final.

by restricting itself to the short and medium term and, secondly, by not setting down objectives even for these more limited time horizons. Although the Commission did set out objectives for the R & D sector in a Communication in 1972,<sup>1</sup> the basic problem of relating R & D to long-term overall economic and social objectives remains. While it is not possible to give full answers, the Community's long-term objectives must include :

- the furtherance of the wellbeing of all the Community's citizens and the results must not exclusively benefit certain privileged groups or interests within it ;
- balanced economic and social development : efforts must be taken both to eliminate further bottlenecks and disequilibria and to prevent new ones from arising ;
- the promotion of international cooperation.

These economic and social objectives cannot of course remain static : they must evolve in line with both technical developments and changing social attitudes. It is against the background of these overall objectives that the specific objectives for Community R & D must be designed.

2.5. The specific objectives for R & D policy must in turn remain incomplete. But here too it is possible to provide certain guidelines. The objectives outlined by the Commission in 1972<sup>2</sup> were fourfold :

'(a) *The extension of scientific and technical knowledge* : Fundamental research, the fruits of which are the very 'capital' of technological progress and whose vitality ensures that the States which support it can assimilate promptly all knowledge acquired in the world of science, is still the basic activity which has to be continuously promoted.

This type of research is the first stage in the advancement of knowledge, and one of its inherent characteristics is a high degree of independence and wide decentralization, both of inception and execution. It therefore requires a special form of back-up to ensure that it develops continuously and dovetails into the complex process of technical advance.

(b) *Social advance* : The following may be mentioned :

- Expansion of research aimed at benefiting man and society (health and preventive medicine, agricultural research, safety at work and in transportation, social sciences, etc.).
- Conservation or improvement of the environment and rural development.
- Optimizing the exploitation of natural resources.
- Transforming large conurbations to create living conditions to meet the changing needs of Europeans (new types of dwelling, urban infrastructures, etc.).
- Building new infrastructures : energy generation, storage and distribution ; telecommunications networks ; new, high-speed of high-capacity transport services ; data-handling networks ; depollution centres for international river basins or the seashore, etc.).

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<sup>1</sup> Communication from the Commission to the Council on the Objectives and Instruments of a Common Policy for Scientific Research and Technological Development (Doc. COM (72) 700).

(c) *Development of advanced technologies for economic ends :*

- Nuclear energy (e.g. advanced reactors and uranium enrichment), data processing, aircraft, space, new means of transport, exploitation of the sea, etc.
- Development and application of new or under-utilized technologies in the majority of industries, including the most traditional : steelmaking, textiles, food, motor vehicles, chemicals, etc.

To illustrate, industrial firms could derive many and substantial benefits from the application of data processing and numerical control techniques, planning, management, improved shopfloor productivity, improved distribution, etc.

(d) *Mastery of progress :* Finally, the need, or rather the necessity, for science-based societies to consider the human consequences of scientific and technical progress and its repercussions on the practical conditions of existence in the future appears even more fundamental.'

The Committee endorses these four objectives. It would, however, regroup under a separate heading :

- (e) Raw materials' management (exploration, exploitation, conservation, recycling and substitution).

### **3. PRIORITIES**

#### **3.1. General**

3.1.1. On the basis of the objectives outlined in Part 2, priorities should be set for R & D work in the Community. While there is no entirely satisfactory system for compartmentalizing these objectives, it might, for the purposes of discussion, be possible to distinguish between the following categories :

- basic research ;
- applied research — short-term ;
- applied research — medium-term ;
- applied research — long-term.

3.1.2. The Committee believes that whatever the timespan involved, applied research problems cannot be adequately tackled purely on a sector-by-sector basis. What is needed is an intersectoral approach to the study of all problems affecting the general interest. Thus, there should be one overall permanent priority, namely : to seek to fulfil the needs and aspirations of society with a view to improving the quality of life.

#### **3.2. Basic research**

3.2.1. Basic research covers all work whose sole objective is the pursuit of new scientific knowledge and from which therefore, by definition, no practical application is immediately intended. Ultimately, of course, its results do have a practical use

in so far as they form a base of information, which is helpful in designing applied R & D projects. Basic research must remain a Community priority for this reason. It is a particularly suitable area for intergovernmental cooperation on two grounds. Firstly, basic R & D, by its nature, is largely carried out in educational and scientific institutions supported by public finance. Secondly, cooperation has the advantages which derive from the pooling of effort, without the drawbacks that arise in applied projects where national interests diverge. The success of the European Organization for Nuclear Research (CERN) in the field of basic research contrasts sharply here with the relative failure of Euratom's major applied project in the 1960s. Efforts to foster voluntary cooperation on basic research in the Community are, therefore, essential. In 1972, the Commission (Doc. COM (72) 700 final) proposed the setting up of an independent European Science Foundation for this purpose, at the same time putting forward a number of ideas on its composition and specific tasks. The idea of setting up the Foundation was favourably received by the Council in one of its Resolutions of 14 January 1974.<sup>1</sup> The Committee welcomes its creation.

### **3.3. Applied research (short-term)**

3.3.1. The period refers to R & D work which might be expected to yield initial results within 1 to 2 years. The timespan is extremely short. It only covers a minor part of R & D work, the remainder being of a longer-term nature. It is mainly of significance in the private sector. However, in the public sector, it can also play a certain role. Here, priority should be given to the work of providing back-up services to the national and Community authorities in the implementation of the various sectoral policies (agriculture, industry, social, environment, etc.). There are many useful examples of work of this kind being done by research bodies in the Member States and by the Community's Joint Research Centre.

### **3.4. Applied research (medium-term)**

3.4.1. The period refers to R & D work which might be expected to yield initial results within 2 to 5 years. This is the period on which the Commission has almost exclusively confined itself in its Communication on the Objectives, Priorities and Resources for a Common Research and Development Policy.

3.4.2. The Commission identifies four priority areas for R & D in the medium term :

1. Resources (energy, agriculture, raw materials).
2. Environment.
3. Economic and industrial development.
4. 'Life of society' (social research, biomedicine, urban development, and transport and telecommunications).

