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Contents

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Editorial

The accumulation of persistent organic compounds, metals and nutrients in soil and in water systems is the result of a land use policy based on a concept of infinite dilution. Because of the limited storage capacity of soils, any contamination may have long term effects difficult to counter. When the saturation value of the storage capacity is reached, high concentrations of chemicals may be mobilized from soils and sediments, and leached into waters or made available to biota.

A widespread and increasing concern in the society today is focused on the impact of toxic and hazardous materials on the environment because of possible dangerous drinking water contamination.

Two sources of groundwater contamination are of particular importance:

- the deliberate release of chemicals such as fertilizers, pesticides and herbicides used for agricultural or other purposes, and
- the uncontrolled release of toxic materials resulting from accidents or from domestic and industral refuse in waste dumps.

To feed the growing population for the next centuries, the area under cultivation on the world will have to be expanded further and productivity increased. These measures give rise to an increase in water consumption and a strong growth in the use of pesticides and consequently in the growth of contamination problems. On the other hand, the disposal of large quantities of waste by legal or illegal dumping already resulted in numerous cases of contamination events, for the most part in industrial sites, which require remediation actions.

Combating environmental pollution after it has arisen is extremely difficult, involving high costs and requiring long time. In a preventive sense, poorly degradable and toxic substances should be used or dumped under strictly controlled regulations. Thus, it becomes of paramount importance a detailed knowledge of the fate of toxic substances dispersed in soil. These represent a threat to groundwater contamination. It is necessary to control their use thus to avoid degradation of land and groundwater supplies. This information will also allow to give a priority to the site remediation actions for the presently contaminated areas and let to design properly the future disposal sites according to the geomorphological and hydrological caracteristics of the selected locations.

The susceptibility of areas to pollutants depends, in fact, not only upon the physico-chemical behaviour of the contaminants (i.e. their solubility, the interaction with the soil components) but also upon the soil characteristics. The effect of similar substances in different soils need not be the same. The assessment of long term risk posed by chemical contaminants in the environment requires,therefore, the definition of a spatially-variable acceptable concentration level for a given pollutant-soil-groundwater system.

Thus, for a better control and understanding of the state of pollution, reference values are needed. These standards should reflect the best available scientific and technical judgement. As most substances currently considered toxic occur naturally in our environment, the standards should reflect the levels we can safely consume in water or be present in the soil, taking into account the amounts we are exposed to from other sources.

S. Facchetti
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Programme News

Fourth R&TD Community Framework Programme

The proposal for the Fourth Framework Programme of Community Activities in the Field of Research and Technological Development (R&TD) to cover the Community's R&TD efforts for the years 1994 to 1998 has been presented by the Commission on 30 September 1992.

The proposal follows on from the Communication entitled "Research after Maastricht: an assessment, a strategy", adopted by the Commission in April, and is part of the new approach to Community R&TD policy, whilst in some respects mantaining continuity. For example, the proposal envisages greater concentration of research effort on a number of generic technologies, the mastery of which is essential to European Industry's competitiveness.

The guiding principle of the programme - the subsidiarity - is reflected in the structure and content of the renewed thematic framework. The programme embraces all the Community's R&TD and demonstration activities covered by the Treaty, being thus consistent with the guidelines laid down by the Commission in April and with the provisions of the Maastricht Treaty.
It will therefore also cover R&TD and demonstration activities connected with the implementation of common policies (e.g. environment, agriculture, fisheries, energy and transport). This will make it possible to ensure that research policy and the other major common policies are more integrated and reinforce each other.
The international scientific cooperation and the preparatory back-up and follow-up activities so far performed outside the framework programme will be also included.

The framework programme comprises four activities, namely:

- implementation of research, technological development and demonstration programmes, by promoting cooperation with and between undertakings, research centres and universities;
- promotion of cooperation in the field of Community research, technological development and demonstration with third countries and international organizations;
- dissemination and optimization of the results of activities in Community research, technological development and demonstration;
- stimulation of training and mobility of researchers in the Community.

Within each of these activities, the following core thematic areas for research priority have been identified:

		Core Thematic Areas	
Activity 1	Implementation of research technological development and demonstration programmes	Information and Communication technologies	Key elements for IT systems; Software engineering and best practice; High performance computing and networking; Image Technologies; Electronic networks and linguistics; ICT support for function integration in manufacturing; Advanced communications; Information exchange between administrations; Technologies for integrated and optimised transport systems.
		Industrial technologies	Manufacturers and industrial users: Cooperative approaches and opportunities; Advanced manufacturing technologies; Human centered manufacturing; Materials and their processing; Measurement and testing; Transport technologies; Science and technology for a new urban habitat; Science and technology for preservation of european cultural heritage; Science and technology for the struggle against social exclusion.
		Environment	Global change; Environmental quality and human health; Natural hazards; Innovative Technologies and infrastructure for marine and polar research.
		Life science and technologies	Genomes; Molecular genetics of plants and bio-diversity; The cell factory; Agriculture, forestry and rural development; Monitoring of agriculture production; Industrial non-food uses of agricultural products, bioenergy; Fischeries and aquaculture; Development of harmonized protocols for clinical and pharmaceutical purposes; Addressing Europe's major health problems.
		Energy	Electricity and heat from renewable sources; Better and cleaner production and use of energy; Safety aspects of nuclear activities; Controlled thermonuclear fusion.
Activity 2	Promotion of cooperation with third countries and international organizations		**Core Thematic Areas** S&T cooperation with non-european industrialized third countries S&T cooperation with central and eastern european countries S&T cooperation with developing countries Strengthening synergies with others S&T cooperation frameworks in Europe Cooperation through COST actions
Activity 3	Dissemination and optimisation of the results of activities in Community research, technological development and demonstration		The research-industry interface The research-scientific community interface The research-society interface Technology transfer Valorisation fund for SMEs (Small and Medium Enterprises)
Activity 4	Stimulation of the training and mobility of researchers in the Community		Training and mobility of group researchers Scientific and technical networks Industry-academic networking Incentives for the european scientific community
	Horizontal support measures		Study and exploratory activities Evaluation activities Promotion of enabling activities Coordination and concertation activities JRC activities for community policies

The technical details of the contents of the various activities will be given later in the specific programmes. The core thematic areas will also be grouped in relation to the specific programmes.

One of the most relevant features of the programme consists in the explicit consideration given to the principle of subsidiarity.
Five activities to which the above principle was intrinsic were identified in the document "Research after Maastricht: an assessment, a strategy" outlining the reorientation of Community R&TD activities, i.e.:

- "big science" or international initiatives often in the form of mega-projects;
- technological priority projects;
- activities for the implementation of the single market;
- pre-normative research in view of the preparation of standards, norms and regulations;
- activities to develop Community-wide integrated systems of networks and mobility programmes.

On the basis of the subsidiarity principle, the research areas of the fourth framework programme can be divided into two major fields, i.e.:

- Science and technology for industrial innovation, in view of strengthening, the scientific and technological bases of Community Industry and of promoting its competitiveness. The core thematic areas include basic IT research, image technologies and advance d manufacturing technologies.
- Science and technology for society and for Europe. The core thematic areas include telematics systems in the field of health care, the struggle against social exclusion, Europe's major health problems, global change and nuclear safety activites.

A prominent place will be covered by the development of generic technologies which will be also at the core of a number of technological priority projects. In this framework an important role could be played by the cooperation between EUREKA and the Community.

The Commmunity will develop its cooperation with the non-European Industrialzed third countries, the Central and Eastern European Countries and the developing countries.
A special effort is planned for SMEs through the use of an optimization fund so as to provide them with additional support for the optimization of their research results.
Lastly the setting up of specific networks for improved integration of academic research into industrial manufacturing is worth of stressing.

The proposed breakdown of financial resources between the four activities included in the framework programme is as it follows:

4th FRAMEWORK PROGRAMME 1994-1998	
	MECU (1992 prices)
First activity	11.600
Second activity (1)	1.400
Third activity (2)	700
Fourth activity	1.000
TOTAL	**14.700**

N.B. Resources allocated to horizontal support measures, which cover the preparatory, accompanying actions as well as incentives for promotion and enabling activies, are set at MECU 1.600. This amount, which is already included in the above figures, is distributed proportionally amongst the four activities and should remain clearly identifiable.

(1) The share of resources allocated to the second activity, which enters for the first time in the Framework Programme, increases relative to the period 1990-94. This implies a substantial rise in international cooperation in science and technology with both Central and Eastern European countries and developing countries.

(2) The share of resources allocated to the third activity increases relative to the period 1992-94. This activity includes the valorisation fund for SMEs as well as all the dissemination actions which will raise the impact of Community R&TD on economic and social cohesion.

Human capital and mobility programme

The "Human Capital and Mobility" programme, which comes under the Third Framework Programme for Research and Technological Development in the Community is aimed at promoting the mobility of young researchers, mainly at post-doctoral level, in view of the creation of a truly European scientific and technical community.

As such it represents an unprecedented extensive transnational fellowship scheme for young researchers.

A group of projects to be supported by 252 mobility fellowships for individual researchers and 239 fellowships for laboratories or research teams has been selected by the Commission of the European Communities.

A total of over 700 young researchers will benefit from these fellowships. The programme allows them to work for up to two years in the best European research establishments in a country other than their own.

It has to be recalled here that, besides training by research, the programme includes also the setting up of scientific and technical research cooperation networks as well as measures to promote access to large-scale scientific facilities and the organization of "Euroconferences".

In addition to the above mobility fellowships, 59 series of conferences and the projects presented by 28 establishments with large-scale scientific facilities to receive extra researchers from other European countries have also been approved.

66.9 MioECUs out of 104 MioECUs, allocated in 1992 for the programme, will be committed as the consequence of the above decision.

261 and 117 MioECUs are allocated for the programme for 1993 and 1994 respectively.

Programme of research on "car-free cities"

A study on "car free cities" has been promoted by the European Environment Commissioner in the attempt to establish the feasibility of conceiving more efficient cities using transport systems alternative to private cars.

Depending on the population density of the cities a two-to five fold reduction of costs would be achieved in car-free cities.

The so far adopted approach of adapting cities to car circulation has to replaced by that of adapting the transport systems to cities where people should walk short distances and use improved common transport systems for long distances.

This implies to reconsider urban planning and transport organisation as well as long term policy of vehicles manufacturers.

The Commission is pursuing the idea to promote a club of car-free cities to cast ideas, proposals and experiments, the feasibility of using LIFE funds - as soon as operational - for financing pilot projects being examined.

Environmental Protection

Environmental Chemicals

EC Research Programme and Support Activities to the Commission

Environmental Research Newsletter n° 8 and markedly n° 3 have already provided detailed information on this programme area and the relevant projects managed by DG XII/E on one side and developed by the JRC on the other side. In the following the most recent progress is reviewed for what it concerns the JRC Specific Research Programme and the Support Activities to the Commission.

JRC Specific Research Programme

1. ECDIN - Databank

ECDIN is a factual databank, created in the framework of the Environment Research Programme of the Joint Research Centre (JRC) of the Commission of the European Communities at the Ispra Establishment (Environment Institute).

A public version of the ECDIN databank is accessible through DIMDI ("Deutsches Institut für Medizinische Dokumentation und Information, Cologne) and through a host in the USA.

Records are updated continously in collaboration with specialists and research Institutes in and outside Europe with special emphasis on occupational health aspects (programme "work environment").

In the frame of third party work, a first contract concluded the German Ministry for the Environment/German Federal Environment Agency (UBA) aiming at the data collection for 150 priority chemicals was completed and a second contract is being prepared, focussing on 200 new priority substances.

CD-ROM

In addition, extract of essential data files are available on CD-ROM for use with personal computers. Contracts for the distribution of ECDIN on CD-ROM were concluded for the english and german language regions in Europe, including Scandinavia, Italy, Spain, Greece and Japan. A contract with a distributor in India is under preparation.

A second updated CD-ROM version of ECDIN was prepared and is available now comprising data on approximately 7500 compounds.

ECDIN CD-ROM: Release of the second version

A new version of ECDIN CD-ROM has been produced during the first 6 months of 1992, and distribution will begin in September.

This new version, which takes into account the experience and observations obtained from the users of the first version is notably increased in content. The number of chemical substances included has risen to about 7,500, and new data files, especially important for the evaluation of environmental toxicity, have been added.

The complete list of the available data files is the following:

Identification
Physical and Chemical Properties
Uses
IRPTC Legal File
Directive 67/548 EEC (Hazardous Substances)
Human Health Effects
Occupational Exposure Limits
Occ. Poisoning Reports
Occ. Disease Prevention
Therapeutic Treatment
Experimental Toxicity
Aquatic Toxicity
Carcinogenicity
Mutagenicity
Conc. in Environmental Matrices
Conc. in Human Media
Conc. in Animal Media
Aquatic Bioaccumulation
Aquatic Biodegradation
Analytical Methods
Odour TLVs
Public Safety Data from B.I.G.

The most significant data added to this version has been specially rechecked and updated. In addition, the substances which were included in the first edition have been reviewed.

In the light of experience gained from using the first edition, some difficulties have been eliminated, and in some areas the presentation of the data has been improved.

It should be noted that the CD-ROM version of ECDIN, although derived from the on-line database, has, however, a completely original interrogation and search language and presentation format.

The compact disc will be on sale world-wide from specialist distributors acting on behalf of the Commission.

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2. Informatisation of the future european waste catalogue

Counctil Directive 91/156/EEC amending Directive 75/442/EEC on waste foresees that the Commission will draw up, not later than 1 April 1993, a list of catalogue of wastes belonging to the categories listed in annex I of the Directive. Council Directive 91/689/EEC on hazardous waste on the basis of three annexes introduced a new definition of hazardous waste. The Directive also prescribes that all categories of hazardous wastes have to be included in the same catalogue.

Actually the catalogue, called European Waste Catalogue (EWC), is elaborated by a working group of independent experts from different Member States and appointed by the Commission. Work is managed by DG XI/A4.

The Environment Institute of the JRC has been put in charge with the informatisation of the European Waste Catalogue (EWC). The research project is carried out as a contract financed by the German Ministry for Research and Technology. The German Federal Environment Agency (Umweltbundesamt) in Berlin, which acts as the representative of the Ministry regarding waste management, supervises the research contract.

The contract shall provide an appropriate and userfriendly product in form of a fully informatised version of the EWC.

Work programme

- Continuous documentation of the drafts of the EWC as elaborated by the experts
- Documentation of the EWC in English language and in the main languages of the Community. During the first phase French, German and Italian languages will be considered.
- Documentation of the national waste catalogues (BE, DE, DK, FR, IT, NL, UK, CH) in their national language and in English language as well.
- Documentation of international waste catalogues and related lists in their English version:
  - hazard characteristics according to Directive 91/689/EEC,
  - OECD-classification for waste products (International Waste Identification Code, IWIC),
  - Basel convention on the control of transboundary movements of hazardous wastes and their disposal,
  - UN transportation code,
  - hazardous goods according to the European catalogue for hazardous goods,
  - arising according to economic activities (NACE-classification),
  - arising according to technical processes OECD-classification),
  - classification and nomenclature of wastes adopted by the custom (EUROSTAT).
- Development of computer programmes for a local (PC, MS-DOS) and a central (UNIX work station) system for the documentation of the EWC nad its linkage (cross-reference) to the national and international waste catalogues and lists.

Support Activities

EINECS (European Inventory of Existing Chemical Substances)

The support work is directed mainly towards the implementation of the Dangerous Substances Directive (67/457/EEC and 79/831/EEC) related EC-legislation.

Work was focused on the updating of Annex 1 of the Directive for instance with respect to the classification, labelling and packaging of organic peroxides and aromatic substances.

Also, comments received from competent authorities after the publication of the EINECS Inventory in the Official Journal of the EC were evaluated and the necessary modifications introduced.

Work concerning the application of Structure-Activity Relationships is continuing with the aim to introduce groups of similar structure for the EINECS inventory, to predict environmental distribution and fate of industrial chemicals and for estimating lacking data and properties. The 1st European Conference on Neural Networks in Environmental Sciences (Lyon, June 1992) has been co-organized by the Environment Institute of the JRC.

EUCLID Database

In relation to the Existing Chemicals Regulation the Institute has received recently the technical/scientific responsibility for the collection and processing of chemical and proprietary data supplied from industry and the creation of the EUCLID data base. Data will be supplied on a harmonised electronic data set and within 1 year of entry into force of the regulation for about 1800 substances of high production volume (HPV), within 2 years for another 600 HPV chemicals and within 5 years for the production range 10-1000 t/year (about 10000 substances). EUCLID will be prepared in two stages:

- EUCLID 1 (including confidential data)
- EUCLID 2 (without confidential data)

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Environment and Human Health

EC Regulatory Action

Regulatory action in the field of "Safety, Hygiene and Health at Work" is managed by DG V (Employment, Industrial and Social Affairs). On account of the fact that 1992 has been the European year of Safety Hygiene and Health protection at work, large space is dedicated to the description of the achievements in this area. Information on research activities managed by DG XII/E and performed at JRC will be presented in future issues of Environmental Research Newsletter.

