

COUNCIL DECISION

of 25 January 1999

adopting a specific programme for research, technological development and demonstration on energy, environment and sustainable development (1998 to 2002)

(1999/170/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⁾,

(1) Whereas by Decision No 182/1999/EC⁽⁴⁾, the European Parliament and the Council adopted the fifth framework programme of the European Community (hereinafter referred to as the fifth framework programme) for research, technological development and demonstration (hereinafter referred to as RTD) activities for the period 1998 to 2002 setting out the general outlines and scientific and technological objectives of the activities to be carried out in the fields of energy, environment and sustainable development;

(2) 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 implementing it, fix its duration and provide for the means deemed necessary;

(3) Whereas, in accordance with Article 4(2) of Decision No 1110/94/EC of the European

Parliament and of the Council of 26 April 1994 concerning the fourth framework programme of the European Community activities in the field of research, technological development and demonstration (1994 to 1998)⁽⁵⁾ and Article 4(2) of the Council Decisions on the specific programmes implementing the fourth framework programme, the Commission has arranged for an external assessment to be conducted which it has transmitted to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions together with its conclusions and comments;

(4) Whereas, in accordance with Article 130j of the Treaty, Council Decision 1999/65/EC of 22 December 1998 concerning the rules for the participation of undertakings, research centres and universities and for the dissemination of research results for the implementation of the fifth framework programme of the European Community (1998 to 2002)⁽⁶⁾ (hereinafter referred to as 'the rules for participation and dissemination') applies to this specific programme; whereas these rules allow the participation of the Joint Research Centre in the indirect actions covered by this specific programme;

(5) Whereas, for the purpose of implementing this programme, in addition to cooperation covered by the Agreement on the European Economic Area or by an Association Agreement, it may be appropriate to engage in international cooperation activities, in particular on the basis of Article 130m of the Treaty, with third countries or international organisations;

(6) Whereas implementation of this programme will also comprise activities and mechanisms aimed at stimulating, disseminating and exploiting RTD results, in particular *vis-à-vis* small and medium-sized enterprises (SMEs), and activities to stimulate the mobility and training of researchers;

⁽¹⁾ OJ C 260, 18.8.1998, p. 48.

⁽²⁾ Opinion delivered on 15 December 1998 (not yet published in the Official Journal).

⁽³⁾ OJ C 407, 28.12.1998, p. 123.

⁽⁴⁾ OJ L 26, 1.2.1999, p. 1.

⁽⁵⁾ OJ L 126, 18.5.1994, p. 1. Decision as last amended by Decision No 2535/97/EC (OJ L 347, 18.12.1997, p. 1).

⁽⁶⁾ OJ L 26, 1.2.1999, p. 46.

- (7) Whereas it is important that the scientific, industrial and user communities should contribute substantially to the definition of activities to be undertaken and should be involved, as appropriate, in the implementation of this programme;
- (8) Whereas research activities under the fifth framework programme should also be geared towards innovation in order to contribute, *inter alia*, to the objectives of the first action plan for innovation;
- (9) Whereas special emphasis should be placed on encouraging the participation of SMEs;
- (10) Whereas the equal opportunities policy of the Community must be taken into account in the implementation of this programme;
- (11) Whereas efficient and transparent management contributes to a more effective and user-friendly programme;
- (12) Whereas administrative expenditure should be included in the Community budget in a transparent fashion;
- (13) Whereas the implementation of this programme should be monitored with a view to adapting it, where appropriate, to scientific and technological developments; whereas in due course there should also be an assessment of progress with the programme by independent experts;
- (14) Whereas the Scientific and Technical Research Committee has been consulted on the scientific and technological content of the specific programmes,

HAS ADOPTED THIS DECISION:

Article 1

In accordance with Article 3(1) of the fifth framework programme, the specific programme on energy, environment and sustainable development (hereinafter referred to as the specific programme) is adopted for the period from 25 January 1999 to 31 December 2002.

Article 2

1. In accordance with Annex III to the fifth framework programme, the amount deemed necessary for carrying out the specific programme is EUR 2 125 million, including a maximum of 6,5 % for the Commission's administrative expenditure.

An indicative breakdown of this amount is given in Annex I.

2. Of the amount in paragraph 1

— EUR 446 million is for the period 1998 to 1999,

and

— EUR 1 679 million is for the period 2000 to 2002.

In the case referred to in Article 2(1)(c) of the fifth framework programme, the Council shall adapt the latter figure in accordance with Article 2(1)(c), second indent of the fifth framework programme. Pending a decision by the Council, this specific programme shall not be implemented beyond the provision of the first indent.

3. The budgetary authority shall, in compliance with the scientific and technological objectives and priorities laid down in this Decision, set the appropriations for each financial year taking into account the availability of resources within the multiannual financial perspective.

Article 3

1. The general outlines, the scientific and technological objectives and the priorities for the specific programme are set out in Annex II. They are consistent with the principles and the three categories of selection criteria indicated in Annex I to the fifth framework programme.

2. In accordance with these principles and criteria the selection criteria indicated in Article 10 of the rules for participation and dissemination shall be applied for the selection of the RTD activities to be carried out.

In addition, any participation of industrial entities in industrially-orientated shared-cost actions should, as a general rule, be appropriate to the nature and purpose of the activity.

All these criteria shall be complied with in the implementation of the programme, including the work programme referred to in Article 5(1), although they may be weighted differently.

3. The rules for participation and dissemination shall apply to the specific programme.

4. The detailed rules for financial participation by the Community in the specific programme are those referred to in Article 4 of the fifth framework programme.

The indirect RTD actions under the specific programme are defined in Annexes II and IV to the fifth framework programme.

Specific rules for implementing the programme are set out in Annex III to this Decision.

