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SECOND COMMISSION WORKING DOCUMENT CONCERNING RTD POLICY IN THE COMMUNITY AND THE FOURTH FRAMEWORK PROGRAMME (1994-98) OF COMMUNITY RTD ACTIVITIES

CONTENTS

SUMMARY
OF THE
SECOND WORKING DOCUMENT
CONCERNING THE FOURTH FRAMEWORK PROGRAMME
OF RTD AND DEMONSTRATION ACTIVITIES (1994-98)

Objective:

To update the first working document of October 1992 (COM(92)406) to take account of:

- *the Edinburgh conclusions*
- *developments in the world context*
- *comments and opinions concerning the first working document*

in order to accelerate interinstitutional deliberations on the Fourth Framework Programme (political agreement) and reach a rapid agreement following ratification of the Maastricht Treaty.

Policy changes:

- *Greater selectiveness with regard to Community RTD activities in order to increase their economic impact (focusing on generic technologies)*
- *Greater integration of national, Community and European activities (Article 130h of the EC Treaty)*
- *Develop research/training synergy*
- *Increase the flexibility of Community activities in order to respond rapidly to new scientific and technological challenges*
- *Bring the financial data into line with requirements and the new financial perspective for 1993 to 1999.*

Greater selectiveness

- *The Fourth Framework Programme covers all research, technological development and demonstration activities. It comprises four activities. The first (RTD and demonstration programmes) contains only seven themes compared with 15 in the Third Framework Programme. Two new themes are introduced: research for a European transport policy and targeted socio-economic research. Each theme covers one or more area of RTD and demonstration.*

- *The selection criteria set out in the first working document have been adjusted to take account of the need to focus and integrate activities, thus reducing the number of areas originally proposed from 54 to 28.*

- *Compared with the October 1992 document, greater priority is accorded to the first activity in order to take account of the Edinburgh guidelines concerning the need to focus on generic technologies of multisectoral application.*

- *When the Commission prepares its formal proposal a selection will be carried out within the individual areas as well in order to focus activities on mobilizing projects and integrate national, Community and European activities to a greater extent.*

This objective will be pursued at three levels:

- *preparation of RTD and demonstration policy options (a new area is proposed in order to promote work in support of decision making)*

- *political level (regular Ministerial consultations)*

- *operational level: between those responsible for RTD activities.*

Appropriate procedures need to be developed within the programmes on the basis of the experience built up and the desire to encourage researchers at national, Community and European level to work together.

Research/training synergy

In order to promote growth and reinvigorate economic and social development a combination of labour and capital is not enough; a third factor is needed – a combination of knowledge, know–how and dissemination of know–how.

Research training activities will be carried out within the themes of the first activity and across the board (fourth activity) to promote the cross–frontier mobility of researchers working on emerging themes. They will be supplemented by research activities making it possible to introduce innovation into education and training systems and by education and training schemes deriving from the COMETT and ERASMUS programmes, etc.

Flexibility

The decisionmaking system is very unwieldy. The Community needs to be able to respond rapidly to scientific and technological changes intervening between the adoption of a framework programme and its review after three years.

Measures are proposed at three levels:

- *framework programme: preparatory activities*
- *specific programmes: limited amount for technology promotion earmarked for unsolicited proposals from SMEs; links with EUREKA*
- *work programmes: adaptability.*

Financial resources

- *13.1 billion ECU (current prices) for the 4th Framework Programme (1994-1998);*
- *with regards to the distribution between the four activities within the Framework Programme, increased priority will be given to the third activity (dissemination) and, to a lesser degree, to the second activity (international cooperation) relative to funding levels during the period 1990-1994;*
- *within the first activity (RTD and demonstration programmes), it is suggested, as an indicative breakdown, to give increased priority to work addressing industry's needs and affecting industrial output within all the topics, as well as to research on a European Transport Policy and life sciences and related technologies.*

EXPLANATORY MEMORANDUM

Introduction

1. In October 1992 the Commission published a working document concerning the Fourth Framework Programme (COM(92)406) with a view to pressing ahead with the discussion on the general guidelines for this Framework Programme pending ratification of the Treaty on European Union. The first working document provided an opportunity for a wide-ranging debate with the constructive participation of the Member States, the European Parliament, the Economic and Social Committee and other Community organizations, together with research scientists and representatives of industry. A very significant point which emerged from the discussions was the emphasis placed on the important role of research with a view to improving the quality of life and strengthening the competitiveness of industry in the Community.

2. In Edinburgh in December 1992 the European Council stressed the need for Community RTD activities to continue to focus on generic, precompetitive research with a multisectoral impact; at the same time it finalized the financial perspective for 1993-99, laid down the general framework for the Community funding allocated to research and called on the Commission to make some changes:

"*Community support for R&D should continue to focus on generic, precompetitive research and be of multisectoral application. EUREKA should remain the principal vehicle for supporting R&D activities which are nearer to the market and the Commission should bring forward proposals to improve the synergy between the Community's research activities and EUREKA. Improving the dissemination of results amongst enterprises, particularly small and medium-sized businesses, cost-effectiveness and coordination between national programmes should be priorities for Community action. These conclusions should be reflected in the consideration and adoption of the Fourth Framework Programme.*"

The European Council also called upon the Commission:

"*to bring forward proposals for improving the management and efficiency of research funded by the Community to achieve better economic effectiveness. To this end the selectivity of actions should be increased, and it should be ensured that Community activities contribute the most value added possible to efforts already under way in the Member States.*"

This second working document takes account of the comments received, developments in the world context and the guidelines issued at the Edinburgh European Council. It complements and clarifies the broad lines set out in the October 1992 working document indicating how to mobilize more effectively the capacities of the Community as a whole, the aim being to move away from a discussion focusing in the main on the activities themselves to concentrate on the framing of a genuine RTD policy for the Community. The object of this approach is to secure agreement between the three institutions on the broad lines of the Fourth Framework Programme by mid-1993 and to facilitate rapid adoption of the formal proposal which the Commission is to put to the Council and Parliament once the Treaty on European Union is ratified and enters into force.

The Fourth Framework Programme should:

- make *Community activities more selective* so as to increase *the economic spin-offs* from Communit research, in particular by concentrating on generic technologies which will enable European industr and its subcontractors to go back on the offensive in international competition;

- seek a closer *integration of national and Community RTD activities*;
- create the conditions for increased *synergy between research and training*;
- empower the Community, using appropriate means, *to respond rapidly* to scientific and technological change;
- be allocated sufficient financial resources *to maintain a sustained effort at Community level* to pursue realistically the objectives set by the Treaty on European Union and thus contribute the most value added possible to efforts already under way in the Member States.

Greater selectiveness to secure improved economic benefits

3. This entails being more selective in the activities carried out, so as to lay the scientific and technical foundations needed for sustainable, environment-friendly development in industry, agriculture and services, exploiting the advantages of the single market in order to improve Europe's competitiveness and the quality of life.

In keeping with the Community's industrial policy strategy endorsed by the Council and given the needs of the other common policies, research activities should focus on precompetitive research into technologies with a multisectoral impact which can help increase industrial competitiveness, especially in key areas, and on themes of interest to society in general; it is necessary to ensure that the results are transferred rapidly to industry, especially to small and medium-sized businesses and to the branches of the economy which will use them. Certain major objectives guide the choice of research activities: to develop efficient and safe infrastructures and in particular an information and communications technology infrastructure; to produce efficiently, cleanly and safely on the basis of modern organization of production; to make environmental protection an aspect of industrial competitiveness; to promote an improvement in health-care and food quality and food hygiene; to ensure technological and industrial integration within the internal market (in particular by strengthening coordination between RTD policy and standardization policy); to anticipate technological and industrial changes so as to ensure that greater account is taken of the needs of the market; to increase the synergy between international cooperation activities and the Community's external policies.

The focusing of Community RTD activities is reflected at three levels:

- the structure of the Framework Programme: on the grounds of rationalization it is proposed that the first activity (research, technological development and demonstration programmes) should be organized around seven main themes including two new themes concerning research into a European transport policy (strategic aspects and systemic and general aspects resulting from Community transport policy and leading to generic activities coming from other themes) and the targeted socio-economic research. Annex I proposes a structure for the Fourth Framework Programme which ensures a large degree of continuity with the Third Framework Programme and takes into account the new elements needed;

- selectiveness criteria: Annex III to the first working document set out criteria for defining Community RTD activities, Annex II to this document (Selection Criteria for Community Activities) supplements these criteria, adding points concerning greater focusing of activities and the integration of national and Community activities; they will be applied when selecting projects;

- applying these criteria to focus Community activities on a smaller number of research, technological development and demonstration areas: the detailed description of the subject matter of the activities proposed for the Fourth Framework Programme will be finalized when the Commission presents its formal proposal. However, it is possible to make progress in the inter-institutional discussion

on this subject by making a preliminary clarification. Careful analysis of the scientific and objectives (thematic content) prompts the Commission to suggest a significant reductio proposed number of core thematic areas in the first working document (from 54 to 28) in t of the financial perspective, the criteria set out in Annex II, and the opinions received so far. Annex III sets out the reasons for and the results of this focusing exercise. Lastly, it relates this smaller number of areas to the four activities of the Fourth Framework Programme, including the major themes making up the first activity.

