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 acitivities 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.

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[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 mangerial 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 (± 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 CO_2 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 meterological 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 sensitve 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 phaenotype 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 CO_2.

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.

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[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, landlides 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 reserach 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 evironmental 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.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

(ECU million)

Theme A Natural environment, environmental quality and global change	250
Theme B Environmental technologies	133
Theme C Space techniques applied to environmental monitoring and research	109
Theme D 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,

   — independet 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 constistent 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.