Article 4

In the light of the criteria referred to in Article 3, and the scientific and technological objectives and priorities set out in Annex II, the Commission:

- (a) shall monitor, with appropriate assistance from independent external experts, the implementation of the specific programme and, where appropriate, submit proposals to Council for adapting it, in accordance with Article 5(1) of the fifth framework programme;
- (b) shall arrange for the external assessment provided for in Article 5(2) of the fifth framework programme to be conducted concerning the activities carried out in the fields covered by the specific programme.

Article 5

1. The Commission shall draw up a work programme specifying:

- (a) in greater detail, the objectives and RTD priorities of Annex II;
- (b) the indicative timetable for the implementation of the specific programme;
- (c) the coordination arrangements set out in Annex III and arrangements to secure the objectives, related to innovation and the participation of SMEs, of the third activity of the fifth framework programme;

(d) where necessary, the selection criteria and the arrangements for applying them for each type of indirect RTD action.

2. The work programme shall take account of relevant interests, in particular the scientific, industrial and user communities. It shall serve as a basis for implementing the indirect RTD actions according to the procedures set out in the rules for participation and dissemination.

3. The work programme shall be updated where appropriate and be made available by the Commission to all interested parties in a user-friendly form, including in electronic form.

Article 6

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

2. The procedure laid down in Article 7 shall apply for the adoption of the following measures:

- the drawing-up and updating of the work programme referred to in Article 5(1), including regarding the content of calls for proposals,
- approval of RTD actions proposed for funding, including participation by entities from third countries, where the estimated amount of the Community contribution under this programme is equal to or more than EUR 0,6 million,
- the drawing-up of the terms of reference for the external assessment provided for in Article 5(2) of the fifth framework programme,
- any adjustment to the indicative breakdown of the amount as set out in Annex I.

Article 7

1. The Commission shall be assisted by two programme committees (hereinafter referred to as 'the committees'), one committees for the subprogramme 'Environment and sustainable development' and one for the subprogramme 'Energy', each composed of representatives of the Member States and chaired by a representative of the Commission.

2. In the cases referred to in Article 6(2), the representative of the Commission shall submit to

the committee a draft of measures to be taken. The committee shall deliver its opinion on the draft measures referred to above 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.

- 3(a) The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.
- (b) 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.

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

4. The Commission shall regularly inform the committees of the overall progress of the

implementation of the specific programme, and shall in particular provide them with information about the progress of all RTD actions funded under this programme.

Article 8

In accordance with Article 5(4) of the fifth framework programme, the Commission shall regularly inform the Council and the European Parliament of the overall progress of the implementation of the programme, including on the participation of SMEs and the simplification of administrative procedures.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 25 January 1999.

For the Council

The President

J. FISCHER

ANNEX I

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

(million EUR)

Type of activity	Amount
<i>A. Environment and sustainable development</i>	
(a) Key actions	
(i) Sustainable management and quality of water	254
(ii) Global change, climate and biodiversity	301
(iii) Sustainable marine ecosystems	170
(iv) The city of tomorrow and cultural heritage	170
(b) Research and technological development activities of a generic nature	119
(c) Support for research infrastructures	69
Subtotal	1 083
<i>B. Energy</i>	
(a) Key actions	
(i) Cleaner energy systems, including renewables	479
(ii) Economic and efficient energy for a competitive Europe	547
(b) Research and technological development activities of a generic nature	16
Subtotal	1 042
Total	2 125

ANNEX II

THE GENERAL OUTLINES, THE SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND THE PRIORITIES

INTRODUCTION

Research, technological development and demonstration (RTD) in the fields of environment, energy and sustainable development is essential for the social well-being of Europe's citizens and the implementation of Union policies. Making use of the knowledge and technologies developed by this programme will make it possible to meet a wide range of social and economic needs so reconciling economic development with environmental sustainability. New markets will bring growth and employment; reliable and competitive supply of energy will be ensured and energy requirements will be met. The results will provide the basis for policies formulated at Community level or deriving from international environmental commitments — in particular, the implementation of the Kyoto Protocol requires urgent support for RTD on a number of issues.

This programme will encourage integrated multidisciplinary approaches seeking to solve problems with a European dimension for which scientific and technological developments are needed. People are a key interactive component of the ecosystem and, therefore, a fair balance between scientific and socioeconomic disciplines must be found in project implementation.

Harnessing the full spectrum of these RTD activities, ranging from basic research to demonstration projects, and using all suitable instruments, including supporting proposals spanning the spectrum of RTD activities, are envisaged to tackle the major issues at stake, in order to meet the need for a better understanding of natural processes and patterns and the interactions with human activities through to the development of new technologies and instruments ensuring further steps towards sustainable development.

Although research and technological development in the field of environment and energy are closely related, they remain distinct areas. For this reason, they will be implemented through two subprogrammes, 'Environment and sustainable development' and 'Energy', each with its own budget and programme committee. Exchange of information between the two committees will be ensured as appropriate.

Strategic objective of the programme

The strategic goal is to contribute to sustainable development by focusing on key activities crucial for social well-being and economic competitiveness in Europe.

An *innovative approach* based on two main elements will make it possible to address complex social-driven issues: integrated multidisciplinary and multisectoral activities involving wherever possible the principal stakeholders, private-public sector partnerships, and end-users from the business, industrial and policy-making sectors, and concentrating on finding solutions to strategic problems, and supporting only proposals which are of substantive regional, European and global significance. Europe has established a leading RTD role in many areas — this must be sustained and remain at the cutting-edge. In other areas improvements are needed for the future benefit of society, as well as the business and industrial sectors.