The Committee approves this choice in broad outline. It accepts that these are, broadly speaking, the R & D areas which are likely to yield the most useful initial

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<sup>1</sup> OJ C 7 of 29.1.1974, p. 5.

results by, say, 1980. It would, however, place very strong emphasis on the specific questions of raw materials. The areas of study such as conservation, recycling and substitution which are likely to yield results within 5 years, should be spelt out in greater detail. Since the potential for improvements will certainly not have been exhausted within this timespan, all of these priority areas are also relevant to long-term R & D.

### **3.5. Applied research (long-term)**

3.5.1. The period refers to R & D work which might be expected to yield initial results within 5 to 30 years. With this timespan, most of the factors which have been accepted as fixed elements in the short term and medium term now become variables. The interreactions between efforts in the various sectors become even greater. Long-term R & D work can, therefore, only be guided by the single general priority already outlined in point 3.1.2.

3.5.2. In the prevailing unfavourable economic climate and tight public budgeting, it may only be politically possible to secure approval for those projects which promise a tangible return within the short or medium term. Certainly, where some R & D projects are fighting for their existence, this approach is tactically correct. But it must never be taken to the point, where sight is lost of the long-term problems and needs. The temptation to relegate the study of long-term problems to a lower order of importance must therefore be avoided at all costs. The returns for action will be less immediate. But the consequences of inaction will be vastly greater. Only by starting long-term R & D projects now, will it be possible to ensure that the problems currently forecast for thirty years hence do not materialize. This is an area for vigilance by the public authorities and, in particular, by the Community. It is also a suitable area for joint effort. It would in many cases be difficult for a single State to justify carrying the entire cost of such projects on its own budget. There is likely to be a high degree of convergence of interests. And it will be possible, through coordination from an early stage, to prevent such differences from emerging.

## **4. THE ROLE OF THE COMMUNITY**

### **4.1. General**

4.1.1. Having decided what R & D should be done, it is necessary to determine the Community's specific role in carrying it out.

### **4.2. The criteria for Community action**

4.2.1. At present, 99% of public R & D is carried out by the national authorities with 1% under the aegis of the Community. As a general principle for future

policy, the Community should only assume responsibility where there are clear benefits to be derived. The Commission suggests five criteria for Community involvement in R & D projects :

- (i) action designed to contribute directly to implementation of the Community's sectoral policies (e.g. agriculture, energy) ;
- (ii) action which, because of the extent of the human and financial resources required, cannot be carried out on a national basis (e.g. fusion programme) ;
- (iii) action where development costs and outlets call for a huge market (e.g. aeronautics, data processing) ;
- (iv) action that is transnational by its very nature (e.g. transport and telecommunications systems, scientific and technical information and documentation) ;
- (v) action meeting local authority requirements common to the Member States (e.g. environment, town planning, biomedical research, CBR).

According to the representatives of the Commission, the latter does not assign any order of importance to these criteria. These representatives suggest that fulfilment of one criterion justifies Community intervention.

4.2.2. Mr Tindemans in his report on European Union also argues that 'research policy must not be spread over a range of heterogeneous and marginal activities'. He recommends that it should be strictly concentrated on priority sectors determined in the light of the three following criteria :

- (a) research directly connected with a common policy of the Union, such being the case, for example, with environmental research which is a necessary support and adjunct to a common environment policy ;
- (b) research directly connected with a common activity in a specific sector, such as research into alternative sources of energy ;
- (c) research too costly to be carried out by an individual State, like, for example, research into controlled thermo-nuclear fusion.

Mr Tindemans goes on to specify that, in these fields, the common policy must :

- be backed by resources adequate in both quantity and duration for results to be achieved which can be used at the industrial level ;
- initiate an exchange of information on the activities and results of national programmes, thus avoiding duplication and making generally available the results obtained ;
- enable small States in particular to take part in work which would not be justified at national level.

4.2.3. The Committee believes that it is necessary to guard against the risk of over-dispersion of effort. In practice therefore, much closer selectivity is required in order to keep Community involvement within the bounds of feasibility. Nearly all R & D work carried out in the Community could be construed as meeting one of the Commission's five criteria. To be meaningful, criteria must be selective. Therefore, while approving the criteria, the Committee suggests that projects chosen for Community involvement should fulfil as many of the criteria as possible. The Committee considers that further selectivity could be achieved by adding the following to the Commission's list :

- (vi) action on which joint effort is likely to lead to major cost savings and/or a significant shortening of the time lapse between discovery and application ;
- (vii) action on which there is a fundamental convergence of Member States' underlying interests in a joint effort ;
- (viii) action in areas where, among the various forces released by R & D work governing the future direction of that work, the positive forces of technological synergy are stronger than the negative, divergent forces.

### 4.3. Direct Community action

4.3.1. The Community directly carries out its R & D work through its Joint Research Centre (JRC). The latter was established at the inception of the Community to undertake a major joint research programme in nuclear energy under the terms of the Euratom Treaty. It comprises four establishments : Ispra, Karlsruhe, Petten and Geel. After the abandonment of the ORGEL reactor project in the early 1960s, the JRC underwent a long period of uncertainty with repeated stop-gap financing by the Council. There was also a major shift in its activities over that period. By 1975, it had diversified its efforts into 22 actions. In financial terms, these were broken down as follows :

Energy (of which one half devoted to nuclear projects)	43%
Public service activities	35%
Environment	10%
Basic research	8%
Management and coordination	4%

It operates at present with 2 300 staff, i.e. 1 400 permanent officials and 900 with local status. Its four-year multiannual research programme, which expires at the end of 1976, has a total budget of some 185 million u.a. for the period.

4.3.2. The Commission, in October 1975, prepared an 'Overall Concept for the next Multiannual Research Programme of the Joint Research Centre.'<sup>1</sup> The objectives for the JRC set out in this Communication might be summarized as follows :

- (1) to act as a focal or crystallizing point for actions coordinated at Community level ;
- (2) to pursue, in the form of direct-action projects, research activities of a Community nature ;
- (3) to conduct research wherein a certain independence of judgment is required ;
- (4) to support Community sectoral policies.

In order to bring about a 'radical transformation' of the JRC, the Commission intends to propose 'a programme that deliberately differs from the current programme in concept, substance and management'. It is proposing to delete certain projects and re-group the remainder. The new programme will thus concentrate on ten major actions limited in time and scope (see Annex III). The Commission submitted its final proposals to the Council on 5 May 1976.<sup>2</sup>

<sup>1</sup> Doc. COM (75) 529 final.

<sup>2</sup> Doc. COM (76) 171 final.

