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II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, in the field of environment and climate (1994 to 1998)

(94/911/EC)

THE COUNCIL OF THE EUROPEAN UNION

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas, by Decision No 1110/94/EC ⁽⁴⁾, the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of environment and climate; whereas this Decision takes account of the grounds set out in the preamble to the Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its

implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 532 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas the activities to be carried out under this programme will help to develop the scientific knowledge and technical competence which the Union needs in order to fulfil the environmental mandate conferred in Part Three, Title XVI of the Treaty;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment';

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the area of environment and climate;

Whereas Decision No 94/1110/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and

⁽¹⁾ OJ No C 228, 17. 8. 1994, p. 78.

⁽²⁾ OJ No C 342, 5. 12. 1994.

⁽³⁾ Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

⁽⁴⁾ OJ No L 126, 18. 5. 1994, p. 1.

social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas provision should be made for measures to encourage the involvement of small and medium-sized enterprises (SMEs) in this programme, in particular through technology stimulation measures;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of environment and climate by research centres, universities and enterprises, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States and regions which participate least in the programme, and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation of the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the

objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas in the resolution of the Council and the Representatives of the Governments of the Member States meeting within the Council on 1 February 1993 on a Community programme of policy and action in relation to the environment and sustainable development ⁽¹⁾, scientific research and technical progress were identified as one of the main instruments with which to implement this policy;

Whereas this programme must be integrated in a global strategy of the European Community in order to fulfil the international commitments resulting from the United Nations Conference on Environment and Development, in particular those relating to the reduction of emissions of greenhouse gases;

Whereas the nature of the activities to be undertaken in this programme requires coordination with activities undertaken under other specific programmes and improved interaction with activities in other frameworks, such as Eureka and COST;

Whereas coordination will be reinforced, in particular, with activities undertaken under the JRC programme and the programme on cooperation with third countries and international organizations;

Whereas the JCR may participate in indirect actions covered by the present programme;

Whereas the JRC will also contribute through its own programme of direct activities, to the attainment of the Community RTD objectives in the areas covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and technological development, including demonstration, in the field of environment and climate, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

⁽¹⁾ OJ No C 138, 17. 5. 1993, p. 1.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 532 million, including a maximum of 7,4 % for the Commission's staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the

results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks, including an indication of the intended end-users of the results, where appropriate,
- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements, including specific modalities for implementing technology stimulation measures for SMEs and other measures, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under the JRC programme, the specific programme on cooperation with third countries and international organizations and other specific programmes, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks, such as Eureka and COST,
- arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is

required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals, including the details of selection criteria,
- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than EU 0,25 million,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,

- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,25 million, the Commission shall inform the committee of the projects and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as a whole.

Article 8

Participation in this programme may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

Introduction

This specific programme fully reflects the orientation of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Chapter 3 (Introduction and Parts A and B) of Annex III, Activity 1 of the framework programme forms an integral part of this programme.

The programme incorporates the degree of continuity needed to maintain and develop the RTD capacity set in place during previous programmes. In addition to pursuing and making use of the work to build up environmental RTD at European level, the programme will consolidate the establishment of networks of excellence taking into account, where appropriate, the need to promote cohesion.

The programme will focus on a limited number of themes and areas where action by the Community is justified. However, environmental problems are becoming more complex and require an interdisciplinary approach and research on systems analysis.

The programme covers four themes: (A) the natural environment, environmental quality and global change, (B) environmental technologies (C) space techniques applied to environmental monitoring and research, and (D) human dimensions of environmental change.

With a view to focusing the Community's research effort and giving it a higher profile in the context of worldwide research into global change, the research activities envisaged in this area will be carried out within the framework of the European Network for Research into Global Change (Enrich). Such activities will help to meet the objectives of the International Geosphere Biosphere programme (IGBP), the World Climate Research programme (WCRP) and the Human Dimensions of Global Environmental Change programme (HDP), and so that the results can be used in the implementation of the fifth framework programme of action for the environment. Account will also be taken of the scientific requirements expressed in the setting-up of the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS). In addition, programme activities will be coordinated with those of the Marine Science and Technology programme.

In accordance with the framework programme, the research conducted on each theme and on the various areas which constitute them will have to meet the following objectives:

1. It must help strengthen the scientific base needed to implement the Union's environment policy by developing through basic research where appropriate the strategic capacity for such implementation and by reconciling the notions of human health and safety, environmental protection and the sustainable management of resources with Europe's legitimate hopes for development and economic growth (themes A to D).
2. It must help meet the objectives of the world programmes of research into global change (themes A, C and D) by focusing on those aspects where only the intervention of the Union, in the form of large projects organized in concert with the Member States, is liable to produce significant results.
3. It must contribute to the development of environmental products, technologies, techniques and services which meet new needs and the exploitation of which could help to boost economic growth (on a lasting and sustainable basis) and create new jobs, as is stressed in the Commission's White Paper on Growth, competitiveness and employment (themes B to D).

The effective implementation of these objectives will be facilitated through the identification of the intended end-users of results, where appropriate. Research supportive of the science base should aim at specific research communities, networks and international programmes. Research aimed at underpinning the development and implementation of the Community's environment policy should reflect the needs of

the Community programme of policy and action in relation to the environment and sustainable development ⁽¹⁾ and of the European Environment Agency. Potential industrial exploitation of project results should be facilitated by direction to specific industry communities and fora, particularly for those involving SMEs.

These actions will be carried out on the basis of close cooperation between universities, scientific institutions and undertakings in the Member States, including SMEs.

Measures for technology stimulation, based on experience gained in Craft activities and feasibility awards, will be introduced in order to encourage and facilitate participation by SMEs, taking account of the needs of those from less advanced regions.

Regional networks of interdisciplinary research may be established in order to study in a European perspective the specific problems of certain European regions, including the Mediterranean basin, the Baltic Sea area, the North Sea area, the Alps, and the Northern and Arctic regions, including the Arctic Circle.

Complementary actions will be implemented by the JRC in areas where it is competent, in particular in Areas A I 'Climate change and impact on natural resources', A II 'Atmospheric physics and chemistry, interactions with the biosphere and mechanisms of environmental change impacts', B I 'Instruments, techniques and methods for monitoring the environment', B II 'Technologies and methods for assessing risks to and to protecting and rehabilitating the environment', as well as in theme C 'Space techniques applied to environmental monitoring and research', described below ⁽²⁾.

CONTENT

A. Research into the natural environment, environmental quality and global change

Clear guidance will be given within the Work programme as to the split between objectives and tasks under this theme and related parts of the 'Marine Science and Technology programme', in particular, and other specific programmes as appropriate. Relevant coordination mechanisms operating through Enrich will need to be taken into account.

Area I: *Climate change and impact on natural resources*

A.I.1. Basic processes of the climate system

Objectives

- To work towards a better understanding and description of the basic processes of the climate system, particularly as regards their reciprocal influences on the global and regional scales.
- To improve climate models by taking account of and incorporating into them improved knowledge of key climate processes.

Research tasks

- A.I.1 (1) Analysis and description of land surface/atmosphere interactions including investigation into the role of greenhouse gas sinks and reservoirs in relation to the dynamic processes of the climate system and the role in the hydrological cycle, particularly on a regional scale.
- A.I.1 (2) Analysis and description of the couplings between atmospheric processes and oceanic circulation.
- A.I.1 (3) Analysis and description of atmosphere-cryosphere-ocean couplings and their role in the climate system.
- A.I.1 (4) Studies of radiative couplings, including the role of greenhouse gases in the troposphere and the lower stratosphere, clouds and their dynamics, and aerosols.
- A.I.1 (5) Studies of the global cycles of greenhouse gases, their atmospheric balance and their fluxes and transformations in the oceans, the biosphere and the lithosphere.

⁽¹⁾ Resolution 93/C138/01 of 1 February 1993 (OJ No C 138, 17: 5. 1993, p. 1).

⁽²⁾ A description of the activities envisaged for the JRC in these areas is contained in the proposal for a decision of the Council relating to the activities of the JRC (COM(94) 68 final 94/0095 (CNS) of 30 March 1994). An extract from this proposal is attached to this Decision.

A.I.2 The climate system in the past

Objective

To contribute to the high-resolution reconstruction of climatic conditions and environmental conditions linked to the climate with a view to enriching our documentation on the climate system and improving our understanding of the way it works.

Research tasks

- A.I.2 (1) Reconstruction of climatic and environmental conditions on both global and regional scales over recent climatic cycles ($\pm 250\,000$ years).
- A.I.2 (2) Acquisition, validation, analysis and interpretation of data from deep cores in old glacial strata and associated glaciological investigation. Modelling of ice rheology and glacial flow.
- A.I.2 (3) Reconstruction of the evolution of the climate and its variability in the Holocene and the late Holocene.
- A.I.2 (4) Analysis of the dynamics of climate change and the variability of the reconstructed climates.
- A.I.3. Climate variability, simulation of climate and prediction of climate change

Objectives

- To describe the evolution of the climate and its variability in recent times (past century or so) and to provide estimates of these over the next century or so, particularly in response to feasible scenarios of changing atmospheric concentrations of greenhouse gases, sulphate aerosols and ozone depletion.
- To improve climate models; in particular by improving their representation of the key dynamical, physical, chemical and biological processes which are believed to influence significantly the current state and future evolution of the climate system.
- To develop improved scenarios of climate change with regional (European) resolution, for forecasting impacts on the environment, society and the economy.

To meet this objective, Europe's climate modelling centres will be associated through a concerted action in order that the scientific teams may have access to the latest models and instruments.

Research Tasks

- A.I.3 (1) Development, validation and application of improved climate models in conjunction with present and past conditions.
- A.I.3 (2) Analysis and description of the present climate and its variability using global and regional data.
- A.I.3 (3) Analysis of the climate variability predicted by the current climate models; development and application of statistical methods suitable for validating the model forecasts in relation to actual data.
- A.I.3 (4) Development of new and improved climate change scenarios at both global and regional scales.
- A.I.3 (5) Development of models for the seasonal forecasting of climate parameters, including models for the seasonal forecasting of extremes (precipitation, drought); development of methods to validate these models.
- A.I.3 (6) Development of down scaling methods to achieve accurate simulation of weather variability (e.g. precipitation) with high spatial and temporal resolution. Development of improved forecasts of change in the type, distribution and frequency of meteorological extremes.
- A.I.3 (7) Study of feedback into the climate system of longer-term environmental change (decades/centuries), with particular regard to the hydrological cycle and changes in the biosphere.

A.I.3 (8) Study of changes in average sea-level, statistics on sea-level, storms and floods, especially in areas subject to flooding.

A.I.4. Impact of climate changes and other environmental factors on natural resources

Objectives

To assess the major impacts on natural resources and the capacity for sustainable adaptation under changing human pressure, as well as from climate variability and change.

A.I.4 (a) European water resources

Objective

To improve knowledge of the probable effects of climate and other environmental change (including changing human demands and demographic pressure) on surface and underground water resources, in terms of quality and quantity, with a view to both improving understanding of the underlying processes and providing a basis for informing development of strategies for their future management.

Research tasks

A.I.4 (a) (1) Development of methods (including models) to estimate, forecast and improve the availability of water resources following environmental change, especially in regions where there is likely to be a gap between availability and demand.

A.I.4 (a) (2) Development of techniques to assess and improve underground water reserves and to assess the relationship between ground water and water/soil interactions in different geological settings and the transport of contaminants through the saturated and unsaturated ground water zone, and in seawater/groundwater interactions.

A.I.4 (a) (3) Development of studies of integrated catchment areas and modelling of river systems (including flow models).

A.I.4 (a) (4) Development of techniques to re-establish the quality of surface and underground water which has been affected by pollution caused by agricultural practices, unsuitable land use, and from other pollution sources.

A.I.4 (a) (5) Assessment and validation of techniques and methods of integrated management of both surface and ground waters linking to appropriate actions in the Telematics programme.

A.I.4 (a) (6) Assessment of the impact of a variation in sea-level on water supplies in coastal regions and in relation to other factors.

A.I.4 (a) (7) Assessment of effects of climatic changes on the quantity and quality of water resources in mountain areas, including the assessment of alpine glaciers as sources of water. Establishment of methods for monitoring and assessment of potential of sustainable uses.

A.I.4 (b) Agriculture, forests and the natural environment.

Objective

To study and assess the probable effects of climate change and other environmental change on crops, forests and other land ecosystems and its consequences for land resources in Europe; to provide a basis for assessing the socio-economic impact of these consequences and to provide a basis for the development of strategies for their future management.

Research tasks

A.I.4 (b) (1) Analysis and description of the long-term impact of climate change and other human factors on the natural environment and on the sustainability and productivity of agriculture and silviculture in Europe.

A.I.4 (b) (2) Development, validation and application of regional mechanistic models which describe the effects of changes to the climate and to parameters linked to the climate such as CO₂ concentration on agriculture, silviculture and natural ecosystems, taking into account other human factors.

- A.I.4 (b) (3) Development of forecasting models to assess the reaction of biodiversity to long-term environmental change; assessment of consequences of climate change in biodiversity; development of a scientific base for *in situ* conservation strategies; establishment of criteria for optimization of the landscape structure with a view to preventing extinction and maintaining appropriate diversity.
- A.I.4 (b) (4) Study of the particular effects of climate change on the northern forests and on marginal ecosystems such as wetlands, tundra and taiga in the arctic and subarctic zones and on Mediterranean forests.
- A.I.4 (b) (5) Integrated studies of the effects of the climate and of human factors on mountain ecosystems and establishment of links to assess socio-economic impact.
- A.I.4 (b) (6) Development of models to assess the potential impact of increased UV-B radiation on the environment (both natural and urban) and on health.
- A.I.4 (b) (7) Assessment of the way in which land use, through such activities as forestry, agricultural practices, urbanization, the collection and processing of waste, water drainage, concentration of specific industrial activities in coastal zones, tourism and civil engineering projects, can influence eutrophication and the contamination of aquatic systems.
- A.I.4 (b) (8) Contribute to understanding the modifications and rehabilitation of forest ecosystems after forest fire.
- A.I.4 (c) Land resources and the threat of desertification and soil erosion in Europa.

Objectives

- To provide an integrated approach to understanding, in the context of climate change, the process of desertification and soil erosion in Europe, in the interest of reversing this process. This will take account of the complex system of varying interdependent factors which lead to the deterioration of land resources in areas susceptible to desertification and soil erosion.
- To develop the scientific foundations for rational management of land resources in certain parts of Europe which are threatened or affected by desertification and soil erosion.

Research tasks

- A.I.4 (c) (1) Integrated research to assess qualitatively and quantitatively the relative roles of the various processes involved in desertification and soil erosion: climatic, hydrological, biological and soil-related.
- A.I.4 (c) (2) Modelling of the complex dynamics of the various processes concerned, on different spatial and temporal scales, in systems which are desertified or susceptible to desertification or soil erosion, including their repercussions on the climate, so as to predict the future course of the phenomenon.
- A.I.4 (c) (3) Setting-up of suitable sets of data with which to detect any change and validate models; identification of indications of potential desertification and soil erosion.
- A.I.4 (c) (4) Development and improvement of counter measures and strategies to control and reduce the deterioration of land resources in areas susceptible to desertification and soil erosion, including assessment of essential technological intervention.
- A.II.1. Atmospheric physics and chemistry

Objectives

- To understand the processes which govern the state and evolution of the stratospheric ozone layer, particularly those that may cause its depletion and to understand the environmental impact of human activities in order to predict changes to its state.

- To understand and quantify the chemical processes in the troposphere; to assess the contribution of regional processes (on a European scale) to environmental change on a hemisphere or planetary scale.

It is necessary to improve the infrastructure for the collection and sharing of data from European collaborative experiments and to facilitate access to shared facilities to conduct such experiments e.g. research aircraft, dedicated ground-based observations and appropriate laboratory facilities. The Enrich mechanism will be involved in such activities. This will also require close cooperation with other programmes.

Research tasks

A.II.1 (a) Stratospheric chemistry and depletion of the ozone layer

It is recognized that support may be required to facilitate access to certain large facilities in order to enable the large-scale European collaborative experiments envisaged under the research tasks below to be undertaken effectively.

- Collection of data, interpretation and modelling of the dynamics of and trends in the chemical composition of the lower stratosphere at high and medium latitudes in the northern hemisphere; detection of the beginning and the extent of perturbations of a chemical nature and of the resulting loss of ozone; mapping of trends in ozone and trace compound concentrations in the lower stratosphere in time and space; assessment of the impact of chemically perturbed air being transported, latitudinally and longitudinally.
- Understanding and modelling of the homogeneous and heterogeneous processes which influence the distribution and spread of the active radicals of halogens, nitrogen and hydrogen in the stratosphere; study of the dynamics and composition of the air in the lower stratosphere; assessment of the incidence of and trends in solar UV radiation in Europe; assessment of troposphere/stratosphere exchanges.

A.II.1 (b) Tropospheric physics and chemistry

- Self-cleansing capacity of the atmosphere: study of the chemical and meteorological processes which control concentrations of oxidizing compounds such as hydroxyl radicals and ozone, including the effect of aircraft and other combustion emissions on the level of ozone in the atmosphere, including its trends and the effect of emissions in the Mediterranean basin on the free troposphere in other regions.
- Identification of the origins of and the physio-chemical modifications to aerosol particles in the atmosphere and their interactions with clouds; studies of the properties and chemistry of clouds.
- Quantification of the role of natural emissions (gas and particulates) in atmosphere chemistry: release of volatile organic compounds by vegetation and their contribution to the formation of ozone, release of sulphur and halogen compounds through biological activity in the marine environment and biological release of reduced and oxidized forms of nitrogen; assessment of the impact of emissions from fossil fuels.
- Characterization of 'chemical early warning signals' of potential global change in the atmosphere, such as the depletion of troposphere ozone in the Arctic and high winter concentrations of nitrous acid in towns (leading to regional early warning systems).
- Development and validation of models and assessment tools to describe the spatial and temporal dynamics of ozone in mountain regions.

A.II.2. Biospheric processes

Objectives

- To understand better the processes taking place within land, aquatic and river systems, coastal ecosystems and the way and the extent to which they are disturbed by environmental change. This should include the fate and the effects of toxic substances and the effects of UV-B radiation.

- To understand better the role of biodiversity in ecosystems; to understand the mechanisms which control the maintenance or evolution of biodiversity and how these mechanisms are influenced by environmental change, including the effects of human activities.

Research tasks

A.II.2 (a) The functioning of ecosystems

- A.II.2 (a) (1) Analysis of ecosystems processes; identification of disturbance to these processes following changes in environmental factors, but allowing for their variability in time and space.

Emphasis should be placed on primary production and fluxes of chemical elements, organic matter, water and energy within and between ecosystems (e.g. between land and coastal ecosystems), on the physio-chemical and biological mechanisms which control such fluxes, in particular the organic matter cycle, and on feedback processes (e.g. those which control gaseous emissions from ecosystems to the atmosphere, the absorption and release of carbon, etc.), and on biological processes which are important in population functioning and dynamics (demographic, and genetic aspects and evolution of the biomass).

- A.II.2 (a) (2) Quantification of organic and inorganic pollutant fluxes within and between ecosystems; analysis of the behaviour and transformation of these pollutants and their effects on ecosystem processes; studies of the interactions between effects of pollutants and eutrophication.

- A.II.2 (a) (3) Development of indicators related to the environmental effects of different pollutants and greenhouse gases. If necessary, these may be differentiated by region in order to guide the technological choices and strategies should there be an exchanges between the emissions. Such research could contribute to the definition of indicators sensitive to the reduction of different pollutants.

- A.II.2 (a) (4) Studies of the factors which control the stability of ecosystems structures, their adaptation and their resistance to environmental change, including their responses to improved environmental conditions.

- A.II.2 (a) (5) Assessment of the effects of environmental factors, natural and anthropogenic, on key biological processes and structures in an ecosystem perspective.

- A.II.2 (a) (6) Development of functional analysis methods as a basis for the integrated management of ecosystems and selected habitats, with special emphasis on sensitive ecosystems such as alpine and mountain, wetland, island and coastal regions.

- A.II.2 (a) (7) Determination and comparison of interactions and links between various process and impact phenomena at regional and local scales, such as the links between eutrophication and contamination, and changes in land use; impact of physical processes in contrasting situations.

- A.II.2 (a) (8) Studies in ecotoxicology focusing on the distribution and effects of toxic substances and combination of substances; combined effects of pollutants and other environmental factors.

A.II.2 (b) Alteration of processes as a result of UV-B radiation ⁽¹⁾.

- A.II.2 (b) (1) Greater accuracy in the relationship between the dose, depending on the wavelength of the UV radiation, and the responses in cases with the most significant effects.

- A.II.2 (b) (2) Identification of the mechanisms controlling the adaptation tolerance and susceptibility of living beings at genotype and phenotype level.

- A.II.2 (b) (3) Quantification of the synergetic/antagonistic interactions between UV-B radiation and other aspects of global change, e.g. increased temperature and CO₂.

- A.II.2 (b) (4) Assessment of the chain of secondary effects of UV-B radiation on ecosystem processes and on biogeochemical cycles, e.g. changes in composition, species associations, the speed of decomposition, competition etc.

⁽¹⁾ The improvement of UV-B radiation dosimetry via the perfecting of measuring techniques is dealt with in Area I of Environmental technologies.

A.II.2 (c) Biodiversity and environmental change

- A.II.2 (c) (1) Understanding the role of biodiversity (including population dynamics) in maintaining the structure, function and stability of ecosystems.
- A.II.2 (c) (2) Understanding the mechanisms which adjust biological diversity at the landscape level (research on biological diversity at lower organization levels can be required in this context). Assessment of the effects of landscape fragmentation.

B. Environmental technologies**Area I: *Instruments, techniques and methods for monitoring the environment****Objectives*

- To help develop and improve analytical and monitoring methods for pollutant emissions and certain components of the environment with a view to better monitoring and forecasting of environmental change.

This contribution will be made (a) in the form of concerted actions, associating manufacturers and potential users of instruments, the JRC, in those areas which concern it, and the Measurement and Testing RTD programme; these concerted actions will aim to identify the needs of potential users and guide development work, and (b) through shared-cost RTD projects in coordination with the Measurement and Testing RTD programme.

- To develop procedures and methods for the identification and study of environmental change (land, inland waters and coastal environments).

These objectives will, among others, aim to meet the needs of the European Environment Agency.

Research tasks

- B.I.1. Contribute to the development of instruments with appropriate specificity, response, accuracy and precision for the ground or airborne measurement of the trace compounds and aerosols of the atmosphere between the point of emission and the free troposphere which cause important environmental phenomena (depletion of the ozone layer, changes in UV radiation, photo-chemical reactions, etc.).
- B.I.2. Contribute to the development of analytical methods to identify and measure certain pollutants and components of industrial waste water and non-industrial water.
- B.I.3. Contribute to the development of novel sensors, e.g. biosensors for application in environmental monitoring where conventional methods prove inadequate, e.g. with respect to sensitivity, selectivity, precision, reliability, sample preparation, on-line monitoring, cost effectiveness.
- B.I.4. Development and validation of land and airborne methods (spaceborne methods are dealt with under theme C) and procedures for the early detection of changes in the continental and coastal environment and for studying the evolution of such changes.
- B.I.5. Development of new technologies to provide improved dosimetry of UV-B radiation.
- B.I.6. Development of new techniques (archeometry) to permit the reconstitution of the environmental conditions of the past.

Area II: *Technologies and methods for assessing risks to and protecting and rehabilitating the environment**Objectives*

- To develop methods for the identification, understanding, estimation, comparative assessment and management and mitigation of the risks posed to the environment, natural resources and human health and safety by agricultural practices, industrial processes, products (including chemical products), urban development and cultural heritage.

- To help develop industrial processes and synthetic products which pose fewer risks to the environment; to help develop, improve and apply both preventive and remedial technologies.

This contribution will be made (a) in the form of concerted actions associating scientists responsible for analysing and understanding environmental risk and major industrial hazards, enterprises responsible for technological development, enterprises liable to benefit from technological development, the JRC, in the areas which concern it, the legislator and the 'Industrial and Materials Technologies' RTD programme, and (b) in the form of shared-cost projects in coordination with the relevant RTD programmes.

Research tasks

B.II.1. Methods of estimating and managing risks to the environment and to humans

B.II.1 (1) Improvement of exposure assessment methods for hazards and risks to health and to the environment, other than the workplace (particularly for early indicators of exposure) from chemicals in the environment; the development of suitable effects assessment methodologies, including alternatives to the use of animals in testing. This research will include methods for exposure prediction. Key elements of this research theme include the validation of existing assessment and testing methods through improving both the quality of the data used and the scientific bases for their inherent assumptions, particularly the validity of the extrapolations used e.g. *in vitro* to *in vivo* tests, animal models to man, laboratory to field, high to low doses, long to short time exposure, specific populations to vulnerable groups, and from single exposures to exposures to mixtures of chemicals.

B.II.1 (2) Better understanding of the mechanisms underlying the accidental release by industry of products which harm the environment or human health; development of safety management systems and systems to attenuate effects. Research should be geared primarily to materials, production systems and operations which, owing to their high toxicity, their inflammability and their propensity to explode, their widespread use in industry or their physical properties (e.g. tendency to form clouds which remain close to the ground or fill complex obstructed areas) cause risks which become apparent far from their source. Work on this theme should be linked to the EU's policy on the prevention of industrial accidents and accidents in the workplace, and seek the development of mitigative technologies, methodologies and well validated tools of assessment.

Atmospheric pollution will serve as a test case in which to integrate all the above aspects in a paradigm of risk management to control air quality, i. e. from characterization of emissions and assessment of exposure and effects, biomonitoring and risk analysis, to helping to develop control measures.

B.II.2. Analysis of the life-cycle of industrial and synthetic products

Development and validation of method to analyse and assess the life cycles of industrial and synthetic products, e.g. paper products and packaging.

B.II.3. Technologies to protect and rehabilitate the environment

B.II.3 (1) Contribute to the development and improvement of industrial processes and products so as to prevent or minimize their impact on the environment.

B.II.3 (2) Contribute to the development and improvement of integrated technologies to minimize solid, liquid and gaseous emissions. The technological choice must be based on a thorough understanding of the trade-off between pollutants.

B.II.3 (3) Contribute to the development and improvement of new technologies for the recycling of materials, including their decomposition to reusable raw materials and the recovery of energy and waste. Study of systems to encourage product recyclability.

B.II.3 (4) Contribute to the development and improvement of processes to treat organic wastes from industry, agriculture and urban areas. Study of systems and microbiological processes to enhance safe cycling of organics and nutrients.

B.II.3 (5) Management of dangerous wastes; development of safe procedures to process these wastes, including recycling of materials or recovery of energy to help make the operation cost-effective, where appropriate. Processing of residues to ensure they are detoxified, stable and safely disposed.

B.II.3 (6) The programme will contribute to the development of technologies to rehabilitate polluted industrial sites and abandoned waste dumps; development of rapid, non-invasive methods to localize and measure contaminants and study absorption/desorption processes and the pathways and bio-availability of pollutants to help establish suitable practices for *in situ* rehabilitation technologies.

B.II.4. Technologies to protect and rehabilitate historical sites

In accordance with European Union policies, research for the protection and preservation of the cultural heritage will be reinforced. The scientific base for the identification and assessment of the consequences of technology needs to be broadened. Research on this theme will be supplemented by assessment of the environmental risk factors (including the effects of tourism) for a range of materials, via the development and improvement of non-destructive methods of analysis and measurement, methods of mapping risks and damage, etc.

Area III: *Technologies to forecast, prevent and reduce natural risks*

Objective

To obtain quantitative data and develop physical models in order to improve methods for prediction, monitoring and management of natural catastrophes and risks. Comparison between theoretical predictions, observations and field measurements should be favoured as well as multidisciplinary approaches.

Research tasks

B.III.1. Hydrological and hydrogeological risks

B.III.1 (1) Development and validation of methodologies to prevent flooding on the basis of *in situ* data and remote sensing, including the development of methodologies for the modelling of spatial and temporal distribution of precipitation, particularly in complex terrain. Development of and experimentation with flood models (water training models), including appropriate coverage of the behaviour of layers of snow and ice. Development of and experimentation with coupling of meteorological and hydrological models in order to improve flood forecasting. Development of integrated water resources and river models to assess the regional and long-term consequences of river engineering works.

B.III.1 (2) Study of trends, monitoring and mapping of the risk of flooding, landslides and avalanches, especially in mountainous terrain linked, notably, to the effects of a change in land use and tourism and to a change in snow and ice cover. Improvement of the monitoring of landslides, mud flows and avalanches and of warning techniques, including triggering mechanisms. Evaluation of mechanisms of gravitational deformation and landslide triggering.

B.III.2. Seismic risk

B.III.2 (1) Development of advanced technologies to observe and analyse stress, strain and displacements in areas of high potential seismic, economic and social impact, including studies of active faults, recurrence times between events. Further understanding of risks from tsunamis could as well be considered. Development of advanced instrumentation to localize and detect earthquakes as well as local ground motion due to specific site effects. More specific studies could include the responses of different rock types to earthquakes, fault mechanisms in porous media and geomorphological response to earthquakes.

B.III.2 (2) Development of advanced automatic sensors for continuous monitoring and control of earthquake-related phenomena including effects on human habitat in tectonically strategic zones, appearing either during or before seismic activity. Integration and validation of

warning systems and the systems referred to above, to forecast earthquakes and tsunamis. Improvement and harmonization of structures and technological devices for the acquisition, transmission, storage and exchange at European level of earthquake data. Application of prediction models with local geological and geotechnical conditions to town planning and construction.

- B.III.2 (3) Improvement of European databases in the field of seismic risk and support to facilitate access to large facilities, where necessary, in particular experimentation and testing for new structures and new materials best suited to reduce seismic risk.

B.III.3. Volcanic risk

- B.III.3 (1) Development of automatic sensors for monitoring geophysical and geochemical phenomena coupled with continued basic research on the nature and behaviour of volcanoes and the continued study using the natural laboratory volcanoes in Europe. Development and validation of automatic systems to monitor volcano activity. Development of and experimentation with remote sensing techniques to monitor eruption clouds. Development of data processing methods to integrate these diverse sources of information (e. g. monitoring data and *in situ* geophysical and geochemical data).

- B.III.3 (2) Development of mobile warning systems

B.III.4. Forest fires

Mapping of fire risk and assessment of fire damage by means of remote sensing; modelling of fire behaviour; improvement of the scientific base necessary for the development of tools to manage and reduce forest fires. Improvement of risk ratings, collection and analysis of statistical data on forest fires.

C. Space techniques applied to environmental monitoring and research

As a relatively new technology, Earth Observation (EO) will require further research and development, as well as practical application, in order to reach its full potential to deliver benefits in the public interest commensurate with the ongoing investment in the space segment and to improve the ability to monitor and understand the Earth system at the global, regional and local scale, to assist the Commission and Member States to implement their own policy more efficiently, and to increase the use of Earth Observation data to develop the service sector in the provision of such information.

Area I: *Methodological research and pilot projects*

Objectives

- To improve and properly target the European technical and scientific capability in EO data treatment and interpretation.
- To develop applications of EO data of European interest, and to improve the quality and cost-effectiveness of the derived information.

These objectives will aim to meet, among others, the needs of the European Environment Agency.

Research tasks

Research projects funded under this area must focus on application areas which are relevant to the environment policy of the European Union, including relevant aspects of other Union policies. Projects should link to other appropriate research activities of the framework programme, particularly in the fields of Marine Science and Technology, Agriculture, Forestry and Fisheries.

Shared-cost activities and concerted actions will be complemented by the JRC direct actions in areas where it has competence and undertakes appropriate research by fostering improved cooperation between

environmental researchers, EO scientists, value-added companies, operational users, and the providers of remotely sensed data.

- C.I.1. Methodological research should aim to solve specific problems of high priority in the use of EO data. Such research is to be carried out in close cooperation between scientists from different application disciplines and instrument developers in order to ensure the full exploitation of EO data.

The following technical themes will be addressed:

- Development of improved data sets from EO instruments suited for adaption in the data structures of geographic information systems. This will facilitate the integration of EO data into that held in statistical information systems which are of particular interest to climate change and the early detection and study of environmental change in the terrestrial and coastal marine environment, environmental monitoring, environmental protection, agriculture, forestry and fisheries.
- Improvement of the cooperation between users of satellite data for environmental purposes with the goal of achieving greater utilization of EO data and technologies and promotion of the transfer of suitable data to applications.
- Development of generic tools and techniques for automated pre-processing, interpretation and integration of remotely sensed and ground data. Development of methods for data reduction. Where JRC has competence and undertakes appropriate research into expert systems, neural networks, parallel processing and integrated GIS, it will provide a complementary input to projects undertaken in this area. In particular, models and structures of appropriate data will be developed for the GISs with a view to facilitating the integration into the statistical information systems of data derived from Earth Observation.
- Support towards the planning of field measurements and ground data gathering campaigns, and development of improved procedures for calibrations and validation.

- C.I.2. Pilot projects are to test the cost-effectiveness of satellite and airborne sensors in an operational environment of selected applications.

Pilot projects will take account of the need to develop previous concerted actions in this field and will normally consist of the following elements: analysis of the operational needs of cooperating user (or users), and the value of the EO derived information as a function of information quality; identification of a suitable data supply chain and suitable processing schemes to derive the required information; preparation of an implementation plan, showing the close involvement of a collaborating user; establishment of a pre-operational pilot system.

Where appropriate links will be sought with relevant actions of the JRC, notably in the domains of environmental monitoring, tropical forest assessment, biomass burning, agricultural monitoring, and ocean colour.

Pilot projects may also be established within the framework of the implementation of the CEO (Research Area III) in order to test infrastructures for data handling and to help establish coherent user communities.

Area II: *Research and development work for potential future operational activities*

In order to underpin policy development the Commission acts both as a major customer itself, and as a proxy for other users, with a special concern to encourage the development of cost-effective operational services and activities. This requires a systems approach to understanding the operational requirement, including identification of the user community, instruments, missions, ground segment data handling, data processing and dissemination. In order to achieve the objective of this programme, support can be provided for the development of instruments in cases where it is clear that ongoing or planned satellite missions are not sufficient to cover the needs for environmental research or monitoring. The specification of these instruments to be funded under this action must be determined by the users community.

Objectives

- To identify and assess the user requirements at EU level for operational satellite EO activities.
- To ensure that space instruments of relevance to European Union policy are identified and developed to meet the requirements of existing and potential users.

Research tasks

- C.II.1. Research should focus on identifying the user requirement with respect to EU policy for satellite and airborne services to secure operational data in a cost-effective manner and defining the instruments, missions and ground structure needed.
- C.II.2. Development of new instruments should be preceded by the identification of user requirements. The case for improving operational characteristics and ensuring continuity of prototype instruments developed through the European Space Agency programmes and operationally orientated European space organizations such as Eumetsat will be considered in accordance to the above objectives. The case for completion of the development of the instruments Vegetation and Amas, based on activities from Member State agencies is of special importance and will be considered in accordance with the above objectives and the outcome will provide guidance for handling similar proposals in the future.

Area III: *Centre for Earth Observation*

An effective ground infrastructure is needed to enable the growing community of users to make optimum use of the available data, and to allow the emergence of operational applications.

Objective

The Centre for Earth Observation will contribute to the establishment of a coordinated, decentralized European Earth Observation network, the 'European Earth Observation System' (EEOS) to increase the use and value of earth observation data.

Research tasks

The work will focus on:

- C.III.1. encouraging better communication between individual users and between user communities;
- C.III.2. stimulating the creation of high-level products where and when necessary;
- C.III.3. promoting improved data standardization and quality assurance;
- C.III.4. coordinating the design and operation of existing and future decentralized data archives and databases and data delivery services;
- C.III.5. improving the visibility of EO data, services and expertise.

A project plan for the design and implementation of the CEO will be proposed at the end of the Pathfinder Phase study, which is scheduled for completion during Summer 1995.

D. Human dimensions of environmental change**Area I: *Socio-economic causes and effects of environmental change***

All the activities under this section of the programme should be closely coordinated with the RTD programmes on non-nuclear energy, transport, targeted socio-economic research and cooperation with third countries and international organizations.

Objectives

- To enhance the understanding of the main social and economic forces of environmental change at global and European level.
- To gauge the principal risks and impact of environmental change on the economy and society, and more specifically for the development of the European Union.
- To understand the interaction of production and consumption patterns, their receptiveness to change and the environmental effects of such changes at the global and European level.

These objectives will aim to meet, among others, the needs of the European Environment Agency.

Research tasks

- D.I.1. Analysis of the total and relative contributions of the main economic activities and of social behaviour and consumption patterns to environmental change at global and European level; development of appropriate ratings and indicators of environmental pressure and of models contributing to and forecasting critical interactions leading to environmental deterioration.
- D.I.2. Assessment of the scale of the impact of environmental change on society and on such key economic sectors as agriculture, silviculture, manufacturing industry, transport and tourism, and key infrastructural sectors such as energy and water supply with particular attention to regions characterized by great environmental and social vulnerability (e.g. mountainous regions, coastal zones, river systems, urban zones, alpine zones regions of high unemployment).
- D.I.3. Assessment of the links between trade liberalization and more sustainable consumption patterns and its effect on the environment as well as on economic and societal development in Europe and in developing countries.