Social objectives Society is making increasing demands for better living conditions, better safety, and better use of scarce resources including secure and economic energy supplies and services. Availability

of a sufficient and economic energy supply must be assured to promote industrial competitiveness and to maintain the quality of life for Europe's citizens. At the same time, the environmental impact of energy production and use must be reduced. Water is of economic, environmental and social strategic value. Rising population and per-capita use of resources, globalisation of economic markets and natural variability in earth systems are causing or exacerbating major environmental problems. The sea is essential for trade and transport in Europe, a source of numerous resources and a major resource for tourism, but it is also the ultimate repository for many by-products of human activity. Cities together with their cultural heritage are the centre of social, cultural and economic life for 80% of Europe's citizens. These key societal issues will only be solved if in addition to developing technologies the socioeconomic context is appropriately analysed and taken into account.

European added-value and subsidiarity. Environmental problems, energy systems, networks and services and the associated environmental impacts, as well as sustainable development issues must be approached in the global context. In this respect, the European level is the most appropriate: most problems and challenges are common to all Member States and most activities to be addressed in the programme are not only European, but also global, in scale. By mobilising resources and focusing on key targets, the programme will form a key part of the European contribution to global initiatives and programmes. Knowledge generated through collaborative RTD at the European level, together with the coordination of fragmented European knowledge, is essential to address the very serious problems facing the Union. These efforts, including prenormative research, will confer genuine European added-value to the efforts to develop appropriate regulatory frameworks, for example in the post-Kyoto process.

Economic development and scientific and technological prospects. The promotion of sustainable development will not be possible unless economic objectives relating to technological development, competitiveness and growth are reconciled with societal goals such as quality of life, employment, security, health and a high quality environment. This challenge must be met in the context of significant structural and demographic changes, and globalisation of the economy. Improving our quality of life and decoupling economic growth from environmental degradation will contribute to European competitiveness and employment. Secure and economic energy supplies and services are vital for all aspects of economic activity. The need for energy equipment suppliers and operators to be competitive in the global market is vital for employment. Enormous potential will exist for global exploitation from several areas of the programme, strengthening economic competitiveness and creating new jobs, such as in the water industry, renewable energy technologies, rational use of energy and reuse of resources, as well as technologies to improve energy efficiency and the water and/or energy industries.

LINKS AND COMPLEMENTARITY WITH THE OTHER PROGRAMMES

Collaboration, coordination and complementarity will be fostered within and between key actions in this and other programmes, including the activities of the JRC. This is of particular significance here given the Community's commitments on integrating environment protection requirements into other policy areas. Coordination with other thematic programmes will be based on the following principles: activities in the quality of life and management of living resources programme will concentrate on epidemiology research arising from environmental and climate changes, whereas this programme will focus on the consequences for human health from climate change; activities within the information society programme will concentrate on the development of information society technologies, and activities in this programme on the integration and adaptation of these technologies in applications; and activities in the programme for promoting competitive and sustainable growth will concentrate on the design and development of materials and technologies for generic use and treatment of industrial waste within the production centre but in this programme the activities will concentrate on the integration, application and demonstration of technologies and materials for energy or urban use, including their design and development where specifically needed for urban or cultural heritage use and the management of industrial waste outside the production centre.

Major examples of collaboration with key actions in other programmes where action to avoid duplication is essential will be found with health, food and environmental factors (climate change and air pollution), sustainable agriculture and fisheries (marine ecosystems), systems and services for the citizen (earth observation technologies and energy distribution networks), land transport and marine

technologies (marine ecosystems, transport and offshore hydrocarbon exploitation), sustainable mobility and intermodality (urban environment) and innovative products, processes and organisation of production (urban waste, materials and industrial processes). Complementarity and coordination will also be assured with the horizontal activities of the framework programme.

- Global international cooperation with international organisations and the scientific, business and industrial communities from third countries is inescapable to address many cross-border environmental issues central to implementing international conventions and programmes, as well as the environmental consequences of energy policies and cross-border supply interdependency. Close links will be maintained with the pre-accession States to collaborate on tackling some of the research needed to meet common challenges and common objectives corresponding to the programme priorities and as such will be open to third country and international organisations. The focus will continue to be fields of mutual concern and cooperation, particularly on global change and related issues through the development and implementation of mechanisms such as the European network for research on global change. There will also be coordination with the programme 'Confirming the international role of Community research' which will address activities of specific regional relevance to the third countries concerned. Legal entities from third countries and international organisations may participate in this programme according to the priorities set out herewith, in line with the objectives outlined in the programme 'Confirming the international role of Community research' and with the rules for participation and dissemination. Full use will be made of the possibilities offered by COST and Eureka and by cooperation with international organisations to foster synergy between actions and projects in this programme and nationally funded research activities. In the case of cooperation with Eureka, projects corresponding to themes of common interest with the framework programme may be developed in the context of the key actions, in conformity with the selection criteria and procedures of the framework programme,

- Activities related to innovation and participation of small and medium-sized enterprises (SMEs) will be given a particular emphasis to help bridge the gap between research results and their effective exploitation in potential applications by the business and policy-making sectors. The participation of SMEs in all RTD activities will be stimulated and encouraged. Their important potential to contribute to the innovation process is fully recognised. Exploratory awards will be available to facilitate the participation of SMEs in collaborative RTD, as well as in cooperative RTD in the case of SMEs without relevant research facilities of their own. An 'innovation unit' will target promotion activities on the deployment and use of the results of this programme; it will also help to ensure complementarity and an interface with the innovation activities implemented in the context of the programme on innovation and participation of SMEs,

- Improving the know-how, skills and qualifications of European researchers and the understanding of the socioeconomic impact of research in the fields covered by this programme is essential to ensure sufficient availability of appropriate expertise and to establish tangible and lasting impacts. Training and socioeconomic research will therefore form an integral part of this programme, complemented by appropriate links with the horizontal programme 'Improving the human research potential and the socioeconomic knowledge base'. Training activities in this programme will include support to fellowships, which will take the form of Marie Curie fellowships following the definitions and rules set out in the horizontal programme, and advanced study and specialised courses.

A. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

The strategic goal of this part of the programme is to promote environmental science and technology so as to improve our quality of life and boost growth, competitiveness and employment, while meeting the need for sustainable management of resources and protection of the environment in line with the goals and objectives of the fifth action programme on the environment as well as other Community policies relating to the environment.

The RTD and demonstration projects will concentrate through four key actions on tackling the issues of sustainable water management and water quality; global change, climate and biodiversity;

sustainable integrated management of marine resources; and city of tomorrow and cultural heritage as well as generic activities concerning the fight against major hazards, the development of earth observation technologies, and socioeconomic aspects of environment within the perspective of sustainable development (the impact on society, the economy and employment). Specific attention will also be given to the need for an optimum use of existing European research infrastructures and for transnational cooperation in the rational and cost-effective development of European research infrastructures to support cutting-edge research in environmental activities.

(a) KEY ACTIONS

(i) Sustainable management and quality of water

Objectives and RTD priorities

The overall goal of this key action is to produce the knowledge and technologies needed for the rational management of water resources, for tackling important problems such as water scarcity, and for networks for domestic needs and those of industry and agriculture, while maintaining the integrity of ecosystems. Research will focus on:

- *Development of treatment and purification technologies to prevent pollution, to purify water, to prevent and mitigate salination of water resources and to use and/or reuse water rationally as well as the development of an integrated approach for the management of water resources and wetlands*

The aim is to develop the knowledge and the technologies needed for the rational management of water resources; to match water supply with demand and achieve cost-efficiency and sustainability; to improve the science base (including on habits, attitudes and cultural patterns), methodologies and management tools to provide a better understanding of the phenomena and allow integrated management and sustainable use of water and wetlands at catchment scale, within constraints of availability, environmental quality and socioeconomic cost-benefits; to develop technologies to prevent and treat pollution of water bodies and groundwater stocks, to purify water and to use and/or reuse water rationally (including closed loop approaches and reliability of collection and distribution networks).

RTD priorities: tools and methodologies for cost-effective and sustainable integrated water resources and wetlands management; effective transfer of knowledge and skills to water users; development of real scale applications across Europe with a view to supporting EU policy; optimisation of technologies to treat and purify drinking water and to minimise use and pollution of water; process-integrated treatment of waste water at source; rational reuse of water; application of closed loop technologies; development of integrated procedures to assess the state of water systems; development of advanced processes to prevent and alleviate salination,

- *Technologies for monitoring and prevention of pollution, protection and management of groundwater and surface water resources, including ecological quality aspects*

The aim is to characterise and to assess the state and evolution of the quality and quantity of surface and groundwaters as well as the functioning of aquatic and wetland ecosystems as the basis for more rational management. This will include the development of technologies for assessing and treating pollution originating from contaminated sites and waste disposal sites as well as the development of biological assessment methods for monitoring water quality.

RTD priorities: improved methods of measuring and monitoring water quality and quantity and techniques for analysing pollutant flows and development of technologies for integrated assessment of soil pollution treatment methods; nutrients from diffuse sources; predictive models and advanced pollution impact assessment methodologies; updated water quality criteria and indicators for water policies,

— *Surveillance, early warning and communication systems*

The aim is to develop systems able to react on different time and space scales, including early-warning predictive systems with direct feedback to pollution sources.

RTD priorities: surveillance systems for point and diffuse pollution sources and for the various environmental recipient systems; control and data management systems, including leakage detection and stormwater management and systems for floods and drought assessment,

— *Technologies for the regulation and management of stocks and technologies for arid and semi-arid regions and generally water-deficient regions*

The aim is to improve and protect water resources and aquatic ecosystems, to optimise water management systems in arid regions, and to better manage water crises.

RTD priorities: integrated approaches at catchment and collection point level incorporating the various political, social, economic and environmental interactions; improved systems for management of water resources and their use at EU, national, regional and local level to assist decision making.

(ii) **Global change, climate and biodiversity**

Objectives and RTD priorities

The aim of this key action is to develop the scientific, technological and socioeconomic basis and tools necessary for the study and understanding of changes in the environment. Aiming for an integrated approach, the priorities are:

— *To understand, detect, assess and predict global change processes*

The aim is to focus mainly on European and subregional causes and impacts of specific global change problems, such as climate change, ozone depletion, biodiversity loss, loss of fertile land and habitats, disruptions to ocean circulation. Attention will be given to both natural and anthropogenic phenomena, in the context of the sustainable use of natural resources.

RTD priorities: variability and change in and between: atmospheric composition, ozone depletion and UVB radiation; biogeochemical and hydrological cycles, biodiversity, climate, ocean processes, sea level; link between climate change and the frequency and scale of extreme events; socioeconomic interactions and impacts on natural resources and human health,

— *To foster better understanding of the terrestrial and marine ecosystems and the interaction between them and other ecosystems*

The emphasis will be on ecosystem interactions with land surfaces and land use, soil, water, atmosphere and ocean; role of biodiversity and climate change; interactions between ecosystems, biogeochemical cycles, large-scale land degradation and desertification.

RTD priorities: global change scenarios and their impact on terrestrial, freshwater and marine ecosystems and the consequences thereof for food security and resource utilisation; assessment of biodiversity, including losses; assessment of global change and climate change impacts on, and risks to, key sensitive systems or areas; identification and quantification of ecosystem role in biogeochemical cycles; land use modelling, soil degradation and desertification trends,

- *To develop scenarios and strategies for the prevention and mitigation of, and for possible adaptation to, the effects of global change, climate change and for the conservation of biodiversity in the context of sustainable development*

The aim is to provide a sound scientific basis for the development of tangible management strategies and actions to address the adverse consequences outlined in the key action.

