

Bulletin  
of the  
EUROPEAN  
COMMUNITIES

*Supplement 3/77*

# **Common policy for science and technology**

Commission  
of the European Communities

In its guidelines for the common policy in the field of science and technology for the period 1977-80, the Commission sets out the objectives, the general conditions, the constraints and the criteria for selection of projects. It describes the priority scientific and technical programmes which exist or are to be developed. It specifies the levels and methods of co-ordination within the framework of a common scientific and technological policy.

The Commission is also proposing to the Council that it adopts measures for the promotion of research projects of industrial interest and undertakes a research programme on long-term forecasting and assessment in the field of science and technology. The latter programme should permit the definition of long-term objectives and options for research and development.

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of the European Communities

Supplement 3/77

## Common policy in the field of science and technology

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## Supplements 1977

1/77 Equality of rights for commercial agents

2/77 Community regional policy — New guidelines

3/77 *Common policy for science and technology*

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## *Preamble*

In its resolution of 14 January 1974,<sup>1</sup> the Council decided to progressively develop a common policy in the field of science and technology.

The Council decided, in this same resolution, that the conclusions from the experience gained in this first phase would be drawn during 1976.

Thus, three years after the beginning of a real common policy in the field of science and technology, the Commission is presenting guidelines for the period 1977-80.<sup>2</sup>

The Commission outlines the objectives, general conditions, constraints, and the criteria for the selection of projects. It describes the priority scientific and technical programmes which exist or are to be developed. It specifies the levels and methods of coordination within the framework of the common scientific and technological policy.

The Commission is also proposing to the Council that it adopts measures for the promotion of research projects of industrial interest and undertakes a research programme on long-term forecasting and assessment in the field of science and technology. The latter programme should permit the definition of long-term objectives and options for research and development.

Finally, taking account of the results of this first phase and on the basis of a general evaluation of the Community's scientific and technical activities the Commission will propose in 1980 new guidelines for the progressive development of the common policy in the field of science and technology.

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<sup>1</sup> OJ C 7 of 29.1.1974.

<sup>2</sup> Information on details of the programmes issued at the request of the Directorate-General for Research, Science and Education of the Commission of the European Communities, 86 rue de la Loi, B 1049 Brussels, Tel. 735.00.40, Ext. 4055.

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**Guidelines  
(1977-80)**

## 1. Community research and technology policy — Why and how?

What are the chances for Europe in the years ahead? The answer to this depends entirely on whether we recognize the central role of science and technology in the development of European policies, and from that recognition proceed to evolve a common research policy. By a common research policy for the next four years, we do not simply mean the continuation of a traditional, somewhat esoteric science policy, but rather the scientific and technological basis for any European policy.

The situation is serious. The signs of an economic crisis become increasingly evident. The boundless faith in continuous linear growth has been shaken; the limits to growth are gradually emerging. The energy crisis that followed the oil embargo in the autumn of 1973 and the current worsening of the situation are no more than symptoms. There are indications of major structural crises. They are liable to intensify with growing speed due to the increasing interdependence of the world economy. At the same time, research and technology, long the driving forces of 'progress', have lost credibility.

After the Second World War the industrial nations concentrated their applied research effort primarily on large-scale technology. The large nuclear centres and other major research facilities came into being and for many years spectacular nuclear and space projects were the order of the day. The direct application of research and development for the benefit of the citizen was not always apparent. The public is questioning the role of science and technology.

Faced with the present manifestations of crisis, public interest in a common research policy is increasing. But at the same time the public is asking legitimate questions. Why, how and where must the Community intensify its research?

How can the Community help solve Europe's long-term problems? Who benefits from the public funds spent on large-scale technological projects? Are the needs of the public taken into

account? What is the justification for this or that research programme?

These guidelines for the Community policy in science and technology over the next four years are aimed at providing answers to these questions. They are an attempt to provide a framework. A framework for the *Community's research policy based on the coordination of national research policies and the definition and implementation of common research programmes*. It sets itself certain limits: only programmes that satisfy a specific set of criteria can be embodied in a common research policy. This set of criteria must be regularly applied to assess existing programmes, and serves as a filter for future programmes and projects. Only in this way can the often unrelated individual projects be integrated into an overall European research policy.

These guidelines are first and foremost a communication from the Commission to the Council of Ministers.<sup>1</sup> They are, at the same time, addressed to all those affected by the European research policy: to the experts in the institutions of the Community and the Member States, to scientists and specialists in industry and to politicians, economists, journalists and citizens who have realized that the common research policy directly affects their own future.

The political objectives in the Member States are often of a medium or short-term character, whereas the structural problems facing the Community are, typically, of a long-term nature. It is here that we find the justification for a long-range common research policy.

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<sup>1</sup> Background, bases and preparation, Annex, p. 60.

## 2. The common policy in the field of science and technology — Objectives, framework, constraints, assessment and selection criteria

Community research policy must have a clear framework and clear objectives.<sup>1</sup> It must recognize the constraints and face the difficulties. It must start with an evaluation of its past efforts and criteria for its future programmes. It must accept the current limitations if it wants to give new impetus to a European R & D policy. The three separate Treaties of the European Communities (the European Coal and Steel Community, the European Economic Community and the European Atomic Energy Community) do not constitute a unified legal framework. Due to the Euratom Treaty the task of the Joint Research Centre was originally limited to Nuclear Energy.

Indeed it is only since the Council Resolution of 14 January 1974<sup>2</sup> (see Annex) that one can speak of a comprehensive Community research and technology policy.<sup>3</sup> This Resolution was a major step forward.

The common policy in the field of science and technology is to have a twofold task: coordinating the policies of the Member States; and defining and implementing research programmes and projects of Community interest. It is intended to underpin the Community's sectoral policies, e.g. 'energy', 'agriculture' or 'environment', and at the same time help in developing new sectoral policies, such as 'raw materials' or 'social and sociological problems'.

However the realization of this new concept remains difficult. The different decision-making procedures resulting from the three Community Treaties continue to exist.

The financial resources available to the Community for its research and technology policy are extremely limited: they amount to only 1-2% of the public funds spent by the Member States on R & D. A pragmatic approach is necessary. These guidelines are intended as a contribution.

The *general objectives*<sup>4</sup> of the Community research and technology policy correspond to the political aims of the Community. There are four main objectives:

- (i) the long-term supply of resources (raw materials, energy, agriculture and water);
- (ii) promotion of internationally competitive economic development;
- (iii) improvement of the living and working conditions;
- (iv) protection of the environment and nature.

Of course, these general objectives cannot be achieved by the common research and technology policy alone. The common policy should contribute to the achievement of these objectives where necessary and where the Member States are unable to do it alone.

In this endeavour, the common research policy, already limited by the Community's historical development and the existing separate treaties, is severely hampered. How is any policy of coordination possible when even in the Member States the planning of research projects and programmes remains partly uncoordinated? How can there be a policy of coordination when the Member States are unwilling to commit themselves in this respect?

How can the Community plan and implement technological projects when the Member States themselves are passing through a difficult period in their own technological planning? The more interesting, practically applicable and important technological projects are for national industry, the more reluctant are the Member States to set aside their national self-interest. The difference between theory and practice in the relationship between national research policies and the Community research and technology policy is one of the handicaps from which the Community's research policy suffers.

It is in the light of these constraints that the progress of the common research policy to date must be assessed. How can the Community pre-

<sup>1</sup> Diagram 1, Annex, p. 38.

<sup>2</sup> Background, bases and preparation, Annex, p. 60.

<sup>3</sup> OJ C 7 of 29.1.1974.

<sup>4</sup> Supplement 4/76 — Bull. EC.

sent a systematic evaluation of research results when there are no common criteria? Indeed this is a problem which Member States themselves are trying to tackle with difficulty.

In the future the Commission will make a systematic effort to account for its work, in an attempt to answer the public's legitimate question: 'What are we getting for our money?' It will call for an intensive joint effort on the part of the Community Institutions and the Member States to develop common criteria which can in turn be of use to Member States. First thoughts towards a common approach are contained in these guidelines.

Despite these limitations, however, the Community research policy has made progress over the past three years. Since the Council Resolution of 14 January 1974, it has progressively developed beyond its mainly nuclear heritage.

The common research policy has moved a step closer to the citizen and his needs. This is especially apparent in the *preparatory work on new Community research programmes*, notably in fields such as:

- raw materials;
- medical research;
- energy;
- social policy;
- town planning;
- development policy.

*Existing programmes* have also been re-orientated to bring them closer to the short- and long-term needs of the citizens. Existing programmes that are being continued are:

- fusion;
- biology and radiation protection;
- environment;
- Community Bureau of Reference;
- ECSC research.

*New Community programmes* have been adopted as an initial response to the critical situation in the energy sector:

- energy conservation;
- new sources of energy;

- plutonium recycling;
- storage of radioactive waste.

In addition, the Joint Research Centre with its four establishments at Ispra, Geel, Petten and Karlsruhe has now for the first time a multi-annual programme consistent with the new orientation of the common R & D policy. The recent successful reorganization of the JRC will assure the effective execution of this programme.

A new method of implementing the common research policy—known as 'concerted action'—has been developed successfully since 1974; under this form of coordinated Community research, the work is entirely carried out and financed by the Member States. Only the modest costs of coordination are charged to the Community budget.

Coordination, the key element of Community research policy, has proved difficult due to the established decision-making procedures and organizational structures, and due to the varying state of research in the member countries. The 'Scientific and Technical Research Committee' (CREST) set up in 1975, which is composed of senior officials from the Member States and gives advice to both the Commission and the Council, plays a central role in the coordination of R & D policy.

The Commission, in a continuing dialogue with other Community bodies, with Member States, with the various advisory committees, with independent experts and with anyone concerned with research policy, has made a particular effort to develop the concept of a common Community research and technology policy. Out of these efforts it has become clear that the selection criteria for common R & D action have to be refined. A set of selection criteria was developed. It is not a rigid scheme but a flexible guide for the Commission and the other Community Institutions, as well as for the scientists, industrial firms and politicians concerned. It can help answer the questions: 'Should this or that research project or programme be carried out by the Community? Will it contribute to the development of the common European research policy?'

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<sup>1</sup> Milan Symposium, 24 to 26 May 1976: 'A Science and Technology Policy for the Community'.

The set of criteria has three levels. The first level is determined by the general political and legal framework of the three Community Treaties and the Council Resolution of 14 January 1974.

The second level embraces four general criteria:

(i) *Effectiveness*: Greater efficiency and rationalization at Community level (as in the case of fusion);

(ii) *Transnational nature*: Research and technology projects requiring transnational actions (as in the case of transport, information and documentation or telecommunications);

(iii) *Large market*: The development costs and marketing opportunities require transnational markets (e.g., data processing, aerospace);

(iv) *Common requirements*: The projects satisfy needs common to all Community countries (e.g., environment, town and country planning, standardization, radiation protection).

These general criteria are to be supplemented by more specific criteria on a third level. The individual criteria carry different weightings depending on the specific programme or project. To some extent they overlap. Some of them can be grouped together.<sup>1</sup> Their function is to provide a systematic check-list and a guide. The satisfaction of any one of the following criteria is an argument for carrying out the project at Community level, it is a necessary but not always sufficient condition. The political decision taken on the basis of these criteria will in the end determine the launching of a Community research project.

The list of the specific selection criteria is as follows:

1. The costs, whether in terms of money or manpower, are too high for any single Member State, or joint implementation can lead to significant savings, as is the case with major long-term projects such as fusion research or with the construction and exploitation of large test rigs.

2. The national R & D capacity is insufficient; in this case collaboration at Community level can lead to results more rapidly, in particular for issues of topical interest—examples being new sources of energy (solar, geothermal) and energy-saving.

3. Activities in Member States can be combined for greater efficiency to form a new comprehensive programme; some areas of genetics and solar energy research are good examples.

4. R & D is in an initial phase, whereas a Community programme would stand a good chance of competing internationally. This refers in particular to areas of industrial research, such as new international land transport systems.

5. A Community project should have real innovation potential in either industry or the public service sector. Research into new sources of energy is a typical example of the industrial innovation potential, while town and country planning and environmental research are typical of the public service sector.

6. Community projects can provide the necessary stimulus to specific research and development areas: pilot projects (e.g., for coal gasification, or the reprocessing of nuclear fuels) and demonstration projects, as in the area of new energy sources (geothermal heat, solar energy, heat pump, heat insulation in buildings).

7. Divergent development trends in Member States should be avoided where they are contrary to Community interests.

A case in point is the coordination of solar energy research in the member countries; in view of the keen international competition, fragmentation of the European industry would be undesirable.

8. Community projects offer the opportunity for a long-term approach; this at a time when national R & D programmes are under growing pressure to produce short-term results in a period of diminishing financial resources. Long-term options have to be kept open, e.g. fusion, or non-nuclear energy research.

9. A large degree of standardization and harmonization of methods of comparison, measures, and information systems is essential for a common R & D policy—and for an internationally competitive industry and technology. The Community Bureau of References, the Environmental Chemicals Data Bank (ECDIN) or the European Information Network (Euronet) are examples.

<sup>1</sup> Diagram 1, Annex, p. 38.

10. The provision of services and infrastructure for the Community. In the narrower sense, this applies to activities such as the Bureau of References or the provision of scientific and technical information. In a wider sense, it applies to the JRC as a whole, which offers a service upon which in particular the Member States with limited research potential would otherwise be unable to call.

11. The function of service and infrastructure is closely linked to the independence of Community research activities. This is where Community research could play an increasingly important role. The fact that the Community's technology policy is less directly connected with industrial interests, and the experience it has gained in the services sector, enable the Community to give a more impartial judgment. It favours Community action in sensitive areas of research, such as radiation protection, reactor safety or applications of genetics.

In general, the explicit support of the Member States for a particular Community R & D programme—e.g., because of a current political situation or an acute crisis—constitutes an important reason for Community action. Similarly, preferential consideration should be given to research projects which can help to bring about the desired structural changes within the framework of the Community's regional policy.

### 3. The Joint Research Centre

The Joint Research Centre consists of four research establishments at Ispra in Italy, Geel in Belgium, Petten in the Netherlands, and Karlsruhe in the Federal Republic of Germany. Their research activities are known as 'direct action'.

Why does the Community need its own research establishments? Is it not sufficient to coordinate research programmes in national research centres or industrial laboratories of the Member States by way of indirect and concerted<sup>1</sup> action projects? Does the Joint Research Centre really play a necessary role in the gradual development of an integrated Community research policy? Has the Community learnt its lesson from the continuing crises of the Joint Research Centre of the past years? These are all questions that are being asked today.

First of all it must be borne in mind that the Joint Research Centre has just gone through a difficult period of reorganization of which public opinion and the scientific world are not sufficiently aware.

Under the Euratom Treaty the Joint Research Centre was set up as an instrument of an independent Community research and development policy in the field of nuclear energy. With the growing interest of Member States and the national industries in the development of nuclear energy in a national context, the situation of the Joint Research Centre became more and more difficult. The Member States with extensive research potential, in particular, were not prepared to develop the reactor concepts and the fuel cycle on a Community basis. This led to the crisis of the Joint Research Centre in the years 1967-1972.

With the four-year programme of February 1973 the Joint Research Centre received new impetus. Research and development activities were extended to non-nuclear fields, but the attitude of some of the Member States to the future of the Joint Research Centre remained ambivalent. Nevertheless it tackled energetically the difficult task of reorganizing its establishments and rede-

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<sup>1</sup> Chapter 7.



fining its activities. In 1977 a new four-year programme was approved. With this, the future of the Joint Research Centre is now secure.

The Joint Research Centre has four main functions:

1. The Joint Research Centre provides the Community with its own independent research and development potential. It acts as a catalyst for projects of Community interest. In particular, it gives the Member States with limited research potential access to a potential that they do not possess. For the various Community Institutions the independent judgment of the Joint Research Centre provides vital support.

The overlapping of interests, often the case at national level—for example with industries having a vested interest in the results—does not exist at the Joint Research Centre.

2. The Joint Research Centre makes available for Community use major testing facilities that could not be afforded or fully exploited by individual Member States.

One example is the planned European helioclimate which will be able to simulate solar radiation and very extreme weather conditions so as to test developments in the field of solar R & D.

3. The provision of services is another important function. The Joint Research Centre has long played an important part in supporting the Community Bureau of References. New service functions relating to nuclear safety or environmental protection are gaining in importance.

In the field of chemicals harmful to the environment, the project for the ECDIN environmental data bank at Ispra will provide an information network available to politicians, research scientists and industrialists as well as to the general public. As part of this function the Joint Research Centre also carries out contract research for third parties.

Indeed, most of the Joint Research Centre's activities will in future be combined with the provision of services for the member countries.

4. A new function of the Joint Research Centre aims at contributing to collaboration with the Third World in the context of development pol-

icy. Numerous Community research projects can be of use to developing countries. Examples include various forms of solar energy research, remote sensing techniques suitable for agricultural and regional planning in developing countries or the development of information systems which can be geared to the particular requirements of certain developing countries.

The new programme of the Joint Research Centre concentrates on four main areas. Approximately half of its financial resources goes to nuclear research and the other half to the non-nuclear activities that have been built up in recent years.

*Nuclear safety:* In the field of nuclear energy, the Community is concentrating on a few key areas. Along with plutonium and actinides, pride of place is being given to reactor safety and radioactive waste. It is endeavouring to prevent divergent trends in the Member States, and, in view of the current critical situation in the nuclear sector, to make services available to the Member States.

Expenditure in the field of nuclear safety is appreciable, even in comparison with what is being spent in the Member States. Community research plays a special role in this important area.

*New sources of energy:* These activities have three main subdivisions: the continuation of hydrogen research including in particular energy production by thermochemical decomposition of water, the growing area of solar energy research, and finally the new area of fusion reactor technology.

*Environment and resources:* These activities concern on the one hand studies on air and water pollution (transport models, measurement methods, including teledetection, the pilot project ECDIN) and on the other hand the application of methods for teledetection in the field of renewable resources, essentially orientated towards the agricultural sector (inventories, harvest forecasts, soil humidity, thermal balances).