Closer integration of RTD activities in Europe

The principle of subsidiarity dictates that the Community should take action on research, only if the objectives can be better achieved by the Community than by the Member States acting on their own. Article 130h of the Treaty on European Union also requires the Community and the Member States to coordinate their activities so as to ensure that national policies and Community policy are mutually consistent. It must be acknowledged that not enough has been done on this point so far. A new approach is needed, with the detailed procedures tailored to each research area.

Such consistency is pointless unless the Community aims to achieve the harmonious development of its scientific and technological resources. Synergy between RTD policy and the structural policies should be strengthened. The amendments proposed by the Commission to the Regulations governing the Structural Funds provide one opportunity in this connection during the new programming period (1994-99). The emphasis now being placed on technology in the less-favoured regions and on skills in the area of science and technology offers new prospects for synergy, in particular with the third and fourth activities of the Fourth Framework Programme. While applying the principle of excellence, Community RTD activities provide a second opportunity. The research priorities reflected in the first activity of the Fourth Framework Programme take account of the interests and capacities of the Member States, including the less advanced ones. The RTD programmes can make an effective contribution at little cost to making good use, for the benefit of the Community as a whole, of the scientific and technological potential of the less-favoured regions by networking them with centres of excellence in the most advanced regions. The third and fourth actions will have a growing impact on the less developed regions and countries through specific measures (national/regional relay centres, transfer networks geared to the traditional industries, measures to avoid the "brain drain", "European chairs"). This synergy between the Structural Funds and research activities would contribute to a genuine cohesion policy by developing the potential of the regions and relating them to the European research area. However, it should not be forgotten that it is primarily the responsibility of the Member States to establish an overall strategy aimed at making the best use of the capacities created by the various sources of Community funding available. A Commission paper on synergy between RTD policy and the structural policies will be sent to the Council, the European Parliament and the Economic and Social Committee.

The call for greater consistency between the national policies and Community policy is based on the fact that less than 4% of all government expenditure on civil research and technological development by the Member States is on joint action under a Community policy.

It is proposed that the following types of action should be launched:

- evaluation of science and technology policy options to supply a common knowledge base for discussions on RTD activities in Europe (see Annex IV);

- political concertation at the highest level, in the form of regular meetings of the European Ministers of Research in conjunction with the Ministers with special responsibility for industry and economic development specifically on this issue:

- concertation at the operational level between the heads of the national and European research bodies and those responsible in industry (producers and users).

7. As far as the practical implementation of RTD activities is concerned the integration of national and Community activities could be achieved in three ways:

   - greater synergy and mutual enhancement of the action taken at national level could be achieved by giving priority in the specific programmes to activities aiming at such closer integration;

   - in fields where worldwide collaboration is already established, only a coordinated, united Europe will be able to hold its own in talks with the other major partners, particularly the USA and Japan; it is proposed that national and Community activities should be integrated to a large extent in certain areas which lend themselves to this approach;

   - integration to create the "European research area" while maintaining the diversity and plurality of approaches will require closer coordination of the research conducted at European level under the auspices of international bodies such as CERN, ESA, ESO, EMBO, EMBL and the ESF.

8. Alongside the traditional networks established in the context of Community activities hitherto, this integration can be achieved with thematic networks of excellence, concertation networks and consortia for integrated projects (see Annex III).

   The Joint Research Centre will make its contribution to this new approach.

Synergy between research and training

9. Building on the existing Human Capital and Mobility Programme, activities to promote the mobility of researchers and stimulate the creation of networks must form an important element of each theme in the first activity under the Fourth Framework Programme. They should also be the subject of a general activity (fourth activity) to develop human resources so as to make it possible to react to new research areas or subjects which emerge.

   Furthermore, research into education and training in Europe should promote the introduction of innovations into training methods. A new research area is therefore proposed.

10. The role of training activities, which seek to raise the general level of scientific and technical competence, is likewise of strategic importance. This calls for action to build on the foundations laid by the Erasmus and Comett programmes by promoting training at European level and mobility as well as promoting scientific information and culture in Europe alongside the implementation of the Fourth Framework Programme.

The ability to respond rapidly to developments in science, technology and industry

11. Related to the objective of improving the economic spin-offs from Community research there is the problem of the speed of response to developments in science and technology. The Community's institutional and decision-making framework for RTD is unwieldy.

The Community therefore has to be able to respond swiftly to developments in the maintaining the interinstitutional balance. This means first of all respecting the nature and of detail of the first two levels of Community legislation (Framework Programme, specific programmes) and the implementation level (work programme). Flexibility could be built into Community RTD activities at three levels:

- Framework Programmme: provision must be made for a limited range of activities so that preparatory activities, definition phases for new programmes and possibly pilot projects can be launched between the time when the Framework Programme is adopted and its mid-term review;

- specific programmes: to ensure flexibility, a limited amount of funds should be set aside, in each specific programme, for unsolicited proposals from operators (mainly from SMEs and technical centres - research organizations) which have to be processed very quickly (technology promotion);

- work programmes: the ability to adapt the work programmes under the specific programmes will enable the Member States and the European Parliament to have a real say in how to respond to developments in science and technology: in the case of the Member States, by being represented on the programme committees and, in the case of Parliament, through the annual budget procedure.

12. The need to strengthen links between Community activities and EUREKA should be stressed in this context. Recalling the respective roles of EUREKA and Community research, the Edinburgh European Council emphasized the need to strengthen the synergy between them. Considerable progress has been made in this connection, and the basis for greater cooperation has been established by the Commission and the EUREKA authorities in accordance with the twin principles of greater transparency in the procedures followed by the countries concerned with regard to EUREKA projects and the Framework Programme and a clearer definition of their respective roles. The essential elements are better circulation of information concerning projects and support measures (standardization etc.), the taking into consideration in EUREKA projects of the results of Community projects, greater clarity in the definition of the respective roles of each forum vis-à-vis industrialists, and especially SMEs, more systematic taking into account of the precompetitive phases of EUREKA projects within the Framework Programme and joint examination of large-scale strategic projects proposed by industrialists. As regards the Community, this entails the establishment, after an extensive pilot phase, of new mechanisms for taking into account projects from the EUREKA framework outside the timetable for Community calls for proposals in accordance with the normal selection rules, along the lines of earlier decisions taken on a case-by-case basis concerning certain large EUREKA strategic projects (JESSI, HDTV, COSINE). The financial resources to be allocated to this activity could be included on an indicative basis in the work programmes for the Community programmes. The same would apply to projects which are part of a research activity within other European scientific and technological cooperation forums. The projects would be taken into account by the respective authorities (in the case of the Community, by the Commission assisted by the committees, on which the Member States are represented) and compared with the merits of projects proposed following the publication of Community calls for proposals. Any involvement by the Community would have to be consistent with the objectives of the specific programmes and confine itself to the precompetitive and generic aspects of projects submitted to the committees for appraisal. EUREKA's national and international authorities should ask the industrialists concerned to look more systematically the relationship with Community RTD actions at each stage right from the defintion of EUREKA projects through to their execution. EUREKA should remain the main vehicle for support for RTD activities which are closer to the market, including demonstration and production development projects, and give rise to increased coordination between the RTD activities of the EUREKA member countries, while drawing benefit from the flexibility and "bottom-up" nature of the initiative.

