COMMISSION OF THE EUROPEAN COMMUNITIES

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Proposal for a

COUNCIL DECISION

adopting two specific research and technological development programmes in the field of the environment

STEP: Science and Technology for Environmental Protection

EOPCH: European Programme on Climatology and Natural Hazards

1989-1992

(presented by the Commission)

SUMMARY

Specific research and technological development programmes
in the field of environment

STEP (Science and Technology for Environmental Protection)

EPOCH (European Programme on Climatology and Natural Hazards)

1989 - 1992

The two programmes contribute to the implementation of line 1.3 of the Framework Programme for research and development (1987-1991). STEP covers the research topics specified under environmental protection, cultural heritage, major technological hazards and fire safety; EPOCH treats the topics under the heading climatology and natural hazards. They continue and expand the current programmes in these areas initiated in 1986.

The main objectives of the programmes are:

- to provide scientific and technical support for the environmental policy of the Community with an emphasis on developing preventative and anticipatory policies;

- to improve the productivity of the overall research effort in the Community, reduce overlaps and evaluate gaps in research coverage through the coordination of national R&D programmes in the field of environment;

- to promote overall scientific and technical quality in this field, as a contribution to the strengthening of the economic and social cohesion of the Community.

STEP comprises nine research areas:

- Environment and human health
- Assessment of risks associated with chemicals
- Atmospheric processes and air quality
- Water quality
- Soil and groundwater protection
- Ecosystem research
- Protection and conservation of the European cultural heritage
- Technologies for environmental protection
- Major technological hazards and fire safety.

EPOCH is sub-divided into four research areas:

- Past climates and climate change
- Climate processes and models
- Climatic impacts and climate-related hazards
- Seismic hazard.

The two programmes will be implemented through shared-cost research contracts, coordination activities (including concerted actions), education and training activities, studies and assessments.

The funding considered necessary for the two specific programmes under action line 1.3 of the Framework Programme is 115 million ECU, subdivided in 75 million ECU for STEP and 40 million ECU for EPOCH.

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DRAFT PROPOSAL FOR TWO SPECIFIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT PROGRAMMES IN THE FIELD OF ENVIRONMENT

STEP: Science and Technology for Environmental Protection

EPOCH: European Programme on Climatology and Natural Hazards

1989-1992

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1. INTRODUCTION

This proposal is a scientific response of the European Community to the environmental challenges of the nineties.

A number of environmental problems have been solved or alleviated since the 1972 Stockholm World Conference on the Environment and, in Europe, the initiation in 1973 of the EC policy for the environment and similar actions at national level. Yet concern for the environment is now greater than ever as new issues of an often more intractable nature have arisen. These vary in scale from the local, to the regional and the global.

Climate change due to the accumulation of greenhouse gases in the atmosphere and stratospheric ozone depletion are now more than a purely scientific concern. Together with them are other changes, also induced by human activities, which affect the functioning of the planetary ecosystem, and which are beginning to be addressed by a world-wide research programme, the IGBP (International Geosphere Biosphere Programme).

At regional level, widespread air pollution, due mostly to energy conversion and use, affects crops, forests, lakes, and human health. Waste disposal is causing international disputes. The use and release in the environment of synthetic organic chemicals is increasing continuously. Modern intensive agriculture has often a negative impact on the environment, which needs to be remedied. The quality of soils is being threatened and groundwater supplies are in danger of becoming unsuitable for human use. The reform of the CAP will create new environmental problems through the set aside of agricultural land which will be in danger of being left to abandon. Deforestation progresses at an alarming rate in the tropical zones. Plant and animal species become extinct at an increasing rate, reducing the potential of biological resources for the future. Over-exploitation of the land, coupled with climate extremes, increases erosion and leads to desertification in arid and semi-arid regions. Coastal waters are subject to eutrophication, marine life is threatened. Human mismanagement augments the risk and/or the impact of landslides, floods, fires, earthquakes. The potential risks of complex technology have been shown by a major nuclear and a number of important chemical accidents.

In facing many of these problems, the right strategy to adopt is difficult, if not impossible, to define because of insufficient knowledge of the phenomena involved, of their consequences on man and the environment, of the effectiveness of mitigating, remedial or adaptive measures and their undesirable impact. Extensive research into these issues must be pursued in the most efficient way.

This is not to say that policy actions should be postponed until a complete understanding is achieved. In most

cases, measures can already be taken that go in the right direction, but R & D is indispensible to refine and improve them and to identify technically-sound, cost-effective and socially acceptable environmental policies.

It is also true that high environmental standards make economic sense, as they may encourage industry to develop and exploit more sophisticated technologies, and to save on energy and raw materials.

Environmental research can be defined as aiming at risk assessment, in the broad sense of the word, while risk management is the object of environmental policy. Research and policy together should result in significant risk reduction.

There is much to say for international collaboration in environmental research, because of the generally transboundary nature of the problems, the interdisciplinary character of the work required, and the need to bring together the skills of scientists from various disciplines, engineers, economists and sociologists. Such co-operation is particularly useful for the member states of the European Community which share common environmental problems, a common policy and are being integrated in a large single market.

In fact, such a co-operation has been extant for a number of years and EC environmental research programmes have yielded a large volume of useful results, as recognised by two successive independent evaluation panels (1985 and 1988). The effectiveness of these programmes has been enhanced by the participation of European non-member states in the COST framework, as well as through specific co-operation agreements with other industrialised countries.

The current programmes were initiated in 1986. They include Environment Protection, Climatology and Natural Hazards, and Major Technological Hazards.

The new programmes proposed here aim at pursuing and expanding them. They are submitted to contribute to the implementation of line 1.3 of the Framework Programme for research and technological development (1987-1991), which stipulates that the purpose of environmental research is "to generate such sufficient knowledge in the fields of environmental protection, climatology and safety, as is necessary for the implementation of the Community environment policy and of the Community consumer protection policy, and for their further development; to contribute also to other relevant Community policies (energy, agriculture, industry, aid to developing countries)".

Furthermore, the two programmes will also address most of the scientific issues to be treated in the IGBP, also known as Global Change. Therefore, they would represent a first, albeit modest, contribution of the Community to this ambitious long-term enterprise, which could very well require a much more substancial effort on the part of Europe in the not so distant future.

A condensed version of the proposed programmes is presented here. Detailed descriptions are given in Working Papers XII/527/88 and XII/528/88.

The objectives of the programmes are:

1. to provide scientific and technical support for the environmental policy of the EEC with a special view of developing preventative and anticipatory policies;

2. to improve the overall research effort in the Community through the coordination of national R&D programmes;

3. to promote overall scientific and technical quality in this field, as a contribution to the strengthening of the economic and social cohesion of the Community.

With regard to the first of these objectives, research in support of environmental policy entails work either of a rather applied and short-term nature aimed at providing concrete answers to practical questions of policy, or long-term work aimed at the understanding of underlying phenomena which would provide the basis for measures to be taken in the more or less distant future, thus helping in the formulation of policies aimed at preventing problems, or making it possible to anticipate them.

The second objective is one which can be pursued simultaneously with the first one. Co-ordination has been fruitful in the past. National research projects have been pooled under various concerted actions, which have also involved non-member states under the COST system. In addition, transnational projects will be the rule in the new programme.

The third objective is not the least important. European research should be of the highest quality. EC co-ordinated projects by effects of synergy may contribute to higher standards and promote scientific productivity, as shown by a bibliometric study carried out in 1988 on behalf of the Evaluation Panel.

Public funding is important and indispensible in the field of environment where much of the research is aimed at the formulation of regulations and belongs definitely to the pre-competitive stage. Also industry recognised the necessity of basic work in the areas of ecology, toxicology and measurement methods as part of EC funded programmes.

2. SCIENTIFIC AND TECHNICAL CONTENT

The content of the programmes has been defined after numerous consultations and intensive discussions with the CGC and its related Working Groups, including with industry. Other Directorate Generals, in particular DGXI, have provided their research requirements.

The recommendations of the recent evaluation exercise have been taken fully into account. The Evaluation Panel recognised that the objectives achieved in the preceding programme correspond to those defined in the Council Decision. It also acknowledged the quality of the research undertaken and concluded that the funds were used effectively. Following the recommendations of the Panel, during the implementation of the programme, in particular in formulating appropriate calls for proposals, emphasis will be given to defining clear operational goals within the general and specific objectives of the programme.

In conclusion, and considering the funding constraints imposed by the Framework Programme, the present proposal covers two research programmes: STEP (Science and Technology for Environmental Protection) and EPOCH (European Programme on Climatology and Natural Hazards).

STEP covers the whole range of environmental research topics specified in line 1.3 of the Framework Programme under the headings "environmental protection", "cultural heritage", "major technological hazards" and "fire safety".