Health and Safety at Work

Guiding principles, method used and assessment

The Community's work on providing better protection for the health and safety of workers has developed progressively as part of the introduction of the social aspects of the Single Market. It was given further impetus with the introduction in the 1987 Single European Act of a specific legal basis: Article 118a. This Article provides that Member States must pay particular attention to encouraging improvements, especially in the working environment, as regards the health and safety of workers, and that they must set as their objective the harmonisation of conditions in this area, while maintaing the improvements made. In order to help achieve this objective, the Community may adopt, by means of directives, minimum requirements for gradual implementation in the Member States.

Guiding principles

The Commission's aim was to establish, on the basis of Article 118a, a basic set of minimum provisions applicable to all Member States.

In doing so, the Commission has always been guided by the following principles, which underpin all its social measures:

- Subsidiarity, which is intended to highlight the specific measures taken by the Community and to illustrate their added value element.
  Article 118a provides for the harmonisation of conditions in the field of the health and safety of workers "while maintaining the improvements made". The first specific measure taken at Community level was to establish protection thresholds below which Member States must not fall. The advantages of the minimum requirements introduced on the basis of Article 118a are all the more obvious because previous levels of protection in the Member States were so low. Sometimes Community measures protect workers against risks which were not previously covered by any national legislation. Such was the case, for example, with the Directive concerning the minimum safety and health requirements for work with visual display units. But this added value element must also be seen in the context of the completion of the Single Market. It is the Commission's role here to propose measures to give workers confidence in the new frontier-free Europe, which should not be allowed to pose an increased risk to their health and safety.

A typical example of this is the Directive on health and/or safety signs at work, which is intended to combat risk factors arising from the linguistic and cultural differences which may result from the free movement of workers.

- Maintaining the diversity of national systems, traditons and practices, where these can play a positive part in the completion of the internal market
  Article 118a specifically provides that Community provisions do not prevent any Member State from maintaining or introducing more stringent measures than those provided for in directives. The use of directives actually favours the maintenance of different national systems, traditions and practices, since they ensure that the same result is obtained in all Member States, but leave it to the Member States to decide how to achieve it. Thus, the Community texts refer the Member States to "national legislation and/or practices" for certain practical aspects.
- Preserving firms' competitiveness and therefore some degree of flexibility in the employment situation.
  The cost of inadequate safety (industrial accidents, occupational illnesses) considerably hampers firms' competitiveness. Conversely, it is acknowledged that improving working conditions encourages their development in the medium term (increased productivity, less absenteeism and reduced direct and indirect costs). The Community's harmonisation in the field serves the same purpose and will also help to reduce the wide differences in the social cost paid by firms in the various Member States. As regards SMEs, which are a special case, Article 118a specifically provides that directives adopted pursuant to this Article should avoid imposing constraints in a way which would hold back the creation and development of such firms.
- Helping to reduce the differences in the level of development in the Member States, without destroying the comparative advantages enjoyed by those countries which have fallen behind.
  This was how the Commission interpreted the term "minimum" requirements" in Article 118a: they should be neither the lowest common denominator nor the arithmetic mean of the existing conditions in the Member States, but should be pitched at their own specific, often high level which promotes harmonisation while maintaining the improvements made, as required by the Treaty.

Method used

The Commission's approach to Article 118a is based on the need to provide better protection for the health and safety of workers across a broad spectrum; to provide equal protection for workers against the risks of occupational accidents and illnesses; and to ensure that the protection provided cannot be by the effects of the free movement of goods. With these three goals in mind, it applied the following method:

- cover the maximum number of fields with a minimum number of directives in order to avoid fragmenting legislation.
  Thus the first directive adopted on the basis of Article 118a was a "framework" Directive designed to promote improvments in the health and safety of workers in all sectors, both public and private[1]. This Directive lays down the general principles governing employers' obligations and responsibilities with regard to protecting the health and safety of workers, and it defines procedures for the information, training, consultation and participation of workers in the field. The framework Directive is also a "programme" Directive, in that it specifically provides for the introduction of supplementary individual Directives containing stricter or more specific measures, failing which the provisions of the framework Directive supply. Some of these individual Directives have already been adopted by the Council: on workplaces, work equipment and personal protective equipment, VDUs, handling heavy loads, exposure to carcinogens and biological agents, temporary and mobile work sites and health and/or safety signs.
  The Directives on work sites, and work equipment and exposure to carcinogens and biological agents also illustrate the Community's desire for across-the-board legislation. A further example is a proposal on certain aspects of the organisation of working time which are regarded as particularly important from the point of view of occupational health and safety. The proposal concerns all workers in that it covers minimum daily, weekly and annual rest periods and certain aspects of night and shift work.
- Make allowance for the specific characteristics of certain high-risk activities or sectors and for the requirements of certain particularly vulnerable categories of workers.
  As far as work equipment is concerned, there is one directive which covers the use of personal equipment by workers at work, laying down minimum requirements for the selection, application, use and maintenance of such equipment, while a second covers work on VDUs, and lays down minimum ergonomic requirements for the design and organisation of VDU workstations.
  As regards workplaces, two directives were recently adopted on safety and/or health signs at work and temporary and mobile work sites.
  There is also a directive on the manual handling of loads involving the risk of back injury for workers, whick provided that, wherever possible, manual handling should be replaced by mechanical handling.
  Proposals on fishing vessels and the extractive industries are currently before the Council, and the Commission is drafting texts on transport activities and agricultural activities.
  These four documents cover the sectors which present the highest risk of fatal accidents for workers, according to the Commission's own figures. In the following activities the accident rate is disproportionate to the siwe of the workforce:[2]
  - agriculture, fishing and forestry:
    6.7% jobs;
    19% fatal accidents
  - construction:
    7.8% jobs
    22% fatal accidents
  - transport:
    5.9% jobs
    16% fatal accidents
  - extractive industries, chemical industry:
    3.6% jobs
    5% fatal accidents.

  These figures were confirmed by an opinion poll carried out in 1991 among 12500 people in Europe, where the accident rate was highest in the following sectors: construction and the metal industry; mining, chemicals and energy; agriculture and fishing; transport.
  Finally, the Commission has put before the Council specific proposals on pregnant woman, handicapped workers and young people aged under 18, all of whom are generally exposed to a higher risk of industrial accident or illness than other workers. Similarly, two directives have already been adopted on workers on board vessels (for better medical treatment on board) and temporary workers.
- Supplement the Community provisions adopted as part of the completion of the Single Market (Article 100a of the EEC Treaty), which lay down basic safety requirements for the design, manufacture and marketing of equipment, products, machinery, etc.

These regulations lay down maximum protection levels which the Member States must respect in order not to undermine the principle of the free movement of goods. They are therefore completely separate from the minimum requirements provided for in Article 118a, which authorise the Member States to maintain or introduce more stringent measures to protect working conditions. The two approaches go hand in glove, however: equipment must comply with the basic requirements of Article 100a and may not be used unless the minimum requirements laid down on the basis of Article 118a are fulfilled.

The complementy nature of these two approaches in an important point, since it demonstrates that the completion of the Single Market is not incompatible with the lasting concern to improve safety conditons at work.

[1] Except for certain specific public service activities and the civil protection services.

[2] (Europe, 1990 figures).

The Commission has also applied the same method to texts adopted before the Single Act came into force, and these are gradually being updated. Two across-the-board proposals on carcinogens and biological agents have been adopted by the Council, which supported the Commission's approach in this instance and agreed to a consolidated text for chemical agents as well.

As regards physical agents, the Commission department concerned is drafting a document intended to apply to a whole series of physical agents, incorporating and updating the 1986 Directive on noise (to date, noise is the only physical agent covered by a directive).

Similarly, a proposal expanding on the 1978 Directive on safety signs has recently been adopted by the Council.

The Commission's method has also involved widespread consultation both with representatives of the Member States and with employers and workers.

The main forum for this consultation is the Advisory Committee on Safety, Hygiene and Health Protection at Work, which was set up in 1974 with the task of helping the Commission to prepare legislation. The Committee comprises representatives of workers, employers and national administrations, and forms a channel of communication between the Commission, the public authorities and the two sides of industry.

Assessment

1992 is in more ways than one an appropriate point at which to assess the Community's work on protecting the health and safety of workers: it is the final run-up to the Single Market, the completion of which has been accompanied by the establishment of a Community social policy; and it marks the completion of the programme introduced by the Commission in 1987 in the field of safety, hygiene and health at work. It has also brought us closer to European Union.

In terms of legislation, the Commission has put before the Council almost all the health and safety proposals referred to in its 1987 action programme and its programme relating to the implementation of the Community Charter of Fundamental Social Rights for Workers.

To date twelve directives have been adopted on the basis of Article 118a of the EEC Treaty. They define minimum requirements for protection, and represent progress even in those Member States with the highest standards. A typical example was the Directive on work with VDUs, which was particularly important given that, according to estimates, the measures will be helping one worker in two by the end of the decade.

Of the eleven proposals mentioned in the programme for the implementation of the Charter, four have been adopted by the Council (medical treatment on board vessels, exposure to asbestos at work, safety signs at work and temporary and mobile work sites), while others are at different stages in the Council procedure (extractive industries and fishing vessels). The proposals relating to physical agents and transport activities should be adopted by the Commission in the near future.

The Commission put forward a proposal on 30 September 1991 for the introduction of a European Agency for Safety and Health. The Agency is to assist the Commission with technical and scientific questions in the drafting and implementation of Community legislation. It would be responsible for coordinating a European occupational health and safety network and for other information and training tasks. The Commission is also working on proposals relating to agricultural workplaces, the updating of the Directives on carcinogens, biological agents and chemical substances, and amendments to the Directive on work equipment.

This assessment is only a progress report: the problems concerning protection for workers are still there and they are still severe. The work done at Community level needs to be passed on by the Member States - who are required to transpose the texts adopted by the Council into national legislation and to monitor their application - and by the various groups concerned (firms, employers, workers).

This was one of the reasons why 1992 was declared the European Year of Safety, Hygiene and Health Protection at Work: its aim is to provide information on the widest possible scale and to increase awareness and motivation amongst those directly involved and the public in general about Community measures in this field.

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Water

Relevant developments in this research area are presented in the following. Information on the EC Research Programme managed by DG XII/E and developed at JRC Ispra have been already given in the past issues of Environmental Research Newsletter (see in particular n° 6 and n° 5). The present issue presents in additional some works performed at JRC Ispra for Third Parties.

EC Research Programme and Support Activities to the Commission

1 Assessment of Environmental Quality and Monitoring

As mentioned in Newsletter n. 8, December 1991 the Environmental Research Programme 1991-1994 includes in Area II.1 "Assessment of environmental quality and monitoring" the development of analytical techniques for widely used pesticides which may pollute ground and surface water bodies used for drinking water production, complemented by investigations on the behaviour of pesticides in water treatment processes. The analysis of their degradation products is also considered. Within this topic, three projects have been selected for EC funding.

The titles and their coordinators are:

- Analysis of Pesticides and their degradation products: an integrated study.
  (E. Benfenati, Istituto di Ricerche M. Negri, Milan, I)
- The development of an automated monitoring system for the determination of pesticides and their conversion products at the trace level in water.
  (R.T. Ghijsen, University of Amsterdam, NL)
- Developpement de nouvelles cartouches de preconcentration selectives pour l'analyse de traces de pesticides et de leurs produits de conversion dans l'environnement.
  (M.C. Hennion, Ecole Supérieure de Physique et Chimie, Paris, F).

A review of the problem of pesticides in ground water and drinking water was prepared by a group of scientists coordinated by M. Fielding, WRC Medmenham, UK (Water Pollution Research Report 27, ISBN 2-87263-068-6, December 1991).

The review was aimed at the development of suitable analytical techniques for individual pesticides not exceeding 0,1% µg/l and their metabolites as stated in the Drinking Water Directive.

The recommendations are related to:

- explaining why pesticides have been found or not in ground water;
- understanding the behaviour and fate of pesticides after use;
- development of sensitive, accurate and simpler screening methods for analysing pesticides;

- Interlaboratory checking of the performance of key pesticide methods;
- evaluation of the significance of pesticide transformation products.

Two projects dealing respectively with the **"Origin and fate of methyl mercury"** and with the **"Identification of the biotic and abiotic matrices in ecosystems in which the transformation of inorganic mercury to methyl mercury and of methyl mercury to other mercury species occurs".** Both coordinated by Dr. M. Bernhard were funded under the STEP Programme.

The specific objectives of the projects were:

- Improvement and adaptation of analytical methods for the identification and determination of the very low HgT concentrations in natural waters and in environmental matrixes other than tissues of organisms;
- Study of the distribution of MeHg and HgT in terrestrial and marine environments to identify critical components (including species which can survive with extremely high Hg concentrations in their tissues) in the various foodchains, their role in the transport route of MeHg to man;
- Investigation of the relative importance of biotic and abiotic Hg methylation in the origin of methyl mercury and the transformations of Hg species and identify the matrixes in which these reactions occur and their role in the Hg contamination both from natural and manmade sources;
- Investigation on the distribution of MeHg and inorganic Hg in experimental system through direct uptake;
- Investigation of the interactions between inorganic and organic Hg species and membrane ligands.

Main results can be summarized as it follows:

- New developments, improvements and adaptations of analytical methods:
  Reliable, sensitive and specific detection methods are of primary importance. Therefore, a considerable part of the project was devoted, in close collaboration among the various partners of the consortium, to improving different Hg determination methods.
  The technology has been transferred successfully to other partners of the consortium.
- Distribution of MeHg and HgT in terrestrial and freshwater ecosystems:
  MeHg concentrations in rainwater collected monthly for one year in the catchments of Lake Gardsjon (Sweden) showed a seasonal variation with highest concentrations in May/July (about 2 ng HgMe/L). The MeHg in throughfall water was in most cases lower than the concentration in the rainwater indicating an uptake of atmospheric MeHg by the canopy.

In soil samples the upper layer contain more MeHg than lower layers. No positive relation was found between HgT and MeHg in soil.

- Distribution of MeHg and HgT in marine ecosystems:
  First results on th HgT concentration in sea water from the Ligurian Sea carried out with newly adapted methods (see above) range between 0.2 to 2.2 ng HgT/L. The HgT and organic Hg measured in a large number of marine species indicate that concentration increases with the size and the trophic level of the specimen.
- Relative importance of biotic and abiotic Hg methylation
  150 bacteria strains isolated from the Fiora river which drains the mercuriferous Mt. Amiata region were tested for their ability to methylate Hg. None of these tested produced MeHg.
- Distribution of MeHg and inorganic Hg in experimental system through direct uptake from water and sediment by freshwater biota:
  In two freshwater macrophytes studied (Ludwigia natans, Elodea densa) accumulation of $HgCl_2$ and MeHgCl added to water only increases about linearly with amounts of Hg compounds added.
- Interactions between inorganic and organic Hg species and membrane ligands:
  High resolution (^{199})Hg nuclear magnetic resonance experiments were performed to monitor Hg speciation when $HgCl_2$ added to water solution is complexed with various buffers or bound to organic ligands or artificial biomembranes.

2 Biogeochemical cycles and ecosystem dynamics

As has been reported earlier, within the STEP Programme the Commission committed funding to the *second phase* of the multi-national interdisciplinary research project "EROS 2000" (European River Ocean System), running from February 1991 to January 1994. The budget of 2.22 MECU is covering the costs for four out of five EROS subprojects, i.e. dealing with bio-organic processes in coastal waters, inorganic processes in coastal waters, atmospheric inputs to marine water, and regional integration, remote sensing and modelling of coastal processes, respectively. The fifth subproject, i.e. regarding particles and sediment-water interactions, is being implemented by the MAST-1 Programme.

The first scientific workshop on the EROS project phase II, still directed on the NW-Mediterranean Sea, had been held in October 1991 at the Netherlands Institute for Sea Research (NIOZ) on the island of Texel. The proceedings of this workshop have been published by the Commission (Water Pollution Research Report n. 28). This peer-reviewed book of 549 pages, edited by J.M. Martin and H. Barth, can be received - free of charge - from Dr. H. Barth (CEC DG XIII-D-1 SDME 3/65, 200 rue de la Loi, B-1049 Brussels)

On the occasion of launching Phase II of the EROS 2000 project, a project brochure has been published which describes the overall project objectives, with particular emphasis on the 2nd project phase, and contains highlights of major scientific results achieved during the first project phase of two years.