*Services:* In addition to its work on nuclear and non-nuclear reference materials and methods, the Joint Research Centre is increasingly taking on public service functions by making its research results systematically available to the Community Institutions and the Member States. Mention

should be made of the research activities in the area of control of fissile materials. For the Member States with limited research potential, in particular, the services of the Joint Research Centre often offer the main means of access to a large interdisciplinary research centre.

The importance of the individual topics on which the Joint Research Centre will be concentrating in future years will be further amplified in the next Chapter. Concentration on these main areas and the intensive development of its main functions could provide further impetus to the Joint Research Centre.

## 4. The principal scientific and technological programmes of the EC

### 4.1 Resources

The European post-war society has become accustomed to apparently unlimited resources. Energy, raw materials and agricultural products appeared to be available without limit. Only with the oil crisis did it become glaringly obvious that there is a limit to growth and that the resources of the planet are finite. Yet in the European Community, the necessary conclusions have not been fully drawn up to now. What is needed is a new awareness of the limits to development, a new restraint, a new sense of responsibility towards the Third World and future generations. Otherwise the squandering of resources that form the foundations of our economic and social development will continue unchecked until it is too late.

#### 4.1.1. Energy

The Community research programmes in the energy sector have to support the development of the common energy policy. It is not a matter of deciding for or against a certain energy source and investigating it, but rather of developing a flexible energy research policy which also makes allowance for improbable events in the future.

An energy research policy of this kind has first to eliminate unworkable alternatives, whilst keeping options open for the future. The different energy options vary in importance depending on the time scale considered. The different phases can be defined as follows: the short-term prospects for the next four years, the medium-term prospects up to the end of this century, and finally the long-term prospects up to the end of the first quarter of the next century. The various energy options vary in importance in these phases. New sources of energy must be developed in the long term. Even if it is possible to reduce substantially the present rate of growth in the consumption of primary energy, there will

still be serious energy bottlenecks in the long term.

It is clear, on the other hand, that new sources of energy cannot solve the immediate energy problems. Only after enormous effort can they gradually start to make an appreciable contribution to the energy supply.

The common research policy first has to clarify the various possible energy options. The selection criteria have then to be applied to the different energy sectors in order to define research projects and give them an appropriate weighting within the context of the three time scales. It is not enough for energy research to develop new energy sources or to increase the yield of traditional sources. It is also important to investigate the effects and basic requirements of present and future forms of energy. How much energy is really necessary?

By whom is the energy used? What are the consequences of using various sources of energy—e.g. nuclear or solar—for the safety of the general public or for the human and natural environment? What are the long-term climatic effects of continued increase in energy production?

Five different energy options can be distinguished. They are at the same time the key elements of the Community energy research policy.

1. *The fossil energy sector:* this embraces coal, lignite and hydrocarbons. It is the aim of the Community energy policy to make increased use of the indigenous and traditional energy sources. Community energy research supports this aim.

In the field of coal research, coal conversion and in particular gasification will play an increasing part. A pilot project at Community level could be a valuable contribution. For hydrocarbons, new marine drilling and exploitation techniques are being supported.

2. *Nuclear fission:* this includes the 'conventional' reactors already in operation and the fast-breeder and high-temperature reactor development projects, as well as the entire nuclear fuel cycle.

The Community as such does not concern itself with direct reactor development. It does however

identify problems of Community interest. Safety is a public concern and consequently is an important topic for research. In the Joint Research Centre's new multiannual programme, research on reactor safety is the most important topic. Radiation protection and the storage of radioactive waste also have high priority; about 80% of the Member States' research on the disposal of highly radioactive waste is being coordinated by the Community.

The problems related to the development of nuclear energy in Europe are becoming more acute. The issues of reprocessing and storage need further clarification. In some Member States there are indications of developments that might jeopardize these nuclear energy programmes. The danger of terrorist groups laying their hands on fissionable material or even occupying atomic plants is taken seriously. In this situation and in view of the transnational nature of these problems that affect all Member States, the Community has an important role to play, both in the development of common solutions for the fuel cycle and the development of common criteria and standards in the area of reactor safety.

3. *Nuclear fusion:* The utilization of fusion energy for the generation of electricity offers the possibility of solving the problem of energy supply for years to come. Results that could significantly contribute to the energy supply cannot, however, be expected before the next century.

Community fusion research plays an important role in keeping these long-term energy options open. The JET (Joint European Torus) is the most important project in the common fusion programme: it is the sole means by which European fusion research can hope to compete with that of the United States and the Soviet Union.

In future, Community research must increasingly concentrate on questions related to the technological development of the fusion reactor. Only when these questions have been solved will fusion contribute to the generation of electricity.

4. *New non-nuclear energy sources and energy vectors:* these energy options include new sources of energy such as wind and wave energy, geothermal energy and above all solar energy and hy-

drogen as a new energy vector. These offer great prospects for the future. At the present time, however, a realistic view must be taken of the limited contribution they can make—even with intensive R & D, to relieve the short-term energy balance.

In the medium and long term, there are good prospects that solar energy can make a substantial contribution, both quantitatively and qualitatively, to the supply of primary energy.

The Community realized the potential of solar energy very early on. The Joint Research Centre carried out preliminary studies on the application of solar energy years ago. At present the main common research subjects, which will be extended in the future, are:

— the application of flat-plate collectors and thermal storage for heating and cooling buildings, which is expected to achieve substantial energy conservation since much energy is wasted in heating and air-conditioning systems;

— the development of a pilot project for a helioelectric power station which is at the design stage—such thermal solar power stations converting direct solar radiation into electricity are not only of importance for the south of Europe, but can also give new impetus to the European export industry;

— the photoelectric conversion of solar radiation into electrical energy using semiconductor cells as developed for space exploration—since 1976 the Community has been successfully coordinating European research in this field;

— photochemical and photobiological research projects which could lead to the production of directly usable high-grade fuels.

The Community has set the pace with its solar energy research. It has stimulated an area of research which was in its infancy and which in the Member States was either non-existent or subcritical. It has reacted to a demand expressed by industry and scientists. Faced with the energy crisis, it has reacted rapidly to the practical needs of the Member States. It has made a contribution to the sectoral energy policy. It has prepared pilot projects, and is to provide a cost-saving public service in the form of a cost-saving simulation and test plant (helioclimatron).

The Community programme on new unconventional energy sources also includes geothermal energy. Geothermal energy could make a considerable contribution to energy supply in certain areas of the Community, for both heating and the production of electricity. The programme will first identify those areas particularly amenable to the exploitation of this source of energy and then develop the appropriate technology for application. In an area traditionally underestimated by the Member States, this programme has provided a major stimulus for further development.

Finally, the development of hydrogen as a potential energy vector complements the research on new energy sources within the framework of the Community programmes.

5. *Energy conservation:* The development of the different types of primary energy sources and energy vectors alone is insufficient. Further measures are necessary. Energy conservation in particular must play an important role in the short and medium term. On the one hand, this requires a new awareness that there is no future for the wasteful society, and that each and every one has a part to play. It also requires research and technological progress in areas such as insulation of buildings and the various possible uses of the different forms of energy. For example excessively large quantities of electricity are used today for heating and cooling with a relatively low degree of efficiency. Through the harmonization of energy conservation measures the Community can provide a useful stimulus to innovation in this field. Community research should provide the basis for such innovation. Energy storage is another major element in the energy conservation programme.

Research and development on energy conservation is in its initial stage. The common research programme will coordinate scattered national programmes and combine them into a new internationally competitive entity.

The energy research policy clearly highlights both the difficulties and the advantages of a common research policy. It is very dependent on external conditions: on the developing energy policy of the Community; on the different and, due to internal and external influences, frequently changing energy programmes of the Member States; on

the strategies of the large utilities over which the Community has virtually no influence. This does not facilitate the coordination of research in the Community. On the other hand the relatively large proportion of real Community programmes in this area bears witness to the Member States' recognition that they will solve their energy problems better by firmly supporting Community research. Common energy research can play an increasing role as a catalyst. It can help make Europe's citizens conscious of the future importance of new energy options, and contribute through appropriate research to improving the future energy supply.

#### 4.1.2. Raw materials

In a world of finite resources, and growing material needs, the European Community, which imports 70 to 100% of most of its raw materials, will be confronted with increasingly serious economic and political problems. It is therefore essential for the Community to develop a coherent and comprehensive raw materials supply policy. In addition to guaranteeing the continued external supply, two components of such a policy are of paramount importance: increase of internal supply, and conservation through recycling, substitution and product design.

R & D can make an important contribution to furthering these objectives. It may also help develop new technologies and know-how which will improve the Community's position as a unique trading partner for developed as well as developing countries.

The Community R & D programme aimed at increasing the internal supply of *primary* raw materials includes three main areas:

- the first concerns the search for new mineral deposits within the Community, in particular of copper, zinc, lead, phosphates and uranium. A joint effort will be made to discover deep and concealed deposits through the improvement of geological knowledge and prospection methods;
- the second area covers new methods of ore processing, for example aluminium-rich rocks. Here feasibility studies will be followed by pilot plant projects;

— the third area concerns mining technology, with special reference to deep deposits and low-tonnage deposits which are now uneconomical. New mining and extraction techniques must be developed.

A joint effort will help avoid duplication and, through coordination, facilitate the discovery of new internal resources as well as the more effective development of Europe's own advanced technologies, which may also improve our export potential.

With regard to conservation in the use of raw materials, an integrated Community R & D programme on *secondary* raw materials is now being prepared. It should improve the technical basis for achieving the following policy aims:

- increased recycling of domestic and industrial waste materials, e.g. non-ferrous metals and paper;
- increased recovery of waste such as old tyres;
- full exploitation of agricultural and forestry wastes through the production of valuable organic materials and products;
- replacement of expensive, non-indigenous materials with others more abundant in the Community;
- design of products for easier recovery of materials or requiring less material for the same performance. Thus far research in this sector has been fragmentary. Its intensification should in most cases also help to improve the energy balance.

The Community's raw materials research will in future grow in importance, as these problems increasingly transcend the scope of Member States. Research is still in its early stages and could in many fields become internationally competitive by combining and coordinating the activities of the Member States. The link-up with environmental protection problems should ensure public support for this Community research activity.

#### 4.1.3. Agriculture and food resources

Community agricultural research programmes must support and develop the common agricultural policy. They must also wherever possible sup-

port the objectives of other Community policies, for example, environment, regional development, energy saving and aid to developing countries.

The early attempts at coordinating research on African and classical swine fevers between 1966 and 1976 gave results which permit the Commission to introduce in the near future proposals aimed at the total eradication of these two diseases from the Community. A similar programme on animal leucoses (1975-78) will assist veterinary control through better diagnosis, and freer movement of livestock by harmonization of national legislation.

The existing programmes which run from 1975-78 also include: a programme on using livestock effluents as a fertilizer and examining its effects on crops and animals (environment, energy saving); a programme to improve productivity in beef production; and a programme to improve the exploitation of the Community's plant protein.

The need to recognize wider interests than the agricultural industry alone points to future research on more rational use of land (regional development, environment); reduction of the use of pesticides and fertilizers (energy saving, environment); effects of intensive agriculture on soil structure and on water (environment); more economic use of animal feed and improved animal nutrition. This view of Community agricultural research encourages the belief that technological progress need not be achieved at the expense of the environment or the consumer.

Future research must also consider the possibility of assisting developing countries in solving their problems.

#### 4.1.4. Water

Water may become a critical resource even in the regions of the Community which are usually well-endowed in this respect. This was clearly demonstrated by the 1976 drought. Greater attention must be given to the problem of ensuring adequate supply and quality. In addition to water pollution research within the framework of the Environmental research programme, new studies

and research are needed to improve our knowledge in the following areas:

- the water cycles in the various regions of the Community;
- water management;
- water storage;
- recharging of groundwater;
- water treatment technology;
- possibly the desalination of sea and brackish water.

## 4.2 Environment

Destruction of the environment is endangering our future. The harmful consequences of economic and industrial developments—often neglected until too late—are becoming ever more apparent. It is vital that action be taken to limit or avert these dangers. In 1973, the Community adopted a common environmental policy<sup>1</sup> which is justified by the transnational character of the problems involved and the need to avoid the consequences that uncoordinated, go-it-alone policies at national level would entail for the free movement of goods and free competition within the Community.

This Community policy needs to be backed by sound scientific and technical knowledge. This is why since 1973, the Community has been carrying out research projects in the field of the environment. The current programme which terminates in 1981 includes the following points:

- the investigation of the effects of pollution on man and the environment by means of epidemiological surveys and ecotoxicological research;
- the improvement of methods for the measurement of pollution, including remote sensing techniques;
- the development of environmental information management, especially the ECDIN pilot project for a data bank on environmental chemicals;

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<sup>1</sup> OJ C 112 of 20.12.1973; Bull. EC 7/8-1973, points 1301 to 1309; OJ C 139 of 13.6.1977; Bull. EC 12-1976, point 2227.

— pollution abatement technology, particularly sewage and industrial effluents, sludge disposal and the development of clean technologies;

— the natural environment, which can be better protected from detrimental human activities through a deeper understanding of natural ecosystems; in this connection, a joint effort will also be launched in the area of climatology to improve the forecasting of the long-term effects of man's activities on the climate; new models will be developed.

Community environmental research is the answer to a common need that is being felt ever more acutely. It is closely linked to other areas of research such as energy, raw materials or town and country planning. It is a means to achieving effective, cost-saving coordination in a field of investigation that is still entirely in the developmental stage. It will permit the introduction of uniform standards of environmental protection throughout the Community. The lively interest displayed by the public in questions of environmental protection will provide a stimulus for the further development of Community research in this sector.

### 4.3 Life in society

Up to now, science and technology policy has not been closely enough linked to the needs of society in general or the individual in particular. Indeed, research policy in the post-war period was concentrated on spectacular large-scale projects; only few research programmes, either in the Member States or at Community level, were devoted to the main problems of the man in the street. In particular social problems were neglected. Today they are assuming a new dimension. The consequences resulting from unsolved social problems are becoming a heavy burden on budgets. In addition, potential conflicts are brewing that could threaten political systems. Consequently, the area of social and sociological problems must be considered a research sector in its own right. In particular the effects of technology on society must be analysed. Community research under the heading of social and sociological problems is preparing to do this.

#### 4.3.1. Social policy

European unification requires a common social policy; it requires detailed knowledge of the present situation and future trends. Serious social strife within the Member States will affect the harmonious development of the Community.

International social research in Europe is only beginning. The planned Community research programme under the concerted action scheme can bring considerable benefit for little input.

The major points of the social research programmes will be:

— The social consequences of technological development. This will consist in particular of social science research to accompany the Community's specific technology programmes.

— Under the heading 'social systems', comparable problems in the Member States will be investigated. The position of the underprivileged, of prisoners, drug addicts, and the mentally disturbed has to be analysed, as has the growing percentage of old people. There has so far been little research into the conflict between town and country and the social difficulties caused by migratory movements, including migrant workers. The trends towards regionalization and decentralization have also to be considered. These are all problems directly affecting the future development of the Community.

— Improvement of the scientific basis for research on social problems. There are still weaknesses in the methods and techniques available. Research in this area should:

- develop deeper and more systematic knowledge of the demographic evolution and its consequences, of the present and future needs and aspirations of individuals, social groups and institutions (utilization of empirical social research), and
- improve the social science data base and techniques available for the analysis of social problems.

Many areas of social science are only just developing. The problems transcend national frontiers. A large amount of empirical data is necessary in order to obtain comparable research results; indi-

vidual Member States on their own provide an insufficient base. The varying development trends in social research in the Member States call for coordination at Community level and thus increase the effectiveness of research in this area. It is possible to test the results of Community research in demonstration projects. Community research can act effectively as a pacemaker in this context.

#### 4.3.2. Town and country planning

Urban and rural authorities are faced with mounting difficulties in all Community countries. The growth of recent years is reaching limits which put an increasing stress on life in large cities. At the same time, financial difficulties reduce the scope for effective action.

Community research on town and country planning is looking for a new approach. In the framework of a concerted action project it will bring together Community urban planning experts who have so far been working at national level and often reacting to, rather than anticipating, problems.

The main activity is concerned with the growth of conurbations and the consequences of the concentration processes. The various town planning policies and the activities of public authorities will be evaluated. The problems in Member States are comparable. The sum of their experiences should produce a new overall picture that social scientists in individual Member States cannot obtain for lack of adequate empirical material. The research results are intended to be of a practical nature in order to help planners and politicians in conurbations that are becoming difficult to manage.

#### 4.3.3. Medicine

Medicine and health are a sector of growing importance within the framework of Community research. The difficulties of maintaining the mounting costs of health within acceptable limits are compounded by the changing health pattern. The diseases of civilized life such as cardiac and circulatory disorders, psychiatric illnesses, geriat-

ric diseases and congenital abnormalities are having an increasing impact. Furthermore, there are new and advanced technologies available to combat diseases, but they are still in an early stage of development.

The Community is developing its research effort in the field of medicine and public health by means of concerted actions. Considerable emphasis is being laid on prevention, on the early detection of diseases and on rehabilitation.

As a first stage of a common research programme the following three fields have been chosen:

(i) The *registration of congenital abnormalities* meets an increasing need at Community level. For any useful investigation of the causes of malformations, large quantities of numerical data will have to be analysed by statistical methods. This is not feasible for any Member State on its own.

(ii) *Cellular ageing and decreased functional capacity of organs*. Here, the so far rather neglected physiological processes of ageing will be tackled. A steadily increasing number of people are living longer in the European Community. Research on cellular ageing has hitherto lacked coordination. The results of the Community research are important for studying ways to maintain better health up to a greater age.

(iii) *Extracorporeal oxygenation* (heart-lung-machine) is concerned with artificial oxygenation, for instance during heart and lung operations. So far, the applicability of oxygenators—e.g. during operations—has been too limited in duration. New technologies must be developed to permit prolonged oxygenation. Such development is expensive. In Europe, there are only a few specialists who can carry out this type of research. Community research is effectively pooling together specialized knowledge on the subject.