The programme is sub-divided into nine research areas:

1. Environment and human health: aiming at the protection of human health from environmental pollution (including the indoor environment) through early identification of groups at risk, quantification of exposure, identification of early effects and through epidemiological surveillance.

2. Assessment of risks associated with chemicals: in view of the assessment of the potential risks to human health and the environment from chemicals, in support of Community regulation.

3. Atmospheric processes and air quality: to elucidate the turn-over of pollutants in the atmosphere and to assess the impact of air pollution on terrestrial and aquatic ecosystems.

4. Water quality: aiming at the development and validation of analytical methods for the determination of water quality and the investigation of the transformation of pollutants in the aquatic environment as well as their effects on living targets.

5. Soil and groundwater protection: in order to generate a scientific basis for the protection of soil and the prevention of groundwater pollution.

6. Ecosystem research: for the acquisition of knowledge on structure, functioning and vulnerability of ecosystems in view of the definition of a long-term strategy for their protection, restoration and/or management.

7. Protection and conservation of the European cultural heritage: to provide a scientific basis for relevant aspects of Community cultural and environmental policies.

8. Technologies for environmental protection: to develop and assess processes for the treatment and disposal of waste, the reduction of emission, including by means of "clean technologies".

9. Major technological hazards and fire safety: to provide a scientific basis for the assessment of risks to the general population from potentially hazardous industrial activities and fire in buildings, the mitigation of accidents and the design of equipment for accident prevention, giving due consideration to human factors.

EPOCH is concerned with the study of climate, especially the climate change induced by greenhouse gases, and with hazards and risks associated with climate change and variability, and with other natural phenomena.

The programme is sub-divided into four research areas:

1. Past climates and climate change: the study of climatic conditions and climate change when man's influence upon climate was inexistent or negligible, to provide a better understanding of the climate system apart from man-induced changes. This will also provide a valuable mean for testing the power of mathematical models to simulate the real climate under known conditions.

2. Climate processes and models: to better understand the mechanism ruling the various components of the climate system in order to improve our ability to simulate and predict climate change, especially the change due to the greenhouse effect.

3. Climatic impacts and climate-related hazards: to understand the effects of climatic and hydrogeological factors, and especially of climate change, upon various sectors of the European environment (sea level, land and water resources) and the occurrence of hazardous phenomena (landslides, floods, wildfires).

4. Seismic hazard: to develop and improve the means for predicting, preventing and mitigating the seismic risk in Europe, not only in earthquake-prone areas, but also in low-seismicity areas, where nevertheless high risk objects (industrial and power plants, dams, etc.) exist.

Further particulars on the two programmes are found under Point 4 below.

3. FUNDING AND IMPLEMENTATION

Total funding, as determined by the implementation of the current Framework Programme, should not exceed 115 million ECU for the period covered by it. The proposed indicative distribution between the programmes is as follows.

STEP - 75 million ECU
EPOCH - 40 million ECU

The allocation of funds within each programme should be finalised after examination of the project proposals received and after taking the advice of the CGC. However, research on major technological hazards under STEP should be funded at the level of at least 12 million ECU in order to make a significant contribution. This again is in line with the recommendations of the Evaluation Panel.

The funds available will be used:

a) to finance shared-cost research contracts for projects submitted in response to public calls for proposals. The projects will be transnational as a general rule. While 50% EC contribution (or 100% of marginal costs for universities and research institutes) might be the base line, a flexible approach will apply;

b) to co-ordinate projects funded at national level, including the renewal of COST concerted actions;

c) for advanced cross-border training of scientists;

d) to carry out studies and assessments, upstream analysis, and programme planning activities;

e) to disseminate R & D results.

Efforts will be made to involve a broad spectrum of participants in the programme (research organisations, industry - including SME's, universities) through the distribution of information packages, and links with professional associations. It is to be expected that the first general call for proposals will be published in the first trimester of 1989. More specific calls will follow later. It is intended to base the calls for research proposals on well-defined projects which probably would permit an easier and more rational selection of proposals. The proposals will be assessed by independent experts on the basis of their quality, relevance to the programme, and prospect of success. The decision to fund will be made by the Commission after consultation with the CGC. As a rule, only well elaborated cooperative projects involving institutions from at least two Member States would be eligible for funding.

Appropriate interfaces will be established with other Community R & D programmes and activities relating to a smaller or greater extent to the field of environment: MAST (Marine Science and Technology), AFE (Actions in Favour of the Environment), REWARD (Recycling of Waste R & D), JOULE (non-nuclear energy), Wood, Agricultural Research, Radioprotection and Radioactive Waste Disposal. (STEP does not cover nuclear risk).

Particular emphasis will be given to co-ordination with the activities of the Joint Research Center relevant to the environmental field.

The association or involvement of European non-member states will be made possible through the COST system and through the bilateral framework agreements with EFTA countries.

The programme will be managed by the Commission with the assistance of CGC n°11, established by the Council resolution of June 1984.

In the scientific management of the programmes, the projects will, wherever suitable, be increasingly regrouped by themes or subthemes to be managed by a leading contractor who will coordinate the work of the participating research teams. In this way, the increase in staff can be kept far below the proportional increase in the budget, taking into account also the shorter time-span of the new programmes.

An independent overall evaluation will be carried out and will be the subject of reports prepared in accordance with the relevant Council Resolution and Communication from the Commission as well as with the provisions of Article 2 § 2 of the Framework Programme.

The evaluation will be based on the objectives of the programmes, on the general goals for each research area and on the appropriate operational goals which will be defined, in line with the opinion of the CGC, at the level of calls for proposals.

These operational goals will be rather narrow in areas of technological development, such as technologies for environmental protection, major technological hazards and fire safety, or seismic hazard. They will have to be defined in a broader sense in areas addressing long-term environmental problems such as ecosystem research or climate processes, where scientific creativity and finding the unexpected are important components.

4. CONDENSED DESCRIPTION OF THE TWO RESEARCH PROGRAMMES

4.1 STEP: Science and Technology for Environmental Protection

A) INTRODUCTION

STEP is a continuation and extension of the ongoing 4th Environment Protection Research Programme (1986-1990) and also includes the follow-up of the pilot programme on major technological hazards.

The scientific content of STEP covers the whole spectrum of research topics specified in chapter 1.3 of the Framework Programme under the headings "Environmental Protection", "Cultural Heritage", "Major Technological Hazards" and "Fire Safety" (except for those items handled primarily by the JRC).

In building upon the existing programme and in extending it, STEP addresses what are widely perceived to be the major environmental research issues of the early nineties climate change excepted; these are

- Air pollution and its effects on non-human targets (terrestrial and aquatic ecosystems).
- Stratospheric ozone.
- Assessment of chemicals.
- Environment and human health.
- Toxic waste disposal.
- Loss of biodiversity and conservation of species and their habitats.
- Agriculture and environment.
- Basic ecosystem research.
- Marine pollution and protection of the marine environment.
- Protection of the cultural heritage.

The above are to be seen in the overall context of global change, IGBP; STEP, together with EPOCH, will be implemented within a cohesive framework capable of making a significant contribution to the investigation of this salient issue of our time.

B) ACHIEVEMENTS OF THE PREVIOUS PROGRAMMES

A critical independent assessment of the achievements of the previous programmes is contained in two evaluation reports (1)(2), prepared by panels of eminent scientists (the evaluation made in 1985 covered also the relevant section of the JRC programme).

The Commission has published the results of these programmes in numerous reports; a number of open symposia and workshops also received wide attention. In most of the research areas, synthetic research reviews have been prepared which provide a comprehensive overview of the achievements in the various research areas.

(1) Evaluation Report No; 14, EUR 10.164, 1986
(2) Evaluation Report No. .., EUR ....., 1988

C) SCIENTIFIC CONTENTS

RESEARCH AREA 1 : ENVIRONMENT AND HUMAN HEALTH

General goal : New, preventive approach to the protection of human health from environmental pollution through early identification of groups at risk, quantification of exposure by means of target or organ loads, identification of early (reversible) effects and through advanced techniques of epidemiological surveillance; assessment of the impact of indoor air quality on human health.

1.1. Development of biological markers of exposure and preclinical effects:

- Development of methods for population monitoring and of systems to identify exposed individuals/groups and quantify internal exposure, target dose and lesions at the cellular and subcellular levels.

- Early indicators of adverse health effects due to exposure to environmental pollutants, to be of potential applicability to the general population.

1.2. Development of environmental epidemiology in the European Community

Development and application of epidemiological surveillance including the following:

- Comparative evaluation of data sets in Member States concerning environmental exposure and health statistics, investigation of the scope for data linkage.

- Development of methods to analyse data in order to identify adverse health effects due to environmental factors.

- Coordination of environmental epidemiology within the Community.

1.3. Indoor air quality and its impact on man

- Exposure determination
- Health effects measurements
- Collection of exposure and health related data.
- Development of methods to analyse data.