This nicely prepared brochure can be ordered from the

EROS 2000 secretariat, c/o Mrs. B. Rovirola
Institut de Biogéochimie Marine, Ecole Normale Supérieure
rue Maurice Arnoux, 1 - F-92120 Montrouge

During the last week of September this year a very particular EROS workshop was organized at Plymouth Marine laboratory (UK). After 4 years of intensive research, data collection, treatment and modelling, and about one year before the termination of EROS work in the NW-Mediterranean it was thought necessary to *integrate* the many individual results achieved so far by the 27 partner institutes collaborating in this project, representing various marine disciplines. This important, but difficult task was achieved through intensive group discussions organized according to the "Dahlem Konferenzen" structure. The subjects and tasks of the four groups are the following:

Group 1: Inorganic Group: Mass balance and behaviour of trace elements in the Gulf of Lions

Tasks: – To establish fluxes (from natural and anthropogenic sources) at the various boundaries of the Gulf of Lions.
– To describe and to identify processes affecting the distribution of selected trace elements (dissolved and particulate) within the Gulf of Lions.

Group 2: Nutrients and organic production

Tasks: – To assess plankton production on a basin wide basis.
– To assess the distribution of the products of production within the plankton and its export.

Group 3: Anthropogenic perturbations

Tasks: – To establish criteria to differentiate natural and anthropogenic inputs of nutrients, metals and organic compounds.
– To review existing analytical data for atmospheric (wet and dry deposition, biogenic emissions), water column (dissolved and particulate, estuarine and open sea) and sediment (coastal and depp sea) contaminants, including compartment sizes and rates (e.g. river discharges, sedimentation rates, ...).
– To identify sources and sinks for major anthropogenic components.
– To assess fluxes and budgets for major anthropogenic components.
– To evaluate critical processes that goven the fluxes and budgets of contaminants.
– To critically assess apparent results of anthropogenic perturbations.
– To identify major gaps and make recommendations for near-future field investigations in the NW-Mediterranean.

Group 4: Global Change

On the basis of climate modelling prediction/scenarios:

Tasks:
- To assess the likely impact of precipitation changes on geochemical catchment weathering, river fluxes, atmospheric washout, ...
- To assess the likely impact of wind changes on catabatic cooling, winter overturn, storms, residual currents, Saharan inputs, ...
- To assess the likely impact of temperature changes on ocean heat flux, evaporation, stratification, ...
- To assess the likely impact of sea level rises on coastal flooding, erosion, ground water salination.
- To compare environmental changes due to demographic and industrialization patterns versus climate impacts.

It is expected that the detailed reports on the four working group will be published as a scientific book by the end of 1993, and the results be presented at an international conference on Biogeochemical Cycles at the Land/Sea Interface, intended to be organized by the Commission in Spring 1994.

3 Nitrogen and phosphate cycles in the deltas of the Mediterranean rivers Ebro, Po and Rhône

From 1987 to 1991 (for the Rhône until July 1992) the Commission of the European Communities funded a research project on the nitrogen and phosphorus cycles in the deltas of the Mediterranean rivers Ebro, Po and Rhône. It aimed at assessing the sources, fluxes and sinks of nutrients at the interface between those Mediterranean marshes and the fresh water (river) or brackish water (lagoon, estuary) environment.

This study has addressed different aspects of processes involving phosphate and nitrogen compounds and their fluxes, in three Mediterranean deltas of the rivers Ebro, Po and Rhône, with wetlands important for wildlife. One of the greatest dangers is the eutrophication of these wetlands with concomitant loss of their biological diversity. At present agricultural activities strongly enhance the eutrophication process.

The following management practices are recommended, based on the results of this programme:

- Decreasing the amounts of fertilizers already accumulated in the rice fields before flooding and applying the fertilizers during growth following the plants' uptake demands. Using urea as N-fertilizer and making use of the P and K already present in the irrigation water.
- Disposing of large size organic matter (plants growing on the channel banks) into the drainage channels (as done by the Comunitat de Regants) should be prohibited.
- Broadcasting fertilizers by helicopters should only be permitted when there is absolute security that the fertilizers do not enter the natural marshes.
- Dry periods during the cultivation of rice may be favourable for its production and can also be used to economize on water use.

Further information on topics 1 to 3 can be obtained from:
Dr. H. Barth, DG XII/E1, CEC, 200 rue de la Loi,
B-1049 Brussels, Tel. ++32-2-2356542

4 Water quality research at the Environment Institute of the JRC-Ispra

The activities, carried out at JRC-Ispra, contribute to the Specific Research Programme in the framework of the research area **"Environmental Studies in the Mediterranean Basin"** and provide Technical and Scientific Support for the Commission (DG XI) and to Third Party Work.

4.1 MITO Project

The JRC-Ispra has promoted, in close collaboration with institutions of five Member States (Portugal, Spain, France, Italy and Greece) a Joint European Project on algal blooms, i.e. MITO Project (MIcrophyte TOxins).

The project mainly addresses the characterization, identification and quantification of algal blooms with particular emphasis on the phytoplanktonic species producing toxins.

The MITO Project focusses on:

- **Analytical Cytology of Phytoplankton:** to develop fast and easy-to-use systems for the detection, enumeration and characterization of phytoplanktonic populations at the cellular level to detect changes in populations structure associated with environmental factors.
- **Aquatic biotoxins:** to develop alternative, sensitive and adequate methods for toxin detection, to study biotoxin production mechanisms and to develop monoclonal antibody against principal toxins.
- **Algal Taxonomy and Physiology:** to recognize the exact taxonomic position of toxic or potentially toxic bloom agents, to study the biological cycle of selected species, to ascertain the effect of environmental factors on growth and toxin production of selected strains and to explore the application of biochemical indices for the evolution of the physiological state of algae
- **Prediction of Toxin Occurrence:** application and/or development of hydrodynamic, transport and biological process models to provide a tool for the prediction of town occurrence, distribution and ecosystem effects

JRC-Ispra organized two field exercises at Corfù (Greece) in September 1991 and in the Adriatic Sea (Italy) in June 1992 The main goal was the study of the horizontal and vertical distribution of phytoplanktonic communities and their pigments comparing classical (microscoplc inspection) and innovative (flow cytometry) methods of analysis The quantification and identification of phytoplankton in sea waters were carried out by flow cytometer and optical plankton analyser on fresh (live) and fixed samples Preserved samples were analysed at JRC Laboratories using flow cytometry and fluorescence microscopy in collaboration with Partec Industry and Munster Univessity (Germany).

The results of these campaigns will be published by the JRC.

Further information can be obtained from:
Dr. G. Premazzi, Environment Institute, CEC-JRC Ispra,
I-21020 Ispra (VA), Tel. ++39-332-789352, Fax ++39-332-789352

4.2 Analytical Quality Assessment, Control and Assurance in the Mediterranean Basin Countries (AQUACON - MedBas Project)

The JRC decided to develop upon request and in close cooperation with the EC - Member Countries of the Mediterranean area (Italy, Greece, Spain, Portugal and France) a project aiming at the improvement of the measurement quality and the comparability of data in environmental analysis.

Following to a series of consultations with representatives of the above mentioned EC - Member Countries, agreement was found on objectives and *modus operandi* of the project and on a number of high-priority study items, all closely related to the implementation of EC-Directives. Objectives of the AQUACON-MedBas Project are:

- to explore the present status of measurement quality for selected and critical analytes and matrices;
- to identify, quantify and eliminate or reduce measurement errors;
- to develop and organize continuous internal and external laboratory quality control systems.

Subprojects on specific high-priority study items have been identified by the Scientific Steering Committee, the members of which assure also the diffusion of the subproject and the collection of interested laboratories in their countries.

Basically, the AQUACON-MedBas Project includes both intercalibration exercises as well as complex collaborative field and laboratory studies, which include in some cases the testing of sampling procedures and the verification of sampling representativity.

The JRC Ispra takes care of the organizational aspects of the single

subprojects, which are offered first of all to the public laboratories, especially in areas where systematic analytical quality control systems are not yet available on a national scale, but might develop as a follow-up of the AQUACON-MedBas activities, but also to commercial and industrial laboratories and universities. The participation is free of charge.

The status of the various subprojects is as it follows.

Subproject 1 "Seawater Analysis"
The subproject started off in 1990 with a sampling error evaluation study for dissolved trace metals comparing different sampling systems (First Report available). The study has been extended to the assessment of sampling errors associated with total suspend matter (First Report available).

The first laboratory study on the measurement errors of dissolved metal determination is at present underway.

An interlaboratory comparison of organochlorine compound determination is planned.

Subproject 2 "Mercury in the Foodchain"
An exploratory interlaboratory exercise has been performed using tunafish and mussel tissue as test matrices (Report available), the experiences of which are currently utilized in a collaborative study.

The mercury body burden of the population in the Mediterranean litoral can be assessed by hair analysis. An exploratory interlaboratory showed satisfactory results (Report in preparation) and further work is planned for 1993.

Subproject 3 "Sediment Analysis"
First interlaboratory comparisons are at present underway for both metal and persistent organochlorine compound determination.

An exercise on PAH-determination is planned and the respective test materials have been prepared.

Subproject 4 "Wastewater Analysis"
The first interlaboratory comparison for TOC, DOC, COD and AOX is in an advanced stage of planning, collecting at present the participating laboratory nominations.

Subproject 5 "Freshwater Analysis"
At the time being a complex collaborative field and laboratory study is in planning. The study includes sampling error assessment for metals and organochlorine compounds in both the dissolved and particulate state as well as the interlaboratory comparison for both groups of analytes on the basis of the respective national methods.

Subproject 6 "Rainwater Analysis"
A first interlaboratory comparison on the analysis of four artificial rainwater samples for anions, cations and pH has been organized (Report available) and the second exercise is currently underway.

The first interlaboratory exercise for metals is in the stage of planning and material stability study.

Subproject 7 "Drinking Water Analysis
The experiences collected during two interlaboratory exercises on metal determination in drinking water performed in the framework of the JRC's 3rd Parties Work Programme led to the formulation of this Subproject, which is at present discussed with the Member Country representatives. The first exercise shall be organized in the first half of 1993.

Subproject 8 "Foodstuff Analysis"
The results of an exploratory exercise on the determination of metals and some other components in four foodstuff materials (Report available) suggested the existence of numerous error sources. At the present an interlaboratory comparison on metals in a series of foodstuff materials is in preparation and the results are expected in the first half of 1993.

Following to extensive discussion the experimental programme for the next years has been settled and a number of subprojects definetively shaped.

Further information and reports can be obtained from:
H. Muntau, Environment Institute, CEC-JRC Ispra,
I-21020 Ispra, Tel. ++39 332 789758 - Fax. ++39 332 785212

5 Support activities

The Environment Institute provides scientific support to the DG XI for the implementation of existing Directives and for the the preparation of new ones.

In response to the request of DG XI for the preparation of a Directive concerning the **ecological quality of surface waters** (see Environmental Research Newsletter N°8), the JRC-Ispra has elaborated a simplified classification scheme for assessing the ecological state of freshwater lakes to be used throughout the European Community, based on generally accepted physico-chemical and biological features such as transparency, dissolved oxygen, chlorphyll a and phophorus concentrations, acid neutralizing capacity, algae and macrophytes, macroinvertebrates and fish indices, and, lastly, a sediment index.

Since the ultimate aim of the future Directive should be to reach a high ecological quality (HEQ) in all surface waters, in the proposed lake classification scheme a matrix, giving clear limitations of classes, has been considered taking into account also the morphoedaphic index. This allows the description of lacustrine systems in *complying* (two classes: excellent, good,) and *uncomplying* waters (three classes: fair, poor, bad) and to follow closely the evolution of the ecological quality of the Community waters, establishing basic (ecological) and minimum (managerial) objectives for lotic environments.

The suggested numerical criteria, corresponding to different degree of environmental quality, should allow to check the compliance (and its implementation) of the future Directive into national legislations.

The study has been published as **EUR Report 14563 EN.**

Further information can be obtained from:
Dr. G. Premazzi, Environment Institute, CEC-JRC Ispra
I-21020 Ispra (Va) - Tel. ++39-332-789266, Fax ++39-332-789352

6 Work for Third Parties

Briantei Lakes
Within a cooperative agreement with the Italian Ministry of the Environment the trophic conditions of four lakes Briantei, have been assessed.

The research concerned the main ecosystem components:

- physical chemical and biological characteristics of the lake waters;
- structure of the phytoplanktonic and zooplanktonic populations;
- lake sediments with reference to the content of eutrophicating substances and their bioavailability, heavy metals, organochlorinated compounds and radionuclides.

Based on measurements of phosphorus released from sediment cores in the laboratory, internal loadings and their role in determining P levels in lake waters were assessed.

Without prejudice to the completion of the purification infrastrure (sewers, waste water treatment plants) for reducing the external nutrient loads, the attainment of the planned restoration goals in acceptable periods of time will be possible only by employing internal measures for the recovery of lakes. Among various options some internal methods have been identified as feasible; they include sediment removal, hypolimnetic withdrawal and hypolimnetic aeration.

The study represents the reference point for setting up a correct safeguarding and restoration plan, and the rational management of the waterbodies.

The results have been published by the EC in the series "Environment and Quality of Life" as **EUR Report 14548 IT** and may be requested from G.Premazzi (see above).

The MAPO Project

The multi disciplinary methodologies being developed within the Institute for Systems Engineering and Informatics, in the Technology Assessment Sector, for the creation of Decision support systems are also being applied to real environmental management problems in the context of work for third party clients

(see ER newsletter no. 9). A major project, **MAPO**, has being undertaken in 1990, 1991 and 1992, and this is described in the following in more details.

The initials **MAPO** indicate a decision support system for the management of planning and control of the cleaning up of the river Po. The work is financed by the Italian Ministry of the Environment. The basin which is the subject of the study is the largest in the country.

The system is inteded to give scientific support to the decisions of the organization responsible for carrying out the clean up of a large river basin. This support will be given by the evaluation of alternative plans of action, and aid to the decision maker in making rational choices based on these evaluations. The alternative plans will be characterized by costs, environmental impacts and social impacts.

The philosophy behind the system is that relevant information about the environmental problem under study is extracted from existing databases, for instance a Geographical Information System (GIS). This information is then passed together with user defined information about specific high level goals to the expert system module. This module then generates the actual alternatives which satisfy the initial hgih level goal of the decision maker. These alternatives are then examined using decision techniques to arrive at a (number of) preferred solution(s).

The system was designed in 5 blocks:

- User Interface;
- Decision support module;
- Expert system module;
- Input control module;
- Communication module.

The user interface takes care of the communication to and from the user and passes requests to the expert system module and the decision support system module.

The decision support module is based on the idea that decision within the environmental field can only be made on more than one criteria.

The MAPO system is therefore implemented in the framework of Multi Criteria Decision Aid (MCDA) theory.

The User Interface module is responsible for all interaction between the system and its users, providing a consistent and friendly communication.

The MAPO system is being developed as an experimental prototype. In order to verify the functionality of the system architecture a simplified case study is being used. This has permitted the verification of the possibility to integrate:

- a decision support system;
- an expert system for structuring knowledge;
- Geographic Information System (remote).

This version has been demonstrated to the Italian Ministry for the environment and to the Italian Authority for the Po valley.

The prototype has been well received, and seem to have convinced the clients of the usefulness of the approach and the benefits to be derived from the application to real cases.

A continuation of the project is being planned, which may include full integration with the information system for the Po river developed by the Italian authorities, with other informations sources, and possible distributed decision makers.

Further information can be obtained from:

- P. Haastrup, ISEI, CEC-JRC Ispra,
  Tel. ++39-332-789083, Fax ++39-332-789394
- M. Paruccini, ISEI, CEC-JRC Ispra,
  Tel. ++39-332-789302, Fax ++39-332-789394

Soil

EC Research Programme and Support Activities to the Commission

1 Soil and groundwater protection

With 11 projects, Area 5 "Soil and Groundwater Protection" is one of the smaller research areas of STEP. The projects involve 55 research groups from all the Member Countries, except Ireland and Luxembourg, and from three EFTA countries (Austria, Norway and Sweden).

More than half of the research groups (30) are from universities, 22 are from public research institutes, one from a private research institute and two are from industry.

The financial volume of the Community contribution to the research projects amounts to 5.59 Mio ECU for a 3-year period, compared to a total cost of 8.09 Mio ECU.

In the following the progress accomplished in the various projects is summarized.

1.1 Protection against inorganic pollution

Emission and sorption of the greenhouse gas nitrous oxide by agricultural soils and natural wetlands (scientific coordinator Prof. K.A. Smith, University of Edimburgh)

The project is aimed at:

- providing estimates of the soil/atmosphere exchange of N_2O over Europe, by obtaining representative data on the emission/ uptake of N_2O from intensively managed and natural land;
- identifying the key soil and other environmental factors controlling gaseous fluxes;
- using results from the above topics to model fluxes over regions;
- developing new methods of measuring gaseous fluxes, to improve the potential for further data collection in future, to permit improved Community-wide models to be constructed.