RTD priorities: formulation and evaluation of options, assessing their scientific, economic, technical and policy feasibility, and their social acceptability; conditions for decoupling economic growth and environmental deterioration; assessment and enhancement of institutional capabilities for implementation of international treaties,

- *To support the development of the European component of the global observation systems for climate, terrestrial systems and oceans*

The aim is to identify and help fill key gaps in existing observation system capacity in order to ensure that the necessary data are available to address the prediction, impact assessment and response options to global change.

RTD priorities: development of instruments, systems and methods to establish and process long-term consolidated data sets of key variables by both *in-situ* measurements and remote sensing techniques. This will cover, as required, the atmosphere, oceans (using, *inter alia*, Euro-GOOS), land, hydrosphere, cryosphere and biosphere.

(iii) Sustainable marine ecosystems

Objectives and RTD priorities

The aim of this key action is to promote the development of sustainable integrated management of marine resources and to contribute to the marine aspects of environment and sustainable development policies of the EU.

This action will contribute to better coordination of national marine policies, and therefore a continued commitment is required, all the more so because the European seas are among the most heavily used in the world. Synergy with other relevant activities of the framework programme will be ensured through a specific coordinating mechanism. The research objectives are:

- *To develop the scientific knowledge on marine processes, ecosystems and interactions*

The aim is to facilitate the sustainable use of the marine environment and resources while fully respecting its overall integrity and functioning.

RTD priorities: effects of physical forces, environmental factors and interactions at the ocean boundaries on ecosystem functioning and natural variability; extreme environments and their communities: functioning and potential for exploitation; sedimentary systems and their contribution to the sustainable management and use of shelf, slope and deepsea floor; origin, delivery and cycling of contaminants, key elements and nutrients, and their impact on ecosystem functioning,

- *To reduce the anthropogenic impact on biodiversity and the sustainable functioning of marine ecosystems through analysis of its causes, consequences and possible solutions and through development of safe, economic and sustainable exploitation technologies*

The aim is to reduce the impact of human activity on the biodiversity and sustainable functioning of marine ecosystems and to develop the technologies required to facilitate safe and profitable economic yet sustainable exploitation of marine resources.

RTD priorities: effects of anthropogenic activities, including exploitation, tourism and urbanisation along the coast, and those of species introduction and biogeochemical cycling on ecosystems; mechanisms of marine biodiversity evolution to reverse trends in its reduction; processes that mitigate impact of contaminants and eutrophication, recovery of degraded systems. Development of technologies for (i) the characterisation and monitoring of marine environments; (ii) sample collection; (iii) exploration of living resources for biotechnological applications; (iv) communication, surveying analysis, imaging, modelling and monitoring systems, deepsea instrumentation and exploratory platforms,

— *To develop the capacity for monitoring and managing coastal phenomena*

The aim is to alleviate pollution, flooding and erosion, in particular of fragile coastlines, and to facilitate land reclamation from the sea.

RTD priorities: long-term coastal morphological changes, interactions between ecology (including vegetation and fauna), morphology, erosion and impact of human activities; extreme events, risk analysis, sea state propagation from offshore to the coast; tidal inlets and river mouths dynamics and stability; estuarine morphodynamics and estuarine-coastal interaction; fate of pollutants; natural coastal defence mechanisms, impact assessment of structures on marine environment, adaptation of innovative engineering techniques for minimising disturbances of the ecosystems; instrumentation, data management and modelling for effective monitoring,

— *To enable operational forecasting of environmental constraints on offshore activities*

The aim is to facilitate safe, sustainable offshore operations within the given environmental constraints and to develop the necessary components of an appropriate marine observation system.

RTD priorities: development of pilot systems for monitoring, prediction and management, with a view to safe offshore operations: (i) observation and measurement techniques and tools for systematic acquisition of ocean parameters, (ii) improve forecasting techniques through refinement of mathematical models capable of predicting impact of natural and human-induced variations on marine ecosystems and resources, (iii) methodologies to assess the pertinence of environmental parameters, and (iv) best practice compatible with requirements of international regulations and conventions.

(iv) **The city of tomorrow and cultural heritage**

Objectives and RTD priorities

The overall goal of this key action is to support sustainable economic development and competitiveness, improved urban management and integrated planning policy, and help safeguard and improve the quality of life and cultural identity of citizens. It will focus on the provision of an integrated socioeconomic knowledge-base, and products, services, tools and technologies for better city management and on the environmental challenges, particularly in relation to reducing pollutant emissions.

— *Integrated approaches aiming at sustainable development of cities and rational management of resources*

The aim is to create new models for the sustainable development of European cities and city regions and prepare medium- and long-term socioeconomic scenarios and research, development and demonstration activities focusing, in particular, on supporting and stimulating economic competitiveness, town planning and architecture, social integration, safety, energy efficiency and conservation (in particular in buildings and in urban transport) and the exploitation of information networks (the concept of 'digital cities').

RTD priorities: urban development scenarios and integrated planning tools; developing strategies for job creation and socioeconomic integration, also taking into account safety and multicultural

aspects; impact of technologies, infrastructure, noise and air pollution from all sources on social development, changes in urban surface use, resource utilisation, health and the environment; demand management, safety and security of supply of essential resources (e.g. energy, land and water); integrated approaches to better use and conservation of resources and reduced pollution and waste taking into account social and environmental sustainability,

— *Protection, conservation and enhancement of European cultural heritage*

The aim is to develop sound management of cultural resources of cities and urban regions to improve citizens' quality of life, tourism and job creation.