RESEARCH AREA 2 : ASSESSMENT OF RISKS ASSOCIATED WITH CHEMICALS

General goal : Establishment of methodologies for the assessment of potential risks from chemicals to human health and the environment, in support of existing and future Community regulations, in particular Directive 79/831/EEC.

2.1. Development and validation of protocols in the context of Directive 79/831/EEC for the assessment of health risks

Emphasis is given to the assessment of mutagenicity and carcinogenicity (quantitative mutagenesis and mechanisms, development of tests for non-genotoxic carcinogens, validation of tests for genomic mutations).

New directions to be considered include:

- Endpoints relevant to cancer, e.g. recombination, gene amplification, etc.

- Detection of specific germ cell mutagens.

- Development of a comprehensive *in vitro* assay for the detection of genotoxic effects at low exposure levels.

2.2. Alternatives to the use of animals in chemicals testing

Research in this field is intended to support recent Community regulations on the protection of animals by improving the scientific basis for the development of methods which replace or reduce the use of animals in toxicological tests, without loss of overall capability for risk assessment.

The effort within the Programme will focus on a few critical topics:

- Metabolic activation by preparations not derived from laboratory animals.

- Measurements of mutations based on DNA technology.

- New toxicity tests based on cell cultures.

2.3. Assessment procedures for the abiotic degradation of chemicals

Emphasis will be given to the simulation of degradation reactions in the absorbed state and to the investigation of suitable carrier materials.

2.4. Research on the assessment of ecological effects of chemicals

Development of integrated tests for "level 1" and "level 2", such as:

- Test methods for the terrestrial and marine environment, using sensitive and representative organisms.

- Development of comparative quantitative laboratory, microcosm and field tests for the prediction of cross-media effects from chemicals.

- Improvement and validation of models linking laboratory data to estimated exposure and effects in the environment.

2.5. Refinement and application of quantitative structure/activity relationships (QSAR's)

QSAR's are of increasing promise and relevance to current important environmental policy considerations; research will consist of testing the validity and applicability of the main types of QSAR approaches, both for health and ecological effects.

RESEARCH AREA 3 : ATMOSPHERIC PROCESSES AND AIR QUALITY

General goal : Elucidation of important physico-chemical processes in the atmosphere and assessment of the impact of air pollution on terrestrial and aquatic ecosystems.

3.1. Tropospheric chemistry, including analysis, sources, transport and deposition of pollutants and other airborne substances

Research will concentrate on the following topics:

- Analysis of pollutants, in particular development of equipment and methodologies, standardization of measurements.

- Laboratory research to investigate the mechanisms and rates of reactions of importance in the atmosphere.

- Field measurements to quantify emissions, transport and deposition.

3.2. Stratospheric chemistry, ozone depletion and related issues

Research on this subject, which is complementary to and implemented together with climatic impact studies within EPOCH, encompasses:

- Tropospheric concentrations and fluxes of key source gases of both natural and anthropogenic origin, including their chemistry and dynamics in the troposphere.

- Laboratory investigations of key processes in stratospheric chemistry.

- Field measurements related to stratospheric ozone depletion.

- Development and validation of models to describe and predict changes in stratospheric ozone.

- Assessment of risks to human health and of ecological consequences of stratospheric ozone depletion.

3.3. Air pollution effects on terrestrial and aquatic ecosystems

Research in this area carries three main goals, namely the direct or indirect impact of air pollution on:

- Agricultural productivity, including economic aspects

- Terrestrial ecosystems, in particular forests (tree physiology, interaction with other stresses, early diagnosis, etc.)

- Aquatic ecosystems (reversibility of acidification, geochemical aspects, impacts on aquatic communities etc.).

RESEARCH AREA 4 : WATER QUALITY

General goal : Development and validation of analytical methods for the determination of water quality and specific pollutants, investigation of the transformation of pollutants in the aquatic environment and of the ecological effects of pollutants.

4.1. Analysis and conversion of pollutants

Research will cover in particular:

- Basic analytical techniques, including sampling and sample treatment; analysis of selected classes of compounds, and collection and treatment of analytical data.

- Behaviour of organic micropollutants in the aquatic environment (distribution and transport mechanisms, structure/activity relationships, bioavailability and bioaccumulation).

- Transformation reactions in the aquatic environment (chemical and photochemical reactions and biological transformations).

- Behaviour and transformation of organic micropollutants in water-treatment processes.

4.2. Effects of pollutants

Research will cover:

- The assessment of the ecological effects of selected pollutants to be identified case by case.

- The study of phenomena linked to an excess of nutritional elements, in particular in the coastal and estuarine environment.

RESEARCH AREA 5 : SOIL AND GROUNDWATER PROTECTION

General goal : Development of a scientific basis for the protection of soil and the prevention of groundwater pollution.

5.1. Protection against inorganic pollutants

Research will cover:

- Pollution by metals: sorption, precipitation/remobilisation, complex formation, transport; uptake by and effects on plants, soil fauna and microorganisms.

- Excessive fertilisation, in particular with regard to nitrogen and phosphate (retention vs. transport to groundwater, modelling of transport, nitrification and denitrification, emissions to the atmosphere).

- Acidification due to atmospheric input.

5.2. Protection against organic pollutants

Sorption and mobilisation, transport, biological and chemical transformation, uptake by and effects on plants, soil fauna and microorganisms.

5.3. Effects of agricultural and forestry practice

- Completion and validation of the EC erosion model

- Effects of mechanical treatment and drainage on soil structure and erosion, including soil compaction

- Effects of set-aside of agricultural land.

RESEARCH AREA 6 : ECOSYSTEM RESEARCH

General goal : Acquisition of knowledge on the functioning of ecosystems to support the establishment of a long-term strategy for their protection, restoration and/or management.

6.1. Terrestrial ecosystems

Research will focus on the following topics:

- Basic processes and patterns (biological and non-biological compartments).

- Ecological studies of populations and species.

- Studies on the optimum conditions for habitat conservation, and development of management strategies.

- Impact of stressors, such as natural stressors, pollution input, anthropogenic activities, specific stresses (e.g. controlled and incidental burning, resource exploitation), loss of genetic diversity and spread of gene-manipulated organisms.

6.2. Aquatic and coastal ecosystems (including wetlands)

Research will deal with a wide range of aquatic ecosystems:

- Coastal benthic ecosystems focussing essentially on the investigation of the vulnerability of near-shore ecosystems, such as the intertidal and subtidal benthic communities along the North Sea and Atlantic coast and specific Mediterranean ecosystems (e.g. Posidonia).

- Alpine lakes.

- Functioning of wetland and river margin ecosystems.

Particular importance will be given to the interaction between connected ecosystems, e.g. rivers/estuarine environment with emphasis on pollutant cycles.

RESEARCH AREA 7 : PROTECTION AND CONSERVATION OF THE EUROPEAN CULTURAL HERITAGE

General goal : Establishment of a scientific basis for the protection of cultural heritage in material form in support of Community cultural and environmental policies.

7.1. Assessment of the mechanisms of the deterioration

Weathering (natural and under the influence of pollutants); physical, chemical and biological decay mechanisms and their interactions.

7.2. Critical environmental factors

Microclimate studies, transport and deposition processes, etc.

7.3. Damage Assessment

Development of methods and techniques for damage assessment.

7.4. Material characterization

Comparative evaluation of various types of materials with regard to their stability against pollution impact.

7.5. Conservation techniques

Assessment of the performance of materials and methods employed in conservation and restoration.

RESEARCH AREA 8 : TECHNOLOGIES FOR ENVIRONMENTAL PROTECTION

General goal : Design and assessment of processes for the treatment and disposal of waste and the reduction of emissions; development of clean technologies.

8.1. Waste Research

Research will be concerned with utilisation, recycling and disposal of:

- Organic wastes (sewage sludge, liquid agricultural waste, etc.) in close cooperation with REWARD in the Materials Programme and EC demonstration activities (DG XI, DG XVII).

- Toxic and dangerous waste, with particular emphasis on characterization of waste, specific treatment processes to facilitate disposal, specific destruction or recycling

processes and biotechnological processes for waste treatment (in close cooperation with the Biotechnology R&D Programme).

- Research will also cover waste disposal on land, with particular emphasis on environmental impact assessment for the design of waste disposal sites, risk assessment and reclamation of abandoned disposal sites.

8.2. Emission abatement

Research will concentrate on:

- Reduction of emissions to the atmosphere (insofar as not covered by the JOULE Programme).

- Advanced technologies for waste water treatment.

- Application of biotechnological processes.

8.3. Clean technologies

The development of new, low emission processes or process-integrated abatement technologies, concentrating on the following industrial sectors:

- Chemical industry
- Metallurgy
- Metal finishing and coating
- Fibres and textiles
- Tanning

Research will be complementary to, and serve as a basis for, the promotion of pilot and demonstration projects under Council Regulation EEC 2242/87 (DG XI).