Medical research has hitherto primarily concentrated on therapy. The early diagnosis of disease and systematic efforts to prevent it, as well as the integration of medical research with other fields of research and vital activities have so far been neglected. In this respect, Community research is trying to develop a new approach, focusing on three inter-disciplinary areas: epidemiology, medical biology and bio-engineering.



#### 4.3.4. Radiation protection

The development of nuclear energy and the use of nuclear techniques in modern medicine and other vital fields incur various problems. The individual citizen is directly concerned with the effects of radiation. The general public's mistrust of radioactive radiation has increased.

The Euratom Treaty entrusts the Community with the task of defining basic safety standards for radiation protection, which are founded on knowledge acquired through scientific research. Since the creation of Euratom, Community research is playing a decisive role in this area. Out of the total funds—about 60 million u.a. per year—spent by the Member States and the Community in the field of radiation protection, 16 million u.a. are devoted to the Community programme. This means that the Community not only exercises a considerable influence, but also coordinates a significant part of the research carried out in Community countries in this field. A scientific community of radiobiologists has thus gradually developed during the 16 years of the radiation protection programme.

The Community's radiation protection programme (1976-80) has the following components:

- evaluation of radiation risk and radioactive contamination of the environment;
- genetic effects of ionizing radiation;
- short-term effects of ionizing radiation, the analysis of which is important as regard treatment after irradiation accidents;
- long-term effects of ionizing radiation, for instance, in tumour development;
- radiation dosimetry and interpretation of the measurements as the basis for all research in radiation protection.

Community research on radiation protection is in line with the collective needs of the Member States. Through coordination, the research is becoming more effective and comprehensive. In addition, there is a close relation between research in the field of radiation protection and research in other fields, such as energy (especially reactor safety), the environment, medicine, and cellular and molecular biology. Irrespective of further developments in the field of nuclear techniques,

research on radiation protection will increase in importance. High on the list of priorities is the protection of citizens against all kinds of radiation, which should include those produced by microwave appliances, UV-irradiation and the use of the laser, the effects of which are still largely unknown.

#### 4.3.5. Molecular biology and genetics

This research field has already been the cause of much debate, not only in the United States, but also in Europe. Manipulation of genes has only become possible by the application of the findings of molecular biology research. Research in this area could well open some of the most fascinating projects of the whole history of biological sciences, but, unless carefully controlled, could also have frightening consequences. Through the stimulation of individual efforts in the Member States, Community research has a chance of accelerating progress in this field.

The Community also has a significant role to play with regard to the protection of the public against potentially dangerous experiments, and will take appropriate action to prevent the development of divergent attitudes in the Member States.

The new programme on molecular and cellular biology emphasizes three main areas:

- (i) *Gene manipulation* concerns action on genes at molecular level. This aspect offers considerable potential in agriculture and bio-industry but needs comprehensive research. In certain cases—for security reasons—a concentration of experiments in specially equipped laboratories is necessary.
- (ii) The field of *bio-technology* concerns the production of new substances from micro-organisms and cell structures. This can lead to lower energy costs, higher yields of specific products, and the development of products which are less harmful to the environment.
- (iii) In *molecular pathology* the purpose of Community research is to contribute to the elucidation of primary causes and symptoms of the diseases of modern civilization. Leukaemia, cancer, arteriosclerosis, genetic anomalies and even

behavioural disorders are the ultimate consequences of molecular changes in the cells. The rapid increase in these diseases and the difficulties of curing them with traditional medical methods warrant a new approach via molecular biology.

Community research in the field of molecular biology and genetics complements the work of other organizations, the European Science Foundation and of the European Molecular Biology Organization (EMBO).

## 4.4 Services and infrastructure

Most of the Community's research and development programmes are intended to provide some kind of service; this is apparent from the selection criteria scheme. But there are two fields of activity which qualify more particularly as 'services' and 'infrastructure', namely, the Community Bureau of References (BCR) and Scientific and Technical Information (STI).

### 4.4.1. Community Bureau of References service function

The Community Bureau of References is concerned with European cooperation in the area of reference materials and methods; this is an important prerequisite for improving the comparability of measurements in many areas of industry and public service. For this work the Community relies on an elaborate network of experts and their advice. In the Community Bureau of References there are 500-600 technical experts at work in about 70 specialized groups.

In the industrial sector, attention is focused on ferrous and non-ferrous metals and on toxic metals in various products and substances, such as petroleum and dust. In the field of raw materials and energy, efforts are being concentrated on the preparation of reference materials for measuring heat losses from building materials, and for other potential applications in energy conservation. The general area of safety is also a prime concern.

Whilst the work of the Community Bureau of References is highly specialized, this should not obscure the fact that research results are of im-

portance to Europe's economic and technological development. It is only through common measures that a common technological and economic development is possible.

In addition, for the safeguarding of Europe's citizens—for instance, against environmental hazards—it is essential to set up universally accepted reference materials prepared by an independent coordinating authority. By its very nature, this work can only be done at Community level.

### 4.4.2. Information

The organization of easy and rapid access to scientific and technical information constitutes an important service for all users of science and technology.

The need for this service is of such evidence—in a Europe poor in energy and in raw materials, but endowed with enviable scientific creativeness and technical know-how—that it led to rapid proliferation and progress of information systems. Unfortunately, these systems developed in a dispersed manner as a result of competition between a great number of public and private initiatives.

Aware of the negative effects and high cost of these divergent activities, the Community and the Member States decided, six years ago, to coordinate their action and to set up a common infrastructure for information and documentation. In the course of the year 1975 a first three-year plan of Community action was put forward. Preparations for a second plan are now completed. The principal aim of these plans is the creation of a network for data transmission (Euronet) realized in cooperation with a consortium of post and telecommunication administrations of the Nine.

Already now, for certain key subjects like environment, energy, agriculture and metallurgy, data bases have been developed. In order to overcome the obstacles encountered by a community with many languages, different measures were studied and proposed.

Multilingual tools were developed: specialized vocabularies, terminological data banks, auto-

matic systems, systems of automatic pre-translation.

Of course, the interest in these programmes must not distract from the importance of the problems which are still to be solved. The traditional data bases are frequently duplicated, the information they contain is sometimes tailored to regional or national needs and is treated in one language only; computer installations remain disparate... quite a number of subjects remain to be dealt with by future Community research.

Nevertheless, the action started has already achieved real convergency of orientation and aims which should eventually lead to an effective common policy in the field of information and documentation.

## 5. Industrial research

The need for intensive Community industrial research is obvious, even though the Community has no comprehensive industrial policy as yet. This hampers the development of an efficient industrial R & D policy. A further factor is the self-interested attitude to commercially exploitable industrial research. Coordination of the scattered European technological projects in industry is becoming more and more urgent.

Traditional industrial structures are rapidly collapsing. In many industrial sectors, production is being transferred to countries with lower labour costs. Today's plant exports from Europe will further accentuate this development. This situation requires the development of new high-technology industries calling in turn for extensive research. An immediate and new impetus is required for the European industry of tomorrow. There is keen international competition (especially from the United States and Japan) in the advanced-technology industries, such as data processing and electronics. The Community's only hope is to intensify its industrial research effort. This calls for a division of labour that could be coordinated by the Community.

The Community does not claim that it is or will be active in all areas of industrial research. Quite on the contrary: it clearly realizes its limitations. Research in areas of a transnational nature calling for a large market is appropriate, e.g. electronic data processing, aeronautics and special measuring instruments. The common need of the Member States and the rationalization of costs and resources are important factors for Community action. Sectoral policies of the Community, such as energy or the environment, should be supported.

At the same time, new criteria and considerations resulting from the criticisms of industrial growth will have increasingly to be taken into account: energy and raw material conservation, pollution abatement technology, humanization of work and consumer protection.

It follows that Community industrial research will have to concentrate on important technological areas that are suitable for coordination. The European Space Agency covers the area of *space*.

In the field of *aeronautics*, a new Community research and development programme offers the scattered European aircraft industry, hard pressed by international competition, a possibility of joint development work. *Electronic data processing* is still suffering from the failures of past years. Plans for Community research are limited to the development of new electronic components and peripherals for large data-processing installations. A new type of intelligent terminal opens up completely new prospects of decentralized data processing and transmission. This also brings data processing nearer to the individual user. Most branches of industry, the new service sectors and the general public can benefit from this money-saving Community project. The potential applications of the new electronic technologies also affect the field of *telecommunications* in which further actions are planned. The bi- and tri-lateral projects in the field of European *nuclear energy* research are being supplemented by Community energy programmes.<sup>1</sup> However, a field that has so far been neglected is *transport research*. The first aim is to develop a Community strategy for inter-city transport systems. The promotion of new transport technologies and the development of compatible transport systems could help towards the integration of Europe. The harmonization of hitherto uncoordinated research projects in this field is foreseen.

Four measures should help to promote industrial research in the years ahead:

- (a) Development of a Community *policy for innovation*.
- (b) Increased promotion of *pilot and demonstration projects* in areas such as coal gasification and energy conservation in industry.
- (c) *Sectoral measures* such as ECSC research and promotion of research and development cooperation amongst small- and medium-sized firms through programmes at Community level (existing examples being the programmes in the footwear and textile sectors).
- (d) *Special measures* for the promotion of European industrial research. Financial support will be provided in particular for innovating industrial firms wishing to collaborate or already collaborating at Community level.

These special measures will serve to promote projects which contribute towards the achievement of the aims of the EEC Treaty and meet at least one of the following criteria:

- (i) economic or more rational use of energy and raw materials;
- (ii) development of innovative technologies linked with industrial restructurization;
- (iii) creation of new jobs, improvement of working and living conditions;
- (iv) improvement of competitiveness on international markets and closing of the technology gap;
- (v) improvement of economic equilibrium between regions;
- (vi) protection of the environment.

To assist the Commission in the application of these measures an Advisory Committee for European industrial research will be set up.<sup>2</sup>

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<sup>1</sup> Point 4.1.1.

<sup>2</sup> Recommendation of the Milan Symposium, 24 to 26 May 1976: 'A Science and Technology Policy for the Community'.

## 6. Coordination of national research and technology policies

Coordination of national research and technology policies<sup>1</sup> is a centrepiece of the common research policy. Since 14 January 1974<sup>2</sup> the Community has had an explicit political mandate on this subject.

The Council specified four goals for coordination:

- (a) the elimination of unnecessary or unwarranted duplication of effort in national programmes;
- (b) the avoidance of divergent tendencies which would be contrary to the interest of the Member States;
- (c) the improvement of efficiency or reduction of the cost of national and Community projects;
- (d) the gradual harmonization of procedures for the formulation and implementation of scientific policies within the Community.

For this, two basic actions are necessary:

- (a) Member States' national research policies, particularly their 'potential, plans, programmes, projects, budgets, measures and methods', must be examined and compared;<sup>3</sup>
- (b) The research objectives of the Member States must be identified, analysed and compared.

This is where considerable difficulties arise in implementing the Council's Resolution. Overall programming and budgeting of research policy only exists in some of the Member States. The incompatibility of existing programming and project planning renders any analysis and comparison extremely difficult. Even within each Member State there is not always agreement about research aims. What is more, in recent times they have, in some cases, changed their declared aims so frequently (for example in the energy or data-processing sectors) that the possibility of an overall up-to-date review at Community level is limited.

In addition, research and development policy depends on other sectoral policies. The research policy is bound to suffer from the lack of coordination in sectors such as energy, social policy or

industry. Furthermore, interesting and important new areas of research extend into horizontal social, economic or technical fields. In addition, some Member States will adhere to a limiting non-committal concept of coordination which, in fact, is not in line with the Council Resolution of 1974. It is a question not only of loose cooperation, but of intensive efforts to coordinate national policies and implement independent Community research projects. These activities are finally hampered by technical and bureaucratic difficulties.

These constraints have to date considerably limited previous coordination efforts. Already the Euratom Treaty contained a provision on the coordination of national research in the field of nuclear energy. Since the Treaty was signed in 1958, work at Community level has, however, had very little influence on the activities of individual States, which only follow their own short-term interests. Only in fusion research has coordination been fully successful.

More has been achieved with smaller pragmatic coordination projects. Experience in the coordination of energy research and medical research has been valuable.

This assessment shows the difficulties of coordination at Community level. More active participation by national governments and research scientists is an essential prerequisite if Community coordination policy is to be more effective in the future.

For coordination there are three *areas* to consider:

- (a) basic research;
- (b) predominantly applied research and development financed by private industry;
- (c) publicly funded research and development.

In the first two areas, there are few coordinating Community activities. Basic research is ill-suited to project-oriented coordination aimed at practical application. The main link between Community activities and basic research consists of the Com-

<sup>1</sup> Diagram 2, Annex, p. 39.

<sup>2</sup> OJ C 7 of 29.1.1974.

<sup>3</sup> Article 1(a)(1) of the Resolution of 14 January 1974, see Background, bases and preparation, Annex, p. 60.

munity's participation in the European Science Foundation. The Commission's Director-General for Research, Science and Education sits on its Executive Council. On the other hand, the distinction between basic and applied research is often arbitrary and obscure. Indeed, in the frame of major Community research programmes and projects, numerous fundamental activities (for example, in the fields of fusion, medicine or genetics) can be defined as basic research, laying the foundations for future development and innovation.

Private industry's market-oriented research that is of a practical nature and subject to competitive pressures is not easily amenable to coordination from outside. The abovementioned specific measures for the promotion of industrial research represent the Community's first attempt to foster coordination in this important field.

The main emphasis of research coordination lies in publicly funded research and development in universities, national research centres and industry.

Coordination must always distinguish between the *policy level* and the *action level*. At the policy level the policies of the Member States have to be analysed and their programmes and aims compared. At the action level it is a question of coordinating programmes and projects already decided upon during their execution in order to bring them together in a common framework.

The Scientific and Technical Research Committee (CREST) plays the central role for coordination at the *policy level*. The dialogue between responsible high officials of the Community and of the Member States is essential for the definition of guidelines and to ensure a regular flow of information. Important individual measures have to be tackled. The collection and processing of statistical data on the research policies of the Member States must be stepped up. It is important to secure greater comparability of programmes and synchronization of budget planning. The development of research and technology indicators could be an important tool for this purpose. In addition, the Community evaluation and assessment criteria for technology assessment must be developed. Efforts must be made to ensure regular and standardized information on the policies of the Member States. The Mem-

ber States should agree on a common model for a research report to be produced say every two years.

The difficulties and obstacles at the policy level also affect coordination efforts at the *action level*. The Community is obliged to take the second step before the first. And yet a promising start has been made. The joint advisory programme committees for the coordination of various forms of Community action (direct and indirect) are proving successful. However, they should also take on a coordination function between national and Community programmes. For this, it is necessary to amend their terms of reference.

Coordination of national research and technology policies has been largely inadequate. The implementation of Community coordination will show to what extent the importance of the common research and technology policy for the future economic and political development of Europe has been recognized.

## 7. Forms, finance, structures and procedures of the Community research and development policy

### 7.1 Forms

The European Community's research policy comprises three distinct forms of action: *direct*, *indirect* and *concerted* action.<sup>1</sup> The direct and indirect forms of action have evolved from the Euratom Treaty, whereas concerted action is a new concept. These three types of action must be considered in relation to one another.

*Direct action* refers to the Community's own research projects carried out 'intra muros' in the four establishments of the Joint Research Centre. They are wholly financed from the general budget of the European Communities. The importance of the Joint Research Centre and hence of direct action has already been shown in Chapter 3: the strongest arguments for an autonomous Community research capacity being the resulting independent expertise available to the Commission and the Community, access for all Member States to a multidisciplinary research centre, and the provision of independent research services.

*Indirect action*, on the other hand, refers to research undertaken 'extra muros', in the form of research contracts concluded with public research institutes or private industrial firms in the various member countries. For these projects only half the funds, on average, are provided by the Community. Indirect research is of particular importance for coordination. In application of the specific selection criteria mentioned earlier it makes possible research and development work which would otherwise not always be feasible in individual Member States. It offers in particular the possibility of using existing research teams and laboratories in the Member States and bringing together the best teams for specific projects.

*Concerted action* represents a new form of Community research. In this case the overall programme is commonly defined, but its individual

components are fully financed by the Member States and carried out under their responsibility. The Commission assures coordination and dissemination of information. Concerted action therefore makes it possible in suitable cases to assure effective coordination with a small additional input.

No hard and fast rules govern the application of these three forms of research; cross-fertilization is always possible. Thus studies carried out in the form of concerted action can give rise to indirect action projects with a greater degree of Community participation. In this way concerted action projects can be used for effective and economical trial runs for new research programmes. The three forms of research require coordination. For this purpose the creation of the joint Advisory Committees on Programme Management (ACPMs) for direct and indirect actions (where they both exist) has proved to be of value. This system will be maintained in the future.

A steering committee is envisaged for each concerted action; its chairman will attend the meetings of the appropriate ACPM, if there is a direct and/or indirect action in the same field.

### 7.2 Financing

The Community's research and technology policy assures Member States a fair return on their money.<sup>2</sup> This is because the concentration of resources and the catalytic function of Community research enhance efficiency. In absolute terms the Community R & D budget is extremely modest, amounting to approximately 1-2% of corresponding expenditure in the Member States. There are no plans for marked increases for the next four-year period.

There is, nonetheless, good reason for according increasing significance to Community research. The research budgets of the Member States are in practice almost entirely earmarked for programmes already drawn up and for contractual commitments to long-term, large-scale projects. For financial reasons the margin for manoeuvring

<sup>1</sup> Diagram 3, Annex, p. 40.

<sup>2</sup> Tables 1 and 2, pp. 30 and 31; Diagram 3, Annex, p. 40

**Table 1 — Community R & D appropriations approved or to be approved<sup>1</sup>**  
(Estimates in thousand u.a., 1977 prices)

Types of financing	1977	1978	1979	1980	1977-80
<b>I. Direct action projects:</b>					
New JRC programme (1977-80)	87 630	90 240	84 210	83 920	} 349 753 <sup>2</sup>
Termination of old JRC programme (1973-76)	3 753	—	—	—	
<b>II. Indirect and concerted action projects<sup>1</sup></b>					
(R) Projects decided by the Council	66 157	67 872	51 029	44 974	230 032
(P) Projects proposed by the Commission	22 500	38 420	39 495	51 311	151 776
(A) Projects in preparation	8 200	54 830	91 235	76 620	230 885
Total II	96 907	161 122	181 759	172 905	612 693
Total I and II	188 290	251 362	265 969	256 825	962 446

<sup>1</sup> Not including ECSC projects, technological projects concerning hydrocarbons and the technological section of the EDF.