RTD priorities: products, methodologies and technologies for diagnosis, protection, conservation, restoration and the sustainable use of the European cultural heritage, focusing on promotion of both movable and immovable cultural assets and the quality of life; measures for protecting cultural heritage against technological and natural hazards; methodologies, including risk assessment, for harmonious and effective integration of cultural heritage into the urban setting,

— *Development and demonstration of technologies for safe, economic, clean, effective and sustainable preservation, recovery, renovation, construction, dismantling and demolition of the built environment, in particular for large groups of buildings*

The aim is to conserve, renovate, enhance, protect and develop the built environment in a manner which responds to citizens' and cultural needs, in a framework of long-term sustainability and improved quality of life.

RTD priorities: effective technologies for economic, safe and environment-friendly design, maintenance, repair, modernisation, conversion, construction, dismantling and demolition of the built environment, in particular for large groups of buildings; essential services to combat hazards and deterioration; more efficient management of resources (materials, energy, water, etc.); safety, security and social dimensions; optimum use and reuse of land (above and beneath the ground), including rehabilitation of contaminated sites; reliable environmental impact assessment; indoor environmental management,

— *Comparative assessment and cost-effective implementation of strategies for sustainable transport systems in an urban environment*

The aim is to promote sustainable cost-effective and user-oriented transport strategies and solutions, integrated within the overall urban context, in order to reduce radically pollution levels (noise and emissions) and urban congestion at affordable prices for users, while guaranteeing effective operation, the quality of life, including socioeconomic aspects, and conservation of the cultural heritage.

RTD priorities: comparative assessment and demonstration of strategic approaches and of technical solutions for innovative and sustainable, collective and individual, transport systems and methodologies and related infrastructure in a specific urban context.

(b) RESEARCH AND TECHNOLOGICAL DEVELOPMENT ACTIVITIES OF A GENERIC NATURE

— **The fight against major natural and technological hazards**

Objectives and RTD activities

The aim is, through a better understanding of processes, mechanisms and events generating natural and technological hazards, to develop technologies and methods for environmental impact assessment, risk forecasting, prevention, evaluation and mitigation. Support to improved decision-making systems, including evaluation and validation tools for assessing hazards and for emergency management would be provided.

RTD priorities: identification and analysis of factors which increase the level of natural risks; development and improvement of methods, models and tools for hazard vulnerability and risk assessment including quantification of the present and future levels of risk; development of effective tools and methods for information management; development of innovative methods and technologies to combat disasters and alleviate their consequences; improvement of the operational safety of hazardous installations,

— **Development of earth observation satellite technologies⁽¹⁾**

Objectives and RTD activities

The strategic aim is to provide a sustainable European capability in operational services for monitoring the earth from space, leading to improvements in our understanding of the planet, more effective conservation of our natural heritage, enhanced management of resources, and mitigation of major hazards. The RTD action will provide applications, products and services based on earth observation, linked to environmental monitoring and management of resources, land use and ecosystems. The focus will be on meeting the needs of a wide range of users, particularly those in Member State authorities. In this way, earth observation will naturally be integrated with other relevant technologies as required, such as airborne remote sensing, space telecommunications, navigation and global information systems.

The following research priorities will be implemented in line with the objectives of the Centre for Earth Observation initiative:

RTD priorities: innovative pilot applications and focused methodological research to improve the effectiveness of activities in priority areas for EU policies; investigations into technical, legal and economic aspects; requirement and feasibility studies to help specify new services and missions; new scenarios to prepare for self-sustaining operational services; promotion, education and training to make better use of existing and planned earth observation data and information sources,

— **Socioeconomic aspects of environmental change in the perspective of sustainable development (the impact on society, the economy and employment)**

Objectives and RTD activities

The overall aim is to develop a sound scientific basis for, and advance the application and use of, models for sustainable development and to facilitate the integration of sustainability considerations into key EU sectoral policies (industry, transport, tourism, etc.) and into the key actions of the fifth framework programme.

This integration is to be achieved by identification and assessment of the key interrelations between socioeconomic driving forces of technological change, economic globalisation, societal behaviour and environmental change, and their socioeconomic impacts. Effective utilisation of this knowledge in policy formulation depends on the development and testing of improved methods and policy tools.

RTD priorities: identification and evaluation of the key relationships between socioeconomic development and environmental change; driving forces and impacts are to be assessed in terms of policies, institutions, demography, production and consumption, technological development, distribution, security, culture and ethics. Development and application of methods and tools for the integration and promotion of economic, social and environmental objectives; descriptive and performance measures of sustainable development and for environmental accounting; development of sustainable development indicators and analysis of ecological footprints. Design and comparative assessments of various approaches to eco-efficiency, including rational use of

⁽¹⁾ Space-related activities are subject to central coordination across the various programmes.

resources and industrial ecology; sustainable production and consumption; environmental governance principles for sustainability.

(c) SUPPORT FOR RESEARCH INFRASTRUCTURE

Objectives

To encourage the transnational use of public or private facilities which address critical needs in order to further improve their exploitation while avoiding unnecessary duplication, and to cover emerging priority needs.

Activities

In order to reinforce the European added-value and optimise the efforts made, the Community support will be directed towards:

- transnational coordination, integrated management of specific aspects of operation, access to and improvement of existing facilities,
- coordination and complementarity of national or multinational initiatives to support facilities needed at the European level,
- networking of communities of researchers and users through research projects and specific training activities centred on appropriate infrastructures, or cooperation of several partners to form an integrated service provider,
- increasing the compatibility of dispersed systems aiming to provide rapid and effective integration of facilities and resources.