The financial implications of the RTD priorities

13. In the context of the financial perspective decided upon in Edinburgh, the new guidelines and the resulting priorities for RTD have the following financial implications:

- the maximum overall amount allocated to the Fourth Framework Programme for the period 1994–98: the 1993–99 financial perspective decided upon in Edinburgh lays down a maximum overall amount for Community RTD activities ranging between one–half and two–thirds of the funding for internal policies over that period; also the growth in RTD expenditure must be consistent with the overall growth in spending on the internal policies (category 3 of the financial perspective); on the basis of RTD expenditure for 1993, the Commission has adjusted its October 1992 assessment taking into account these various considerations and an appraisal of the financing requirements, and is now proposing ECU 13.1 billion ECU at current prices for the Fourth Framework Programme (cf. Annexe 1). This financial envelope, however, must cover needs expressed by the whole of the Community and thereby contribute to supporting the competitiveness of its industry. Given the increased emphasis on priority areas, this amount will considerably strengthen certain activities whilst at the same time allowing certain new areas to be included within the first activity; among other things it will cover the needs of the energy demonstration activtities which were previously the responsibility of the THERMIE programme and which are now the responsibility of the Framework Programme; it also guarantees an adequate reply by the Community to external challenges such as massive investments by other countries, notably the USA and Japan and internal challenges such as the tendency not to increase national research budgets;

- the breakdown of this overall amount between the four activities and the relative priorities assigned to the major themes making up the first activity: Annex I sets out the relative shares for each of the four activities proposed; the financial balance between the four activities has been altered compared with Annex I to the first working document to take account of the decisions taken and guidelines issued by the Edinburgh European Council (financial framework, priority given to the first activity concerning generic technologies, greater importance attached to dissemination and utilization of results within the themes and at centralized level); given the comparative importance of this first activity, Annex I also gives additional indications concerning the respective priorities assigned to the major themes making up this first activity. Thus it is proposed to finance each research for a European Transport Policy to the tune of 280 MECUs given that the Community transport policy requires specific research work which must be sufficiently financed; among other things so as to contribute to a better quality of life in Europe, life sciences and related technologies must benefit from of tools to help with decision making in the field of Community RTD policy on the other hand require specific research work which must be adequately financed; firther so as to contribute to improving the quality of life in Europe, the life sciences and related technologies must benefit from additional means in order to cope with increasing needs to do research in general biotechnology and biomedicine and health, as must the research that is needed to accompany the reform of the Community policies in the field of agriculture, forestry, rural development, fisheries and fish farming.

ANNEX I

FOURTH FRAMEWORK PROGRAMME (1994–98)

	MECU (current prices)
First Activity (Research, Technological Development and Demonstration Programmes)	10925
Second Activity (Cooperation with Third Countries and International Organizations)	790
Third Activity (Dissemination and Application of Results)	600
Fourth Activity (Stimulation of the Training and Mobility of Researchers)	785
MAXIMUM OVERALL AMOUNT	13100

	MECU (current prices)
Indicative breakdown between themes in the first activity	
-Information and Communications Technologies	3900
-Industrial Technologies *	1800
-Environment *	970
-Life Sciences and Technologies *	1325
-Energy *	2525
-Research for a European transport policy	280
-Targetted Socio-economic Research *	125
	10925

* of which JRC 1067 MECU. N.B.: in addition to participating in the first activity the JRC will also participate in the third activity to the tune of 70 MECU.

ANNEX II

SELECTION CRITERIA FOR COMMUNITY ACTIVITIES

All the scientific and technical objectives indicated in the Framework Programme must be clearly defined, carefully selected and pursued applying the following criteria:

1. Community research, technological development and demonstration (RTD) activities must focus on clearly defined objectives which will contribute towards:

   - strengthening the technological base of Community industry and providing it with the knowledge and know-how (skills) required to make it more competitive at international level;

   - defining and implementing Community policies; or

   - meeting the needs of society and promoting a sustainable development.

   This approach will also yield short-term, medium-term or long-term economic benefits and should contribute to the strengthening of economic and social cohesion in the Community, while being consistent with the pursuit of scientific and technical quality.

2. The Community's RTD activities must observe the principle of subsidiarity, whereby the Community takes action if, and only if, the objectives cannot be fully achieved by the Member States and can be better achieved by the Community.

3. On this basis, the following types of action could warrant Community activities:

   - action on a very large scale for which Member States could not provide the necessary facilities, finance and personnel, or could only do so with difficulty ("critical mass");

   - activities tackling ambitious themes, addressing large-scale problems or of long-term scientific benefit. Activities of this type require specific research at Community level and can thus often enhance the Community's overall contribution to the solution of international problems;

- activities producing obvious financial benefits which justify joint action even allowing for the extra costs inherent in all international cooperation;

- activities which are complementary to those being carried out nationally and which aim at strengthening the scientific and technological base of the Community as a whole and where there is a better chance of applying the results at Community level;

- activities contributing to the achievement of a common objective, such as completion of the single market or unification of the European scientific and technical area, and, where the need is felt, to the establishment of uniform rules and standards.

4. The Community's RTD activities must form part of projects to be assessed on the basis of their scientific and technical excellence.

In this process of selecting the projects to be carried out in the specific programmes, priority will be given to projects:

- allowing closer integration of the research being conducted in the Member States, at Community level and within other European and international cooperation forums;

- making it possible to respond as effectively as possible to the Community's objectives regarding economic and overall industrial competitiveness.

ANNEX III

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES

1. The new guidelines for a genuinely Community RTD policy, as reflected in the criteria set out in Annex II to this document, have compelled the Commission to engage in a stringent focusing and selection exercise affecting all the RTD activities set out in the first working document (COM(92)406.

   The activities selected are designed to support the common policies and are primarily aimed at strengthening the Community's scientific and technological bases and those of its industry in order help it compete more effectively at international level. In particular, in the light of the industrial policy adopted in 1990 and in order to meet the growing needs of society, a number of Community public-interest objectives have been identified (see point 4 of the Explanatory Memorandum); Community research should make a contribution to achieving these aims.

   To use Community funds as efficiently as possible, a preliminary selection has been made between the core thematic areas proposed in the first working document and within each of them.

   Where each research area is concerned, particular attention has been paid to the possibilities of integrating national, Community and European activities.

2. The following list of RTD activities indicates that this focusing exercise has entailed a significant reduction in the number of core thematic areas from 54 in the first working document to 28 areas in this one:

   First activity

   Information and communications technologies; developing the information and communications infrastructure
   - telematic technologies in support of applications of general interest
   - technologies for integrated information and communications systems
   - technologies for advanced communications services
   - information technologies

   Industrial technologies
   - design, engineering, and systems technologies and technologies for the human-centred organization of production
   - materials and materials processing and recycling technologies
   - advanced propulsion systems
   - standardization-related research, measurement and testing

Environment
- natural environment and global change
- innovative environmental protection technologies

Life sciences and technologies
- General biotechnology
- biomedicine, health and drugs
- application of life sciences and technology in agriculture, forestry, rural development, agro-industry and fisheries

Energy
- technologies for cleaner and more efficient production and use of energy
- nuclear safety
- controlled thermonuclear fusion

Research for a European transport policy
- research for a European transport policy

Targeted socio-economic research
- research into problems of social integration
- research on education and training
- evaluation of science and technology policy options

Second activity

- scientific and technological cooperation in Europe
- scientific and technological cooperation with non-European industrialized countries
- scientific and technological cooperation with developing countries

Third activity

- dissemination and utilization of results
- transfer of technology
- financial environment of the transfer
- scientific services for Community policies

Fourth activity

- training and mobility of young research scientists

3. In order to conduct the research two main avenues will be used: (i) focusing financial resources on a limited number of subjects selected for their specific added value (shared-cost activities) and (ii) encouraging the integration of national, Community and European activities by appropriate means

In particular, alongside the traditional networks established in the context of Community activities hitherto, this integration can be achieved by the following means:

- *Thematic networks of excellence* bringing together for a given technological or industrial objective manufacturers, users, universities and research centres to facilitate the integration and transfer of knowledge and technologies and ensure that greater account is taken of the needs of the market. They would be organized, with catalytic support from the Community, along the lines already tested in areas such as microsystems, linguistics and flexible manufacturing. They would be "bottom-up" in both design and management.
- *Concertation networks* in which the Member State would play an important role by identifying the national laboratories or institutes which would take part in the activity decided upon. The Commission would organize the concertation. This method could be used to carry out epidemiological research and clinical studies under the biomedical research programme, for example.
- *Consortia for integrated projects* along the lines of the Fusion Programme. The Member States identify the laboratories or institutes which would take part in the integrated project which would be supported by pooling financial resources from the Community. Major European research bodies such as CERN, ESA and EMBL could also be invited to take part.

In this connection, the Commission considers that the JRC can make a contribution towards the implementation of this new approach. As it is itself actively engaged in research, and is closely involved in the formulation and implementation of Community policies, it could play the role, in the scientific and technical areas where its competences lie, of organiser, of focal point for networks bringing together public and private laboratories in the Member States, and could act as a centre of gravity for European research consortia in specific areas.

The following descriptions reflect this new approach.

FIRST ACTIVITY

Research, technological development and demonstration programmes

Information and communications technologies; Developing the information and communications infrastructure

Over the last few years, information and communications technologies (ICT) and industries in Europe and in the rest of the world have undergone far-reaching changes which call for a rethink of the priorities and procedures for the Community's RTD activities in this field.