Area II: *Economic and social responses to environmental problems**Objectives*

- To identify and enlarge the range of possible options in the field of social and economic action in response to critical environmental situations.
- To develop economic and social indicators and criteria with which to assess progress in the realization of sustainable development.

Research tasks

- D.II.1. Establishment of appropriate quantitative indicators of 'sustainable development', in space and time, in key economic sectors, with reference to the total stock of natural and human capital, ecological support capacity (including ecological diversity and the functioning of ecosystems), efficacy of materials and use of energy (industrial metabolism), and incorporating ethical considerations relating to the environment (e.g. fairness to and between present and future generations).
- D.II.2. Studies of cultural, historical and value-orientated barriers to sustainable development.
- D.II.3. Improving instruments to evaluate and compare various instruments of environment policy.
- D.II.4. Improving methodological approaches with which to incorporate environmental costs and benefits into economic performance indicators and accounting systems; establishment of key approaches to the application of accounting systems adjusted to the environment at different levels; improvement of techniques to internalize environmental costs; assessment of hypotheses and ethical implications, while stressing alternative systems of environmental assessment.
- D.II.5. Development of strategies and instruments to achieve sustainable development in the key economic areas of agriculture, silviculture, development aid, energy, tourism and transport and by improving the economic efficiency and the scientific base of the optimized mix of environmental instruments (regulatory measures and economic incentives), release and quality of environmental standards, with special attention to sectors and problems that cross geographical and administrative borders.

Area III: *Integration of scientific knowledge and economic and social considerations into the framing of environmental policies*

Objectives

- To analyse and improve the use of scientific knowledge and develop methods to deal with uncertainty in the framing of environment policies.
- To establish generic and interdisciplinary approaches to optimize the combination of scientific gauging of risk with socio-economic assessment of risk in environmental risk management.
- To step up the capacity to use environmental statistics with a view to drawing up the policies concerned.
- To analyse and improve models and instruments for the management of environmental risks where causes and effects cross international and regional borders.

Research tasks

- D.III.1. Development of new approaches integrating scientific and socio-economic parameters into the management of natural and technological risks. To conduct case studies on complex problems involving several components of the environment with a view to studying and improving the management of risks integrated at local and regional level (e.g. the Mediterranean basin, wetlands, alpine regions, urban environment; waste and problems related to water management).
- D.III.2. To assess and improve the methods and procedures for using scientific knowledge in the formulation, implementation and evaluation of environmental and other policies; to examine alternative approaches so as to take account of scientific uncertainty in the formulation of policies, and taking account also of such essential environmental principles as the 'precautionary principle'.
- D.III.3. Development of models to establish links between damage to the environment and the other relevant physical and socio-economic variables. This will be achieved by improving the design and definition of information systems on environmental damage and of techniques for integrating environmental data.
- D.III.4. Development of methods for the assessment of environmental data and for their transformation into useable information, i.e. useable by policy-makers and public interest groups.

Area IV: *Sustainable development and technological change*

Objectives

- To understand the key parameters of environmentally sustainable technological development and its interaction with competitiveness and employment in the European Union.
- To develop methodologies to assess and maximize the contribution of RTD to sustainable development.

Research tasks

- D.IV.1. Develop and apply criteria (e.g. economic, regulatory, employment potential, social acceptability) for the specification of core technologies which promise competitive advantage as a result of environmental improvements: either by means of 'generic' innovations such as minimization of materials, improved product design, etc; or by systematic assessments of possible technological responses to critical environmental problems (e.g. global warming, ozone depletion, biodiversity loss, water shortages, soil degradation, etc.).
- D.IV.2. Develop methods for cost-risk-benefit of evaluation of technologies which have a major impact on the environment, including integrated assessment approaches at the regional process and production levels (e.g. cost-benefit analysis, eco-audits, cumulative environmental impact assessment, industrial metabolism/life cycle analysis, process re-engineering); incorporate sustainability criteria into the formulation, assessment and utilization of European RTD activities.

- D.IV.3. Elucidate the links between social preferences based on environmental considerations and technological change, e.g. social acceptability of technologies, societal preference for 'green' products; impact of new ideas on environmental protection such as life cycle management, extension of producer liability, etc; develop combined environmental/commercial performance indicators; undertake studies of successful approaches to sustainable development at the level of the company.
- D.IV.4. Elucidate the links between various types of environment policy instrument (legislation; market instruments) and their influence on technological development.
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ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

(ECU million)	
<i>Theme A</i> Natural environment, environmental quality and global change	250
<i>Theme B</i> Environmental technologies	133
<i>Theme C</i> Space techniques applied to environmental monitoring and research	109
<i>Theme D</i> Human dimensions of environmental change	40
Total	532 (1) (2)

(1) Of which:

- a maximum of 3,8 % for staff expenditure and 3,6 % for administrative expenditure,
- ECU 5 million for the dissemination and optimization of results,
- 2 % for training,
- up to 5 % for specific measures in respect of SMEs.

(2) A sum of ECU 320 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the fourth RTD framework programme for environment and climate, is earmarked for the specific RTD programme 'to be carried out on the one hand by means of direct action (JRC) and on the other by means of activities within the framework of a competitive approach and intended for S/T support to Community policies (1995 to 1998).'

The breakdown between different areas does not exclude the possibility that projects may cover several areas.

ANNEX III**SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME**

The programme will be carried out through indirect action, whereby the Community makes a financial contribution to RTD activities carried out by third parties or by JRC institutes in association with third parties:

1. Shared-cost actions of the following type:

- 1.1. RTD projects carried out by undertakings, research centres and universities, including, where appropriate, basic research of an industrial relevance.

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

- 1.2. Technology stimulation to encourage and facilitate participation of SMEs in RTD activities:

- by granting awards for carrying out the exploratory phase of an RTD activity, including the search for partners, during a period of up to 12 months. The award will be granted following the selection of an outline proposal to be submitted normally by at least two non-affiliated SMEs from two different Member States. The award will cover up to 75 % of the cost of the exploratory phase, without exceeding ECU 45 000, and
- by supporting cooperative research projects, whereby SMEs having similar technical problems but not having adequate own research facilities, engage other legal entities to carry out RTD on their behalf. Community funding for cooperative research projects, involving non-affiliated SMEs from at least two different Member States, will normally cover 50 % of the cost of the research.

Following an initial call, in both cases proposals may be submitted at any time during the period covered by the work programme being implemented.

These activities will be complemented by specific preparatory, accompanying and support measures.

2. Measures appropriate to this specific programme:

- support of financing infrastructures or facilities necessary for the performance of a coordinated action.

Community funding may cover up to 50 % of the costs of these measures.

3. Preparatory, accompanying and support measures, such as:

- conferences, seminars, workshops or other scientific or technical meetings, including intersectoral or multidisciplinary coordination meetings,
- use of external expertise, including access to scientific databases,
- scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out within the third action; the factors liable to encourage use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,
- studies to assess the socio-economic consequences and any risks to the environment associated with all the projects under this programme. These studies will be carried out in close collaboration with the programmes on non-nuclear energy, transport, international cooperation and targeted socio-economic research, so as to ensure optimum exploitation and continued use of their findings,
- training activities related to research covered by this programme,
- independent evaluation of programme administration and of the implementation of the activities,

- development of international scientific cooperation, in particular in the area of research into global change, including with the developing countries,
- measures in support of the operation of networks to provide information and decentralized assistance to SMEs in coordination with Euromanagement auditing activity of RTD.

Community funding may cover up to 100 % of the costs of these measures.

4. **Concerted actions**, consisting of the coordination, notably through 'concertation networks', of RTD projects in the programme and those already financed by public authorities or private bodies. Concerted actions may also serve as the necessary coordination for the operation of common interest groups which, through shared-cost RTD projects, bring together around the same technological or industrial objective, manufacturers, network operators, software houses, service providers, users, universities and research centres.

The Community participation may cover up to 100 % of the costs of the concertation.

Extract from the proposal for a Council Decision for the JCR programme (COM(94) 68 final — 94/0095 (CNS)) concerning the activities envisaged for the Joint Research Centre (JRC) in the areas covered by the specific programme on environment and climate

The JRC will contribute to the promotion of environmental protection in close cooperation with the corresponding shared cost action programme and through the following three sectors:

- natural environment, environmental quality and global change,
- technologies for environmental protection,
- applied space techniques for environmental monitoring and research.

The European Community should make a major contribution to international research into global change, in particular by participating in major initiatives undertaken by the scientific community, such as the International Geosphere Biosphere programme (IGBP) — the activities of the European IGAC (International Global Atmosphere Chemistry) Project Office (EIPO) will be continued at Ispra for IGBP — the World Climate Research programme (WCRP) and the Human Dimension programme (HDP).

In this context the Joint Research Centre will concentrate its research on:

- the surveillance and study — particularly using remote sensing technology — of biosphere-atmosphere interactions and interactions between the processes taking place on land and in the ocean and the relating parameters affecting climate change,
- physical and chemical analyses of atmospheric processes (in particular the study of sulphur in the atmosphere), including the behaviour of biogenic and anthropogenic emissions. This should include both measurements and modelling,
- the surveillance of global change by remote sensing through the development of advanced earth observation techniques. This should include research into the development of techniques for using space data obtained from satellite observation for the surveillance of the marine environment and of changes in the terrestrial ecosystem. A number of advanced techniques (including those of a statistical nature) for using the new earth observation system should also be developed.

In addition, the JCR will make a significant contribution to the implementation of the Centre for Earth Observation (CEO).

The scientific community and decision-makers need accurate and consistent earth observation data spanning a long period. To meet this urgent need, the European Community should set up the Centre for Earth Observation in close cooperation with the Member States and in association with the European Space Agency. This project is designed to guarantee users continuous and long-term availability of consistent data relating to earth observation. It will set up a decentralized network of interested European bodies and thus bring users, the bodies responsible for thematic analysis and data-processing centres together in a single forum. The role of focal point of such a network should be performed by the JCR, while the programmes of shared-cost action will provide support for the national components of the network.

The JRC will also contribute to the Enrich network by making its scientific research on global change available.

The JCR will continue to contribute to improving environmental quality, mainly through research on air and water quality and the evaluation of the risks arising from chemical products and waste. Research into air quality inside buildings will also be continued, as will the study of pollution caused by metals in trace quantities.

Research into innovative technologies for environmental protection will aim to:

- improve industrial safety and environmental management by providing industry, research bodies and the public authorities with innovative methodologies (in particular design tools) for evaluation of the safety of chemical installations,
- developing mechanisms for the control of chemical reactions which might become uncontrollable, tools for predicting the dispersion of toxic or flammable products and the consequences of combustion and explosion.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, in the field of biotechnology (1994 to 1998)

(94/912/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130 i (4) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas by Decision No 1110/94 EC ⁽⁴⁾, the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of biotechnology; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 522 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas research in biotechnology may lead to improvements in agricultural and industrial efficiency and viability, to more protection of the environment and health and a better quality of consumer products;

Whereas agriculture should benefit from biotechnology spin-offs to maintain its productivity levels, whilst preferring technical solutions in order to diversify products, reduce environmental impacts, and favour partnerships with European enterprises;

Whereas this programme may make a significant contribution to the stimulation of sustainable growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment';

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of biotechnology;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality; whereas the implementation of this programme should be directed towards strategic and, where possible, measurable aims with a view to facilitating coordination with programmes in the Member States and evaluation of the present programme;

Whereas basic research in biotechnology must be encouraged throughout the Community because it provides a source of innovation offering a large range of scientific opportunities to meet the real needs of society;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

(1) OJ No C 228, 17. 8. 1994, p. 107.

(2) OJ No C 341, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p. 1.

Whereas provision should be made for measures to encourage the involvement of small and medium-sized enterprises (SMEs) in this programme, in particular through technology stimulation measures;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which undertakings, particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of biotechnology by research centres, universities and enterprises, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas the nature of the activities to be undertaken in this programme requires close cooperation and coordination with activities undertaken under other specific research programmes; whereas such coordination and cooperation should achieve synergies especially in the fields of biomedicine and health, and agriculture and fisheries;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise support activities and activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States or regions which participate least in the programme (close coordination with Activity 3 of the framework programme being necessary to achieve synergies), and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation of the programme;

Whereas *ex ante* and *ex post* assessments should be made of possible socio-economic and ecological consequences and of any technological and biological risks and of the social desirability of the activities undertaken in this programme;

Whereas, in view of the rapid progress being made in biotechnology, the programme should also contribute to the development of ethical guidelines for the promotion of biotechnological research;

Whereas any projects aimed at modifying germ cells or any stage in the development of the human embryo must be excluded from the research funded by this programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to

adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas on 23 April 1990 the Council adopted Directive 90/219/EEC on the contained use of genetically modified micro-organisms ⁽¹⁾ and Directive 90/220/EEC on the deliberate release into the environment of genetically modified organisms ⁽²⁾; and whereas research financed by the Community must follow all the legislative provisions of the biotechnology regulatory framework concerning the protection of human health and the environment, the protection of workers exposed to biological agents at work, and the protection of animals used for experimental purposes or for other scientific purposes, current at the time of the programme's application;

Whereas this programme should set up a scientific basis to guide the formulation and technical adaptation of biotechnology regulations;

Whereas, to achieve this, there must be an informed public in society which, by making the content, goals and methods of biotechnology transparent, takes part in a competent manner in the discussion on issues as to the desirability of this programme;

Whereas activities undertaken within this programme will take account of common principles such as those embodied in international treaties for the protection of fundamental human rights and of the draft Bioethics Convention of the Council of Europe, once it is adopted;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and technological development, including demonstration, in the field of

⁽¹⁾ OJ No L 117, 8. 5. 1990, p. 1.

⁽²⁾ OJ No L 117, 8. 5. 1990, p. 15.

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Paragraph 4.A of Annex III, first activity of the fourth framework programme, is an integral part of this programme.

The Background

The Commission has presented in its White Paper on 'Growth, competitiveness and employment' an analysis of the potential of biotechnology revealing definite promise based on the omnipresence of bioprocesses and the competitiveness of sectors of application but identifying weaknesses on which Community efforts should have priority.

The economic sectors whose competitiveness significantly depends on biotechnology (pharmaceuticals, chemicals, agriculture, food) account for the employment of 16,4 million people in Europe and exports worth ECU 132,8 billion. Europe has up to approximately 3 000 companies involved in some aspect of modern biotechnology, including a number of world-class chemical and pharmaceutical companies. The sustained growth of these sectors depends on a strong and innovative science base; a highly trained and skilled workforce; the efficiency of technology transfer from the science base to industry; the rapidity with which novel and innovative techniques are incorporated into established practices; the adoption of a multidisciplinary approach to biotechnology-based processes; the validation of scientific principles to underpin a unified market for biotechnology-derived products; and the harmonious application of bioprocesses as beneficial alternatives to promote the environment, human health and welfare. Progress along these lines will ensure that the estimated sales of non-food biotechnology products of up to ECU 40 billion by the year 2000 can be realized with prominent European participation and a high degree of social acceptance.

This situation is historically unique, as it brings biotechnology into the present reality of scientists, policy makers and industry, whereas earlier research programmes had been based on future promise.

Particularly relevant to bringing the life sciences to play an increasing role in society will be the arrival on the market, under the period covered by the fourth framework programme, of the first generation of transgenic plants endowed with useful new properties, of safer and more efficient vaccines deriving from rDNA work or of natural antimicrobial substances preventing microbial spoilage of food products.

While two other programmes, on biomedicine and health research and on agriculture and fisheries research, will promote the applications of biotechnology within their respective sectoral activities linked to the provision of goods and services, the biotechnology programme itself will create further opportunities by deliberately penetrating the heart of living systems. The flow of information between those three will be the key to success.

It will be the responsibility of the Community to promote under this programme further research work where society would expect the highest returns. This points to privileged areas for the exploitation of new knowledge, all of which experience in common an acute need for cross-linking connected topics and/or integrating large groups of experts on an international scale. Such an integrative approach must also be taken in order to:

- ensure safety when using living cells in the production process,
- give commensurate importance to the European contribution to international genome projects,
- promote reasonable development of agriculture, taking environmental protection into account, and taking appropriate account of animal protection, in so far as, for example, genetic modification of animals and crops or health is involved,

- overcome the purely academic distinctions between specialist areas such as neurobiology, endocrinology or immunology with a view to unravelling cellular and molecular interactions.

International collaboration with the Human frontier science programme will be strengthened, as will links with Eureka projects and national programmes within the Community.

Environmental impact and also, in principle, socio-economic aspects will be taken into account, on the basis of parameters which are as quantifiable as possible, in project selection and the evaluation of research objectives and in evaluating the results.

Translation of the programme's research findings should be viewed in connection with the socio-economic environment and the consequences which are therefore likely and hence calls for special attention. In special cases, demonstration projects must be set up. Dialogue between the research community and public opinion in connection with ethical and social issues and consequences of biotechnological research and the application thereof will be launched or continued under the programme. As far as research is concerned, what is being sought is not only the obtaining of public 'acceptance' with regard to the consequences of research, but above all the creation of transparency to enable a well informed public to make a responsible judgment on biotechnology and its applications.

This programme will be implemented, as appropriate, in coordination with the specific programmes on: Information technologies; Standardization, measurement and testing, Environment and climate, Industrial and materials technologies, Non-nuclear energy; and Targeted socio-economic research.

Measures intended to encourage the participation of SMEs, in particular technology stimulation measures and links between science parks and biotechnology SMEs, taking account of the needs of those from less advanced regions, as recommended by the White Paper on Growth, competitiveness and employment, will be implemented.

The Proposed RTD Activities

The centre of any biological process in nature or in systems domesticated by man really is the living cell, which functions as a minute factory.

Each cell consumes its raw materials, converts energy, produces high value molecules as well as wastes, and has learned through evolution how to carry out those constructive processes in equilibrium with its environment. An infinite number of cells in living organisms bred for agricultural purposes, or in fermenters conducted for the industrial supply of valuable molecules, all behave as populations of clean productive units which can be exploited in a sustainable manner. In an attempt to focus biotechnology where it genuinely differs from alternative technologies, all efforts must start with a thorough understanding of how the cell manages to be so successfully industrious.

I. OBJECTIVES REQUIRING CONCENTRATED MEANS

Area 1: Cell factories

Industrial and environmental exploitations of living cells would hardly be achievable without a global approach integrating contributions from biological disciplines, computer science and process engineering which they have to depend on. New interfaces between biotechnology and other advanced technologies offer opportunities for the integration of biology also with other sciences and technological fields. A multidisciplinary vision of cell factories must be promoted, with the intertwined participation of academic and industrial laboratories.

The primary objective is to reach an understanding of how living cells, micro-organisms as well as animal and plant cells, manage to be productive and how industry can use cellular processes and further design and operate safe, reproducible and sustainable bioprocesses.

Optimal use should be made of relevant biological knowledge generated from studies on: cell biology and signalling, cell multiplication, membrane structure and function, macromolecular interactions, protein folding and secretion, enzyme catalysis mechanisms and control of the enzymatic activity,

biotechnology, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 552 million, including a maximum of 7,5 % for staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged under Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by

independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks,
- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements, including specific modalities for implementing technology stimulation measures for SMEs and other measures, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under other specific programmes, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks, such as Eureka and COST,
- arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according

to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals, and establishment of criteria and mechanisms for project approval and selection,
- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than ECU 0,5 million,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,

- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,5 million, the Commission shall inform the committee of the activities and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as a whole.

Article 8

Participation in the area of prenormative research, biodiversity and social acceptance may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

transcriptional and post-translational events, genetic stability and interactions, microbial physiology and biodiversity, the control of metabolic fluxes and interactions, extremophily, extremotolerance, cellular stress reactions, antimicrobials, etc. also for the purpose of identifying and producing anti-metabolites and inhibitors of enzymes for industrial, pharmaceutical and medical use. Support will be given where the combination of this biology with engineering approaches is most likely to realize the biotechnological potentials of cell factories, particularly in fields such as: the fundamental aspects of fermentation, biotransformation, biocatalysis, bioremediation, biosensors and process control of technologies cell culture and co-culture, downstream processing, etc.

The research tasks will be concentrated on relevant generic topics of interest to industry and other end-users of biotechnology. A typical project will require the integration of biological and biochemical engineering disciplines and will be aimed at solving gaps in basic knowledge as well as technological barriers which prevent the full exploitation of the cell's capability as a factory for the conversion or production of useful biomolecules.

The biosafety of vector systems, cell lines and microbial cultures will be an important consideration of any project selected for this action.

In order to optimize Community resources and exploitation of research results, bioprocess engineering activities will be synergistically and closely coordinated with the contributions invited under the programme on Industrial technologies, or under the Agriculture and fisheries research programme which covers interrelated work applying processing, end-use and scaling-up technologies adapted to industrial conditions. The emphasis of cell factories is in the development and optimization of generic technologies potentially applicable to a large number of sectors.

Area 2: Genome analysis

Genome analysis is a field in which a global approach is essential. The coordination of European networks, supported by previous EC programmes in this area, has enabled these networks to participate successfully in world-wide genome programmes, thus demonstrating a significant European added value. This effort will be continued and strengthened in the fourth framework programme through the further analysis and sequencing of model genomes, such as *Bacillus subtilis*, *Saccharomyces cerevisiae* and *Arabidopsis thaliana*. The mapping and sequencing projects will combine efforts to unravel new genes with studies on genetic function; they will make a new effort to encourage the development of novel software and other bioinformatic tools and, where appropriate, to integrate the development and extension of the methodological and instrumentation basis. Also relevant transcriptional and replicative mechanisms will be investigated, as well as higher levels of organization of the genomes, such as now made possible by the new knowledge of complete chromosome composition and structure becoming gradually available.

Methodologies and new tools for genome analysis should be established. These will render possible the association of detailed biological functions with newly unravelled genes from any appropriate model genome. A systematic approach to function search will be allowed through networks of specialized laboratories which on the basis of mutated, deleted or over-expressing strains carrying uncharacterized genes, will rely on standardized tests pointing the way towards the associated functions. Conversely, targeted approaches to biotechnologically important functions will be encouraged through the submission of proposals by consortia willing to screen, in yeast or other appropriate organisms, the collection of disrupted mutants against pre-defined phenotypic alterations with a view to identifying sets of genes coding for industrially relevant pathways. Special attention will be given to additional innovative approaches (i. e.: based on mRNAs, gene structure or promoter similarities, etc.) exploitable for harvesting the maximum biological benefits from existing genome projects. By bringing the gap between sequencing activities and the functional characterization of sequences, another entry into the cell factory concept will be provided from the specific angle of the genetic control of metabolic pathways.

Comparative methods will be exploited across different genomes including the human genome. These approaches will include the development of new mapping procedures based on the use of homologous DNA probes from model genomes, heterologous expression through cDNAs in bacteria or fungi and

development of new informatic software to improve detection of functional or structural homologies. The development and sharing of advanced technologies and a decentralized pool of exchangeable clones, probes and data will be organized.

With a view on possible medical applications, work on the human genome will be concentrated in the Biomedicine and health research programme. However, comparative approaches and related technology developments will include human DNA and, with respect to human cells, the same limitations will be applied, i.e. alteration of germ cells or any stage of embryo development with the aim of modifying human genetic characteristics in a hereditary manner is excluded from the programme objectives. The coordination with accompanying measures on the ethical, social and legal aspects, executed elsewhere in the programme, will be emphasized.

Area 3: Plant and animal biotechnology

(a) Plant molecular and cellular biology

Plant molecular and cellular biology, including protein engineering physiology and pathology, at the crossroads of agricultural, industrial and environmental issues, will be developed by stressing the need for an integrated research. Particular attention will be given to the molecular understanding and eventual modification of relevant plant processes as an approach leading to new tailor-made market-relevant agricultural or forestry products, and to production methods compatible with the environment, health and consumers' demand, which areas are included within the Agriculture and fisheries research programme. Identifying, characterizing and exploiting useful biological traits of agricultural and industrial relevance, in terms of quality improvement and greater environmental acceptability, and their corresponding genes would be the main target for such activity.

These include: pest and disease resistance; stress tolerance; quality, quantity and tissue specific expression of valuable plant metabolites such as starch, oils, valuable protein, fibres, pharmaceuticals in leaves, seeds, roots, etc., at the cell level; improved enzymes and macromolecules for processing; developmental pathways, reproduction and regeneration; improved enzymes and macromolecules for processing.

Underpinning science will have to be considered, such as that allowing control of stable heterologous expression and of stability of expression, cell structural analyses (to understand and regulate the traffic of molecules), or identification of nutritional and health properties of food and feed components (to fine tune molecular breeding objectives towards crops displaying healthy attributes), which is complementary to an important objective of the Agriculture and fisheries research programme. A typical project will attempt to achieve the appropriate level of integration of plant science with end-user technology, and of target-oriented research with those areas of eukaryotic biology where key knowledge is stemming from (genome analysis, structural analysis of macromolecules and enzymes, signalling pathways, bioinformatics, etc.).

(b) Animal physiopathology

Low resolution maps of a few farm species will be available shortly. Physical maps that are tightly related to the genetic maps must be established. Gene mapping will be very useful to select animals for traits which are under the control of many genes (quantitative trait loci or QTL) such as the resistance to diseases, to eliminate genes with harmful effects or to transfer new genes of interest from various strains of animals by appropriate breeding. European networks will be established or extended to map the genomes of animals, including fish, chosen for their importance in agricultural, industrial or fisheries sector. Such studies will greatly advance our knowledge on QTL analysis. Research activities related to animal disease resistance, developmental biology, and basic reproductive mechanisms of the farm animals will also be supported, due consideration being given to animal welfare and animal genetic diversity principles.

In so far as an understanding of certain severe human and animal diseases requires transgenic and other animal models to be developed, studies will be conducted to allow the development of new techniques to raise animal models with precise and predicted genetic characteristics designed to provide information of high quality and specificity in relation to pathological disorders. Research

will be encouraged where it produces evidence on the physiological roles of regulated/deregulated pathways, or genetically-encoded factors during the evolution of any particular disease.

An equally important objective will be the development of new methods for somatic gene therapy, particularly vectors to transfer genetic material capable of complementing weakened or missing gene functions potentially of medical importance. The programme will also consider other associated techniques to overcome barriers precluding the general applicability of somatic gene therapy protocols, with regard to recipient cells. Models which could be used for the evaluation of the method will also be considered.

Concerning the last two subjects which might impinge on future medical and veterinary applications, the emphasis of this programme will remain on the design and development of safe experimental tools giving rise to possible synergies with the Biomedicine and health or Agriculture and fisheries research programmes.

Area 4: Cell communication in neurosciences

Cellular biology, molecular biology including molecular genetics and biochemistry, pharmacology will be combined with genetic engineering in order to promote multidisciplinary studies on cell physiology and cell communication of the nervous system including associated cells and with a view to promoting neurosciences using the support of these disciplines. Special attention will be paid to the physiology of the development of the nervous system, the management of information (intra- and intercellular events) by the nervous cells, possible cellular dysfunctions such as those associated with human and animal degenerative diseases, the design of neuro-drugs taking advantage of biotechnology (e.g. molecular modelling), the development of *in vitro* tests for the pharmacotoxicology of such substances.

This programme will concentrate on approaches at molecular and cellular levels and the development of related tools.

The four actions described will be supported by specific measures designed to improve interactions between research and research teams, on the one hand, and practical applications and users, on the other. Ethical issues, questions concerning safety provisions, public information issues and — in particular with a view to the link between research and industry — training issues will play a role in this.

II. OBJECTIVES MAINLY ADDRESSED BY CONCERTATION

Four other activities will be approached mainly by concerted actions supplemented where appropriate by cost-shared actions. The objective in this case will be to share work and information in fast-moving fields, and to pool data or methods which may provide useful bases upon which science policy and regulatory measures could be developed further.

Area 5: Immunology; transdisease vaccinology

In immunology and immunotechnology, new biotechnology-derived substances in relation with the immune system (monoclonal and recombinant antibodies, immunotoxins, cytokines, growth factors, receptors, adhesion molecules etc.) may reveal a range of effects preventing or controlling major human and animal pathologies. Special attention will be given to the possibility to initiate mechanistic studies of the interaction of these substances with the physiology of the organism, in order to develop new pharmacological concepts which should be relevant to specific interests of the Biomedicine and health research programme.

Research on transdisease vaccinology will be encouraged across Europe (live carriers and non-live carriers for vaccines, their ability to induce immunity to normal or pre-immunized organisms, their safety in normal, immunocompromized hosts and in other species likely to be in contact — antigen delivery systems, particularly those giving the possibility to administer a unique dose — mucosal and peroral vaccination — induction of T and/or B immune responses, and host-pathogen interactions, etc.). Model diseases of pathogenic and/or oncongenic origin used for the demonstration of the new methods will have to be chosen for their importance in human or veterinary medicine.

Area 6: Structural biology

The systematic determination of the three-dimensional structures of biomolecules will contribute to the knowledge of the relationships between primary structures and the tertiary structures of biologically active macromolecules and, even more, the quaternary structures of the multi-subunit complexes which mediate most biological activities. The accelerating accumulation of structural information underlines the need to store, retrieve and analyse this information (see Infrastructures).

The objective is the understanding of the structural basis of biomolecules and complexes (proteins, DNA, RNA, carbohydrates and lipids) which is essential to the discovery and refinement of new biochemical entities. The improvement of the resolution of the techniques and the growing size of structures that they can assess will be crucial. Such technical developments will allow work on subcellular structures, e.g. chromosomes, spliceosomes, replisomes, with further implications for biological understanding.

Biological macromolecules that catalyze chemical reactions (enzymes, abzymes, ribozymes) are particularly of interest for industry. To obtain biomolecules with new properties, two different and complementary ways are to be considered. On the one hand there is the rational design of biomolecules which requires a detailed understanding of, and control over biomolecular conformation and reactivity (position of functional groups, folding properties). On the other hand there is *in vitro* directed molecular evolution whereby multiple rounds of selection, amplification and mutation, leading to biomolecules with the desired properties, are applied.

Finally, the emerging interface of biology and electronics will be stimulated with a view to allowing the integration of competences in structural biology, molecular engineering and nanolithographic patterning towards new possibilities of designing functional units which could incorporate modifications at the scale of the nanometre.

Area 7: Pre-normative research, biodiversity and social acceptance

Community efforts will be brought into closer harmony with national efforts when this leads to methods or data that would consolidate the rational basis of regulatory approaches and would support the development of internationally accepted standards and systems of risk assessment. This activity will have synergies with other programmes, e.g. Biomedicine and health, Industrial and materials technologies, Environment and climate, Agriculture and fisheries. This activity will be encouraged in three fields: the development of toxicological/pharmacological *in vitro* tests, the biosafety evaluation of biotechnology-derived products, and the development of processes solving environmental problems.

As far as *in vitro* testing is concerned, priority interest will be in neurobiology, immunology and developmental pharmaco/toxicology as well as in the development of cultures or co-cultures of cells maintaining their normal metabolism, with a clear view to providing methods and data usable as alternatives to animal testing and eventually made available for prevalidation studies, such as the Biomedicine and health research programme has planned.

As far as the biosafety evaluation of transgenic organisms and derived products is concerned, special emphasis will be given to the risks possibly associated with releases of genetically modified organisms, including recombinant life vaccines, into the environment and to the scientific support to the implementation of the Community's regulatory framework ensuring safety for man and the environment.

This should be approached at two levels. First at the basic level of molecular ecology and, second, at the level of prenormative research, which gathers data of particular usefulness to regulatory authorities when carrying out risk assessments under Community legislation.

Most of these studies, and particularly prenormative research, should be complemented by field tests in order to take into consideration environmental factors.

Microbial ecology does not only serve prenormative research but it is an indispensable element for studies on environmental biotechnology and microbial biodiversity.

In order to lead environmental biotechnology to useful results, knowledge acquired from microbial ecology, microbial diversity and bioprocessing (see cell factories) should be appropriately combined, aiming at the prevention, detection of hazardous compounds and the remediation of the environment.

Microbial diversity should be better understood, with particular attention to microbial characterization in the natural environment, isolation strategies and cultivation procedures, direct analysis of microbial communities through DNA sequencing and RNA analytical methods, biosystematics using molecular techniques and markers, screening strategies and conservation.

Plant and animal diversity studies will also be part of the more general approach which consists in using molecular and cellular biology to bring about methodological improvements for the conservation of genetic resources or/and for exploring unexploited diversity.

Particular emphasis will be put on analysing lateral issues such as public perception and the acceptance of biotechnology in general, in liaison with the horizontal activity on ethical, social and legal aspects of the life sciences and technologies.

Area 8: Infrastructures

The development of user driven centres for bioinformatics, information infrastructures and resources as a service and support to wider scale research by the Community or its Member States should be encouraged. This should include the collection, annotation, maintenance and distribution at a European scale of sequence and bioresource database, the coordination of national and specialized nodes of biocomputing and the development of biological collections. The services shall aim to support and underpin the overall objectives of the Biotechnology programme, particularly in the areas of genome sequencing, structural biology and biodiversity. Special attention shall be paid to ensure that these services match the research needs, including those of large industry and SMEs.

Necessary actions should be taken as to ensure proper publicity and wide spread distribution of collections and information contained in databases. In the case of biological collections, coupling of specimen distribution channels and related information systems will be fostered in order to ease access to repository catalogues and eventual ordering and delivery.

Large scientific and technical communities should be able to have simple and, as far as possible easy access to deposit and retrieve information from diverse sources of data, including bibliographic indexes. To achieve these objectives, the following facilities should be provided by the information services: user-friendly interfaces; cross-reference and navigation mechanisms between data entries; interconnection of diverse national and Community-wide databases via European networks; extensive use of standards and, when necessary, definition of new exchange formats. Close cooperation with existing R&D programmes in the field of Information Technologies should be encouraged in order to benefit from their findings and achievements.

Research activities on novel bioinformatics techniques will be supported whenever they could contribute to improve the service aspect of the mentioned tasks.

III. OBJECTIVES TREATED BY MEANS OF HORIZONTAL ACTIVITIES

Demonstration activities in biotechnology

New biotechnologies stemming from forefront European research encounter specific difficulties and socio-economic barriers which preclude their full exploitation in the market place. European biotechnology researchers continuously produce a rich flow of opportunities that can benefit society in many different ways. However, a variety of techno-economic uncertainties, inherent to the adoption of these complex interdisciplinary processes (which are not easily understood by the technology users, or even, in some way or another, feared by the public), hamper the full exploitation of research efforts and increase the time and risks involved in the market penetration of well established, new

biotechnological concepts. Community support to carefully selected biotechnology demonstration activities will encourage European concerns to deploy the costly, critical-mass, interdisciplinary resources needed for overcoming those hurdles and will, therefore, facilitate the adoption of new biotechnologies by potential users in industry and services, as well as the end consumers. To this end, when appropriate, platforms of technology-users, including industry platforms for small and medium-sized enterprises ('extended audiences') might be created in order to maximize both the impacts of the demonstration projects and the awareness about the techno-economic potential of the new technology subject to the demonstration.

Biotechnology demonstrations can be linked to any scientific and technological research area considered within this specific programme and will be developed in close cooperation and synergy with the Agriculture and fisheries, and the Biomedicine and health research programmes, integrating resources from all disciplines relevant to project implementation. A high thematic flexibility is needed for the bottom-up identification of demonstration activities from which the highest impact is to be expected, both in strengthening the competitiveness of European industries, and in promoting an objective public understanding of biotechnology. Particular focus areas might include, amongst others: novel cell technology and biochemical engineering approaches with the potential to maximize benefits from the cell factories; new vaccines; use of transgenic plants and animal models; bio-remedial application of micro-organisms for the removal of toxic wastes.

Ethical, social and legal aspects (ESLA)

The participation of the Community in a dialogue embracing all relevant socio-political and bioethical positions, taking into account cultural differences and existing national policies will be encouraged and, where appropriate, deliberately organized. Whilst recognizing existing national and international points of view, scientific studies will focus on transdisciplinary approaches of selected topics, of high relevance and possible impact within the biotechnology programme, and on the applications of their results (e.g. genome research, biodiversity, intellectual property, in particular research exemption for patents, introduction of new biotechnology products for industry and environment, transgenic animals, neurosciences). Where appropriate, these activities will also contribute to identifying areas for the application of common principles and for agreeing their best possible interpretation. The continuous updating of scientific data in support regulatory processes will be facilitated.

Public perception

Specialized working groups will be established to prepare *ad hoc* initiatives, like workshops, conferences, reports and surveys important for the public perception of biotechnology. Appropriate and timely information about research objectives, scientific breakthroughs, knowledge and added value/benefits obtained, and obstacles are the key elements for the public perception of biotechnology which must be reviewed in an open discussion about possible applications and implications of the results of this new technology. It is important that in addition to information dissemination, in particular through conferences and surveys, it could be demonstrated that suggestions and concern expressed from the public side are considered in strategic planning.