Infrastructure

Supporting infrastructure for assessing and observing the earth systems (e.g. ocean), in order to improve prediction of natural hazards and global changes will include more specifically:

- climate and global change research facilities: centres for climate prediction, super-computer facilities; archiving facilities; centres for integrated assessment; climate and global change databases; simulation chambers, ground-based stations and aircraft for the observation of atmosphere; devices and networks for observation of palaeo-environmental information; support to taxonomy,
- marine research facilities: marine databases; collection of marine samples, support to taxonomy; test basins; research vessels; platforms and centres for forecasting of ocean state; manned, robotic, and automatic observation systems,
- natural hazards research facilities: facilities and key operational networks for data on earthquakes, floods, tidal waves and storms, landslides, volcanoes and forest fires.

B. ENERGY

The strategic goal of this part of the programme is to develop sustainable energy systems and services for Europe and contribute to a more sustainable development worldwide, leading to increased security and diversity of supply, the provision of high-quality, low-cost energy services, improved industrial competitiveness and reduced environmental impact.

The RTD and demonstration projects will concentrate through two key actions on tackling the issues of cleaner energy systems including renewable energies and economical and efficient energy for a

competitive Europe as well as generic activities concerning the socioeconomic aspects of energy within the perspective of sustainable development (the impact on society, the economy and employment).

(a) KEY ACTIONS

(i) Cleaner energy systems, including renewables

Objectives and RTD priorities

The aim of this key action is to develop and demonstrate technologies and associated measures which will help minimise the environmental impact of the production and use of energy in Europe and be consistent with the energy policy objectives, including the reduction of the Community's dependence on imported energy. These will help preserve the ecosystem by reducing emissions at local and global levels and increasing the share of new and renewable energies. Accordingly action will be taken to investigate cleaner, most notably renewable, energy sources as well as to help reduce the environmental impact of existing fossil fuel use. Work will focus on:

- *Large-scale generation of electricity and/or heat with reduced CO₂ emissions from coal, biomass or other fuels, including combined heat and power*

The aim is to obtain substantial improvements in efficiency with reduction of the cost, external dependence and environmental impact of energy conversion processes, whether based on fossil fuels or renewable energy sources.

RTD priorities: combustion and other thermochemical conversion processes (e.g. gasification, pyrolysis); generation of electricity and/or heat with reduced CO₂ emissions from coal, biomass, waste or other fuels; improving the efficiency of gas turbines; combined heat and power,

- *Development and demonstration, including for decentralised generation, of the main new and renewable energy sources, in particular biomass, wind and solar technologies, and of fuel cells*

The aim is to enable the deployment of new and renewable energies in grid connected and 'stand alone' applications where there are prospects of a substantial contribution to energy supplies.

RTD priorities: fuel cells, for both stationary and transport applications; clean conversion and cost-effective use of biomass in the context of energy generation systems for heat and power; wind energy, in both on-shore and off-shore applications; solar technologies, photovoltaics and solar thermal technologies; other renewable energy options that can contribute significantly to overall programme objectives,

- *Integration of new and renewable energy sources into energy systems*

The aim is to overcome the problems associated with integrating new energy sources into established energy systems, develop new applications and overcome barriers to the greater uptake of renewable energies.

RTD priorities: overcoming the technical problems associated with the integration of renewable energy sources into energy grids and processes; hybrid systems, combining different renewables or renewables with conventional systems; improving acceptability of renewables e.g. reducing visual intrusion and noise; identifying, and seeking ways to remove, non-technical barriers to integration of renewables,

— *Cost-effective environmental abatement technologies for power production*

The aim is to reduce the environmental impact of power production focusing on the most polluting energy streams.

RTD priorities: emission abatement technologies for power stations (e.g. for reducing emissions of CO₂, SO_x, NO_x and other pollutants); hot gas cleaning; including understanding of basic scientific phenomena.

(ii) **Economic and efficient energy for a competitive Europe**

Objectives and RTD priorities

The aim of this key action is to provide Europe with a reliable, clean, efficient, safe and economic energy supply for the benefit of its citizens, the functioning of society and the competitiveness of industry. A more efficient use of energy is required with technologies capable of achieving substantial overall cost reductions and reduction of energy intensity, environmental impact and external dependence. Action will need to be taken at all stages of the energy cycle, production, distribution and final use, to improve efficiency and reduce costs. Work will focus on:

— *Technologies for the rational and efficient end use of energy*

The aim is to make a major step towards a sustainable energy system by substantially reducing the energy intensity of demand and making more effective, sustainable use of energy in the built environment, transport and industry (including agriculture). This requires the development and deployment of new technologies, improving existing technologies and dissemination and demonstration aimed at modifying user behaviour. RTD will focus on areas with the greatest potential to deliver sustainable use of energy.

RTD priorities: particular emphasis will be given to cross sectoral technologies, such as process control, and an integrated approach to improving energy efficiency in the built environment, transport and industry, including agriculture; lighting, space heating and cooling and the integration of renewables into buildings; improved energy and environmental performance of vehicles and the corresponding infrastructure, including fuels, energy storage, conversion, combustion and transmission; reduction of energy intensity of industrial processes where emphasis will be given to process integration, separation and drying,

— *Technologies for the transmission and distribution of energy*

The aim is to achieve the full potential of intelligent energy networks in optimising the efficiency of the whole energy system through improving the flexibility, reliability and competitiveness of energy transmission and distribution systems while reducing costs, transmission losses and environmental impact. Emphasis will be given to facilitate the integration of new sources of supply into European energy networks and to contribute to management of, and support to, liberalised energy markets.