RESEARCH AREA 9 : MAJOR TECHNOLOGICAL HAZARDS AND FIRE SAFETY

General goal : Development of the scientific basis for the assessment of risk to the general population from major industrial accidents and from fire in buildings and the investigation of possibilities for preventing and mitigating such accidents.

9.1. Physical and Chemical Phenomena

- Phenomenology of release and early stages of dispersion of gases and aerosols.

- Dispersion over large areas with emphasis on dense gases and aerosols.

- Combustion: conditions for generation of destructive blast pressures; blast propagation and formation of large fires and fireballs; fire development and growth in buildings.

9.2. Technologies of Accident Prevention

- Safety and reliability of existing technologies and their improvement for production, storage and transport of dangerous goods, safety devices; possible measures to mitigate accidents (e.g. water sprays).

- Alternative technologies: avoidance or reduction of hazardous intermediates or products; avoidance of hazardous operating conditions.

- Instrumentation: early warning and detection devices/systems and their coupling with mitigation installations.

9.3. Evaluation and Management of Risk

- Hazard analysis: systematic procedures for identification and quantification of risk.

- Management of risk: organisational systems; risk perception by the public; acceptable risk levels; socio-economic effects of risk control regimes.

- Human factors: role of man in production processes; workplace design; man-machine interaction; population behaviour in case of accidents and fires.

D) LINKS TO AND COOPERATION WITH OTHER COMMUNITY PROGRAMMES

Utmost importance will be given to complementarity and close coordination with the relevant sections of the JRC programme.

In many areas, such as atmospheric chemistry and erosion, joint implementation with EPOCH is envisaged.

The new programme REWARD (Recycling of Waste R & D) is under the same management as STEP, permitting an integrated approach to waste management.

As regards the marine environment, joint operations with the MAST programme (Marine Science and Technology) are foreseen in a number of research fields.

The sociological and economic aspects will be treated in close cooperation with the FAST-programme and with the European Foundation for the Improvement of Living and Working Conditions, Dublin.

The very nature of environmental research generates interfaces and connections with numerous other Community R&D programmes; wherever appropriate, close links with these programmes will be established, in particular with JOULE, Raw Materials, Radiation Protection, Biotechnology, Medical Research, Science and Technology for Development, Agricultural Research, the Fisheries Programme (DG XIV), CORINE and the demonstration programmes on Clean Technologies and Waste (DG XI) and Energy (DG XVII).

E) ASSOCIATION OF NON-MEMBER STATES AND INTERNATIONAL COOPERATION

European non-Member Countries may be either associated with the programme within the context of existing Framework Agreements for scientific and technical cooperation, or with specific concerted actions through COST-agreements.

The Commission will also endeavour to strengthen cooperation with non-European states in appropriate research areas.

STEP will provide input for a Commission participation in EUREKA projects, e.g. EUROTRAC and EUROCARE.

Cooperation with relevant international programmes will be further enhanced, in particular with the research activities of WHO and UNEP; formal participation in programmes such as IGBP of ICSU may be envisaged.

F) IMPLEMENTATION OF THE PROGRAMME

As regards research in the narrow sense, STEP will be implemented by:

- Contract research
  Shared-cost contracts will be funded on the basis of calls for proposals specifying, where appropriate, specific well defined cooperative projects; transnational cooperation will be the general rule.

- Concerted actions
  Concerted actions will normally be implemented within the COST framework and aim to coordinate research funded nationally; it may be complemented by contract research to fill the gaps. In addition to the overall coordination, the implementation of specific strategic projects will be promoted.

- Coordination activities
  In addition to formal concerted actions, less formal and sometime ad hoc coordination mechanisms will be established to promote specific projects.

These activities will be complemented by:

- Training, in particular by grants for students and post-graduates.

- Assessments and upstream analyses with a particular emphasis on reviewing and presenting scientific results and generating reports for immediate use for environmental regulation and management.

4.2 E P O C H: European Programme on Climatology and Natural Hazards

A) INTRODUCTION

EPOCH (European Programme on Climatology and Natural Hazards) is a continuation and extension of the ongoing R&D programme on Climatology (1986-1990).

As regards the scientific contents, EPOCH has been drafted as a reply to the following questions :

- Which are the main and most urgent problems to be solved in the field of climate change and natural hazards, especially as regards Europe ?
- What knowledge is most needed in order to solve them ?
- How can that knowledge be obtained ?
- Therefore, which areas have to be investigated, and which research guidelines should be provided.

While in the ongoing programme the section "Natural Hazards" was limited to a pilot action in the field of seismic risk, EPOCH represents an effort to meet more effectively the concerns of most Member States of the Community, and therefore covers a fuller range of hazards (landslides, storms and floods, forest fires, seismic phenomena). As regards climatic impacts, a greater stress is put on subjects such as the effects of climate change on sea level rise, on vegetation, agriculture and water resources and on land degradation leading to desert-like conditions in Europe, especially under conditions of progressive drought.

In so doing, EPOCH is fully in line with the terms of reference specified by the Framework Programme for research in the field of Climatology and Natural Hazards, thus :

"Research on Climatology and Natural Hazards will focus on efforts to understand the mechanisms which govern the phenomena concerned, e.g. by developing powerful models capable of forecasting such phenomena in temporal and spatial scales useful for planning and prevention, by refining our ability to assess impacts upon specified segments of European Community geography, society and economy, and by establishing a sound scientific basis for any preventive or corrective measure"(1).

B) ACHIEVEMENTS OF THE PREVIOUS PROGRAMMES

For an assessment of the achievements of the previous programmes (1981-1985 and 1986-1990) reference is made to the Evaluation Report (2). In particular, the Panel stated that it "was impressed by the degree of structural unity, transnationality and interdisciplinarity in the programme", while its activities appear "to have been well chosen, of high standard, and well carried out".

(1) OJ L 302 of 24.10.1987, p. 7
(2) Evaluation Report No. ...., EUR ...., 1988.

The results of the research conducted under the previous programmes have been published in various books and reports, most of which were the outcome of contact group meetings, symposia and workshops, among which the symposium held in Brussels in November 1986 to assess the current scientific consensus concerning the climate change due to greenhouse gases, and the associated impacts.

C) SCIENTIFIC CONTENTS OF THE PROGRAMME

1. RESEARCH AREA 1 : PAST CLIMATES AND CLIMATE CHANGE

General goal : The study of climatic conditions and climate change when the influence of man upon the climate system was inexistent or negligible. This should provide a better understanding of the functioning of the climate system (atmosphere, oceans, biosphere, cryosphere) apart from changes induced by man's activities.

1.1. Modelling of extremes

Modelling past climate fluctuations leading to extreme climates (e.g. ice ages) for which typical parameters are known from proxy data. This should help to asses the power of mathematical models to simulate the real climate under known conditions.

1.2. Transient behaviour of the European climate : data and modelling

Reconstruction from proxy data and model simulations of past climates, aimed at understanding long-term variations (astronomical time scales) in relation to the corresponding atmospheric concentrations of CO_2.

2. RESEARCH AREA 2 : CLIMATE PROCESSES AND MODELS

General goal : To understand the mechanisms ruling the various components of the climate system, and their interactions, in order to improve the physical formulation and the parametrization of climate models, and hence our ability to predict climate change.

2.1. Climate change detection, modelling and prediction, especially as regards greenhouse gas effects.

The improvement, testing and validation of climate models in order to enhance their predictive ability with the objective of improving the regional details of prediction of climate change in Europe.

2.2. The global carbon cycle

Multidisciplinary research of the global carbon cycle including biological, geochemical and modelling aspects. This would provide an essential contribution to our understanding of carbon dioxide sources and sinks, especially in view of determining future atmospheric CO_2 levels.

2.3. Land surface processes

Observation and modelling of the land surface characteristics, which determine the fluxes of energy, mass and momentum between soil and atmosphere.

2.4 Climatic aspects of ozone changes and troposphere-stratosphere interactions

Data collection and modelling studies to investigate the relations between changes in ozone concentration and climate. Research on this topic is complementary to stratospheric chemistry research foreseen in the STEP programme, and will be implemented in common.

2.5. Cloud-radiation interactions

Study and modelling of the role of clouds in energy and mass transfer within the climate system.

2.6. Ocean circulation and air-sea fluxes

Ocean circulation studies for climate modelling, especially as regards CO_2 absorptivity in relation to ocean water temperature.

2.7. Cryospheric processes

Modelling of ice sheets, in order to understand their formation, stability and disappearance, especially in rapid deglaciation processes.

3. RESEARCH AREA 3 : CLIMATIC IMPACTS AND CLIMATE-RELATED HAZARDS

General goal : To understand the effects of climatic and hydrogeological factors, and especially of climate change, upon various sectors of the European environment.