<sup>2</sup> Not including any estimate for annual adjustments for JRC personnel expenditure.

Table 1 summarizes the financial resources broken down by direct, indirect and concerted actions, which the Community must include in its budget in the years 1977-80 in order to implement the R & D programmes already approved and the projects envisaged in these guidelines.

**Table 2 — Community R & D appropriations by sectoral policies**

(cumulative figures 1977-80) (estimated in thousand u.a., 1977 prices)

**A. Direct, indirect and concerted action projects**

Sectoral policies	Direct action projects	Indirect and concerted Action projects	Total	
			in thousand u.a.	in %
Energy policy	187 600	378 260	565 860	58.8
Industrial policy	—	136 985	136 985	14.2
Environment policy	28 144	13 397	41 541	4.3
Resources and raw materials	7 036	20 900	27 936	2.9
Transport policy	—	18 600	18 600	1.9
Agricultural policy	—	14 416	14 416	1.5
Social policy	—	8 620	8 620	0.9
Development aid	—	4 500	4 500	0.5
Public services and other	126 973	17 015	143 988	15.0
Total <sup>1</sup>	349 753	612 693 <sup>2</sup>	962 446	100.0

**B. Projects with specific financing or financing not included in the budget**

ECSC	148 550
Hydrocarbons	102 200
EDF	1 500

**C. Grand total<sup>3</sup>**

A + B	1 214 696
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<sup>1</sup> Not including any estimate for annual adjustments for JRC personnel expenditure.

<sup>2</sup> Including Community participation in concerted action projects (approx. 4-8 million u.a.).

<sup>3</sup> The contributions of Member States to the Projects A and B can for the period 1977-80 be evaluated as follows: (in thousand u.a.):

— indirect action projects	697 610
— concerted action projects	58 100
— ECSC	99 400
— Hydrocarbons	190 000

Total: 1 045 110

Table 2 gives a breakdown of the funds by sectoral policy of the Community and includes the funds for coal and steel research (financed through the ECSC budget), the funds for the promotion of hydrocarbon technology (financed through the Community's general budget) and the funds for research activities financed through the European Development Fund (EDF).



national research policies is continually diminishing which means that there is less and less possibility for initiating new research and development programmes within Member States.

These financial problems coincide with the current structural crisis affecting high-technology projects. At the same time, there is a growing public demand for research of more direct benefit to society. In this situation the Community could increasingly—for financial reasons—be the body capable of acting resolutely to tackle new research and development programmes, especially where long-term projects or those without direct industrial application are concerned.

### 7.3 Structures and procedures

Diagrams 4 and 5 in the Annex<sup>1</sup> show the present structure and the chronological process respectively of decision-making in relation to R & D programmes.

Broadly speaking, three types of advisory bodies in the Community can be distinguished:

At the policy level,

advising the Council and the Commission:

— CREST and its subcommittees;

advising the Commission:

— CERD, STC (for nuclear energy only), CCF (fusion), SCAR (agricultural research) and GAC (JRC).

At the action level,

advising the Commission:

— ACPMs and SCAR<sup>2</sup> (on the implementation of specific programmes).

The Scientific and Technical Research Committee (CREST) is the central body concerned in the development of Community R & D policy. It is composed of senior officials from the national administrations and the Commission. For CREST to function effectively, its members must be able—after internal, interministerial agreement—to express their opinion on all scientific, technical, administrative and financial aspects of Commission proposals in the area of science and

technology. Without prejudicing procedures laid down in the Treaties the Committee is empowered to deal with all areas of research and development, including nuclear energy, agriculture, coal and steel. As regards the programmes of the JRC (direct action), CREST has essentially to assure that the orientation of these programmes is in line with the guidelines of the common science and technology policy.

CERD is a committee of independent experts through which the Commission maintains direct contact with well-known figures in research, science and technology. It has provided the Commission with effective support over the past four years, particularly in the development of the energy R & D policy, and the 'Europe + 30' project. For the future it will be necessary to analyse the individual structures and procedures, advisory bodies and decision-making processes to determine their effectiveness. This should contribute to a simplification of the present planning and decision-making processes, greater efficacy and a more responsive and dynamic Community research and technology policy.

Here too there is a need for joint analysis and action by the Commission and the Member States. The present, at times heavy, Community procedures, can only be improved if Member States succeed in making their own structures and decision-making processes correspond better.

<sup>1</sup> Pages 41 and 42.

<sup>2</sup> Procedures of the management committees in the framework of the agricultural policy.

## 8. International cooperation

Community research should be complemented by international cooperation; indeed, in the area of research the Community maintains links with many States and international institutions.

Four categories in particular should be mentioned in this context:

1. Neighbouring West European countries not belonging to the Community, known as COST countries after the Committee on European Cooperation in the field of Scientific and Technical Research (COST). COST should remain the principal forum for cooperation with the Community's neighbours. 1977 has seen the inauguration of a new phase with the COST countries being offered the opportunity to participate in various Community programmes. With regard to the possible enlargement of the Community, COST furthermore offers the advantage of early collaboration with the potential candidates.

2. The group of developing countries with which special agreements are in force (Lomé Convention, Arab countries, etc.). These countries are particularly interested in the achievements of the Community's research and technology policy, and are making direct demands on the Community.

However, careful analysis of the varying conditions and requirements in different developing countries is necessary. The development of appropriate technologies in areas such as solar energy, remote sensing, water research or agricultural research is necessary and appear feasible. In this way the Community research policy can bring substance to the existing collaboration agreements in the field of R & D in support of the Community development policy.

A study group formed by CREST is at present considering which activities could be carried out at Community level so that the activities of the Community and the Member States complement each other effectively.

3. The non-European industrial countries of the Western World. Research and development have a special part to play in the Communities' close cooperation with these countries. The research

potential of these countries represents for the Community both a challenge and possible enrichment. Energy research is an example which is of current concern; the Community should actively participate in the international nuclear fuel cycle evaluation.

4. International organizations. In the future the Community intends to maintain its close links with all international organizations in the research and development field, and in particular with the United Nations and its agencies such as Unesco, ECE, the IAEA, FAO, UNEP and the WHO, with the OECD, including the IEA and the NEA, and with the ESF.

Finally the common science and technology policy must make the appropriate contribution in the North-South, East-West and Euro-Arab dialogues.

## 9. Dissemination of information, utilization of results and evaluation of research and development

The common policy in the field of science and technology can only be of practical use if there is efficient management of results of research and development.

For every programme it will be necessary to examine the conditions under which its results could best be disseminated and applied. During the programme, and even after its completion, a continuous process of evaluation will ensure that dissemination and exploitation are monitored. The amount of effort devoted by public authorities in the Community to the dissemination and utilization of research results should be commensurate with the effort invested in research itself.

Research results available to the Community should not be managed in isolation from those of the Member States. The management of these results must be in line with the general policy designed to encourage both the exchange of information and coordination.

For this purpose, an advisory committee for the diffusion and practical utilization of research and development results should be set up within CREST. It would assist the Commission in working out proposals for a common policy in this area, with a view to adopting a common attitude towards the outside.

### 9.1 Dissemination of information

In the case of scientific information, the problem is not so much to improve its dissemination as to promote the preferential circulation of information within the Community. Creating a climate favourable to fostering relations between research workers and industrialists in the Community would lead to a better exchange of information, resulting in better coordination and a sensible orientation of future research.

At Community level the appropriations for each research programme should include the necessary funds for exchanges of staff between participating laboratories, specialized seminars and laboratory visits.

Furthermore there should be an improvement of the infrastructure for the exchange of documentation. This should include inventories of research projects, the exchange of literature not easily available, and the promotion of decentralized distribution systems on a national, regional or sectoral level.

### 9.2 Utilization of results

For projects of interest to the Community, it does not appear necessary to modify to any great extent the existing industrial property policy.

With regard to indirect and concerted action projects, the principle that patented or non-patented inventions remain the property of the contract-holders should be maintained. In return, the contract-holders are obliged to exploit their inventions in such a way as to satisfy the needs of the Community.

In the future the Community should stimulate even more actively the utilization of research results. However, it should be borne in mind that every step in the progress towards a genuine licence market and the unification of patent laws will come up against the barriers created by sectoral policies and national interests. As regards the utilization of research results, the Community should, *inter alia*, examine and try out the measures advocated at the Milan Symposium in 1976.<sup>1</sup> Those meriting particular attention include: market research and feasibility studies, development of prototypes, demonstration projects, laboratory visits and investigation of new sources of finance for development.

Organized channels for information on the supply of and demand for new technologies would help find and favour developers from within the Community rather than from outside. Collaboration

<sup>1</sup> Milan Symposium 24 to 26 May, 1976: 'A Science and Technology Policy for the Community'.

with national or regional bodies set up to promote the utilization of research is essential. Where such bodies do not already exist, they should be created.

### 9.3 Evaluation of research and development

In addition to the questions already dealt with in this chapter—*dissemination of information, industrial property policy and the utilization of results—the evaluation of the efficiency of research ('Erfolgskontrolle')* is a matter of ever-growing urgency at a time when resources are becoming increasingly scarce.

Evaluation criteria are a prerequisite for assessing the results of common research activities and programmes. It is now imperative that a set of such criteria for the Community be systematically worked out. Financial planning and actual funding, the original schedules and its real evolution as well as technical project definition and actual development including the organizational structures need to be assessed. The scientific, economic and social usefulness of each project should be demonstrated.

It is only on the basis of a commonly accepted evaluation system of this sort that projects can be assessed and if necessary discontinued, new priorities fixed and separate programmes coordinated and consolidated in a logical fashion. Systematic evaluation is a prerequisite of an efficient Community research and technology policy. The Commission will therefore—especially in the light of the 1976 Milan Symposium—pay particular attention to this task.

## 10. Long-term priorities for the research and development policy

Scientific and technological programmes have increasingly long-term effects. Revolutionary and apparently visionary technological processes such as those involved in artificial intelligence or genetic engineering are becoming realities. We must prepare now for the realities of tomorrow.

The increasing duration of individual technological projects, particularly major ones such as research into new forms of energy, make it more than ever necessary to consider the long-term perspectives of today's research decisions and their impact on future generations. Nuclear fusion for instance cannot hope to make a useful contribution till after the turn of the century, but requires a firm commitment today.

We cannot allow the Community of tomorrow to be burdened by the effects of today's short-term political vision. A long-range analysis is necessary to anticipate future problems and opportunities on the basis of probable and less probable scenarios for our future which can be devised, analysed, evaluated and retained or rejected as necessary. On this basis, long-term technological priorities can be evaluated and ensure that new forms of R & D continue to evolve, serving the future needs of the Community and of future generations. *A common policy in the field of science and technology without long-term objectives and priorities is therefore incomplete and not well founded.* In order to contribute to the definition of these long-term R & D objectives and priorities, it is proposed to undertake a programme of forecasting and assessment in the field of science and technology (FAST) to assist the development of a coherent science and technology policy in the long term.

The proposed programme will have three main tasks. The first will involve monitoring and analysing existing forecasting and assessment research activities within the Community and elsewhere. This information, supplemented by a limited number of studies contracted out, will, as a second task, be used to highlight potential conflicts, problems and opportunities facing the Community in the long term. The information

will serve in particular to suggest alternative courses of R & D action to meet future needs. The subsequent choice of R & D priorities should contribute to the harmonious development of the Community and to satisfying changing societal needs. Finally, this activity will necessitate, as a third task, close collaboration with existing specialized groups within the Community—such as DATAR (Délégation à l'aménagement du territoire et à l'action régionale) in France, the Science Policy Research Unit (SPRU) in the UK and the Institut für Angewandte Systemanalyse in the Federal Republic of Germany, Community institutions such as the Foundation for the Improvement of Living and Working Conditions, and international organizations and projects such as the International Institute for Applied Systems Analysis (IIASA), the International Federation of the Institutes for Advanced Studies (IFIAS) or the OECD 'Inter-Futures' project. This should not only result in an active exchange of ideas with national, international and Community research bodies in this field but should also encourage the development of a truly European forecasting network.

Set up initially for the period of five years, the programme will be carried out by a staff of 10 experts with a budget over the whole period of 4.4 million u.a. This budget will not only cover a limited number of contracts where these are necessary to supplement existing work but will to a large extent be used for organizational and coordinating activities (seminars, workshops, brainstorming groups, publications, etc.).

This programme should be considered as a first step towards solving long-range problems. It is a central element in the five-year pilot phase on which the Commission intends to embark as a follow-up to 'the Europe + 30' Report, carried out as a result of the Council Resolution of 14 January 1974.

In brief, it is proposed to carry out a five-year pilot phase in order to gain further experience in the use of forecasting techniques and to determine the most useful and appropriate organizational structures for a more permanent Community forecasting and assessment capability in a second phase.

In this pilot phase, the proposed programme (FAST) will play a central role, which will involve coordinating and mobilizing existing forecasting capabilities within the Community, analysing available results and stimulating new work. The coordination of related activities within the Commission and those of the Community Institutes will be an essential part of this pilot phase.

At the end of the five-year forecasting and assessment programme (FAST), the effectiveness of the contribution of FAST to the development of a long term R & D policy will be assessed and appropriate proposals put forward. Any new proposals will be made in the light of a general review of the whole pilot phase and the experience gained during this five-year period.

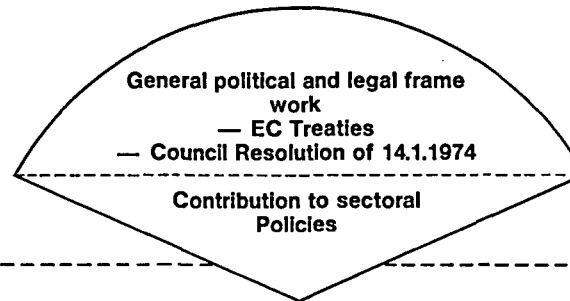
## Final remarks

Key areas of Community concern, such as economic competitiveness, secure energy and raw material supplies, and the preservation of a humane social and physical environment are becoming more and more dependent on a common policy in the field of science and technology; in the absence of well coordinated efforts, these problems might well prove insoluble. The European dimension is becoming a reality at the level of science and technology.

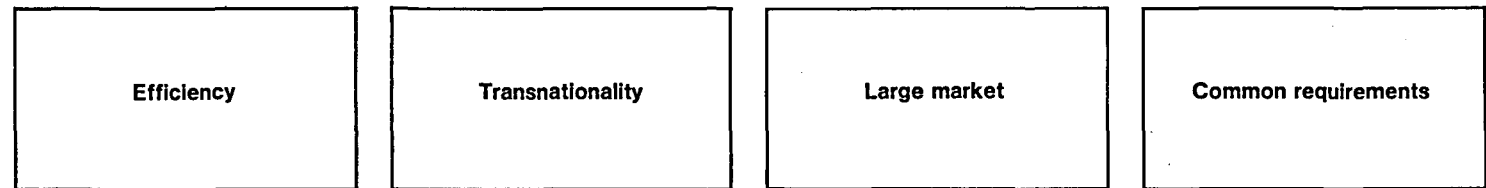
It is essential to pursue energetically the further development of the common research policy. Scientists, politicians, industrialists and the public must all contribute, in the awareness that research and technology policy constitutes a driving force for European unity.