Socio-economic impacts

An important factor for the competitiveness of European industry and employment will be the adoption of up-to-date and sustainable production systems. Consequently the opportunities offered by biotechnology will be promoted. In large industrial areas (agro-industry, pharmacy, fine chemicals etc.) while new products and productions tend to be based on biotechnological research (for example new pharmaceuticals), the actual production will rely in general on traditional technologies. Efforts will be made to assess these indirect effects of the biotechnology research programme, by which new tools and methods get amalgamated with an existing background of established practices, to the benefit of industrial branches already in place. At the same time, questions will be asked on the rise of new industrial sectors based on opportunities offered to research SMEs, and on the specific related handicaps/chances experienced in Europe.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

	ECU million
Objectives requiring concentrated means	
Area 1. Cell factories	121,5
Area 2. Genome analysis	88
Area 3. Plant and animal biotechnology	133
Area 4. Cell communication in neurosciences	33
Objectives mainly addressed by concertation	
Area 5. Immunology, transdisease vaccinology	39
Area 6. Structural biology	55
Area 7. Prenormative research, biodiversity, social acceptance	52,5
Area 8. Infrastructures	30
Total	552 (1) (2)

(1) Of which:

- a maximum of 3,5 % for expenditure on staff and 4,0 % for administrative expenditure;
- ECU 5,0 million for the dissemination and optimization of results;
- up to 5 % for specific measures in respect of SMEs.

(2) Up to 6 % of the funds will be allocated to horizontal demonstration activities; up to 3 % of the funds will be allocated to horizontal activities on ethical, social and legal aspects and on public perception and socio-economic impact studies; up to 7 % of the funds will be allocated to horizontal training activities.

This breakdown does not exclude the possibility that a project could relate to several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

The programme will be executed through indirect action, whereby the Community makes a financial contribution to RTD activities out by third parties or by JRC institutes in association with third parties:

1. Shared-costs actions of the following types:

- (a) RTD projects (including demonstration projects) carried out by undertakings, research centres and universities, including, where appropriate, basic research of an industrial relevance; consortia for integrated projects with a common objective may be encouraged.

Demonstration activities, as defined in Annex III of the framework programme, are intended to overcome the obstacles hindering the utilization of new technologies and to build the bridge between technology producers and users. Feasibility studies and awards to those who get involved in these technologies may also be included.

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

- (b) Thematic networks, bringing together primary producers, manufacturers, end-users, universities and research centres on a generic technology, in order to facilitate the incorporation and transfer of knowledge and mobility of researchers, and to ensure that greater account is taken of market needs.

Community funding will normally not exceed ECU 20 000, in average per partner and per year, covering up to 100 % of the additional costs for the coordination of the action. Members of a network could also apply for research projects under normal procedures.

- (c) Technology stimulation to encourage and facilitate participation of SMEs in RTD activities:

- (i) by granting awards for carrying out the exploratory phase of an RTD activity, including the search for partners, during a period of up to 12 months. The award will be granted following the selection of an outline proposal to be submitted normally by at least two non-affiliated SMEs from two different Member States. The award will cover up to 75 % of the cost of the exploratory phase, without exceeding ECU 45 000 or ECU 22 500 in the exceptional case of a single applicant SME; and
- (ii) by supporting cooperative research projects, whereby SMEs having similar technical problems but not having adequate own research facilities, engage other legal entities to carry out RTD on their behalf. Community funding for cooperative research projects, involving normally at least four non-affiliated SME's from at least two different Member States, will normally cover 50 % of the cost of the research.

Following an initial call, in both cases proposals may be submitted at any time during the period covered by the work programme being implemented.

2. Preparatory, accompanying and support measures, such as:

- studies in support of this programme and in preparation for future activities,
- support for exchanges of information, conferences, seminars, workshops or other scientific or technical meetings, including intersectoral or multidisciplinary coordination meetings,
- use of external expertise, including access to scientific databases,
- scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out under the third activity; the factors liable to encourage

use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,

- analysis of possible socio-economic consequences and technological risks associated with the programme, which will also contribute to the programme 'Targeted socio-economic research',
- training actions for research covered by this programme in order to enhance employment skills and to facilitate technology transfer to industry,
- technology stimulation to encourage and facilitate participation of SMEs in RTD activities: by mobilizing all above means (publications, interactions with industry platforms, specific training, fact-finding studies, partnering events, etc.) to identify and possibly overcome some of the handicaps hindering a high level of participation of SMEs in the conduct of biotechnological research and innovation, with emphasis on procedures at the interface of RTD activities and firms involved or interested in projects,
- independent evaluation of the management and execution of the programme and of the implementation of the activities,
- measures in support of the operation of networks for increasing awareness and providing decentralized assistance to SMEs, in coordination with the Euromanagement auditing activity of RTD.

Community funding may cover up to 100 % of the costs of these measures.

3. Concerted actions, consisting of the coordination of RTD projects already funded by public authorities or private bodies. The Member States will help the Commission to identify relevant laboratories or institutes, in order to ensure that no major activities are left out of this concertation process.

The concerted action option can also be used under the programme as a way of establishing the feasibility and defining the content of proposals for shared-cost research activities.

Community funding will cover up to 100 % of the costs of the concertation.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, in the field of biomedicine and health (1994 to 1998)

(94/913/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas by its Decision No 1110/94/EC (4), the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of biomedicine and health; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 103i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 336 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas RTD activities in biomedicine and health should be encouraged in order to improve public health within the Community;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment';

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of biomedical and health research;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality;

Whereas basic research in biomedicine must be encouraged to reinforce the scientific and technological bases of European health undertakings and to promote medical advances with the aim of improving the health of the European citizen;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas provision should be made for measures to encourage the involvement of small and medium-sized enterprises (SMEs) in this programme, in particular through technology stimulation measures;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to

(1) OJ No C 228, 17. 8. 1994, p. 119.

(2) OJ No C 341, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p. 1.

facilitate the action which undertakings, and particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of biomedicine and health by research centres, universities and undertakings, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise support activities and activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States or regions which participate least in the programme, and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation of the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and technological development, including demonstration, in the field of biomedicine and health as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 336 million, including a maximum of 8,5 % for staff and administrative expenditure.
2. An indicative breakdown of this amount is given in Annex II.
3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.
2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.
3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.
2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks,
- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements, including specific modalities for implementing technology stimulation measures for SMEs and other measures, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under other specific programmes, and for ensuring appropriate interactions with other Community activities, such as in the field of public health and with the European Medicines Evaluation Agency (EMA), as well as with activities carried out in other frameworks, such as Eureka and COST,
- arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is

required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged when they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals and establishment of criteria and mechanisms for project approval and selection,
- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than ECU 0,2 million,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,
- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,2 million, the Commission shall inform the committee of the activities and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as a whole.

participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 8

Participation in the following programme areas: brain research; research on diseases with major socio-economic impact; human genome research; public health research, including health services research; and research on biomedical ethics may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Paragraph 4.B of Annex III, first activity of the above-mentioned framework programme, is an integral part of this programme.

This programme will be implemented in synergy with other specific programmes in the field of life sciences and technologies, as well as in such fields as telematics, measurement and testing, and targeted socio-economic research.

Background

Health is of the highest value for every European citizen and the competence of the Community has been extended recently by Articles 129 and 130f of the Treaty so as to include public health research. Health care is a first economic sector absorbing 7,25 % of the GDP and creating work for more than six million people or 7 % of the active population. There are more than one million qualified nurses, 850 000 medical doctors, 250 000 pharmacists, three million hospital beds and 0,8 % of the population per day is in a hospital bed.

Research is essential to any strategy to protect the health of the citizens, to fight diseases and to support health industries. It is important to target the research towards projects of interest to the Community and consumers, and promote the transfer of research to clinical practice.

The challenge for health research is to combat the great scourges such as cancer, AIDS, cardio-vascular diseases, allergic disorders, neuro-mental diseases and problems linked with age and handicaps. Rising health care costs have become a concern for all EC countries, while the European citizen is demanding more and more high-quality health care. New health technologies and health care systems are expected to face these common problems. The development of new medicines has become more and more expensive in both time and money, mainly due to the need to satisfy increasingly complex regulatory requirements which need to be streamlined within an international context.

Certain fundamental health problems are in the domain of the health industry the competitiveness of which must be safeguarded and improved. Rather than adding a supplement to substantial investments already made by the Member States and European industry, the Community research will bring added value by an integration action, by synergy of national efforts and by interaction of all disciplines from basic to clinical research towards problem-solving activities.

Measures intended to encourage participation of SMEs will be implemented, in particular technology stimulation measures and interaction between science parks and biomedical and health SMEs, taking account of the needs of those from less-advanced regions, as recommended by the White Paper on Growth, competitiveness, and employment.

With the launching of the biomedical and health research programme Biomed 1 within the third framework programme, more than 6 000 research teams are collaborating within 400 networks designed to encourage cooperation between teams from all EC and EEA countries and between complementary disciplines, with a view to tackling health-related problems not readily solved in a narrower context.

Within the fourth framework programme it is intended to go beyond concertation only and to participate in cost-sharing research where indicated only for specific task-oriented research. There are numerous priorities to establish taking into account the large variations in national health systems, research structures, health industries, clinical practices and therapeutic procedures. Only those proposals with a sound scientific

concept, a high likelihood of success, a clear Community added value and contributing to the health and wealth of the European citizen will be selected.

No support will be provided to projects which may contravene elementary principles of the European Convention on Human Rights, the Charter of the United Nations and the future Bioethics Convention of the Council of Europe, subject to its adoption.

RTD activities proposed

The programme should be focused on priorities but should avoid rigidity and retain some flexibility for the following reasons:

1. New challenging health problems may arise which demand a rapid research response.
2. New scientific opportunities may arise which offer interesting research possibilities which will lead to health benefits for the population of the Community, but which do not coincide exactly with the research priorities of the scientific and technical content.

I. SPECIFIC RESEARCH AREAS

1. *Pharmaceuticals research*

The general objective is the development of the scientific and technical bases required for the evaluation of new drugs, notably for the treatment of neurological, mental, immunological and viral diseases. These actions should also underpin the activities of the European Medicines Evaluation Agency and provide it, at the international level, with the research-based background necessary to achieve harmonization of technical requirements for drug development. Research will be conducted through collaboration between industry, research centres, hospitals, universities, and the authorities responsible for verifying the efficacy, safety and quality of new drugs, while respecting the ethical, social and legal aspects of medical research.

The contribution of functional imaging to neuropharmacology research will also be explored.

Research will be conducted in particular in the following areas:

- Pharmacotoxicology: prevalidation research of *in vitro* alternative methods, possibly using human cells and tissues, and where unavoidable animal models, in the general aim of reducing, refining and replacing animal experimentation, progressively and each time it is scientifically possible, also making use of mathematical modelling systems. Preference will be given to those tests which have reached the most advanced stages towards validation as those developed within the Biotechnology programme. Prevalidation research on these tests should ideally provide the European Centre for the Validation of Alternative Methods with the best candidates for proper validation studies.
- Pharmacovigilance: development of systems for high performance surveillance networks for early detection of possible undesired effects of new drugs, in accord with the existing regulatory framework and with particular attention to the international harmonization efforts. It will include research on the exposure of patients to drugs, into harmonization of diagnostic terms and criteria, approaches to assess adverse drug reactions signals, use of health statistics for pharmaco-epidemiology, transnational case-control studies, transnational registers and cohort studies.
- Clinical Trials: to support intra-european collaboration in large, randomized clinical trials of high scientific quality, in order to stimulate better opportunities for improved diagnostic procedures, for therapies treatments as well as for their pharmaco-economic aspects.

The development of European multicentre clinical trials networks of high scientific standard would help an objective evaluation of new diagnostics or therapeutics in a shorter time while preserving its scientific value; modelling systems should also be taken as a basis.

Research in this field will be mainly directed towards the establishment of clinical trials registries, research into meta-analysis methodologies and randomized clinical trials for rare diseases, including a depository of orphan drugs available for clinical research at European level.

2. *Research on biomedical technology and engineering*

Health technology assessment and prenormative research become more important in a European-wide market with its directives concerning medical devices and accompanying standardization activities. For industry as well as for decision-makers at all levels, it is essential to have in addition to requirements for safety, timely access to objective information on efficacy and efficiency of medical devices, before introducing these on the health market.

Research and development will be conducted in particular in the following areas:

- Minimal intervention techniques and robotics: robotics, three-dimension imaging, micro structure technology and 'nanotechnology' to support surgical therapy, and widen the range of clinical indications for minimal medical interventions; new ergonomic approaches of the operating theatre for minimally invasive surgery.
- Imaging techniques: magnetic resonance, ultrasound, biomagnetism, positron emission tomography, etc., as well as microwave imaging and fluorescence and near infra-red spectroscopy and imaging; comparative and integrated evaluation of different biomedical imaging technologies.
- Research on biosensors, especially with regard to their clinical value, as among others is the case of glucose monitoring for diabetes, oxygen monitoring and ion sensing for critical care.
- Meeting the needs of the increasing population of elderly and handicapped persons calls for more research on rehabilitation technology in coordination with the relevant parts in the Telematics programme. The powerful trend towards replacement in medicine requires more research on biomaterials, especially towards improved mechanical properties and biocompatibility of polymers, as well as on artificial organs, such as on artificial heart and artificial pancreas. Research aiming at the modelling of human functions, as well as in biomechanics, haemodynamics and biorheology, is also required in that respect.
- Cellular engineering: synergistic benefits would accrue by combining cell and molecular biology with chemical, mechanical and electrical engineering, opening new possibilities for clinical applications.

3. *Brain research*

The high prevalence of mental illnesses and the increasing incidence of neurodegenerative diseases represent an immense economic and social burden in the Member States:

The new opportunities created by molecular biology and genetics, novel instrumentation and information technology will contribute to major advances in neurosciences and improvement in prevention and treatment. Research which integrates fundamental aspects with clinical applications and industrial development will be encouraged.

In the field of neurosciences, participation in the decade of brain research will be promoted, in particular in the following areas:

- Research on the physiopathology and basic mechanisms leading to nervous system diseases which should integrate molecular, cellular and clinical approaches with the aim to promote appropriate and effective treatment of neural diseases.
- Research on central nervous system damage, regeneration and plasticity, development of therapeutic strategies for damage limitation, re-growth promotion and repair.
- Transdisciplinary research on the understanding of the genetic and immunological basis of nervous system diseases, in close cooperation with activities under human genome analysis and biotechnology programmes.
- Establishment of cell cultures and where necessary animal models of the human diseases of the brain for pathogenicity and development of therapeutic agents.
- Contribute to the development of better methods of brain imaging which combined with computer science will allow a better understanding of brain structures, functions and metabolisms, to map the distribution of proteins and other structures throughout the brain and to characterize the anatomical structures and psychological mechanisms interacting with cognitive function and dysfunction.

This approach will integrate the contribution of several disciplines, together with biomedical engineering, and bring together the most advanced technologies and infrastructures scattered over Europe.

- Clinical research, mainly focused on clinical trials, treatment of neurological, neurosensory and psychiatric diseases, prognosis and progression of these diseases and the impact of therapeutic practices.
- Research into the mechanisms of pain including the development of new therapies and the conduction of clinical trials to evaluate the effectiveness of currently available therapies.
- Research on addiction behaviour which should integrate basic and clinical approaches, with the general aim of reducing drug demand.
- Development of combined epidemiologic and long-term prevention programmes to evaluate the impact of neurological and psychiatric diseases and the benefits of their treatment also in small groups and high risk groups.
- Research on cognitive sciences including development of models of neuronal behaviour, learning, memory and psycholinguistics.

4. *Research on diseases with major socio-economic impact: from basic research into clinical practice*

From all horizontal activities such as molecular biology, physiology, genetics, statistics, epidemiology and generic technologies, the ultimate yardstick for the European citizen is the benefit for him as an individual. The population expects basic answers by integration of basic and clinical research to improve the prevention, diagnosis and treatment of these illnesses with major socio-economic impact and the around 5 000 'orphan' illnesses which can be tackled optimally at an international level.

4.1. *Cancer research*

Improvements in cancer diagnosis, therapy and prevention require integrated fundamental and clinical approaches to research. It is particularly important to bring new advances in cellular, molecular and developmental genetics into contact with oncology and epidemiology, in order that new biological insights into the underlying causes of cancer allow for the development of novel approaches. The study of host-tumour interaction in the context of immune response and of somatic gene therapy targeted at cancer cells are fundamental together with epidemiological studies for investigating possible causative factors in carcinogenesis. In the area of research into genetic factors that cause susceptibility to cancer, priority should be given to projects relating to therapeutic approaches.

Research will be conducted in particular in the following areas:

- Molecular mechanisms of tumorigenesis and metastasis, including characterization of the genes and proteins responsible. Together with human genome research, genetic factors of cancer predisposition.
- The control of normal cellular growth, differentiation and death, and abnormalities which can alter this to predispose to cancer, including the development of accurate cellular and transgenic models suitable for cancer research.
- Specific anti-tumour immune responses and possibilities for early detection, including making use of biological techniques and progress in medical imaging and curative intervention.
- Research to support the effectiveness of systemic treatment modalities including cytotoxic agents as well as biological response modifiers.
- Research to improve the therapeutic ratio of radiotherapy as well in the domain of ballistic selectivity, as in the manipulation of radiation response in tumours and normal tissues.
- Quality of life as a parameter for treatment assessment including terminal care and rehabilitation, while respecting individual freedom of choice and the ethical rules seeking to protect human dignity at the end of life and to ensure that pain is treated at a sufficiently early stage in incurable diseases.
- Research into the causal relationships between environmental factors and the development of cancer.

4.2. *Research on AIDS, tuberculosis and other infectious diseases*

Many advances have been made in AIDS research in recent years. The concertation of AIDS research at European Community level has contributed to this progress, but a decisive breakthrough has yet to be made. There is neither a vaccine nor a drug capable of curing the disease. The number of seropositive people continues to show an increase. The immunosuppression caused by HIV in infected people provides an opportunity for the occurrence of old diseases, already drug resistant in some areas, and for opportunistic cancers.

Research will be conducted in particular in the following areas, with emphasis on the integration of basic and clinical research:

- Viro-immunological research, the genetics, molecular and structural biology of HIV and its variability.
- Contribution to the development of a safe and effective vaccine against AIDS and the establishment of markers to evaluate vaccine efficiency and to follow up the evolution of disease.
- The identification, synthesis and evaluation of antiviral compounds and drugs against AIDS.
- Clinical research, mainly focused on clinical trials, treatment of AIDS and opportunistic diseases, prognostic and progression of these diseases and the impact of therapeutic practices.
- Studies on the host response, pathogenesis, experimental models and new pathologies such as infectious diseases, including those caused by unidentified infectious agents, prion induced diseases and resistance mechanisms to conventional therapy, including the problem of hospital infections.
- Disease prevention, using epidemiological methods, including the development of new specific monitoring systems to determine the distribution patterns of old and new infectious diseases, analysis of risk factors for the development of AIDS, opportunistic diseases and novel infectious agents.
- Socio-economic and health services research: requirements for caring and prevention, analysis of socio-economic consequences and forecasts in cooperation with public health research.

4.3. *Research on cardiovascular diseases*

In order to accelerate the pace of unravelling the physiopathological mechanisms leading to cardiovascular disease development, in particular arteriosclerosis and hypertensive disorders, and translate these findings into prevention and treatments, multidisciplinary research will be stimulated by combining the expertise of physicians and scientists with different backgrounds in basic and clinical cardiovascular research and in molecular genetics.

In the field of cardiovascular research mainly the following subjects will be addressed:

- Analysis of the cellular and molecular mechanisms leading to diseases of the heart and blood vessels, including research on cardiac and vascular cell growth, injury and repair; cardiovascular-associated inflammation.
- Development of clinically useful agents for injury or excessive growth prevention, damage limitation and repair.
- Research on the understanding of the genetic basis of cardiovascular diseases, in particular those of high prevalence such as atherosclerosis and hypertension, including identification and decoding of genes, research on expression pattern, gene function and modification; where unavoidable, development of animal models and therapeutic strategies.
- Clinical research including assessment, verification and definition of the exact contribution of current basic knowledge in order to understand the onset and development of clinical pathologies; validation of preclinical screening programmes as well as multi-centre clinical trials for testing devices and therapeutic procedures.
- Research on imaging and non- or minimally interventional techniques that will enable studies of the structure, metabolism, and function of the heart and blood vessels.
- Research on combined epidemiologic and long-term prevention programmes including evaluation of possible differences in risk factors, impact of psychosocial factors on incidence and prevalence of cardiovascular diseases and the benefits of their treatment in high risk groups.

4.4. *Research on chronic diseases, ageing and age-related problems*

Because of the demographic evolution in Europe and the enormous social and economic impact of age-related problems in general and chronic diseases, handicaps and dependency in particular, a focus research effort is needed in conjunction with the other parts of the programme.

Research will be conducted in particular in the following areas:

- Etiology, including environmental aspects, and treatment of chronic diseases such as chronic arthritis, diabetes mellitus, respiratory problems (including asthma). Particular attention will be given to auto-immune aspects, immuno-genetics and T-cell disorders.
- Development through a transdisciplinary approach of new rehabilitation methods, new devices (see bioengineering) and appropriate care provisions in order to diminish dependency of the elderly, the handicapped and those with chronic disorders, in conjunction with biomedical technology and engineering part of this programme and with the telematics programme.
- Etiology and pathogenesis of congenital and genetic diseases, including hemoglobinopathies and in particular thalassemia. Evaluation of new protocols and methods of risk estimation, genetic counselling and possible prevention. Evaluation of new therapeutic approaches.
- Study of morbidity and co-morbidity caused by mental, motoric and sensorial handicaps and disabilities as a bridge between basic research and clinical practice, and in conjunction with the brain research part of this programme.

4.5. *Research on occupational and environmental health*

The objectives are to improve the scientific knowledge needed to increase the safety and health protection of workers in order to avoid accidents at the workplace and prevent work-related diseases and to reduce environmental risks for the population.

Research will be conducted in particular in the following areas:

- Identification and control of risk factors at the workplace with an emphasis on biological and chemical hazards in short- and long-term effects.
- Health education and preventive measures to reduce accidents at work and exposure to risk factors.
- The interaction between risk factors at the workplace and in the environment, fundamental research on allergic diseases affecting public health, and the aetiology of occupation and environment related diseases. Connections between occupational and environmental risk factors (e.g. toxic agents) and the aetiology of diseases in general (e.g. cancer).

4.6. *Research on 'Orphan' illnesses*

'Orphan' illnesses are these rare diseases (some 5 000) where no country in itself can afford to spend the necessary resources and case mix to implement basic and clinical research at the low number of cases occurring at national level. Nevertheless at an EC level as well as at a general scientific level these 'exceptional' cases turn out to be quite similar and to offer exceptional experiments by nature to do in-depth research on the basic mechanisms of diseases and handicaps and to offer opportunities to link genetic research with biochemical and physical expression of disease. Examples are inborn metabolic diseases due to defective peroxisomes, etc. Actions will include an inventory of rare disorders and together with the section on pharmaceutical research a depository of orphan drugs for clinical research.

5. *Human genome research*

The achievements, activities and infra-structure established in preceding programmes have to be consolidated and — where appropriate — to be modified, to serve future needs. Fundamental research, with its emphasis on functional studies in order to ensure that advances in genetics are used to enhance human health, will be supported. Development of appropriate technologies and applications which contribute to the well-being of patients will be stimulated. In particular, attempts will be made to develop somatic gene therapy where the conditions/acceptance in Europe justify a targeted effort, e.g. cystic fibrosis. Research will also be carried out for the development

of new diagnostic techniques for genetic diseases and of new therapies resulting from the most recent progress in molecular genetics and in particular gene analogues or gene expression regulators.

Sharing and harmonization of genetic databanks comprising European Community participation in the management of international databases of the human genome (e.g. GDB) will be promoted. Links will be maintained with appropriate international organizations or forums (e.g. the Human Genome Organization, HUGO).

The confidentiality of any personal information collected in the course of the research must conform to the best data protection practice. No research modifying, or seeking to modify, the genetic constitution of human beings by alteration of germ cells or of any stage of embryo development which may make these alterations hereditary, will be carried out under this programme.

It has become clear in recent years that, while the possibility of diagnosing diseases with the aid of human genetics is developing rapidly, there is a therapeutic approach in only a few cases. Research should aim to prevent the gap between diagnosis and therapy from widening further.

Assistance provided under this programme should give priority to projects relating to therapeutic approaches.

Research will be conducted in particular in the following areas:

- Gene mapping and genome analysis, including construction of integrated transcriptional maps; sequencing of specific chromosomal regions; exploitation of comparative approaches.
- Analysis of gene regulation, including the improvement of techniques for gene targeting and the development of animal models (e.g. the mouse), if no equivalent alternatives are available.
- Analysis of gene function, including identification of regulatory sequences; analysis of mechanisms of regulation of expression of specific genes, notably those involved in disease.
- Pre- and postnatal diagnosis and understanding of the patho-physiology of genetic disease at DNA-level, including non-genetic factors and development of protocols for risk estimation and for genetic counselling, with an emphasis on possible prevention.
- Somatic gene therapy, including development of vectors to transfer genetic material into cells *in vitro*; development of methods to deliver corrected genes *in vivo* effectively and safely; coordination of clinical trials on somatic gene therapy.
- Databases, including experimental data collection, storage, analysis, and development of integrated genome databases, taking account of the specific measures for the protection of intellectual property.
- Technology development, including promotion of research aiming at the development of methods suitable for the achievement of any one of the abovementioned objectives, while respecting the ethical, social and legal aspects specific to research on the human genome.

6. *Public health research, including health services research*

More than 110 000 deaths under age 65 from 21 common diseases would be avoided annually, if only each European region could attain the optimal death rates reported nationally for each of those diseases.

Traditions, practices and the legal and administrative organization of public health services and systems are so varied in Member States as to render impractical any harmonization of services in this domain. However, objectives of research should be to assist Member States in strengthening their coverage of public health issues, assist in the formulation and implementation of objectives, policies and strategies, and contribute to continuity of health protection provision across the Community.

Research will be conducted in particular in the following areas:

- Research on methods for evaluating health education and prevention, primary care, assessment of health needs, including the needs of emerging dependency groups, performance measurements of health policy initiatives and the evaluation of health technologies.

- Coordination and comparison of European health data, including nutritional data, from the various Member States of the Community,
- Standardization of methods for outcome measurement of health care.
- The impact of the internal market on supply of health care across internal frontiers; regulations and de-regulations as well as the balance between health systems financed by the private and public sectors.
- Health economics and methods of evaluation of the organization of health systems.
- Research on new health indicators and new techniques of modelling.
- Health technology assessment, including the assessment of the costs, effectiveness and broader impact of all methods used by health professionals to promote health, prevent and treat diseases and improve rehabilitation and long-term care.
- Defining a European approach for the introduction of new technologies in health systems.

7. *Research on biomedical ethics*

Research on biomedical ethics will address general standards for the respect of human dignity and the protection of the individual in the context of biomedical research and its clinical applications. The social impact and the public awareness of the problems associated with biomedical progress will be addressed.

Topics to be considered in particular are:

- Medically assisted procreation, including gender selection, preimplantation and prenatal diagnosis, research on embryo, use of foetal ovarian tissue, post-menopausal pregnancy, sperm and egg donation and their possible conservation.
- Human genome analysis and its clinical applications, including testing, screening and somatotherapy.
- End of life, including palliative care, euthanasia, artificial prolongation of life by advanced medical techniques, resuscitation.
- Resource allocation: ethical and social dimensions of the choices to be made in health budgets and resource allocation.
- Organ and tissue transplantation including the use of human cells, organs, tissues, and xeno-transplant as well as the functioning of tissue and organ banks.
- Patient's consent: informed consent of the individual for diagnosis, therapy, prevention or research, including the consent of vulnerable populations like e.g. prisoners and cognitively impaired patients.
- Confidentiality and privacy considering medical data, genetic and non-genetic, with an emphasis on the specific problem raised by modern information systems such as computerization with automatic data transfer, including patentability and intellectual property rights in the context of legal protection of biotechnological inventions.

II. HORIZONTAL ACTIVITIES

Research activities on biomedical ethics carried out within biomedical and health research and the activities on the ethical, legal and social aspects carried out by the horizontal unit 'Legal and ethical aspects' will be performed jointly throughout the three life sciences and technologies programmes and activities in other frameworks in order to benefit from interdisciplinary competences.

Measures will be taken to encourage the participation of all partners active in this area (universities, hospitals, research centres, bioethics institutes, patient associations, etc.).

In order to improve dialogue and mutual understanding between the main national, sociopolitical and bioethical positions, whilst recognizing the cultural differences which exist in Member States, working groups will be organized to prepare reports and surveys of interest also to the European Parliament and the Council. Targeted workshops to identify and debate areas of national and international divergences

and, where appropriate, research activities with multidisciplinary approaches to such topics will be carried out. Public awareness activities on new biomedical technologies will also be funded. This horizontal activity takes into account the European Bioethics Convention and its draft Protocols, subject to their adoption.

Wherever possible, experimentation and testing on animals should be replaced by *in vitro* or other methods. No research modifying, or seeking to modify, the genetic constitution of human beings by alteration of germ cells or of any stage of embryo development which may make these alterations hereditary, nor research seeking to replace a nucleus of a cell of an embryo with a nucleus taken from a cell of any person, embryo or subsequent development of an embryo, known as cloning, will be carried out.

Demonstration activities within biomedical and health research will facilitate comparative European multi-centre trials of new drugs, new therapeutic approaches, and ready-for-testing prototypes of new medical devices. Special attention will be given to demonstration of the latest technologies in clinical diagnostics and imaging technologies, implantable sensors for the monitoring or rehabilitation of pathological conditions, artificial organs, biocompatible materials, new cancer therapies and irradiation technologies. A bottom-up approach will be used, in cooperation with other Life Sciences programmes, to identify the best opportunities for pre-competitive demonstration, in order to prove the technical viability of these new technologies, together with, as appropriate, their economic advantage at a pre-competitive level. The early involvement of hospitals and clinicians in these demonstrations will allow for an efficient dissemination of knowledge and a quick realization of the benefits to be derived from the adoption into practice of such innovative approaches, drugs and devices. While keeping as a first priority the benefits for patients, demonstrations in these areas will take into account the specific needs of the biomedical engineering and pharmaceutical industries and health care delivery organizations, and will be implemented by partnerships involving these manufacturing industries, the health profession, the health-care providers and health authorities.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

Area	ECU million
1. Pharmaceuticals research	37
2. Research on biomedical technology and engineering	37
3. Brain research	40,5
4. Research on diseases with major socio-economic impact: from basic research into clinical practice	141
4.1. Cancer research	33,5
4.2. Research on AIDS, tuberculosis and other infectious diseases	27
4.3. Research on cardiovascular diseases	27
4.4. Research on chronic diseases, ageing and age-related problems	33,5
4.5. Research on occupational and environmental health	13,5
4.6. Research on 'orphan' illnesses	6,5
5. Human genome research	40,5
6. Public health research, including health services research	33,5
7. Research on biomedical ethics	6,5
Total	336 (1) (2)

(1) Of which:

- a maximum of 3,5 % for expenditure on staff and 5 % for administrative expenditure,
- ECU 3 million for the dissemination and optimization of results.

(2) Up to 5 % of the funds will be allocated to horizontal demonstration activities; up to 1 % of the funds will be allocated to horizontal activities on ethical, social and legal aspects; up to 5 % of the funds will be allocated to horizontal training activities. These funds also include the necessary support for specific measures in respect of SMEs.

This breakdown does not exclude the possibility that a project could relate to several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

The programme will be executed through indirect action, whereby the Community makes a financial contribution to RTD activities carried out by third parties or by JRC institutes in association with third parties:

1. Shared-cost actions of the following types:

- (a) RTD projects (including demonstration projects) carried out by undertakings, research centres and universities, including, where appropriate, basic research of an industrial relevance.

Demonstration activities, as defined in Annex III of the framework programme, are intended to overcome the obstacles hindering the utilization of new technologies and to build the bridge between technology producers and users. Feasibility studies and awards to those who get involved in these technologies may also be included.

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Technology stimulation to encourage and facilitate participation of SMEs in RTD activities

- (i) by granting awards for carrying out the exploratory phase of an RTD activity, including the search for partners, during a period of up to 12 months. The award will be granted following the selection of an outline proposal to be submitted normally by at least two non-affiliated SMEs from two different Member States. The award will cover up to 75 % of the cost of the exploratory phase, without exceeding ECU 45 000 or ECU 22 500 in the exceptional case of a single applicant SME, and
- (ii) by supporting cooperative research projects, whereby SMEs having similar technical problems but not having adequate own research facilities, engage other legal entities to carry out RTD on their behalf. Community funding for cooperative research projects, involving normally at least four non-affiliated SME's from at least two different Member States, will normally cover 50 % of the cost of the research.

Following an initial call, in both cases proposals may be submitted at any time during the period covered by the work programme being implemented.

2. Measures appropriate to this specific programme:

- measures in support of standardization,
- measures intended to set up general service tools for research centres, universities and undertakings,
- support of financing infrastructures or facilities necessary for the performance of a coordination action (reinforced coordination activity).

Community funding may cover up to 100 % of the costs of these measures.

3. Preparatory, accompanying and support measures, such as:

- studies in support of this programme and in preparation for future activities,
- support for exchanges of information, conferences, seminars, workshops or other scientific or technical meetings, including intersectoral or multidisciplinary coordination meetings,
- use of external expertise, including access to scientific databases,
- scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out under the third activity; the factors liable to encourage use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,

- analysis of possible socio-economic consequences and technological risks associated with the programme, which will also contribute to the programme 'targeted socio-economic research',
- training actions related to research covered by this programme in order to enhance employment skills and to facilitate technology transfer to industry,
- independent evaluation of the management and execution of the programme and of the implementation of the activities,
- measures in support of the operation of networks for increasing awareness and providing decentralized assistance to SMEs, in coordination with the Euromanagement auditing activity of RTD.

Community funding may cover up to 100 % of the costs of these measures.

4. Concerted actions, consisting of the coordination, in particular through concertation networks, of RTD projects funded by public authorities or private bodies. The Member States will help the Commission to identify relevant laboratories or institutes, in order to ensure that no major activities are left out of this concertation process.

Concerted actions may also serve as the necessary coordination for the operation of common interest groups which, through shared-cost RTD projects, bring together, around the same technological or industrial objective, manufacturers, network operators, service providers, users, universities and research centres.

The concerted action option can also be used under the programme as a way of establishing the feasibility and defining the content of proposals for shared-cost research activities.

Community funding will cover up to 100 % of the costs of the concertation.

5. Participation in this programme of international organizations may be financed, in exceptional cases, on the same basis as that of legal entities established in the Community.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme for research and technological development, including demonstration in the field of transport (1994 to 1998)

(94/914/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission⁽¹⁾,

Having regard to the opinion of the European Parliament⁽²⁾,

Having regard to the opinion of the Economic and Social Committee⁽³⁾,

Whereas, by Decision No 1110/94/EC⁽⁴⁾, the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the area of transport; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 240 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment';

Whereas the development of trans-European transport networks facilitating network access, interconnection and interoperability will have a predominant role in creating an open, competitive market; whereas the research activities must be concentrated on the conditions necessary to network interoperability and interconnection, particularly as regards intermodality and access possibilities;

Whereas this programme should contribute to the development, integration and management of a more efficient and safer transport system that respects the environment and the quality of life, in order to promote sustainable mobility of people and goods;

Whereas, to ensure that an improved transport system is compatible with the aim of enhancing the quality of life, research into this sector may include reflexions on regional, housing and urban planning policies;

Whereas the research activities for a common transport policy must be focused at the strategic European level on modelling and transport scenarios with a view to gaining a better understanding of transport demand and of the impact of transport systems in Europe;

Whereas the RTD activities must be system-oriented and integrated, and take account of the strategic goals of common European transport policy and the results of research conducted within the other themes of the first activity, which will be disseminated for this purpose, in order to devise specific solutions applicable to the transport sector;

Whereas the research activities in this field will primarily concern the identification of needs calling for new technologies, and the evaluation, integration and global validation of technological innovations;

Whereas this research must also attach particular importance to ergonomics and human factors in an operational framework and to defining a new, harmonized set of methods for evaluating the global impact of European transport systems;

(1) OJ No C 228, 17. 8. 1994, p. 164

(2) OJ No C 341, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p. 1

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the area of transport;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas provision should be made for measures to encourage the participation of small and medium-sized enterprises (SMEs) in this programme, in particular through technology stimulation measures;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of transport by research centres, universities and enterprises, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas synergy should be sought with the second activity of the framework programme;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas several concerted activities in the field of transport research are carried out in the framework of European cooperation in the field of scientific and technical research (COST); whereas some activities provided for in this programme may follow on from or supplement those concerted activities;

Whereas this programme should also comprise activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States and regions which participate least in the programme, and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation of the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme for research and technological development, including demonstration, in the field of transport, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 240 million, including a maximum of 8,3 % for the Commission's staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the

principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks,

- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements, including specific modalities for implementing technology stimulation measures for SMEs and the general unies of other measures, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under other specific programmes, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks, such as Eureka and COST,
- arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals and establishment of selection criteria,
- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than EU 0,4 million,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,
- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,4 million, the Commission shall inform the committee of the projects and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as a whole.

Article 8

Participation in this programme may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives. Section 6 of Annex III (first activity) of the framework programme is an integral part of this programme.

General considerations

- (a) The development and implementation of the common transport policy calls for research to achieve efficient and cost-effective transport networks for goods and passengers under the best possible environmental social and energy consumption conditions (sustainable mobility).

This specific research programme is intended to improve the efficiency of the individual transport modes and speed up their integration into European transport networks and to support Community transport initiatives at both national and European levels.