3.1. Sea level change

Research on the climatic and geological factors determining future sea level change, hazard of storm surges for European coasts, as well as the impacts to be expected from sea level rise for natural ecosystems and coastal land use in Europe.

3.2. Climatic impacts on land and water resources

Assessing the perturbations which a climate change could induce in the complex relations between vegetation and edaphic parameters. The impacts of increasing CO_2 in a changing climate on European forests and crops.
Models capable to characterise the effects of climate change on hydrological systems (surface and ground water supplies).

3.3. European land degradation and desertification in a changing climate

Effects of climatic and meteorological factors on soil erosion, especially in areas within Europe where such degradation has led to desert-like conditions.

3.4. Instability and erosion of natural slopes

Physical and human factors leading to the erosion and instability of natural slopes, such as can produce large-scale destructive landslides. Mapping of areas at risk, classification of instability processes in relation to climate, lithology, geological structure, morphology, active erosion. To develop methods of prevention, control and rehabilitation.

3.5. Storms and floods

Understanding, preventing and mitigating the risks associated with floods and related hazards. Methods and methodologies for the study, forecast and control of floods, and for flood hazard assessment. Ascertain how land use practices and human works have created conditions favourable to the occurrence or the aggravation of floods. Application of radar and satellite data to forecast and track severe storms, and to improve the hydrological models of catchment behaviour.

3.6. Wildfires

Understanding the conditions favouring or preventing the occurrence and spread of forest fires (ecosystem biomass, structure of vegetation, properties of vegetation fuels). Development of methods for forecasting fire severity and frequency.

4. RESEARCH AREA 4 : SEISMIC HAZARD

General goals : To develop and improve the means for predicting, preventing and mitigating the seismic risk in Europe, not only in earthquake-prone areas, but also in low-seismicity areas where nevertheless high-risk objects (industrial and power plants, dams, etc.) exist.

4.1. Strong-motion measurements

Research and data analysis concerning various aspects of ground motion during strong earthquakes (ground acceleration and velocity).

4.2. European data centres and information services

Creation of European facilities (networked data centres) for the collection and exchange of relevant data, and for the dissemination of elaborated information to civil authorities, press media and the public, concerning the on-going seismic activity.

4.3. Multidisciplinary earthquake prediction studies

Identification and mapping of both seismological and non-seismological precursors of earthquakes, such as long-term regularities and seismic gaps, variations in the seismicity patterns, active faults, geophysical precursors (e.g. geoelectric, geomagnetic, electrotelluric, gravity), ground water and gas emissions, ground deformations, etc.

4.4. Risk assessment including methods of evaluating seismic vulnerability of housing stock, lifelines, historical buildings and monuments

Vulnerability assessment studies based on analyses of past damage. Studies of different types of structures to estimate vulnerability functions. Survey of objects at risk and impact studies of the consequences of earthquakes. Study of the effectiveness of existing codes and regulations.

4.5. Establishment of a task force for scientific field missions after a destructive earthquake

Constitution of a body of volunteer scientists to be rapidly mobilised and engaged in scientific field missions soon after a destructive earthquake.

D) LINKS TO AND COOPERATION WITH OTHER COMMUNITY PROGRAMMES

Cooperation, or common coordination of selected activities, is foreseen first of all with the STEP programme, e.g. in the field of research on the stratospheric ozone depletion.

Cooperation is also to be foreseen with the Remote Sensing programme of the JRC, possibly in the framework of the DG XII coordination action of space activities; with DG VI as regards forest fires; with DG XI as regards the programme CORINE and the analysis of policy options to face the impacts of the foreseen climate change, with DG XII/E-5 and DG XVII as regards the relationship between energy policies and climate change.

E) ASSOCIATION OF NON-MEMBER STATES AND INTERNATIONAL COOPERATION

The programme is open to cooperation with non-member states through the COST organisation. An agreement of cooperation already exists with Switzerland. Informal cooperation is going on with the US Department of Energy (CO_2 programme). Similar links are developing with Canada and, as regards palaeoclimatic research, with the European Science Foundation.

EPOCH also covers a large part of the research subjects foreseen in the IGBP programme, and this should be the basis for future links and cooperation with that programme.

A similar remark applies to the World Climate Research Programme and the World Climate Impact Programme.

F) IMPLEMENTATION OF THE PROGRAMME

EPOCH will be implemented by various means.

(a) Research work will be supported through

(i) Shared-cost contract research, whereby transnational European projects will be funded;

(ii) Coordination activities, through the continuation of the established groups of European scientists, to enhance cooperation at large between teams not receiving research funds from the EC. Some of these activities may be reinforced by research contracts to support key projects in relevant areas.

(b) Education and training activities will be pursued through

(i) The reinforcement of the already established European School of Climatology and Natural Hazards, through annual or biennial courses on selected relevant topics, to be held in cooperation with various European research institutions;

(ii) Sectoral grants for European graduates and post-graduates in fields relevant to climatology and natural hazards;

(iii) The publication of a series of books and monographs dealing with important topics relevant to the research areas of the programme and meeting the needs of different kinds of concerned audiences.

II

(Preparatory Acts)

COMMISSION

Proposal for a Council Decision adopting two specific research and technological development programmes in the field of the environment (1989 to 1992):

— STEP: Science and technology for environmental protection

— EPOCH: European programme on climatology and natural hazards

COM(88) 632 final — SYN 168

(Submitted by the Commission on 24 November 1988)

(88/C 327/06)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 130Q (2) thereof,

Having regard to the proposal from the Commission,

In cooperation with the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas Article 130K of the Treaty provides that the framework programme shall be implemented through specific programmes developed within each activity;

Whereas by its Decision 87/516/Euratom, EEC (1), the Council adopted a framework programme of Community research and technological development (1987 to 1991), providing *inter alia* for activities in the field of the environment;

Whereas, for the selection of Community actions, the framework programme sets out criteria among which is that of contributing to the strengthening of the economic and social cohesion of the Community, consistent with the pursuit of scientific and technical quality;

Whereas the Council of the European Communities and the Representatives of the Member States, meeting within the Council, declared in their Resolution of 19 October 1987 on the continuation and implementation of a European Community policy and action programme on the environment (1987 to 1992) (2) that improving the scientific bases of environment policy, *inter alia* through appropriate research programmes, was one of the priority areas of Community action;

Whereas the participation of certain European non-member States in a Community R&D programme in the field of the environment would be beneficial;

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

HAS ADOPTED THIS DECISION:

Article 1

Two specific research and technological development programmes for the European Economic Community in the field of the environment, as defined in the Annex, are hereby adopted for a period of four years, starting from . . .

Article 2

The amount deemed necessary for the execution of the two programmes is Ecu 115 million, including expenditure on a staff of 30, subdivided as follows:

— STEP (Science and technology for environmental protection): Ecu 75 million,

— EPOCH (European programme on climatology and natural hazards): Ecu 40 million.

Article 3

Detailed rules for the implementation of the programmes and the rate of the Community's financial participation are set out in the Annex.

(1) OJ No L 302, 24. 10. 1987, p. 1.

(2) OJ No C 328, 7. 12. 1987, p. 1.

Article 4

1. In the third years of the programmes' implementation, the Commission shall undertake a review of the programmes and shall report to the Council and the European Parliament on the results thereof, together, if necessary, with any proposals for modification or prolongation.

2. An evaluation of the results achieved shall be conducted by the Commission, which shall report thereon to the Council and the European Parliament.

3. The abovementioned reports shall be established having regard to the objectives set out in the Annex and in conformity with the provisions of Article 2 (2) of Decision 87/516/Euratom, EEC on the framework programme.

Article 5

1. The Commission shall be responsible for the execution of the two programmes and shall be assisted in their implementation by the Management and Coordination Advisory Committee (CGC) on Environment and Climatology, set up by Council Decision 84/338/Euratom, ECSC, EEC (1).

2. The contracts entered into by the Commission shall regulate the rights and obligations of each party, including the methods of disseminating, protecting and exploiting the research results.

Article 6

1. The Commission is hereby authorized to negotiate, in accordance with Article 130n of the Treaty, agreements with non-member States and international organizations, in particular with those countries participating in European cooperation in the field of scientific and technological research (COST), and those having concluded framework agreements for scientific and technical cooperation with the Community, with a view to associating them wholly or partly with the programmes.

2. Where framework agreements for scientific and technical cooperation between non-member States and the European Communities have been concluded, organizations and enterprises established in those countries may participate in a project undertaken within these programmes.

Article 7

This Decision is addressed to the Member States.

(1) OJ No L 177, 4. 7. 1984, p. 25.