**DIAGRAM 1 — Selection criteria for EC R&D programmes/projects**

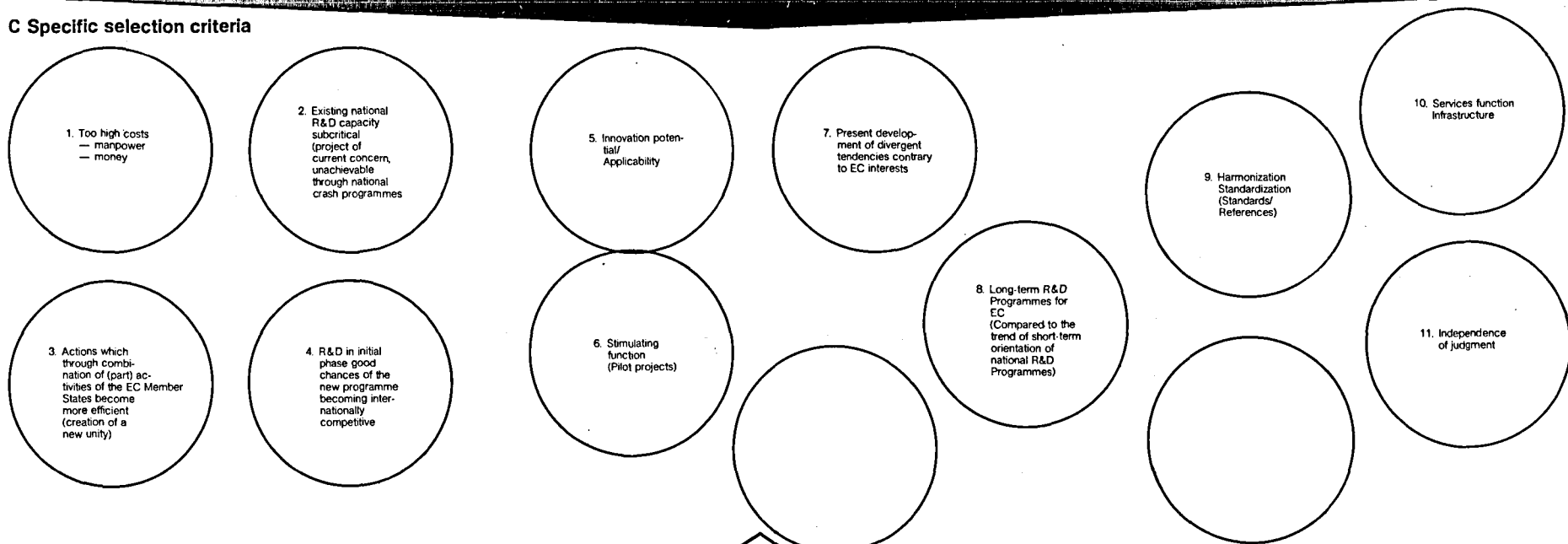
A



B General criteria



C Specific selection criteria



SPECIFIC EVALUATION AND TECHNOLOGY ASSESSMENT CRITERIA FOR EC R&D PROJECTS/PROGRAMMES (See 7.3. Evaluation)





DIAGRAM 2 — Coordination of the R&D policies of the EC Member States

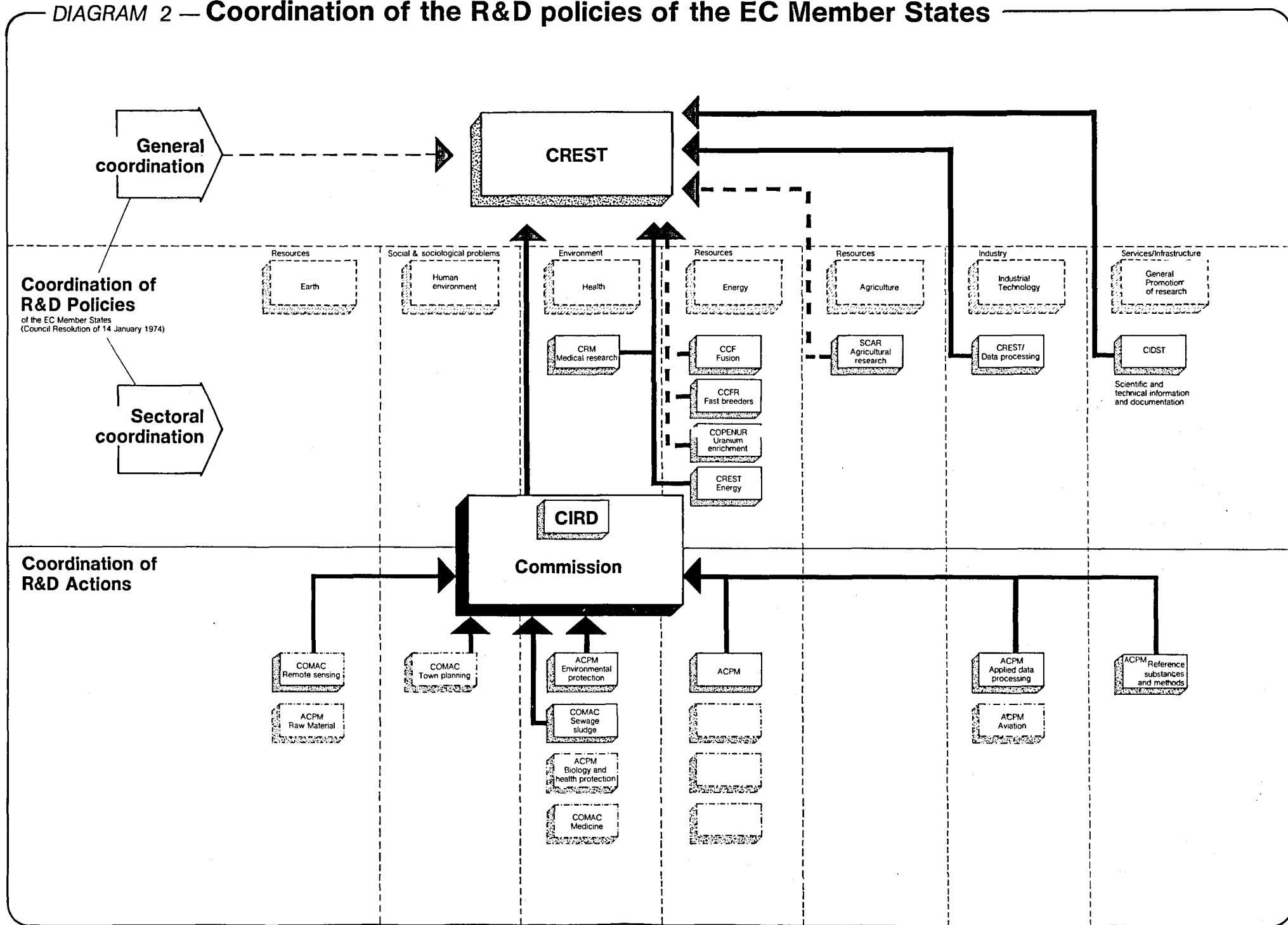
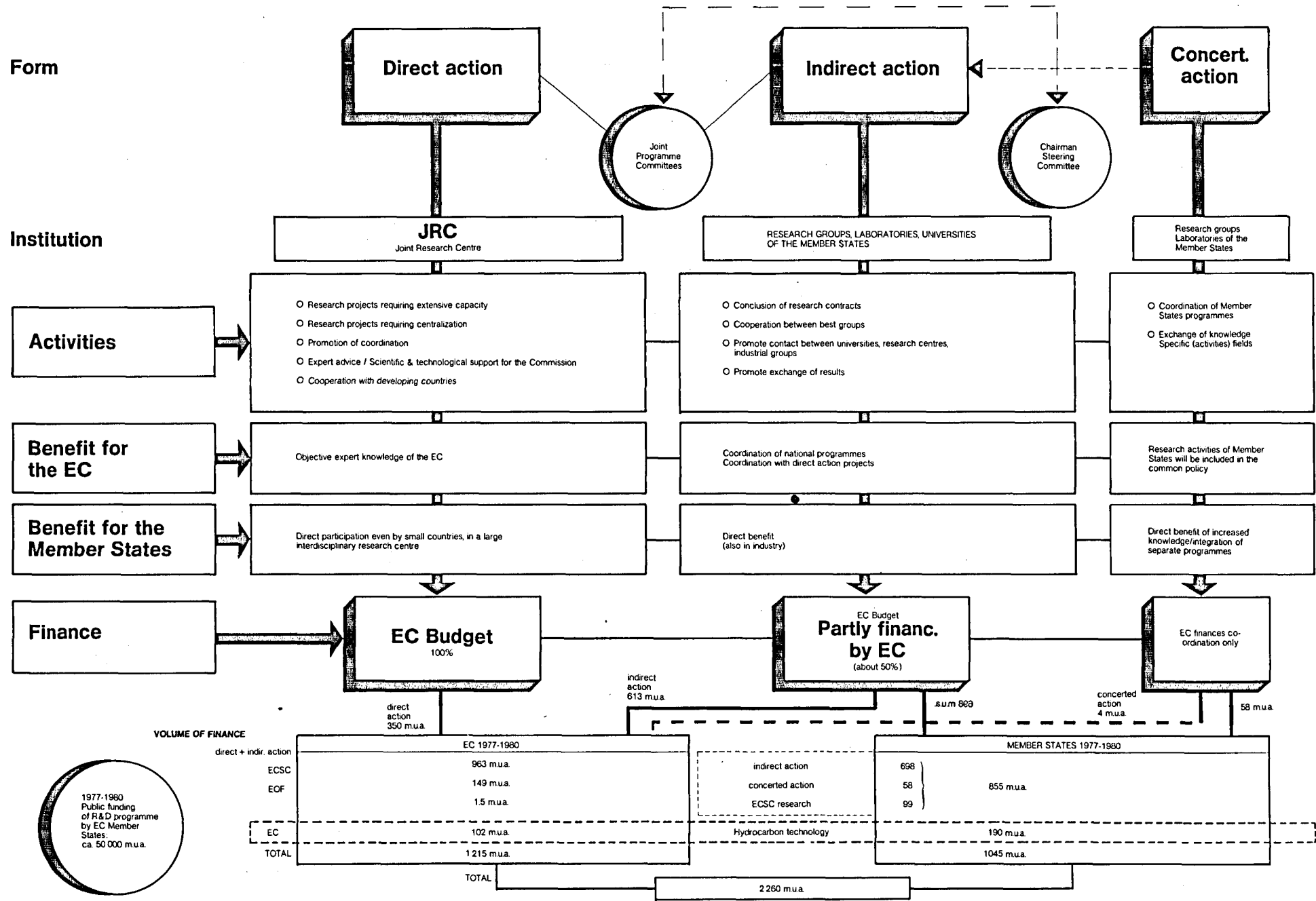
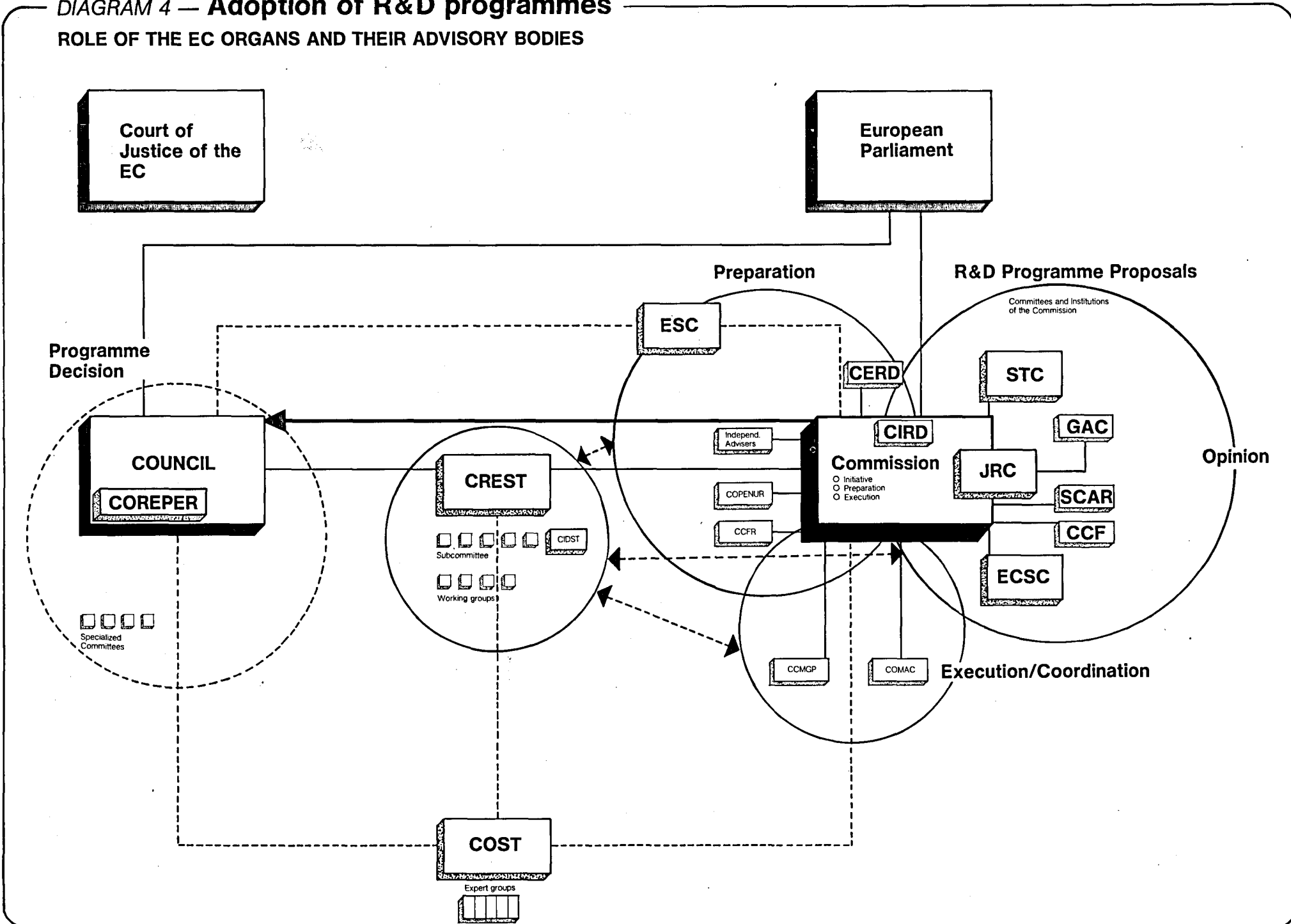


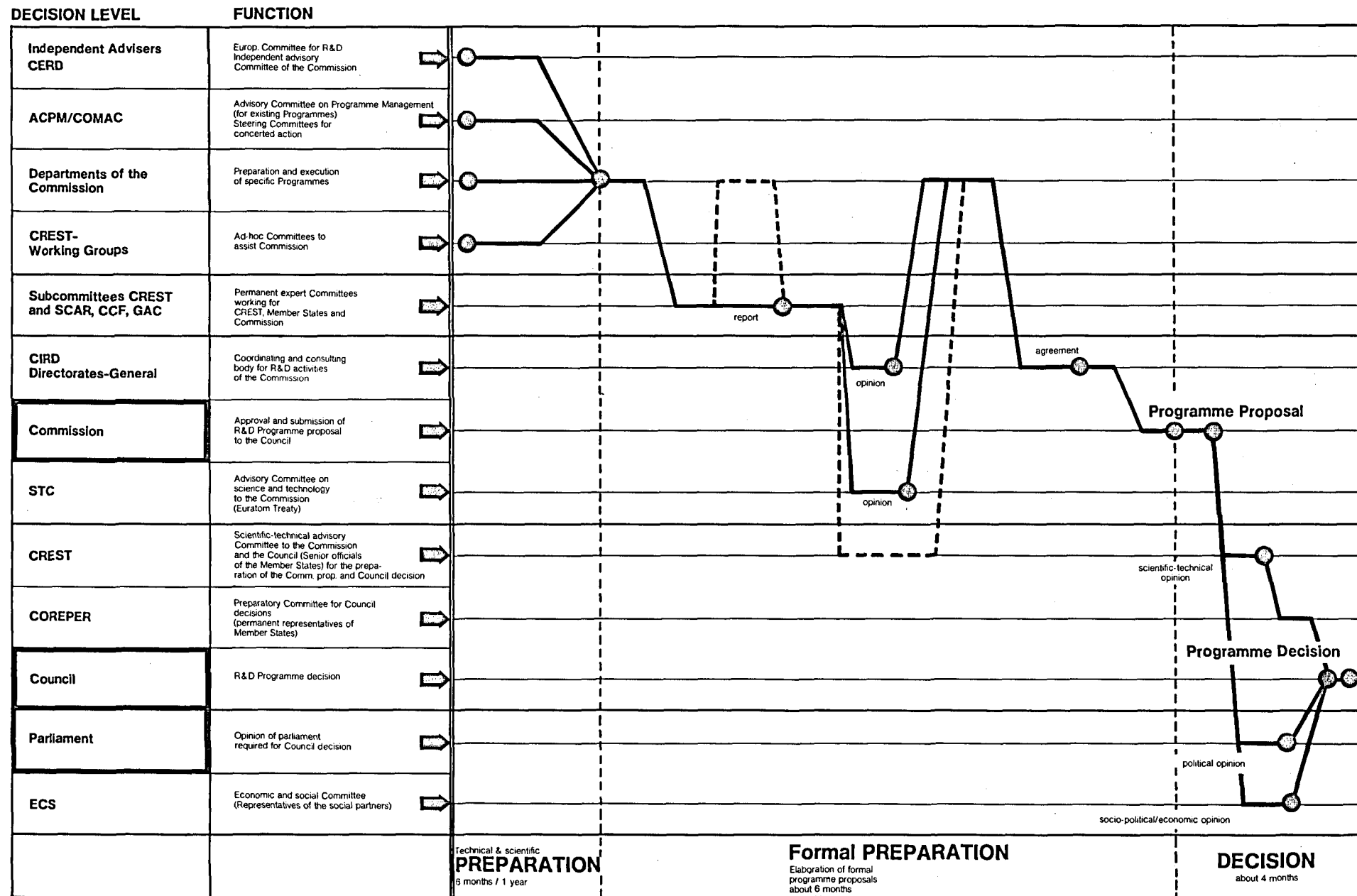
DIAGRAM 3 — R&D Forms and financing



**DIAGRAM 4 — Adoption of R&D programmes**  
**ROLE OF THE EC ORGANS AND THEIR ADVISORY BODIES**



**DIAGRAM 5 — Adoption of R&D Programmes**  
**DECISION MAKING PROCESS**



NOTES 1: In the case of the ECSC, the Commission decides after consultation of the Consultative Committee and with the assent of the Council.  
 2: The decision making process shown is not fully applicable to direct action programme

## Decisions to be taken

### *Draft Council Resolution on the guidelines for the common policy in the field of science and technology*

*The Council of the European Communities,*

Having regard to the Treaties establishing the European Communities;

Having regard to the Communication from the Commission;

Having regard to the Opinion of the European Parliament;

Whereas the common policy in the field of science and technology is an essential component of social progress, balanced economic expansion and the improvement of the quality of life;

Whereas, in order to develop this common policy, the Community institutions must periodically review the prospects, set the objectives and determine the priorities of the policy, and also allocate the necessary funds;

Whereas its Resolutions of 14 January 1974,<sup>1</sup> and in particular the development of the common policy in the field of science and technology, require the coordination of national policies, and whereas the Community institutions must maintain the necessary links between the programmes implemented at Community level and the related work carried out in the Member States;

Whereas it is important to pay close attention and, whenever the Community's interests warrant it, to give support to the activities of the European Science Foundation since this Foundation plays a significant role in the coordination of basic research;

Whereas the efforts made by the Community and the Member States to disseminate, protect and apply the results of research and development must be commensurate with the efforts they devote to that research and that development;

Whereas, whenever it may prove necessary or advisable, it is important to try to associate non-member countries, particularly European non-member countries, with Community research and development schemes;

Having regard to the opinion of the Scientific and Technical Research Committee,

*Has adopted this Resolution:*

#### *Article 1*

The Council hereby approves the guidelines adopted by the Commission for the development of the common policy in

the field of science and technology during the period 1977-80. It therefore invites the Commission to make appropriate practical proposals for research and development actions.