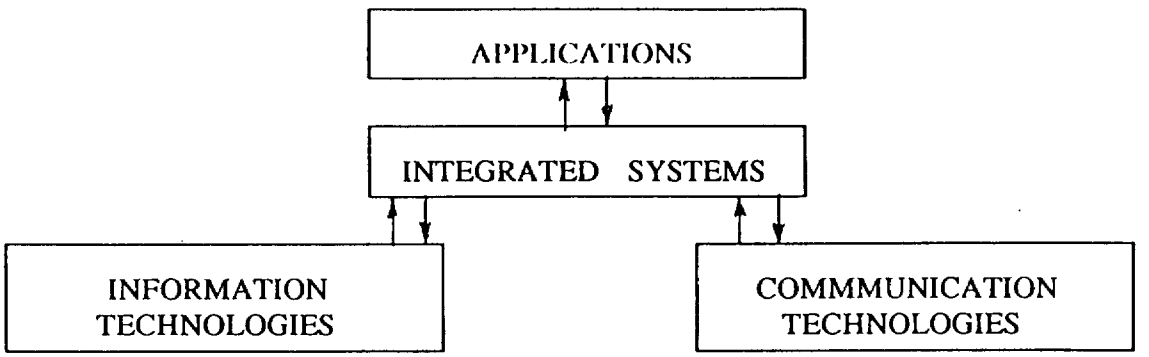
The blurring of the borderlines between information and communications technologies and other sectors, coupled with the growing overlap between information technology, telecommunications and telematics, make the establishment of new information and communications infrastructure essential both for overall economic growth and to meet society's new needs. Whereas in the 1980s RTD policy focused on the technology for a growing ICT industry, for the 1990s the Community needs a user-orientated policy geared to developing the new infrastructure.

This new infrastructure encompassing all technologies, products, services and applications combining electronics, information technology and telecommunications into increasingly integrated systems reflects a series of contrasting phenomena.

It is dynamic. This information and communications infrastructure optimizes the contents of the data, as input, storage, processing and transmission capacity and efficiency rise rapidly and relentlessly as a result of technological progress and the closer involvement of users keen to steer developments towards satisfying their own specific needs.

It also determines the development of most economic and social activity. Businesses need this infrastructure to gather financial and commercial data without delay, to transfer funds, to exchange specifications with their partners and to avail themselves of specialist services which they would not otherwise be able to obtain. Increasingly, manufacturing processes based on advanced information technologies are enabling industry to provide higher quality products at lower cost with minimum impact on the environment. Workers in small firms can look forward to access to distance-learning vocational training courses in the near future. Efficient operation of government departments, health-care systems and transport networks also depends on this infrastructure, which must meet the new challenges facing society.

The new infrastructure consists of four main technological components with the following overall structure:



ICT areas encompass the technologies which are at the very heart of the infrastructure and which supply the component elements for systems incorporating these two technologies. In their turn, they form the basis for the implementation of applications in areas such as health-care, transport and education. This four-part structure determines the main areas in which RTD efforts should be focused.

By contrast, the economic situation and the interest shown by the users themselves are leaving the pace of technological progress further and further behind demand. The market is slowing down, competition is becoming fiercer and users are growing more demanding as they learn to take advantage of the range of options offered by open systems which release them from their dependence on the makers.

This paradox - with information and communications technologies becoming increasingly necessary and omnipresent but less and less profitable - poses a serious challenge to the economy and social progress and, in particular, calls for a new research and technological development policy from the Member States and the European Community.

Given the economic and structural difficulties currently confronting the industries in question and the budget restrictions, there is a growing danger that establishment of this new information and communications infrastructure could be cast into doubt or delayed which, in turn, could jeopardize economic recovery and the vital response to society's new needs. This is why the public authorities all over the world are showing renewed interest in information technology, electronics and telecommunications.

These facts have now been recognized and action has been taken in Japan, the United States and several Member States.

The European Community has long been aware of the economic and social importance of new information and communications technologies. Both the Second and Third Framework Programmes successively increased the share of the funding earmarked for their development.

However, the Community's efforts in this field must be radically adjusted to the new situation described above, which will entail adapting both the content of the programmes and the procedures for implementing them.

As regards the content of the activities, the Commission feels that the European Community's contribution should concentrate on a limited number of priority generic technologies or technologies with multiplier or structural effects, by virtue of the type of activities to which they apply.

Four areas, each combining continuity and novelty, comply with these criteria. They focus on the four components of the information and communications infrastructure defined above. They were selected after careful examination of the strengths and weaknesses of industries and research centres in the Community with regard to infrastructure needs, taking account of the conclusions of the recent evaluation of the programmes and of the views expressed by the national authorities within CREST and on the management committees.

They cover the development of:

- telematic technologies in support of applications of general interest;
- technologies for integrated information and communications systems;
- technologies for advanced communications services;
- information technologies.

These four areas combine the contents of a number of the core themes included in the working document submitted to the Council and the European Parliament on 9 October 1992 and are defined in greater detail below.

The first area concerns application programmes tailored to society's fundamental needs and to creating new markets for the data processing and communications industries. The aim of these programmes is to develop technologies which can be added to the basic technologies in order to satisfy the requirements of specific uses and the need to develop functional specifications and to confirm the R&D results in full-scale tests.

These include technologies for health-care services and the integration of the handicapped and the elderly, and for telematic systems for transport and flexible and distance learning, for rural areas and for exchanges of information between researchers, libraries and administrations.

These themes are taken from core themes 5, 8 and 9 in the first working document, and include the part of core theme 18 relating to the handicapped and the aged.

The second area covers projects combining data processing and communications technologies into complex, multi-application systems requiring the involvement of large numbers of researchers and users from different disciplines.

They include information and language engineering, information technology, high-performance networking and integrated customized systems, the contribution of ICT to functional integration in manufacturing, technologies for multimedia systems and information system security.

These technologies correspond to all or part of core themes 3 to 7 and 10 in the first working document.

The third area covers generic activities in support of many and varied end-uses. The technologies in question allow the integration of "intelligence" into networks, and also relate to digitalized video services, photonic switching and mobile communications.

They correspond to core theme 7 in the first working document.

The fourth area also covers generic IT activities, including the development of microelectronic technologies, particularly ASICs, open microprocessor systems, integrated microsystems and flat screens, and optimum use of software and distributed data processing (data bases, man-machine interface and open architectures).

These technologies correspond to all or part of core themes 1 to 4 in the first working document.

As regards the procedures for implementing the activities, a number of considerations must be taken into account:

- The projects should focus largely on a few major themes in order to avoid the dispersion noted in the past. This focusing should be accompanied by closer coordination of national and Community research activities. This approach will also ensure greater complementarity with EUREKA.

- In conjunction with technology promotion and better dissemination of technology, it will also enable SMEs to take part in better targeted clusters of projects and derive greater benefit from Community programmes.

- users will be involved more closely since use of technologies is the best guarantee that they meet the needs of the market.

- The RTD activities in certain areas could use clusters of targeted projects accompanied and strengthened by networks of excellence, associations of suppliers and users, the coordination of national initiatives, international cooperation, special campaigns to disseminate the results, and training activities complementary to and coordinated with similar, more centralized schemes where necessary. These activities will combine targeted action, and hence selectiveness and efficient use of resources with the flexibility and responsiveness needed for the management of change.

Industrial Technologies

In view of the globalization of markets, the emergence of new competitors, the internationalization of the processes involved in the acquisition of new technologies, and the need to protect the environment more effectively, industry is obliged to adapt its structure and its cooperation and competition strategies.

In this context, the Community's technology strategy has an important role to play as a catalyst and in support of industry's initiatives and efforts since a combination of national and Community activities is essential in order to stimulate industry's capacity to develop new products and processes meeting the needs of consumers and of society in areas such as transport, habitat, health-care, environment, sustainable resource-management and working conditions.

In accordance with the Community's new industrial policy, Community activity should focus on areas of technology the applications of which will have a rapid impact in a sufficiently large field of industrial activities.

Against this background, the Community activities will aim at promoting multidisciplinary research, the development and application of generic technologies, multi-sectoral cooperation, interfaces between assemblers and subcontractors, links between industry and universities, research by and for SMEs, and training and education in an industrial context.

The activities will focus on the following four areas:

- Design, Engineering, and Systems Technologies and Technologies for Human-centred Organization of Production

- Advanced Propulsion Systems

- Materials and Materials Processing and Recycling Technologies

- Standardisation-related Research Measurement and Testing.

This reduced number of core thematic areas is based in whole or in part on core themes 10 to 14 and covers applications of technologies developed in core theme 6 and aspects relating to production technologies, materials, prenormative research, and propulsion technologies in the core themes concerning means of transport - road, air, rail and shipping (15), urban habitat (16), cultural heritage (17), and social exclusion (18).

Despite the high priority given to industrial technologies in the current context, it is possible to envisage a degree of focusing of the efforts within the core thematic areas. Wider use of (intensified) concerted activities wherever this suffices to secure the added value from the Community dimension should allow a more selective approach to shared-cost activities (focusing on strategic themes requiring a minimum critical mass or the sharing of risks on a European scale) without narrowing the range of themes proposed for action at Community level in the first working document.

The first two aras cover the technologies involved in the life cycle of materials and products, including applications of information and telecommunications technologies available. The activities will be aimed mainly at improving the quality, reliability and performance of materials and products, the flexibility of production, working conditions and the use made of human resources, more rational management of basic resources, greater recovery and recycling of materials, and a reduction in the product design and manufacturing cycle and in impact on the environment.