The aim is to contribute to the optimization of trans-European transport networks, improved productivity of modes of transport and individual operators, the capacity of each mode of transport to be integrated with the others, accessibility for users and the development of a multi-modal transport system at urban, rural, regional and trans-European level.

The research will place emphasis on the optimization of transport systems, including from the point of view of users, the improvement of safety, the reduction of harmful emissions, and on achieving social acceptability.

In 1991 transport services in Europe, including own account transport and private transport, accounted for 5,6 million jobs and between 7 and 8 % of GNP, while the transport equipment industry accounted for 2,6 million jobs.

The demand for transport in particular road and air transport has risen in spectacular fashion (70 % since 1970) and this trend is continuing. The growth has resulted in increased congestion and inefficiency. The consequent costs to the European economy, including the costs of the safety problems inherent in transport operations, are estimated to be at least ECU 50 billion per year for road and ECU 4 billion for aviation growing to ECU 10 billion by 2000.

Transport is the second largest consumer of non-renewable energy and, unlike industrial and domestic users, its level of consumption is steadily increasing.

The results of transport research will therefore have a direct and indirect effect on the economy and quality of life in the Community.

- (b) The general objective of research under this specific programme is to arrive at prenormative or prelegislative conclusions making it possible to incorporate into the transport sphere new policy options, among others the implementation of new generic technologies and further the development of the European Union by establishing the preconditions for an efficient trans-European transport system, which is compatible with the environment. A particular area will be the research work needed for the integration of EC networks to the ones of central and eastern Europe. This shall be carried out in synergy with the specific programme for research and technological development, including demonstration, in the field of cooperation with third countries and international organizations.

The aim of the research in question is to provide information for decisions and quantify the foreseeable impact of the various possible options.

It is necessary to acquire an understanding of mobility in order to analyse potential developments. In some cases, it is also necessary to set up experiments in order to confirm in practice the findings of more theoretical, technological studies and in particular the results of various other specific programmes. The methodologies for these experiments are part and parcel of this research activity. They should make it possible to establish in socio-economic terms the merits of introducing new technologies and carrying out any technical adjustments that may be necessary.

With this in mind two types of approach are needed:

- strategic research for a trans-European multi-modal transport system,
- specific research concerning the optimization of each mode.

This research covers passenger transport and goods transport. Special attention will be paid to the interrelationships between the management of these two types of flows.

The two approaches must take into account:

- general policy concerns, such as: quality of life, regional and housing planning, competitiveness, safety, environment, energy saving and traffic congestion (sustainable mobility),
 - the different needs, frameworks of conditions and competences: at the European, national, regional and urban levels. Particular regard will be given to developing mechanisms for addressing, on the one hand problems of transport access to the peripheral regions of the Community; and on the other hand, problems of transit transport in the central regions of the Community.
- (c) The opportunities provided by improved organizational and market arrangements, new technologies, economic development and environmental improvements should contribute to a breaking down of the barriers separating different modes of transport (and those between transport and information and communication systems).

The first approach will provide authorities, users and industry with the appropriate decision-making instruments based on research into: the methodology for establishing a European database and information system; the development of scenarios; the development of multicriteria models and methodologies; the economics of transport systems; the organization and regulation of transport systems; the integration and application of new technologies; and improvements in overall policy assessment. These tools will make it possible for public authorities to define the needs and constraints to orientate future actions which cater for the requirements of users, within the context of an overall land-use policy. They are essential considering that large amounts of public and private money are committed by the political authorities for long-term investments in infrastructure projects, and the application of new management and communication systems to transport services.

The second approach will ensure, on the one hand, the development of compatible management systems for the individual transport modes as these are crucial for network interoperability, interconnection and accessibility as well as, on the other hand, improving capacity, safety, reliability and quality of the transport services.

In line with the common transport policy, technological innovation shall be accompanied by research into the integration of such new technologies into the new operational and institutional situations (including those related to the new technical standards and guidelines for trans-European transport networks). A new, harmonized methodology will be necessary to assess the overall impact of transport systems so as to optimize the trans-European network.

The RTD activities will be conducted within a coherent and coordinated framework taking account of, and communicating requirements to, the activities under other specific programmes of the fourth framework programme: Telematics applications, Industrial and materials technologies, Non-nuclear energy and, where they relate to the objectives of the common transport policy, Standards, measurement and testing, Environment and climate and Targeted socio-economic research; and to ensure the internal coherence of the activities of this programme. Work focusing on generic technologies will be carried out under the relevant themes within the first activity, with the result that the demonstration activity will address the integration and systematic validation of the results via an integrated approach aimed at achieving the objectives of the common transport policy, taking also account of the needs of the less advanced regions.

Basic research will be undertaken where appropriate, directed in particular at understanding the demand for mobility, and for understanding human behaviour, of both passengers and operator.

Tangible results should become available in the short and medium term, in particular enabling a modular approach and phased implementation of transport systems in coordination with Eureka.

1. STRATEGIC RESEARCH FOR A TRANS-EUROPEAN MULTIMODAL NETWORK

The purpose of this research is to improve the efficiency of the European transport system regarded as a whole with different modal components.

The aim will be to maximize system synergies and compatibilities to develop the interoperability and interconnection of individual transport modes for their integration in the trans-European transport network through a full knowledge and understanding of the European transport system, its individual elements, their interrelationships, interdependencies, and through a definition of appropriate performance indicators. This research will help by providing the necessary elements for the development of multi-modal trans-European networks, through socio-economic and technological research to guide the development of the Common Transport Policy. As part of the socio-economic research, the legislative framework, aims and effects of the various national transport policies should be studied.

This knowledge includes exploring the new technological means for gathering and processing data on European transport, the comprehension of modelling techniques and techniques for developing scenarios of transport needs including the methodologies for assessing technological innovation and new transport concepts. Common criteria will be established for evaluating the capacity of each transport mode to contribute effectively to the trans-European transport networks and the effects and implications for future policy of the privatization of transport operations. In this context the research will produce common tools for validation parameters and economic instruments.

Finally, this work will establish experimental programmes including pilot projects making use of existing infrastructure and technological innovations.

The research is subdivided into six areas of investigation:

Understanding mobility

An understanding of mobility (of passengers and goods) and foreseeable developments in mobility at European level is a prerequisite for improving European transport policy. Research will be carried out into the methodology for establishing a European database and information system, which is as compatible as possible with the existing national, regional or local databases. This information system will exploit new technologies.

Attention will focus on defining the procedures for aggregating existing bases and using, for this purpose, byproducts of existing systems or systems being developed whose primary purpose is different (centralized reservations, road information, electronic tolls, logistics, car 'phones, etc.). The general aim is to achieve an adequate overall understanding, at the lowest possible cost, while respecting the privacy of individuals and allowing links with more detailed bases and less aggregated geographical levels. Special attention will be paid to flows into and out of the Community.

This database should make it possible to highlight links and types of flows for which modal switching can be considered, and should make it possible to provide information for a European flow forecasting model sensitive to policy alternatives. The database should include environmental and economic data in order to facilitate studies on the effectiveness and impact of future developments and policy measures. Inclusion of data on goods transport volumes by pipelines should also be considered.

Certain regions and transport links in the Community are affected by extremely acute congestion problems. By dealing with this matter on a European scale, with a common transport policy, it should be possible to make better overall use of the existing networks. An interesting avenue of approach would seem to be the diversification of entry and exit points for flows of goods and people: extra-Community optimization may facilitate intra-Community optimization, by reducing internal trips. In this connection, special attention will be paid to the consequences of the increasing opening up of the Community to eastern Europe; and to an evaluation of the implications for future transport

demand, and travel and distribution patterns of changes in society and in industry, of growing environmental and social constraints, and of the adoption of new technologies. In particular an analysis is required of the way in which the locality of the destination influences the choice of the optimal mode, particularly where destinations are far from urban centres. The above research concerning the present situation and medium-term developments should be supplemented by research aimed at establishing long-term forward planning scenarios.

Developing intermodality

The development of intermodality and complementarity between the different modes of transport is generally regarded as a promising way of improving the European transport system. The above research will, as a whole, seek to clarify the area of excellence of each mode and the technological and organizational conditions governing the achievement of complementarity. The desire to develop intermodality and complementarity is based on the (often implicit) observation that the comparative efficiency of modes is variable depending on the area in question and the type of flows involved. The research will aim to objectivize this observation by developing multicriteria models and methodologies making it possible to define the conditions under which each mode can be better employed. It will contribute towards helping to formulate a common European transport policy compatible with the sustainable development objective.

Economics of the transport system

The transport system does not have an intrinsic purpose in itself but is intended to enable other activities to take place (production, consumption, leisure, knowledge, etc.). It is increasingly becoming a burden for household budgets and for the society as a whole. The relationship between transport and such activities will be examined and, where appropriate, models and methodologies developed.

The choice of new infrastructures has major environmental and budgetary consequences and has a lasting effect on the modal split between flows. It is a virtually irreversible act necessitating solid guarantees. The system should be funded at the most efficient level of cost by spreading the burden between the direct and indirect beneficiaries so that, as far as possible, the sum total of individual choices approximates to the optimum. The development of infrastructure evaluation methods must take into account the regional accessibility factor, as well as the economic, social and environmental aspects.

Three possibilities should be explored as a matter of priority: new infrastructures, funding and methodologies for proper consideration of all direct and indirect costs of transport. As well as the development of price mechanisms and the effects of true costs on modal split, the socio-economic costs and benefits of mobility should be investigated, for example the effects and evaluation of travel time savings.

Studies must also be made of the impact of fiscal policy instruments.

System organization and interoperability

Implementing transport policy may result in organizational problems associated with technological developments and institutional changes. Efforts should be made to improve the existing organizational set-ups, while complying with the principle of subsidiarity and free competition.

Research into the interoperability of different national systems is needed in order to ensure continuity of services for users throughout the European network. The research will aim to define the conditions needed for such interoperability, with particular attention being paid to standardization.

The development of multi-modal systems in cities is changing mobility patterns. As a result, research will be promoted which aims to establish new criteria for the planning of public transport networks and ring roads to establish new criteria for the planning of public transport networks and ring roads to avoid congestion and harmful development on the outskirts of towns.

A final point is that the introduction of new technologies and the Europeanization of the market will bring about changes in working practices. Consequently, it will be necessary to provide training in line with the changing structures. There will need to be a degree of convergence in working conditions and training if network interoperability is to be achieved satisfactorily.

Integration of new technologies

Incorporating and applying new generic technologies in the transport sphere, for instance for using the global positioning systems by satellite, in order to improve network efficiency and safety, remain major concerns. Taking account of work in the technology programmes, the strategic research should encourage the adoption/transfer of successful technological solutions from one mode to another. Appropriate scientific and technical research should make it possible to find out which are the most promising technologies in terms of matching means and processes to the general objectives of European transport policy.

Policy assessment

This research is aimed at acquiring a better understanding of causality relations between policy goals and policy means taking into consideration potential conflicts between them. The investigation and evaluation of scenarios include evaluation of different effects and the development of models for the prediction of social (socio-economic), energy, environmental and safety impacts of changes in mobility and the transport system.

Lastly, a better understanding of the European transport system and its probable developments should make it possible to highlight the main dysfunctions. Research aimed at resolving them should be carried out, in particular concerning the application of economic and policy instruments, covering both the development of new technologies and institutional, organizational and socio-economic changes.

2. NETWORK OPTIMIZATION

In addition to the above research aimed at overall optimization of the European transport system, it is also necessary to carry out research into the internal optimization of each mode (air, rail, road, urban, inland waterways and maritime transport) and into the integration of these modes of transport (intermodality); in this context, full use will be made of the results of research undertaken as part of other specific programmes, which will be disseminated for this purpose. Of course, the specific optimizations must be compatible with the overall optimization which remains the priority objective. It will be necessary to iron out any contradiction between sectoral optimization and overall optimization in combined transport and rail transport, in particular so as to ensure the interoperability of transnational rail networks, both conventional and high speed networks (on existing routes), by gradually abolishing technical, legal and operational obstacles. The research should lead to the definition of functional requirements for the implementation of integrated intermodal transport chains which, in the case of regional links, need to be supplemented by major nodal points and more widespread link structures; it will also be necessary to draw up pilot schemes to integrate and assess the new technologies with regard to transfers (goods transport) and connections (passenger transport), management, supervision and information. In this sense RTD will build on and integrate existing or current technological developments from other RTD projects or programmes. Identification of technological requirements and the integration and validation of new technologies should be included.

The research in question will take into account areas of investigation common to all modes but which need to be specified in terms of the features of each individual mode. Research on transport of dangerous goods may be included under those transport modes where appropriate.

2.1 Railways

Four actions are foreseen for railway RTD: development of the European rail traffic management system; safety; interoperation; and economic, organizational and social matters. The research has to be set in the wider context of the needs and preferences of public transport users, taking account of the changing institutional arrangements in some Member States for the ownership and management of the rail system.

The work will be aimed at removing obstacles to the compatibility of the national rail systems and, to this end, should provide economic and technical solutions to the problem of the interoperability of the rail network as a subsystem and part of a European intermodal system. Likewise the access of every EC Member State to the European high-speed network will be procured by means of economic and

environmental studies related to the required new lines, in such a way that this access might be achieved with maximum economic benefit and minimal environmental impact.

Firstly, one of the priority issues is the compatibility of train traffic control systems, on which research was started in the framework of the Euret programme. This research has the objective of developing a European rail traffic management system and its principal functionalities through the integration of the results of research on generic technology developed in other programmes. It was developed with the collaboration of the railways and industry and will take into account user needs.

This work needs to be continued so as to develop a common architecture for the European rail traffic management system, and it is necessary to reach the stage of pilot projects to validate the technology through specific applications and demonstration programmes which guarantee the compatibility of the newly-defined systems, mainly by means of tests in railway tracks equipped with different control and traction options.

In this context it is necessary to develop the system specifications, study the ergonomic aspects and human factors, communications and equipment design. The interfaces between connected systems, i.e. communications, management, and information for the public and other services must be taken into account. Finally, in view of the importance of this common architecture for the development of the European rail network, including the high-speed train network, the research results will be validated in the context of the essential requirements and technical specifications being established at a Community level.

Secondly, rail safety is based on the principle of the intrinsic safety of equipment and systems and on the influence of human factors. For the new functionalities, it is necessary to use hardware and software components whose failure mode is not necessarily known or finite. No system is therefore ever totally safe and there is always a risk, however small, of failure. This risk will be quantified to allow harmonized criteria to be applied throughout the Community and ensure that investment decisions for safety equipment can be taken as a function of their added value and capacity to further improve human safety. The research work will, if possible, build on techniques developed for other industries, and adapt them to specific rail applications, if necessary by defining new concepts.

The capacity of a rail section is limited by the need to maintain sufficient distance between trains to enable each one to stop in complete safety in the remaining portion of available track. To be able to achieve this, the current safety systems often leave a gap which is much greater than necessary, in the absence of knowledge of train braking performance, communication systems and the specific approved spacing used. In high-density areas improved train flow is necessary; this requires recourse to innovations developed in other programmes and new techniques and safety systems. Research work is also needed to improve performance and reliability of safety systems, and other vital systems such as the electric traction system.

Thirdly, with regard to the interconnection and interoperability of rail networks, the work will deal with the elimination of obstacles to rail traffic, especially at frontiers, due to national equipment and requirements, and will recommend new common solutions to overcome them such as studies of new connection lines. The degree of interoperation which is appropriate will vary according to the type of rail service, the geographical location within the network, the extent to which national borders are crossed, and customer demand. Research is needed to establish a framework, including a method of evaluating costs and benefits, for longer-term decisions on the degree of interoperation which is appropriate, and to establish ways in which technological differences between different rail systems might be overcome where interoperation is justified.

This research using the results of other Community research activities, will result in the development of interoperability specifications. The essential requirements foreseen in Community drafts on the trans-European high-speed and conventional rail networks will be addressed, as will problems (concerning for example infrastructure; electrical power systems; electro-magnetic interfaces, compatibility and acoustic pollution; noise and vibration) related to the associated subsystems.

In order that strengths of the rail system can also be better used in border-crossing traffic, information systems are required so that information about wagons, containers and loading of goods is transmitted in advance and is made available for planning and control purposes. In order to make rail traffic, including the formation and dissolution of trains, more efficient and ergonomic, research is required into the community-wide introduction of automatic wagon couplings. Fourthly, research will be undertaken on economic, organizational and social matters regarding the cooperation of railway operators with each other and with other transport operators, arising from the fact that new community and national legislations sets new conditions and opens new opportunities for railway companies. The results will inform the research carried out in the other specific activities of the fourth framework programme. Work on the following will be of great interest: the elucidation of the lack of economic profitability of rail transport in comparison with other modes of transport; an assessment of the information required to evaluate measures which might increase the attractiveness of rail transport for both passengers and freight; the intermodal connection of high-speed lines; the economic and social profitability of connections from the peripheral parts of the Community to the European high-speed network; alternative routes for operational lines in order to increase their profitability; and alternative uses for non-operational lines.

2.2. Integrated transport chains

With the opening of the single market, the future extension of the European Community and the progress of the central and eastern European countries towards market economies, the international transfer of goods will inevitably grow strongly. It is generally expected that traffic will double in 20 years, with a substantial increase in road transport. Taking into consideration the significant external costs caused by road transport, multi-modal transport may be a promising solution. Its development could contribute to both a more efficient use of road transport and an improvement in the quality of the environment. Studies should therefore be conducted into the extent to which demand for road transport can be reduced, or transferred to other modes or more sustainable forms of transport such as rail freight and public transport with the aim of minimizing external and internal costs.

The main objective of this programme is to help solve those problems which impede the further growth and realization of optimum quality of integrated freight transport, consistent with the principle of sustainable mobility.

The work will be based on existing research in technological (particularly in telecommunications and informatic items), economic, social and environmental fields and analyse the costs/benefits of transfers between modes through an evaluation of effective transfer options (e.g. short sea shipping). A systematic approach will be followed, based on a conceptual and practical interdependency between individual research tasks, leading to demonstrations of pilot or prototype installations. Consequently all the main actors in this field will also be interconnected. The research will include:

- developing criteria for the improvement of interfaces between transport modes at transfer points to create preconditions for the rapid and reliable transfer of goods,
- improving the access to multimodal transport by small and medium-sized enterprises in both transport and other industries,
- studying the interrelationship between the transport infrastructure on the one hand, and multimodal loading units on the other, taking account of the needs of consignors of freight,
- addressing the criteria for modal interoperability using existing or planned infrastructure, in order to inform the decisions of the infrastructure providing authorities, and notably to ensure links with peripheral or isolated regions of the Community,
- in order to improve the economic efficiency of intermodal transport generally, developing information and implementation strategies, and analysing incentives, for the use of logistical tools throughout the whole logistic chain, with special regard to management, the use of telematic aids, and operations at the beginning and end of the chain,
- network development, including guidelines for the operational characteristics of terminals and linking between terminals,

- guidelines for automated systems of the documentation processing used in intermodal transport,
- guidelines for automatic identification of the loading units, whilst in transit as well as in transport centres,
- the methodological development of a study of cost-benefit and multi-criteria analysis including financial, economic, social and safety aspects concerning the implementation, in the different systems of operation — ongoing or to be developed — of transfer centres between different transport modes,
- a cost-benefit and multi-criteria analysis of the financial, economic, social and safety aspects of the application of the different possible techniques to be used in intermodal transport by rail, as well as its management at borders, loading unit transfer, change of wagon axles or axle gauge of variable width,
- technico-economic studies to improve the conditions of rail operation (speed, ability, to run on tracks of different gauge, maximum load etc.) and scope for commercial development (improvement of gauge, etc.).

2.3. Air transport

A systematic approach to the air transport sector is necessary in order, on the one hand, to define the objectives of European interest with regard to overcoming congestion in air space and at airports, improving safety and minimizing the impact on the environment and, on the other hand, to enable the results of research into generic technologies to be coordinated and assessed.

Firstly the work will address air traffic management (ATM). Within the general framework of Ecarda and the International Civil Aviation Organization's (ICAO) concepts (CNS/ATM) and consistent with the European Civil Aviation Conference (ECAC) strategy for the 1990's, the research will contribute to the definition of technical and operational solutions suited to European needs. Original contributions are expected to enhance the European role and competitiveness in the world. Building upon existing work defining a consolidated ATM concept, and in close cooperation with the Member States, ECAC and Eurocontrol (in particular the EATMS project), the research will evaluate and demonstrate the integrated elements, both operational and technological, for a future ATM system foreseen for 2006 onwards, having at least double the existing capacity, with maintained safety and at a minimum cost.

This work will also integrate the results of generic technology research developed under other programmes and identify the application-related technologies necessary to develop an effective system from the technological, operational and organizational viewpoint. Institutional questions which the possible use of satellites could provoke will also be examined.

Operational consideration will also address the specific aspects, such as the role of human intervention and communication by both pilot and air traffic controller, including for example selection and training; automation of the planning and executive control functions, architecture of new automated air traffic control (ATC) systems; the use of experimental systems of communication, navigation (including navigation by satellite) and automated surveillance, and in particular the use of an aeronautical telecommunications network (ATN) for integration of the Flight Management Systems (FMS) and the ATC systems; and the man/machine interface in ATC. Innovations developed in the context of other activities will be used, and adapted as necessary. The overall integration of these elements will be validated initially on experimental test benches to enable the improvement in capacity and safety of the overall ATM system to be quantified. To facilitate the integration and validation process a validation plan will be developed together with the methodology to be used in the process. Suitable certification methods will be developed and validated for such ATM systems and procedures (including a socio-economic evaluation of any future ATM system).

Secondly, the work will address air transport safety and environmental protection to complement the work of the joint aviation authorities and national aviation administrations.

In particular it will model and assess the airworthiness and operational factors that affect the safety of air transport and environmental issues, determine possible further enhancements in these fields and support future standardization and regulatory activities in the field of certification and inspection of airworthiness. Through strategic research, including modelling of the influence of

critical factors, the work will address: accident prevention and occupant survival criteria; external hazards (icing, collision with the ground, lightening, electromagnetic integrity, engine ingestion, etc.); as well as aircraft reliability and safety standards (airworthiness requirements) taking account of the role of ICAO in setting international noise and emissions standards, and of the work being carried out in Theme B (Industrial technologies) and Theme C (Environment) of the fourth framework programme with regard to future noise and emissions standards.

More precisely the inspection of airworthiness and flight operations, work will take account of the results of the Industrial and materials technologies programme concerning aircraft design and will address the feasibility and socio-economic and systematic evaluation of technologies design to improve crash and fire protection, passenger evacuation, integrity and reliability of crack-detection techniques, certification methods, human factor issues for aircraft which are highly automated as well as for long-range and high-workload operations, and take-off and landing criteria for runways rendered difficult because of atmospheric conditions.

Thirdly, the work will address airports. In order to meet the urgent need to increase airport capacity, in particular landings and take-offs, the research will address concepts of airport design, management issues such as the different kinds of traffic flows within airports and the interface between airport management and control systems on the one hand, and ATM on the other. Modelling and simulation techniques will be developed, where appropriate, in order to define the system requirement and high-level functional architecture. The research will include an examination of the impact of alternative operational strategies on the capacity and level of service of European airports; and a study of system for weather analysis and forecasting. Issues relating to the harmonization of the airport operations and the management of air-traffic flows at network level should also be covered.

2.4. Urban transport

Urban transport poses six types of problems, namely: the needs and preferences of users, their safety and that of pedestrians, energy efficiency and savings, passenger transport-system efficiency, efficient freight distribution and environmental protection. The technical responses to these problems are not necessarily the same but together they must contribute to resolving these six problems. To this end, the actions undertaken in the telematics, energy and transport spheres must be developed in a coherent fashion, and some of the work in this sub-theme will relate closely to work being undertaken in the 'Integrated transport chains' sub-theme.

The work will address solutions able to: improve the efficiency and capacity of urban transport systems especially by improving the attractiveness of public urban transport, to both users and those affected by it; and rationalize traffic management and transport demand by improving the conditions of urban life. In particular, the work will address:

- use of spatial planning policies,
- ecological traffic management (for example, priority to public transport in traffic control systems, favouring the circulation conditions compatible with the urban surrounding),
- safety management, especially for vulnerable users,
- optimization of road use including minimization of spatial mobility (for example by increasing safety, and increasing its capacity in terms of passengers and goods carried rather than of vehicles),
- measures and conditions to stimulate public transport as opposed to private transport,
- factors contributing to the effective integration of different modes and the development of an integrated urban transport strategy (including cycling and walking) to improve town accessibility, in particular the design criteria for the organization and operation of transfer points between local and long-distance traffic, and other efficient measures such as car-pools and car-sharing,

- demand management and an examination of modal split in situations of multiple modal choice,
- goods distribution (city logistics), and the impact of traffic regulations on the retail trade and on manufacturing industry,
- the obtaining of better knowledge of the operating conditions of the transport system and its foreseeable evolution (measurement of congestion, prospective studies of the evolution of mobility rules, development of new procedures for obtaining and analysing data, etc.),
- the practical problems arising from the increasing restrictions on private vehicles. It would be especially necessary to deepen knowledge about the daily behaviour of drivers in face of the existing rules, dependency on the private vehicle in everyday habits, etc.,
- measures to encourage cyclist and pedestrian networks, and to improve the safety of cyclists.

In addition, it will also analyse on the one hand the financing and charging systems for urban transport and in particular public transport as advocated in the White Paper on a common transport policy, and on the other hand the external costs entailed by the different modes of transport in built-up areas (public/private, level of responsibility). In particular, the effects of different systems of financing public transport, including pricing policies and the use of funds raised by congestion charging, will be looked at. With the coming of the internal market, all Member States are today looking for new forms of organization and new financing modes for urban transport systems. Consolidating the better application of existing measures with new technologies (including transport telematics), with new transport means (electric and hybrid vehicles, bimodal bus, trolley bus, light rail), and with traffic control, trip planning, parking management, emergency services, integrated ticketing systems and other low-technology approaches such as bus and high-occupancy vehicle lanes, requires specific solutions which have to be developed taking account of the particular condition of urban areas and of the necessary interface with inter-urban systems. A large scale evaluation of this integration through pilot projects will be required.

The influence of the transport system on the distribution of activities and the growth of the cities, although being unanimously accepted, has received up to now a very poor analysis. The new forms of organization and financing of the urban transport system will have, without any doubt, an important impact on the urban development rules in the short and medium term. On the other hand, with the general aim of looking for a sustainable development, the different kinds of organization and the corresponding transport systems are fulfilling a crucial role which deserves a special research effort.

Most built-up areas may have to consider introducing a range of measures (for example road pricing, traffic regulation systems which give priority to public transport, promotion of car pools, promotion of cycling and walking). Little is known about the complex interactions which will arise in these different combinations and their interfaces with interurban systems. In particular the safety of cyclists and pedestrians must be improved in the explicit context of a multimodal environment. A progressive introduction of selected measures could be carried out in towns, chosen for the purposes of research, to validate them and ensure their gradual implementation. Validation through simulation and demonstration is necessary to assess the cost effectiveness and environmental and socio-economic effects of introducing new technologies or concepts and to identify further the key factors (the relationship between transport and land use, industrial or telematic innovations, regulatory measures or new transport concepts) which need to be addressed by research for attaining the benefits of sustainable mobility for the travelling public.

Multi-modal and inter-urban passenger transport

The efficiency of passenger transport systems will be considered in a multi-modal context. Passenger multi-modality includes the traditional long-distance modes with special reference to high speed rail, but also new short distance concepts (people movers). The design, location and organization of the land-land, land-air and land-sea interfaces must allow an easy, quick and safe change between modes of transport. Special attention must be given to the possible transferability of concepts developed in the area of multi-modal freight transport. Passenger multi-modality also occurs in situations where the passenger may choose among several modes of transport for the continuation of the journey. The

research activities should examine modal split in situations of multiple modal choice, e.g. the implementation and assessment of multi-modal passenger information systems linked to automatic debiting services for the purchase of tickets, seat reservation, etc.

2.5. Maritime transport and inland waterways

Maritime transport

An important starting point for all research activities in the maritime transport field is the assessment of available technologies and the forecasting of required developments. The results will provide the framework for the specific research with the objectives of increasing quality and efficiency, improving safety and protecting the environment of maritime transport through the identification and development of common solutions to the major problems, not only strategic but also technological, for the development of operational systems which integrate new generic technologies, standard procedures, organizational factors and human resources. Particular emphasis will be placed on the issues of interconnectivity and interoperability for maritime traffic elements, such as Vessel Traffic Management and Information Systems (VTMIS), to provide solutions and support the need to integrate locally distributed systems to form a trans-European network.

Firstly, the work will address, amongst other things, the evaluation and modelling of maritime transport supply and demand and flows of goods, at both world and intra-European levels. In particular, the role of short-sea shipping (including ferries) will be analysed within the framework of the logistics chain and the need for harmonization of procedures. This will include the development, integration and evaluation of sea/inland waterway systems and analysis of competitiveness between operators (both Community and non-Community) for the whole operation (land and maritime), management structures, the chain of human resources and the quality of service (total quality control, etc.). The need for the introduction of high-speed short-sea transportation units will also be addressed, in the light of the Common Transport Policy, of market demand, and of the research into the technological cost-effectiveness of fast ships (construction, propulsion and safety) being carried out in the Industrial and materials technologies programme.

Secondly, the work will simulate, evaluate and demonstrate the contribution of new technologies, notably those developed under other specific programmes, to the improvement of maritime traffic management. Aspects related to port facilities and the land/sea interface will be particularly addressed; information exchange between ports and port communities will help the flow of goods, improve safety and the interface role of ports. It is also necessary to analyse and develop new techniques for the whole operation (ships and ports), notably taking into account the necessity of promoting across Community ports the harmonized use of cargo handling methods adapted to the state of technological development achieved in Europe.

It is also necessary to analyse the options for improving the provision of maritime transport through the application of new technologies, notably new rapid transfer systems for goods and passengers and, of their reliance on good port design, management and operation; on professional qualifications and on infrastructure capacity. This will address the definition of a new generation of operating systems and higher-performance ships, able to ensure more efficient, safer and environmentally friendly operations (e.g. higher speed, reduced emissions and fuel consumption). The use of alternative, more environmentally friendly energy sources will also be examined, as will improvements in maritime operating conditions; and improvements in ships' maintenance.

Thirdly, bearing in mind that failure to implement sound safety procedures may cause death or injury to people, damage the environment, and affect the competitiveness of operators, the work will also evaluate the factors having an influence on maritime safety. It will cover both the safety of traffic and the safety of on-board operations. The risks and safety of maritime operations will be analysed, with particular reference to structural failure; mechanical and electrical failures; navigational errors; operations in restricted and sensitive areas, or under extreme weather conditions; the management and monitoring of dangerous goods and the control of pollution, with particular regard to the disposal and treatment of ships' waste in ports. The impacts of the whole chain of human factors on the safety and efficiency of the maritime transport system will be assessed (e.g. ship operation, traffic management and control, shore-based operations), with a view to preventing accidents. Common

criteria for establishing the level of training of crews, as well as procedures for the whole operation (ship and shore-based), communications and traffic management will be developed. Simulation methods for traffic scenarios will be developed.

The application of integrated telematic tools will be evaluated, including the development of common methodologies to support management and ensure interoperability of the maritime navigation and safety systems, e.g. GMDSS, by the European maritime administrations.

Inland waterways

The work will address the integration of new generic technologies together with organizational factors and human resources for inland waterways.

It will analyse in particular the role of this transport mode in the whole chain and will define evaluation criteria for scenarios which are able, as a whole, to reflect the importance and potential of inland waterways and in particular, the obstacles which could hamper the development and transfer of goods transport demand to inland waterways.

In particular, the work will enable the transfer of the results of generic technology research to inland waterways with respect to cost-benefit, safety and environmental impact criteria, notably to improve the whole operation of ships and ports. This will include the development of the sea-river link, the basis for the waterborne transport concept. The strategic aspects of operating a comprehensive and integrated system of inland waterway transport for example on the Rhine-Main-Danube axis must be thoroughly researched, with particular reference to the transport of dangerous goods. It will also be necessary to examine the evolution of barge construction and characteristics as a function of increased speed, reduced emissions and energy consumption. Similarly, human factors with regard to safety on barges and inland infrastructure need to be analysed, particularly the requirements for certification, training and the operational use of information and communication means. Finally, the work will address restrictions to navigation, low-depth hydrodynamics, infrastructure, ports, traffic management and organization, and goods information flows.

2.6. Road transport

Research should contribute to the provision and improvement of the road infrastructure to the efficiency of operation, to the reduction of land use and pollution, devising measures to improve safety of the European road transport (including determining whether the increase in road haulage has affected road safety), and in the management of demand for road transport. It will inform decisions about the need for legislation in support of the Community's transport policy. It will be set in the context of the wider policy goals of enabling the road transport system to play a full part in the creation of an open and competitive market in Europe; and of ensuring the exploitation of research results through the introduction of innovative products and systems. Road Transport includes passengers and goods with cars, trucks, buses, bicycles, pedestrians and other road vehicles. RTD should contribute to the following areas:

- traffic demand management (long term),
- traffic, transport and information management (TTIM) (short and medium term),
- traffic safety,
- road infrastructure.

Experience suggests — not only in the field of road transport — that research findings are often not implemented for technical, economic, legal, political or social reasons. The implementation process must be improved if value is to be obtained for the money spent on research. Ways of overcoming such barriers in the road transport sector will be investigated. Implementation issues should be addressed on the basis of a coherent approach to the evaluation of various types of projects and programmes within the road transport sector. In particular, the implementation problems that might

arise from a variety of procedures and technologies for collecting charges from road users must be assessed. The institutional and legal problems of developing information services for road users will be studied; as will the problems of enforcement of laws and regulations.

Management of demand

On the road network, demand can sometimes outstrip supply. The aim of the research is to help sustain mobility and accessibility by matching the demand with the available supply of roads, while taking account of increasing environmental constraints. Transport demand management is defined as the implementation of policies and strategies designed to optimize the use of roads by both cars and heavy goods vehicles. This definition allows a wide range of potential shifts in behaviour, including multimodal transport and changes in time-period.

The questions of management of demand are generally dealt with in Area 1 of this programme. Specific research for the use of road transport will be carried out in addition to Area 1 and Urban Transport and in coordination with them. A wide range of policy instruments and technological innovations should be examined e.g. alternative fiscal measures, road pricing. Alternative scenarios will be developed, using modelling and simulation techniques where appropriate. Modelling techniques for land use, transport and modal split using GIS technology should be examined by full scale demonstration projects.

Traffic, transport and information management (TTIM)

TTIM covers all road users, including cyclists, pedestrians and those with mobility problems. It aims at best use of the existing infrastructure in European conditions by using real-time information for the effective management and control of the road network whilst taking account of the needs for improved safety and environmental protection. Problems related to the management and control of recurring and non-recurring congestion, and the facilitation of the urban/inter-urban interface, should be studied. The practical experience in implementation, and the results from existing TTIM systems and TTIM pilot projects, achieved in the Community programmes and in the Member States should be investigated. The results from this investigation should serve as a base for further research in the field of TTIM. Solutions should be capable of rapid implementation and will form an integrated part of the transport system.

Safety

Road accidents cause some 50 000 deaths each year in the Community, and considerably more injuries, with enormous economic consequences. The aim of the research is to increase the safety of all road users. Areas for research are:

- analysis of risk on the road and the causes of accidents (particularly the effects of speed), together with the construction of common definitions to enable data to be used on a comparable basis throughout the Community,
- the safety of road infrastructure (design geometry, signs, control signals, lighting, surface properties etc.) and of temporary road works,
- road user behaviour, taking account of the age factor, and ways in which it can be affected, e.g. changes in legislation/regulation, training, enforcement measures, information and publicity,
- the use of standards and development of the necessary methodologies as a means of improving both primary safety (accident reduction) and secondary safety (injury to vehicle occupants and other vulnerable road users such as pedestrians, cyclists and the disabled),
- risk analysis of the movement of dangerous goods, and management strategies for incidents involving such goods.

Road infrastructure

This research will contribute to the optimizations of the European network by reducing the construction and maintenance costs, taking into account the operating conditions over the lifetime of the pavement or structure without reducing the corresponding quality, by minimizing delays and accidents to road users, and by reducing the environmental impact of road construction and use. It will pay attention to the particular needs of the peripheral regions and islands, and of sparsely populated areas; consider alternative means of upgrading roads in these areas when such action becomes appropriate; and consider the problems of transit regions.

The research will secure a sound basis for the future development of Eurocodes and Euronorms by evaluating, in broad terms, prospective scenarios for design, common standards and performance criteria in fields such as 'intelligent roads'. All network infrastructure management strategies for construction as well as for maintenance need to take account of the wider network effects resulting from user costs through accidents, delays or diversions (congestion, road works) intelligent use of the network, and change in mobility of persons and goods.

Areas of particular interest will include the potential costs and benefits of harmonizing techniques (e.g. cost-benefit analysis) and geometric design standards of new road construction. Research should also refer to improved technologies and management systems for pavement and construction maintenance. Improvement in pavement design would allow maximum advantage to be taken of advances in the development of new and recycled materials. A wider issue for road design is the need to reduce the impact on the environment (including noise and vibration) arising from roads.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

Area	(ECU million)
1. Strategic research for a trans-European multimodal network (definition, demonstration and validation)	48
2. Network optimization	192
2.1. Railways	38,5
2.2. Integrated transport chains	16,5
2.3. Air transport	38,5
2.4. Urban transport	26,5
2.5. Maritime transport and inland waterways	45,5
2.6. Road transport	26,5
Total	240 (1)

(1) Of which:

- a maximum of 4,65 % for staff expenditure and 3,65 % for administrative expenditure,
- ECU 2 million for the dissemination and optimization of results;
- up to 5 % for specific measures in respect of SMEs.