#### *Article 2*

In all branches of science and technology in which direct, indirect or concerted action is undertaken, the coordination of research and development activities financed from public funds at national level shall be gradually developed and intensified during the period 1977-80.

In order to assist the Community institutions in this task of coordination, the Advisory Committees on Programme Management (ACPMs), which were set up by the Council to advise on direct or indirect action in 1969, shall also formulate opinions and recommendations concerning all Community and national research activities envisaged in the fields for which they are respectively competent. The Council Resolution of 18 July 1977 relating to ACPMs<sup>2</sup> shall therefore be amended in accordance with Annex A.

#### *Article 3*

In view of the important role played by the European Science Foundation in the coordination of basic research, the Council invites the Commission to pay special attention to those of its activities which are of interest to the Community, and to make any suitable proposals with regard to support for or participation in such activities.

#### *Article 4*

In order that the Community as a whole can gain maximum benefit from research and development results, the Council invites the Commission to take the appropriate measures and to prepare immediately the necessary action and coordination proposals regarding the dissemination, protection and application of these results.

#### *Article 5*

The Council invites the Commission, in cooperation with the Scientific and Technical Research Committee, to undertake, between now and the end of 1979, a full review of the Community's scientific and technical activities and to present its conclusions thereon. In particular, the report should evaluate the results achieved by Community activities in the field of science. The specialist committees set up to assist the Community authorities in the various fields of science and tech-

<sup>1</sup> OJ C 7 of 29.1.1974.

<sup>2</sup> OJ C 192 of 11.8.1977.

nology shall take part in this review so that the full range of Community activities is covered.

During the course of 1980 the Commission will be invited to define, in the light of this review, the objectives and new guidelines which the Community should pursue in the field of science and technology, taking into account the related research and development activities under way in the Member States.

#### *Annex A*

#### **Amendments to be made to the Council Resolution of 18 July 1977 on the Advisory Committees on Programme Management<sup>1</sup>**

'2. Without prejudice to the responsibility which the Commission bears in the implementation of the programmes, each Committee shall have the task of contributing, as an advisory body, towards:

— the successful implementation of the programme for which it is competent and in particular the detailed description of the projects and the evaluation of their results;

— the progressive coordination of all Community and national research activities within the field for which it is competent.'

'6. Each Committee shall deliver opinions, which shall be prepared by the secretariat and be submitted for the Committee's approval. Any member of a Committee may ask for his views to be recorded in these opinions. The opinions shall be forwarded to the Commission and copies thereof sent to the Council. The Scientific and Technical Research Committee and its sub-committees shall be informed periodically of the work of the Advisory Committees on Programme Management by the Commission's services.'

'7. Each committee shall comprise no more than:

(a) for the Commission delegation, three officials designated by that institution;

(b) for the delegations of the Member States, three experts designated, according to the criteria which it deems most appropriate,<sup>1</sup> by each of the Governments of the Member States taking part in the programme in question; the absence of a government expert shall not prevent a committee from holding a valid meeting.

In exceptional cases the delegations may derogate from these provisions by joint agreement.'

#### ***Proposal for a Council Decision on the promotion of industrial research projects***

##### *The Council of the European Communities,*

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to Article 2 of the Treaty establishing the European Economic Community;

Whereas a common policy in the field of science and technology is an essential element for social progress, for balanced economic expansion and for the improvement of the quality of life;

Whereas promotion of industrial research projects can contribute to the attainment of the aforementioned aims of the Treaty;

Having regard to the Council Decision of 14 March 1977 adopting the fourth medium-term economic policy programme,<sup>2</sup>

Having regard to the Resolution of the European Parliament of 10 May 1977 on the need for innovation and research policy measures to be taken by the Community in the near future in those areas in which Member States derive a low revenue from the granting of licences and have to pay substantial licence fees to non-member countries;<sup>3</sup>

Whereas industrial undertakings are the main media of innovation and whereas measures to develop the innovative capacity of such undertakings, especially those of small or medium size, should help them adjust to the structural changes currently taking place;

Whereas the structural changes taking place in industry call for ever closer association and collaboration between Community firms but such firms sometimes experience difficulty in finding an appropriate public sponsor to facilitate the implementation of some of their industrial research projects;

Whereas the Community should encourage such undertakings to carry out industrial research projects or encourage associations between such firms by making appropriate financial contributions towards some of their industrial research projects;

Whereas the financial contribution of the Community should not change unfavourably the conditions of competition in a

<sup>1</sup> Where possible, one of these experts should be responsible for the national programmes in the sector concerned.

<sup>2</sup> OJ L 101 of 25.4.1977.

<sup>3</sup> OJ C 133 of 6.6.1977.

way which is incompatible with the principles laid down in the Treaty;

Whereas, because it is necessary to confine such contributions to priority sectors and a small number of well-defined projects, the Commission must be able to use every possible means of evaluating, case by case, the potential benefits of such projects and their compatibility with the aims of the common policy in the field of science and technology;

Whereas industrial innovation should also contribute primarily towards a more economic or more rational use of energy and raw materials, the protection of the environment and the improvement of working conditions;

Whereas the process of innovation will facilitate the adoption of new technologies linked with industrial reorganization, strengthen competitiveness on the international markets and improve the balance of trade in technological knowhow;

Whereas industrial innovation can help, in particular, to create new jobs and improve the economic equilibrium between regions;

Whereas the powers of action necessary to promote research projects of industrial interest are not provided in the Treaty;

Having regard to the opinion of the Scientific and Technical Research Committee,

*Has decided as follows:*

#### *Article 1*

The Commission may, subject to the terms laid down in this Decision, provide, by means of contracts, financial assistance for the implementation of industrial research projects initiated by individuals or undertakings within the Member States of the European Community and which either:

- wish to cooperate with each other on a Community basis; or
- have already established cooperative links between them.

Special attention shall be given to projects presented by individuals and small or medium-sized undertakings with innovation potential. Care shall be taken to ensure that the Commission's financial contribution does not change unfavourably the conditions of competition in a way which is incompatible with the corresponding provisions of the Treaty.

#### *Article 2*

The projects shall contribute towards the achievement of the aims of the Treaty establishing the European Economic Community and meet at least one of the following criteria:

- economic or more rational use of energy and raw materials;

- development of new technologies resulting in industrial restructurization;
- creation of new jobs, improvement of working and living conditions;
- improvement of competitiveness on international markets and narrowing of the technology gap;
- improvement of economic equilibrium between regions;
- protection of the environment.

#### *Article 3*

The Commission shall invite interested individuals and undertakings to submit their projects to it.

All projects shall be accompanied by a report giving a detailed description of the project in accordance with the requirements of Annex A.

#### *Article 4*

The Commission shall define the terms of the contract and the amount of financial assistance to be provided after receiving the opinion of the Scientific and Technical Research Committee and after consulting an Advisory Committee on industrial research to be set up by the Commission.

#### *Article 5*

Council Regulation (EEC) No 2380/74 of 17 September 1974<sup>1</sup> shall apply to any patentable or other knowledge or inventions resulting from the implementation of projects which have benefited from a financial contribution from the Commission pursuant to this Decision.

#### *Article 6*

This Decision shall enter into force on the day following the date of its publication in the Official Journal of the European Communities.

#### *Annex A*

##### **Description of the industrial research project (Article 3)**

1. Title of the project and the undertakings or individuals concerned.

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<sup>1</sup> OJ L 255 of 29.9.1974.

2. Financial status, technical expertise and available manpower of the undertaking(s) managing the project.
3. Aim and relevance of the project.  
Specify how the project meets the criteria laid down in Article 2.
4. Detailed description of any earlier research (examples from the patent portfolio).
5. Programme of work planned (involving both qualified and non-qualified staff).
6. Detailed breakdown of operating expenditure, including cost of new equipment to be bought.
7. Has the project already been submitted to another national or international body for financial assistance?
8. Proportion of total cost needed (what aid measures have been or will be taken by the Member States to help launch the project?).
9. Financing schedule for the part of the programme not covered by the aid measures referred to in (8) above.
10. Results expected.
11. Proposed applications of the results of the project, if successful.
12. Schedule of work and financial commitment.
13. Would the project be carried out if no Community assistance was granted?

*Proposal for a Council Decision  
on a research programme on forecasting  
and assessment in the field  
of science and technology*

*The Council of the European Communities,*

Having regard to the Treaty establishing the European Economic Community and in particular Article 235 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to Article 2 of the Treaty establishing the European Economic Community;

Whereas in an increasingly rapidly changing world it is necessary for the Community to try to shape its future, anticipating future problems, needs and wants, and jointly to develop its policies on well-defined long-term objectives; whereas research and development activities can play an important part in achieving these objectives;

Whereas the Council, through its Resolution of 14 January 1974, approved an action programme on forecasting, assessment and methodology in the European Communities, as a necessary element for defining the long-term action of the Community and to ensure the technical backing for future decisions of Community institutions in the scientific and technological field;

Whereas the ensuing study entitled 'Europe + 30' stressed the usefulness of an need for long-term forecasting activities to guide Community policies and decisions;

Whereas the Commission needs a capability to establish priority areas for Community research and development action in view of possible long-term developments and to determine the effects of research and development activities on the long-term social and economic development of the Community;

Whereas extensive forecasting and technology assessment research is being carried out nationally and internationally but is not at the present time sufficiently monitored and used by the Commission nor specifically tailored for the particular problems facing the Community;

Whereas in its Resolution of 14 January 1974, the Council invited the Commission to draw up specific proposals on the basis of the results of the preliminary study (Europe + 30);

Whereas rather than creating a Community forecasting institute as suggested in the preliminary study (Europe + 30), it is preferred that the Community should gain further experience during a five-year experimental phase;

Whereas research in the field of forecasting, assessment and methodology should contribute to the attainment of the abovementioned objectives of the Treaty;

<sup>1</sup> OJ C 7 of 29.1.1974.



Whereas the required powers are not provided by the Treaty;  
Whereas the Scientific and Technical Research Committee (CREST) has delivered an opinion on the proposal from the Commission;

*Has decided as follows:*

#### *Article 1*

A research programme for the European Economic Community on forecasting and assessment in the field of science and technology as defined in the Annex to this decision is hereby adopted for a period of five years beginning on 1 January 1978. This Annex forms an integral part of this decision.

#### *Article 2*

The upper limit for expenditure commitments and the maximum number of staff necessary for the execution of the programme is estimated to be 4.4 million u.a., and a staff of 10 respectively, the unit of account being defined in Article 10 of the Financial Regulation of 25 April 1973 applicable to the general budget of the European Communities.<sup>1</sup>

#### *Article 3*

The Commission shall be responsible for the implementation of the programme. It shall be assisted in this task by an Advisory Committee to be set up by the Commission and composed of national representatives to ensure close liaison between the research programme and related national activities in this field. The Committee shall advise on the execution of the programme.

#### *Article 4*

Member States shall take the measures necessary to ensure that their research bodies and institutes competent in this field undertake, with the Commission, the coordination provided for in this Decision.

#### *Article 5*

At the end of the fourth year the Commission shall evaluate the programme and report to the Council and the European Parliament.

#### *Article 6*

The information resulting from the implementation of the programme shall be disseminated in accordance with Regulation (EEC) No 2380/74.<sup>2</sup>

#### *Article 7*

This Decision is addressed to the Member States.

#### *Annex*

##### **Forecasting and assessment in the field of science and technology (1978-82)**

(Indirect action)

An estimated maximum amount of 4.4 million u.a. and a maximum staff of ten would be allocated to this objective.

The main aim of the research programme will be to contribute to the definition of long-term R & D objectives and priorities, and so to the development of a coherent science and technology policy in the long term.

To achieve this objective, the programme will have the following three main tasks:

- (1) Monitoring existing forecasting and assessment research activities within the Community and elsewhere and analysing their results as to their relevance to the development of the Community.
- (2) Highlighting, on the basis of the above information and where necessary with additional studies, potential conflicts, problems and opportunities affecting the long-term development of the Community and suggesting alternative courses of R & D action to help solve or achieve them.
- (3) Establishing, in collaboration with the Member States, a system of coordination between existing specialized research groups in this field within the Community and so creating a Community forecasting network. This will, by way of example, necessitate close liaison with Community institutes (Foundation for the Improvement of Living and Working Conditions and the proposed Institute for Economic Analysis and Research) and other national and international organizations concerned.

<sup>1</sup> OJ L 116 of 1.5.1973.

<sup>2</sup> Council Regulation of 17 September 1974 adopting provisions for the dissemination of information relating to research programmes for the European Economic Community, OJ L 255 of 20.9.1974.

# Brief analysis of public funding for research and development

## Introduction

1. The 15 graphs and 2 tables attached summarize the main features of the development of public R & D funding in the Member States during 1970-76.
2. Almost all the information comes from the annual reports submitted to the Scientific and Technical Research Committee (CREST) by the Statistics Subcommittee. In some cases information has been brought up to date. In other cases, general information on USA and Community expenditure has been added.
3. All the data are expressed on the basis of 1970 prices and exchange rates. Calculations were carried out by adjusting for inflation the figures expressed in national currencies, using consumer price indices. These figures were converted into EUR at 1970 exchange rates. The totals are now expressed in actual values regardless of monetary adjustments that have occurred since the end of 1971.
4. Figures for 1970-75 stem from statistics which can be considered as final (actual R & D expenditure from the budgets). 1976 figures are provisional (budget estimates for R & D expenditure); these figures have been deflated, where needed, using the average value of price indices for 1976.
5. Data in Graphs 1, 11, 12, 13 and 14 are expressed in absolute values, i.e. in EUR, the unit of account used in Community statistics. The data in Graphs 2 to 10 and 15 (comparison of R & D expenditure with other economic parameters) have been converted into indices, the base year being 1970.

## Comments

An analysis of the graphs and tables included in this paper shows the following features:

- A general tendency for public R & D expenditure to stagnate in all the Community countries since 1970-71. The sole exception is Germany, where this trend is only visible from 1973 onwards.
- Public research expenditure is now growing more slowly than the total public budgets and gross domestic product of the Member States. This could mean that for some years, R & D has no longer been considered as a priority sector which calls for budget growth proportionately greater than that of total public budgets.
- While public R & D expenditure in the Community has remained stationary, there has been renewed growth in the

USA since 1975. Even if civil research expenditure alone is taken into consideration, the gap is increasing:

USA — 1976 — expenditure per head: 35 EUR;

EUR-9 — 1976 — expenditure per head: 21.5 EUR.

— The small share of R & D funds in the Community budget, in comparison to the equivalent percentages in the member countries, should be noted

	<i>Community (Commission)</i>	<i>EUR-9</i>
	%	%
1974	1.82	3.70
1975	2.06	3.36
1976	1.87	3.25
average 1974-76	1.90	3.44

(data based on 1970 prices and exchange rates)

— It is clear that the share of Community expenditure going to R & D is very small in comparison with R & D expenditure for all member countries:

1976 total expenditure EUR-9	7 234.2 Mio EUR <sup>1</sup>
1976 expenditure on international cooperation EUR-9	730.1 Mio EUR, i.e. 10.1%
1976 Community expenditure	93.0 Mio EUR, i.e. 1.3%

— An interesting feature of Community expenditure is the strong concentration on energy, accounting for 64% of the total. Health and industry come next with 15-16% and 12-14% of Community expenditure respectively. Agriculture, social and sociological problems and exploitation of the earth each represent about 2% of the total.

<sup>1</sup> At 1970 values and exchange rates; in current terms, this total is 11 400 million EUR.

## Nomenclature for the analysis and comparison of science programmes and budgets (NABS)

- Chapter 1 — Exploration and exploitation of the earth and its atmosphere.
- Chapter 2 — Planning of the human environment.
- Chapter 3 — Protection and improvement of human health.
- Chapter 4 — Production, distribution and rational utilization of energy.
- Chapter 5 — Agricultural productivity and technology.
- Chapter 6 — Industrial productivity and technology.
- Chapter 7 — Social and sociological problems.
- Chapter 8 — Exploration and exploitation of space.
- Chapter 9 — Defence.
- Chapter 10 — General promotion of knowledge.