ANNEX

I. OBJECTIVES

Environmental issues in one form or another, whether air pollution, groundwater quality or the greenhouse effect, pervade almost every aspect of human life. This is reflected in the three objectives which are shared by the two programmes, STEP (Science and technology for environmental protection) and EPOCH (European programme on climatology and hazards), namely

— the provision of scientific and technical support for the environmental policy of the Community, and for other relevant Community policies such as energy, agriculture, industry, aid to developing countries, both for the solution of short term policy questions and for the medium and long-term formulation of preventive and anticipatory policies;

— the further improvement of the productivity of the overall research effort in the Community, the reduction of overlaps and the identification of gaps, through the coordination of the national R&D programmes in the field of environmental research;

— the promotion of overall scientific and technical quality in the field of environmental research, as a contribution to the strengthening of the economic and social cohesion of the Community, R&D capabilities at the highest level in all parts of the Community being one of the prerequisites for its harmonious development.

II. CONTENTS

STEP (Science and technology for environmental protection)

RESEARCH AREA 1:

Environment and human health

1.1. Development of biological markers of exposure and preclinical effects

1.2. Development of environmental epidemiology in the European Community

1.3. Indoor air quality and its impact on man

RESEARCH AREA 2

Assessment of risks associated with chemicals

2.1. Development and validation of protocols in the context of Directive 79/831/EEC for the assessment of health risks

2.2. Alternatives to the use of animals in chemicals testing

2.3. Assessment procedures for the abiotic degradation of chemicals

2.4. Research on the assessment of ecological effects of chemicals

2.5. Refinement and application of quantitative structure/activity relationships (QSARs)

RESEARCH AREA 3

Atmospheric processes and air quality

3.1. Tropospheric chemistry, including analysis, sources, transport and deposition of pollutants and other airborne substances

3.2. Stratospheric chemistry, ozone depletion and related issues

3.3. Air pollution effects on terrestrial and aquatic ecosystems

RESEARCH AREA 4

Water quality

4.1. Analysis and conversion of pollutants

4.2. Effects of pollutants

RESEARCH AREA 5

Soil a d groundwater protection

5.1. Protection against inorganic pollutants

5.2. Protection against organic pollutants

5.3. Effects of agricultural and forestry practice

RESEARCH AREA 6

Ecosystem research

6.1. Terrestrial ecosystems

6.2. Aquatic and coastal ecosystems (including wetlands)

RESEARCH AREA 7

Protection and conservation of the European cultural heritage

7.1. Assessment of the mechanisms of the deterioration

7.2. Critical environmental factors

7.3. Damage assessment

7.4. Material characterization

7.5. Conservation techniques

RESEARCH AREA 8

Technologies for environmental protection

8.1. Waste research

8.2. Emission abatement

8.3. Clean technologies

RESEARCH AREA 9

Major technological hazards and fire safety

9.1. Physical and chemical phenomena

9.2. Technologies of accident prevention

9.3. Evaluation and management of risk

EPOCH (European programme on climatology and natural hazards)

RESEARCH AREA 1

Past climates and climate change

1.1. Modelling of extremes

1.2. Transient behaviour of the European climate: data and modelling

RESEARCH AREA 2

Climate processes and models

2.1. Climate change detection, modelling and prediction, especially as regards greenhouse gas effects

2.2. The global carbon cycle

2.3. Land surface processes

2.4. Climatic aspects of ozone changes and troposphere-stratosphere interactions

2.5. Cloud-radiation interactions

2.6. Ocean circulation and air-sea fluxes

2.7. Cryospheric processes

RESEARCH AREA 3

Climatic impacts and climate-related hazards

3.1. Sea level change

3.2. Climatic impacts on land and water resources

3.3. European land degradation and desertification in a changing climate

3.4. Instability and erosion of natural slopes

3.5. Storms and floods

3.6. Wildfires

RESEARCH AREA 4

Seismic hazard

4.1. Strong-motion measurements

4.2. European data centres and information services

4.3. Multidisciplinary earthquake prediction studies

4.4. Risk assessment including methods of evaluating seismic vulnerability of housing stock, lifelines, historical buildings and monuments

4.5. Establishment of a task force for scientific field missions after a destructive earthquake

III. IMPLEMENTATION

The programmes shall be implemented by means of (i) shared-cost research contracts, (ii) concerted actions, (iii) coordination activities, (iv) education and training activities and (v) studies and assessments.

The programmes are open to universities, research organizations and industrial companies, including small and medium-sized enterprises, individuals, or any combination thereof established in the Community. As a rule projects must be transnational.

The association and involvement of non-member States, international and national organizations will be founded on the criterion of mutual advantage. In the case of European non-member States, their association and involvement will be made possible through the COST system and through the bilateral framework agreements with EFTA (European Free Trade Association) countries.

For shared-cost contracts, the Community participation will generally be 50 % of the total expenditure, but this percentage may be varied according to the nature and the stage of development of the research. In respect of universities and research institutes carrying out projects, the Community may bear up to 100 % of the additional expenditure involved.

IV. EVALUATION CRITERIA

The Commission's Communication to the Council concerning a Community Plan for Action relating to the evaluation of Community research and development activities for the years 1987 to 1991 (COM(80) 660 final) states that the objectives and milestones of each research programme have to be set out in a testable form.

1. The first objective of the two programmes is the provision of scientific and technical support for the environmental policy of the Community, and for other relevant Community policies.

   Taking into account the general goals of the separate research areas to the programmes, the evaluation criteria should consist of the following:

   — the scientific and technical progress made, contributing to the solution of short term policy questions;

   — the advances in the understanding of environmental processes as a basis for the medium and long term formulation of preventive and anticipatory policies;

   — the contribution to the definition of norms and standards.

2. The coordination of national R&D programmes will be evaluated by criteria such as:

   — the added value due to coordination which was not obtainable in one national programme alone;

   — the repartition of research tasks between national programmes as a result of coordination.

3. The promotion of overall scientific quality in the field of environmental research, as a contribution to the strengthening of the economic and social cohesion of the Community, will be evaluated by criteria such as:

   — the degree of transnationality of the research projects;

   — the participation in training and educational activities;

   — the application of the results obtained, to regions of the Community other than those where the research was conducted;

   — the quality of environmental research as measured by suitable bibliometric studies.

FINANCIAL DATA
CONCERNING THE R & D PROGRAMMES
IN THE FIELD OF ENVIRONMENT
(Indirect and concerted actions)

1989-1992

FRAMEWORK PROGRAMME ITEM: 1.3 ENVIRONMENT

Budget Heading: ENVIRONMENT

Article: 731

Item: 7314

Entitled	Budget (in MECU)	Staff
STEP (Science and Technology for Environmental Protection)	75	20
EPOCH (European Programme on Climatology and Natural Hazards)	40	10
Total	115	30

GLOBAL FINANCIAL STATEMENT

1. Total cost over duration:
(million ECU)

- From the budget of the Community: 115.000
- From other sectors at national level: 105.541

1.1 a) Commitment schedule

	1989	1990	1991	1992	Total
Staff	0.215*	0.652*	2.675	2.785	6.327
Administration	0.415	0.432	1.120	1.165	3.132
Contracts	9.870	55.416	19.205	21.050	105.541
Total	10.500	56.500	23.000	25.000	115.000

b) Payment appropriations

	1989	1990	1991	1992	1993	Total
Staff	0.215	0.652	2.675	2.785	-	6.327
Administration	0.415	0.432	1.120	1.165	-	3.132
Contracts	2.370	24.416	31.205	36.050	11.500	105.541
Total	3.000	25.500	35.000	40.000	11.500	115.000

* 19 staff members (11A, 2B, and 6C) are covered by the previous programmes in 1989 and 1990 and will be transferred to the new programmes as follows:

STEP - 8A, 2B, 5C
EPOCH - 3A, 1C

FINANCIAL STATEMENT

1. BUDGET TITLE

STEP (Science and Technology for Environmental Protection).

2. LEGAL BASIS

Article 130 Q.

3. PROGRAMME DESCRIPTION AND OBJECTIVES

STEP is a continuation and extension of the ongoing 4th Environmental Research Programme (1986-1990). It covers the whole spectrum of research topics specified in Chapter 1.3 of the Framework Programme under the headings "Environmental Protection", "Cultural Heritage", "Major Technological Hazards" and "Fire Safety".

The programme has the following main objectives:

a) to provide scientific and technical data which support the Community Environment Policy;

b) to address longer-term environmental problems, thus preparing the way for the development of preventative and anticipatory policies taking account of foreseeable environmental trends, and to provide the means to evaluate the effectiveness of current environmental policies;

c) to serve as an instrument for enhancing further, at Community level, the co-ordination of national research activities in the environmental field, in order to improve the productivity of the overall effort through the encouragement of joint projects, the elimination of duplication, and the evaluation of gaps in research coverage;

d) to strengthen industrial competitivity;

e) to contribute to the definition of norms and standards in view of the completion of the internal market in 1992;

f) to promote the processing and evaluation of research results in the environmental field in view of their use in environmental regulation and management;

g) to support training in environmental sciences.