The breakdown between different areas does not exclude the possibility that projects may come under several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

The programme will be executed through indirect action, whereby the Community makes a financial contribution to RTD activities carried out by third parties or by JRC institutes in association with third parties:

1. Shared-cost actions of the following types:

(a) RTD projects carried out by undertakings, research centres and universities.

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Technology stimulation to encourage and facilitate participation of SMEs in RTD activities:

(i) by granting awards for carrying out the exploratory phase of a collaborative RTD activity, including the search for partners, during a period of up to 12 months. The award will be granted following the selection of an outline proposal to be submitted normally by at least two non-affiliated SMEs from two different Member States. The award will cover up to 75 % of the cost of the exploratory phase, without exceeding ECU 22 500 per successful applicant SME; and

(ii) by supporting cooperative research projects, whereby SMEs having similar technical problems but not having adequate own research facilities, engage other legal entities to carry out RTD on their behalf. Community funding for cooperative research projects, involving normally at least four non-affiliated SME's from at least two different Member States, will normally cover 50 % of the cost of the research.

Following an initial call, in both cases proposals may be submitted at any time during the period covered by the work programme being implemented.

2. Measures appropriate for this specific programme

- measures in support of standardization, and measures aimed at the establishment of tools of general value to the objectives of the programme,
- financial support for field tests aimed at assessing the cost-effectiveness and environmental and socio-economic effects of introducing new technologies or concepts, and for reinforced coordination actions.

The Community participation may cover up to 100 % of the costs of these measures.

3. Preparatory, accompanying and support measures, such as:

- studies in support of this programme, and preliminary actions in preparation of future activities,
- publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out within the third action; the factors liable to encourage use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,
- analysis of possible socio-economic consequences associated with the programme, which will also contribute to the programme 'Targeted socio-economic research',
- training actions for researchers and users in the area of transport in order to stimulate technology transfer and enhance employment skills,
- measures in support of the operation of networks for increasing awareness and providing decentralized assistance to SMEs in coordination with the Euromanagement auditing activity of RTD.

The Community participation may cover up to 100 % of the costs of these measures.

4. Concerted actions consisting of the coordination, notably through 'concertation networks', of RTD projects in the programme and those already financed by public authorities or private bodies. Concerted actions may also serve as the necessary coordination for the operation of common interest groups which, through shared-cost RTD projects (See 1 (a)), bring together around the same objective, manufacturers, network operators, service providers, users, universities and research centres.

The Community participation may cover up to 100 % of the costs of the concertation.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, in the field of target socio-economic research (1994 to 1998)

(94/915/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas, by Decision No 1110/94/EC ⁽⁴⁾, the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of target socio-economic research; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 103i (3) of the Treaty stipulates that the framework programme is to be implemented through specific programmes developed within each activity under the framework programme and that each specific programme is to define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 105 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment';

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of targeted socio-economic research;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of targeted socio-economic research by research centres, universities and enterprises, in the Member States and between these and the corresponding Community RTD activities;

Whereas the activities carried out under this programme must stimulate, utilize and supplement the activities carried out to evaluate the socio-economic impact in the other specific programmes implementing the fourth framework programme; whereas to this end the measures necessary to ensure mutual information and coordination must be taken;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

(1) OJ No C 228, 17. 8. 1994, p. 177 and OJ No C 262, 20. 9. 1994, p. 23.

(2) OJ No C 205, 25. 7. 1994, p. 344.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p. 1.

Whereas this programme should also comprise support activities and activities for the dissemination and exploitation of RTD results; and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation of the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the said programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the JRC will also contribute, through its own programme, to the attainment of the Community RTD objectives in the areas covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and technological development, including demonstration, in the field of targeted socio-economic research, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 105 million, including a maximum of 14,5 % for staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks,
- the implementation schedule, including dates for calls for proposals,

- the proposed financial and managerial arrangements and the general lines of other measures, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under the JRC programme and other specific programmes, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks,
- arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals,
- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than ECU 0,13 million,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,
- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations, including the financing of the participation of international organizations even where the level of the Community contribution is less than ECU 0,13 million.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,13 million, the Commission shall inform the committee of the projects and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as well as of socio-economic activities carried out under the programmes.

Article 8

Participation in this programme may be open in the area of the evaluation of science and technology policy options, on a project-by-project basis without financial support by the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Paragraph 7 of Annex III (first activity) of the framework programme is an integral part of this programme.

1. GENERAL OBJECTIVES AND CONTEXT

The White Paper on Growth, competitiveness and employment, considered by the European Council in December 1993 started discussions at European level and contributed to the decision-making required at decentralized, national or Community level to lay the foundation for sustainable development of Europe's economies enabling them to withstand international competition and create jobs.

These targeted socio-economic research activities aim at elucidating decision-making in future by developing a shared knowledge base on the challenges facing Europe, based on research and other work in three inter-related areas:

- evaluation of science and technology policy options,
- research on education and training,
- research into social integration and social exclusion in Europe.

The research in these three areas will require high priority for conceptual and methodological work on constructing and integrating data and indicator systems as a common effort of the European social science research community with the aim of becoming comparable Europe-wide and establishing a common research infrastructure (databases on the parties involved and research results; directories and manuals, glossaries and thesauruses, etc.). This is thus not simply a matter of harmonizing statistics but rather, it is creating a scientific system of social reporting which can contribute to the basic understanding of social and economic development. An appropriate proportion of the resources allocated to this field will therefore be earmarked for the definition of a strategy for carrying out this work and developing such infrastructure and to the associated pilot projects.

Evaluation of science and technology policy options for Europe will provide a common knowledge base for decision-makers in the fields of science and technology policy at regional, national and European level and for all those responsible for other areas of activity in which science and technology play a role, with the ultimate objective of encouraging greater consistency and closer coordination of RTD efforts and policies in Europe.

These activities will follow up the Monitor programme (FAST, SAST and Spear) and will build on the work done by the JRC's Institute for Prospective Technological Studies, the Value, Sprint or Eurostat programmes and the experience acquired from the specific programmes (evaluation of the socio-economic impact of research), as decided at the time of adoption of the third framework programme.

The JRC's Institute for Prospective Technological Studies will contribute to the Community's RTD activities in this field and coordinate its work closely with this programme ⁽¹⁾.

The objective of the Community's research activities on education and training must be to support the efforts made by the Member States to strengthen the links between research, education and training and to improve their education and training systems through research and disseminating good practice and innovations. The objective is to help to promote the development in Europe of a society in which lifelong training and education permanently play a central role.

⁽¹⁾ A description of the activities envisaged for the JRC in these areas is contained in the proposal for a decision of the Council relating to the activities of the JRC (COM(94) 68 final, 30 March 1994, 94/0095 (CNS)). An extract from this proposal is attached to this Decision.

In line with the subsidiarity principle, this research will supplement the Member States's activities and other international organizations (e.g. OECD). In order to avoid duplication, it will also be coordinated with the technological research on the same subject under the telematics programme and with the Community's activities in the field of education and training, i.e. the work on the Socrates and Leonardo programmes, the successors to the Erasmus, Lingua, Comett, Petra, Force and Eurotecnet programmes in particular. In this context, account will also be taken of the basic data-gathering and systems analysis work conducted within the Eurydice network and of the work of the Cedefop.

Poverty and social exclusion are major problems facing the Member States. Research into social integration and social exclusion in Europe is necessary in order to gain a fuller understanding of these problems so that remedies can be found.

There are two objectives in this field: to study how far the actual process of European integration (single market, economic and monetary union, world context, etc.) itself gives rise to particular causes of social exclusion and integration, as opposed to factors specific to the changes at national and local level, and to allow all Member States to benefit from successful social integration schemes, by conducting comparative research and by joint application of the results of evaluations of the most innovative projects.

Research under this heading is closely linked to Community initiatives (notably the new medium-term action plan against social exclusion) and national initiatives aimed at combating social exclusion in Europe.

As well as these horizontal targeted research activities, socio-economic research will be carried out within each specific programme under the first activity (evaluation of socio-economic impact and risks) and also under the second activity (socio-economic conditions for international scientific and technical cooperation and links with the Community's external policy), the third activity (more efficient uptake of RTD results) and the fourth activity (training and mobility of researchers in the social and economic sciences). This programme will be designed and implemented so as to ensure stronger synergy and support for research extending, bringing to fruition or stimulating similar work within other specific programmes and related Community activities. Close contacts will be maintained with the COST projects in the field of social sciences and with European organizations working in the areas covered by this programme.

2. COMMUNITY ACTIVITIES

1. Evaluation of science and technology policy options in Europe

(a) Specific objectives

The immediate specific objectives of the programme, defined in line with the subsidiarity principle, are:

- to bring together at European level the efforts of the various individuals and institutions involved in the evaluation of science and technology policy options; to encourage the development of networks of scientists, heads of parliamentary offices and governmental departments responsible for the evaluation of science and technology options, together with experts on socio-economic evaluation of technologies from industry and experts from other areas of socio-economic life,
- to produce specific elements of analysis allowing evaluation of different science and technology policy options at regional, national or European level, taking into account the views of these networks. These will take the form of reports, sets of indicators, information files or periodic publications and will use new media (computer systems, multimedia products, etc.).

(b) Themes

The Community research on this topic will concentrate on three principal inter-related themes.

(i) *Analysis of the RTD situation in Europe in the world context*

The primary objective of the research will be to generate facts allowing evaluation of the strengths and weaknesses of RTD in Europe, compared with the other leading regions of the world:

- the RTD situation in Member States, in non-Community countries, in individual regions or in inter-regional associations,
- policies pursued at regional, national, European and world level: objectives implementing procedures, regulatory and budgetary and fiscal aspects and impact on the scientific and technical base and on socio-economic development, including the macroeconomic level,
- strategies of the industrial and business circles concerned by sector or type of firm; globalization and transnational cooperation; technological trends among multi-national companies; incentives for firms to invest in R&D; the role of collaboration; inertia and changes observed in the producing system and constraints on the development and take-up of new technologies in small and medium-sized enterprises,
- research in and comparative analysis of national systems of innovation, technology management, the social shaping of technology, and links between the science base and industrial innovation.

(ii) *Evaluation of the inter-relations between short- and medium-term needs and socio-economic changes and new scientific and technological developments*

Strategic short- and medium-term (five to 10 year) forward analyses of the major economic, social and cultural challenges and of scientific and technological developments will provide firm guidance for the discussions on the direction to be taken by research efforts in Europe (at national, Community and European level). In particular, efforts will be made to identify the science and technology policy options with the most favourable impact on growth, quality of life, competitiveness and job creation in Europe.

The following challenges will therefore be analysed:

- the economic, industrial and financial challenges. This work will concentrate on an in-depth analysis of the changes under way or in prospect in the world economy and in the European production system in Europe and of their consequences for research, particularly the consequences of the emergence of new regional free trade zones (e.g. the North American Free Trade Association), of fast-growing regions (South-East Asia) or of regions in transition (eastern Europe and the CIS), the major worldwide problems (environment, health and ageing, mobility, energy, food, etc.) and changes in production processes and forms of economic organization,
- the socio-cultural challenges. Europeans' growing awareness of the environment, ethical problems and safety in all its forms, including health and safety at work, the emergence of new leisure pursuits or new cultural activities, the social implications of the emergence of an 'information society', adaptation of mentalities to the changes in production methods and the impact of these factors on consumption patterns will be evaluated with regard to the design, production and dissemination of new knowledge, products and processes. Special attention will also be paid to the relationships between technological development, employment and the organization of society, including individual and collective values. It will be necessary to link research 'observatories' which will monitor public opinion, attitudes, etc. on science and technology issues, including research on the public understanding of, and attitudes towards, science and technology. On the basis of the conclusions set out in the White Paper, and in close liaison with the specific programmes most concerned, special emphasis will be placed on the challenges rising from the emergence of the information society. Multidisciplinary studies will be carried out into the social impact of the spread of information and communication technologies and their interaction with private users so as to pinpoint policy options and experiments likely to bring about widespread acceptance of such technologies by the general public.

The potential impact of new scientific and technological developments will be evaluated in the light of:

- the potential benefits of RTD and the advantages which it can offer from various points of view — scientific (e.g. new insights into natural phenomena, new methods), economic (e.g. improving the competitiveness of companies in various sectors) or social (e.g. job creation, new forms of work, consumer protection, etc.),
- the potential costs and risks: from the economic point of view (e.g. widening of the gaps between regions) and from the social point of view (e.g. destruction of jobs, marginalization of technically illiterate sections of society, psycho-sociological effects, etc.) and from the cultural point of view (e.g. acceptability of new technologies, cultural impacts, etc.).

These strategic forward analyses activities will focus on general socio-economic issues, emerging fields of science and technology or fields developing at the interface between different areas of research (e.g. work to identify technologies of major importance for industry and other sectors of activity in Europe).

(iii) *Methods, tools and approaches*

Finally, a limited proportion of the resources for the programme will be allocated to funding work on methods and tools for socio-economic evaluation of science and technology (work on scientific and technological indicators, on various methods of strategic forward analysis such as scenario building, structural analysis, consultation of experts and new forms of consultation of the players involved and of the public, etc. and on methods of evaluating research programmes).

To provide material for the work in these three fields, an open information system generating and providing access to RTD statistics and indicators will be developed with the cooperation of Eurostat. The system must contain information on RTD resources (inputs) and results (outputs) and on Europe's competitive position, must cover both the public and private sectors and must contain data allowing comparisons at world level. It will be built around the statistics and indicators generated at national, Community (Eurostat and the JRC's Institute for Prospective Technological Studies) and OECD level or by international organizations (Unesco, Unido, FAO, etc.) and original studies. The relevant tasks will be included in the statistical framework programme.

This open information system must allow regular publication of a situation report on RTD in Europe in particular. The data-collection activities and the analyses will be coordinated closely with those carried out in the programme on cooperation with third countries and international organizations, including work on the validity of indicators.

The activities in this field should draw on ETAN (European Technology Assessment Network) to be established under this programme. This network should operate in close cooperation with the main bodies actively involved in evaluation of science and technology policy options in Europe. The intention is to make the best use of the expertise available from these various socio-economic circles and to circulate information on the research and other work in progress in the European Union.

2. Research on education and training

(a) Specific objectives

The specific objectives of the programme, defined in line with the subsidiarity principle, are:

- to provide the knowledge base, tools and references necessary for the development of research on education and training in Europe. This will help to develop a common knowledge base, infrastructure and instruments which can be used for specific activities,
- to bring together at European level the efforts of the various individuals and institutions involved in research on education and training,
- to encourage the development of networks of specialists in educational science (pedagogics, didactics, educational sociology, etc.), the heads of education and training departments in administrations and businesses and other bodies responsible for training those responsible for educational systems and the two sides of industry,

- to shape the intellectual structure of the multidisciplinary field of research on education and training at European level.

(b) Themes

The themes covered by these activities can be subdivided into three main categories:

(i) *Effectiveness of policies and actions*

- Impact of the action taken at regional, national and European level; effects of the introduction of new training schemes in educational systems and of the development of continuous education and training; impact of greater mobility, increased trade, closer contact, etc.
- Comparative analysis of the situation and policies on education and training; social and cultural bases of the Member States' policies; roots and impact of the diversity of the education and training systems in a multi-cultural Europe, notably on employment.
- Teachers and trainers as the key components of education and training systems: new forms of interactions between teacher and pupil; methods of assessing knowledge and representations of teachers and trainers; comparison of effectiveness of traditional methods and teach-yourself systems using new technologies, in-service training of teachers and trainers, management of relevant education and training institutions.

(ii) *Methods, tools and technologies: innovation and quality in formal and informal education and training*

- New technologies in education and training and methods of learning: principles and comparison of the effects of new technologies and tools in education and training (educational software, multimedia and hypertext systems; audiovisual and multimedia methods; virtual reality, etc.). Cognitive bases and operating mechanisms for these technologies; comparison of the cost-effectiveness of various methods of learning and interaction with traditional methods and aids.
- Dissemination of innovations in teaching methods: processes for dissemination (whether spontaneous or planned) of innovations in teaching methods in educational systems and economic life; intellectual bases and organizational mechanisms for the transfer and dissemination of technological innovations by means of training schemes; social and cultural aspects of the dissemination of innovations in education and training.
- Quality of education and training systems: evaluation methods and quality criteria for tools, programmes and branches; establishment of quantitative criteria; cost-benefit analyses.

(iii) *Education, training and economic development*

- Comparative analysis of education and training systems and their relation to economic development and employment in Europe.
- Comparative analysis of the ways in which training measures can be adapted to cope with the economic demands of European business and society, needs for knowledge, skills and qualifications arising from completion of the internal market, development of economic and social potential at regional level, the globalization of trade, new methods of production and business organization, the calls for greater competitiveness, scientific and technological literacy.
- Learning at work: distribution of training and learning between educational and other institutions, personal and organizational incentives, educational systems and employability; acquisition of skills across the life-cycle; transitions from school to work.
- Education systems and multi-culturalism: the links between education, social exclusion integration.

3. Research into social integration and social exclusion in Europe

(a) Specific objectives

The immediate specific objectives of the programme, defined in line with the subsidiarity principle, are:

- to provide the knowledge base, tools and reference necessary for the development of research on social integration and social exclusion in Europe. To help to develop a common knowledge base, infrastructure and instruments which can be used for specific activities,
- to bring together at European level the various researchers into economic and social sciences, law and the humanities specializing in this field so that they can work together and with the other players involved (government agencies, non-governmental organizations, trade unions, trade associations, etc.) in order to gain a fuller understanding of social integration and of the various forms of social exclusion in a multi-cultural society and of the causes and options for solutions.

(b) Themes

Taking account of the changes in progress throughout the European continent on the whole and the need to analyse the effectiveness of national activities, the exploratory activities will centre on four topics:

(i) *Forms and processes of social exclusion and integration*

This comparative targeted research will analyse the multidimensional processes of social exclusion. For society as a whole, social exclusion takes the form of disintegration and fragmentation of social relations and, hence, of loss of control thereof; for individuals and particular groups, social exclusion means deprivation or other forms of social disadvantage.

Particular attention will be paid to the spatial and socio-cultural dimension of social exclusion, i.e. geographical concentration of excluded groups (for example, urban segregation), and to the processes of exclusion associated with living in deteriorated and devalued areas. These are both the product of, and the cause of, social exclusion and/or integration.

Finally, the analysis should help to cast light on the pathways to exclusion and integration, *inter alia* by analysing demographic changes (age and family structures, gender difference, etc.). To give one example of the issues to be covered, one change forming part of the exclusion process is the increasingly precarious position of sections of the population on the fringes of exclusion, for example those who continuously enter and leave the welfare systems at brief intervals or who lose one job after another.

(ii) *Causes of social exclusion, particularly unemployment:*

This work will concentrate on:

- cross-national analyses of the effectiveness of policy interventions,
- the impact of the economic changes affecting Europe in terms of aggravation or reduction of unemployment, including the growth of part-time employment and the growth of youth employment,
- the consequences of European integration for the national forms of welfare state,
- the development of the informal economy in Europe and the consequences thereof.

(iii) *Migration*

The growing numbers of immigrants from the less developed countries outside Europe and from central and eastern Europe must be taken into account in the traditional models for explaining migratory flows and the impact thereof in order to assess their possible implications.

(iv) *Evaluation of the impact of social integration policies:*

An urgent requirement is the analysis of effective policies of social integration in a multi-cultural Europe. This will concentrate on:

- comparative evaluation of the approaches taken by the existing social policies (e.g. switch from welfare policies to active integration policies, promotion of equal treatment, particularly for men and women) and of the role of the various players involved (the two sides of industry, non-governmental organizations, etc.) taking account of changes in the forms and processes of social exclusion in Europe,

-
- analysis of socio-economic factors concerning protection of the health and safety of workers. Cross-national cost-benefit analysis of preventative health and safety policies will be made. These activities will take account of the results of the research conducted in other programmes, particularly if they could contribute to structural improvements in this field. This includes the programmes on biomedicine and health (particularly the research on occupational and environmental health), telematics applications of common interest (particularly telematics for improving employment and the quality of life) and industrial and materials technologies (particularly the reliability of production systems). In particular, socio-economic consequences of protection of the health and safety of workers on the conditions of competitiveness in the Community or other regions will be analysed, with particular emphasis placed on the links between regulation and social exclusion. Account will be taken of the conditions associated with the special nature of small and medium-sized enterprises,
 - the dimension of social cohesion and citizenship in the process of European integration, of development of its institutions and the specific activities at Community level. This will include the analysis of legal institutions.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

	(ECU million)
Area 1 — Evaluation of science and technology policy options	50
Area 2 — Research on education and training	25
Area 3 — Research into social integration and social exclusion in Europe	30
Total	105 ⁽¹⁾ ⁽²⁾

(¹) Of which:

- a maximum of 8,9 % for staff expenditure and 5,60 % for administrative expenditure,
- ECU 1 million for the dissemination and optimization of results.

(²) A sum of ECU 33 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the fourth RTD framework programme for targeted socio-economic research, is earmarked for the RTD specific programme to be carried out by means of direct action (JRC) (1995 to 1998).

The breakdown between different areas does not exclude the possibility that projects may come under several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

The programme will be executed through indirect action, whereby the Community makes a financial contribution to RTD activities carried out by third parties or by JRC institutes in association with third parties:

1. Shared-cost actions of the following type:

(a) RTD projects carried out by undertakings, research centres and universities.

Community funding will normally not exceed 50 % of the cost of the project. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Thematic network, bringing together research carried out by organizations, universities, research centres and end-users, in a particular field of analysis or reflection, will be used to facilitate the transfer of technology or knowledge and the mobility of researchers and to ensure that greater account is taken of the needs of policy makers. Community funding of networks will normally not exceed ECU 20 000, on average per partner and per year, covering up to 100 % of the additional costs for the coordination of the action. Members of a network could also apply for research projects under normal procedures.

2. Measures appropriate to this specific programme:

- thematic studies aimed at rapidly responding to specific questions arising in the course of the programme,
- measures to encourage the establishment and standardization of databases on the players and research projects involved,
- schemes to provide general tools to research centres, universities and undertakings (thesauruses, directories, etc.).

The Community's contribution covers up to 100 % of the costs of the measures.

3. Preparatory, accompanying and support measures, such as:

- studies in support of this programme and in preparation for future activities,
- support for exchanges of information, conferences, seminars, workshops or other scientific or technical meetings, including intersectoral or multidisciplinary coordination meetings,
- use of external expertise, including access to scientific databases,
- scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out under the third action; the factors liable to encourage use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,
- training actions related to research covered by this programme in order to enhance employment skills,
- independent evaluation of the management and execution of the programme and of the implementation of the activities.

Community funding may cover up to 100 % of the costs of these measures.

4. Concerted actions, consisting of the coordination, notably through 'concertation networks', of RTD projects already funded by public authorities or private bodies.

The concerted action option can also be used under the programme as a way of establishing the feasibility and defining the content of shared-cost research activities.

Community funding will cover up to 100 % of the costs of the concertation.

5. Participation of international organizations in activities under this programme may be financed, in exceptional cases, on the same basis as that of legal entities established in the Community.

Extract from the proposal for a Council Decision for the JRC programme (COM(94) 68 Final — 94/0095 (CNS)) concerning the activities envisaged for the Joint Research Centre (JRC) in the areas covered by the targeted socio-economic research specific programme

The European Science and Technology Observatory of the Institute for Prospective Technological Studies of the JRC will provide an information service on progress in science and technology and ensure surveillance of scientific developments and technological innovation.

In order to improve communications and to avoid duplication of effort the Observatory will work in close cooperation with Eurostat and establish close links with European organizations and the OECD, but also with ESA, CERN, Eureka, etc. Its activities will be conducted in close cooperation with those foreseen under the heading for the corresponding shared cost action programme.

It will act within the ETAN network, whose creation is foreseen in the shared cost actions programme as the focal point within, on one hand, a network consisting of various similar observatories in the Member States, and on the other, university and industrial experts responsible for evaluating the relevance, development and impact of scientific technological breakthroughs.

In a Community perspective, it will contribute by gathering information for the regular evaluation of the state of RTD in Europe and comparing it with the situation in other developed countries.

The aim of the technological watch system will be to detect new scientific breakthroughs and technological innovation at an early stage and to alert those responsible in the Community to the implications and consequences, notably for technological research and for the industrial world.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, in the field of training and mobility of researchers (1994 to 1998)

(94/916/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas by Decision No 1110/94/EC ⁽⁴⁾, the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of training and mobility of researchers; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 103i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 744 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas the development and better utilization of human resources in the Community through the training and mobility of researchers is one of the priorities of the fourth framework programme;

Whereas Community activities in the field of training and mobility of researchers should contribute to increasing Community prosperity, on the basis of industrial competitiveness, the quality of life and sustainable development and to supporting growth and high levels of employment;

Whereas the promotion of human resources must also contribute to the Community's scientific cohesion by offering scientific institutions and researchers in the less favoured regions training and research opportunities enabling them to achieve excellence;

Whereas intensification of Community collaboration by the networking (including twinning) of laboratories and research teams in different countries is an important means of strengthening the European research base; whereas it is also important to facilitate the access of Community researchers to large-scale facilities essential to high quality research;

Whereas the participation in networks of laboratories and research teams from less-favoured regions, together with measures seeking to encourage leading scientists to work for extended periods in these regions, will help to strengthen and harmonize the scientific and technical capacities and potential in the Community as a whole;

Whereas training activities, networking and facilitating the access to large-scale facilities call for appropriate accompanying measures, such as conferences and courses, prizes for young scientists, dissemination and utilization of research results and the consultation of distinguished European scientists and representatives of industry;

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities

⁽¹⁾ OJ No C 228, 17. 8. 1994, p. 209, and OJ No C 262, 20. 9. 1994, p. 27.

⁽²⁾ OJ No C 205, 25. 7. 1994, p. 322.

⁽³⁾ Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

⁽⁴⁾ OJ No L 126, 18. 5. 1994, p. 1.

to be carried out in accordance with this principle in the field of training and mobility of researchers;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the Community should only support RTD activities of high quality;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of training and mobility of research by research centres, universities and undertakings, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas the training activities for researchers in the specific programmes of the first, second, and third activities of the fourth framework programme must be coordinated;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise support activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States or regions which participate least in the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme for research and technological development in the field of training and mobility of researchers, as set out in Annex I is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 744 million, including a maximum of 5,6 % for the Commission's staff and administrative expenditure.
2. An indicative breakdown of this amount is given in Annex II.
3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.
2. The rules for the participation of undertakings, research centres and universities, and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

- the scientific and technological objectives and research tasks,
- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements, including preparatory, accompanying and support measures,
- arrangements for coordination with other RTD activities carried out in this area, in particular under other specific programmes,

— arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals and establishment of criteria and mechanisms for project (including individual training grants) selection and approval,

- the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity, except for individual training grants, where this is equal to or more than ECU 100 000 and in the case of Euroconferences equal to or more than ECU 50 000,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,
- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 100 000 and in the case of Euroconferences less than ECU 50 000, the Commission shall inform the committee of the activities and of the outcome of their assessment.

3. As regards individual training grants, the Commission shall inform the committee of the proposals received and the outcome of their assessment.

Article 8

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

The section of Annex III to the fourth framework programme concerning the fourth activity is an integral part of this programme.

1. THE CONTEXT

1.1. Stakes

The optimal utilization of human resources is a basic parameter of all socio-economic activity. The Commission's White Paper on 'Growth, competitiveness and employment' signalled in particular the importance in regard to researchers of 'their qualifications, their ability to meet the needs of developing industries and the extent to which the capital they represent is utilized' in order to contribute 'to renewing growth, strengthening competitiveness and boosting employment in the Community'.

Although Europe possesses, in the field of research, a human capital that ranks high in the world, its utilization is often ponderous and slowed down by differences that still exist between Member States and between different disciplines. The development of human resources by means of training through research and their better utilization through transnational mobility and cooperation are essential means to meet the general objectives of the framework programme. In this context, it is essential to ensure equal opportunities for male and female researchers.

While respecting the fundamental principle of scientific excellence that governs Community RTD programmes, this programme will make an important contribution to economic and social cohesion by reducing the isolation of researchers, by improving communication and by establishing a climate of collaboration in the world of European research.

In order to encourage creativity and innovation, there is a need to stimulate transnational training and cooperation activities proposed spontaneously by researchers themselves (bottom-up approach) without the outside imposition of pre-established targets or objectives. It will be necessary to avoid overlap (in the case of projects, proposed to the fourth activity, that satisfy the specific objectives of the first activity), while at the same time ensuring the complementarity links that are necessary if the training and mobility activities of Community programmes are to create a bridge between fundamental research and applied research. For this reason, the training actions of the specific programmes of the first activity and of the JRC will be coordinated with those of this programme.

This specific programme which is aimed at providing advanced training in laboratories throughout the whole Community, will be open in character and will also stress cooperation between universities and industry.

1.2. Continuity and evolution in the programme

This programme is a continuation, with necessary modifications, of the 'Human Capital and Mobility' programme (1990 to 1994) and the earlier programmes 'Stimulation' (1983 to 1988), 'Science' (1988 to 1992), 'The Large Installations Plan' (1989 to 1992) and 'SPES' (1989 to 1992).

Continuity elements, essential to any long-term activity, concern objectives (to increase, through training, mobility and cooperation, the efficiency of research and of research infrastructures), cohesion factors (to take into consideration the needs for qualified scientific staff in the less-favoured regions) and subsidiarity factors (to exploit the catalytic effects originating from the pooling of abilities and resources dispersed throughout the Community).

2. RTD ACTIVITIES

2.1. General objectives

The aim of the programme is to promote, through the stimulation of training and mobility of researchers, a quantitative and qualitative increase of human resources within the Community and associated States ⁽¹⁾. Its general objectives are the following:

- to stimulate training through research and, by means of cooperation, to foster better utilization of high-level researchers in the Community,
- to improve the mobility of European researchers throughout the Community, encouraging mobility both between universities, research institutes and industry and between disciplines, thus better exploiting the research potential in the different disciplines,
- to promote, for instance through networks, transnational cooperation on research activities proposed essentially by the scientists themselves and not eligible for support under the first activity,
- to facilitate the access of all European researchers to existing large-scale facilities that are essential for high-quality research,
- to improve the scientific and technological cohesion of the Community and contribute to the attainment of a general level of scientific excellence by offering research opportunities to scientific institutions and researchers from all regions of the Community. As was the case under the 'Human Capital and Mobility' programme (1992 to 1994), the return to their region of origin of researchers originating from the less-favoured regions will be encouraged and financed.

This activity will cover the exact, natural, economic and management sciences, as well as those social and human sciences that contribute to the Community's objectives in research, technological development and demonstration.

2.2. Specific activities

The programme is divided into three interdependent areas (research networks, access to large-scale facilities, training through research), to which is attached an activity concerning accompanying measures aimed at improving communication between researchers themselves and with industry, at encouraging young researchers and at publicising the results and achievements of the programme.

2.2.1. *Research networks*

Networks will allow researchers from five or more research teams in at least three countries to join their efforts in a common research project and to constitute, in this manner, groups capable of performing research of higher quality. Small associations of laboratories and research teams from different countries (including twinnings) will also be eligible for support when they are considered to form the core of a future larger network.

Grants will be awarded to help researchers to perform experiments in common, to exchange results, to reinforce research staffs through temporary contracts for visiting scientists from a country other than that of the team concerned and, in exceptional cases, to cover additional costs linked to scientific equipment where it is necessary for the joint research of the network. The average grant to a research team participating in a network shall correspond typically to the cost of taking on a post-doctoral researcher.

It will be the task of each network, by means of an appropriate project management, to distribute the research responsibilities between its research teams and to coordinate the research operations so that cooperation and communication is as open and efficient as possible. Advantage should be taken of the capabilities and potential of modern telematics, whenever appropriate.

Each network shall ensure the diffusion of its principal research results by the timely publication of brochures and overview articles. Arrangements shall be made, where relevant, for establishing regular dialogue with industrial laboratories, particularly from SMEs, that could exploit the research

⁽¹⁾ An 'associated State' is a third country participating financially in this programme, notably countries having ratified the agreement on the European Economic Area, which are associated with the implementation of the framework programme.

findings or finance an extension of the research towards new objectives. As far as possible, SMEs of the less-favoured regions will be associated in this dialogue and encouraged to integrate with the transnational research teams.

The proposed lifetime of a network should not be less than three years.

2.2.2. *Access to large-scale facilities*

This activity is devoted to large research installations whose uniqueness or rarity in the Community, high investment or upkeep costs, and importance for research justifies substantial effort at Community level. It will be of particular importance to researchers working in regions of the Community where such installations do not exist.

Community actions, complementing national and international efforts, will include:

- support for researchers in order to facilitate their access to large installations and large instruments that are necessary for research and rare in the Community,
- support for improvement to large-scale facilities (for example, development of new technologies critical to the facilities, development of new generations of peripheral equipment and instrumentation) where such support is necessary in order to provide wider access to Community researchers, thus encouraging more efficient use of these facilities.

2.2.3. *Training through research*

- Implementation of an activity of training through research and stimulation of researcher mobility in all the fields covered by the programme. Training periods may have a duration of between three months and three years and will allow European researchers to undergo training or specialization outside their country of origin. With regard to the scientific and technological cohesion of the Community, measures will be taken to encourage the return to their region of origin of researchers from the less-favoured regions.

Other measures will be taken, in particular as regards grant levels, to enable leading scientists from the industrialized regions to work for extended periods in research centres in the less-favoured regions. The main aim of their visits shall be to enable these centres to benefit from their knowledge and the results of the research they are undertaking. Arrangements should be separated from those of the training fellows.

While respecting the fundamental principle of scientific excellence, particular attention will be paid to training in the field of the management of changes within enterprises as they relate to new technologies. Special attention will be attributed to the training of researchers belonging to SMEs.

- Coordination of the training activities defined in the specific programmes in the first second and third activities of the fourth framework programme. The purpose is to offer a coherent framework (correspondence of training grants and of categories of fellows, single entry points for receiving proposals and for expenditure commitments, harmonization of evaluation and selection procedures, etc.) for the various actions at the Community level of training through research without going so far as to impose a centralized system unsuited to the special requirements of each programme.
- Terms and conditions for Community research grant-holders. The work programme, provided for in Article 5, will detail the arrangements that will apply to research grant-holders.

2.2.4. *Accompanying measures*

Accompanying measures will be taken to contribute to the objectives of the programme in relation to the stimulation of researcher mobility and training; at the same time, they will be an appropriate vehicle for the dissemination of information on the conditions and procedures for participating in the various activities of the programme and for the dissemination of its results.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

Area	ECU million
1. Research networks	335 ⁽¹⁾
2. Access to large scale-facilities	112
3. Training through research	260
4. Accompanying measures	37
Total	744 ⁽²⁾

⁽¹⁾ Of which about 50 % is to be used to support training within the research teams of the network.

⁽²⁾ Including a maximum of 2,7 % for staff expenditure and 2,9 % for administrative expenditure.

The breakdown between different areas does not exclude the possibility that a project could relate to several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

1. Research networks

Participants in this shared-cost action will be research teams, in universities, research institutes and industry, grouped in transnational networks for the purpose of jointly conducting a research project.

As a general rule, a network shall consist of at least five research teams from at least three countries; its intended lifetime should be at least three years. However, networks of less than five teams in different countries (including twinning) may be supported when they are considered to form the core of a future larger network. Such networks will be supported, in a starting phase, for a maximum of only two years; the continuation of support will depend on the number of participants having increased to five or more from at least three countries.

Networks to be financed by the Community shall be selected on the basis of their scientific quality, taking into account the added value that working together as a network could represent for European science and the participation of industry where relevant to the project proposed. While respecting the overriding criterion of scientific quality in the selection process, proposals linking established laboratories of high quality, on the one hand, and promising laboratories situated in the less-favoured regions, on the other, will be encouraged.

The Community contribution will be granted to cover 100 % of the additional costs of creating and maintaining the network. As a general rule, it shall not be used to procure durable equipment or to contribute to infrastructural costs. A part of the Community contribution awarded to a network may however be used to cover the costs of 'infrastructure-equipment' when it is needed to help establish a new research team to be set up in a less favoured region ⁽¹⁾ of the Community by a researcher trained abroad on a post-doctoral fellowship in the frame of this or the previous Human Capital and Mobility Programme.

2. Access to large-scale facilities

The term 'large-scale facility' refers to an installation, which is rare in the Community, whose investment and operating costs are high, and whose importance for research justifies a substantial effort at the Community level in order to encourage the access of researchers and the more efficient use of the facility. A group of smaller complementary installations, located on the same site, could also be considered to be a large-scale facility, if this group as a whole has equivalent characteristics to those described above.

Access to large-scale facilities shall be financed by the Community on the basis of the following selection criteria:

- the qualities of the facility, in particular the originality and range of possible experiments, as well as the capacity of its scientific, technical and logistical infrastructure,
- the scale of adequately demonstrated interest by potential new users,
- the cost effectiveness of Community support,
- the benefit to the Community in terms of improving the scientific and technical potential of the less-favoured regions.