### Other basic data

#### *Exchange rates 1970*

DM	FF	Lit	Fl	FB	£	DKr
3.66000	5.55419	625.00	3.62000	50.000	0.416667	7.50000

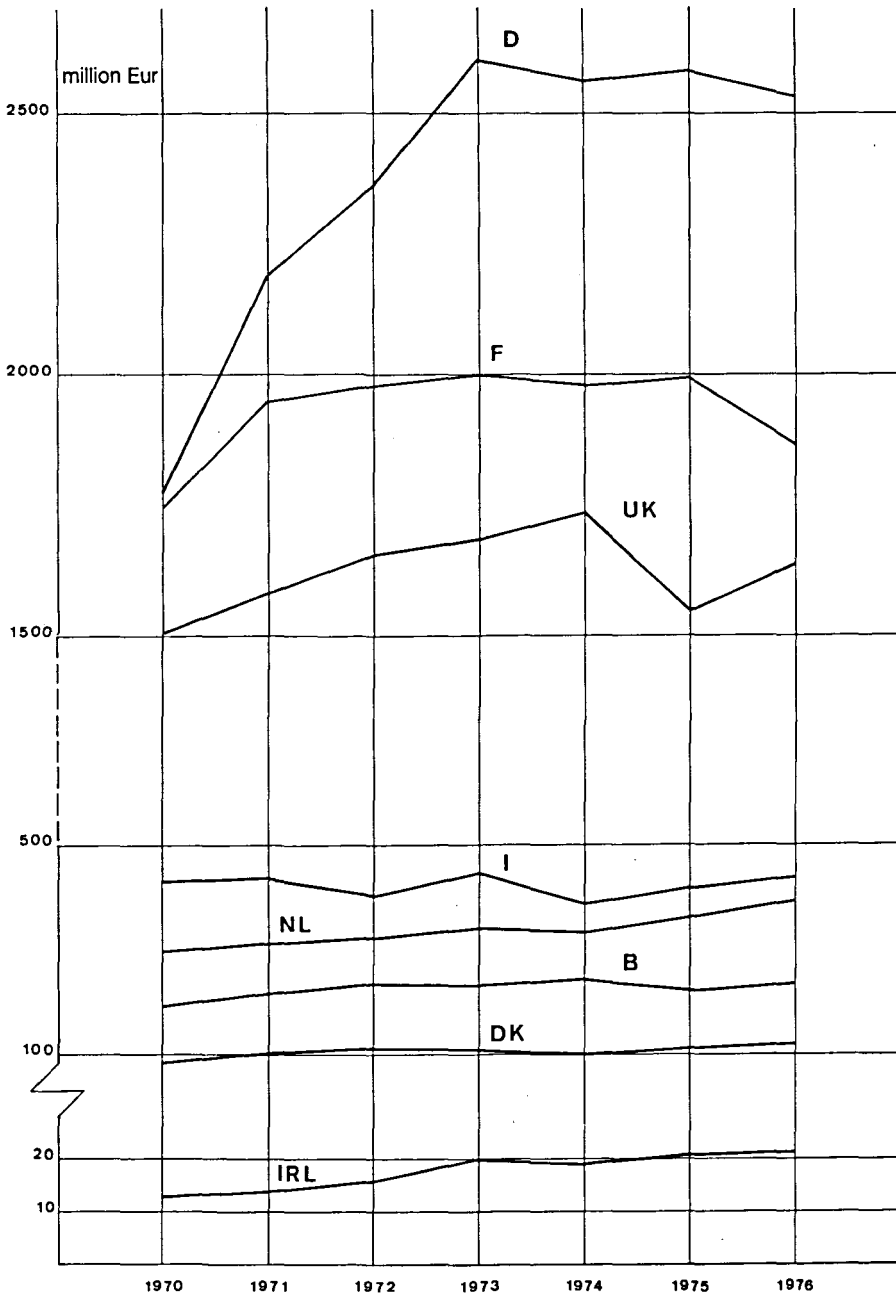
#### *Index of consumer prices (1970 = 100)*

Year	D	F	I	NL	B	UK	IRL	DK
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971	105.3	103.0	104.8	107.6	104.3	109.5	108.9	106.0
1972	111.1	111.7	110.8	116.2	110.0	117.2	118.4	113.0
1973	118.8	120.2	122.8	125.7	117.7	127.9	131.8	123.3
1974	127.1	136.3	146.3	138.0	132.6	148.5	154.2	142.2
1975	134.7	152.2	171.1	151.7	149.5	184.5	186.4	155.8
1976	141.2	166.4	199.1	164.8	163.0	215.2	220.7	168.9

Public R&D expenditure 1970-76

Graph 1

1970 prices and exchange rates

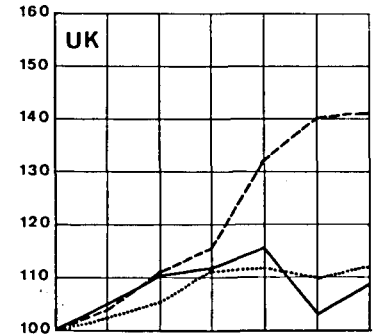
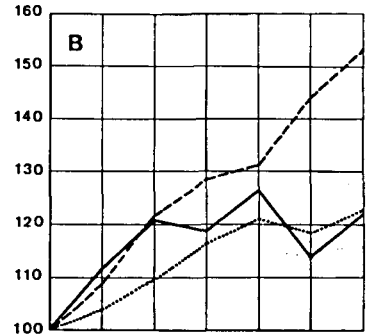
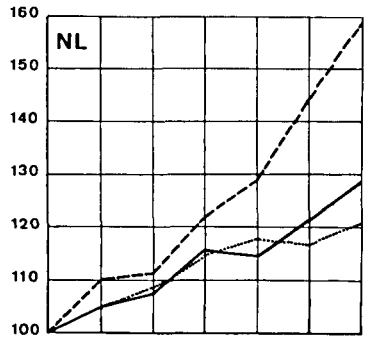
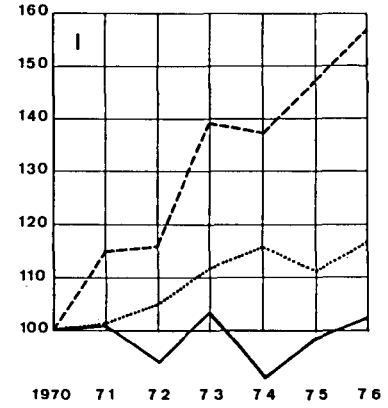
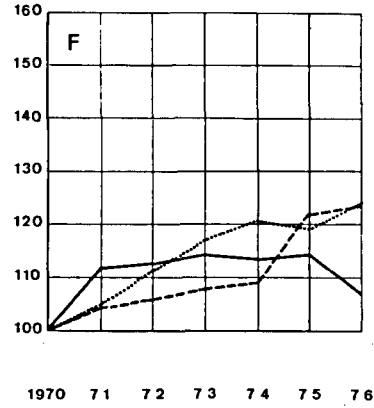
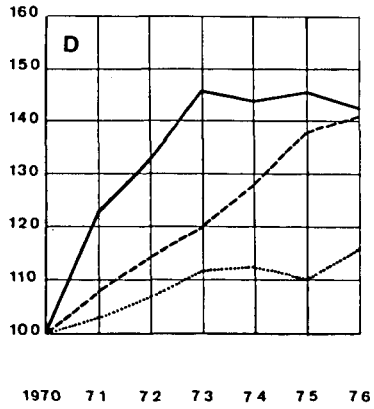


———— Public R&D expenditure  
----- Total public budget  
..... Gross domestic product

Graph 2-7

1970 prices and exchange rates

1970 = 100

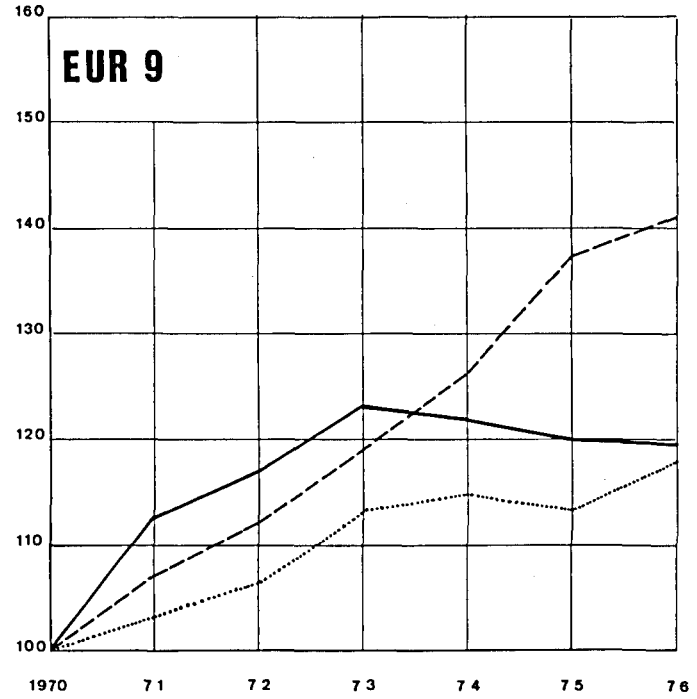
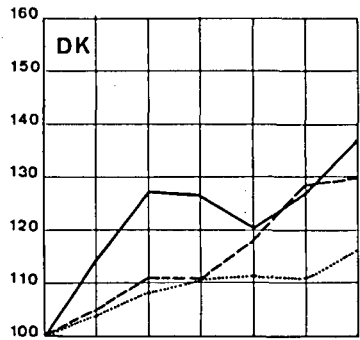
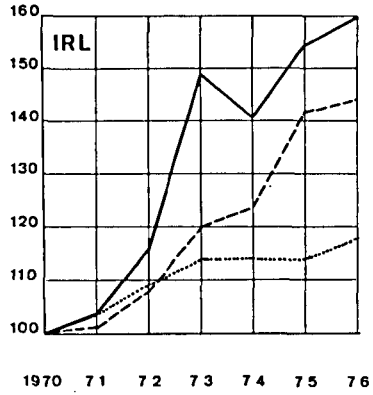


— Public R&D expenditure  
 - - - Total public budget  
 ..... Gross domestic product