4.3.3. While it broadly endorses the Commission's outline of the next programme the Committee believes that the JRC must not only be maintained as a body which can play a worthwhile role in Community R & D policy, but that it should also have its responsibilities enlarged by a gradual extension of Community involvement in suitable areas. This form of R & D by direct Community action is also of great importance in that it provides the smaller Member States with the possibility of participating in projects which are beyond their individual means.

4.3.4. With regard to the next multiannual programme, however, the Commission is correct in concentrating on a few major projects which offer good prospects of success. Successful accomplishment of a modest number of tasks, even if not perfectly balanced over the range of justified requirements, is preferable to an over-ambitious programme that cannot be successful. The selected programme must always be within the range of skills, equipment and financial resources available to the JRC.

4.3.5. In selecting projects for the JRC's multiannual programme, the following criteria should be applied :

- (a) each project must support at least one of the chosen objectives ;
- (b) each preferred project must be capable of accomplishment in one of the JRC's establishments ;
- (c) each preferred project should provide opportunities for further strengthening of the JRC.

Only by systematic pursuit of such a policy can the Community ensure continuance and improvement of Joint Research Centre establishments as focal points of scientific and technical excellence. Only if scientific and technical excellence is ensured will it be possible to obtain satisfactory returns on research investments, i.e. successful research results in competition with other centres of excellence in the world.

4.3.6. The Joint Research Centre of the Community also needs to be strengthened by :

- (a) greater job security of staff ; specifically, research staff must be given adequate job security throughout the full duration of the project on which they are engaged, if that project is to be carried out under optimal conditions ;
- (b) enlarging the range of choice for research staff as much as possible so that they can opt for the project which best dovetails with their personal interests, qualifications and experience ; this type of flexibility might ultimately be provided by a single European Statute for research staff which would allow free movement of staff, not only within the Joint Research Centre but also between all research establishments in the Community ;
- (c) longer continuity of projects and policies ;
- (d) better communications with the Community at large ;
- (e) better reporting and publicity for successful ventures ;
- (f) training programmes in respect of project identification, project management, planning and progress reporting (especially for middle management, e.g. project manager level). Besides technical competence in a particular scientific field, researchers need a strong background in R & D management skills. These



skills are essential in order to tackle the increasingly extensive planning, budgeting, organizational and review procedures associated with R & D projects. Such training is also useful for scientists, who, at a certain stage in their careers, have to switch from research to research management ;

(g) a long-term policy for career development of research staff on all levels.

#### **4.4. Indirect Community action**

4.4.1. The Community can also carry out R & D projects 'indirectly', i.e. by contracting them out to research establishments in the Member States. This procedure is currently used for a total of some 20 R & D projects covering agriculture, energy, industry, social research, environment, development aid and public service activities. Approximately 40% of the Community's R & D budget is currently allocated in this way. The Committee considers that it is essential to maintain a fair balance between the 'indirect' and 'direct' action forms and to ensure their full complementarity.

4.4.2. The Committee is extremely anxious that the uncertainty surrounding the largest and most important of these indirect programmes, that of Thermonuclear Fusion, be resolved immediately. The Council must come to an agreement on the specific question of the siting of the JET. Continued uncertainty will have serious repercussions on the continuity of the programme, and will create problems of staff recruitment. But, most seriously of all, it will mean that the Community will lose ground to the other front-runners in the field (USSR, USA and Japan). The Committee would refer to its opinion on the subject.<sup>1</sup>

#### **4.5. The coordination of national R & D work**

4.5.1. Coordination of national R & D work at Community level is essential. It is all the more important when one considers that the amount of money spent by the Member States of the Community on national work is ninety-nine times greater than that spent on Community projects. Even small proportionate improvements in efficiency or financial savings would be of major significance. The Community, without taking on responsibility for national R & D work, can therefore play a major role through coordination, in reducing duplication of effort and increasing the efficiency of R & D. This work is of great importance if the Community's involvement in R & D policy is not to remain peripheral.

4.5.2. The work of the Committee on Scientific and Technical Research (CREST) in helping the Commission to coordinate R & D policy is of major significance. The fact that it has encountered certain difficulties in the past couple of years since its establishment indicates the longhaul nature of the task. Nevertheless, the achievements of CREST constitute a useful base from which future Community coordination efforts can be carried out.

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<sup>1</sup> OJ C 35 of 16.2.1976, p. 19.

4.5.3. A precondition for coordination is an effective information system. The difficulties encountered by the Community in this field are well illustrated in the case of nuclear research by the Community's failure to put Article 5 of the Euratom Treaty into effect. Under this Article, the Commission has power to 'call upon Member States, persons or undertakings to communicate to it their programmes relating to the research which it specifies in the request'. The Member States themselves have considerable difficulty in coordinating the activities of their various local research establishments. Information needs to be forwarded in a standardized form from the local centres to the Community authorities and vice versa. In addition to introducing the Community's Information and Documentation on Science and Technology Network (IDST) on a pilot basis, the Commission should examine the possibility of extending the collection of relevant R & D information beyond the agriculture and energy sectors to other sectors.

4.5.4. Community coordination of R & D can only be successful if it is backed up by an adequate administrative framework. In this way, the natural will of researchers to communicate and coordinate their efforts can be provided with an effective channel. Once Council decisions are taken it is necessary to ensure that Member States create the administrative machinery required for their implementation. Specifically, the tasks associated with the Community coordination of R & D must become a fully integrated part of national programmes. Once the problems of coordination of R & D projects in a given sector have been successfully overcome, the question of Community involvement in that sector in the form of direct or indirect action becomes a secondary issue.

## **5. INTERNATIONAL COOPERATION**

### **5.1. General**

5.1.1. The international implications of R & D are of two fundamentally different kinds. On the one hand, there is the two-way exchange between countries who are on a broadly equal footing. On the other hand, there is the one-way transfer from these countries, individually and collectively, to the developing countries.

### **5.2. Cooperation with other developed countries**

5.2.1. Just as intra-Community collaboration on R & D can avoid duplication and permit larger problems to be tackled, worldwide cooperation is imperative for the same reasons. Given the size of the combined world R & D effort, improvements, however small proportionately, would be substantial when measured in absolute terms. The human and financial resources so released could then be redeployed so as to enlarge the scope of the R & D effort whether in the study of new areas or in the pursuit of existing R & D projects in greater depth. The exchange of information on thermonuclear fusion (EEC, USSR, USA and Japan) and space research (USA,

USSR) are good examples. They show that, for purely economic reasons, super-powers are already being forced to cooperate in fields which are costly and which are likely to become more so in the future.