Efforts will be focused in particular on intelligent and computer-integrated design, engineering and manufacturing, rapid prototyping, new industrial applications for lasers, microsystem technologies, clean industrial processes such as biotreatment, collectors, advanced materials (superconductors, bio-materials, etc) and technologies needed for the emergence of new products, particularly in areas such as transport, the urban habitat and health-care.

The third area relates to the application and integration of generic technologies and the development of specific technologies needed for the development of advanced propulsion systems for more efficient, safer and cleaner means of (road, air, sea and rail) transport.

For the first three areas, flanking measures designed to optimize the impact of Community activities will be improved and strengthened: training schemes, action to encourage and facilitate the dissemination and utilization of results, appropriate specific procedures to encourage the involvement of SMEs ("technology promotion", CRAFT, feasibility awards) and industrial activities coordinated around a common objective such as the factory of the future, clean cars, etc., in order to facilitate the integration of technologies and the transfer of knowledge between projects and between sectors, and coordination with EUREKA.

The fourth research area covers technologies and methods of measurement and testing in the framework of prenormative research in support of Community policies or meeting the needs of society and industry.

The approach will have to be sufficiently flexible to cater for the changing needs of prenormative research activities, while complying with the established procedures and ensuring scientific and technical excellence. Integrated activities would be a particularly appropriate means of facilitating the development of measurement and testing by organizing networks of national laboratoires.

The Joint Research Centre should make a specific contribution to this research as regards prenormative research on advanced materials and structural mechanics, and measurement and reference material.

Environment

The guidelines for research, particularly environmental research, reflect the need to expand the scientific and technical basis with a view to ensuring throughout the Community a harmonious and balanced development of economic activities, and sustainable and non-inflationary growth respecting the environment.

Consequently, the Community's research and technological development activities must support policy formulation and implementation in the many different fields covered by this objective. The Community's Fifth Action Programme on the Environment set the primary objective of moving towards sustainable development. Against this background, it set out a new strategy for addressing, on the basis of the sharing of responsibilities, activities which affect natural resources or damage the environment instead of waiting for problems to arise. The aim of the strategy is to alter trends and practices which are harmful to the environment in order to improve the quality of life and the socio-economic development of the present generation and of future generations by increasing the range of instruments for changing the behaviour of those concerned. In addition, the programme specifically addresses several priority problems and hazards which affect the Community as a whole and which must be resolved. They include climate change, acidification and quality of the air, protection of natural resources and biodiversity, water-resource management, the urban environment, coastal regions, waste treatment, industrial hazards, civil protection and urban disasters. To assess and manage complex environmental problems such as these a multidisciplinary approach is called for. A new approach is therefore appropriate, fully reflecting the political guidelines but also flexible enough to encourage interactions and allow proper attention to be paid to each specific field such as marine science and technology (including polar research) or climatology.

The two research areas are therefore as follows:

- **Natural Environment, Environmental Quality and Global Change; and**

- **Innovative Environmental Protection Technologies.**

The first area concerns the fundamental characteristics and processes governing the natural environment, including land, oceans and air, and how they are affected by human behaviour. Research on these subjects would be ideally suited for an integrated approach enabling the Community to make a major contribution to the worldwide action on global change. This applies in particular to modelling. Generally, Europe is expected to play a growing role in Earth observation activities. The Community must step up its action in this field, in conjunction with the space agencies. This is a typical example of a field in which the Joint Research Centre could make a significant contribution.

The second area covers the development of prevention, assessment, detection, environmental protection and restoration technologies. In this case, links will be established with EUREKA to ensure that the results of this environmental research yield their full potential in terms of the development of technologies and innovatory markets for European industry.

Core themes 19-22 proposed in the first working document plus the environmental technology aspects of core themes 16 (Urban Habitat), 17 (European Cultural Heritage) and 18 (Social Exclusion) will therefore be condensed into two areas.

Life Sciences and Technologies

The activities relating to life sciences and technologies are crucial for the future of the Community, this being a rapidly expanding field which is vital for the relevant common policies.

The benefits which they can bring for man and society are a priority in their own right. The Member States' capacities in this field vary widely, but many of them can rely on an internationally recognized scientific and technical base. Consequently, the Community must concentrate on themes which cannot be covered at other levels but in which the Community must hold its own against fierce international competition. Examples include the recent advances in molecular biology and determination of the genetic heritage.

Strong basic technological research is needed to offer a wide range of methods of tackling very different research problems. The aim of this integration activity will be to provide the infrastructure for combining the efforts of the many institutes involved, in interaction with the existing industrial focal points. The priorities for action by the Community include development of genome sequencing processes which are ideally suited for the establishment of European cooperation networks. An integrated European consortium could also be set up to bolster the Community's position in the field of molecular phytogenetics.

The arguments for greater investment in research into biomedicine and health are primarily of a social and economic nature. Rising costs in this field have become a major concern for every country, even the richest. At the same time, citizens in every Member State are demanding high-quality health-care. The wide diversity of public-health systems, and of causes of mortality and morbidity, in Europe, is an asset which must be tapped. Comparative epidemiology and research into the health services will provide a means of harnessing this diversity as a source of numerous research hypotheses. This approach will contribute to the prevention of major diseases such as cancer, cardiovascular disease, infectious diseases such as AIDS, neurological and mental illnesses and age-related or diet-related pathology.

Particular attention will be paid to the development of the scientific basis and the techniques necessary to evaluate new drugs for the treatment of neurological, psychiatric and immunological disorders and to participation in the Brain Decade, notably by the development of methodology, instrumentation and specialised infrastructure which are necessary for the study of the nervous system.

Primary production, whether from agriculture, horticulture, fisheries or forestry, supplies the raw materials to meet food and other needs. The reform of the common policies entails considerable changes. Research concerning agriculture, forestry, rural development, fisheries and aquaculture must *reflect these changes and address methods, techniques, production systems and products.*

Agro-industrial research must keep ahead of this trend and focus on methods of processing biological raw materials and increasing their added value while ensuring the safety of foodstuffs. It will provide feedstocks for fine chemistry, food ingredients and cosmetic and medicinal substances. Biotechnology in turn will underpin the development of this activity, interacting closely with other technologies such as information technology and chemical engineering.

The activities will therefore be divided into three areas:

- **General Biotechnology;**

- **Biomedicine, Health and Drugs;**

- **Application of Life Sciences and Technologies in Agriculture, Forestry, Rural Development, Agro-industry and Fisheries.**

Energy

Community research, technological development and demonstration activities (RDD) in the energy field should be aimed at the development of clean and safe energy systems allowing the use of efficient technologies, guaranteeing compatibility between energy use and the equilibrium of the biosphere, including man and the environment.

The RDD effort to be undertaken covers non-nuclear energy, the safety of nuclear fission energy and controlled thermonuclear fusion.
Various RDD themes will be addressed, some reflecting the problems facing society and others reflecting political or economic developments. the various types of traditional energy sources (fossil, nuclear) and energy use projects with a view to reducing their (local, regional and global) environmental impact by improving energy efficiency, producing and using clean fossil fuels, minimizing emissions into the atmosphere (CO_2 and other pollutants such as SO_2 and NO_x) and improving the safety of the nuclear fuel cycle as a whole.
RDD into renewable energy sources and the use of such sources will make a direct contribution to this general objective while meeting the concerns with regard to diversification and the improvement of the security of energy supplies in the Community and the satisfaction of needs by appropriate local resources.
A suitable balance will be sought between the desire for more efficient supplies from conventional or renewable sources and the need for the Community to assume the responsibilities placed on it for the nuclear field by the Euratom Treaty. The Joint Research Centre will make a targeted contribution in each of these fields, particularly renewable energy sources.

The concerns underlying the Community policies on energy, of course, but also on agriculture will be an integral part of the procedure for defining the RDD priorities. The incorporation into the Fourth Framework Programme of energy demonstration activities (strictly linked to the development of new technologies) will also help to encourage cooperation between industrialists, operators and users on innovation projects which can be applied on a wider scale (in conjunction with EUREKA and various Community instruments) both in the Community and in third countries (including developing countries). The THERMIE programme, valid up to the 31st of December 1994 and being the continuation of the previous demonstration programmes, is an appropriate means to satisfy the need for Community demonstration activity in the energy field.

The advantages of taking action on each of these themes at Community level are well established, for example in the case of controlled thermonuclear fusion. However, the work on nuclear safety should focus particularly on research into the operation of nuclear reactors in Eastern Europe and in the CIS.

Core themes 32 to 35 in the first working document have now been compressed to three areas:

- **Technologies for Cleaner and More Efficient Production and Use of Energy;**
- **Nuclear Safety;**
- **Controlled Thermonuclear Fusion.**

Research for a European Transport Policy

Implementation of the Treaty on European Union will add fresh impetus to the common transport policy. For the first time, "Measures to Improve Transport Safety" are explicitly included in the list of objectives to be attained. The provisions on trans-European networks and on economic and social cohesion likewise provide the Community with a new basis for contributing to the establishment and development of transport infrastructure.