1970 Prices and exchange rates

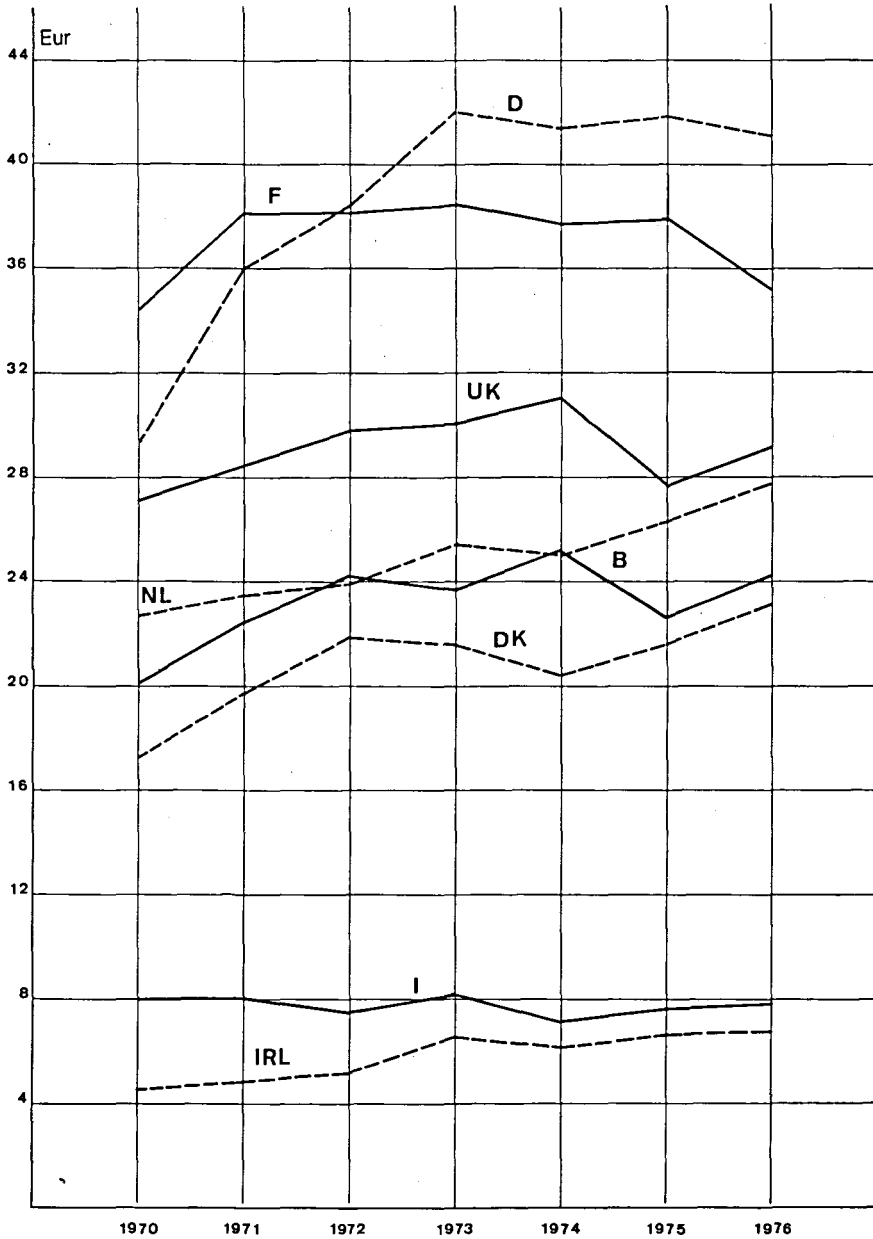
Graphs 8-10

1970 = 100



**Per capita public R&D expenditure 1970-76**

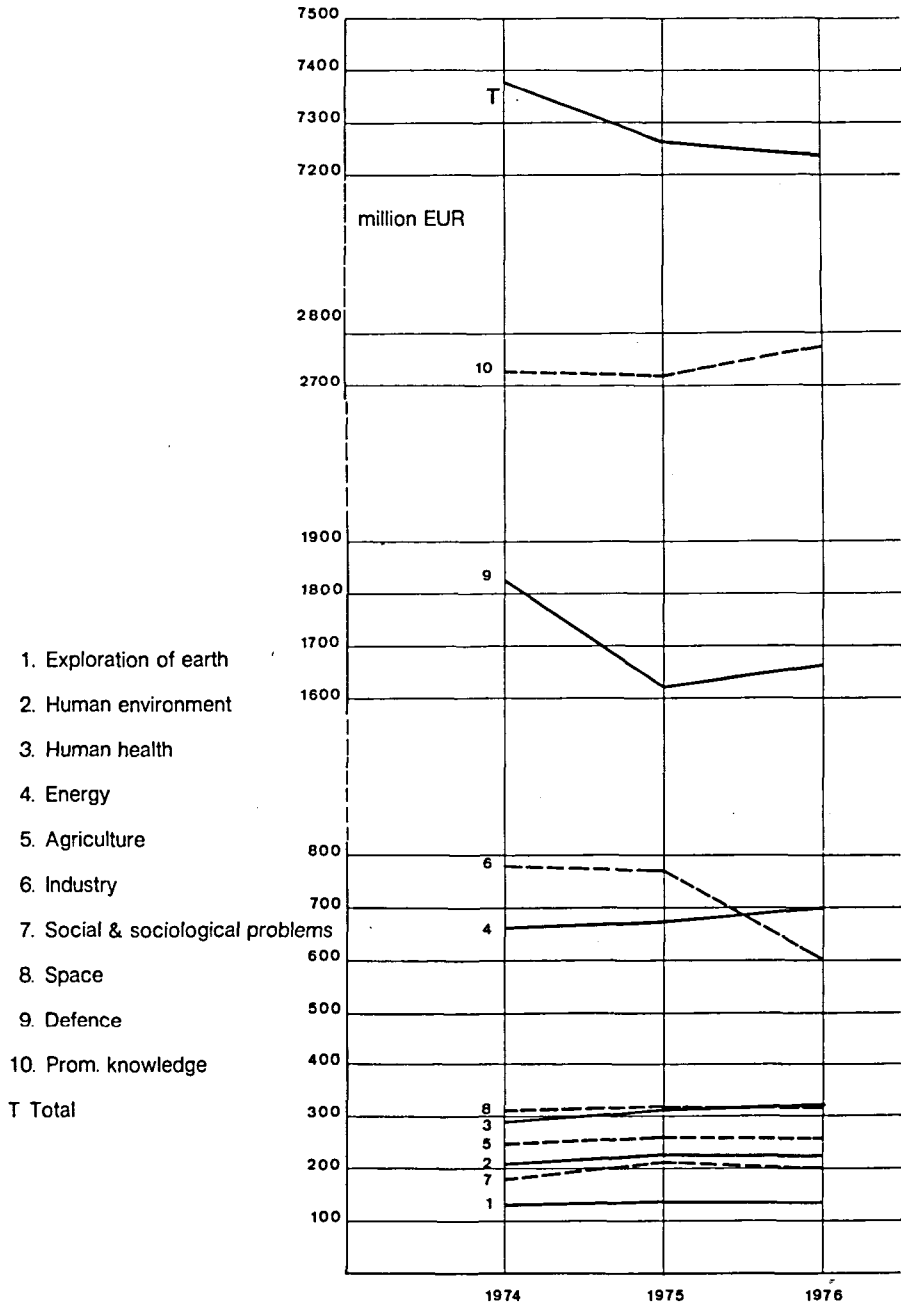
1970 prices and exchange rates



Public R&D expenditure by NABS objective 1974-76

Graph 12

Eur 9 1970 prices and exchange rates



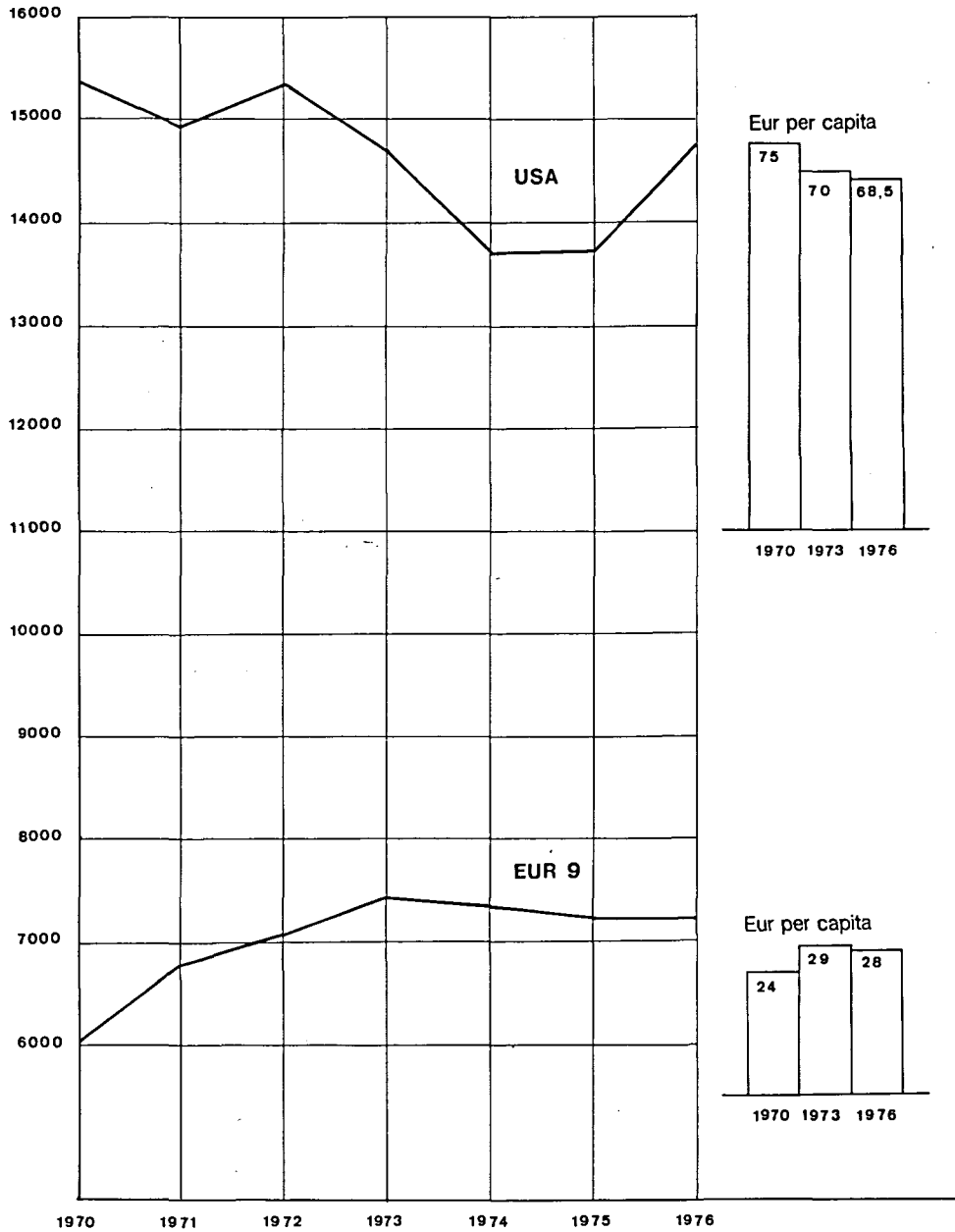


# Public R&D expenditure USA/EUR 9 1970-76

Graph 13

1970 prices and exchange rates

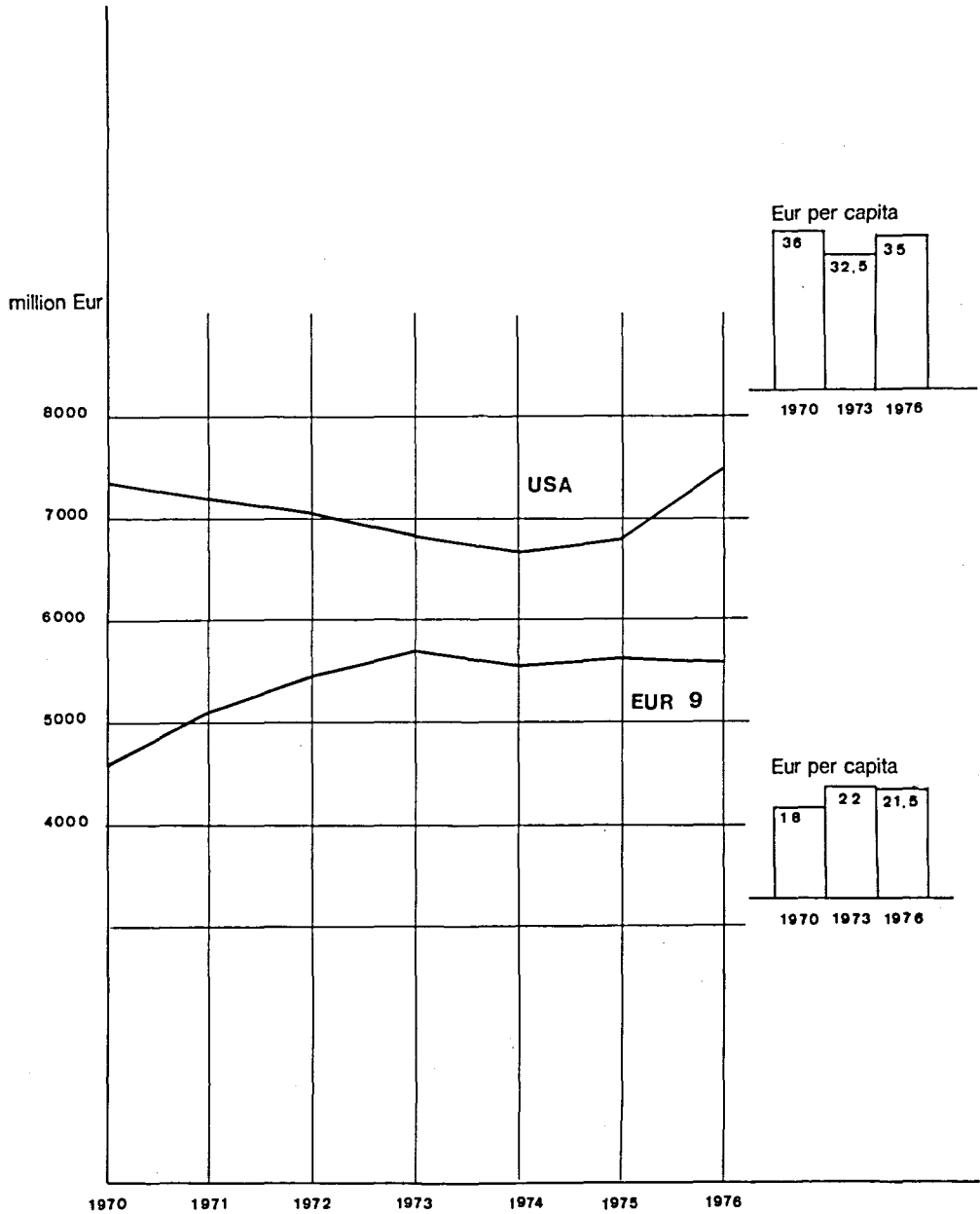
million EUR



# Public civil R&D expenditure USA/EUR 9 1970-76

Graph 14

1970 prices and exchange rates



Community - Commission

Graph 15

— R&D expenditure  
- - - - - Total Budget  
1970 prices and exchange rates

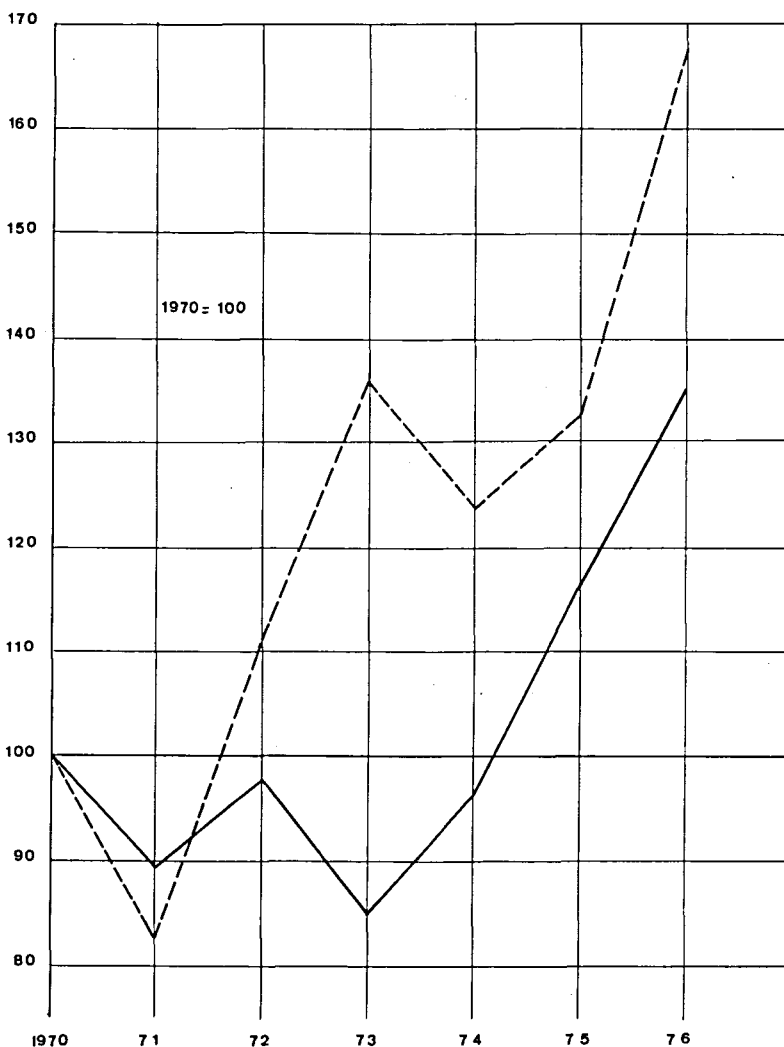


Table 1a — *Public R & D expenditure by NABS objective — 1974**in 1 000 EUR, 1970 prices and exchange rates*

NABS	D	F	I	NL	B	UK	IRL	DK	EUR 9
1	43 419	58 346	6 440	3 412	5 986	10 343	618	1 677	130 241
2	66 082	85 504	4 686	16 138	4 176	33 616	1 359	1 776	213 337
3	97 156	89 216	15 719	22 761	11 481	44 768	1 089	7 544	289 734
4	275 485	150 481	68 980	13 166	36 655	110 869	70	2 960	658 666
5	43 452	69 125	11 549	24 914	10 885	68 202	7 315	9 898	245 340
6	193 143	244 704	23 401	21 375	24 539	260 525	4 736	9 942	782 365
7	103 952	21 452	6 042	21 422	12 325	12 929	909	4 195	183 226
8	105 414	114 988	33 892	8 368	6 317	36 364	—	2 826	308 169
9	303 331	673 679	20 025	12 582	1 587	813 090	—	663	1 824 957
10	1 330 349	463 980	201 070	188 409	131 458	347 313	2 784	61 632	2 726 995
Other	—	8 824	—	6 145	—	—	—	—	14 969
Total	2 561 783	1 980 299	391 804	338 692	245 409	1 738 019	18 880	103 113	7 377 999

Table 1b — *Public R&D expenditure by NABS objective — 1975**in 1 000 EUR, 1970 prices and exchange rates*

NABS	D	F	I	NL	B	UK	IRL	DK	EUR 9
1	46 145	60 177	4 703	3 846	5 491	10 473	591	1 844	133 270
2	66 230	89 182	5 375	21 511	3 206	38 365	1 565	1 657	227 091
3	109 966	97 309	11 226	23 814	8 532	49 908	1 455	8 271	310 481
4	272 394	171 882	74 637	7 846	29 195	113 275	141	3 054	672 424
5	48 511	77 057	12 599	27 877	9 783	69 031	8 436	10 565	263 859
6	189 921	285 729	43 746	17 281	29 562	192 169	4 531	10 322	773 261
7	126 010	22 038	6 047	26 402	10 811	14 863	1 387	4 530	212 088
8	109 511	111 457	36 172	8 908	7 924	35 093	—	3 981	313 046
9	284 981	591 472	14 200	12 765	1 524	720 352	—	783	1 626 077
10	1 330 157	481 719	215 105	199 554	115 607	308 605	2 585	63 941	2 717 273
Other	—	8 221	—	9 433	—	—	—	—	17 654
Total	2 583 826	1 996 243	423 810	359 237	221 635	1 552 134	20 691	108 948	7 266 524

Table 1c — Public R&amp;D expenditure by NABS objective — 1976

in 1 000 EUR, 1970 prices and exchange rates

NABS	D	F	I	NL	B	UK	IRL	DK	EUR 9
1	46 282	60 181	6 773	3 882	6 645	10 626	655	1 980	137 024
2	59 817	88 637	6 037	25 167	3 442	39 840	1 669	1 903	226 512
3	106 365	99 652	17 070	25 701	10 352	49 940	1 400	7 850	318 330
4	273 215	162 862	97 716	7 679	30 248	122 808	212	3 256	697 996
5	48 949	78 758	13 091	27 716	10 431	65 392	8 622	10 936	263 895
6	178 106	208 587	32 032	19 073	31 566	117 681	4 438	10 286	601 769
7	110 140	25 243	6 413	24 634	13 666	16 925	1 519	5 227	203 767
8	116 254	98 180	34 822	10 618	11 331	40 740	87	4 394	316 426
9	288 419	562 638	12 858	12 893	1 433	784 894	—	856	1 663 991
10	1 304 678	473 331	209 153	215 207	119 093	377 575	2 757	70 642	2 772 436
Other	—	6 276	4 159	8 465	—	13 129	—	—	32 029
Total	2 532 225	1 864 345	440 124	381 035	238 207	1 639 550	21 359	117 330	7 234 175

Table 2 — National and Community R&amp;D expenditure

1970 prices and exchange rates

Years	1. Total expenditure EUR 9		2. Int. cooperation expenditure EUR 9			3. Community expenditure			
	million EUR	Index 1970 = 100	million EUR	as % of 1.	Index 1970 = 100	million EUR	as % of 1.	as % of 2.	Index 1970 = 100
1970	6 047.5	100.0	682.4	11.3	100.0	68.9	1.1	10.1	100.0
1971	6 799.2	112.4	639.4	9.4	93.7	61.5	0.9	9.6	89.3
1972	7 077.5	117.0	677.5	9.6	99.3	67.4	1.0	9.9	97.8
1973	7 432.8	122.9	780.6	10.5	114.4	58.5	0.8	7.5	84.8
1974	7 378.0	122.0	788.0	10.7	115.5	66.1	0.9	8.4	95.9
1975	7 266.5	120.2	748.1	10.3	109.6	80.0	1.1	10.7	116.1
1976	7 234.2	119.6	730.1	10.1	107.0	93.0	1.3	12.7	134.9

## Background, bases and preparation

1. Background to and justification for these 'Guidelines for the Community policy in the field of science and technology'.

On 14 January 1974 the Council of Ministers decided on the development of a common policy on science and technology that would include coordination of national policies and the joint implementation of projects of interest to the Community. The Council of Ministers approved four Resolutions.<sup>1</sup>

— Council Resolution of 14 January 1974 on the coordination of national policies and the definition of projects of interest to the Community in the field of science and technology.

— Council Resolution of 14 January 1974 on the participation of the European Communities in the European Science Foundation.

— Council Resolution of 14 January 1974 on an initial outline programme of the European Communities in the field of science and technology.

— Council Resolution of 14 January 1974 on a programme of research as an instrument of forecasting, assessment and methodology in the European Communities.

Of particular importance for these guidelines are the following extracts from Article 1 of the Council Resolution of 14 January 1974 on the coordination of national policies and the definition of projects of interest to the Community in the field of science and technology:

'(a) In order to define objectives and ensure the development of a common policy in the field of science and technology involving the coordination of national policies and the joint implementation of projects of interest to the Community the following operations shall be progressively carried out within the Community:

(1) the examination and comparison of Member States' national policies in this field, particularly their potential, plans, programmes, projects, budgets, measures and methods in this field;

(2) the identification, analysis and comparison of the objectives of the Member States in order to determine the common goals to be adopted and the appropriate ways and means of achieving them;

(3) the coordination of national policies on the basis of 1 and 2 above with the aim of:

— eliminating unnecessary or unwarranted duplication of effort in national programmes;

— avoiding any divergent tendencies which would be contrary to the interests of the Member States;

— improving the efficiency, or reducing the cost of national

and Community projects by sharing of tasks or, possibly, by the concentration of resources or research teams;

— gradually harmonizing procedures for the formulation and implementation of scientific policies within the Community;

(4) the definition of projects of interest to the Community, taking into account possibilities for participation in some of these projects by non-member countries, particularly European ones;

(5) the selection of appropriate ways and means for implementing these projects;

(6) consultation for the purpose of:

(i) prior information on the development of and prospects for cooperation between Member States or with non-member countries with a view to the possible harmonization or coordination of the attitudes of Member States;

(ii) seeking as a general rule a common attitude on the part of Member States towards cooperation with or within international organizations.

(b) For the purpose of accomplishing the tasks defined above, Member States shall transmit the necessary information available to the Commission, at the appropriate time and before adopting final decisions at national level, with the exception of information militarily or industrially classified as secret.'

2. Further bases for these guidelines are the Commission Communication, approved by the Council on 15 December 1975, entitled 'Common research and development policy',<sup>2</sup> the results of the Milan Symposium on the science and technology policy for the European Community held in May 1976 and the work of various committees, in particular the Scientific and Technical Research Committee (CREST) and the European Research and Development Committee (CERD).

3. For earlier work on the selection criteria defined here for the Community research and development programmes and projects, see the following documents:

— Objectives and resources for a Community policy on scientific research and technological development.<sup>3</sup>

— Scientific and technological policy programme.<sup>4</sup>

<sup>1</sup> OJ C 7 of 21.1.1974.

<sup>2</sup> Supplement 4/76 — Bull. EC.

<sup>3</sup> Supplement 6/72 — Bull. EC.

<sup>4</sup> Supplement 14/73 — Bull. EC.

## Abbreviations used

ACPM	Advisory Committee on Programme Management
B	Belgium
CBR	Community Bureau of References
CCF	Consultative Committee for Fusion
CCFR	Coordinating Committee on Fast Reactors
CERD	European Research and Development Committee
CIDST	Committee for Scientific and Technical Information and Documentation
CIRD	Interservice Committee on Research and Development
COMAC	Steering Committee on Concerted Action
COPENUR	Standing Committee on Uranium Enrichment
COREPER	Permanent Representatives Committee
COST	European cooperation in the field of scientific and technical research
CREST	Scientific and Technical Research Committee
CRM	Committee on Medical Research and Public Health
D	Federal Republic of Germany
DK	Denmark
ECDIN	Environmental Chemicals Data and Information Network
ECE	Economic Commission for Europe (United Nations)
ESC	Economic and Social Committee
ECSC	Consultative Committee of the ECSC
ESF	European Science Foundation
EUR	Statistical unit of account of the European Communities equivalent to 0.888671 grams fine gold. This unit corresponds to the US dollar before the Smithsonian Agreement of December 1971
EUR-9	The nine Member States of the European Communities
Euronet	European information network
F	France
FAO	Food and Agriculture Organization (United Nations)
FAST	Forecasting and Assessment in the field of Science and Technology
GAC	General Advisory Committee of the JRC
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IRL	Ireland
I	Italy
JRC	Joint Research Centre
NABS	Nomenclature for the analysis and comparison of science budgets and programmes
NEA	Nuclear Energy Agency
n.i.	Not itemized
NL	Netherlands
OECD	Organization for Economic Cooperation and Development
R & D	Research and Development

SCAR	Standing Committee on Agricultural Research
STC	Scientific and Technical Committee
UK	United Kingdom
UNEP	United Nations Environment Programme
Unesco	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WHO	World Health Organization



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