5.2.2. The Community's role should be fourfold :

- (1) to undertake a fair share of the total number of R & D projects, especially advanced-technology projects ;
- (2) to maintain the quality of Community R & D in specific fields, where international cooperation is also required, at a level which allows the free exchange of information with the leading non-member countries ;
- (3) to coordinate the Community's information-exchange and cooperation efforts with non-member countries ;
- (4) to promote such cooperation with all non-member countries, whether individually or in groups.

### **5.3. Cooperation with developing countries**

5.3.1. The Community has an important role in ensuring the transfer of technology with the developing countries in line with the new form of thinking on the world order, as expressed in recent international negotiations.

5.3.2. In the first instance, the Community should follow the guidelines already laid down in the case of the ACP countries in the Lomé Convention.

5.3.3. The Community should also take into account the principles set out in points 55 and 56 of the UNIDO Lima Declaration,<sup>1</sup> namely :

'That appropriate measures should be taken by developing countries to organize research institutions and establish training programmes to cover the needs of their industrial development and make possible progressive mastery of the different production and management techniques and of industrial development, thus facilitating the establishment of structures to absorb modern technologies.

That intensive efforts should be made by the competent bodies to formulate an international code of conduct for the transfer of technology corresponding to needs and conditions prevalent in developing countries by defining terms and conditions to such transactions to take place under the most advantageous conditions for those countries.'

5.3.4. The Community should similarly take account of the guidelines adopted by the Seventh Special Session of the United Nations General Assembly,<sup>2</sup> specifically those on :

- the development of the scientific and technological infrastructure of developing countries ;

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<sup>1</sup> Second General Conference of the United Nations Industrial Development Organization (UNIDO), Lima, 12 to 27 March 1975.

<sup>2</sup> United Nations, Seventh Special Session of the General Assembly, 1 to 16 September 1975, Final Resolution on Development and International Economic Cooperation (Science and Technology).

- the provision of assistance to developing countries for direct support to their science and technology programmes ;
- the drawing up of an international code of conduct for the transfer of technology ;
- the favourable access of developing countries to relevant information on advanced and other technologies and to technologies whose transfer is not subject to private decision ;
- the improvement of the transparency of the industrial property market in order to facilitate the technological choices of developing countries.

## **6. THE RELATIONSHIP OF R & D TO END USE**

### **6.1. General**

6.1.1. The usefulness of R & D is determined by both the extent and speed with which its results are taken up in practical applications. This means ensuring :

- (1) a close relationship between those who carry out R & D and those who will benefit from it ;
- (2) the removal of technical barriers ;
- (3) a system for the collation, evaluation and dissemination of results ;
- (4) where appropriate, a licensing system, which both protects authors' rights and encourages application.

### **6.2. The establishment of User Requirement Boards**

6.2.1. Much of the research carried out under the aegis of the Community is either pure or fundamental research, or leads to projects which are beyond the financing means of the Member States. There is also the danger that, where the research effort is carried out on a Community basis, the gap between the research effort and practical utilization of the resultant findings will be increased.

6.2.2. A second important aspect is that within some of the Member States there is room for closer cooperation between research and industry. This is a *sine qua non* if public research is to make a decisive contribution in the economic and social policy fields.

6.2.3. Thirdly, a certain inbuilt scepticism towards innovation is often found in the attitudes of both industrial management and the general public. It stems from an understandable fear of the unknown and, in some instances, from a justifiable natural human wariness against failure and repetition of past mistakes. Apart from doing work of a high quality, part of the answer lies in the timely provision of adequate public information in simple language. The information must cover not only the innovation itself but also its potential impact on society.

6.2.4. Optimal conditions for R & D project selection and execution can best be assured by a close relationship between those who carry out R & D and those who will use its results. This could be achieved by creating committees with appropriate representation of research organizations, industrial users of R & D and consumers to advise the Commission and the Council. The committees could learn from the operation of the User Requirement Boards in the United Kingdom. Their main task would be to help the Commission and the Council in identifying the needs for new technology in the relevant sector and in suggesting ways in which these needs could be met. The Committee believes that there is a strong case for introducing such committees, where they do not already exist, also at national level in order to provide similar assistance to the public R & D programmes of the Member States. The Committee's Section for Energy and Nuclear Questions intends to request authorization to compile information for the members of the Committee on the operation of User Requirement Boards.

6.2.5. The Boards should also help the Commission in monitoring R & D projects. At present this supervisory function is carried out by the Commission with the assistance of Advisory Committees on Programme Management (ACPMs). The latter generally comprise a maximum of three representatives of the Commission and three government experts appointed by each Member State.

6.2.6. Finally, the Boards should be empowered to make recommendations to ensure the best possible use of the results once obtained.

### **6.3. The removal of technical barriers**

The results of Community R & D can only be applied on a Community-wide basis if there is a genuine common market for products, plant, means of transport, services, etc. The removal of technical barriers is therefore a prerequisite of a common R & D policy.

### **6.4. The dissemination of results**

6.4.1. Innovation can only be encouraged if steps are taken to see that the results obtained are made available to all industries of any size in the Community.

6.4.2. The Committee endorses the Commission's principle that the effort deployed in this area should be commensurate with the effort devoted to research itself. The methods used must, of course, be adapted to the type of information to be communicated. Creation of an IDST network and other systems could help greatly here.

### **6.5. Licensing and author's rights**

Where the Community has R & D work of an industrial nature carried out on contract, it must have guarantees that the results will be directly applied in line with

the Community's interests. Here, the Commission should give special study to the design of a model for Community research contracts which lays particular emphasis on innovation. The Commission favours continuation of the procedure under which 'the firm that carries out the research will remain the owner of the new products, equipment and processes that it has invented, and will be given priority in exploiting them'. This is acceptable. But where implementation is unsatisfactory, the Commission must have power to withdraw the privilege of exclusive concession and grant licences to third parties. The Commission should also have the power to negotiate, where appropriate, the payment of royalties to the Community in consideration of its contribution, the proceeds being used to expand Community R & D activity.