The programme comprises nine research areas:

1. Environment and human health;
2. Assessment of risks associated with chemicals;
3. Atmospheric processes and air quality;
4. Water quality;
5. Soil and groundwater protection;
6. Ecosystem research;
7. Protection and conservation of the European cultural heritage;
8. Technologies for environmental protection;
9. Major technological hazards and fire safety.

4. PROGRAMME JUSTIFICATION

Improving the scientific bases of environment policy is one of the priority areas of Community action, as defined by the Council of the European Communities in the resolution on the continuation and implementation of a European Community policy and action programme on the Environment. The increasing complexity and transboundary, or even global, nature of environmental issues requires a multinational research effort for their investigation and solution.

5. FINANCIAL IMPLICATIONS FOR INTERVENTION APPROPRIATIONS

(million ECU)

5.1 Total cost over duration:

- From the budget of the Community: 75.000
- From other sectors at national level: 68.978

5.2 a) Commitment schedule

	1989	1990	1991	1992	Total
Staff	0.096	0.303	1.775	1.848	4.022
Administration	0.265	0.275	0.715	0.745	2.000
Contracts	6.139	35.422	13.010	14.407	68.978
Total	6.500	36.000	15.500	17.000	75.000

b) Payment appropriations

	1989	1990	1991	1992	1993	Total
Staff	0.096	0.303	1.775	1.848	-	4.022
Administration	0.265	0.275	0.715	0.745	p.m.	2.000
Contracts	1.539	16.422	20.510	23.207	7.300	68.978
Total	1.900	17.000	23.000	25.800	7.300	75.000

5.3 Method of Calculation

a) Expenditure by contract

This expenditure covers the Community's financial contribution to the research carried out under shared-cost contracts to be concluded with industry and the research institutes of the Member States. It includes expenditure for the services of experts in helping with programme management. The cost of the external evaulation by independent experts, estimated to be 250.000 ECUs, is also included.

b) Operating expenditure

This expenditure covers administrative costs (the committee which supports the Commission in the execution of the programme, working party meetings, document distribution and dissemination of information), use of data processing and telecommunications facilities and other supporting activities.

c) Personnel costs

The requirements for this programme have been estimated on the basis of auxiliary staff, consultants, costs of mission and statutory required staff[1] of:

1) in 1989[2]

No new staff.

2) for 1990[3]

4 statutory officials - category A

1 statutory official - category C

This supplementary staff will be requested under the 1990 budget.

6. FINANCING OF EXPENDITURE

The appropriations required to cover the Community's contribution to this project are to be entered in the Community's future budgets.

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[1] The cost of the new staff is calculated at the 50% rate in the enrolment year.
- The expenditure concerning personnel has been calculated on the following basis:
  . 93.000 ECUs/year for an A official
  . 58.000 ECUs/year for a B official
  . 37.000 ECUs/year for a C official

[2] 15 members of staff (8A, 2B, 5C) are covered by the previous programme in 1989 and 1990 and will be transferred to this programme in 1991.

[3] 4% inflation has been provided for 1990.

7. TYPE OF CONTROL

- Administrative control by the Directorate-General for Financial Control as regards budget implementation.
- Scientific control by the Directorate-General for Science, Research and Development.
- CGC Committee.
- Audits by the Court of Auditors in accordance with the provision of the Treaty.

FINANCIAL STATEMENT

1. BUDGET TITLE

EPOCH (European Programme on Climatology and Natural Hazards).

2. LEGAL BASIS

Article 130 Q.

3. PROGRAMME DESCRIPTION AND OBJECTIVES

EPOCH is subdivided into 4 research areas:

1. Past climate and climate change: the study of climatic conditions and climate change when man's influence upon climate was inexistent or negligible, to provide a better understanding of the climate system apart from man-induced changes. Reconstruction of past climates is a valuable means to test the power of mathematical models to simulate the real climate under known conditions.

2. Climate processes and models: to better understand the mechanisms ruling the various components of the climate system in order to improve our ability to simulate and predict climate change.

3. Climatic impacts and climate-related hazards: to understand the effects of climatic and hydrogeological factors, and especially of climate change, upon various sectors of the European environment (sea level, land and water resources) and occurrence of hazardous phenomena (landslides, floods, wildfires).

4. Seismic hazards: to create the means for predicting, preventing and mitigating the seismic risk in Europe, not only in earthquake-prone areas, but also in low seismicity areas, where nevertheless high risk objects (industrial and power plants, dams, etc.) exist.

The programme should be implemented through: (i) contract research; (ii) co-ordination activities; (iii) education and training.

4. PROGRAMME JUSTIFICATION

The climate change foreseen in the next decades as a consequence of man's activities (fossil fuel burning, industrial activities, deforestation, etc.) poses serious problems of a global character. The impacts which such change may have on the European environment, society and economy may be serious and must be assessed in view of adopting counteractive, preventative and adaptive policy options.

Natural hazards also constitute a serious threat to European environment and economy. All these problems are of a transboundary nature and require a multinational approach for their proper solution.

5. FINANCIAL IMPLICATIONS FOR INTERVENTION APPROPRIATIONS

(million ECU)

5.1 Total cost over duration:

- From the budget of the Community: 40.000
- From other sectors at national level: 36.563

5.2 a) Commitment schedule

	1989	1990	1991	1992	Total
Staff	0.119	0.349	0.900	0.937	2.305
Administration	0.150	0.157	0.405	0.420	1.132
Contracts	3.731	19.994	6.195	6.643	36.563
Total	4.000	20.500	7.500	8.000	40.000

b) Payment appropriations

	1989	1990	1991	1992	1993	Total
Staff	0.119	0.349	0.900	0.937	-	2.305
Administration	0.150	0.157	0.405	0.420	p.m.	1.132
Contracts	0.831	7.994	10.695	12.843	6.700	36.563
Total	1.100	8.500	12.000	14.200	6.700	40.000

5.3 Method of Calculation

a) Expenditure by contract

This expenditure covers the Community's financial contribution to the research carried out under shared-cost contracts to be concluded with industry and the research institutes of the Member States. It includes expenditure for the services of experts in helping with programme management. The cost of the external evaluation by independent experts, estimated to be 150.000 ECUs, is also included.

b) Operating expenditure

This expenditure covers administrative costs (the committee which supports the Commission in the execution of the programme, working party meetings, document distribution and dissemination of information), use of data processing and telecommunications facilities and other supporting activities.

c) Personnel costs

The requirements for this programme have been estimated on the basis of auxiliary staff, consultants, costs of mission and statutory required staff[1] of:

1) in 1989[2]

1 statutory official - category A

1 statutory official - category C

This supplementary staff is requested under the 1989 budget.

2) for 1990[3]

2 statutory officials - category A

1 statutory official(s) - category B

1 statutory official(s) - category C

This supplementary staff will be requested under the 1990 budget.

6. FINANCING OF EXPENDITURE

The appropriations required to cover the Community's contribution to this project are to be entered in the Community's future budgets.

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[1] The cost of the new staff is calculated at the 50% rate in the enrolment year.
- The expenditure concerning personnel has been calculated on the following basis:
  . 93.000 ECUs/year for an A official
  . 58.000 ECUs/year for a B official
  . 37.000 ECUs/year for a C official

[2] 4 staff members (3A, 1C) are covered by the previous programme in 1989 and 1990 and will be transferred to this new programme in 1991

[3] 4% inflation has been provided for 1990.

7. TYPE OF CONTROL

- Administrative control by the Directorate-General for Financial Control as regards budget implementation.
- Scientific control by the Directorate-General for Science, Research and Development.
- CGC Committee.
- Audits by the Court of Auditors in accordance with the provision of the Treaty.

ASSESSMENT OF IMPACT ON SMALL BUSINESS

1. Participation and potential benefits

The two proposed R&D programmes, STEP (Science and Technology for Environmental Protection) and EPOCH (European Programme on Climatology and Natural Hazards), 1989-1992, have the purpose of providing scientific and technical support for the environment and consumer protection policy of the Community and to contribute also to other relevant Community policies, including industry.

In doing so, the two programmes will promote both long-term research aiming at the understanding of basic phenomena needed for the formulation of preventive and anticipating policies, as well as research and technical development of a more applied and short-term nature.

The impact on industry in general, and on small business in particular, will be an indirect one in the first case and both a direct and indirect one in the second case.

While long-term research by its nature will be mostly carried out by universities and public research institutes, though industry is not excluded, industry will benefit from its results, which should help it to anticipate the trend in environmental policies and standards, to apprehend at an early stage and at their true value environmental problems and to adapt their industrial strategy accordingly. This can stimulate the development of new technologies as a source of industrial progress.