Emissions of N_2O in excess of 100 g N $ha^{-1}d^{-1}$ were measured from a recently fertilised wet clay soil under grass in summer. Low-lying natural sites also gave substantial emissions under wet and warm conditions. Much lower fluxes were determined from lighter-textured and better-drained soils. Spatial variability within a site was generally greater than temporal variability. Simulated N deposition increased emissions, and the nitrification inhibitor dicyandiamide (DCD) reduced emission from soil fertilised with $(NH_4)_2SO_4$.

Denitrification and N-emission from different european cultivation systems and different soil types (NEMIS) (Scientific co-ordinators Dr. A.M. Lind and Dr. F. Eiland, Danish Institute of Plant and Soil Science)

The objectives of the project are:

- To provide representative data on denitrification and N-emission from agricultural land in different countries in the EC;
- To use these data together with intensive registrations (climate, soil chemistry, soil water state, nutrient levels, crop development) to make a common database.

Guidelines for field registrations have been made. The general field registrations comprise: Soil type and series, particle size distribution, textural class, structure, moisture release curve, bulk density, pH and content of total N and organic C.

Variable properties which are registrated during experimental periods comprise: air temperature, soil temperature in two depths, soil moisture content, precipitation (or irrigation equivalent), concentration of NH_4^+-N and NO_3-N in soil profile and oxygen state in soil sampling depth, if possible.

Guidelines for input to and use of the common database have been made.

A unifying concept for the assessment of the bio-availability and leachability of cadmium and zinc (Scientific coordinator: Steve M. Mc Gaath, IACR, Rothamsted Experimental Station)

Main goals to be achieved are:

- To develop a laboratory technique in which plant uptake response to concentrations and activities of Cd^{2+} and Zn^{2+} in soil solution can be measured, and determine whether plant uptake of these is determined by their activity in solution under different soil (pH, metal load) and plant growth conditions (temperature, water regime);
- To determine whether, in addition to soil solution concentration of the metals ("intensity"), the buffering capacity of the soil solid phase ("capacity") determines plant metal uptake;
- To develop a simple test to assess bio-availability of Cd and Zn, using simple salts;
- To apply the above objectives to a range of different soils throughout the EC;
- To combine measurements of metal concentration/activity in soil solution with a conceptual model of Cd an Zn uptake by plants and combine this with measurements of leachability;
- To use the understanding gained from experimental data for the purpose of generalisation and development of generally valid concepts.

Soil solutions displaced from unplanted pots showed that contamination of soil solution samples was not a major problem and that pH changes considerably after exposure to air. This pH change as well as storage time affect the speciation (i.e. the activity) of Cd and Zn in solution.

The experiments carried out to test for changes in metal uptake by plants over time showed that fertilizer would have to be added daily according to the plants requirements in order to minimise changes in availabiltiy of Cd and Zn to the plants.

Fundamentals of chemical and physical aspects of soil and groundwater protection (inorganic pollutants) (Scientific coordinator: Prof. Dr. W.H. van Riemsdijk and Prof. Dr. ir. F.A.M. de Haan, Wageningen Agricultural University)

The project is aimed at:

- increasing knowledge with respect to metal ion speciation and metal ion transport in natural porous systems;
- improving existing models and develop new mechanistic models that allow for the calculation of the distribution of metal ions over the solid and liquid phase both under equilibrium conditions as well as in combination with waterflow;
- developing analytical methods that allow for the measurement of the free mletal in concentration in soil solutions or pore water.
- developing methodologies for dealing with the effect of physical and chemical heterogeneities on the transport of reactive pollutants in natural porous systems.

Binding of cadmium and lead to humic acids has been measured using various voltammetric techniques. A numerical model is under development for interpreting voltammetric data. Different types of iron(oxyhydr)oxides have been prepared and partly been analyzed in terms of surface structure. Humic acids and ironoxide show interaction in terms of proton binding. A semi-empirical Cd-adsorption model was validated for a sandy soil and used to describe spatially variable Cd-contents in a field. The travelling wave behaviour due to non-linear adsorption, of which theory was developed earlier, was used to explain transport behaviour for degrading solutes, for layered soils and for randomly layered soils. A start was made to describe transport of a linearly adsorbing solute in a two dimensional randomly heterogeneous flow domain (aquifer).

Integrated analysis of water and solute flow to predict the environmental hazard of farm management strategies in theEC (Scientific coordinator: G. Vachand Université Joseph Fourier, Grenoble)

The objectives of the projects are:

- Evaluation and consolidation of the scientific basis describing the processes governing the fluxes of water and solutes filtering through soil under different crops and land management, including via preferential flow;
- Measurement and characterization of the basic parameters required to describe these fluxes of water and solute in various European soil units;
- Identification, and possible adaptation of integrated models capable of simulating and predicting water and solute fluxes under various crops and land management;
- Establishment of rules and procedures for validating these models;
- Application of the validated tools through the use of the existing regiona geographic information systems (GIS).

The basic idea of this program is to develop intercomparisons of measurements techniques and models in order to validate methods of measurements of nitrogen transport and transformation in soils, in relation with agricultural practices, and to elaborate advices for less pollutant cultivation techniques under different european situations.

Heavy metal toxicity to soil microbes (Scientific coordinator: K.E. Giller, Wy College, University of London)

General objectives of the project are:

- To establish which metals and at which concentrations can result in the negative effects previously observed in symbiotic N2-fixation,
- functioning of VA-mycorrhiza and the turnover of carbon and nitrogen through the microbial biomass in soils contaminated with metals.
- Development of standardised laboratory methods for measuring heavy metal toxicity.
- Identification of the adaptation of microorganisms to elevated metal concentrations.

The project will evaluate the need for revision of the maximum permitted metal concentrations in agricultural soils as stipulated in CEC directive 86/278/CEC.

A procedure for the determination of C yield efficiencies using glucose addition to soil was adopted and modified. The proportion of C respired increased with increasing C additions. Soils were collected from field experiment plots treated with either calcium nitrate, ammonium sulphate, peat of sewage sludge (containing metal concentrations close to CEC limits). In addition, ammonium sulphate and sewage sludge treatments were limited to adjust pH to near neutral. C yield efficiencies in unlimited soils treated with ammonium sulphate (pH 4.4, 1.36% C) or sewage sludge (pH 5.3, 2.7% C) were lower than in other soils.

In solution studies of the germination and growth of Glomus mosseae, the sensitivity to metals was Cu > Cd > Zn. Mycelial growth was more sensitive to Zn than spore germination. A routine system of producing mycorrhizal plants was developed.

A range of *R. leguminosarum bv trifolii* strains were tested for tolerance to elevated concentrations of Cu, Zn, and Cd in a buffered-arabinose MES(BAM) defined growth medium adjusted to pH 6.0 and 6.5. Ryzobium from farmyard manuze and sewage sludge amended soil was inhibited by free Zn ion while free Cu inhibits FYM and S strain.

1.2 Protection against organic pollutants

Effect of monoculture practices on soil organic matter status and quality in relation to interactions in soil and transport to groundwater of selected herbicides (Scientific coordinator: Prof. N. Senesi, USB, Bari)

The project is aimed at:

- ascertaining the extent to which the agronomic practice of long-term monoculture - extensively applied in many countries of the EC, such as vineyards and citrus in Italy and hops in Germany - and the implied repetitive application of specific herbicides -

such as glyphosate, simazine, diquat, paraquat, atrazine and 2,4-D - to the soil may alter the status and properties of soil organic matter and whether these modifications may affect the mobility of herbicides through the soil and their downward transport to the groundwater.

Results of bulk soil analyses show that minor differences occur among soils sampled in the same area (citrus or vineyard).

Humic aicds (HAs) isolated from citrus and vineyard soils have been characterized chemically and spectroscopically. The extraction yields are generally low and are enhanced by adding 1 N sodium pyrophosphate to the conventional 0.5 N NaOH extractant solution.

At a first comparative examination of the more than 400 FT-IR, fluorescence and ESR spectra obtained on the model products of interaction between HAs from citrus and vineyard soils and the herbicides glyphosate, simazine, atrazine, diquat and paraquat, a number of relevant modifications appear to occur in the spectroscopic properties, the interpretation of which is expected to provide useful information on the types and mechanisms of binding between the various HAs and herbicides (the study is still in course).

Breakthrough curves have been obtained by multiple development, thin-layer chromatography of the solid-phase-extracted leachates of the vineyard soil columns, equilibrated first with the herbicide 2,4-D and successively with simazine. Dissolved organic carbon and UV absorption have also been measured in the leachates to obtain information on the possible cotransport effects of the mobile soil organic matter on these herbicides.

Halogenation of organic macromolecules in the terrestrial environment (Scientific coordinator: Anders Grimvall Linköping University)

The project is aimed at quantitavely assessing the contribution of natural halogenation processes to the widespread occurrence of organically bound halogens in soils and groundwater. More precisely, the role of non-specific halogenation mechanisms, such as enzymatically mediated halogenation of humic substances, will be examined in laboratory studies as well as field studies. In addition, natural production of compounds considered to be xenobiotic and the impact of soil acidity on natural halogenation processes will be evaluated in detail.

Laboratory studies using ^{36}Cl as radiotracer of chloroperoxidase-mediated chlorination of humic acid demonstrated that - in the presence of enzyme, inorganic chloride and hydrogen peroxid - chlorine was incorporated into the humic acid.

Soil extracts were produced using a modified method for peroxidase extraction, and the obtained extracts were tested for their chlorinating capacity. The test results showed that practically all extracts contained a chlorinating catalyst.

A procedure for sampling of soil air at soil surface has been developed and combined with gas chromatographic analysis of chloroform. Results from four Dutch sampling sites indicate that the chloroform concentration is hiigher in soil air than at soil surface.

Sampling and chemical analysis of groundwater has been performed at three unpolluted sites in Denmark with different geology and geohydrochemistry. The results from two of the aquifers strongly indicated that peat lignite or humic clays were a common source of organic matter and AOX.

Subsoil Microbiology (Scientific coordinator: I.P.E. Anderson, Bayer AG)

The purpose of the project is manyfold i.e.:

- Obtain knowledge and data which will support a realistic evaluation of the benefits and risks of chemicals to ground water purity;
- Measure seasonal fluxes in temperature, moisture, and oxygen levels at selected depths in the unsaturated zones of soils;
- Develop laboratory and field methods for characterizing subsoil microorganisms, their degradation capacities, and their activity levels;
- Determine the capacity of the microflora in subsoils to degrade natural and synthetic chemicals under laboratory and field conditions;
- Use information gained in these studies to evaluate the environmental relevance of tools (i.e., lysimeters) currently used to investigate the fate of chemicals in soils;
- Use biological and pedological data from these studies to improve mathematical models used for predition of the fate of chemicals in soils.

Field stations were built in Germany, France and the United Kingdom. Probes were installed at each station for monitoring temperatures and oxygen partial pressures at 4 to 6 depths in the soil profile.

Methods for analysis of the oxygen content of soil air and measurement of subsoil temperatures were tested and established by each group.

Samples were collected down the soil profile at each station. The final depths reached at each station were determined by the structure of the subsoil and the height of the water table. The physical and chemical characteristics of the soils from each station were determined.

The distribution, composition and activity levels of the microflora in the soil down the profile at each station were investigated.

1.3 Protection against soil erosion

European Soil Erosion Model (EUROSEM) (Scientific coordinator: R.P.C. Morgan and R.J. Rickson, Cranfield Institute of Technology)

The project is aimed at completing the development of the European Soil Erosion Model (EUROSEM) as a procedure for evaluating soil erosion risk and designing soil protection measures to combat erosion.

Version 2.2 of EUROSEM was issued as a diskette along with a User Guide to the collaborating scientists.

Field data collection has continued at Woburn, Murcia and Valencia.

Field plots have been set up at Firenze and Catania and rainfall simulators constructed and tested for use at both sites. Additional field plots have been established in southern Norway. The catchment at Syv Baek has been instrumented and monitoring is in progress.

Progress has been delayed on the construction of the hardware model to rethink the purpose of the proposed experiments.

The necessary fundamental relationships for developing a sub-routine to deal with stoniness has been established while the fundation for developing a sub-routine for snowmeet and frozen soil has been prepared.

New tables of guide values for input data on soils to EUROSEM have been produced, and relationships from the literature between soil properties and their erodibility have been established.

Relationships between discharge, flow velocity and flow area have been developed. These will be used to improve the modelling of rilled catchments.

Further information can be obtained from:
P. Mathy, CEC DG XII-E, 200 rue de la Loi, B-1049 Brussels
Tel. ++32-2-2358160, Fax ++32-2-2363024

2 Soil Research at the Environment Institute of the JRC Ispra

Soil quality studies at the Environment Institute of the JRC Ispra are part of the research on Chemical Waste carried out at the Institute.

The importance of soil constituents for the sorption of atrazine was studied in 24 soil profiles all deriving from granodioritic materials. Each profile is subdivided in several horizons going from the soil surface to the parent material.

The soil-water distribution (Kd) of atrazine showes to be governed

by the soil organic matter. Other soil components like oxides of aluminium, manganese, or iron, play a minor role, and are only important for soils with extremely low organic matter contents. Not only the amount of organic matter in a soil, but also its composition determines Kd. In particular, the humic acids are strongly correlated with Kd. This underlines that caution should be taken when soil sorption of atrazine and possibly other related compounds is to be estimated from published organic carbon soil sorption coefficients (Koc). In particular, the assumption that soil organic matter in "ordinary soils" has a constant composition with an invariable efficiency of solute partition can result in overstimation of soil sorption. Consequently misleading results can be obtained for the assessment of groundwater contamination. An analysis of the concentration of various organic matter fractions will improve estimations of the soil sorption. In the absence of sorption data, predictions of the soil sorption for atrazine and possibly other s-traizines are more precise when based on the octanol/water partition coefficient of the compound, rather than on the aqueous solubility.

The environmental problems due to the high consumption of coal for generating electricity in Europe are taking an increasing interest. Large amounts of trace metals are mobilized in the combustion residues, from coal-fired power plants. High concentrations of selenium in soil and drainage water are potentially toxic to biota and may indicate a source of industrial contamination. Selenate was shown to be released from coal fly ash by water leaching at concentrations ranging from 1300 to 50 μg/L. Sorption data of selenite and selenate in a soil profile have been obtained in order to provide information for modeling the transport of selenium in a soil profile. Distribution coefficients (Kd) ranged from 59 to 314 L/kg for selenite and from 3.2 to 14 L/Kg for selenate. If selenate is so mobile in the soil water system it may reach hazardous concentrations in surface and ground waters.

Further information can be obtained from:
L. Götz, Environment Institute, CEC-JRC Ispra
I-21020 Ispra (Va), Tel. ++39-332-789588, Fax ++39-332-789323

Ecosystems

Ecosystems do represent a research area of major concern in the 1991-94 R&D Programme of the Commission of the European Communities as well as in the 1989-92 STEP Programme. The issues n° 4, n° 6 and n° 8 of Environmental Research Newsletter have provided detailed information concerning this research area for which new achievement are given below.

EC concerted Action Continental Ecosystems Research

The overall objective of this concerted action is to develop a coherent approach to support the continental ecosystems research in Europe. For the purpose, the focussing of the objectives of the current and of the next framework programmes in view of the most efficient utilization of the available resources for ecosystems research, on one hand, and the integration of these objectives with those of nationally-funded programme and of international initiatives (IGBP, ESF as an example), on the other hand, are mandatory. In addition the integration of the projects with those related to the interface between continental ecosystems and other parts of the geosphere-biosphere is essential.

1 Concerted Actions on Ecosystems Research

The Concerted Actions COST 611, 612, 613, 341, 647 and 681, legally linked to the 4th Environment Research Programme, ended formally on December 31,.1990. Final reports are ready or will be available soon. The achievements were reviewed at the Conference celebrating 20 years of COST (Vienna, November 1991).

The Concerted Action "Effects of air pollution on terrestrial and aquatic ecosystems" was launched as a Cost project in 1984 (COST 612). 15 workshops and 1 symposium were organised within the framework of the 3 working parties (WPs) of this concerted action (WP I: effects on terrestrial ecosystems, in particular forests; WP II: effects on aquatic ecosystems; WP III: effects on agricultural productivity).

The objective of COST 612 was not merely to investigate direct effects of high concentrations of air pollutants on isolated organisms but to develop an ecosystemic approach, considering the whole spectrum of interacting environmental factors. Further impetus has to be given to this approach on account of the fact that other environmental factors (CO_2 concentration level in the atmosphere, rainfall patterns, temperature rise) play a role in the key processes in continental (terrestrial, aquatic, wetland) ecosystems.