## **7. SUMMARY OF RECOMMENDATIONS**

7.1. The Commission should, as soon as possible, make proposals for the creation of a long-term forecasting instrument.

7.2. The Community's overall long-term economic and social objectives must include :

- the furtherance of the wellbeing of all the Community's citizens ;
- balanced economic and social development ;
- the promotion of international cooperation.

7.3. Accordingly, the objectives for R & D policy in the Community must be :

- the extension of scientific and technical knowledge ;
- social advance ;
- development of advanced technologies for economic ends ;
- mastery of progress ;
- raw materials' management.

7.4. Basic research must remain a Community priority.

7.5. For all applied research, there should be one overall permanent priority, namely :

- to seek to fulfil the needs and aspirations of society with a view to improving the quality of life.

7.6. The priority for short-term applied R & D should be :

- to provide national and Community authorities with the back-up services necessary for the implementation of their sectoral policies.

7.7. The priority areas for medium-term applied R & D should be those identified by the Commission, namely :

- resources ;
- environment ;
- economic and industrial development ;
- 'life of society'.

7.8. Specific Community involvement in R & D should be limited to :

- (i) action designed to contribute directly to implementation of the Community's sectoral policies ;
- (ii) action which, because of the extent of the human and financial resources required, cannot be carried out on a national basis ;
- (iii) action where development costs and outlets call for a huge market ;
- (iv) action that is transnational by its very nature ;
- (v) action meeting local-authority requirements common to the Member States ;
- (vi) action on which joint effort is likely to lead to major cost savings and/or a significant shortening of the time lapse between discovery and application ;
- (vii) action on which there is a fundamental convergence of Member States' underlying interests in a joint effort ;
- (viii) action where, among the forces released by R & D work governing the future direction of that work, the synergetic forces are stronger than the divergent.

7.9. On 'direct' Community action, the Committee broadly endorses the Commission's outline of the next multiannual programme for the JRC. The latter must not only be maintained as a body which can play a worthwhile role ; its responsibilities should also be enlarged.

7.10. At the same time, the selected programme for the JRC must always be within the range of skills, equipment and financial resources available to it.

7.11. The JRC also needs to be strengthened by :

- greater job security of staff ;
- enlarging the range of choice for research staff ;
- longer continuity of projects and policies ;
- better communications with the Community at large ;
- better reporting and publicity for successful ventures ;
- training programmes in R & D management ;
- a long-term policy for career development for staff.

7.12. A fair balance between 'direct' and 'indirect' actions must be maintained and their full complementarity ensured.

7.13. The uncertainty surrounding the largest of the indirect programmes, that of Thermonuclear Fusion, must be resolved immediately. The Council must come to an agreement on the siting of the JET.

7.14. Coordination of national R & D work is also an important Community task. Specifically :

- the work of CREST constitutes a useful base for such work ;
- the work must be backed up with an effective information system on R & D projects ;
- Community coordination efforts must also be backed up by an adequate administrative framework at national level.

7.15. In cooperating on R & D with other developed countries, the Community should :

- undertake a fair share of the total number of R & D projects, especially advanced-technology projects ;
- maintain the quality of Community R & D in specific fields, where international cooperation is also required, at a level which allows the free exchange of information with the leading non-member countries ;
- coordinate the Community's information-exchange and cooperation efforts with non-member countries ;
- promote such cooperation with all these countries, whether individually or in groups.

7.16. In its relations with the developing countries, the Community should :

- ensure the transfer of technology in line with the new form of thinking on the world order, as expressed in recent international negotiations (e.g. Lomé Convention, UNIDO Lima Declaration, UN Seventh Special Session).

7.17. To ensure the broadest and speediest practical application of R & D results, the Community should :

- set up committees composed of representatives of research organizations, industrial users and consumers (user requirement boards), to help the Commission and the Council in identifying the needs for new technology in a given sector and in suggesting ways in which these needs could be met ;
- encourage the removal of technical barriers ;
- promote the dissemination of information on the results of R & D work ;
- design research contract and licensing systems which both protect authors' rights and encourage application.



## **ANNEXES**

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## ANNEX I (1a)

PUBLIC EXPENDITURE ON RESEARCH AND DEVELOPMENT <sup>1</sup>

Evolution 1970 - 1975

	Public expenditure on R & D			Public expenditure on R & D per capita			Rate of growth over previous year <sup>2</sup>		
	million u.a.			u.a.			%		
	1970	1974	1975	1970	1974	1975	1970	1974	1975
Belgium	194.1	334.4	345.0	20.00	34.23	35.22	18.6	19.6	3.2
Denmark	85.6	145.1	168.0	17.37	28.76	33.21	—	9.7	15.8
Germany	1 776.6	3 701.2	3 956.3	29.29	59.64	63.98	16.7	5.5	6.9
France	1 745.6	2 494.4	2 971.0	34.49	47.51	56.33	1.8	12.2	19.1
Ireland	13.4	22.7	26.9	4.55	7.36	8.61	27.6	9.8	18.5
Italy	429.9	440.7	525.1	8.03	7.95	9.41	29.1	5.0	19.2
Netherlands	295.8	504.3	588.0	22.72	37.23	43.06	13.1	8.7	16.6
United Kingdom	1 506.7	2 003.0	1 997.6	27.15	35.72	35.64	—	18.9	— 0.3
<b>Total</b>	<b>6 047.7</b>	<b>9 645.8</b>	<b>10 577.9</b>	<b>24.10</b>	<b>37.46</b>	<b>40.62</b>	<b>—</b>	<b>8.3</b>	<b>9.7</b>

<sup>1</sup> Calculated at current exchange rates.<sup>2</sup> Calculated in national currency.

Source : Commission of the European Communities.

## ANNEX I (1b)

PUBLIC EXPENDITURE ON RESEARCH AND DEVELOPMENT <sup>1</sup>

Evolution 1970 - 1975

	Share of R. & D. expenditure in total budget			Share of R. & D. expenditure in gross domestic product		
	%			%		
	1970	1974	1975	1970	1974	1975
Belgium	2.81	2.72	2.32	0.77	0.80	0.73
Denmark	1.77	1.81	1.83	0.55	0.59	0.61
Germany	4.16	4.72	4.35	0.96	1.21	1.22
France	5.84	6.08	5.76	1.24	1.17	1.15
Ireland	0.86	0.98	0.97	0.34	0.43	0.44
Italy	2.08	1.39	1.39	0.46	0.37	0.39
Netherlands	3.65	3.25	3.04	0.94	0.91	0.96
United Kingdom	3.49	3.04	2.77	1.25	1.34	1.23
<b>Total</b>	<b>3.84</b>	<b>3.78</b>	<b>3.54</b>	<b>0.98</b>	<b>1.06</b>	<b>1.04</b>

<sup>1</sup> Calculated at current exchange rates.