Short term research and technological development will be part of a number of research areas in STEP, such as assessment of risks associated with chemicals, water quality, technologies for environmental protection and major technological hazards, and in the areas of EPOCH dealing with climatic impacts and climate related hazards, and with seismic hazard. Activities in these areas are well suited for an active and direct participation of industry, especially of SME's which are strong in the development of instrumentation and measuring devices. Indirect benefits for industry will arise from the results of these more applied research projects such as development and validation of protocols for the assessment of health risks or the development of alternatives to the use of animals in chemical testing, which should lead to more rapid and reliable testing procedures in the food, cosmetics and pharmaceutical industries.

2. Advantages to business

Participation in the programme offers an opportunity for business to work in close collaboration with universities and with public and private research institutes. The collaborative projects required by the programme will provide SME's with access to relevant and detailed research results which are not yet published and will quite often never be published in the open literature. The requirement for transnational projects should be an incentive for SME's to establish international research contacts.

3. Difficulties which may be encountered by SME's

Small business may encounter difficulties in the following respects:

- Funding of the part of the shared-cost research which is not covered by the Community and which amounts generally to at least 50% of the total cost.

- The cost of preparing a project proposal can be a deterrent for some SME's, as well as the lack of familiarity with Commission procedures.

4. Impact on employment

As the research is precompetitive, and to a large extent long-term research, and is not specifically aimed at industry, the impact on employment is impossible to evaluate with any degree of confidence.

There is certainly a positive effect on the maintenance and recruitment of research staff directly involved in projects funded by the programme.

5. Consultations of industry

The proposal for the two programmes was discussed by the Round-Table "Environmental Research" of the Industrial Research and Development Advisory Committee (IRDAC).

OPINION

expressed by the
CGC Environment and Climatology

on the proposals for R & D Programmes
in the field of environment (STEP & EPOCH) 1989-1992

The CGC Environment and Climatology discussed in detail the draft proposal for environmental research consisting of 2 programmes: STEP and EPOCH. In formulating its opinion, it has taken into account on the one hand, the objectives and financial provisions for environmental research in the Framework Programme for Research and Technological Development 1987-1991 and on the other, the recommendations of the Evaluation Panel which recently concluded its study of the past programmes.

The CGC agrees that Community environmental research should fulfill the following broad objectives:

1. the provision of scientific support to the Action Programme for the environment;
2. the improvement of the overall research effort in the Community, through the coordination of national R&D programmes.
3. the promotion of scientific and technical quality as a contribution to the strengthening of the economic and social cohesion of the Community.

The CGC endorses the Commission proposal to concentrate its action on 2 programmes: STEP for environmental protection, including major technological hazards, and EPOCH for climate and natural hazards which should be closely co-ordinated.

The CGC underlines the need for the establishment of clear operational goals, wherever appropriate, for the implementation of the programme.

The CGC agrees generally with the distribution of funds between the 2 programmes proposed by the Commission. It recognises the need for the provision of adequate staff, for the planning and execution of the programmes, as recommended by the Evaluation Panel.

It is in favour of the participation to the programmes of European non member states (EFTA and COST).

The CGC's views on the 2 programmes are detailed in the attached pages.

In conclusion the CGC agrees with the scientific content and the ways of implementation proposed for STEP and EPOCH and, on the understanding that clear and appropriate operational goals will be developed for each area of the two programmes before the issuance of calls for proposals, recommends that the proposals are transmitted to the Council and Parliament for early approval.

OPINION

of the Management and Coordination Advisory Committee (CGC) - Environment and Climatology on the draft proposal for an R&D Programme in the field Science and Technology for Environmental Protection 1989-1992 (STEP)

1. The CGC discussed the draft proposal for a Research and Development Programme in the field of Science and Technology for Environmental Protection 1989 to 1992 (STEP) (Doc. XII/CGC/ENV/88/3/2 Rev. 1).

2. In formulating this opinion, the CGC took into account the results of two evaluations of the previous programmes done in 1985 (Evaluation Report no. 14, EUR 10164, 1986) and in 1988 (Interim Evaluation Report).

3. The CGC notes the substantial achievements of the previous programmes. It emphasizes the continuing need for a Community Programme on environmental-protection research, given the still growing concerns about environmental problems.

4. The CGC supports the general aims of the proposed Programme which is designed to provide R&D support to the environmental and related policies of the Communities, and in particular to its Environment Action Programmes. The Programme will also provide a basis for the development of anticipatory and preventive policies.

5. The CGC underlines that the programme proposal is consistent with the terms of reference for environmental research laid down in the Council decision of 28 September 1987 concerning the framework programme for Community activities in the field of research and technological development (1987 to 1991).

6. With regard to specific aspects of the Programme proposal, the Committee's comments and recommendations are as follows:

Objectives and scientific contents

7. The CGC appreciates that the presentation of the scientific and technical contents of the programme has been rationalised with regard to the previous one and welcomes the effort to introduce, on project level, an integrated trans-media approach to environmental research. The important research problems of the early nineties regarding environmental protection are addressed by the programme proposal.

8. The CGC supports the establishment of clear operational goals in research areas wherever appropriate, while other research areas providing more basic scientific knowledge, have broader objectives.

9. The CGC endorses the incorporation in STEP of research on major technological hazards from industrial activities and underlines the need for a strong coordinated European effort in this area.

10. The CGC welcomes the incorporation of an independent research area on the protection and conservation of the European cultural heritage.

11. The CGC stresses the need to integrate research on the socio-economic impact of the major environmental issues, whenever appropriate.

Ways of implementation

12. The CGC is in favour of a sound balance between contract research and concerted actions to be complemented by suitable and flexible mechanisms for coordination of national research. As a rule, all projects should be transnational.

13. The CGC insists on a tight coordination between STEP and other Community research programmes, in particular with EPOCH, the JRC programme and with MAST and JOULE.

14. The CGC strongly supports the opening of the programme to the participation of European non-Member States.

15. The CGC welcomes the intention to cooperate closely with and contribute to pertinent international programmes and suitable EUREKA projects.

16. The Committee underlines the importance of training activities related to the research projects to be implemented.

17. The Committee requests greater clarity, simplification and acceleration of procedures in the selection, administration and management of research projects, in order to ease the workload on Commission Services and on itself.

OPINION

expressed by the CGC Environment and Climatology
on
the draft proposal for a R&D Programme in the field of
CLIMATOLOGY AND NATURAL HAZARDS
(1989-1992)

1. The CGC discussed in detail the draft proposal for a Research and Development Programme in the field of Climatology and Natural Hazards (EPOCH *) whose contents have been drafted in cooperation with an Ad-hoc Working Party appointed by the CGC.

2. The CGC welcomes and shares the favourable opinion expressed in the Evaluation Report on the previous programme with regard to both the scientific results and the development of European cooperation in the fields covered. In the light of those comments, and subject to the remarks below, it endorses the proposed programme as responding to the research needs arising in particular from the greenhouse gases issue, and because of the overwhelming importance of climate change and natural hazards for human activities.

Aims and objectives

3. The CGC endorses the aims and objectives of the proposed Programme as defined in the draft proposal. Within this framework, it recognises the continuing need to provide R&D support to the environmental and related policies of the Community.

4. The Committee also recognizes that the scope of the proposed Programme is fully in line with the terms of reference of the Framework Programme as regards Climatology and Natural Hazards.

5. The CGC is of the opinion that EPOCH can provide a valuable, coordinated input to European wide projects as well as contribute to international programmes such as the IGBP, the WCRP, the International Decade for Natural Hazards Reduction. Such input should be provided in close cooperation with STEP and MAST.

6. The CGC considers that the research foreseen under EPOCH will contribute a sound basis for any preventive or corrective measures that might be considered in relation with the foreseen climate change and its impacts on the European environment.

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* European Programme on Climatology and Natural Hazards

Scientific contents

7. The Committee is in agreement with the scientific contents of the proposed programme. This is in line with the current concern throughout the Community about environmental problems, such as for instance those posed by enhanced atmospheric CO_2, to the resolution of which climatological research can effectively contribute.

8. The CGC supports the expansion of the previous programme particularly as regards the following items :

   (i) the greater stress being put on the impacts of climate change, especially as regards the European agriculture and water resources, the sea level rise and its consequences, the aridification and desertification of important European regions.

   (ii) the study of the causes, mechanisms and impacts of selected natural hazards (natural slope instability and erosion, storms and floods, wildfires, earthquakes and tsunamis), which can seriously affect the environment and the society in all European countries.

Ways of implementation

9. The Committee endorses the ways proposed to implement the programme and especially the fact that cooperation between scientific institutes of the member states will be strongly suppported by means of joint projects, coordination of research activities and scientific meetings.

10. The Committee recommends that the current training activities be pursued, and welcomes the institution of a European School of Climatology and Natural Hazards as a most useful and efficient contribution to such activities.