In the case of proposals for the improvement of facilities, Community support will be granted only to transnational applications. The selection criteria will include the following:

- the estimated increase in the capacity of the facilities to provide wider access to researchers,
- the European interest of the proposed development, in particular as regards its originality and its complementarity to existing facilities elsewhere (developments leading to replication of equipment and performance potential existing in other facilities in the Community will not be financed).

⁽¹⁾ Objective 1 region of Regulation (EEC) No 2081/93 (OJ No L 193, 31. 7. 1993, p. 5) and Objective 6 region of Protocol 6 on special provisions for Objective 6 in the framework of the Structural Funds in Finland and Sweden.

Shared-cost actions

Community support will be granted to cover 100 % of the additional costs relating to the use of existing facilities by researchers other than those belonging to the host organization. Priority will be given to new users and to researchers who come from countries other than that in which the facility is located. Grants are intended to cover the travel and subsistence costs of the researchers, fees for the researchers to use the facility (including fees for introductory courses for new users), and the publication and dissemination of scientific results. Such grants will not provide support to procure durable equipment or to contribute to infrastructural costs.

In the case of the improvement of installations, Community funding will not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions that do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs. If, in relation to the objectives of this programme, equipment is to be procured, Community support will be proportional to the use of the equipment in the frame of the programme.

Specific support measures

Specific support measures (studies, seminars, workshops, etc.) will also be supported in order to encourage the exchange of information between large-scale facilities and European researchers on subjects of common interest, complementing national and international efforts.

3. Training through research

Participants in this activity are, on the one hand, researchers, primarily with a doctoral degree or equivalent level of education, wishing to receive training or to specialize outside their country of origin and, on the other, the research institutions hosting them.

Researchers must be citizens of Community Member States or of an associated State.

The research institutions must be legal entities, established in the Community or an associated State and have the capacity to provide training through research.

The activity will be financed through Community grants for training and mobility designed to cover the subsistence and mobility expenditure of the researchers and provide an adequate contribution to research and management costs, including those incurred by the host laboratories. The arrangements to be made will aim to secure comparable conditions of payment and support for researchers across programmes and across Member States after allowing for local circumstances. The training period could vary from three months to three years.

The training programme covers research in all the exact and natural sciences, economic and management sciences, as well as in the human and social sciences that contribute to the Community's RTD objectives.

Eligibility

Persons whose studies or career have reached the following levels are eligible for support:

- post-doctoral: researcher with a doctoral degree or equivalent level of education or alternatively, having at least four years full-time research experience at postgraduate level,
- experienced researcher: researcher with at least eight years' full-time research experience at postgraduate level,
- postgraduate: holder of a degree, obtained from a university or equivalent institution of higher education, which qualifies the holder directly to embark on a doctorate or equivalent degree.

Return grants

Return grants, awarded for a period of one year, are reserved for researchers from less-favoured regions who have been in receipt of a grant for at least two years for training through research. Their purpose is to enable the researcher to return to his region of origin, with which he must provide proof of links (birth or extended period of residence during the last few years). Applications for such grants may be submitted six months before the end of the training period: following preliminary evaluation, the final approval and payment of the grant will be subject to satisfactory accomplishment of the training project.

Selection criteria

- Curriculum vitae of the candidate for a grant,
 - research experience,
 - scientific interest of the proposal,
 - value and realistic nature of the work,
- and the qualities and abilities of the host laboratory.

The applications must be presented by researchers with the agreement of the host institution where they wish to undergo their training.

Call for proposals

Calls for proposals will be made regularly on a number of preset dates throughout the whole duration of the programme.

4. Accompanying measures

The accompanying measures set out in Annex I will include in particular:

- the development of a system of Euroconferences,
- the organization of practical courses in laboratories, including industrial laboratories, to acquaint researchers with methods and techniques that are novel or little used. These courses will be organized, whenever practicable, in the less-favoured regions of the Community,
- summer schools or comparable activities contributing to the training of young researchers,
- the award of prizes to young undergraduate students and a competition for talented young scientists in secondary education,
- the study of the participation in the programme of women researchers and of measures that could be implemented with a view to its improvement,
- the encouragement of the participation of the less-favoured regions in the programme,
- the publication and dissemination by all appropriate means of the objectives, details of participation, implementation and results of the programme,
- the organization of seminars as a forum for debate with the programme's fellows on the impact of the programme on their scientific activities and their careers,
- the evaluation of the economic and social impact and of possible technological risks arising out of the activities conducted in the frame of this programme,
- regular evaluation, in direct consultation with Member States, of progress made under the programme with regard to cohesion,
- study of the possibility of organizing training through distance-learning for the less-favoured regions of the Community, in close consultation with other Community programmes.

Calls for proposals for Euroconferences, practical courses and summer schools will be published on a regular basis. Particular attention will be given to the participation of young researchers, while ensuring the high scientific quality of the above activities.

Financing

The accompanying measures selected will be the subject of a contract between the Commission and the proposer(s). The contract may provide for financial participation by the Community of up to 100 % of the approved costs.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme for the dissemination and optimization of the results of activities in the field of research and technological development, including demonstration (1994 to 1998)

(94/917/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof (1),

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas, by Decision No 1110/94/EC (4), the European Parliament and the Council adopted a fourth framework programme for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying *inter alia* the activities to be carried out in the field of dissemination and optimization of results; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the aims of this programme are to ensure the widest possible dissemination of the results of research, to achieve optimum exploitation by encouraging, with the assistance of the various operators concerned, the conversion of the results obtained into innovations, to promote technology transfer, in particular to small and medium-sized enterprises, and to support the initiatives launched at national and regional level so as to give them a Community dimension;

Whereas the innovation process is complex and interactive and involves various types of operators, and the activities for disseminating and exploiting results

must therefore be combined with those aimed at improving technology transfer;

Whereas the creation of an environment favourable to the exploitation of results and the dissemination of technologies in all sectors of industry and in all regions of the Community contributes directly to adapting the industrial fabric and increasing the competitiveness of undertakings, thereby strengthening the scientific and technological base of European industry (including SMEs) so that it can become more competitive internationally.

Whereas the amount deemed necessary for carrying out this programme is ECU 293 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of dissemination and optimization of results;

Whereas the rules for the participation of undertakings, research centres (including the JRC) and universities and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas the nature of the activities to be undertaken in this programme requires close coordination with activities undertaken under other specific programmes;

(1) OJ No C 228, 17. 8. 1994, p. 198.

(2) OJ No C 341, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p. 1.

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas the dissemination of results to SMEs is a priority of the fourth framework programme, and this dissemination concerns SMEs participating in the specific programmes and also any undertakings likely to employ scientific knowledge or new technologies to strengthen their competitiveness;

Whereas it is necessary to develop and strengthen knowledge infrastructures to enable the results to be disseminated and exploited in the various Member States, bearing in mind that SMEs operate primarily within national boundaries;

Whereas this programme benefits, in particular, small and medium-sized enterprises in the Member States and regions least involved in the Community's RTD activities and contributes to improved economic and social cohesion in the Community;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme for the dissemination and optimization of the results of activities in the field of research and technological development, including demonstration, as set out in Annex I is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 293 million, including a maximum of 7,7 % for staff and administrative expenditure.
2. An indicative breakdown of this amount is given in Annex II.
3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.
2. The rules for the participation of undertakings, research centres and universities and for the dissemination of results are specified in the measures envisaged under Article 130j of the Treaty.
3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia* the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.
2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent experts of the activities carried out within the domains covered by this programme and their management during the five years preceding this assessment.
3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in

Annex I to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II and shall be updated where appropriate. It shall set out in detail:

- the objectives and types of activities to be undertaken,
- the implementation schedule, including dates for calls for proposals,
- the proposed financial and managerial arrangements and the general lines of measures for implementing the activities, including preparatory, accompanying and support measures,
- arrangements for coordination with dissemination and optimization activities carried out, in particular, under the specific programmes in Activity 1 of the framework programme, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks, such as Eureka and COST.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by a committee composed of representatives of the Member States and chaired by the representative of the Commission.

3. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 14 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

5. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is

delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) above shall apply to:

- the preparation and updating of the work programme referred to in Article 5 (1),
- the content of the calls for proposals,
- the assessment of the activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than ECU 0,2 million, and the assessment of all activities proposed for Area C,
- any adjustment to the indicative breakdown of the amount as set out in Annex II,
- specific modalities for the financial participation of the Community in the different activities envisaged,
- the measures and terms of reference for programme evaluation,
- any departure from the rules set out in Annex III,
- participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,2 million, the Commission shall inform the committee of the activities and of the outcome of their assessment.

3. The Commission shall regularly inform the committee of progress with the implementation of the programme as a whole.

Article 8

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

Scientific and technological aims and content

The present specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its objects in the field of dissemination and optimization.

The chapter in Annex III relating to the third activity under that programme is an integral part of this programme.

I. AIMS AND GENERAL PRINCIPLES OF IMPLEMENTATION

The action in the field of dissemination and optimization of results supplements the actions undertaken by the Member States by giving them a dimension and an added value at a Community level. It has five objectives:

- to ensure the widest possible dissemination of the results of RTD activities under Community and national programmes,
- to optimize their exploitation, i.e. to ensure with the assistance of the various operators concerned that the results obtained under Community and, where possible, national programmes are transformed into innovations,
- to promote transfer to technology particularly to SMEs,
- to support the various initiatives launched at national level so as to give them a trans-European dimension,
- to ensure the continuing development of expertise in innovation and technology transfer.

By virtue of its aims and content, this programme will help the regions of the Community least favoured by the RTD programmes and will contribute to economic and social cohesion. The work programme will propose specific measures to this effect. It is therefore closely linked to various initiatives in these domains and takes account of the communication from the Commission on cohesion and RTD policy (COM(93)203 final). Pilot actions will be implemented in coordination with other Community activities having similar objectives.

The programme also contributes to cooperation activities with non-member States and international organizations in the fields for which it is responsible.

Responsibility for the exploitation of RTD results must be largely borne by enterprises, but Community assistance and monitoring are also needed, without however putting undue burdens on enterprises.

At Community level, the dissemination and exploitation activities are implemented through the specific programmes of the first activity and this programme. In particular, a sum representing on average 1 % of the total budget for the fourth framework programme has been set aside to this end, under the first activity, for the dissemination and exploitation of the results. This will cover in particular sectoral dissemination and exploitation activities.

The specific programmes of Activity 1 implement dissemination and exploitation activities relating to their fields of research, in close coordination with those under the present programme, with a view to avoiding duplication and wastage of resources, maintaining a good geographical balance in the actions envisaged and allowing proper utilization of the skills and infrastructures existing under the third activity — in particular the network of relay centres as a common basis for activities.

In close cooperation with this specific programme, other specific programmes ensure, *inter alia*, that account is taken of the dissemination and optimization aspects amongst the criteria for evaluating and selecting RTD projects, and that the provisions of the contracts which relate to protection, exploitation and dissemination are complied with, and that networks and partnerships established in connection with research projects are also enabled to contribute to the process of dissemination and exploitation of the results obtained.

II. CONTENT

A new approach is necessary to achieve these aims, given the diversity of the operators involved, the cumulative, interactive and complex nature of the innovation process and the specific needs of SMEs.

This approach involves integrating the follow-up to Value (programme for the dissemination and utilization of research results) and Sprint and relevant Thermie dissemination and optimization activities into a single programme and exploiting to the full the synergies between the activities provided for by the various areas of this programme.

The emphasis on SMEs is reflected in the three parts proposed. Part A, concerning the 'dissemination and exploitation of the results of Community research', is particularly addressed to the SMEs participating in the specific programmes or those which are capable of exploiting the results of Community or national research programmes. Part B, concerning the 'dissemination of technologies to enterprises', is aimed at the large number of SMEs which have to integrate in their activities the know-how and new technologies on which the preservation or enhancement of their competitiveness depends and which they have to procure from external sources because they do not possess the necessary internal RTD capacity. Part C, concerning the 'financial environment for the dissemination of technology', provides for measures and instruments to assist both these categories of SMEs.

A. Dissemination and exploitation of the results of research

The aim of this domain is to promote the dissemination and trans-sectoral and transnational exploitation of the results of research, wherever possible, regardless of their source, and in particular to publicise Community RTD activities and their results in order to increase utilization and to facilitate scientific and technical cooperation in Europe.

It comprises a cohesive set of activities comprising services of a general nature, such as the Community network of relay centres, the public information and dissemination service, services specializing in assistance with regard to the protection and exploitation of research results, together with action to improve not only the economic but also the social impact of the exploitation and transfer of the results of research.

1. *The Community network of relay centres*

The action taken under the third framework programme to establish a network of 'Value' relay centres in the Member States in order to promote Community RTD activities and their results will be continued and intensified with the aim of attracting closer attention from enterprises and research laboratories in the individual countries, improving the transnational exploitation of research results and fostering scientific and technical collaboration.

This action should be developed and strengthened through the following:

- providing services for enterprises and research laboratories to facilitate their access to information on Community RTD and demonstration activities,
- facilitating, where possible, the transnational dissemination of results of national research or of programmes such as Eureka and COST,
- systematic examination of the technical and economic potential of RTD results, in collaboration with the specific programmes and contractors concerned, with a view to their dissemination to the relay centres,
- examination of the potential scientific and technological needs of industry so that the supply of results from Community or national research programmes can be, where possible, better matched to them,
- organization of targeted actions designed to promote results, with the emphasis on themes selected for their relevance to the needs of local industry,
- developing the synergies with the relevant national and regional networks and operators with the aim of boosting the promotion of Community RTD programmes, the transnational dissemination and exploitation of research results from any source, including support for the activities of the OPET network in the field of dissemination and optimization of RTD results,
- supplying telematic services to the relay centres, to facilitate the organization of joint activities,

- collaboration among the 'Value' relay centres in defining the methodology of discussion and exploitation of results and for technology transfer, attention being paid to Sprint networks.

2. *The information and dissemination service*

The three pillars of this structure are the data collection and production service, the services and products which specialize in the dissemination of information via networks serving the general public or the various target groups and those which concentrate on publicising and heightening public awareness of research.

The following activities are planned:

- optimization of Community research and development information service (Cordis) and its extension to provide access to available sources of electronically stored information (Eureka, COST, other international research frameworks, national contact points, etc.) and multimedia documents,
- tailoring and packaging the information to specific target 'multiplier' groups (scientific journalists, documentalists, relay centres and other intermediary networks, etc.),
- design and production of new information products adapted to the wide ranges of potential requirements for dissemination on a variety of media including CD-ROM, public networks, extracts from databases, bulletins, etc.,
- sustained publication activity aimed at the scientific community, information 'multipliers' and the public at large,
- use of various means of communication with the public and methods of increasing awareness other than publications, such as audiovisual and multimedia techniques,
- improvement of coordination with similar activities at national level.

3. *Protection of know-how*

The aim of this line of action is to inform researchers and in particular SMEs and sensitize them to questions relating to the protection of industrial and intellectual property rights and to help organizations which do not themselves possess the necessary resources to protect the results of Community RTD which they have acquired.

Conferences and training activities will be organized with the aim of enhancing researchers' awareness of the various aspects of intellectual and industrial property rights. Steps will also be taken to develop collaboration with the European Patent Office and its national counterparts with a view to the organization of joint activities.

Provision will be made for continuing protection of the property rights (patents, trademarks, etc.) of the Community. On request also, subject to certain conditions, assistance and support may be made available to universities, research centres and SMEs with the aim of protecting the results of Community research.

4. *Help with the exploitation of research results*

The aim of this line of action is to offer, particularly to SMEs, specialized services and assistance in addition to the activities of the relay centres, to facilitate transfer from research to industry and the trans-sectoral and transnational exploitation of results.

- the services offered under this heading after assessment of the technical and economic potential for exploitation of the results can include, in particular, the identification of future markets (including a study on technological change), technical and economic feasibility studies, promotion activities, training schemes, advice on exploitation strategies and examination of subsequent industrial exploitation potential within the framework of inter-governmental (e.g. Eureka) or other Community initiatives,
- assistance will take the form of partial financial support for activities in the fields of transfer, adaptation and exploitation of research results.

It may include projects which are specifically designed to meet the needs of SMEs, support for know-how transfer schemes (training, technology clubs, researcher mobility) to promote academic/industrial partnerships, thereby encouraging qualified graduates to undertake careers in industry and the shared-cost financing of transnational and trans-sectoral exploitation projects.

This work will be done with the help of selected experts, or consultants or competent organizations in the Member States. Steps will be taken to further develop coordination between the networks created and national and regional exploitation and technology dissemination activities.

As far as means supporting the utilization of results through training and personnel transfer are concerned, synergy will be looked for with Leonardo and corresponding complementary measures at specific programme level.

5. *The exploitation of research and the needs of society*

The aim of this line of action is to carry out measures and studies which will help to improve the effectiveness of the exploitation and transfer of research results and to set out future strategy in the light of both economic and social needs and to organize joint action projects involving the scientific and educational community, public and private decision-makers, the social operators and the media in order to streamline communications between the general public and the world of science.

The competent structures in the Member States will be associated with the implementation of this line of action with the aim of stimulating synergies and ensuring mutual enrichment via the adoption of a coordinated approach and exchanges of information.

The action could include the following themes and activities from the standpoint of the transfer and exploitation of know-how, in the light of the outcome of the evaluation of the current activities:

- evaluation of the economic and social impact of RTD activities,
- the economy and the management of research,
- organization of communication projects designed to enhance awareness of the implications and impact of science and technology.

These activities will be implemented in close cooperation with those undertaken for the evaluation of the scientific and technical policy options in the programme of 'targeted socio-economic research'.

B. *Dissemination of technology to enterprises*

Priority attention will be given to SMEs in the industrial, craft and service sector which depend on access to new technology for the preservation of their competitiveness but do not have sufficient resources to participate in Community research activities or the direct exploitation of Community research results. Many of these enterprises are in the lower or middle ranges of technological intensity and measures must be taken to improve their absorption capacity for new technology.

Hence the need to heighten their awareness of the new technologies which are available, whatever their origin, and of the opportunities they provide from the standpoint of their individual needs and strategies. They are so numerous that direct action is not a feasible proposition.

To reach these enterprises, the Community, in conjunction with the Member States and the regions, must play the role of a catalyst and motor. This may involve decentralization of organizations and activities. The Community will rely on the competent organizations in the Member States, the technology transfer (TT) intermediaries, the multipliers of information, training and educational institutions etc., in order to optimize the impact of its action.

The action taken under this heading is intended to raise the level of European awareness of these organizations and improve their quality and professionalism by fostering the establishment of cooperation networks, exchange of good practice, the provision of training and support for joint activities. Efforts will be made to establish synergies with the MINT project (Managing the Integration of New Technologies) and networks established under the Sprint programme (such as Eurotech).

Community action must also contribute to the establishment of an environment favouring the absorption of technologies, via the organization of awareness-enhancement projects in the business sector, the demonstration of effective methods and the promotion of modern innovation management techniques. Finally, it must raise the general level of knowledge of the relevant mechanisms, instruments and policies and facilitate the dissemination of good practice to the local and regional operators, particularly by organizing the exchange and evaluation of experience.

Hence the simultaneous involvement of six major categories of operators:

- technological resource centres (TRCs), capable of providing SMEs with the technological expertise they need for an innovation project (universities and public research centres, sectoral joint research centres, companies specializing in research under contract, etc.),
- suppliers of interface services, capable of rapid diagnosis of the needs of client SMEs and able to put them in touch with the competent TRC,
- suppliers of specialized advisory services, (quality, design, management, search for partners, creation of networks, etc.),
- suppliers of financial services, able to mobilize the capital resources required for innovation projects,
- the national, regional or local public organizations which lay down policies, determine the conditions under which enterprises have to operate and manage support procedures,
- organizations for training and vocational training.

Three lines of action are to be followed in this domain:

1. *Transnational networks providing support for the transfer and dissemination of technology*

The emphasis will be firmly fixed on European orientation and the quality and effectiveness of the services providing support for innovation and technology transfer. A coordinated bottom-up approach, geared to the needs of enterprises from the outset and encompassing every aspect of the transfer and utilization of technologies, will be promoted in this context.

Provision will be made for the following activities:

- consolidation and development of the transnational cooperation networks of national or regional operators in the fields of technology transfer or dissemination, so as to strengthen their European orientation: RTD organizations, sectoral technology centres, science and technology parks, local and regional technology dissemination organizations and networks, etc.,
- promotion of cooperation between universities, research centres, industry, SMEs and large enterprises, and sources of financing in order to facilitate the setting-up, expansion and transnational development of high-tech firms,
- organization and support for access to international expertise for designing and evaluating technology dissemination networks in the less-favoured regions. Promising projects not yet up to the required level would be given proposals for improvements through partnerships with a view to enabling, as far as possible, their subsequent acceptance,
- support for national or regional schemes to make technology transfer services more effective, in the form of training sessions (e.g. in the form of a 'summer university'), exchanges of experience and good practice, publication of manuals, etc., in order to give a trans-European dimension to these initiatives,
- measures to facilitate the trans-European dissemination of technological opportunities, whatever their origin, and to promote contact between suppliers, potential clients and intermediaries (TT conferences, technology exchanges, etc.) through maximum use of the network of relay centres.

2. *An environment favouring the absorption of technologies by industry*

The aim is to foster the absorption of new technologies not only by industry in general, and especially by SMEs, but also by public sector organizations, particularly at a local level. A special effort will be made to help the users to express their requirements and hence to choose the technologies which match their individual strategies and absorption capacities (demand-led approach).

The following activities are proposed:

- support for pilot projects for the trans-regional or inter-sectoral transfer of technologies which can serve to demonstrate the methods and conditions of adoption of technologies by new users. These projects will be supported by intermediary organizations selected for their capability of playing a positive role as multipliers in the dissemination of technology in the SME sector,
- promotion, among businesses and especially among SMEs, of good practice in the various domains of innovation management and absorption of new technology by new users, including strategic planning, technology watch, value analysis, design, quality management and the marketing of innovations. These activities may include the organization of competitions (for prizes such as the EC Design Prize) and support for decentralized projects for the promotion of an integrated approach to the application of these management techniques (initiatives such as MINT). Special efforts will be made to encourage undertakings to adapt organizational methods which allow them to adapt to radical innovations,
- implementation of schemes to encourage the less-favoured regions to join with the more advanced regions in an exchange of experience on the design and application of measures aimed at increasing the capacity of their SMEs to absorb technologies,
- promotion of inter-business cooperation in the field of technology in all its phases (search for partners, establishment of contacts, support of cooperation between SMEs and large enterprises, mobilization of financial resources, negotiation of contracts) with the help of appropriate instruments and networks,
- promotion of decentralized awareness-enhancement projects in the fields of technology transfer and innovation (e.g. 'Innovation Road Show').

3. *Exchanges of information and experience with regard to policies for the dissemination of technologies*

Action under this heading is intended to improve the inter-linkage of national, regional and Community TT policies and the instruments used for their implementation.

This means not only raising the levels of awareness of innovation systems (and their performance) and of regional, national and Community rules and regulations, but also the organization of regular exchanges of experience and good practice between the various operators concerned.

The following actions are proposed:

- continuing observation and analysis of the various European systems, policies and instruments (European Innovation Monitoring System) with particular emphasis on the development of methodologies and codes of best practice; similar emphasis will be placed on comparative analysis of the rules and regulations with regard to licensing, tax incentives or legal instruments,
- action to help the regional operators to analyse their TT infrastructures and fine-tune their policies and instruments with the assistance of external experts,
- creation of a forum for the exchange of experience and good practice in the formulation, implementation and evaluation of national and regional TT policies (Innovation Policy Forum).

These activities will be implemented in close cooperation with those undertaken under other Community programmes, in particular the programme of 'targeted socio-economic research'.

C. *The financial environment for the dissemination of technology*

The aim in this area of activity is to improve the European environment for financing the exploitation, adaptation and dissemination of technology by means of an appropriate Community scheme to be implemented in accordance with the principle of subsidiarity.

This domain encompasses:

1. *Indirect support measures*

These include:

- the organization of schemes for improving transnational communications between financial circles and promoters of technology projects (such as investment forums),

- exploration of schemes like the Technology Performance Financing scheme started under the Sprint programme,
 - support for the development or establishment of effective systems for mobilizing private capital, including investment exit mechanisms.
2. A pilot scheme to promote the transfer and exploitation of technologies by SMEs, e.g. via a system of premiums for SME participation in activities designed to promote the dissemination and exploitation of Community RTD results addressing also the issues of intellectual property rights (IPR) and legal aspects. The management of this activity will be largely decentralized and entrusted to organizations with a well-developed national or regional network and experience in the provision of support for SMEs (public innovation agencies, relay centres, etc.).
 3. The granting of technical and management assistance, particularly in the less-favoured regions of the Community, to public and private financial intermediaries, in Member States, offering small and medium-sized enterprises the opportunity for participative co-funding, with particular reference to facilitating the evaluation of technological projects to be submitted by SMEs and allowing optimum exploitation of the research results.

These actions will be closely coordinated with the various Community actions in this field (Eurotech Capital, European Investment Fund, business policy, etc.).

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

		(ECU million)
Area A:	Dissemination and exploitation of the results of research	142
Area B:	Dissemination of technology to enterprises	136
Area C:	The financial environment for the dissemination of technology	15
Total		293 (1) (2)

(1) Of which a maximum of 4 % for staff expenditure and 3,7 % for administrative expenditure.

(2) A sum of ECU 37 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the fourth framework programme for Action 3 (dissemination and optimization of results), is earmarked for activities within the framework of a competitive approach and intended for S/T support to Community policies (1995 to 1998).

The breakdown between different areas does not preclude projects covering a number of fields.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

1. Participants in this programme include:

- research centres, universities and undertakings, notably SMEs, which by virtue of their business (manufacturers or service providers) could potentially benefit from S/T knowledge and technologies developed by third parties and could offer a 'real life' test bench or demonstration case for the utilization of RTD results,
- organizations active in the field of S/T information dissemination and/or providing assistance in the exploitation of RTD results, technology transfer and innovation,
- operators (including private and public financial intermediaries) who by their activities could contribute to, or support, the utilization of RTD results, the transfer of technologies and innovation. Such assistance may cover technical, organizational, managerial and financial aspects.

2. The programme will be carried out through indirect action, whereby the Community makes a financial contribution to dissemination and optimization activities carried out by third parties or by JRC institutes in association with third parties:

(a) Shared-cost actions of the following types

Dissemination and optimization projects carried out by the participants referred to in paragraph 1.

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Measures appropriate for this specific programme

- measures concerning standardization, and measures aimed at the establishment of usage protocols of general value to the objectives of the programme,
- financial support for infrastructures and installations necessary for reinforced coordination actions, such as the relay centre network or specialized and sectoral networks
- measures aimed at facilitating participation of undertakings, research and user organizations in the programme as well as facilitating their access to research results, technologies or innovation,
- publications and activities for the dissemination, promotion and exploitation of results, in coordination with activities carried out by the specific programmes of Activity 1 (the main factors liable to enable and encourage use of results being taken into account from the outset and throughout the duration of RTD projects the partners in which are expected to constitute a key network for diffusion and exploitation of results),
- use of external expertise, including for access to or development of information systems and networking,
- assistance for the mobility of staff with a view to disseminating know-how and technology.

The Community's contribution covers up to 100 % of the costs of the measures.

These activities will be complemented by specific preparatory, accompanying and support measures.

(c) Preparatory, accompanying and support measures, such as:

- studies in support of this programme, and preliminary actions in preparation of future activities,
- analysis of possible socio-economic consequences associated with the programme, which will also contribute to the programme 'Targeted socio-economic research',

- training actions for researchers and users in order to stimulate technology transfer and enhance employment skills,
- measures in support of the operation of networks for increasing awareness and providing decentralized assistance to SMEs in coordination with the Euromanagement auditing activity of RTD,
- independent evaluation of the management and execution of the programme and of the implementation of the activities.

The Community's participation may cover up to 100 % of the costs of these measures.

(d) Concerted Actions

Concerted actions consisting of coordination, notably through 'concertation networks', or RTD exploitation or innovation projects in the programme and those already financed by public authorities or private bodies. Concerted actions may also serve as the necessary coordination for the operation of common interest groups which, through shared-cost projects, bring together around the same technological or industrial objective manufacturers, network operators, software houses, service providers, users, universities and research centres.

The Community participation may cover up to 100 % of the costs of the concertation.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme for research and technological development, including demonstration, to be carried out for the European Community, on the one hand, by the JRC and, on the other, by means of activities within the framework of a competitive approach and intended for scientific and technical support to Community policies (1995 to 1998)

(94/918/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas, by Decision No 1110/94/EC (4), the European Parliament and the Council adopted a fourth framework programme of Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998, specifying *inter alia* the activities to be carried out by means of direct action, on the one hand, and, on the other hand, by means of activities within the framework of a competitive approach and intended for scientific and technical support to Community policies; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary.

Whereas the RTD activities carried out by means of direct action are conducted by the Joint Research Centre (JRC); whereas these activities consist of institutional research activities for which the JRC has expertise and special, if not unique, facilities in the Community and institutional, scientific and technical support activities which necessitate the neutrality of the JRC;

Whereas other scientific and technical support activities necessary for the formulation and implementation of Community policies and which do not necessitate the neutrality of the JRC will be implemented by the Commission within the framework of a competitive approach and in the context of a customer/contractor relationship;

Whereas the amount deemed necessary for carrying out the direct action is ECU 600 million and the amount deemed necessary for the scientific and technical support activities within the framework of a competitive approach is ECU 128 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas the specific programme specifies the content of the activities to be carried out in accordance with this principle by way of direct actions and of activities within the framework of a competitive approach and intended for scientific and technical support to Community policies;

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and to the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on Growth, competitiveness and employment; whereas it is therefore necessary to promote the prenormative research activities considered to be necessary under other Community policies;

Whereas, as part of the direct action, the scientific and technical activities to support Community policies should

(1) OJ No C 228, 17. 8. 1994, p. 219 and OJ No C 262, 20. 9. 1994, p. 30.

(2) OJ No C 205, 25. 7. 1994, p. 316.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 126, 18. 5. 1994, p.1.

remain consistent with the requirements of these policies for the duration of the implementation of this programme;

Whereas the JRC may also take part in the indirect action carried out under the other specific programmes in the same way as third parties situated in a Member State or an associated State;

Whereas the Commission must ensure that research activities carried out as part of the direct and the indirect actions respectively are complementary;

Whereas the JRC may also take part, on a competitive basis, in any other activity implemented by the Community and carry out research on behalf of third parties;

Whereas exploratory research should be encouraged;

Whereas the JRC may contribute to the implementation of Community activities, in particular in the fields of information technologies, industrial and materials technologies, standards, measurement and testing, agriculture and fisheries, environment and climate, non-nuclear energy, targeted socio-economic research, the dissemination and utilization of the results of the research activities, and technology transfer;

Whereas the JRC, with its laboratories and installation, can make an effective contribution to the training and mobility of researchers, and whereas, to this end, cooperation should be encouraged in all the Member States between laboratories and public and private scientific institutes;

Whereas the JRC may contribute to other European research activities, including Eureka; whereas the JRC should be better integrated into networks or consortia with partners in all the Member States, in both its institutional and its competitive activities; whereas it should, in particular, be a driving force in improving links between research laboratories and institutes in all regions of the Community;

Whereas account should be taken of the fact that the EFTA Member States which are parties to the EEA Agreement may participate fully in this specific programme;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme; whereas at the end of this programme there should be a final evaluation of the results obtained with the objectives set out in this Decision; and whereas the conclusions of these evaluations should be submitted to the European Parliament, the Council and the Economic and Social Committee;

Whereas the Board of Governors of the JRC plays an important role in the operation of the Centre and in the implementation of its activities;

Whereas the objective of the competitive support activities is to meet requirements which arise during the implementation of Community policies; whereas, therefore, to ensure maximum flexibility, the Commission must be able to take the action needed to adapt these activities;

Whereas the Commission will determine the responsibilities, in particular as regards the grant of the financial resources provided for in these activities, according to the field of activity concerned; whereas the resources will be granted on a competitive basis;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and technological development activities to be carried out:

- on the one hand by the JRC, mainly through direct action, and
- on the other, by means of activities suited to a competitive approach and intended for scientific and technical support to Community policies

is hereby adopted for the period from 1 January 1995 to 31 December 1998.

Section I:

Direct action (JRC)

Article 2

1. The direct action consists of institutional research activities and institutional scientific and technical support activities.

2. The institutional research activities, as described in Annex IA, are those for which the JRC has expertise and special, if not unique, facilities in the Community which contribute to the implementation of the RTD policy of the Community. They shall be carried out in such a way as to ensure their complementarity with the corresponding indirect action contained in the other specific programmes of the fourth framework programme.

3. The institutional scientific and technical support activities, as described in Annex IB, are the activities necessary for the formulation and implementation of Community policies and the tasks assigned to the Commission under the Treaty which necessitate the neutrality of the JRC.

Article 3

1. The JRC shall participate in the implementation of Community action on research, technological development and demonstration in the fields of information technologies, industrial and materials technologies; standards, measurement and testing; environment and climate; agriculture and fisheries, non-nuclear energy; and targeted socio-economic research and through its exploratory research activities.

2. It shall also participate in the implementation of Community action on the dissemination and optimization of the results of Community research, technological development and demonstration activities.

Article 4

1. The operational budget of the JRC under this programme is ECU 600 million.

2. An initiative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

If additional funding is approved in accordance with Article 1 (3) of the decision on the framework programme, the JRC will receive a share proportional to its share of the present overall amount for the fourth framework programme, provided that, after evaluation, the European Parliament and the Council consider that the JRC is making satisfactory progress towards increased openness to competition.

Article 5

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraph 1.

Article 6

The Commission shall be responsible for the implementation of the direct action and, to this end, shall call upon the services of the JRC. The Commission shall be assisted by the Board of Governors of the JRC (hereinafter referred to as the Board of Governors) in this task.

Article 7

1. In order to help ensure, *inter alia*, the cost effective implementation of the activities, the Commission, assisted by the Board of Governors, shall continually and systematically monitor progress on the implementation of the direct action in relation to the objectives set out in Annex I. It shall assess in particular whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary in the light of results of the monitoring process, submit proposals to Council to adapt or supplement the institutional research activities. With regard to the institutional scientific and technical support activities, the Commission will, if necessary, make adaptations to ensure that they are consistent with the requirements of the relevant Community policies.

2. The Commission shall each year before 15 April submit to the European Parliament, the Council and the Economic and Social Committee a report on the implementation of the activities of the JRC. This report shall be accompanied by the comments of the Board of Governors as contained in its annual report. The latter may also submit, through the Commission, to the European Parliament, the Council and the Economic and Social Committee a separate report on any aspect of the implementation of the JRC's activities.

3. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission, after consulting the Board of Governors, shall have an external assessment conducted by independent experts of the activities carried out by the JRC within the areas covered by this programme and their management during the five years preceding this assessment. The results of this assessment shall be submitted to the Council, the European Parliament and the Economic and Social Committee.

4. At the end of this programme, the Commission, after consulting the Board of Governors, shall have an

independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to the fourth framework programme and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 8

In order to ensure effective coordination between the JRC's institutional research activities and the other activities provided for in the fourth framework programme, systematic exchanges of views will be held between the JRC, including the Board of Governors, and the committees for the specific programmes with due regard to their respective responsibilities.

Article 9

The Commission, assisted by the Board of Governors, may, on the basis of the criterion of mutual benefit, request the JRC to execute projects with legal entities established in third countries where this contributes effectively to the implementation of the JRC's institutional activities. Participation of legal entities from third countries shall not benefit from Community financing under this programme.

Section II:

Activities within the framework of a competitive approach and intended for scientific and technical support to Community policies

Article 10

The scientific and technical support activities necessary for the formulation and implementation of Community policies and which do not necessitate the neutrality of the JRC will be implemented by the Commission within the framework of a competitive approach and in the context of a customer/contractor relationship. These activities are described in Annex IV.

Article 11

1. The amount deemed necessary for the implementation of the activities covered by this section is ECU 128 million.
2. An indicative breakdown of this amount is given at Annex V.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 12

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.
2. The rules for the participation of undertakings, research centres and universities, and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.
3. Annex VI sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 13

1. The Commission shall continuously and systematically monitor progress with this section of the programme in relation to the requirements of Community policies. It shall in particular assess whether the objectives, priorities and financial resources are still appropriate. It shall, where appropriate, take action to adapt these activities depending on the results of this monitoring process.
2. At the beginning of each year the Commission shall submit a report to the European Parliament and the Council with information on the activities carried out during the previous year, and the work programme for the current year.

Article 14

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Sections 1C, 2B, 3A, 3B, 4C, 5 and 7A of Annex III (first activity of the framework programme are the basis of the objectives of this programme.

The Joint Research Centre (JRC) will conduct strategic and applied research. It will therefore be an integral part of European science and technology. The JRC will also contribute to the establishment of the scientific and technical basis needed for the formulation and implementation of various Community policies.