RTD priorities: intelligent energy transmission and distribution systems; long-distance transmission of gas and electricity; optimised network management and control systems; optimal system efficiency for electricity, gas, and district heating and cooling systems; superconductivity,

— *Technologies for the storage of energy on both macro and micro scale*

The aim is to improve the efficiency and reduce the environmental impact of energy storage; at the macro scale in order to optimise the benefits of intermittent sources of renewable energy, at the medium-size scale to permit the development of zero-emission vehicles and at the micro scale to enable further downsizing of electronic devices.

RTD priorities: reliable and cost efficient energy storage technologies, including liquefied natural gas and liquefied petroleum gas, H₂, advanced batteries, both macro and micro, for stationary and mobile applications,

— *More efficient exploration, extraction and production technologies for hydrocarbons*

The aim is to allow more efficient identification of the energy resources available within the EU and to optimise their exploitation, reducing the costs and environmental impact of their production with the development of technologies which will be more competitive in global markets.

RTD priorities: improved tools for characterisation and management of hydrocarbon reservoirs; exploration and production technologies for hydrocarbons, especially for hostile subsea locations; reduced environmental impact and improved recovery techniques for hydrocarbons, including those of wider application for example for geothermal energy; recovery of hydrocarbons from coal beds,

— *Improving the efficiency of new and renewable energy sources*

The aim is to achieve the widest possible deployment of renewable energies by reducing the costs of their use in energy production and by advancing our understanding of the availability of renewable resources in Europe, improving the efficiency of the technologies and reducing the costs of their manufacture.

RTD priorities: biomass exploitation and management of waste as a fuel resource; improving efficiencies of photovoltaic cells and wind turbines; reducing costs of production of renewables technologies (e.g. turbine blades, PV modules),

— *The elaboration of scenarios on supply and demand technologies in economy/environment/energy systems and their interactions, and the analysis of the cost effectiveness (based on whole life costs) and efficiency of all energy sources*

The aim is to develop strategies for the production and use of energy, for the introduction of new energy technologies and for policy development.

RTD priorities: long- and short-term scenario analysis at the global, Community, and regional level of supply and demand in the context of economic developments, social and environmental needs; modelling and policy impact analysis; overall assessment of energy markets and technology impacts taking into account the operation of liberalised energy markets.

(b) **RESEARCH AND TECHNOLOGICAL DEVELOPMENT ACTIVITIES OF A GENERIC NATURE**

— Socioeconomic aspects of energy within the perspective of sustainable development (the impact on society, the economy and employment)

Objectives and RTD priorities

The aim is to develop and apply tools for assessing and monitoring the socioeconomic aspects of energy technologies, systems and services using a 'technology assessment' approach at the project level and a 'global systems analysis' approach at a much more general level.

RTD priorities: for technology assessment, the social dimension (e.g. behaviour, acceptance), the innovation dimension, including the 'command and control' measures and the impact of other policies, the assessment of the externalities and their internalisation and, finally, comparative assessment; for systems analysis, the understanding of the relationship between energy, environment, technologies and economic growth taking into account societal values and natural and human resources.

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

The specific programme will be implemented through the indirect RTD actions as provided for in Annexes II and IV to the fifth framework programme. In addition, the following rules specific to this programme will apply:

1. Accompanying measures

The accompanying measures will comprise in particular:

- studies on support of the specific programme, including the preparation of future activities,
- the exchange of information, conferences, seminars, workshops and scientific and technical meetings,
- recourse to external expertise, including access to scientific databases, in particular for the purposes of the monitoring of the specific programme provided for in Article 5(1) of the fifth framework programme, the external assessment provided for in Article 5(2) of the fifth framework programme and the evaluation of indirect RTD actions and the monitoring of their implementation,
- dissemination, information and communication activities, including scientific publications, activities for the exploitation of results and the transfer of technologies, encouragement of innovation financing and assistance with the protection of intellectual property,
- training schemes related to RTD activities covered by the specific programme other than Marie Curie fellowships,
- support for schemes to provide information and assistance for research players, including SMEs, and including the development of closer international scientific cooperation,
- support for promotion of common data structures and for data compatibility, standardisation, processing, management and exchange,
- recourse to external expertise in setting up and providing access to information, assistance and innovation promoting services and networks.

2. Financial participation rates

In the specific case of RTD projects, demonstration projects and integrated projects, the costs of use of research vessels, off-shore platforms and airborne platforms will be eligible costs. Details of these costs are set out in the work programme.

3. Additional rules for participation and dissemination

This programme is also open to legal entities established in third countries and international organisations which may participate on a project-by-project basis provided their participation contributes effectively to the implementation of the programme.

Such entities and international organisations may exceptionally receive financial support where their participation is beneficial and offers added-value for achieving the objectives of the programme.

4. Coordination arrangements

The Commission will endeavour to ensure complementarity between the indirect RTD actions under the programme, in particular by grouping them around a common objective, and to avoid duplication, while respecting the legitimate interests of proposers of indirect RTD actions. In this context, coordination will also be ensured by the two programme committees as appropriate.

As far as possible, coordination will also be ensured between actions under the specific programme and those carried out in:

- other specific programmes implementing the fifth framework programme,
- the research and training programmes implementing Council Decision 1999/64/Euratom of 22 December 1998 concerning the fifth framework programme of the European Atomic Energy Community (Euratom) for research and training activities (1998 to 2002)⁽¹⁾,
- other European research frameworks including Eureka and COST,
- other Community research-related instruments.

It will comprise:

- (i) the identification of common themes or priorities, resulting in particular in:
 - exchange of information,
 - the carrying out of work decided on jointly, entailing in particular the joint initiation of one of the procedures referred to in Article 9 of the rules for participation and dissemination;
- (ii) the reassignment of proposals for indirect RTD actions between specific programmes or between a specific programme and a research and training programme.

⁽¹⁾ OJ L 26, 1.2.1999, p. 34.