The COST 647 concerted action (Coastal Benthic Ecosystems) dates back in 1979. The second phase of the project ended in 1991. It has been recognized the need to extend long-term data sets and to get a larger geographical coverage. In addition the consolidation of the biological data with related physico-chemical parameters is required. Lastly more information on the interactions of benthic habitants with pelagic, terrestrial and fluvial ecosystems are mandatory.

Follow up of the ESF-EC collaboration

The European Science Foundation set up the Forest Ecosystem Research Network (FERN) in 1986 with the objective of developing cooperation among scientific institutions involved in European forest ecosystem research. Working groups were created to deal with (a) a retrospective study of man-induced changes and the influence of fires and grazing (b) nitrogen dynamics and (c) architectural patterns.

Although the FERN action came to conclusion in 1991, the scientific themes of the project have been introduced in the 1991-94 Community R&D programme on Environmental Protection (Topic: Biogeochemical cycles and ecosystem dynamics)

Contribution to the research on Global Change

Many aspects of the functioning of ecosystems are important to our understanding of global processes. These aspects, currently considered within the framework of the developing Core project GCTE (Global Change and Terrestrial Ecosystems) of IGBP, are mainly concerned with the changes in ecosystem "physiology" and structures, induced by (a) climatic changes (b) changes in the chemical composition and physics of the atmosphere and (c) land use changes. The feedback mechanisms, in particular the effects of modified or changing ecosystems on the atmosphere (greenhouse gases) and on the hydrosphere (modification of the hydrological cycle) are also being examined within this framework.

Finally, the effects of environmental changes on biodiversity will be dealt with by IGBP. These themes are part of the EC 1991-1994 R&D programme and a coordination between the two international undertakings is desirable.

Further information can be obtained from:
Mr. P. Mathy, CEC, DG XII/E-1, 200 rue de la Loi
B-1049 Brussels, Belgium
Tel. ++32-2-2358160, Fax ++32-2-2363024

2 Research projects funded within the 1991-1994 EC Programme "Environment"

Continental ecosystems

Water-use efficiency and mechanisms of drought tolerance in woody plants in relation to climate change and elevated col

The present project aims at providing a fundamental basis for assessing adaptation features of woody plants in the context of

climate change. It takes into account the main physiological processes and morphological-structural alterations involved in the global plant responses to combined effects of elevated CO_2, drought constraints and high light and temperature stresses which have been shown to strongly interfere with drought stresses.

NIPHYS - Nitrogen physiology of forest plants and soils

NIPHYS (Nitrogen Physiology of Forest Plants and Soils) is an investigation of the present effects of soil-borne and deposited nitrogen on forest organisms and soils along a climatic transect through Europea in order to substantiate predictions on effects of changing depositions and global climate on broad-leaved and coniferous trees.

Influence of nitrogen deposition on the carbon balance in Peatland ecosystems

The project will improve our understanding of the processes of plant growth and decomposition of plant residues in peatland ecosystems. The main objective is to determine the influence of nitrogen (N) deposition on the carbon balance in nutrient poor peat bogs.

Effects of rapid climatic change on plant biodiversity in boreal and montane ecosystems

Enhanced greenhouse warming will, in the next century, diminish the extent of boreo-alpine habitat. A similar reduction occurred during the Holocene thermal maximum. This project will examine the extent of these readjustments in four montane 20-km squares, situated in Norway, Scotland, western Alps and Appenino Abbruzese, and will assess their consequences for local biodiversity.

Photo-oxidant toxicity and nutrient imbalance in trees as consequence of increased nitrogen emissions and inputs

In many forests throughout Europe, trees are exposed to increasing concentrations of ozone and hydroperoxides together with elevated inputs of nitrogen. Free radicals and/or formation of hydroperoxides, from reactions between ozone and unsaturated hydrocarbons produced in plants, are suspected to be responsible for the phytotoxicity of ozone. In both long-term and short-term experiments with poplar and pine, this will be examined for reaction products of these reactions, formation of free radicals, aldehydes and monocarbonic acids, and the expression of the antioxidant enzymes, ascorbate peroxidase, glutathione reductase, superoxide dismutase, catalase and their regulation by the phytohormone ethylene.

VAMOS: Variation du réservoir de matière organique du sol

The innovation of this project is to perform a set of integrated experiments using standard labelled (13C and 15N) plant material in coniferous forest ecosystems to study its decomposition rate and the fate of its carbon and nitrogen in relation to climate and to measure, by labelling different humus, the turnover of the soil organic matter pools.

EXMAN - Experimental manipulation of forest ecosystems in Europe

The aim of the research is to quantify and increase the understanding of biogeochemical cycling of elements, turnover of biomass and the effects of atmospheric deposition on forest ecosystems. Special emphasis is placed on soil conditions.

ERMAS - European river margins as indicators of global change

This project will test the hypothesis that river margin ecosystems are more sensitive to environmental change than the adjacent aquatic or terrestrial system.

Physico-chemical forms of aluminium in non-equilirbium aquatic systems and related biological effects

The aim of the project is to increase the understanding of chemical/geochemical processes influencing biological systems in aquatic mixing Zones under severe dis-equilibrium conditions. Special emphasis will be put on the enhanced toxicity towards fish in mixing Zones between neutral or limited rivers and acid tributaries.

The effect of environmental change on european salt marsches. Structure, functionning, exchanges potentialities with marine coastal, water

The main aims of project are:

- To estimate the importance and the causes of inter-annual variations in export-import budgets;
- To measure the amount and annual variations of mineral and organic particulate matter imported;
- To compare natural salt marshes with grazed ones;
- To classify marshes on a functional basis through the combination of the assessment of marsh maturity and marsh management;
- To estimate the role and value of salt marshes not only as for their classical capacity to support waterfowl but by showing the integration of halophytic organic matter in marine food webs;
- To formulate management proposals that can maintain or increase the functional value of salt marshes, especially when sea level rise occurs.

Assessment of the two main and connected human influences, river disturbance and subsequent fish stocking, on the genetic diversity and stability of natural riverine fish populations

The present project proposes to assess the rarely investigated genetic diversity of riverine fishes in central and southern European rivers, which are often heavily regulated.

Extended HUMOR: extention of project HUMOR: humic substances modifiers for the response of aquatic ecosystems to acidification

This present proposal is an extension of the conceptual goals of the original HUMOR Projects. The project aims at the study the chemical and biological changes occurring at the soil/water interface.

Effects of interaction between eutrophication and major environmental factors on the ecosystem stability of reed vegetation in European land-water ecotones (EUREED)

This project aims at examining the relation between eutrophication and major environmental factors on the ecosystem stability of reed (phragmites autralis) vegetation in European land-water ecotones.

The effect of the bioavailability and turnover of low-molecular-weight organic compounds on the degradation and preservation of organic matter within sediments

The proposed study is expected to give considerable insight into the key biogeochemical factors controlling the degradation and preservation of organic matter within aquatic sedimental ecosystems.

ODER - Oder discharge - Environmetal response

Using a multi-disciplinary approach the project ODER team will quantify the metal and organic compound contents of suspended matter and sediments and water/pore water phases. Fluxes will be determined through radiochemistry of selected nuclides (Pb-210, Th 234, Cs-137). Sediment dynamics will be studied with high-resolution side scan sonar and remote vehicle observation. A thorough hydrographic, nutrient and primary productivity assessment will be carried out.

MATURE: Biogeochemistry of the maximum turbidity zone in estuaries

In this project it is proposed to study the role of biological processes in the formation and subsequent utilization of particles in the maximum turbidity zone of three European estuaries: Gironde, Schelde and Elbe. Special attention will be given to organic matter and biological processes acting on it.

3 Concerted Action: Decomposition and accumulation of organic matter in terrestrial ecosystems

The ultimate objective of this concerted action is to advance our quantitative understanding of decomposition and accumulation of organic matter so as build a body of knowledge that can be used to understand and predict environmental changes in terrestrial

ecosystems and associated feed-back processes, brought about by a wide variety of causes.

The short-term objective and the expected achievement is to define the specific requirements for cross-European research for the fourth Framework Programme, that benefits from (1) cooperation of research groups from different countries, with different specializations some of which have access to advanced and costly equipment, (2) data on long-term experiments available for a limited number of sites, and (3) the wide range in physical and chemical climate, soils and ecosystems available across Europe.

During the Doorwerth Workshop, the need was identified for an interdisciplinary research framework which integrates biochemical analysis, physical analysis and biological process studies rather than isolated research by these disciplines. A serie of interdisciplinary workshops will be an important process to facilitate the:

- development of a quantitative and predictive understanding of soil processes;
- promotion of a wider availability and application of specialist techniques for the physical and chemical analysis of SOM;
- application of molecular biology techniques to characterise microbial groups and activities;
- development of SOM fractionating measurements which define functional pools;
- provision of analytical or experimental standards to calibrate field experiments and laboratory methods;
- consideration of problems relating to the heterogeneity in time and space and particularly of scaling-up from the resolution of microanalytical techniques to bulk soil, soil profiles, soil series and landscapes;
- critically review current understanding of the functional roles of fungi, bacteria and invertebrates and their interaction, in litter decomposition, soil organic matter formation and stabilization;
- identify methods and approaches for investigating the role of soil organisms (incl plant roots) in transfers of organic and mineral C and N within the litter and soil profile;
- evaluate current models of soil organism activities ins soil (food webs, hydrology, indirect effects of C and N fluxes).

4 European cooperative research projects on forest litter decomposition

DECO: Forest organic matter turnover in a European climatic transect

As a part of the FERN project (see ERN n° 8, December 1991) 35 forest sites in 13 European countries are monitored for decomposition rates of a standard *Pinus sylvestris* litter. The standard litter is prepared by Jädras Field Station in Sweden, on the basis of soil climate variables (temperature, water content, water tension) which can be derived from the SOIL model, DECO model can calculate the expected mass loss rates of organic matter in a given forest stand.

CORE: Mechanisms of nutrient turnover in the soil compartment of forests.

The objective is to improve our understanding of the control of nutrient immobilization and release associated with soil organic matter dynamics. Process models are being developed so that the responses of forest soils to changing physical and chemical environmental conditions can be predicted and tested.

These two projects are the fruit of the close collaboration between the Commission of the European Communities (DG XII-E/1) and the European Science Foundation (Forest Ecosystems Research Network - FERN). The success of this collaboration lies in the complementarity of the coordination work done by ESF to consolidate the implementation of European research projects launched by CEC.

DECO and **CORE** projects are led by Dr. Philip Ineson, Institute of Terrestrial Ecology, Grange-over-Sands (U.K.) the University of Exeter, the GSF Münich, the University College of Dublin, the CNRS Montpellier, the Free University of Amsterdam and the University of Copenhagen being the scientific partners.

For more information about DECO:
A. Teller CEC DG XII-E, 200 rue de la Loi, B-1049, Brussels
Tel. ++0032-2-2358446, Fax ++0032-2-2363040

For more information about CORE:
Mathy, CEC DG XII-E, 200 rue de la Loi, B-1049, Brussels
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ENCORE (European Network of Catchments Organised for Research on Ecosystems)

The objectives are:

- To establish a network of catchments within Europe, covering a range of environmental conditions (including pollution climates) representative of Europe, where a common baseline programme of research and more intensive research programmes could be carried out, taking into account existing catchment-based research projects.
- To indentify indicators of environmental change and damage at different hierarchical levels within catchments suitable for the analysis and prediction, as far as possible, of the effects of natural and anthropogenic perturbations on biotic communities and ecosystem stability.
- To develop, or modify existing process-based models to assess and predict the response of catchment ecosystems to natural and anthropogenic perturbations.

ENCORE is coordinated by N. Horming, Institute of terrestrial Ecology, Grange-over-Sandfs (U.K.)

NITREX (Nitrogen Saturation Experiments)

The project is aimed at investigating the degree and rates of reversibility of nitrogen saturation. For the purpose nitrogen deposition to entire ecosystems - catchments or large forest stands - is experimentally changed.

Nitrogen is added or removed to simulate natural precipitation in the course of 11 large scale experiments covering the European gradient from high (The Nederlands) to low (Norway) nitrogen deposition. Nitrogen-15 will be used to trace the fate of nitrogen in the ecosystems.

NITREX is jointly coordinated by Prof. Dr. N. Van Breemen, Agricultural University of Wageningen (NL) and Dr. R.F. Wright, Norvegian Institute for Water Research.

ECOTREE (European Cooperative Research Projects on Tree Physiology)

The projects address the impact of pollutant imputs, water shortage, nutritional deficiencies and influence of temperature extremes on tree physiology and ecosystem functioning and stability. Six projects are covered under **ECOTREE**, i.e.:

- Interacting effects of drought and pollution on tree physiology.
  (Scientific coordinator: Prof. T.A. Mansfield, University of Lancaster).
- Dynamics of biological and physiological signatures and leaching in a spruce stand in clean and ambient air under natural sites conditions.
  (Scientific coordinator: Dr. F. Horsch, Kernforschungszentrum Karlsruhe)
- Influence of ammonia and ozone on stress sensibility of forest trees.
  (Scientific coordinator: Prof. J.N.B. Bell, Imperial College of Science, Technology and Medicine, London)
- Water stress, Xylem disfunctions and dioback mechanisms in European oak trees.
  (Scientific coordinator: Dr. E. Druyer, Institut de la Recherche Agronomique, Nancy)
- Role of ectamycorrhiza in stress tolerance of forest trees.
  (Scientific coordinator: Dr. D.L. Goldbold, University of Göttingen)
- Interactions between air pollutants, climatic and nutritional factors on coniferous tree physiology.
  (Scientific coordinator: Prof. P. Dizongremel, University of Nancy I)

For more information about ENCORE, NITREX and ECOTREE:
P. Mathy, CEC, DG XII-E, 200 rue de la Loi, B-1049, Brussels
Tel. ++32-2-235 81 60, Fax ++32-2-236 30 24

Climatology and Natural Hazards

1 EPOCH: European Programme on Climatology and Natural Hazards (1989-1992)

The research undertaken under EPOCH is well under way, to final results from contracted researches being expected towards the middle of 1993.

Information on the EPOCH contracts provided in the Environment Research Newsletter No. 8 (December 1991) in further completed in this issue by indicating the contract, coordinators and their institution.

AREA 1: Past climates and climate change

EPOC-0001 - Data Analysis to Detect Trends in Stratospheric Temperature
M.-L. Chanin, CNRS - Service d'Aéronomie, F-Verrières le Buisson

EPOC-0004 - Global Change over the Last 30 Thousands Years
J.C. Duplessy, CNRS - Centre des Faibles Radioactivités - F-Gif/Yvette

EPOC-0033 - The Greenland Icecore Project (GRIP)
M. Fratta - European Science Foundation - F-Strasbourg

Area 2: Climate Processes and Models

EPOC-0002 - EUCREX - European Cloud and Radiation Experiment
E. Raschke - GKSS - Forschungscentrum Geesthacth - D-Geesthacht

EPOC-0003 - Climate of the 21st Century
K. Hasselmann - Max-Planck-Institut für Meteorologie - D-Hamburg

EPOC-0012 - Fundamental Studies on the Predictability of the Atmosphere and Climate
C. Nicolis-Rouvas - Institut Royal de Météorologie - B-Bruxelles

EPOC-0016 - SLAPS - Spatial Variability of Land Surface Processes
A. Dowley - University College Dublin, Center for Water Resources Research - IE-Dublin 2

EPOC-0017 - The Global Carbon Cycle and its Perturbation by Man and Climate
M. Heimann - Max-Planck-Institut für Meteorologie - D-Hamburg

EPOC-0024 - HAPEX-SAHEL
J.P. Goutorbe - CNRS (URA 1357 du CNRS/ Météorologie Nationale)

EPOC-0030 - ECHIVAL Field Experiment in a Desertification Threatened Area (EFEDA)
See "Desertification in the Mediterranean Area"

EPOC-0035 - Global Balance of Spitsbergen Ice Mass and Prediction of its Change due to Climatic Change
M. Vallon - CNRS - Lab. Glaciologie et Géophysique de l'Environnement - F-St. Martin d'Hérès

EV4C-0113 - Arctic Ice Thickness Monitoring Project
P. Wadhams - Scott Polar Research Inst., University of Cambridge - GB-Cambridge

Area 3: Climatic Impacts and Climate-related Hazards

EPOC-0013 - An Investigation into the Impact of Elevated CO_2 upon the Response of European Forests
P.G. Jarvis - University of Edinburgh - GB-Edinburgh

EPOC-0014 - MEDALUS - Mediterranean Desertification and Land Use Impacts: Modelling and Evaluation
See "Desertification in the Mediterraneran Area"

EPOCH-0015 - Climate Change, Sea Level Rise and Associated Impacts in Europe
D.E. Smith - Coventry University, Dept. of Geography - GB-Coventry

EPOC-0020 - Forecasting Forest Fire Spread in Mediterranean Ecosystems for Prevention Planning and Fire Management
See "Wildfires"