Against this background, transport will play a larger part in the Fourth Framework Programme for research and development, which will build on the experience gained and progress made in the earlier programmes and, as in the past, rely on the active participation of the private sector, the scientific community and the end-users.

The first objective of research for a European transport policy will be to support the development and integration of transport systems (in the context of sustainable development). It will place the emphasis on the complementary nature of the individual modes, will develop scenarios and conduct analyses at urban, rural, regional and trans-European level and explore the interrelationships between human factors and technology. Attention will also be paid to the strategic organizational and institutional aspects to ensure effective implementation of technological innovations and that their net impact is to produce more complementary, efficient methods suited to the needs of an integrated transport system and ensuring the competitiveness of industries in the sector in question.

This overall research strategy will take into account the objectives of European transport policy. It will be backed up by the activities carried out, within the major themes covered by the first activity, concerning research relating to industrial technologies and

data–comminications services for transport. These activities will be stepped up as a result of a new specific research theme entitled:

- **Research for a European Transport Policy.**

Its objective is to contribute to the development and management of safer, more efficient and more environment–friendly transport systems. These research activities will focus on research of a strategic nature, in particular through the creation of appropriate models and scenarios relating to European transport flows, the evaluation of technical innovations and their impact on the performance and management of individual transport modes and their interoperability, interconnectibility and accessibility.

To verify the strategic parameters for implementing such innovations, particular emphasis will be placed on their validation with a view to applying them to transport systems. This will entail research into transport systems modelling, and the integration of instruments resulting from other research activities, in particular telematic and industrial research activities, into an overall transport system. Political and economic feasibility, social acceptability and human factors in an operational environment should also be explored.

Targeted Socio-economic Research

This new topic covers two types of work:

- evaluation of the options for European science and technology policy;

- research work in two specific areas: research into the problems and opportunities for European integration; and research on education and training.

Work to evaluate options for European science and technology policy is essential in order to update and enlarge the knowledge base available to decision makers who are responsible for research, technological development and demonstration projects policies in the Member States and at the Community level. Work will include strategic analyses, forecasting and technological evaluation needed to make available to decision makers (whether they have responsibilities at the executive level, legislative power or are simply responsible for research) reliable decision making tools such as long term scenarios, possible options for scientific and technology policy and expert reports prepared by users of RTD from the fields of industry, the scientific community and society in general. Such work must when necessary lead to the launching of preparatory actions and definition phases for new RTD actions planned by the Community (cf. Annexe IV).

The RTD work proposed in the other two areas cited correspond to developments in policies as shown in the new Treaty on European Union. Article 3 of this Treaty on European Union provides for a policy in the social sphere, the strengthening of economic

and social cohesion and a contribution to education and training of quality. Article 130f sets the Community's RTD activities the objectives of making Community industry more competitive and providing support for all the Community's other policies and activities.

It is necessary above all other things in a second area to support research which will provide an expandable knowledge base covering the common problems of society in Europe in the context of the integration and the diversity which will continue to increase after the application of the Treaty on European Union. Such research will be concentrated on specific problems of European society which need to be tackled in common by the Member States. The European dimension will allow maximum benefit to be drawn from the diversity of approaches taken at a national level and to strengthen research infrastructure (networks, databases, etc.). Social exclusion and city life are two of the biggest problems facing European society today. The work will cover understanding the mechanisms which lead to the exclusion of certain social groups from mainstream socio-economic life and the dissemination at a Europe wide level of examples of where groups have been successfully integrated. The contribution of technological developments to the resolution of such problems will be evaluated in the whole context of all means that have been tried out across the Community. The problem which is common to all Member States that is the complexity of urban life, the different methods of organising it and making it work will form a priority part of the work in this second area.

The third area covered by the research work addresses the methods, tools and systems of education and training and the introduction of new innovations in these areas (cf. Annexe IV). In order to give to those people already doing work in Europe in this field of education and training a reference framework and further to provide them with a solid base, research is necessary into the current state and the existing needs in this field, into the policies that are being followed, tools and methodologies, etc. as well as experimental projects in the different sectors concerned. The potential benefits are mainly at the European level, and the problems that must be addressed will require an interdisciplinary approach which will be easier to put into place using the various complementary resources present in the different countries, and it can not be disputed that undertaking such work at the Community level will lead to additional benefits.

This topic therefore covers three areas:

- research into the problems of social integration
- research on Education and Training;
- evaluation of Science and Technology Policy Options.

This entails reducing the number of core themes originally planned (16 and 18 under the first activity and the first, second and fourth core theme of the horizontal measures in the first working document) and to add new research areas concerning research on education and training and the evaluation of science and technology policy options (see Annex IV to this document).

In addition to this targeted socio-economic research, the Fourth Framework Programme outlines the economic and social research to be conducted within each main RTD theme (Evaluation of the Socio-economic Impact of Research) and under the fourth activity (Training and Mobility of Researchers in Economic and Social Sciences). This will lead to reconsidering the related core themes originally proposed under the third activity.

SECOND ACTIVITY

Promotion of Cooperation in Community Research, Technological Development and Demonstration with Third Countries and International Organizations

The background to Community R&TD policy is a world context in which there has been a considerable upturn in policy in this area in the United States and Japan. In the United States President Clinton recently presented his programme for economic growth which includes scientific, technological, industrial and educational initiatives; investment expenditure on policies in these areas should be considerably increased over the period 1993-98. In Japan, despite the current economic difficulties, the government has undertaken to continue and even step up the public research effort, especially in basic research and university research.

The objectives regarding this second activity are to strengthen Europe's scientific and technological capacity and to support the Community's policies on scientific and technological cooperation with third countries based on the principle of mutual benefit. Closer cooperation of this type will allow the Community greater access to the knowledge, know-how and research opportunities available in European countries - - distinguished depending on whether it is with industrialised countries or with the countries of central and Eastern Europe and the CIS - non-European industrialized countries and developing countries. Article 130H of the Treaty serves as a reminder that there should be coherence between national research policies and those of the Community. And that any such coherence of policies must target both activities internal to the Community and those affecting the rest of the World, i.e. must include the field of cooperation with non EC countries. Through close cooperation with the Community programmes on development aid and economic restructuring, this will enable researchers in the Community to collaborate with scientists, technologists and industrialists in these other countries. In this way, better use can be made of the limited resources available to address scientific and technological questions of growing international importance, while at the same time contributing to economic development and to improving international relations.

Since the accent is on geographical areas, the activities will concentrate on three areas:

- **Scientific and Technological Cooperation in Europe;**

- **Scientific and Technological Cooperation with Non-European Industrialized Countries;**

- Scientific and Technological Cooperation with Developing Countries.

Compared with the second activity in the first working document, core themes 2, 4 and 5 have been combined into a single theme and the order has been slightly readjusted.

THIRD ACTIVITY

Dissemination and Application of the Results of Community Research, Technological Development and Demonstration Activities

European industry is generally less efficient than its rivals at turning research results into commercially viable products or processes. Securing a return on investment is becoming a critical factor in many industrial sectors. In addition, there are increasing signs of resistance where the social acceptability of science and technology is concerned.

To remedy this situation and taking into account developments in the United States and Japan, the Community must make a substantial contribution to improving the dissemination and utilization of research results and also to creating conditions to facilitate the transfer and take-up of new technologies, whatever their origin, by industry, and especially SMEs, while meeting the needs of society.

The centralized activities under the third activity must be coordinated with the dissemination and utilization activities in other activities.

The activities must take into consideration the fact that innovation is a complex, interactive process and that special skills and a multi-sectoral approach are needed for the transfer and utilization of technologies.

The activities to be carried out (and funded) within the specific programmes, the JRC programmes and the demonstration schemes are not described below.

The activities proposed at a centralized level are grouped together in the following three areas:

- dissemination and exploitation of results;
- transfer of technologies;
- financial environment of the transfer.
- scientific services for Community policies.

1) The first area covers all activities aimed at making greater use of, or establishing:

- a European infrastructure for dissemination and utilization with the objectives of publicizing the Community's RTD activities, promoting scientific and technical cooperation and facilitating the application of research results in Europe, in particular by strengthening the European public information and dissemination service (CORDIS, OPET and other activities), and expanding the network of relay centres;

- specialist services and direct assistance to promote transnational utilization of RTD results (including the JRC and EUREKA) which are targeted on SMEs in particular. They comprise assistance with the protection of results, help in the finding of industrial partners, market research, awareness-raising and training schemes, the establishment of technology associations, and support for projects on trans-sectoral applications.

- strategic and interdisciplinary discussions about the effectiveness of the transfer of RTD results (acceptability and evaluation of social impact, management and communication of research, pilot communication projects).