In line with the priorities defined in the White Paper 'Growth, competitiveness and employment' in the research field, the scientific and technical activities carried out by the JRC should meet the needs of the Community as a whole, its institutions and Member States with the objectives of:

- helping to strengthen the scientific and technological basis of European industry and to encourage the development of its international competitiveness,
- providing the independent scientific expertise necessary for the implementation of Community policies and the tasks which the Treaty assigns to the Commission,
- providing scientific and technical services to Community institutions and making JRC capabilities and scientific and technical installations available to public and private bodies,
- contributing to the improvement of public safety aspects of new and applied technologies,
- contributing to the improvement of environmental impact assessment and protection,
- contributing to the reduction of scientific and technological disparities between Member States.

The European dimension of its research must remain one of the fundamental strengths of the JRC. Its activity should be characterized by a multidisciplinary approach based on the broad span of its capabilities. This multidisciplinaryity is reflected in the choice of subjects covered by its institutes, thus ensuring its ability to meet new challenges as they arise.

Thanks to its capabilities and its involvement in the formulation and implementation of Community policies, the JRC will contribute to the integration of national, Community and European activities. It shall endeavour in particular to improve links between the research laboratories and institutes in all parts of the Community, and may be the focal point of such networks in its areas of expertise. It will furthermore participate in relevant Eureka projects.

This large exposure should not, however, lead to an excessive dispersion of the activities undertaken. Without ignoring the expectations of its customers the Centre and its management must have clear views on the proper scientific and technical policy for the JRC and be able to maintain a balance in order to ensure that the activities and contracts which are accepted can be executed at all times with the requisite level of competence, both qualitatively and quantitatively.

Against this background, it should also be pointed out that some activities are horizontal: those concerning environmental protection may appear in fields other than that headed 'Environment'. The same applies, for example, to activities concerning the working environment.

The work to be carried out by the JRC falls into two categories:

- institutional research activities,
- institutional scientific and technical activities in support of Community policies.

A. INSTITUTIONAL RESEARCH ACTIVITIES

These research, technological development and demonstration activities for which the JRC has special, if not unique, expertise and installations in the Community will contribute to the Community research policy.

Industrial technologies

The contribution of the JRC to this sector is aimed at improving the competitiveness of European industry, conducted in close coordination with the corresponding shared-cost action programmes. It will focus on prenormative research which, save exceptions, will be undertaken within the framework of networks of European bodies with interests and capabilities in this type of research and in association with standards organizations, in particular the European Committee for Standardization (CEN). This will guarantee that the overall requirements of industry are taken into account from the start.

Line 4: Industrial technologies and materials technologies

Research into materials will be directed mainly at the following sectors, which have a prenormative dimension and good potential as enabling technologies, with an emphasis on clean technologies:

- ceramics, metals and composite materials: process development, study of interfaces and joints, improvement of technological properties, characterization and demonstration,
- surface modification and characterization technology: ion implantation and laser beam, protective coating, non-destructive evaluation methods,
- prenormative research leading to standards on material recyclability, including the development of a database on recyclable materials (ecological characteristics and estimation of useful life).

This research is aimed at acquiring, in close cooperation with the national laboratories concerned, the scientific knowledge necessary for these materials to be used industrially, and to provide the standards bodies with knowledge which is essential for standardization in this field.

Furthermore, the development of non-destructive evaluation techniques to study the reliability and useful life of mechanical constructions will continue with a view to the development of component inspection techniques and the harmonization of qualification procedures. This research will continue to be conducted in the framework of the laboratory networks which have existed for a number of years, which will be gradually enlarged in line with needs.

Line 5: Measurements and testing

These activities are directly related to standardization and include:

- (a) Prenormative research on reference materials and prenormative and normative research on reference measurements, in particular in the following sectors:
 - preparation, characterization and certification of high-quality reference materials. International intercomparison exercises will be used to ensure adequate quality assurance and to facilitate harmonization,
 - establishment of a common scientific basis for the chemical reference measurements,
 - measurements and evaluation of basic data, improvement of their quality and accuracy using the experimental installations available and by making use of European and international collaboration, in particular through networks.

The distribution of reference materials produced within a Community framework is assured by the Institute for Reference Materials and Measurements (IRMM). The results achieved by IRMM in establishing extremely accurate measurements have won it recognition as a reference centre. Intercalibration campaigns conducted by the IRMM among the network of all interested laboratories in the Community will provide each laboratory with an impartial and reliable evaluation of the quality of its own measurements. This activity will be extended on request to any third country laboratory, on payment of a fair fee.

- (b) Prenormative research in the field of structural safety and reliability to improve the design specifications of civil engineering works for the development of standards (Eurocodes), in particular, by taking into account earthquakes, and the construction technologies of European industry. This research will continue to be conducted with the organizations in the Member States which have been grouped together since 1989 in the European Association of Structural Mechanics Laboratories.

In order to carry out destructive dynamic tests on civil engineering works and industrial structures made of steel, concrete, brickwork and composite materials, the JRC has constructed the ELSA ('European Laboratory for Structural Assessment') test wall and the LDTF ('Large Dynamic Test Facility', which are unique in Europe.

Environment

Line 6: Environment and climate

In order to optimize the complementary role of JRC direct action with respect to specific programme Environment and Climate, close cooperation will be ensured between JRC programme managers, other DG XII programme managers, in the preparation and updating of the Work programme and in the management of projects. The objectives for these research areas are listed below alongside the relevant section headings set out in the shared-cost action specific programme 1994 to 1998.

Thema A. Natural environment; environmental quality and global change

The European Community should make a major contribution to international research into global change, in particular by participating in major activities undertaken by the scientific community, such as the International Geosphere Biosphere programme (IGBP) — the activities of the European IGAC (International Global Atmosphere Chemistry) Project Office (EIPO) will be continued at Ispra for IGBP — the World Climate Research programme (WCRP) and the Human Dimension programme (HDP).

The JRC will also contribute to the Enrich network by making its scientific research on global change available.

This network should also contribute to the development of the research capacities of the developing countries, mainly — but not solely — in Africa and the Mediterranean area; it should also provide support for the central and eastern European countries. Enrich should be implemented by means of the JRC's own contributions, of shared-cost projects and using other Community mechanisms.

Thema A, Area I. Climate change and impact on natural resources

The JRC activities on the application of remote sensing techniques listed under theme C below are also relevant to this area, in particular, the impact on agriculture, forests natural environment, land resources and desertification in Europe.

Thema A, Area II: Atmospheric physics and chemistry, interaction with the biosphere and mechanism of environmental change impacts

Research area: Atmospheric processes

The objective is to contribute to the assessment of climate perturbations in the troposphere and lower stratosphere due to atmospheric chemistry of anthropogenic and natural emissions in Europe. The JRC's activities on the application of remote sensing techniques listed under theme C would also contribute to this objective.

The work is in the frame of international collaborative programmes, such as IGBP (International Geosphere Biosphere programme) and GAW (Global Atmosphere Watch). Important topics in the field of stratospheric chemistry and ozone depletion are the total ozone column and UV radiation and their evolution. Special attention is also given to tropospheric ozone and the oxidative efficiency of the atmosphere (BEMA — Biogenic Emissions in the Mediterranean Area, and Ozone projects) and to the role of aerosol precursors and aerosol/cloud interactions (Sulphur and Climate project). The JRC has a twofold role, i. e. execution of a part of the research work and improving the coherence between the contributions of the national laboratories to the projects.

Thema B, Area III: Technologies and methods for assessing risks to the environment and for its protection and rehabilitation

Research area: Environmental quality

Research on selected aspects of the total chemical pollution — taking into consideration the subsidiarity principle — based on European collaboration and in support to prenormative research for the single European Market. Lines of research:

- (a) chemical pollution in soil and water; contaminant transport acid accumulation, biological processes and related monitoring;
- (b) total human exposure to chemicals; environmental compartments, exposure routes and health effects for trace metals and selected classes of organics;
- (c) processing and management of data e. g. adaptation of geographic information systems.

Research area: Industrial reliability

The aim is to elaborate together with industry, public authorities and national laboratories a sound scientific basis for improving safety and environmental impact of technology, e.g. development of multicriteria methods for the definition of aggregate indicators of the state of the environment; development of new methodologies for assessing the safety and reliability of industrial systems; to provide novel design methodologies and experimentally verified calculation tools for safe operation of chemical reactors.

Thema B, Area IV: Technologies to forecast, prevent and reduce natural risks

JRS activities on the application of remote sensing techniques reported under theme C are relevant to this area too.

Thema C, Area I: Methodological research and pilot project

Research area: Remote sensing for the terrestrial and marine biosphere

The objective of this work is to document and understand the functioning of the terrestrial and marine biosphere at a global scale. The associated actions will hinge on the development and combined application of remote sensing techniques and models, and will directly support the efforts of the scientific community in the exploration of the ecosystem from space.

Particular emphasis will be given to the monitoring and understanding of the biosphere and its interactions with the other components of the global climate system, in particular the atmosphere. The extent of the tasks (data management and model exploitation) will require a coherent joint European approach. In those fields the JRC acts as the counterpart of the European Space Agency from the user side of the scientific community.

The existing facilities of the JRC may also be used for participating in the collection and evaluation of seismic data.

Research area: Advanced earth observation techniques

The overall objective of the work is to evaluate and develop possible applications of remote sensing techniques taking into account the European Microwave Signature Laboratory and the common project with the European Space agency called Earsec. This effort will be directed to the preparation of the scientific community for the utilization of data from earth observation sensors, the development of methods to interpret satellite derived data and the evaluation of advanced techniques of earth observation.

In particular advanced earth observation techniques will be developed to monitor global change. This will include research into the development of techniques for using data derived from spaceborne sensors for the surveillance of the marine environment and of changes in the terrestrial ecosystem. In so doing the work follows the requirements of subsidiarity in that, in general, projects are undertaken that are of overall European interest, and that require a coherent European approach.

Theme C: Area II: Research and development work for potential future operational activities

Research area: Remote sensing monitoring

Research will be carried out into the development of remote sensing based methods that could in the future lead to applications projects for the benefit of Community policies, such as External Affairs Development and Environment. The work undertaken within this framework involves input from institutes and organizations in the Member States. However, much of this work requires an impartial analysis that can only be provided by a laboratory at the European level:

- (a) Tropical Forest Information System: to provide, at regular intervals, relevant information on the state of the tropical forests.
- (b) Ecosystem Monitoring in the African Savanna: evaluation of plant primary productivity in the Sudanese zone of the sub-Saharan Africa.
- (c) Biomass Burning Monitoring and Impact Assessment: impact of land fires upon the ecosystem for regional resource management. Use of satellite data to map and monitor fires on continental to sub-continental scales.
- (d) European Environmental Monitoring: emphasis on land degradation and soil erosion in Mediterranean environments; forest and natural grassland ecosystem mapping in central and northern Europe; Corine land cover updating; Geographical Information System on soil information.
- (e) Remote Sensing Data and Marine Information System: research on understanding the marine environment and the impact of environmental changes on available fish stock.
- (f) Ocean colour: development of a new programme, the Ocean Colour Techniques for Observation Processing and Utilization System (Octopus) to assure the full processing and utilization of data from the new ocean colour sensor, the Sea Viewing Wide Field of View Sensor (SeaWiFS).
- (g) Atmospheric monitoring: monitoring of atmospheric (tropospheric and stratospheric) changes and of biosphere/atmosphere interaction, in connection to research carried out under theme A, Area II.
- (h) Development of methods aimed at improving the detection of dangerous objects for the protection of the population, using the European Microwave Signature laboratory, following its validation for this purpose.

Theme C, Area III: Centre for Earth Observation

Research area: Centre for Earth Observation (CEO)

The JRC is participating with other services of the Commission, the European Environment Agency, the European Space Agency (ESA) and within national organizations in the creation of the European Earth Observation System (EEOS), an end to end service which will provide users with continuous and long-term availability and use of consistent data relating to earth observation. As a contribution to the EEOS the JRC is developing the CEO — Centre for Earth Observation — a decentralized European data management and information system which will assure value added data services. It will address scientific users, policy makers and commercial operators.

Line 11: Non-nuclear energy

Special efforts will be made in the area of renewable energy sources; prenormative research will be intensified in the areas of photovoltaic energy, solar energy, energy conservation, the development of materials for clean technologies, and analysis of systems and standardization procedures from the energy point of view. Cross-border research of this kind should facilitate the dissemination of these technologies, which are approaching some degree of maturity. The JRC will contribute to the development of technologies for cleaner and more efficient use of energy, with the emphasis on environmental aspects, in the following sectors and in close cooperation with the corresponding shared-cost action programme:

- photovoltaic energy: the activities will include component tests and studies on the design and control of large-capacity systems. The research will be based on the use of the ESTI ('European Solar Testing Installation') of the JRC and on networks with partners in the Member States. Basic scientific research into energy savings will be continued,
- materials for clean technologies: research will cover the development of materials for clean technologies such as long-lived catalyst supports for emission control, nanoporous ceramic membranes for advanced ceramic filters, ceramic alloys and composite materials for high-temperature applications (turbines and heat exchangers).

Line 13: Targeted socio-economic research

The European science and Technology Observatory (ESTO) of the JRC's Institute for Prospective Technologies will provide the European Parliament, the Commission and any other interested public or private bodies with an information service on progress in science and technology, and ensure surveillance of scientific developments and technological innovation. This service may contribute to an analysis of the situation in the Community and the rest of Europe in a global context, as well as to an analysis of the technological strategies of economic operators (industry, public authorities, etc.) and their social impact.

An independent comparative study of the Community's expectations with regard to new scientific, technological and technical developments will contribute to decision-making, whether by the Commission, the public authorities or businesses.

In order to improve communications and to avoid duplication of effort, the Observatory will work in close cooperation with Eurostat and establish close links with European organizations and the OECD, but also with ESA, CERN, Eureka etc. Its activities will be conducted in close cooperation with those foreseen under the targeted socio-economic research specific programme.

It should act within ETAN (European Technology Assessment Network), to be established under the abovementioned specific programme, as part of a network consisting of various similar observatories in the Member States, in cooperation with university and industrial experts responsible for evaluating the relevance, development and impact of scientific technological breakthroughs.

In a Community perspective, it will contribute by gathering information for the regular evaluation of the state of RTD in Europe and comparing it with the situation in other developed countries.

The aim of the technological watch system will be to detect new scientific breakthroughs and technological innovation at an early stage and to alert those responsible in the Community to the implications and consequences, notably for technological research and for the industrial world.

B. INSTITUTIONAL SCIENTIFIC AND TECHNICAL SUPPORT ACTIVITIES

These activities are necessary for the formulation and implementation of Community policies and the tasks assigned to the Commission under the Treaty.

The following description, which is based on current Community policy requirements, is given for guidance only and may be modified in accordance with the relevant provisions of Article 7 (1).

Information and communications technologies

Line 3: Information technologies

The JRC will make its contribution to this field, notably in contributing to the improvement safety and systems reliability. This will include safety-critical computer systems, computer systems, robots and safety-relevant computer systems. The main prenormative areas will cover, in particular, the drawing-up of design guidelines to ensure that safety and reliability are taken into account. Tools for the analysis and validation of the safety and reliability of systems will be developed.

Furthermore, the JRC will make a contribution in the area of high-performance computing and its applications, in association with a network of national centres, in defining methods for comparing such systems.

The Centre could also be called on to become a conformity testing site for specialized software and make other contributions in the information technology area, such as the development of testing methodologies, and contribute to the organization of workshops and training activities.

Environment

Line 6: Environment and climate

In order to optimize the role of the JRC in support of the regulatory work of the Commission (fifth Community programme of Policy and Action on the Environment) close cooperation will be ensured between JRC programme managers and managers of the relevant Directorates-General. For clarity, the objectives for these support activities are listed below alongside the same relevant headings set out in institutional research (section A).

Theme B, area II: Instruments, techniques and methods for monitoring the environment***Research area: European reference laboratory for air pollution (Erlap)***

Scientific and technical support to the regulatory action of the Commission for:

- the preparation and implementation of EC Directives on ambient air quality, with special regard to the urban environment and industrial emissions. The neutral and central coordinating role of the JRC will be further enhanced by the Commission's decision to create the European Reference Laboratory of Air Pollution (Erlap) Commission communication to the Council and to the European Parliament: in preparation). The establishment of harmonization procedures designed to ensure absolute coherence of information coming from the different Member States will be a priority. Such procedures should make for much more effective application of the framework directive on air quality and enhance awareness of the impact of regulations on air quality in the areas of transport, energy, industry and urban development. Initially, particular attention will be paid to the last two sectors,
- the implementation of EC Directives on environmental radioactivity, particularly on those related to information exchange with Member States, both under normal conditions and following an accident.

Research area: Support to European Environment Agency (EEA)

The major role of the European Environment Agency (EEA), as indicated in the Council Regulation which created the EEA (Regulation (EEC) No 1210/90 of 7 May 1990) ⁽¹⁾, is to establish and coordinate, in cooperation with the Member States, the European Environment Information and Observation Network.

The Network will comprise of the main components of the national information networks, the National Focal Points and the Topic Centres.

The Agency will collect process and analyse the information available from the National Focal Points and the Topic Centres. It will be then of paramount importance that the Agency be provided with calibrated data, in comparable and consistent formats in order to be able to furnish the Member States, the Commission and other users with data and information on the environment.

The Council Regulation foresees in Article 15 and Annex A an important role of cooperation for the JRC which had to provide scientific and technical support to the Agency with the following priority tasks:

- harmonization of environmental measurement methods,
- intercalibration of instruments,
- standardization of data formats,
- development of new environmental measurement methods and instruments,
- other tasks as agreed between the Executive Director of the Agency and the Director-General of the JRC.

The JRC work is initiated on request of the Agency and will be conducted in close cooperation with the relevant Topic Centres.

Theme B, Area III: Technologies and methods for assessing risks to the environment and for its protection and rehabilitation***Research Area: Europe Centre for the Validation of Alternative Methods (ECVAM)***

Ecvam is intended to scientifically and technically support the regulatory work of the Community. In particular to coordinate efforts designed to promote the orderly scientific and regulatory acceptance of alternative methods (alternative to vivisection) which are of importance to the biosciences and which can reduce, refine or replace the use of laboratory animal procedures. To this end, discussions between government, companies, scientists, consumers and animal protection associations are being conducted. The

⁽¹⁾ OJ No L 120, 11. 5. 1990, p. 1.

reinforcement of this dialogue is essential if the Community is to achieve the objective laid down in the Community programme of Policy and Action in relation to the Environment and Sustainable Development ⁽¹⁾, concerning a reduction in the number of vertebrates used in laboratory experiments.

Ecvam was formally created in 1991 by a Commission decision and communication to the Council and European Parliament (SEC(91) 1794).

Research area: Industrial reliability

To support the implementation of environmental directives on Major Hazards, Biotechnology Hazards, Environmental Impact Assessment and Safety at Work.

To analyse the safe handling of dangerous products during the complete product-life cycle, in particular in transit and storage.

Research area: European Chemicals Bureau (ECB)

Technical focal point for research based work for the implementation of Community regulations and directives in the field of chemicals control. The JRC has been formally entrusted with a central role by the creation of the European Chemicals Bureau (Commission communication to the Council and to the European Parliament, OJ No C1, 5. 11. 1993, p. 3).

Research area: Foodstuff and European Community Pharmaceutical Information Network (Ecphin)

- Technical and scientific support to Directorate-General Internal Market and Industrial Affairs (DG III) concerning the harmonization of analytical methods applied to foods and consumer goods.
- Integrated information and communication services to support DG III and the European Agency for the Evaluation of Medicinal Products (EAMP) (Council Regulation EC No 2309/93), in monitoring market transparency (scientific information and prices) for medicinal products and in the electronic interchange of documents/data with national authorities.

Research area: Quality control of consumer products

To provide an impartial service by making available scientific and technical means to the Consumer Policy Service (CPS) for the control of trace contaminations in industrial products offered for public use.

To assist the CPS in the definition and verification of products safety and provide methods for quality control.

Life sciences and technologies

Line 10: Agriculture and fisheries (including agro-industry, food technologies, forestry, fish farming and rural development):

- Research and development on new technologies using remote sensing to improve the methods of monitoring the Common Agricultural Policy (CAP) will include:

- (a) the second phase (1995 to 1998) to the pilot project for the application of remote sensing to agricultural statistics (MARS-STAT):

The first phase (1989 to 1993) of MARS-STAT, which was the subject of the Council Decision of 23 September 1988, is now completed. As planned, certain specific activities now no longer come under the RTD phase but may be operationally used by the Member States or the Commission. Nevertheless, other actions are still in development and require continued work before becoming operational.

The second phase aims, in particular, to continue the work with regard to vegetation evolution and forecast models with the aim of obtaining an integrated agricultural information system at Community level. Studies on the applications of methods or new sensors should also be followed up.

⁽¹⁾ OJ No C 138, 17. 5. 1993, p. 1.

Finally, it could prove useful to extend these applications to the needs of other countries, notably the central and eastern European countries,

(b) techniques for surveillance and control of the implementation of the CAP (MARS-CAP):

For some time, remote sensing techniques have been applied for the production of citrus fruits, vineyard and olive tree registers and the inspection of the use of CAP subsidies at regional and local level. The new CAP rules, which have been extended to all the main crops, need scientific and technical support using remote sensing for the development of an integrated system for the management and control of declared agricultural land and the registers of the various crops:

- The European Office for Wine, Alcohol and Spirit Drinks, as described in the Commission communication to the Council and the European Parliament (COM(93) 60 final of 16 September 1993), provides the Commission with scientific and technical support to enable it to verify the proper application of Community provisions. Focusing mainly on control of the alteration and the origin of wines, and intended for use in the choice of arbitration procedures between two Member States, this activity makes use of nuclear magnetic resonance and mass spectrometry and also calls for the development of new analytical techniques.
- The elaboration of methodologies for reference measurements and the preparation of reference materials necessary for the quality control of food products are another impartial contribution of the JRC to the European agricultural policy.

Line 13: Targeted socio-economic research

The aim of this activity is to gather, for the formulation and implementation of Community policies by the Community, basic information and analyses on scientific and technological developments and innovations, and their prospects and consequences, in particular their impact on industrial competitiveness. Through its impartiality, the JRC is in a position to provide independent opinions, in particular by taking account of the results of studies carried out by European and non-European public or private bodies in the fields in which it has acquired competencies, such as energy, transport and the environment.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY FOR SECTION I OF THIS
PROGRAMME (JRC DIRECT ACTION)

	(ECU million)
FIRST ACTIVITY	
Information and communications technologies	
— Information technologies	11
Industrial technologies	
— Industrial and materials technologies	90
— Measurements and testing	105
Environment	
— Environment and climate	294
Life sciences and technologies	
— Agriculture and fisheries	47
Energy	
— Non-nuclear energy	20
Targeted socio-economic research	33
Total	600 (1) (2)

(1) Of which:

- an amount of ECU 199 million is estimated necessary for institutional support activities,
- approximately 6 % may be allocated to exploratory research.

(2) This total includes the JRC's budget contribution necessary for its participation in shared-cost actions.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE DIRECT ACTION

1. The Commission, assisted by the Board of Governors of the JRC, shall implement the direct action on the basis of the scientific objectives and contents described in Annex I. The activities relating to this action shall be performed in the relevant institutes of the Joint Research Centre (JRC).
2. In the implementation of institutional activities, the JRC will, whenever appropriate and feasible, participate in or organize networks of public and private laboratories in the Member States or European research consortia. Particular attention shall be paid to cooperation with industry, especially with small and medium-sized enterprises. Research bodies established in third countries may also cooperate on projects, in accordance with the relevant provisions of Article 9 and, where applicable, of agreements for S&T cooperation between the Community and the third countries concerned. Particular attention will be paid to cooperation with research laboratories and institutes in the countries of central and eastern Europe and the former Soviet Union.

The knowledge gained through implementation of the projects will be disseminated by the JRC itself and under activities carried out within the third activity of the framework programme.

3. The accompanying measures shall include:
 - the organization of visits to JRC institutes of grant holders, visiting scientists and seconded experts,
 - organization of the secondment of JRC staff to national laboratories, industrial laboratories and universities,
 - systematic exchange of information, through *inter alia* the organization of scientific seminars, workshops and colloquiums and scientific publications,
 - specialized training with the emphasis on multidisciplinary,
 - the independent scientific and strategic evaluation of the performance of the projects and programmes.
-

ANNEX IV

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENTS OF THE COMPETITIVE SUPPORT ACTIVITIES

This section of the specific programme fully reflects the orientations of the fourth framework programme in applying the selection criteria and in specifying its scientific and technological objectives.

The scientific and technical support activities which come within the framework of a competitive approach are described below on the basis of Annex III (first activity and paragraph D of the third activity) of the fourth framework programme.

The following description is given for guidance only on the basis of the current requirements of Community policies. It refers in particular to paragraphs 1C, 2D, 3A, 3B, 4C and 5 of the first activity.

In order to ensure that the activities are fully in line with the actual requirements of Community policies throughout the fourth framework programme, these objectives may be modified in accordance with the provisions of Article 13 (1) of this Decision.

The scientific and technological objectives may cover the following:

FIRST ACTIVITY**Information and communications technologies***Line 3: Information technology*

This support is intended to enable the Commission to pursue the Community information technology policy, notably in fields such as software technology, components and systems, or multimedia technology, as well as in other priority fields such as, for example, high-performance computing systems, microprocessing systems and the integration of such technologies into a professional environment.

Industrial technologies*Line 5: Measurements and testing*

The activities in this sector may be aimed at the development of non-destructive test methods for mechanical structures and the software needed for the development of Community standards in the field of structural mechanics, in particular for structure used in construction or, more broadly, civil engineering.

Environment*Line 6: Environment and climate*

The aim of these activities is to support the Commission's regulatory activities in the general framework of environmental policy, including the development of analytical methods and the implementation, through a network of analytical laboratories, of test series on atmospheric pollution, water quality, waste and land-based pollution.

One particular activity will be the use of aerospace remote sensing methods for the surveillance of tropical forest, desertification and marine productivity.

Some subjects concerning the regulation of industrial hazards and some measures relating to industrial safety, including biotechnology, may be the subject of a support activity.

Life sciences and technologies*Line 8: Agriculture and fisheries (including agro-industry, food technologies, forestry, fish farming and rural development)*

Support activities in this field may include contributions to:

- the application of remote sensing techniques to agriculture by the gathering of images, the handling and treatment of data,
- a series of tests for quality control in food products,
- control of dairy products,
- the evaluation of phytopharmaceutical products, notably with regard to those aspects linked to their launch on the market.

Energy

Line 11: Non-nuclear energy

Support activities in this field will include:

- the handling and processing of information from projects carried out under Community programmes, in particular demonstration projects,
- certification procedures for energy conservation in buildings, industry and transport as well as the application of energy modelling methodologies (relationships between energy production, consumption and environmental impact) to particular energy scenarios.

THIRD ACTIVITY

These generally short activities may concern any field, their aim being to meet specific requirements which appear during the implementation of various Community policies.

By their nature, such requirements will only appear during the implementation of this programme and the activities concerned will aim to provide an immediate response.

ANNEX V

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY FOR SECTION II OF THIS PROGRAMME (COMPETITIVE SUPPORT ACTIVITIES)

	<i>ECU million</i>
FIRST ACTIVITY	91
Information and communications technologies	
— Information technologies	10
Industrial technologies	
— Measurement and testing	10
Environment	
— Environment and climate	26
Life sciences and technologies	
— Agriculture and fisheries	30
Energy	
— Non-nuclear energy	15
THIRD ACTIVITY	37
Total	128

ANNEX VI

SPECIFIC RULES FOR IMPLEMENTING THE COMPETITIVE SUPPORT ACTIVITIES

The competitive support activities are carried out by means of work suited to a competitive approach in the context of a customer/contractor relationship and intended for scientific and technical support to Community policies. The implementation of this research will be assigned to research bodies and centres, including the JRC, universities or undertakings.

The Commission will determine the responsibilities, in particular as regards the grant of the financial resources provided for in these activities, according to the field of activity concerned. The resources will be granted on a competitive basis.

COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and technological development, including demonstration, to be implemented by the Joint Research Centre for the European Atomic Energy Community (1995 to 1998)

(94/919/Euratom)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,

Having regard to the proposal from the Commission ⁽¹⁾ which has consulted the Scientific and Technical Committee,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas, by Decision 94/268/Euratom ⁽⁴⁾, the Council adopted a framework programme for Community activities in the field of research and training for the European Atomic Energy Community (1994 to 1998), specifying *inter alia* the activities to be implemented by the Joint Research Centre (JRC) for the European Atomic Energy Community; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 2 of Decision 94/268/Euratom stipulates that the framework programme shall be implemented through specific programmes adopted in accordance with Article 7 of the Treaty;

Whereas the RTD activities carried out by means of direct action are conducted by the JRC; whereas these activities consist of institutional research activities for which the JRC has expertise and special, if not unique, facilities in the Community and of institutional, scientific and technical support activities which necessitate the neutrality of the JRC;

Whereas the amount deemed necessary for carrying out this programme is ECU 300 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of

resources within the financial perspectives and the conditions set out Article 1 (3) of Decision 94/268/Euratom;

Whereas the content of the framework programme of Community activities in the field of research and training was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be implemented by the JRC for the European Atomic Energy Community (EAEC) in accordance with this principle;

Whereas Decision 94/268/Euratom (framework programme 1994 to 1998) lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment'; whereas it is therefore necessary to promote the prenormative research activities considered to be necessary under other Community policies;

Whereas, as part of the direct action, the scientific and technical activities to support Community policies should remain consistent with the requirements of these policies for the duration of the implementation of this programme;

Whereas the JRC may also take part in the indirect action carried out under the other specific programmes in the same way as third parties situated in a Member State or an associated State;

Whereas the Commission must ensure that research activities carried out as part of the direct and the indirect actions respectively are complementary;

Whereas the JRC may also take part, on a competitive basis, in any other activity implemented by the Community and carry out research on behalf of third parties;

(1) OJ No C 113, 23. 4. 1994, p. 24.

(2) OJ No C 341, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 115, 6. 5. 1994, p. 31.

Whereas exploratory research should be encouraged;

Whereas the JRC, with its laboratories and installations, can make an effective contribution to the training and mobility of researchers, and whereas, to this end, cooperation should be encouraged in all the Member States between laboratories and public and private scientific institutes;

Whereas the JRC may contribute to other European research and technological development activities; whereas the JRC should be better integrated into networks or consortia with partners in all the Member States, in both its institutional and its competitive activities; whereas it should, in particular, be a driving force in improving links between research laboratories and institutions in all regions of the Community;

Whereas the Commission should undertake the tasks incumbent upon it in the area of nuclear safety, making use of the technical expertise of the JRC;

Whereas particular attention should be paid to the safety of the nuclear fuel cycle and its impact on the environment;

Whereas, in the field of safeguards, the JRC should contribute to the development of the new technologies needed to ensure, in this area, compliance with the obligations arising from the Treaty;

Whereas, more generally, the Commission should, by making use of the capabilities of the JRC, continue to contribute to the setting up of a coherent, reliable international system of safeguards through its cooperation with the competent international organizations, in particular the International Atomic Energy Agency and with any third countries which also wish to take part in such a system;

Whereas the work and experience of the JRC, in particular in the field of reactor safety and safeguards, should be usefully exploited by the Community in enhancing the effectiveness of its activities to help the central and east European countries and the new independent States on aspects of nuclear fission safety;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise activities for the dissemination and exploitation of RTD results;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the next framework programme of research and training activities for the EAEC; whereas at the end of this programme there should be a final evaluation of results obtained compared with the objectives set out in this Decision; and whereas the conclusions of these evaluations should be submitted to the European Parliament, the Council and the Economic and Social Committee;

Whereas the Board of Governors of the JRC plays an important role in the operation of the Centre and in the implementation of its activities,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme concerning research and technological development activities to be conducted by the Joint Research Centre is hereby adopted for the period from 1 January 1995 to 31 December 1998.

Article 2

1. The activities referred to in Article 1 shall include institutional research activities and institutional scientific and technical support activities.

2. The institutional research activities, as described in Annex IA, are those for which the JRC has expertise and special, if not unique, facilities in the Community which contribute to the implementation of the RTD policy of the Community. They shall be carried out in such a way as to ensure their complementarity with corresponding indirect action contained in the other specific programmes of the framework programme.

3. The institutional scientific and technical support activities, as described in Annex IB, are the activities necessary for the formulation and implementation of Community policies and the tasks assigned to the Commission under the Treaty which necessitate the neutrality of the JRC.

Article 3

1. The JRC shall participate in the implementation of Community action on research and training in the fields of nuclear fission safety and controlled thermonuclear fusion and through its exploratory research activities.

Article 4

1. The operational budget of the JRC under this programme is ECU 300 million.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision 94/268/Euratom, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

If additional funding is approved in accordance with Article 1 (3) of Decision 94/268/Euratom, the JRC will receive a share proportional to its share of the present overall amount for the framework programme, provided that, after evaluation, the European Parliament and the Council consider that the JRC is making satisfactory progress towards increased openness to competition.

Article 5

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision 94/268/Euratom.

2. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraph 1.

Article 6

The Commission shall be responsible for the implementation of this programme and, to this end, shall call upon the services of the JRC. The Commission shall be assisted in this task by the Board of Governors of the JRC (hereinafter referred to as the 'Board of Governors').

Article 7

1. In order to help ensure, *inter alia*, the cost effective implementation of the activities, the Commission, assisted by the Board of Governors, shall continually and systematically monitor progress on the implementation of the direct action in relation to the objectives set out in Annex I. It shall assess in particular whether the

objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary in the light of the results of the monitoring process, submit proposals to the Council to adapt or supplement the institutional research activities. With regard to the institutional scientific and technical support activities, the Commission will, if necessary, make adaptations to ensure that they are consistent with the requirements of the relevant Community policies.

2. The Commission shall each year before 15 April submit to the European Parliament, the Council and the Economic and Social Committee a report on the implementation of the activities of the JRC. This report shall be accompanied by the comments of the Board of Governors as contained in its annual report. The latter may also submit, through the Commission, to the European Parliament, the Council and the Economic and Social Committee a separate report on any aspect of the implementation of the JRC's activities.

3. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision 94/268/Euratom and in compliance with the timetable laid down in that paragraph, the Commission, after consulting the Board of Governors, shall have an external assessment conducted by independent experts of the activities carried out by the JRC within the areas covered by this programme and their management during the five years preceding this assessment. The conclusions of this evaluation shall be submitted to the Council, the European Parliament and the Economic and Social Committee.

4. At the end of this programme, the Commission, after consulting the Board of Governors, shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to the framework programme and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 8

In order to ensure effective coordination between the JRC's institutional research activities and the other activities provided for in the framework programme, systematic exchanges of views will be held between the JRC, including the Board of Governors, and the committees for the specific programmes with due regard to their respective responsibilities.

Article 9

The Commission, assisted by the Board of Governors, may, on the basis of the criterion of mutual benefit, request the JRC to execute projects with legal entities established in third countries where this contributes effectively to the implementation of the JRC's activities.

Participation of legal entities from third countries shall not benefit from Community financing under this programme.

Done at Brussels, 15 December 1994.

Article 10

This Decision is addressed to the Member States.

For the Council

The President

A. MERKEL

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the framework programme for the European Atomic Energy Community, in applying the selection criteria and in specifying its scientific and technological objectives.

Annex III of the framework programme constitutes the basis of the objectives of this programme.

The Joint Research Centre (JRC) will conduct strategic and applied research. It will be carried out as an integral part of the European science and technology system and should also contribute to the scientific foundation of the various Community policies. It will be based on:

- scientific and technical excellence,
- impartiality and independence,
- unique research facilities,
- openness to all Member States.

In line with the priorities defined in the White Paper 'Growth, competitiveness and employment', the scientific and technical activities carried out by the JRC should meet the needs of the Community as a whole, its institutions and Member States with the objectives of:

- helping to strengthen the scientific and technological basis of European industry and to encourage the development of its international competitiveness,
- providing the independent scientific expertise necessary for the implementation of Community policies and the tasks which the Treaty assigns to the Commission,
- providing scientific and technical services to Community institutions and making JRC capabilities and scientific and technical installations available to public and private bodies,
- contributing to the improvement of public safety aspects of new technologies,
- contributing to the improvement of environmental impact assessment and protection,
- contributing to the reduction of scientific and technological disparities between Member States.

The European dimension of its work must remain one of the fundamental strengths of the JRC. Its activity should be characterized by a multidisciplinary approach based on the broad span of its capabilities. This multidisciplinaryity will be reflected in the subjects developed by its institutes, thus ensuring its ability to meet new challenges as they arise.

Thanks to its capabilities and its involvement in the formulation and implementation of Community policies, the JRC will contribute to the integration of national, Community and European activities. Thus it will participate in networks of public and private laboratories in the Member States or European research consortia and may be the focal point of such networks in its areas of expertise.

This large exposure should not, however, lead to an excessive dispersion of the activities undertaken. Without ignoring the expectations of its customers, the Centre and its management must have clear views on the proper scientific and technical policy for the JRC and be able to maintain a balance in order to ensure that the activities and contracts which are accepted can be executed at all times with the requisite level of competence, both qualitatively and quantitatively.

The research to be conducted by the JRC falls into two categories:

- institutional research activities,
- institutional scientific and technical activities in support of Community policies.

A. INSTITUTIONAL RESEARCH ACTIVITIES

These research, training and demonstration activities for which the JRC has capabilities and installations which are special, if not unique, in the Community contribute to the implementation of Community research policy.