## ANNEX I (2a)

PUBLIC EXPENDITURE ON RESEARCH AND DEVELOPMENT BY OBJECTIVE  
IN THE COMMUNITY COUNTRIES IN 1975 (million u.a.)

Objective	Belgium	Denmark	Germany	France	Ireland	Italy	Netherlands	United Kingdom	EUR 9
1. Exploration and exploitation of the earth and its atmosphere	6.5	2.9	70.7	89.5	0.8	5.8	6.3	13.5	195.0
2. Planning of human environments	4.9	2.6	101.4	132.7	2.0	6.7	35.2	49.4	334.9
3. Protection and improvement of human health	14.8	12.7	168.4	144.9	1.9	13.9	39.0	64.2	459.8
4. Production, distribution and rational utilization of energy	49.4	4.7	417.1	255.8	0.1	92.5	12.8	145.8	978.2
5. Agricultural productivity and technology	14.6	16.3	74.3	114.7	11.0	15.6	45.6	88.8	380.9
6. Industrial productivity and technology	44.7	15.9	290.8	425.3	5.9	54.2	28.3	247.3	1 112.4
7. Social and sociological problems	14.4	7.0	193.0	32.8	1.8	7.5	43.2	19.1	318.8
8. Exploration and exploitation of space	12.4	6.1	167.6	165.9	0.0	44.8	14.6	45.2	456.6
9. Defence	2.3	1.2	436.3	880.3	0.0	17.6	20.9	927.1	2 285.7
10. General promotion of knowledge	181.0	98.6	2 036.7	716.9	3.4	266.5	326.6	397.2	4 026.9
Expenditure not itemized				12.2			15.5		27.7
Total expenditure	345.0	168.0	3 956.3	2 971.0	26.9	525.1	588.0	1 997.6	10 577.9

Source : Commission of the European Communities.

## ANNEX I (2b)

PUBLIC EXPENDITURE ON RESEARCH AND DEVELOPMENT BY OBJECTIVE  
IN THE COMMUNITY COUNTRIES IN 1975 (%)

Objective	Belgium	Denmark	Germany	France	Ireland	Italy	Netherlands	United Kingdom	EUR 9
1. Exploration and exploitation of the earth and its atmosphere	1.9	1.7	1.8	3.0	3.0	1.1	1.1	0.7	1.8
2. Planning of human environments	1.4	1.5	2.6	4.5	7.4	1.3	6.1	2.5	3.2
3. Protection and improvement of human health	4.3	7.6	4.3	4.9	7.1	2.6	6.8	3.2	4.3
4. Production, distribution and rational utilization of energy	14.3	2.8	10.5	8.6	0.4	17.6	2.2	7.3	9.3
5. Agricultural productivity and technology	4.2	9.7	1.9	3.9	40.9	3.0	8.0	4.4	3.6
6. Industrial productivity and technology	13.0	9.5	7.4	14.4	21.9	10.3	4.9	12.4	10.6
7. Social and sociological problems	4.2	4.2	4.8	1.1	6.7	1.4	7.6	1.0	3.0
8. Exploration and exploitation of space	3.6	3.6	4.2	5.6	0.0	8.5	2.6	2.2	4.3
9. Defence	0.7	0.7	11.0	29.8	0.0	3.4	3.7	46.4	21.7
10. General promotion of knowledge	52.4	58.7	51.5	24.2	12.6	50.8	57.0	19.9	38.2
Total expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

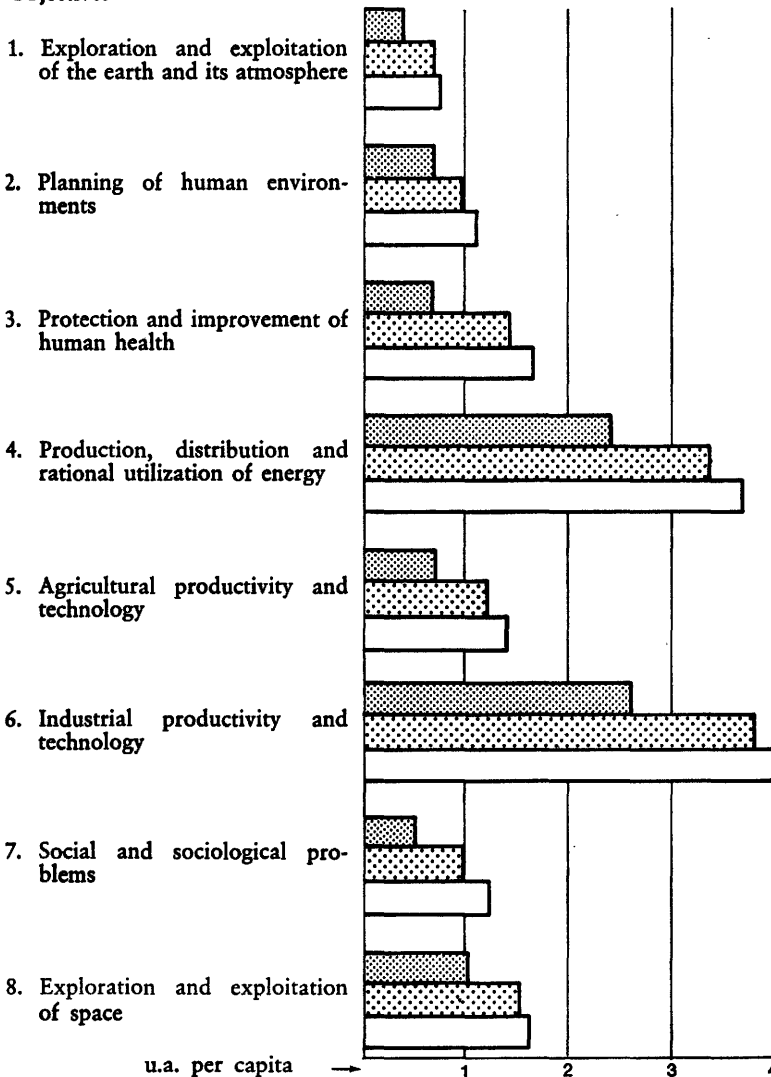
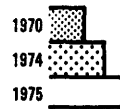
ANNEX I (3)

**PUBLIC EXPENDITURE ON RESEARCH AND DEVELOPMENT  
IN THE COMMUNITY**

**Evolution by main objective 1970 - 1975**

Per capita R & D expenditure in u.a.  
(estimate for 1970)

**Objectives**



Source : Commission of the European Communities.