EPOC-0022 - An Investigation of the Effects of Increasing Concentrations of Atmospheric CO_2 and Changing Climate on Natural and Managed Grassland Communities in Europe Using Open-Top and Closed Chambers
M.B. Jones - University of Dublin, School of Botany IE-Dublin 2

EPOC-0023 - AFORISM - A Comprehensive Forecasting System for Flood Risk Mitigation and Control
E. Todini - Università di Bologna, Centro IDEA - I-Bologna

EPOC-0025 - The Temporal Occurrence and Forecasting of Landsliding in the European Community
J.-C. Flageollet - Université Louis Pasteur, Centre Européen Risques Géomorphologiques - F-Strasbourg

EPOC-0026 - Weather Radar and Storm and Flood Hazard
R. Moore - NERC, Institute of Hydrology - GB-Wallingford

EPOC-0027 - Ricerca Integrata sulla Degradazione dei Versanti in Territori Montani (Integrated Research on the Degradation of the Slopes in Mountainous Areas)
G. Enne - Ente Regionale di Sviluppo Agricolo della Lombardia - ERSA/Ente Regionale di Sviluppo Agricolo della Lombardia - I-Milano 2, Segrate

EPOC-0028 - Drought Effects on Vegetation and Soil Degradation in Mediterranean Countries
See "Desertification in the Mediterranean Area"

EPOC-0029 - Rainfall Induced Landslides in Selected Mediterranean Mountainous Zones of Italy, Spain and Greece: the Application of Geographic Information Systems to Hazard Mapping
P. Gostelow - NERC, British Geological Survey - GB-Keyworth

EPOC-0031 - The Effect of Climatic Changes on Agricultural and Horticultural Potential in the EC
M. Parry - Environmental Change Unit, University of Oxford - GB-Oxford

EPOC-0032 - Slope Stability at Mount Etna, Sicily
G.C. Brown - The Open University, Dept. of Earth Sciences - GB-Milton Keynes

EPOC-0034 - Physical Processes in the Mediterranean Climates and Related Slope Instabilities in Over consolidated Clayey Soils
G. Scarpelli - Università degli Studi di Ancona, Facoltà di Ingegneria - I-Ancona

EPOC-0038 - FUTURALP Proposed by ICALPE. A Multinational Multi-Disciplinary Cooperative Project on the Potential Impacts of Climate Change on Alpine Ecosystems
M. Dubost - International Centre for Alpine Environments - Campus Scient. du Bourget du Lac F-Chambery

EPOC-0040 - Design and Demonstration of a System for Decision Support in Forest Fires Detection and Prevention
See "Wildfires"

EPOC-0044 - Flood Hazard Assessment
E. Penning-Rowsell - Middlesex Polytechnic, Flood Hazard Research Centre - GB-Enfield

EV4C-0112 - A Threatened Mediterranean Landscape: Western Crete
See "Desertification in the Mediterranean Area"

Area 4: Seismic Hazard

EPOC-0037 - Application of Earthquake Strong Motion Databank to Seismic Risk Analysis and Engineering Design
N.N. Ambraseys - The Imperial College of Science, Technology and Medecine, Dept. of Civil Engineering - GB-London

EPOC-0039 - Seismic Behavior and Vulnerability of Buried Lifelines
O. Klingmüller - Gesellschaft für Schwingungs-untersuchungen und Dynamische Prüfmethoden mbH - D-Mannheim

EPOC-0042 - High-Quality Earthquake Strong Motion Measurements for Structural and Seismic Source Studies
P. Bernard - Institut National des Sciences de l'Univers., Lab. de Sismologie - F-Paris

EPOC-0043 - Earthquake Prediction Studies in Central Italy and Greece
R. Madariagea - Institut National des Sciences de l'Univers, Lab. de Sismologie - F-Paris

EPOC-0045 - Seismic Electrical Signals
P. Varotsos - University of Athens, Dept. of Physics, Solid State Section - GR-Athens

EPOC-0046 - Analysis and Mitigation of Earthquake Triggered Landslide Hazard Affecting Dams, Routes and Lifelines
J.M. Crepel - Coyne et Bellier, Scientific Computing-Dept. (D.C.S.) - F-Paris

2 Environment Programme Climatology and Natural Hazards

The table below summarizes the status of the project proposals following the call for proposals (ref. J.O. C184/6 of 16th July 1991) for the individual research areas and topics of the ENVIRONMENT programme related to Climatology and Natural Hazards.

The priority list established by the Commission services was presented to the Committee of the ENVIRONMENT programme (CERP) for opinion. The tables summarize the information on the proposals retained by the Directorate-General XII financed with 1991 and 1992 budgetary credits only. Further decisions as regards funding will be taken later in the light of the 1993 and 1994 budgets.

Area I: Participation in Global Change Programmes
Climate Change and Climate Impact

	Topic	a)	b)	CEC Financial Contribution MECUs
I.1	Natural Climatic Change	34	3	2.80
I.2	Anthropogenic Climate Change	45	12	8.47
I.3	Climate Change Impacts	35	13	12.30
	Total	**114**	**28**	**23.57**

Area IV: Technological and Natural Risks
Natural Risks

	Topic	a)	b)	CEC Financial Contribution MECUs
IV.I.1	Seismic Hazard	57	3	1.88
IV.I.2	Volcanic Risk	24	11	5.42
IV.I.3	Wildfires	16	3	2.90
	Total	**97**	**17**	**10.20**

Desertification in the Mediterranean Area

	Topic	a)	b)	CEC Financial Contribution MECUs
IV.3	Desertification in the Mediterranean Area	40	17	16.55

a) = n° of proposals received
b) = n° of proposals selected for EC funding

3 Desertification in the Mediterranean Area

Desertification is nowadays considered as a major environmental problem affecting directly or marginally the most fragile areas of our globe.

Although it has been questioned whether this phenomenon is occurring in Europe, it is now a fact that desertification is already established in certain areas in the Mediterranean lands of Europe as a results of the bad management of land and water resources and progressive drought under changing climatic conditions.

Moreover, it is also recognized that the factors that are causing desertification in the northern Mediterranean region, the processes involved and the rate of degradation are not adequately known, since desertification phenomena have been studied for years mosltly outside Europe. Research, is therefore needed to better understand and quantify the process involved in this complex phenomenon, and to provide the scientific basis for the fight against desertification.

Desertification R&D activities under the EPOCH programme

Research in the CEC on the desertification in the Mediterranean region has been initiated in a systematic and integrated way under the EPOCH programme. Research supported under this programme was focussed on:

- the effects of climatic and meteorological factors on soil degradation and desertification with emphasis on the establishment of relationships between climatic parameters and soil degradation/credibility;
- the impact of progressive drought on vegetation with emphasis on the establishment of relationships between climate, soil erosion and plant cover;
- standardized field measurements and data analysis in order to increase the understanding of complex processes involved in the desertification phenomenon.

The research dealing with desertification and land surface properties currently implemented under the EPOCH programme are presented in the following.

EPOC-0014 - MEDALUS (Mediterranean Desertification and Land Use)
Coordinator: University of Bristol -
Dpt. of Geography (Prof. J.B. Thornes)

EV4V-0112 - A Threatened Mediterranean Landscape: western crete
Coordinator: Univ. of Cambridge -
Dpt. of Geography (Prof. A.T. Grove)

EPOC-0028 - Drought effects on vegetation and soil degradation in Mediterranean Countries
Coordinator: National Techn. University of Athens (Prof. G. Tsakiris)

Desertification R&D activities under the ENVIRONMENT Programme

The ENVIRONMENT Programme expands and strengthens the important experimental and theoretical work undertaken under the EPOCH programme and stresses the need for an integrate and interdisciplinary approach.

The objectives of the specific topic "Desertification in the Mediterranean area" of the ENVIRONMENT R&D programme are to thoroughly understand the desertification phenomenon in the Mediterranean region, its genesis and its evolution, in order to provide guidelines for the national managment of desertification-prone areas and for protecting and possibly rehabilitating the zones threatened especially where climatic and anthropogenically induced hazards are increasing.

Projects are solicited:

- to study the history and the evolution of the phenomenon in specific climatic, geomorphological, cultural and socio-economic context, in order to thoroughly understand all its component causes;
- to study the various biotic and abiotic factors involved in the desertification process in specified areas, and their interactions;
- to monitor and map the extension, spread and progress of the desertification process, in particular through the identification of indices of potential desertification;
- to model the future likely changes in the complex interactive dynamics of the various physical, biological, cultural and socio-economic factors in specific areas;
- to develop strategies for preventing and combating desertification. In particular, to assess which technological interventions would be necessary in order to protect and possibly rehabilitate the zones damaged or at risk.

A call for proposals for the Environment Programme had been launched on 16th July 1991. The deadline for the submission of proposals in the field of the Desertification was 31st October 1991. Forty proposals were received involving more than 200 european institutions requesting more than 40 MECU. Three of these proposals were focussed on the evolution of the desertification in the past, fiftheen on the study of the various natural processes involved, twelve on the monitoring and mapping of desertification progress, four on the study of the interactions between the physical, biological and socio-economic factors, and six on the technological interventions and development of criteria to fight desertication.

The following seventeen proposals have been selected for funding in the 91-92 budget of the programme. The E.C. contribution to these projects amounts to 16,55 MECU.

EVSV-0031 - Desertification in the white mountains of Crete. A botanical study with special reference to the effects of grazing and wildfires.
Coordinator: University of Copenhagen
(Prof. A. Strid)

EV5V-0033 - HAPEX-SAHEL.
Coordinator: C.N.R.M. - Groupe d'Etude de l'Atmosphère (Mr. J.P. Goutorbe)

EV5V-0021 - Understanding Natural and Anthropogenic causes of desertification in the Mediterranean Basin.
Coordinator: University of Cambridge -
Dept. of Archeology (Dr. Van der Leeuw)

EV5V-0023 - Modelling and exploring the impact of climate change on ecosystem degradation, hydrology and land use along a transect across the Mediterranean.
Coordinator: Intern. Ecotechnology Res. Centre - Cranfield (Dr. A. Imeson)

EV5V-0025 - A GIS decision support system for the prevention of desertification resulting from forest fire.
Coordinator: National Agric. Research Found. of Athens (Dr. G. Nakos)

EV5V-0027 - Palynological study on desertification in south-western Europe: timing, natural trends and human impact.
Coordinator: Università La Sapienza - Dip. Biologia Vegetale (Prof. M. Follieri)

EV5V-0029 - Assessment of remote sensing techniques for monitoring the extent and progression of desertification in the Mediterranean area (ASMODE).
Coordinator: Ingenieursbureau voor Environ. Analysis and Remote Sensing BV, Delft (Mr. A. Rosema)

EV5V-0035 - An integrated approach to Mediterranean land degradation mapping and monitoring by remote sensing (DEMON).
Coordinator: CNRS - Centre d'Ecole. Fonction. et Evolutive (Dr. B. Lacaze)

EV5V-0037 - Origin and evolution of desertification in the Mediterranean environment in Spain.
Coordinator: C.S.I.C. - Inst. de Ciencias de la Tierra (Dr. B.R. Julia)

EV5V-0039 - Assistance in Management of Mediterranean land threatened with desertification based on modelling runoff and soil erosion on representative catchments (DM2E)
Coordinator: CEMAGREF - Div. Ouvrages hydrauliques - Aix-en-Provence (Mr. J. Lavabre)

EV5V-0041 - Land management practice and erosion limitation in contrasting wildfire and gullied locations in the iberian peninsula
Coordinator: Universidade de Aveiro -
Dpt. de Ambiente e Ordenamento
(Dr. C. de O. Alves Coelho)

EV5V-0043 - Desertification risk assessment and land use planning in a mediterranean coastal area
Coordinator: Universidad de Barcelona -
Dpt. de Geografia (Dr. M. Sala)

EV5V-0045 - A multinational, multidisciplinary research programme on the role and the place of the mountains in the desertification of the mediterranean mountain regions
Coordinator: ICALPA - Int. Centre for Alpine Environnements (Mr. M. Dubost)

Contract negotiations are going on for four other projects aiming at continuing and further develop the work undertaken under the MEDALUS Projet (EPOC-0014) at the regional scale. Information on these projects will be provided in a next issue.

4 Wildfires

Wildfires R&D activities under the EPOCH Programme

Research in the field of wildfires is supported under the 2nd Framework Programme within the frame of the EPOCH programme.

A specific research topic on wildfires is included in the area "Climatic impacts and climate-related hazards" (area III of the programme). Research under this topic is focussed on understanding fire physics and fire behaviour characteristics and forecasting fire severity and fire prevention possibilities in relation to climatic and weather, forest status and causes of fire.

EPOC-0020 - Forecasting forest fire spread in mediterranean ecosystems for fire prevention and management
Coordinator: Imperial College of Science - London (Prof. F.C. Lockwood)

EPOC-0040 - Design and demonstration of a system for decision support in forest detection and prevention
Coordinator: ARMINES - Ecole Nat. Sup. de Paris - Valbonne (Dr. J.L. Wybo)

Wildfires R&D activities under the ENVIRONMENT Programme

Research under the specific topic on wildfires included in the area "Technological and Natural Risks" (area IV of the programme) is aiming at understanding the factors, natural and human, favouring or hindering the occurrence and frequence of fires in order to develop suitable means for forecasting, prevention and risk management. Research in this field expands the activities undertaken under in EPOCH programme and is focussed on the:

- study of the factors that control fire ignition and spreading and their interations with other abiotic or biotic factors;
- study of relations between aspects of fire regime (intensity, seasonality, spatio-temporal distribution, etc.) and potential change of fire regimes due to climatic change;
- improvement of fire behaviour modelling with the development of models applicable to the various landscape, coupling them with GIS and remote sensing techniques to estimate fire risk and to assist in fire management;
- study of the long term consequences of fires on ecosystem and landscape structure. Study of the interactions between landscape structure and fire, in particular, the effect of fires on the homogenization of the landscape;
- study of contribution from fires on the biogeochemical cycles of greenhouse gases;
- assessment of the advantages and disadvantages of fire practices associated with land-use (claring, stubble burning, vegetation management, etc....) either for fire hazard reduction or for conservation purposes in Mediterranean landscapes;
- development of techniques and technological means for early and remote warning systems to operate is complex terrains forecasting of fire spreading and rehabilitation.

Sixteen proposals have been submitted in the field of wildfires following a call for proposals launched for the Environment Programme. Four of these proposals have been concentrated on the physical aspects of wildfires and fire behaviour modelling, four on fire impacts on soil and vegetation and eight on technological development for fire prevention and mitigation. The total amount requested was 27,3 MECU.

The following projects have been selected for funding under the 1991-1992 budget of the programme. The total E.C. contribution allocated to these projects amount to 2,9 MECU.

EV5V-0019 - Modelisation incendie et etudes de risques pour la valorisation de l'environnement (MINERVE)
Coordinator: C.E.A. - Lab. d'Expérim. et de Modélis. Feux (Dr. J.C.Y. Mallet)

EV5V-0017 - Post-fire soil and vegetation dynamics in natural and afforested areas in southern europe: the role of fire intensity

EV5V-0015 - Simulation of forest fire
Coordinator: Agence MTDA (Mr. D. Alexandrian)

Further information can be obtained from:
R. Fantechi, DG XII/E-2, CEC, 200 rue de la Loi, 1040 Brussels
Tel. ++32-2-2355735

Other Activities Relevant to EC Environmental Programmes

EC/EFTA Stratospheric Ozone Research Programme

EASOE (European Arctic Stratospheric Ozone Experiment)

The European Arctic Stratospheric Ozone Experiment (EASOE) is a major research efort organized by European scientists to investigate the causes and the extent of the Northern hemisphere ozone loss. EASOE was planned by a group of scientists reporting to the EC/EFTA Task Group on Stratospheric Ozone Research and in wide consultation with other European researchers. The First European Polar Ozone Workshop at Schliersee in 1990 was an important feature in the design of the campaign. EASOE built on the experience of earlier European (CHEOPS I, I and TECHNOPS) and American campaigns. It was coordinated by the European Ozone Research Coordinating Unit and financed by national funding agencies and the European Community. Over 300 scientists were involved.

The objectives of EASOE were, firstly to study processes playing an important role in ozone depletion, i.e. the formation of polar stratospheric clouds (PSCs) and the way that chemical processes are modified in their presence. Secondly, these local processes would be studied in a hemispheric and seasonal context, i.e. to observe the build up and decay of the polar vortex, where much of the perturbed chemistry is believed to originate, and to observe and understand the role played by chemical compounds in ozone depletion.

The objectives defined the operational measurement strategy for EASOE:

- the campaign was to cover the entire winter period from November 1991 to March 1992;
- measurements were to cover a wide geographical area to provide a near-hemispheric perspective;
- a wide variety of instruments and instrument platforms - aircraft, large balloons, small balloons, ground stations - were required;
- a close relationship between theroretical and observational studies was to be maintained.