Safety of nuclear fission

The objective is to increase scientific and technical knowledge and to contribute to the development of technologies aimed at improving the safety of the whole of the nuclear cycle and reducing the environmental impact of the use of nuclear energy, and to respond to the need to assume the responsibilities of the Community arising from implementation of the Treaty.

The JRC contribution will be in the following fields:

- reactor safety,
- fuel cycle safety
- safeguards and fissile materials management.

Reactor safety

JRC research will be focused mainly on the following areas:

- a contribution to accident prevention: the development of non-destructive analytical techniques (NDA) for the improvement and refinement of inspection procedures and the development of qualification methodologies to facilitate their harmonization,
- probabilistic safety studies: the JRC will contribute to the improvement of methodologies and to the emergence of a consensus on their implementation in safety studies,
- studies conducted through European networks into the mechanisms of component ageing, a method of attenuation, evaluation of the integrity of structures and inspection possibilities,
- studies on severe accidents will be conducted on the internal and external phenomena relating to the containment in experiments with degradation of the reactor core using real materials and operating at a real temperature. This contribution will include participation in the interpretation of the results of experiments simulating accidental releases conducted in national laboratories. Furthermore, the JRC will contribute to the study of the release of fission products and the transfer phenomena. These studies will be carried out in conjunction with the activities in this field foreseen under indirect actions and will thus contribute to a wider Community effort. In this context, optimum use should be made of the human, technical and financial resources of the JRC and the relevant bodies in the Member States, and of the experience gained through the implementation of the specific programme on 'Nuclear fission safety'.

This research will continue to be the subject of a major cooperation effort within the framework of the networks involving European and non-European partners. It is aimed in particular at the development of common design tools intended for industry and the authorities responsible for safety.

It will make extensive use of the JRC's ability to set up cooperation networks between the European partners concerned and thus to participate in the implementation of the Community policy provided for in the Treaty.

Fuel cycle safety

The main objective of the studies conducted by the JRC is to reduce the environmental impact of using nuclear energy by means of research into the fuel cycle permitting optimized management of the end of the cycle. They will be conducted in close cooperation with the activities in this field foreseen under indirect actions.

This research will be aimed at improving the understanding of actinides and the plutonium cycle and contribute to improved solutions for the management of radioactive waste, with a view in particular to reducing the volume and radiotoxicity of such waste. It will take account of changes in reactor design.

It will also be aimed at supporting the Member States' current strategy of deep burial of radioactive waste and exploring management strategies which would make it possible to reduce the amount of waste

produced by future fuel-cycle installations. This research will be conducted in close cooperation with national laboratories.

The subjects covered will include:

- studies of the safety of the behaviour of nuclear fuels (UO_2) and mixed oxide),
- study of fundamental and solid-state physico-chemical analyses of actinides,
- study of nuclear aerosols,
- minimization of secondary actinides and other radionuclides with long half-lives in the nuclear fuel cycle,
- plutonium fuel technology,
- characterization of spent fuel with a view to its elimination,
- radionuclides for medical applications.

Safeguards and fissile materials management

The research conducted at the JRC is aimed at obtaining, in good time, results or new techniques implementation of which is necessary for compliance with obligations arising from safeguards provided for in the Treaty and the Non-Proliferation Treaty.

It is necessary in particular to develop new techniques to meet the new challenges related to the development of the fuel cycle and the strengthening of the control systems.

These activities are aimed at the development and improvement of techniques including:

- non-destructive test techniques using gamma and neutron radiation on intermediate and final products,
- measurements relating to volume and weight in large tanks in fuel production and reprocessing plants,
- sealing techniques and new marking systems for objects containing nuclear materials and for containers,
- surveillance systems using the storage and processing of digital images for automatic surveillance and examination and for improvement of recordings in the long term without inspectors.

A particular effort will be devoted to research on the design of multisensoral integrated systems able to function in the absence of inspectors by using mobile robotic technology. These systems will use intelligent software for the production of data and the accounting of materials.

These activities will be conducted in particular using the experimental installations Perla ('Performance and training laboratory'), Tame ('Tank measurement') and Lasco ('Surveillance and containment') of the JRC which offer experimental conditions which are representative of reality in an installation.

Lastly, the JRC research in the field of safeguards also forms part of a process of European cooperation as illustrated by the Esarda network ('European Safeguards Research and Development Association') and international cooperation with the USA, Canada, Japan and Russia.

Controlled nuclear fusion

This activity forms part of the Community fusion research programme. It is aimed at improving the pool of knowledge and the technology of the 'safety and environment' dimension of future machines intended for the European programme. The bulk of the work will be dedicated to support for the International Thermonuclear Experimental Reactor (ITER) but may also involve any other fusion reactor.

For this purpose, the JRC has designed and constructed the European Tritium Handling Laboratory (Ethel). The aim of this installation is the development of methods of handling tritium, but special attention will be paid to the verification and validation of methods of preventing and reducing tritium and activation product waste in the work area and the environment under both normal and accident conditions.

The laboratory is also able to offer research capability to any other European organization which is a member of the Community fusion programme or is associated with it.

Part of the activities will concern the development and characterization of materials to meet the following requirements: good compatibility with tritium, behaviour as effective barriers against infiltration of tritium with low induced radioactivity. The JRC, which has long experience in this field, will make a significant contribution within the framework of the ITER and for the longer term requirements of the Fusion programme.

In addition to these activities, more general studies, including operational safety during maintenance, will be conducted by the JRC in line with specific demands relating to the ITER project or, more broadly, the Fusion programme, in particular studies on low-activation materials and remote handling.

B. INSTITUTIONAL SCIENTIFIC AND TECHNICAL SUPPORT ACTIVITIES

These activities are necessary for the formulation and implementation of Community policies and tasks assigned to the Commission under the Treaty.

The following description, which is based on current Community policy requirements, is given by way of guidance and may be modified in accordance with the relevant provisions of Article 7 (1).

Nuclear fission safety - Reactor safety

The aim of this activity is to meet specific demands with regard to fostering a harmonized approach to reactor safety and demands relating to Community activities concerning the safety of nuclear plants in the countries of central and eastern Europe and the republics of the former USSR.

Safeguards

The objective is to provide scientific and technical support for the implementation of safeguards in accordance with the Euratom Treaty and support to the Commission in the framework of the Community's collaboration with the IAEA.

The fields covered by support for the Community include:

- the development and operation of on-site laboratories to carry out analyses in connection with checks in certain major fuel-cycle installations in the Member States (communication from the Commission to the Council and to Parliament of 24 March 1992),
- analyses of safeguards samples (European Commission's Safeguards Analytical Measurements Ecsam) as part of a network operated by the JRC,
- non-destructive tests, inspection of tanks, development and calibration of instrumentation and measurement systems,
- development of sealing technologies for fuels and containers and identification and surveillance techniques,
- development of integrated surveillance systems not needing the presence of inspectors and of computerized systems for nuclear materials compatibility and the management of databases,
- analysis of nuclear materials being unlawfully transported in the Community and seized by the national authorities,
- training of Euratom inspectors in all of the above techniques and support to the Euratom Safeguards Directorate in terms of health protection.

The support to the Commission in the framework of the Community's collaboration with the IAEA will in particular cover:

- analytical measurement and surveillance techniques for tanks, including the development and calibration of instrumentation for inspectors and the operation of an international network for the quality assurance of control measures,

- non-destructive techniques, including tests and calibration of methods and instrumentation and the development of the associated software to meet the requirements of the Agency inspectors,
- development of sealing techniques for the dry storage of irradiated fuel, its transportation and its storage in containers,
- development of surveillance techniques for the verification of information on the design of nuclear installations,
- development of integrated systems of measurement,
- study of new techniques to strengthen the international controls carried out by the Agency, including the development of ultrasensitive analysis of samples taken from the environment,
- training of inspectors and operators;
- the development of techniques which make use of remote sensing.

These support activities will make use of the specialized experimental installations available in several JRC establishments (Geel, Ispra and Karlsruhe).

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY FOR THIS PROGRAMME

<i>(ECU million)</i>	
Nuclear fission safety	254 ⁽¹⁾
Controlled thermonuclear fusion	46
Total	300 ⁽²⁾ ⁽³⁾

⁽¹⁾ Of which an amount of ECU 87 million is estimated necessary for institutional support activities.

⁽²⁾ Of which approximately 6 % may be allocated to exploratory research.

⁽³⁾ This total includes the JRC's budget contribution necessary for its participation in shared-cost actions.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

1. The Commission, assisted by the Board of Governors of the JRC, shall implement the direct action on the basis of the scientific objectives and contents described in Annex I. The activities relating to this action shall be performed in the relevant institutes of the Joint Research Centre (JRC).
2. In the implementation of its activities, the JRC will, whenever appropriate and feasible, participate in or organize networks of public and private laboratories in the Member States or European research consortia. Particular attention shall be paid to cooperation with industry, especially with small and medium-sized enterprises. Research bodies established in third countries may also cooperate on projects, in accordance with the relevant provisions of Article 9 and, where applicable, of agreements for S&T cooperation between the Community and the third countries concerned. Particular attention will be paid to cooperation with research laboratories and institutes in the countries of central and eastern Europe and the former Soviet Union.

The knowledge gained through implementation of the projects will be disseminated by the JRC itself.

3. The accompanying measures shall include:
 - the organization of visits to JRC institutes of grant holders, visiting scientists and seconded experts,
 - organization of the secondment of JRC staff to national laboratories, industrial laboratories and universities,
 - systematic exchange of information, through *inter alia* the organization of scientific seminars, workshops, colloquiums and scientific publications,
 - specialized training with the emphasis on multidisciplinary,
 - the independent scientific and strategic evaluation of the performance of the projects and programmes.
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COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and training in the field of nuclear fission safety
(reactor safety, waste management and radiation protection) (1994 to 1998)

(94/920/Euratom)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,

Having regard to the proposal from the Commission ⁽¹⁾, which has consulted the Scientific and Technical Committee,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas, by Decision 94/268/Euratom ⁽⁴⁾, the Council adopted a framework programme of Community activities in the field of research and training for the European Atomic Energy Community (1994 to 1998) specifying *inter alia* the activities to be carried out in the field of nuclear fission safety; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 2 of Decision 94/268/Euratom specifies that the framework programme is to be implemented through specific programmes adopted in accordance with Article 7 of the Treaty; whereas each specific programme is to specify its precise objectives in accordance with the scientific and technical objectives referred to in Annex III to the Decision, define the detailed rules for implementing it, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 160 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority subject to the availability of resources within the financial perspectives and to the conditions set out in Article 1 (3) of Decision 94/268/Euratom;

Whereas the content of the framework programme of Community activities in the field of research and training was established in accordance with the principle of

subsidiarity; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of nuclear fission safety;

Whereas, as is laid down in Annex III to Decision 94/268/Euratom, the Community needs a 'Nuclear fission safety' programme with the objective of arriving at a better understanding of nuclear safety issues and of stimulating broad collaboration between the Member States in this field;

Whereas Decision 94/268/Euratom (framework programme 1994 to 1998) lays down that Community action is justified if, *inter alia*, the research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the abovementioned Decision 94/268/Euratom provides that the Community's research actions should strengthen the technological base of Community industry and provide it with the knowledge and know-how required to make it more competitive at international level, while ensuring the safety of all nuclear activities;

Whereas the Community should only support RTD activities of high quality;

Whereas basic research in the field of nuclear fission safety must be encouraged within the Community so as to enable innovative approaches to be developed;

Whereas the rules for the participation of undertakings, research centres (including the JRC) and universities, specified in Decision 94/761/Euratom ⁽⁵⁾, apply to this specific programme;

Whereas this programme will help to strengthen synergy between the research and training activities carried out in the field of nuclear fission safety by research centres, universities and undertakings established in the Member States and between these and the corresponding Community research and training activities;

(1) OJ No C 113, 23. 4. 1994, p. 4.

(2) OJ No C 344, 5. 12. 1994.

(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).

(4) OJ No L 115, 6. 5. 1994, p. 31.

(5) OJ No L 306, 30. 11. 1994, p. 1.

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should comprise also activities for the dissemination and exploitation of research results, in particular *vis-à-vis* small and medium-sized enterprises, as well as activities promoting the mobility and training of researchers within this programme to the extent necessary for the proper implementation of the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the next framework programme of research and training for the European Atomic Energy Community; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision; and whereas the conclusions of these evaluations should be submitted to the European Parliament, the Council and the Economic and Social Committee;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the JRC will also contribute, through its own programme, to the attainment of the Community research and training objectives in the areas covered by this programme,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and training for the European Atomic Energy Community in the field of nuclear fission safety, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 160 million, including a maximum of 12,5 % for staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision 94/268/Euratom concerning the framework programme, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision 94/268/Euratom concerning the framework programme.

2. The rules for the participation of undertakings, research centres and universities are specified in Decision 94/761/Euratom.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, the progress within the programme in relation to the objectives set out in Annex I. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision 94/268/Euratom concerning the framework programme and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to the framework programme and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. The Commission shall be responsible for the implementation of the programme. In this context, it will ensure arrangements for coordination with other RTD activities carried out in this field, in particular under the JRC programme.

2. The Commission shall be assisted in the implementation of the programme by a consultative Committee for the Nuclear Fission Safety programme, which is established hereby in replacement of the existing Coordinating Committees (CGCs) (No 5 on Safety of Reactor and Fission Material; No 6 on Radioactive Waste Management and Disposal; and No 10 on Radiation Protection Research) set up by Decision 84/338/Euratom, ECSC, EEC ⁽¹⁾. The procedures and operational modalities defined in that Council Decision apply to the new Committee.

Article 6

Participation in the areas of radiological impact on man and the environment and of mastering events of the past

may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 7

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

⁽¹⁾ OJ No L 177, 4. 7. 1984, p. 25.

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

The present specific programme fully reflects the orientations of the framework programme for the European Atomic Energy Community, in applying the selection criteria and in specifying its scientific and technological objectives.

Section 1 of Annex III of the framework programme is an integral part of the present specific programme.

1. THE CONTEXT

Although nuclear energy has reached considerable maturity in the Community and elsewhere in the western world — the safety record of its nuclear plants is excellent — it is not universally accepted by our society. The Community action therefore aims at stimulating collaboration with the objective to improve knowledge in specific areas and to develop a new global and dynamic approach to nuclear safety in the broadest sense. The joint setting of priorities should bring all interested parties closer in a better understanding that nuclear energy, like other mature technologies, can benefit from further development. The potential of some new developments to improve nuclear safety is to be assessed taking into consideration their effect on public perception. Of course, it must be understood that new technology will not necessarily be applied simply because it exists, just as we cannot afford to make a definite judgement about its use by future generations on the basis of today's knowledge.

In that sense, a global dynamic approach means that there must be an improvement of the understanding and quantification of the overall risk associated with the use of nuclear energy: considering the whole cycle, considering all exposure to ionizing radiation, not only from nuclear but also from medical and other applications as well as from natural radioactivity; considering normal and accidental conditions; considering the usefulness of mastering events of the past associated with its use elsewhere — e.g. the New Independent States (NIS); and considering the possibility of technological evolution just as in other high-technology areas.

To support that approach, the various activities are set out and managed accordingly in one single programme. Consequently, they are deliberately not grouped as a set of individual actions (as in the previous framework programme), although they are assembled according to the main emphasis of the respective activity as related to the use of nuclear energy in the global sense. The technical maturity reached in some areas of the nuclear cycle implies a reorientation of priorities, concentrating on aspects dealing with exposure of man and environmental impacts. A number of concerted actions will be launched to safeguard adequate exchange of information and data collection.

Close interaction with national and international organizations competent in the fields of nuclear fission safety will enable the Community to contribute worldwide to an improvement of nuclear safety, including protection of man and his environment against the effects of ionizing irradiation. It will enhance the integration of national efforts to further improve the performance of the European nuclear industry and will give essential input to the relevant regulatory responsibilities of the Community and the Member States.

Cooperation in research on nuclear fission safety has been well established with third countries such as the United States of America, Canada, Japan and with some EFTA countries. Together with the collaboration with central and eastern European countries (PECO), including the New Independent States which is of particular importance, this may lead to the further convergence of national activities in this field. Synergy with other Community instruments (e.g. Phare, Tacis) should be sought.

Close interaction has also been achieved and will continue with the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA) and the World Health Organization (WHO), as well as with non-governmental international organizations involved in standardization and recommendations, such as the International Commission on Radiological Protection (ICRP), the International Commission on Radiation Units and Measurements (ICRU) and the International Standards Organization (ISO). This international cooperation is the main instrument for achieving worldwide consensus on the fundamental issues of nuclear fission safety.

Opportunities for training and mobility of scientific and technical staff will be assured by activities such as the 'European Radiation Protection Education and Training' scheme (Erpet) and the Eurocourses organized together with JRC Ispra.

As indicated in the different activities proposed, the JRC is closely associated with them ⁽¹⁾.

2. PROPOSED ACTIVITIES

A. Exploring innovative approaches

The proposed activities will illustrate a new approach which aims at exploring ways to improve the acceptance of nuclear energy through an integrated initiative addressing the three main issues of common concern:

- reactor safety, especially with regard to severe accidents,
- the management of long-lived radionuclides (including plutonium),
- the risk of fissile material diversion.

These activities will be carried out in close cooperation with authorities, industry and the scientific community.

It is proposed to pursue two main lines of approach: in continuity with R&D work performed hitherto, on the one hand, innovative approaches will be reviewed as to their potential to enhance the safety of reactors and of their fuel cycle and, on the other hand, the potential of alternative waste management options will be explored.

A.1. *Conceptual safety features*

Besides a continuous improvement of the safety of reactors which takes account of the experience from operating plants and new results from research, industry is offering reactors with improved safety, e.g. by an increased use of passive features. Prospective theoretical and some experimental investigations are foreseen to assess these designs with regard to their benefit to overall safety. These investigations will be of generic nature and the results should provide supporting data for the licensing of these reactors.

Approaches to reduce the amount of long-lived radioactivity in spent fuel by changing the composition of the fissile material could be included in an overall analysis of the fuel cycle which could also cover the aspect of safeguards.

The investigation of advanced fuel cycle strategies will require some experimental research which will be performed in concertation with the JRC.

A.2. *Partitioning and transmutation*

Methods other than plutonium (Pu)-burning, aiming at reducing the long-lived (half-life > 30 years) nuclide inventory of nuclear waste, including minor actinides should be investigated although the final disposal of nuclear waste in deep repositories cannot currently be avoided. As numerous partitioning and transmutation (P&T) studies are being conducted worldwide, this part of the programme should mainly concentrate on providing a synthetic evaluation of the research and developments going on.

Some work in this area will be pursued in concertation with the JRC.

⁽¹⁾ A description of the activities envisaged for the JRC in these areas is contained in the proposal for a decision of the Council relating to the activities of the JRC (COM(94) 70 final, 30 March 1994, 90/0074 (CNS)). An extract from this proposal is attached to this Decision.

B. Reactor safety

Although accident prevention is essential in nuclear use, it is nevertheless of vital importance to improve the understanding of severe accidents in order to prevent possible radioactivity release under these extreme conditions. Thus, severe accident phenomena and mechanisms will be the main items of research.

Furthermore, different measures to mitigate the consequences of a severe accident will be studied.

Besides the activities in a severe accident, attention should be given to other matters of great importance to maintaining and improving the safe operation of existing installations while advancing knowledge applicable to future reactors.

B.1. *Severe accidents*

Investigations of the various phenomena involved e.g. core degradation and the release and behaviour of fission products will be carried out. These results of the experimental Phebus Fission Product project, previously organized jointly by CEA-Cadarache and JRC Ispra, will provide essential data in this respect. Molten fuel-coolant interaction and molten core-concrete interaction as well as hydrogen generation and combustion are the main concerns with regard to the primary system and containment integrity.

The Commission should promote the coordination of the activities performed by the Member States and by the JRC under its institutional activities, taking into account the existence of the large facilities, with the aim of producing the data needed by the designers and the licensing authorities.

Besides the study of accident progression mechanisms, major attention will be devoted to the integrity of the containment system and the material characterization of the various safety-relevant components under severe accident conditions in order to evaluate the safety margins.

The proposed activities include theoretical and experimental investigations, code developments and validation as well as benchmark exercises. The joint use of large test facilities is foreseen.

B.2. *Supplementary safety related activities*

Taking into account research work undertaken in the Member States and/or under other specific research programmes, some activities may be conducted in relation to human factors, probabilistic safety assessment, ageing and, if necessary in the light of significant and rapid changes occurring in this field, in relation to control and instrumentation.

C. Radioactive waste management and disposal and decommissioning

One of the main objectives of this activity is to contribute to a further integration of the efforts undertaken by the Community and the Member States to develop the technical basis for a common understanding of the scientific issues of the disposal of long-lived radioactive waste, specifically spent fuel and vitrified High Level Waste (HLW). The strategic issues involved are the time horizon to be considered for the analysis of disposal concepts and the possibility of retrievability of waste.

In this respect the Commission should promote research initiatives by which countries with large nuclear programmes could assist other countries in exploring possibilities for the disposal of long-lived wastes on a smaller scale, e.g. from research reactors, medical or industrial establishments. The need to establish the scientific basis for guidelines, e.g. on 'Waste equivalence' and on 'exemption levels, is recognized.

C.1. *Safety aspects of geological disposal*

Disposal in deep geological strata is at present the only known method of long-term isolation of radioactive substances from the biosphere. The Community's analysis of the long-term safety of disposing of HLW, the Pagis (Performance Assessment of Geological Isolation Systems) study, concluded that — assuming predictable natural evolution — such deep geological disposal can assure adequate protection even tens of thousands of years after the emplacement of the waste if appropriate sites are selected. In these circumstances and in view of the repository-siting concepts hitherto adopted, attention must be given to the development of siting methodologies and criteria for the evaluation of the suitability of potential sites. There are basic questions, however, on which a European consensus could be sought through appropriate research, e.g., the long-term time horizon up to which the safety analysis of disposal concepts has to be elaborated, the possibility of retrieval of the disposed material and the accidental intrusion. It is considered that the possibility of retrieval and the accidental intrusion are not issues of the same level of concern as an agreed long-term time horizon.

The Community's Plan of Action in the Field of Radioactive Waste ⁽¹⁾ should play an important role in stimulating the participation of the Member States in the relevant investigations and exploring the possibility of developing a common approach on these questions.

C.2. *Underground laboratories for waste disposal*

Underground laboratories are a necessary prerequisite for meaningful research on crucial phenomena related to geological disposal. As in the previous programmes tests and investigations on geological disposal in the underground laboratories in Asse (Germany) and Mol (Belgium) should be continued. The efforts should be focused on the best utilization of the existing underground laboratories in Europe. Possible new laboratories could also become part of the Community programme. These facilities should offer important opportunities for participation from all EC countries for performing research projects under representative conditions. The projects shall provide qualitative and quantitative elements for characterizing possible disposal sites, for designing optimized repository concepts and for evaluating the long-term protective performance of disposal strategies.

Research on geological and engineered barriers, development of special mining and waste emplacement techniques and radiological investigations should be carried out in the underground laboratories and in associated research facilities, thus contributing also to demonstrate the feasibility and safety of underground repositories.

C.3. *Supporting research*

The assessments of waste disposal schemes will require further analysis and modelling of the performance of natural and engineered barriers, transfer of radioactivity from the waste packages in the repository through the geosphere into the biosphere as well as the verification and validation of long-term predictive assessment models of the geological environment of repositories. Useful information on the evolution of disposal systems is also gained from natural analogue and geoprospective studies.

Development of effectively controlled advanced waste volume minimization is envisaged with a view to introducing safe and effective standard practices.

Another object of R&D is the provision of scientific data to support EC policies in the field of nuclear safety standards, and of reliable methods to implement such policies.

Actions to enhance the safety culture of nuclear energy and confidence in safety should include the technical application of radiological optimization principles and the further development of quality assurance methodology in conjunction with the EC 'Network of testing facilities'.

⁽¹⁾ OJ No C 158, 25. 6. 1992, p. 4.

Results from the previous telemanipulation programme should be gathered and evaluated to enable interested parties in the Union to benefit from the accumulated experience and conclusions of that programme.

C.4. *Decommissioning*

The dismantling of nuclear installations is part of closing the nuclear cycle. It particularly concerns the solution to issues of environmentally compatible disposal of radioactive wastes, of the minimization of radiological impact and the reduction of costs.

Activities in this area comprise:

- the support of relevant decommissioning projects, in particular with a view to testing of decommissioning strategies as well as to the systematic collection and processing of data,
- the establishment of databases on experience with specific techniques, the arising of radioactive waste, the occupational exposure and the associated costs.

D. *Radiological impact on man and the environment*

The Euratom Treaty defines the Community responsibility for 'establishing uniform safety standards to protect the health of workers and the general public and ensure that they are applied' and for 'studying the harmful effects of radiation on living organisms'. Although the present radiation protection standards and the underlying scientific information are of high quality, it remains imperative to reduce the remaining uncertainties in the quantification of radiation risks arising from the use of ionizing radiation in energy production, industry and medicine, as well as from exposure to natural radiation, that is to low radiation doses. This concerns all phases of the nuclear cycle where (potential) exposure situations may exist and also considers the consequences of nuclear accidents, the limitation of the extent of possible health effects, the mitigation of environmental consequences and the development of methods for the management of nuclear emergencies. The range of issues concerned and the many underlying scientific disciplines require a truly interdisciplinary approach to radiation protection research and the intensive involvement of university based research.

The priorities set forward here are closely linked with the validation work proposed in the area of mastering events of the past, which mainly deals with the health and environmental consequences of the Chernobyl and other radiation accidents and of past uncontrolled releases of radioactive materials.

D.1. *Understanding the mechanisms of radiation action*

The mechanisms of radiation action need to be known in order to be able to extrapolate the radiation effects determined experimentally to predict, with confidence, the effects at low doses. Continuation of the studies of radiation induced hereditary effects and effects after *in-utero* irradiations will contribute to a deeper understanding of the mechanisms at the cell level. This understanding will be gained by mobilizing the most up-to-date techniques from molecular and cellular biology, by studying mutation and chromosomal aberration formation and the role of DNA repair and by combining this work with recent developments in radiation energy deposition modelling to elucidate a comprehensive biophysical model of cellular radiation action. The extension of this understanding to the radiation induced cancer process will take advantage of new knowledge of oncogenesis, in general, coupled with continuing studies of the early molecular and cellular events in radiation induced cancer. The development of models of the radiation induced cancer process founded on sound biological principles will further contribute to more accurate assessments of radiation risk.

D.2. *Evaluation of radiation risks*

Risk evaluation depends on reliable assessment of the level of exposure, which in turn depends on an accurate determination of internal and external doses. This necessitates research on environmental pathways of radioactive substances to man and on the age dependent metabolism and biokinetics of incorporated radionuclides. Targeted research will include work to develop more sensitive and delicate instrumentation for measurement of external and internal irradiation

and the further extension and application of risk assessment models for the health and environmental impact of discharges of radioactive materials to the environment and of nuclear accidents. Risk estimates converting radiation dose to the probability of induction of health effects will be derived from epidemiological studies of exposed populations, using the knowledge on radiobiological mechanisms and a dosimetric approach.

D.3. *Reduction of exposure levels*

Criteria, methods and strategies for reducing exposure to ionizing radiation from all sources (natural, medical and industrial) have to be developed further with a view to reducing or preventing the induction of health effects. These include aspects of exposure monitoring, techniques for environmental restoration including site restoration, treatment of health consequences including acute radiation damage, risk management for normal and emergency situations and the implementation of the Alara philosophy (as low as reasonably achievable). The approach is based on justification of the practical benefits, their optimization taking account of economic and social factors and the limitation of any individual risks which might occur as a result of the adoption of such measures. These principles will be applied to problems of practical relevance, such as the development of criteria for the recycling of material from decommissioned nuclear facilities; occupational exposure arising from waste management, decommissioning and environmental mitigation, including radon mitigation strategies; and optimization strategies and techniques in medical radiological diagnostic procedures.

E. *Mastering events of the past*

The situation in eastern and central Europe and in the New Independent States (NIS) presents liabilities in nuclear safety, which the international community must share not only for altruistic reasons. In addition to humanitarian considerations, the European Union has an interest in the establishment of safe conditions in neighbouring countries. The accident of Chernobyl was a reminder that radioactive material released in an accident is no respecter of international borders.

The consequences of the Chernobyl accident, of other radiation accidents and of uncontrolled releases of radioactive materials in the NIS have led to environmental contamination and health hazards which represent unique opportunities for initiating collaborative projects, including scientific and technical research schemes as well as training schemes.

The objective of this part of the specific programme is to establish an operational platform to work out long-term mitigation strategies, to monitor the continuously changing circumstances and to initiate targeted research projects and to provide catalytic links and appropriate coordination between the R&D programme and the technical assistance programmes.

E.1. *Consequences of Chernobyl and other radiation accidents*

Environmental research in the more heavily contaminated terrestrial and aquatic areas will include the analysis of exposure pathways and the evaluation and validation of existing radioecological databases. A special aim of the work will be to use the results from the radioecological studies for predictive assessments and to develop improved emergency management systems not only to provide guidance on the mitigation of the consequences of the accident but to provide an effective framework for response to future accidents. They will deal especially with the environmental consequences and applicability of countermeasures in highly contaminated zones, the development of intervention criteria, waste management procedures and environmental restoration.

Health effects studies will concentrate on the development of methods of biological and retrospective dosimetry in close cooperation with epidemiological studies of cancer induction in the more exposed groups of the population. A study of the treatment strategies used for the over-exposed accident victims aims at deriving improved treatment protocols using newly developing methodologies. The occurrence of increased rates of childhood thyroid cancer reported in Belarus and the Ukraine demands systematic research to provide important information on radiation-induced thyroid cancer and an estimate of the extent of this health problem in the future. At the same time the treatment of the thyroid cancer patients will be optimized by the development of therapy protocols.

E.2. *Cooperative networks*

In the field of radiation protection, a collaboration with institutes of Belarus, the Russian Federation and the Ukraine was initiated in late 1991 which involves some 100 EC institutions and 100 CIS institutions and has led to the establishment of a central laboratory in the Ukraine. The establishment of such a network will reinforce the collaborative research programme between the European Union and the CIS in the whole area of nuclear fission safety. In addition it can be used as a platform for coordination of the many international and bilateral initiatives in these areas.

In the area of waste management and site restoration, similar networks with the central and eastern European countries will assist these countries in developing safe solutions for their particular problems. In addition, networks of information exchange would be useful to learn from the Russian experience of waste management. Cooperation in the field of reactor safety will address some problems typical of existing Russian reactor designs as well as research in areas of interest for future plants. The progressive inclusion of these Eastern countries in Community nuclear safety programmes is to be seen as an efficient way to develop a wide ranging safety culture.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

	(ECU million)
Area A: Exploring innovative approaches	7
Area B: Reactor safety	48
Area C: Radioactive waste management and disposal and decommissioning	43 ⁽¹⁾
Area D: Radiological impact on man and the environment	50
Area E: Mastering events of the past	12
Total	160 ⁽²⁾ ⁽³⁾

(¹) Of which up to ECU 4 million for decommissioning-related R&D activities.

(²) Of which:

- a maximum of 8,5 % for staff expenditure and 4,0 % for administrative expenditure,
- 1,25 % for the dissemination and optimization of results,
- at least 30 % for basic research,
- approximately 2 % for training.

(³) An amount of ECU 254 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the framework programme for research and training activities in the nuclear field (1994 to 1998) for 'Nuclear Fission Safety', is earmarked for the specific research and technological development programme to be implemented by the Joint Research Centre for the European Atomic Energy Community (1995 to 1998).

The breakdown between different areas does not exclude the possibility that projects could cover several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

This programme will be carried out through indirect action, whereby the Community makes a financial contribution to research and training activities carried out by third parties or by the JRC in association with third parties:

(a) Shared-cost actions:

- Research and training projects carried out by undertakings, research centres and universities; creation of large integrated projects with a common objective will be stimulated.
- Support for financing the infrastructure or installations necessary for coordinated action (reinforced coordinated activity).

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Preparatory, accompanying and support measures, such as:

- studies in support of this programme and in preparation for future activities,
- support for exchanges of information, conferences, seminars, workshops or other scientific or technical meetings, including meetings on intersectoral or multidisciplinary coordination,
- use of external expertise, including access to scientific databases,
- scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities conducted under the third action of the fourth framework programme of the European Community activities in the field of RTD,
- analysis of the socio-economic consequences and technological risks associated with the programme,
- training actions related to research covered by this programme and which may facilitate technology transfer,
- independent evaluation of the programme and of the implementation of the activities.

Community funding may cover up to 100 % of the costs of these measures.

(c) Concerted actions, consisting in coordinating, particularly with the aid of concertation networks, research and training projects already being financed by public authorities or private bodies. A concerted action may also provide the coordination necessary for the operation of thematic networks which, through shared-cost actions, bring together manufacturers, users, universities and research centres around a single technological or industrial objective.

The Community participation may cover up to 100 % of the costs of the concertation.

Extract from the proposal for a Council Decision for the JRC programme (COM(94) 70 FINAL (CNS)) concerning the activities envisaged for the Joint Research Centre (JRC) in the areas covered by the specific programme of research and training in the field of nuclear fission safety

The objective is to increase scientific and technical knowledge and to contribute to the development of technologies aimed at improving the safety of the whole of the nuclear cycle and reducing the environmental impact of the use of nuclear energy, and to respond to the need to assume the responsibilities of the Community arising from implementation of the Treaty.

The JRC contribution will be in the following fields:

- reactor safety,
- fuel cycle safety,
- safeguards and fissile materials management.

Reactor safety

JRC research will be focused mainly on the following areas

- a contribution to accident prevention: the development of non-destructive analytical techniques (NDA) for the improvement and refinement of inspection procedures and the development of qualification methodologies to facilitate their harmonization,
- probabilistic safety studies: the JRC will contribute to the improvement of methodologies and to the emergence of a consensus on their implementation in safety studies,
- studies conducted through European networks into the mechanisms of component ageing, a method of attenuation, evaluation of the integrity of structures and inspection possibilities,
- studies of serious accidents: these studies will be conducted, on the one hand, through studies of the internal and external phenomena in the containment in experiments with degradation of the reactor core using real materials and operating at a real temperature; these operations will be carried out on a small and a large scale at the JRC and, on the other hand, through a contribution to the study of the release of fission products and the transfer of phenomena by participation in the releases conducted in other laboratories, in particular the CEA (study of the source-term) and by carrying out aerosol resuspension tests at the JRC. They will be carried out in conjunction with the activities in this field foreseen under indirect actions.

This research will continue to be the subject of a major cooperation effort within the framework of networks involving European and non-European partners. It is aimed in particular at the development of common design tools intended for industry and the authorities responsible for safeguards.

It will make extensive use of the JRC's ability to set up cooperation networks between the European partners concerned and thus to participate in the implementation of the Community policy provided for in the Treaty.

Fuel cycle safety

The main objective of the studies conducted by the JRC is to reduce the environmental impact of using nuclear energy by means of research into the fuel cycle permitting optimized management of the end of the cycle. They will be conducted in close cooperation with the activities in this field foreseen under indirect actions.

This research will be aimed at improving the understanding of actinides and the plutonium cycle and drawing up the best possible waste management strategy, in particular by minimizing the production of high-level waste. It will take account of changes in reactor design.

It will also be aimed at supporting the Member States' current strategy of deep burial of radioactive waste and exploring management strategies which would make it possible to reduce the amount of waste produced by future fuel cycle installations. This research will be conducted in close cooperation with national laboratories.

The subjects covered will include:

- studies of the safety of the behaviour of nuclear fuels (UO₂ and mixed oxide),
- study of fundamental and solid-state physico-chemical analysis of actinides,
- study of nuclear aerosols,
- minimization of secondary actinides and other radionuclides with long half-lives in the nuclear fuel cycle,
- plutonium fuel technology,
- characterization of spent fuel with a view to its elimination,
- radionuclides for medical applications.

Safeguards and fissile materials management

The research conducted at the JRC is aimed at obtaining, in good time, results of new techniques implementation of which is necessary for compliance with obligations arising from safeguards provided for in the Treaty and the Non-Proliferation Treaty.

It is necessary in particular to develop new techniques to meet the new challenges related to the development of the fuel cycle and the strengthening of the control systems.

These activities are aimed at the development and improvement of techniques, including:

- non-destructive test techniques using gamma and neutron radiation for the analysis of waste, production waste and irradiated fuel,
- measurements relating to volume and weight in large tanks in fuel production and reprocessing plants;
- sealing techniques and new marking systems for objects containing nuclear materials and for containers,
- surveillance systems using the storage and procession of digital images for automatic surveillance and examination and for improvement of recordings in the long-term without inspectors.

A particular effort will be devoted to research on the design of multisensoral integrated systems able to function in the absence of inspectors by using mobile robotic technology. These systems will use intelligent software for the production of data and the compatibility of materials.

These activities will be conducted in particular using the experimental installation Perla ('Performance and training laboratory'), Tame ('Tank measurement') and Lasco ('Surveillance and containment') of the JRC which offer experimental conditions which are representative of reality in an installation.

Lastly, the JRC research in the field of safeguards also forms part of a process of European cooperation as illustrated by the Esarda network ('European Safeguards Research and Development Association') and international cooperation with the United States of America, Canada, Japan and Russia.