## ANNEX I (4.1.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****1. Exploration and exploitation of the earth and its atmosphere**

NABS Code <sup>1</sup>	Heading	'000 u.a. <sup>2</sup>	% <sup>2</sup>
10	<i>Research of a general nature</i>	19 558	10.0
11	<i>Soil and substrata</i>	88 284	45.0
111	Oil and mineral prospecting	9 132	4.7
112	Exploration and exploitation of marine shelves	16 070	8.2
12	<i>Land hydrology</i>	6 232	3.2
13	<i>Seas and oceans</i>	50 658	25.8
14	<i>Atmosphere</i>	29 533	15.1
141	Meteorology	9 544	4.9
142	Aeronomy	12 268	6.3
19	<i>Other research</i>	1 705	0.9
1	<b>Total</b>	<b>195 970</b>	<b>100.0</b>

<sup>1</sup> Nomenclature for the Analysis and Comparison of Science Programmes.<sup>2</sup> Source : Commission of the European Communities.<sup>3</sup> Breakdown imputed by ESC Secretariat.

## ANNEX I (4.2.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****2. Planning of the human environment**

NABS Code	Heading	'000 u.a.	%
20	<i>Research of a general nature</i>	13 931	4.2
21	<i>Land development</i>	34 861	10.4
210	General	14 099	4.2
211	Urban development	9 846	2.9
212	Rural development	6 731	2.0
219	Development of other areas	—	0.0
22	<i>Construction and planning of buildings</i>	38 679	11.5
220	General	18 151	5.4
221	Residential buildings	4 153	1.2
229	Non-residential buildings	7 568	2.3
23	<i>Civil engineering</i>	57 868	17.3
24	<i>Transport systems</i>	95 040	28.4
25	<i>Telecommunications systems</i>	80 573	24.1
26	<i>Water supply</i>	12 826	3.8
260	Research of a general nature	8 372	2.5
261	Drinking water supply	2 143	0.6
269	Water supply for energy, industry and agriculture	33	0.0
29	<i>Other research</i>	1 105	0.3
2	<b>Total</b>	<b>334 883</b>	<b>100.0</b>



## ANNEX I (4.3.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****3. Protection and improvement of human health**

NABS Code	Heading	'000 u.a.	%
30	<i>Research of a general nature</i>	84 137	18.3
31	<i>Medical research</i>	225 469	49.0
32	<i>Research on food hygiene and nutrition</i>	19 310	4.2
321	Research on food hygiene	13 793	3.0
322	Research on nutrition	1 379	0.3
33	<i>Research on pollution</i>	104 091	22.7
330	General	18 620	4.1
331	Water pollution	15 494	3.4
332	Air pollution	18 483	4.0
333	Pollution of the soil and substrata	2 161	0.5
334	Noise abatement	4 598	1.0
335	Radioactive pollution	14 391	3.1
339	Other pollution	2 988	0.7
39	<i>Other research</i>	26 758	5.8
3	Total	459 765	100.0

## ANNEX I (4.4.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****4. Production, distribution and rational utilization of energy**

NABS Code	Heading	'000 u.a.	%
40	<i>Research of a general nature</i>	14 478	1.5
41	<i>Primary energy products and associated products</i>	201 910	20.6
410	General	—	0.0
411	Solid fossil fuels and their derivatives	5 380	0.6
412	Liquid and gaseous fossil fuels, their derivatives and industrial gases	24 750	2.5
413	Nuclear fuels	165 421	16.9
419	Other primary energy products and associated products	98	0.0
42	<i>Primary energy conversion</i>	676 358	69.1
420	General	196	0.0
421	Conversion of non-nuclear fuels	4 500	0.5
422	Nuclear fission	608 076	62.2
423	Thermonuclear fusion	32 380	3.3
429	Conversion of other energy sources	4 011	0.4
43	<i>Production, storage, transport and distribution of electricity, gas, steam and hot water</i>	57 227	5.9
431	Electricity	47 054	4.8
432	Gas	—	0.0
433	Heat (steam and hot water)	—	0.0
434	Hydrogen	—	0.0
44	<i>Energy conservation</i>	3 326	0.3
49	<i>Other research</i>	24 945	2.6
4	Total	978 244	100.0

## ANNEX I (4.5.)

## PUBLIC R &amp; D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES

## 5. Agricultural productivity and technology

NABS Code	Heading	'000 u.a.	%
50	<i>Research of a general nature</i>	131 839	34.6
51	<i>Domestic and wild animal products</i>	78 243	20.5
511	Veterinary medicine	9 904	2.6
52	<i>Crops (including forestry) and wine</i>	139 686	36.7
53	<i>Fishing and fishery products</i>	23 541	6.2
59	<i>Other research</i>	7 619	2.0
5	Total	380 928	100.0