The operational centre of EASOE was in the Swedish Arctic at ESRANGE, Kiruna. To assist in both mission planning and data analysis, a data centre was established at the Norwegian Institute for Air Research (NILU) in Oslo. Daily meteorological data from the European Centre for Medium Range Weather Forecast and the UK Meteorological Office were collected at NILU for dissemination. The NILU data centre also housed the experimental data from the campaign, accessible to all EASOE participants.

EASOE preliminary results

- The atmosphere in the northern hemisphere was highly perturbed in the 1991/92 winter. Into an atmosphere alread loaded with manmade chlorine compounds, large amounts of aerosol were injected by the eruption of Mt. Pinatubo.
- Stratospheric aerosol ahs been measured throughout the EASOE study region by various techniques.
- Measurements of chlorine compounds in the Arctic lower stratosphere indicated that much of the chlorine, which had been released from the CFCs, was in forms capable of destroying ozone during January and February. These levels of active chlorine decreased in March.
- Measurements of nitrogen dioxide, both inside and outside the polar vortex, were anomalously low between November and February. In the region of the volcanic aerosol both nitric oxide and nitrogen dioxide, which normally inhibit the destruction of ozone by chlorine, were severely depleted. Nitrogen dioxide levels recovered somewhat in March.

- Ozone amounts in the European Arctic and middle latitudes were anomalously low during the campaign and are less than expected from simple extrapolations of ground- and satellite-based ozone measurements. The low ozone amounts can be partly explained by the unusual tropospheric weather patterns during the winter.
- Rates of ozone los, calculated using models which simulated the observed high levels of active chlorine and low levels of nitrogen oxides, were large at times during January and February in many of the air parcels studied. The subsequent rise in temperatures in spring, which led to a decrease in the levels of reactive chlorine compounds, precluded a major ozone lsos (an "ozone hole").
- The campaign measurements indicated the potential of the chlorine already in the stratosphere to cause large ozone loss. With the inevitability of increased chlorine-loading during the rest of this decade and the possibility in other years of lower temperatures (and hence higher levels of reactive chlorine) later in the winter, this potential for ozone destruction could be realized in the future.

With the increased awareness of atmospheric chemistry/climate change interactions, as well as discussion about future emissions from long-haul subsonic and supersonic aircraft, the lower stratosphere will remain a crucial region to be studied.

Many questions still need to be resolved, ranging from the chemistry at the surfaces of the sulphate aerosols, the precise partioning of chlorine compounds in the lower stratosphere, the exchange of air masses between the polar vortex and middle latitudes and between the stratosphere and troposphere. Some of these, and other, issues need to be addressed by future European campaigns, both in polar and middle latitudes. The European research effort relies heavily on the existing network of instruments for measurements of the lower stratosphere. This network, which is partly funded by the EC STEP and Environment Programms, was very important in EASOE. Laboratory studies of fundamental chemical processes, including the properties of polar stratospheric clouds and sulphate aerosol need to be extended. Finally, EASOE showed the benefit of a strong modelling programme coordinated with field measurements. This should provide a further complementary component of future research programmes on stratospheric ozone.

Further information can be obtained from:
Dr. H. Ott, Dr. J. Büsing, DG XII, D1, CEC
200 rue de la Loi, 1049 Bruxelles (Belgium)
Tel. ++32 2 235 11 82 - Fax ++32 2 236 30 24

EC R&D Programme MUST

European Conference on Underwater Acoustics

In the context of the supporting initiatives of MAST, a European Conference on Underwater Acoustics was organized in Luxembourg on the 14 to 18 September 1992.

Some 250 persons attended the conference, and 37 posters were exhibited. The conference which was very successful consisted of 25 half-day sessions, in total, devoted to the following topics:

Transducers, Noise, Signal processing, Calibration, Sound propagation, Scattering, Fisheries, Sea Floor, Tomography, Benchmarks for acoustic models, Wideband

The proceedings of the conference are available upon request.

For information please contact the Conference Secretariat:
I. Schwarzhaupt, CEC, 200 rue de la Loi (SDME 3/85)
B-1049 Brussels, Tel.: ++32-2-2352549, Fax: ++32-2-2363024

Optical Remote Sensing of the Marine Environment in Europe

The use of optical remote sensing for exploring the marine environment has been steadily growing, in recent years, both in the amount and scale of applications as well as in the refinement of methods and techniques. This is due to the potential of ocean colour data to provide novel information on biological, geochemical and physical processes of the sea. Ample proof of such capabilities is provided by the historical data set generated by the Coastal Zone Color Scanner (CZCS) experiment, from late 1978 to early 1986.

In order to insure the full exploitation of ocean colour data in Europe (*), the *Ocean Colour European Archive Network (OCEAN)* Project was set up by the CEC, Institute for Remote Sensing Applications (IRSA), JRC Ispra, through a joint endavour with the European Space Agency (ESA), as a Support Activity for DG XI. The most immediate objective of the Project was the generation of a data base of bio-optical information on the marine environment, as derived from the historical CZCS data available in Europe, and of the scientific tools needed for its exploitation. In addition, a consequent goal was that of promoting the use of ocean colour data archives in an *Application Dernonstration Prograrnrne (ADP)* devoted to marine regions of European interest. Last, but not least, there was also the long term objective of developing a 'network' (hence the name of the Project) of institutions, facilities, competences and ultimately of people -in essence the structure for an operational ground segment- capable of supporting, and exploiting, in Europe future ocean colour missions. Also, the Project was set up as an European contribution to the 'Productivity of the Global Ocean' Activity of the International Space Year 1992.

Since the start of the Project, in l990, the *OCEAN ADP* has focused the attention of several European research groups on a number of marine basins of European interest. These can be identified into three main regions:

- the northern European basins, *i.e.* the North Sea and the Baltic Sea,
- the Mediterranean basin, including the Black Sea,
- the northeastern Atlantic basin, from the subpolar area to the equatorial area.

In general, the research activities concerning these 'European' regions, approached in the OCEAN framework, can be summarized under the following main headings:

- assessment of pigment patterns, and their variability in both space and time;
- relationships between plankton pigments and nutrients;
- evaluation of plankton biomass and production;
- surface circulation and water constituent dispersion, including sediment transport;
- currents, bathymetry and islands interaction;
- upwelling dynamics;
- coastal runoff and plumes;
- monitoring of potential pollution sources;
- fisheries applications.

The continuation of such activities, using the experience gained in the OCEAN Project, will allow to take advantage of the upcoming ocean colour space missions, and in particular to prepare for the European Polar Platform mission planned by the ESA for the end of this decade. In fact, even though the exploitation of CZCS data is still far from complete, a growing demand for real time data, and for longer time series as well, has determined the planning of new ocean colour missions that will fly during the 1990's. As the *OCEAN* activities are reaching their conclusion, it is now being proposed that the exploitation of new data will be pursued, in Europe, through an initiative for a Programme on *Ocean Colour Techniques for Observation, Processing and Utilization Systems (OCTOPUS).*

The OCTOPUS Programme is another joint initiative of the CEC, IRSA, JRC Ispra, and the ESA, devoted to the exploitation of ocean colour data that will become available in the next few years, for applications concerning the marine basins of European interest. The Programme is centered on (1) the utilization of the scientific tools develop by the CEC/ESA cooperation within the *OCEAN* Project, devoted essentially to the historical archives of CZCS data available in Europe, and on (2) the foreseen availability of new

(*) See Environmental Research Newsletter No 6, December 1990, p. 13.

ocean colour data. In fact, a series of space missions, devoted to the deployment of improved optical sensors for observation of the ocean, are planned by the major space agencies, for the next few years (*i.e.* the SeaWIFS, by NASA, in 1993; the OCTS, by NASDA, in 1995; the MERIS, and possibly follow-ups in ERS family, by the ESA, towards the end of this decade). In order to take advantage of the possibilities for environmental monitoring offered by these new systems, the *OCTOPUS* Programme integrates three main components, devoted respectively to:

- Information System, for data collection, management and distribution (ESA taks);
- Science Support, for data processing and applications, and Coordination (CEC task);
- National Research Activities, to be conducted in various European Institutions.

The Programme calls for the realization of a complete, documented, accessible archive of SeaWiFS data on marine regions of European interest (using the structures developed by *OCEAN* Project). It will support local studies of the marine environment in Europe, of interest *per se* and as significant components of global phenomena. Further, the Programme shall foster both experimental and theoretical work, aimed at assessing the unique conditions and special cases offered by European Seas. It will ultimately allow the exploitation of ocean colour and other kinds of concurrent data (*e.g.* sea surface temperature and roughness) from complementary space missions, contributing to large data systems being developed - in Europe and elsewhere- for envioronmental assessments and monitoring.

The first component to the present Programme, provided by the ESA, is devoted to the following main activites:

- operational background (i.e. data acquisition and pre-processing);
- standard data product generation;
- data archive and catalogue;
- user interface (*i.e.* order handling, browse and guide services);
- data distribution, off-line service;
- data distribution, special on-line service (*e.g.* during oceanographic campaigns).

An important prerequisite for the realization of such an Information System is the availability of a distribution license agreement concerning SeaWiFS data (to be obtained by the ESA from Orbital Science Corporation, which is managing the US SeaWiFS mission). This will permit ESA to use a certain number of High Resolution Picture Transmission (HRPT) receiving stations to acquire and distribute SeaWiFS data both for scientific research and applications, as well as for commercial/operational users.

The coordination of data acquisition, processing, archiving and cataloguing would be performed through ESA/ESRIN facilities, located in Frascati, Italy, and would be based on the ESRIN-coordinated TIROS network, which includes operational HRPT acquisition stations and processing facilities located at different sites in Europe, Africa, Latin America, southeast Asia and Antarctica. All network facilities have compatible hardware configurations (based on SUN workstations) for receiving and processing HRPT data. In some cases raw data may be exchanged on *exabyte* cassettes with other facilities for generating and archiving standard products.

The second component of the Programme, provided by CEC, is based on the role to be played by the IRSA, JRC Ispra, as a scientific coordinator in:

- research background (*i.e.* assessment of scientific methodologies and applications)
- standard data products definition;
- processing algorithms development;
- data calibration and validation;
- special applications;
- research projects, on the track of the *OCEAN ADP* endeavour.

This component on Science Support and Coordination concerns the consolidation of the scientific issues of an European SeaWiFS Programme, based on the results of the *OCEAN* Project, with the aim of exploiting the ocean colour know-how accumulated at the IRSA since the time of the Ocean Colour Scanner (OCS) experiment, in the early 1970's. It extends the plans made by the *OCEAN* Project to continue the supply of ocean colour information throughout this decade. Furthermore, it is considered as the forerunner, and possibly the foundation, of the major research effort which will be required for the implementation of the MERIS European mission.

A third 'national research' component constitutes the bulk of the research activities foreseen by the Programme. In fact, this European ocean colour initiative should be made up also of contributions from individual scientists and institutions, which would be stimulated by the availability of an otherwise unobtainable data set (that of SeaWiFS, with the possible integration by other kinds of data already existing), but to which full responsibility would be left for their own research development. In this sense, the European Programme can be thought of as a forum, or a focal point for ocean colour related national projects, much in the same way as the *OCEAN* Project itself. Moreover, such individual research efforts would obviously be supported by the data and know-how available within the CEC and the ESA, which would act as consultants in the development, and possibly in the coordination, of various projects.

The development of optical observation techniques has opened new perspectives for the understanding of marine environmental processes and phenomena. The first results of the *OCEAN* Project confirm that the real wealth of information delivered by oceanographic remote sensing is to be found in the long-term, large-scale monitoring of interacting bio-geo-chemical and physical processes of the sea. This means that unique opportunities are offered by the capabilities, now being developed, of translating crude optical remote sensed data into value-added realizations of environmental parameters of importance in the sea - and of generating synoptic, repetitive, statistically significant time series of composite images describing the variations of such parameters in time, over entire basins.

In the next few years, looking now beyond the lifetime of the proposed *OCTOPUS* Programme, several advanced space probes and large stations are going to assemble outstanding time series of marine environmental data covering most oceanic regions of European concern and, indeed, the global ocean. These data sets will provide a great new potential for addressing basic scientific questions as well as primary operational needs. On such basis, it is evident that a continuing Programme designed to promote the exploitation of know-how and information assets accumulated on the above topics in Europe, during the past decade, is not only possible, but actually extremely desirable as well.

Further information can be obtained from:
V. Barale, Institute for Remote Sensing Applications,
CEC-JRC Ispra, I-21020 Ispra (Va), Italy, Tel. ++39-332-789274

VISIMAR Visualization and Simulation of Marine Environmental Processes

EUREKA/EUROMAR Project 495

For many years now, the use of moving satellite images in television weather reports has brought home to the public the ceaseless shifting nature of the Earth's atmosphere. The use of moving images has been enormously successful in grabbing people's attention and promoting an understanding of meteorology.

VISIMAR, EUREKA project 495, aims to give oceanography the same visual appeal - as well as providing some important scientific insights. Animations allow to get immediately a good idea of the quality of data and present them in a comprehensive way to anyone. Researchers at several institutes have been working on ocean circulation models for many years. Their models show large-scale changes in the elevation of the sea surface, as well as its currents, temperature and salinity. But the output of these models is normally just raw data (numbers on paper) which is hard enough for the researchers themselves to interprete, let alone the public. The researchers can convert the raw data into still images on a screen using commercially available computer graphics software, but that is no substitute for moving pictures.

VISIMAR was launched in June 1990, and after a definition phase it's now on the development stage. Its partners include universities

and research institutes, government laboratories and commercial companies, as well as the Joint Research Centre of the Commission of the European Communities. The aims of the project are to integrate existing technologies and specially developed software into a package that will allow the ouput of computer models to be automatically converted into moving animations. The partners are producing their own films as well as developing commercial packages to be sold to other institutions.

With different approaches the animation techniques have been used to illustrate the behavior, development and distribution of several indicators of the marine environment. These include the layer velocities, vertically average velocities, surface elevations, temperatures, salinities, water densities, surface slick thickness, spill masses and a number of concentrations of water quality indicators. So model results which have been animated by the participants are sea elevation along the Spanish and French coast, the North Sea, the Barents Sea and the Baltic, transport of sewage, river flow and oil spills. So far VISIMAR partners have made mainly short animations of about 1 to 10 minutes, which have been presented at conferences, at public and university lectures and at TV (News and environment programs). By the end of the VISIMAR project they hope to be able to make multimedia presentations with moving animation, still images and text, to show what the system can do.

The contribution of the Joint Research Centre to the VISIMAR project is integrated in the activity "Monitoring the Marine Environment" executed at the Marine Environment Unit of the Institute for Remote Sensing Applications. The animation system under development should be capabale of producing animations of both remote sensing data (e.g. time series of sea surface temperature pattern) and output data of numerical simulations for marine processes (e.g. phytoplankton blooms).

The VISIMAR project coordinator is
Professor Dr. Jan O. Backhaus, University of Hamburg,
Institute for Oceanography, Troplowitzstr. 7, D-2000 Hamburg 54, Tel. ++49.40.41232604, Fax ++49.40.41234644.

Further information can be obtained from:
Wolfram Schrimpf, Joint Research Centre, Institute for Remote Sensing Applications, CEC-JRC Ispra
I-21020 Ispra(VA), Tel. ++39.332.785352, Fax ++39.332.789648

EUROCARE

Since the October 1991, 17 EUROCARE project proposals have been approved by the Board and many of them further developed for 45 days circulation in order for them to be announced at the Ministerial conference in Tampere on 22 May. Two new projects, both connected to Olympics '94, were presented to the Karlsruhe Board meeting in April.

External Relations

Standardization of the RILEM recommendation on general methodology for service life prediction is a very important task for EUROCARE. This request has been positively received, and passed over to ISO for further procedural steps. Illustrating the usefulness of the EUREKA Supportive Measures very well, this case was presented in EUREKA News in January.

The chairman was invited by UNESCO/RILEM to participate on behalf of EUROCARE in the scientific committee for the international congress on the Conservation of stone and other materials in Paris, June 29-July 1, 1993. The intention of this conference is not to repeat the numerous symposia and conferences on the subject of stone deterioration, but to:

- Stimulate research,
- Contribute to a better organization of the exchange of scientific information,
- Tighten the links between research and industry,
- Encourage more general information dissemination through the media.

As this action-oriented approach was considered to be in the EUREKA spirit, EUROCARE accepted the invitation to act as a sponsor for the conference, and it is proposed to link the Third EUROCARE Market Place Conference to this congress in Paris.

Considerable effort has been devoted to developing proposals for the Third Framework Programme of the CEC Environment programme, in order to create the basis for joint CEC/EUROCARE projects.

Further information can be obtained from:
S. Haagenrud Lillesteøm, Norway
O. Levis Dublin Ireland

Support for pilot projects to conserve European architectural heritage

The Commission of the European Communities has decided to continue its action in support of the conservation of Europe's architectural heritage for the tenth year running.