2) The second area comprises all the activities aimed at making greater use of, or establishing a European infrastructure for the transfer of technologies.

Emphasis will be placed on improving the quality and efficiency of innovation support services and the take-up of new technologies by industry, and especially SMEs. This will be achieved by setting up networks and supporting transnational pilot projects, making firms aware of the best practices with regard to the management of technological resources, better knowledge of mechanisms and strengthening the coordination of policies and appropriate instruments. The network of OPETs (organizations for the promotion of new energy technologies) is a useful instrument for the energy sector.

3) The third area concerns the improvement of the European environment for funding technology transfer with the aid of indirect measures such as the establishment of links between the funders and owners of technological projects, continuation of the experimental system of performance-relted funding of technology, support for the establishment of effective mechanisms for the mobilization of private capital and investment "exit", and analysis of the most appropriate legal structures and the promotion thereof. It also covers the establishment of a fund for technology take-up by SMEs. This instrument will be compatible with the arrangements set up by the Member States and will be adapted to the specific national situations. It will be managed and promoted on a decentralized basis, by public-sector or private-sector intermediaries in the individual Member States. It should be designed so as to

mobilize a maximum amount of resources from the financial intermediaries. The fund will cover loan guarantees, interest-rate subsidies, measures to encourage venture capital, and managerial and technical assistance activities.

4) Scientific Services for Community Policies

This theme covers the JRC's ad hoc scientific and technical support for Community policies. In practice, these measures concern dissemination of results of research conducted by the JRC for other Commission departments as its contribution to theformulation and implementation of Community's policies.

More formal, long-term support activities such as the action taken by the European Centre for the Validation of Alternative Methods now come under the first activity. The core theme included in the horizontal support measures in the first working document has been deleted.

FOURTH ACTIVITY

Stimulation of the Training and Mobility of Researchers in the Community

Stimulating the training and mobility of researchers is an essential means of strengthening, in accordance with the principle of subsidiarity, the scientific and technological system and hence the scientific and technological basis of European industry and its international competitiveness.

Training and mobility activities will be carried out within each theme of the first activity in order to provide users in priority areas for the Community not only the RTD results they need but also the human resources capable of utilizing them.

However, the European dimension should also be used to develop human resources making it possible to react in real time to scientific and technological developments in emerging areas. The fourth activity, addressing advanced training in centres of excellence throughout the Community will therefore be open in nature and will also focus on partnership between universities and industry.

This activity includes the following elements:

- Stimulation of Training and Mobility (in particular for young researchers through a Community bursary scheme);
- Promotion of the Mobility of Human Resources in Networks (constituting not only the logistic and operational basis for exchanges but also an important tool for developing the Community dimension of research).

Implementation of this activity will take into account, on the one hand, the situation within the Community through specific measures directed towards the least favoured regions in the context of the reform of structural policy, and, on the other, the situation outside the Community, in particular in EFTA and Central and Eastern European countries, through appropriate synergy with the action taken under the second activity.

The mobility of researchers, as producers of knowledge and know-how often with little pattern, are, as much as research itself, a critical variable in the transfer of technology. Increasing mobility between centres of research or universitites and industry can therefore help improve competitiveness.

The following types of action are planned:

- Coordination of the training activities under each specific programme. This will entail harmonizing the schemes, finding solutions to problems common to all the programmes and, in particular, preparing a guide for European bursaries. Measures such as these will contribute to economic and social cohesion within the Community and will be particularly useful for small businesses with no training infrastructure of their own.

- Putting in place of training activities in basic research and in non targeted research (as opposed to that foreseen in the first activity) with the creation of "European laboratories without walls".

- Training in management of change in industry, through partnership between industry and higher education establishments, and oriented towards training in new technologies.

- Encouragement of new scientific and technological approaches. The basic aim is to promote transnational cooperation in basic research in order to develop, thanks to the European dimension, the human resources, materials and methods needed to respond, in real time, to new scientific and technological challenges as and when they emerge. Such cooperation is essential to allow the development of large and costly instruments and to enable them to be put at the disposition of all the researchers in the Community and to prepare advanced generic technologies which are essential for every Member State and which should be developed jointly in order to ensure interoperability.

These activities will be combined into the following area:

- Training and Mobility of Young Research Scientists;

it will replace the four core themes originally proposed.

ANNEX IV

EVALUATION OF SCIENCE AND TECHNOLOGY POLICY OPTIONS

Technology assessment in a European context covers a very wide range of interrelated activities: monitoring technological and economic developments, anticipating in the long, medium and short term the socio-economic changes that will dictate a shift of emphasis in RTD and, conversely, forecasting the scientific and technological changes which are likely to have a short, medium or long-term impact on society; analysis of the behaviour patterns of the various players involved (governments, social forces, researchers and institutions) in the face of these changes; evaluation of programmes and policies at national, regional, European and international level; relevance of trends in Community policy to the future of RTD activities in Europe.

The United States recognized the importance of these issues more than twenty years ago, and its Office of Technology Assessment has since acquired an international reputation. Similarly, Japan set up the National Institute of Science and Technology Policy to carry out studies of this type. In Europe, technology assessment activities have developed very rapidly over the past decade and have been institutionalized at both national and European level (Science and Technology Options Assessment, European Parliamentary Technology Assessment Network).

The Commission's departments have built up a great deal of practical experience over the years through the Monitor (FAST, SAST, Spear), JRC (Institute for Prospective Technological Studies) and Value and EUROSTAT's programmes. Managers of specific programmes have themselves gained a wealth of experience assessing the socio-economic impact of research in their fields as specified in a decision taken when the Third Framework Programme was approved.

This new approach therefore entails including a new area "Evaluation of Science and Technology Policy Options" as follows:

The aim is to make available to the parties involved, decision-makers and users of RTD, a European instrument for evaluating science and technology policy options and, with that in mind, to bring together the various strands of activity at regional, national and European level in the fields of forecasting, technological and strategic monitoring and assessment of RTD programmes and policies. By putting in place a limited number of dedicated networks, a technology monitoring system, concertation and study activities, support activities (open data bases, lists of indicators, directories of technology assessment in Europe, etc.) and by the dissemination of information through workshops, seminars, information weeks, etc., it will be possible to offer those involved in technology assessment in Europe a pluralistic framework for dialogue and for comparing approaches, leading to the formulation of science and technology policy options for Europe which can be used by RTD operators, decision-makers and users. That is why the proposed activities will be carried out in close collaboration with parliamentary science and technology assessment agencies at national and European level (in particular

STOA and the European Parliamentary Technology Assessment Network), national and regional public TA bodies, the existing teams of research scientists and social partners. A limited cluster of activities should be organized so as to launch preparatory activities, definition phases for new RTD Community actions. Analyses of socio-economic impact and the risks involved in the specific programmes will continue.

FINANCIAL STATEMENT

Part 1: Financial implications

1. TITLE OF THE OPERATION

Fourth Framework Programme of Community activities in the field of research and technological development (1994-98)

2. BUDGET HEADING CONCERNED

Sub-section B6

3. LEGAL BASIS

Article 130i of the EEC Treaty and of the Treaty on European Union as signed, and Article 7 of the EAEC Treaty

4. DESCRIPTION OF THE OPERATION

4.1 Specific objectives

Implementation of research, technological development and demonstration programmes by promoting cooperation with and between enterprises, research centres and universities;

Promotion of cooperation in the field of Community research, technological development and demonstration with third countries and international organizations;

Dissemination and application of results of Community research, technological development and demonstration activities;

Stimulation of the training and mobility of researchers in the Community.

4.2 Duration

1994-98

4.3 Target population for the operation

Industrial enterprises - including specifically SMEs - research centres and universities in their research and technological development activities.

5. CLASSIFICATION OF THE EXPENDITURE AND REVENUE

5.1. Non-compulsory expenditure.

5.2 Differentiated appropriations.

5.3 Type of revenue involved

The EFTA countries as defined in Article 2 of the Protocol amending the Agreement on the European Economic Area (EEA) will contribute to proportional additional financing for this framework programme, if the EEA Joint Committee provided for in the Agreement so decides, probably limited to the non-nuclear activities.

6. TYPE OF EXPENDITURE OR REVENUE

Research and development projects carried out by external contractors can come under one of the following three forms of Community financial participation:

- participation in research costs, within a ceiling of 50% of costs. This participation may be determined on the basis of conventional costs negotiated in advance. As regards universities and similar organizations, they will have the possibility of requesting either funding of 50% of the overall costs or funding of 100% of additional costs.

- in the case of projects of a specifically industrial nature (demonstrations, prototypes, etc.), contribution, linked to the research results, of a predetermined amount within ceilings determined by the Community for this type of project.

- payment of a flat-rate contribution for small-scale projects not exceeding a ceiling set for each specific programme.

Concerted actions, which consist of the coordination of research and development projects, may receive a contribution of up to 100% of the cost of the concertation.