## ANNEX I (4.6.)

## PUBLIC R &amp; D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES

## 6. Industrial productivity and technology

NABS Code	Heading	'000 u.a.	%
60	<i>Research of a general nature</i>	223 696	20.1
61	<i>Metalliferous ores and preliminary processing of metals</i>	25 028	2.3
610	General	—	0.0
611	Extraction and dressing of metalliferous ores	1 112	0.1
612	Products of iron and steel industry	16 797	1.5
613	Non-ferrous metals	1 780	0.2
62	<i>Other minerals</i>	5 896	0.5
63	<i>Products of chemical industry</i>	37 153	3.3
631	Petrochemicals and coal by-products	556	0.1
632	Pharmaceutical products	7 564	0.7
64	<i>Metal articles, mechanical machinery and Equipment</i>	14 127	1.3
65	<i>Electrical, electromechanical and electronic engineering</i>	299 671	26.9
650	General	1 669	0.2
651	Office machinery and data-processing equipment	195 999	17.6
652	Telecommunications equipment	83 094	7.5
659	Other electrical products and equipment	12 236	1.1
66	<i>Precision and optical instruments</i>	3 226	0.3
67	<i>Civil transport equipment</i>	418 138	37.6
670	General	3 671	0.3
671	Aeronautical engineering	400 451	36.0
672	Road transport equipment	2 447	0.2
673	Rail transport equipment	2 781	0.3
674	Marine transport equipment	7 898	0.7
679	Other transport equipment	890	0.1
68	<i>Products of other industries</i>	43 938	4.0
680	General	667	0.1
681	Food, drink and tobacco	30 145	2.7
682	Textile products	2 670	0.2
683	Rubber products	334	0.0
684	Plastic products	222	0.0
686	Utilization of industrial, agricultural and domestic waste for non-energy purposes	445	0.0
689	Miscellaneous products	4 561	0.4
69	<i>Other research</i>	17 798	1.6
6	Total	1 112 364	100.0

## ANNEX I (4.7.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****7. Social and sociological problems**

NABS Code	Heading	'000 u.a.	%
70	<i>Research of a general nature</i>	93 334	29.3
71	<i>Systems analysis and planning</i>	38 443	12.1
72	<i>Education, vocational training and retraining</i>	63 689	20.0
73	<i>Cultural questions</i>	22 218	7.0
74	<i>Management and organization in business and administration</i>	12 910	4.0
741	Hospital management and organization	3 092	1.0
75	<i>Improvement of working conditions</i>	30 315	9.5
76	<i>Social action</i>	5 770	1.8
77	<i>Social relationships and conflicts</i>	28 944	9.1
78	<i>Organization of leisure</i>	1 052	0.3
79	<i>Other research</i>	22 090	6.9
7	Total	318 765	100.0

## ANNEX I (4.8.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****8. Exploration and exploitation of space**

NABS Code	Heading	'000 u.a.	%
80	<i>Research of a general nature</i>	11 964	2.6
81	<i>Research on launchers and satellites</i>	429 320	94.0
811	Launching systems	31 096	6.8
812	Scientific exploration	81 690	17.9
813	Applications	124 202	27.2
814	Mixed systems	14 384	3.2
89	<i>Other research</i>	8 311	1.8
8	Total	456 626	100.0

## ANNEX I (4.9.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****9. Defence**

NABS Code	Heading	'000 u.a.	%
9	Total	2 285 756	100.0

## ANNEX I (4.10.)

**PUBLIC R & D EXPENDITURE 1975 — BREAKDOWN BY SUB-OBJECTIVES****10. General promotion of knowledge**

NABS Code	Heading	'000 u.a.	%
100	<i>Research of a general nature</i>	268 190	6.6
101	<i>Research in the exact and natural sciences</i>	1 925 649	47.8
1010	General	935 845	23.2
1011	Logic, mathematics and physics	474 365	11.8
1012	Astronomy and astrophysics, earth sciences and chemistry		
1013	Biosciences	134 900	3.4
1019	Other disciplines	163 894	4.1
102	<i>Agronomic research</i>	4 027	0.1
103	<i>Medical research</i>	168 323	4.2
104	<i>Engineering research</i>	772 756	19.2
105	<i>Research in the social sciences and humanities</i>	407 117	10.1
109	<i>Other disciplines</i>	482 419	12.0
		2 416	0.1
10	<b>Total</b>	4 026 870	100.0

## ANNEX II

### **BREAKDOWN OF ACTIVITIES IN THE PROPOSED NEW JRC MULTIANNUAL PROGRAMME**

#### **I — Reactor safety (nuclear)**

The programme comprises six projects covering the following research :

- reliability and risk assessment ;
- light water reactor loss of coolant accident ; out-of-pile studies and in-pile studies ;
- liquid metal fast breeder sub-assembly thermohydraulics ;
- fuel coolant interactions and core melt-down ;
- dynamic structure loading and response ;
- structural failure prevention.

#### **II — Plutonium fuels and actinide research (nuclear project)**

The programme comprises three projects covering the following research :

- utilization limits of plutonium fuels ;
- plutonium and actinide aspects of the safety of the nuclear fuel cycle ;
- actinide research.

#### **III — Nuclear materials and radioactive waste management (nuclear)**

The programme comprises four projects covering the following research :

- evaluation of the long-term hazards of radioactive waste disposal ;
- chemical separation and nuclear transmutation of actinides ;
- fuel materials management ;
- studies for decontamination of reactor components.

#### **IV — Solar energy (non-nuclear)**

The programme comprises three projects covering the following research :

- habitat and thermal conversion ;
- European solar irradiation facility ;
- orientative studies.

#### **V — Hydrogen (nuclear)**

The programme comprises two projects covering the following research :

- thermochemical processes for water decomposition ;
- heat source coupling.

## **VI — Conceptual studies on thermonuclear fusion reactors (nuclear)**

The programme comprises the following activities :

- participation in the conceptual study and development of specific designs for an experimental power reactor ;
- analysis and evaluation of a complete power plant.

## **VII — High-temperature materials (nuclear)**

The programme comprises four projects covering the following fields :

- meeting point Petten ;
- study of the effect of the operational environment on mechanical properties of materials in high-temperature applications ;
- study of failure modes in high-temperature applications ;
- study of the relationship between the structure and properties of specific high-temperature materials.

## **VIII — Environment and resources (non-nuclear)**

The programme comprises four projects covering the following fields :

- atmosphere ;
- water ;
- chemicals ;
- renewable resources (agricultural).

## **IX — Measurements, standards and reference techniques (metro)**

The programme comprises five projects covering the following activities :

- measurement of nuclear data (nuclear project) ;
- nuclear reference materials and techniques (nuclear project) ;
- non-nuclear reference materials and techniques (non-nuclear project) ;
- scientific support to the services of the Commission (nuclear project) ;
- scientific support for the secretariat of the Community Bureau of References (non-nuclear project).

## **X — Service and support activities (nuclear)**

The programme comprises five projects covering the following activities :

- exploitation of the HFR reactor ;
- informatics ;
- training and education ;
- safeguards ;
- technical evaluations in support to the Commission.

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*Source* : Doc. COM (76) 171 final.