Research activities carried out by the Joint Research Centre will, in principle, be fully funded.

7. FINANCIAL IMPACT

7.1 Method of calculating the total cost of the operation

The Framework Programme has been defined so as not to exceed two-thirds of the amount allocated to category 3 of the financial perspective for 1993-99.

This is in accordance with Article 130i of the Treaty on European Union which states that the Framework Programme determines the amount deemed necessary (maximum overall amount in the Treaty) together with its distribution between the activities envisaged.

The amounts will cover scientific, technical, demonstration and related horizontal support measures as well as personnel costs and administrative, scientific and technical expenses directly linked to the execution of the activities and measures. As far as activities carried out by the JRC are concerned, these amounts will cover the infrastructure for the institutes.

7.2 Breakdown

The four activities correspond to the four objectives listed at 4.1 above.

4th FRAMEWORK PROGRAMME 1994-98	
	MECU (current prices)
First Activity (Research, Technological Development and Demonstration Programmes)	10925
Second Activity (Cooperation with Third Countries and International Organizations)	790
Third Activity (Dissemination and Application of Results)	600
Fourth Activity (Stimulation of the Training and Mobility of Researchers)	785
MAXIMUM OVERALL AMOUNT	13100

	MECU (current prices)
Indicative breakdown between themes in the first activity	
- Information and Communications Technologies	3900
- Industrial Technologies *	1800
- Environment *	970
- Life Sciences and Technologies *	1325
- Energy *	2525
- Research for a European transport policy	280
- Targetted Socio-economic Research *	125
	10925

* of which JRC 1067 MECU. N.B.: in addition to participating in the first activity the JRC will also participate in the third activity to the tune of 70 MECU.

7.3 Indicative schedule

MECU - current Prices

YEARS	Financial Perspectives	Actual Amounts 4th FP
1994	4325	pm
1995	4715	2928
1996	5078	3153
1997	5450	3384
1998	5852	3635
Total 1994-1998		13100

The definitive yearly amounts will be determined by the budgetary authority in accordance with the financial perspective agreed for 1993-99.

8. ANTI-FRAUD MEASURES PLANNED UNDER THE OPERATION

Audit programme of the Directorate-General. Supervision by the officials formally responsible for the actions.

Part 2 : Basis for cost/effectiveness analysis

1. OBJECTIVES

The Framework Programme corresponds to the objectives established by the Treaty on European Union and notably its Article 130f(1) which states: "The Community shall have the objective of strenghtening the scientific and technological bases of Community industry and encouraging it to become more competitive at international level, while promoting all the research activities deemed necessary by virtue of other chapters of this Treaty." The four activities selected reflect Article 130g.

2. JUSTIFICATION OF THE OPERATION

The operation is justified by the need for the Community to help strengthen the scientific and technological bases of Community industry and to encourage it to become more competitive at international level, while contributing to the definition and implementation of Community policies and to meeting the needs of society.

An analysis of the consequences in the research area of the central role played in Community action by the principle of subsidiarity, in the terms of the decisions adopted at Maastricht, has been carried out. This has made it possible to highlight a number of cases where the principle of subsidiarity applies in an intrinsic fashion: 'big science' activities; technology priority projects; RTD activities aimed at organizing the single market; prenormative research; activities in support of the European scientific community.

3. MONITORING AND EVALUATION OF THE OPERATION

The form and frequency of the process of evaluation will be such as to enable the Commission to respond to the requirements under Article 4 of the draft Decisions in the proposal above, and to evaluate Community RTD programmes and policies.

The principal factors of uncertainty which can affect the results of the operation include any delay which may occur in the implementation of activities under the present proposal, the ability and readiness of private enterprises to take full advantage of the benefits which these activities will offer them, and the unavoidable difficulty in making a direct link, especially in the short term, between research expenditure on the one hand and industry's competitive success on the other, notably in the light of the fact that innovation is not a linear process from fundamental research, through applied research to commercial application.

The indicators and quantitative or qualitative criteria which make it possible to measure the results will be determined at the level of each specific programme.

During the third year of implementation of the Fourth Framework Programme, the Commission will examine the state of its progress in relation to indicators. It will assess, in particular, if the objectives, the priorities as well as the financial means are still adapted to the changing situation (see Article 4(1) of the draft Decision). After the completion of the implementation of the Fourth Framework Programme, the Commission will undertake an evaluation of it (see Article 4(3) of the draft Decision).

IMPACT ASSESSMENT FORM

THE IMPACT OF THE PROPOSAL ON BUSINESS

WITH SPECIAL REFERENCE TO SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

Title of proposal: Second Commission working document concerning the Fourth Framework Programme of Community activities in the field of research and technological development (1994–98)

Reference number:

The proposal

1. *Taking account of the principle of subsidiarity, why is Community legislation necessary in this area and what are its main aims ?*

The objectives of the Community's research and technological development activities are to strengthen the scientific and technological bases of Community industry and to encourage it to become more competitive at international level. The need for Community action is acknowledged by Title VI of the EEC Treaty and by Chapter I of the Euratom Treaty. In addition, Article 130f of the Treaty on European Union stipulates that the Community shall promote all the research activities deemed necessary by virtue of other Chapters of the same Treaty. The approach described in Article 3b of the Treaty on European Union dictates that the Community's RTD activities must be subsidiary.

The impact on business

2. *Who will be affected by the proposal ?*

- *Which sectors of business ?*

The Community's RTD activities must concentrate more on generic technologies for widespread use in all sectors of economic activity in Europe. The joint research funded by the budget allocated to the Fourth Framework Programme on, for example, information technologies, industrial technologies, materials or biotechnology will affect very many sectors.

- *Which sizes of business (what is the proportion of small and medium-sized firms)?*

The Community encourages RTD and cooperation by businesses, including SMEs, research centres and universities. The complementarity between the comparative advantages of small firms and big

companies has prompted the Commission successfully to encourage small firms to become involved in the Community's research programmes, notably with the aid of special incentives. SMEs have also benefited most from the improvements made to the management of Community research, e.g. simplification of the information packages, support in seeking partners and targeted proposer days, etc. The Fourth Framework Programme expands this approach by providing for technology promotion activities for SMEs, by focusing the dissemination measures on small firms and proposing a completely new financial instrument specially designed to encourage SMEs to apply the results of Community research. This instrument forms part of the third activity and is a new addition to the package of measures designed to ensure more effective participation by SMEs in the Community's RTD activities.

- *Are there particular geographical areas of the Community where these businesses are found ?*

In principle, the Community's RTD activities serve no geographical or regional objective. Although the objective of strengthening economic and social cohesion in the Community and of promoting harmonious development also apply to RTD policy, scientific and technical excellence is the overriding selection criterion applied for this particular policy. This criterion in itself is a factor encouraging cohesion in so far as it enables scientists from the least favoured regions to participate in the most advanced research activities in Europe. The evaluation panel's September 1991 report on the impact of the Framework Programme on economic and social cohesion in the Community revealed increasing involvement by firms from the least favoured regions (most of them SMEs) in the Community partnerships. The Fourth Framework Programme should help to continue this trend, building on the results of the operations carried out under the Structural Funds (and in particular STRIDE) to bolster RTD structures in the least favoured regions. Specific measures for the "Objective 1" regions (as defined by the Structural Funds) are also planned under the third and fourth activities.

3. *What will business have to do to comply with the proposal ?*

The proposal imposes no formal obligations on businesses in the Community. On the contrary, it provides them with greater means to participate in joint research. The private sector will retain primarily responsibility for fully seizing the opportunities opened up and for applying the results of the research projects for the manufacture and successful marketing of innovatory products.

4. *What economic effects is the proposal likely to have ?*

- *on employment, on investment and the creation of new businesses and on the competitive position of businesses ?*

By making European businesses more competitive at international level, the Community's RTD activities will create jobs and encourage investment. The Commission communication evaluating the Second Framework Programme for Community research and technological development (SEC(92)675 of 22 April 1992) and the subsequent analysis of this evaluation by CREST give an idea of the economic impact of the Community's RTD activities. The proposed Fourth Framework

Programme follows the concentration strategy started in the third. More selective allocation of the funds requested for the individual activities should ensure that the activities have greater relevance and impact.

5. *Does the proposal contain measures to take account of the specific situation of small and medium-sized firms (reduced or different requirements, etc.) ?*

Arrangements specifically for small firms will continue to be developed and, in certain cases, tested. New rules have also been proposed (cf. paragraph 2 above).

Consultation

6. *List the organizations which have been consulted about the proposal and outline their main views.*

This second working document on the Fourth Framework Programme is the fruit of a policy debate within the Commission, which keeps in constant contact with the advisory bodies responsible for RTD (CREST, IRDAC and CODEST), the European Parliament and the Economic and Social Committee, UNICE, the national authorities, researchers and the relevant European and national organizations.

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