The theme for 1992 was "Conservation projects in towns and villages to rehabilitate, through an integrated approach, monuments and their immediate environment within their surrounding public space".

The theme for 1993 is gardens of historic interest.

A garden of historic interests is understood as a landscaped creation of public interest in historical or artistic terms. It is regarded as having the status of a monument and reflects the close relationship between conservation and nature as perceived in the culture and traditions of each country.

Further information can be obtained from:
Commission of the European Communities
DG X - Culture Unit (Room T-120 4/48)
200 Rue de la Loi, B-1049 Brussels

Information

EUROCOURSES at the Joint Research Centre Ispra

The CEC JRC-Ispra is organizing Courses for the training of scientific and technical staff in advanced sectors of science. The training courses are linked with the Commission R&D Programmes and based on the specific competences of the individual institutes of the JRC (see also previous Environmental Research Newsletters).

Extract from the programme foreseen in 1993.

Chemical and Environmental Science

Quality of environmental measurements,
Environment Institute Ispra, in collaboration with DG XII - BCR
Ispra, 3-7 May, 1993

Chemistry of acquatic environment: local and global perspectives
Environment Institute Ispra in collaboration with the Swiss Federal Institute of Technology, ETH, Zurich
Ispra, September 27-October 1, 1993

Environmental informatics applications
Summer course
Environment Institute Ispra in collaboration with the University of Athens
Athens, Greece, June 21-25, 1993

Technologies for environmental cleanup: toxic and hazardous waste management
Environment Institute Ispra in collaboration with the LLNL, CA., USA
Ispra, September 13-17, 1993

Business and the environment
Institute for Prospective Technological Studies Ispra
Sevilla, Spain, November 8-12, 1993

Remote Sensing

The use of ERS-synthetic aperture radar imagery
Institute for Remote Sensing Applications Ispra
Ispra, March 15-17, 1993

Remote Sensing applied to agricultural statistics: regional inventories
Institute for Remote Sensing Applications Ispra
Athens, Greece, March 29-April 2, 1993

Advanced in the use of AVHRR data for land applications
IRSA, Ispra
Ispra, November 22-26, 1993

Further information and documentation can be obtained from:
Secretariat EUROCOURSES, JRC, I-21020 Ispra (Va),
Tel. ++39-332-789819/789308 - Fax ++39-332-789839

European Master in Environmental Management

The courses of the European Master in Environmental Management - the launching of which had been anticipated in Environmental Research Newsletter n° 8, December 1991 - have started on November 9th, 1992.

The official opening of the academic year 1992-93 took place at the headquarters of EAEME (European Association for Environmental Management Education) in Varese on November 6th, in the presence of the Italian Minister for the Environment, former European Commissioner for the Environment, Mr. C. Ripa di Meana.

Fourteen academic institutions from 8 different European countries are cooperating in this educational activity which is financially supported by the Commission of the European Communities.

Sixtysix students coming from different European countries have been enrolled to attend the courses which are simultaneously given at three focal points, namely Archamps (F), Arlon (B) and Athens (GR).

The objective of this programme is to train the students in the management of environmental interdisciplinary problems having transnational and pan-European character so as to develop specific competences meeting the urgent needs in both public and private industries and administrations.

Master courses last one academic year; thus Master will be awarded at the end of October of this year.

Further information can be obtained from:
Dr. G. ROSSI, Environment Institute, CEC JRC Ispra,
I - 21020 Ispra (VA) Tel. ++39-332-789981,
Fax ++39-332-785631

The Institute of Sound and Vibration Research

Southampton runs short courses on following subjects:

22-24 March	Instrumentation and Measurement Techniques for Noise Control in association with Bruel & Kjaer)
22-24 March	Active Control of Sound and Vibration
29 March - 2 April	Clinical Audiology

Further information regarding the above courses may be obtained from:
ISVR Conference Secretary
Institute of Sound and Vibration Research
The University, SOUTHAMPTON, SO9 5NH
Tel. +0703 592310 - Fax +0703 593033

The Free University Brussels

The Faculty of Medicine and Pharmacy Human Ecology runs a Master's and a Ph. D. Course in Human Ecology, under the auspices of the World Health Organisation and endorsed by UNESCO (Man and the Biosphere Program).

The programs' aim is to promote understanding of human interactions in an ecological framework in all its complexity and to stimulate thinking about solutions to environmental problems by means of a holistic, interdisciplinary approach.

For further information please contact:
Free University of Brussels, Human Ecology
Pleinlaan 2 - B-1050 Brussels

Conferences

CONFERENCE REPORTS

Relationships between atmospheric CO_2 and ecosystem functioning

Brussels, December, 12-13, 1991

Review ongoing research activities in Europe and in the United States

In most countries thee has been a widening in research in the past years from acid rain research to ecosystem research will increased attention to research on global change/climate change, often involving the same funding agencies, research infrastructure and, to a considerable extent, research institutes and research groups. This shift was facilitated by the often common expertise and closely related methodology applciable in the two research areas.

In some countries, notably the UK and the Netherlands, nationally coordinated programmes involving "new money" are being implemented, facilitating an inventory of an important part of the research. But a comprehensive overview of the total research efforts is probably hard to obtain because: often many funding agencies are involved; the amount of research relevant to the subject matter, but not directly aimed at it, is very large; inventories based on questionaires suffer from deliberate misinformation given by the researchers/research groups, and there are great definitional problems in keying out relevant research topics and fields, and methods of accounting differ among countries (e.g. in France external research funds do not include a salary component).

The following gaps in knowledge has been identified:

- **Input-output budgets of C in terrestrial ecosystems**
  There is increasing strong envidence for a terrestrial CO_2 sink in the order of 1-3 Gt C per year.
  It will be very difficult to measure that sink term either by repeated stocktaking or by measuring net CO_2 fluxes at the upper boundary of terrestrial ecosystems, because the net flux is in the order of a percent or so of the (annually integrated) gross input or output flux and spatial variability is large. Nevertheless, increasing technical sophistication has brought eddy covariance measurements of annual net fluxes within the realm of practical application. Leaching losses of organic C may be considerable and would easily be estimated, but information is still scarce. The same is true for net emissions of hydrocarbon gases by plants. In addition to providing direct information about the net atmosphere - land surface CO_2 transfer, flux measurements of CO_2 for selected ecosystems are extremely useful to test process models.
- **Feedbacks and interactions**
  There are strong interactions between effects of elevated CO_2 on photosynthesis and nutrient uptake and nutrient levels. Litter quality is strongly influenced by the atmospheric CO_2 level, both through changes in nutrient levels in leaves, and through changes in cellulose-lignin ratio's.
- **Individual parts of the C cycle**
  we lack a mechanistic understanding of C and nutrient allocation in plants including factors controlling fine root growth and -turnover, and root exudation; while photosynthesis is reasonably well understood, we lack insight in the factors determining respiration; very little is known about the effects of CO_2 level on phenology; we know virtually nothing about the long-term (5-10 years) effects of elevated CO_2 on plants.
  We lack a mechanistic understanding of many of the biological and abiotic factors determinign mineralization and soil organic matter formation and decomposition; termites, leaf cutter ants and probably other meso- and macro fauna involved in decomposition will probably change their ways of handling litter following a change in substrate quality.
- **Scaling up**
  We have to distinguish between temporal and spatial dimensions, and monitoring, experimentation and modelling.
  Scaling up in space: environmental variables that can be treated as independent at a small scale become increasingly dependent at increasingly larger scales. To handle scaling up to continental and global scales, prioriterizing among the many different ecosystems has high priority (!).
  Scaling up in time: scaling up in time is implicit in most process models. To test those, paleo data (dendrochronology) are indispensable; long-term monitoring along representative transects including ecosystems sensitive to environmental change facilitates integrated scaling up in space and time.
- **Key aspects in modelling**
  The poorly understood parts of the C cycle listed earlier are factors contributing to inadequate model structures.
  Other key problems in modelling are: lack of phenology; lack of long-term data on effects of elevated CO_2 on plants and ecosystems to parameterize and test models, obtained by a range of experimental tools at different scales in time and space; identification of physiological types or keystone species (some preliminary indications of different may be due to differences in methods!); the relationship between the rate of decomposition of soil organic matter, and chemical and physical attributes of organic matter (fractionation, functional group analysis, degree of physical and chemical protection against microbial attack by inorganic substances); differences in Q 10 values of different functional groups of decomposing organisms.
- **Proposals for workshops to define research initiatives**
  The following topics were considered important for targeted workshops aimed at defining research initiatives needed to test hypothesis about the interactions between CO_2 and terrestrial ecosystems.
  Evaluation of methods for exposure of soil and vegetation to elevated CO_2 concentrations at a range of scales; evaluation of methods to evaluate fluxes of gaseous C between vegetation and the atmosphere. Consideration of eddy covariance and mass balance techniques for vegetation/atmosphere exchange and other gas exchange and other gas exchange techniques for fluxes between ecosystem compartments; methods for measuring dissolved carbon fluxes through soil, plus transfer of dissolved carbon to the aquatic system; impacts of land use changes on sources and sinks of CO2 at regional scale, with emphasis on Europe; linking of models for decomposition in soil and growth of vegetation at the scale of the plant or vegetation unit; estimation of C budgets of ecosystems through satellite imagery.

Further information can be obtained from:
H. Barth, CEC, DG XII/E-1, 200 rue de la Loi
B-1049 Brussels, Belgium
Tel. ++32-2-2356452 - Fax ++32-2-2363024

Experimental manipulations of biota and biogeochemical cycling in ecosystems approach, methodologies, findings

18-20 may 1992 Copenhagen Denmark

During recent years many experimental ecosystem manipulations have been undertaken in many parts of the world. These include addition of lime to lakes, of lime and nutrients to catchments and other terrestrial ecosystems, and acidification of lakes and forests.

Recently, removal of atmospheric acid inputs to ecosystems by roof constructions, drought experiments as well as irrigation experiments, have been started as a means of studying ecosystem dynamics and processes. Studies on manipulation of the biota (e.g. fish populations in lakes, forest management practice, etc.) are also now widely undertaken.

The aim of the symposium was to present and review the state-of-the-art of major ongoing studies on manipulations of ecosystems throughout the world. The main presentations have been given by invited speakers. The main emphasis has be on the discussion of the scientific approach of the manipulations, the applied methods, and of the results obtained. The symposium have focus on studies

and effects at the ecosystem level. Special attention have been given to below-ground processes and methodologies.

Further information can be obtained from:
P. Mathy, Commission of the European Communities
Directorate-General for Science, Research and Development
200, rue de la Loi, B-1049 Brussels, Belgium
Tel. ++32-2-2358160, Fax ++32-2-2363024

International Workshop on the role of fire in Mediterranean ecosystems

"The role of fire on Mediterranean Ecosystems"
Laboratoire ARAGO (Univ. Paris 6, CNRS URA 117)
21-25 September 1992

Every summer in the Mediterranean regions of Europe, large fires scar the landscape and present ecological problems in which fire is both a cause and a consequence. There exists a disparity between the large sums of money spent annually on fire fighting and prevention and the application of ecological understanding that should normally be a part of any management strategy in high risk areas.

Within the last ten years, notably following the research initiated or stimulated by the organizers of the workshop, research on the impact of fire in Mediterranean ecosystems (flora, fauna and soil) has been undertaken in many different countries along the northern Mediterranean basin.

The data accumulated over the course of the last decade, both published and in press, in addition to methodological and conceptual advancements, has revolutionized our understanding of the roles of fire in Mediterranean ecosystems. Beginning with descriptions of post-fire succession, initially on plants and subsequently on animals, research objectives have enlarged to include the impact of fire on organisms and populations as well as soil properties and modelling.

Further information can be obtained from:
L. Tzabaud - CNRS Montpellier

ANNOUNCEMENTS

Hydrosis 93: application of geographic information systems in hydrology and water resources

Vienna, Austria, 19-22 April 1993

Organized by:

- Institut für Wasserwirtschaft, Hydrologie und konstruktiven Wasserbau, Universität für Bodenkultur (BOKU), Vienna, Austria
- International Commission on Groundwater (ICGW), of the International Association of Hydrological Sciences (IAHS).

The objective of this conference is to exchange experiences in the application of GIS and to identify research needs with respect to the specific requirements of hydrology and water resources. The conference will provide a forum for identifying the benefits and needs in application of GIS in the water-related research and decision-making field. Contributions were solicited from the fields of groundwater hydrology, surface water hydrology, agrohydrology, ecohydrology, etc.

For information and all organisational matters please contact:
Conference Secretariat HydroGIS 93
c/o Interconvention Austria Center Vienna
A-1450 Vienna, Austria
Tel. ++43-222-23692646, Fax ++43-222-2369648

Social functions of nature

Chantilly, (Les Fontaines), 8-12 March 1993

Organized by the Centre National de Recherche Scientifique (CNRS, France) research group 949 "Society and Scientific and Technological Risks" (SORISTEC), under the patronage of the International Association of Sociology (research committee on "Environment and Society"), with the collaboration of the CNRS Environmental Programme and STRETIE of the French Department of Environment.

Further information can be obtained from:
Denis Duclos, 16 rue Moreau, F-75012 Paris
Tel. ++33-1-43434575, Fax ++33-1-49280478

Natural Phenols in Plant Resistance

Freising-Weihenstephan, Germany - 13-17 September 1993

Organized by:

- Faculty of Agriculture and Horticulture
  Technical University of Munich (Germany)

The aim of the symposium is to give an overview on the present knowledge on the role of phenolic compounds in plant resistance towards biotic and abiotic stress. The symposium offers the opportunity to intensify the link between basic and horticultural research.

Further information can be obtained from:
Dr. M. Geibel or Dr. D. Treutter
Institut für Obstbau Technische Universität München
D-8050 Freising-Weihenstephan, Germany
Tel. ++49-8161/713753, Fax ++49-8161/714499

Water disposal by landfill

28 June-1 July 1993, Bolton, U.K.

Organized by:

- Bolton Institute of Higher Education
  School of Civil Engineering and Building (U.K.)

The aim of the symposium is to provide an overview of current Geotechnical Engineering practice with regard to waste disposal by landfill; to create a European forum for interchange of ideas and concepts to promote developments and improvements; to point the way for future research, design development, investigation/monitoring, legislation, training etc.

Further information can be obtained from:
Prof. R.W. Sarsby
Chairman of the Organising Committee, (GREEN '93)
Bolton Institute of Higher Education
School of Civil Engineering and Building
Deane Road, BOLTON BL3 5AB, UK
Tel. ++44 204 28851, Fax ++44 204 39907

Eco Recyclage: international market for waste recycling and waste management technolgoies

Grenoble-Alpexpo du 5-8 October 1993

Organized by:

- Institut Français de l'Environnement

Further information can be obtained from:
- Henri Debarnot, Drire (38), Tel. 76693434
- Bernard Volk, Alpexpo (38), Tel. 76396600

Catalytic reactions in gas-liquid-solid reactors

Montpellier (France) 12-17 September 93

Organized by the European Federation of Catalysis Societies (EFCATS) and the Working Party "Chemical Engineering in the Applications of Catalysis" (EFChE).

The goal is to examine in a comprehensive and transdisciplinary way the problem raised by the use fo three-phase systems (gas-liquid-solid) in catalytic reactors. More precisely, the objective is to bring together catalysis chemists, organic chemists and chemical engineers to confront their points of view. For example, it should shown how kinetic effects (activity and selectivity) can be disguised or concealed by mass and heat transfer processes making reasonable mechanisms difficult to determine.

The symposium should suggest solutions to the organic chemists, for the crucial problems in scaling up polyphasic organic reactions. It should also make the chemical engineers aware of the specificity of certain reactions, as in fine chemistry, where viscosity, thermal stability, specially modified catalysts, etc... can pose special problems.

The objective of the symposium is to focus on fine and speciality chemicals, but petrochemicals (hydrotreatment) or triphasic catalysis with consumable solids should not be excluded, as long as both aspects of catalytic reactivity and reactor engineering are addressed.

For further information and proposals of contributions, please contact:
Dr. Jean F. Jenck, Unité Mixte CNRS - Rhône Poulenc
BP 166, F-69151 Décines, Fax ++33/72 05 21 27

14th International symposium on polynuclear aromatic hydrocarbons

The 14th International Symposium on Polynuclear Aromatic Hydrocarbons "Tan-Tar-A, Lake of the Ozarks, Missouri USA September 8-11, 1993.

For further information, contact:
Prof. E. Cavalieri or Dr. F. Rogan
Tel. 402 559 4040, Fax 402 554 4651
At the University of Nebraska, USA

HELECO '93 New Prospects for the Environment

Athens, 1-4 April 1993

An initiative of the technical chamber of Greece

HELECO '93 will bring together expert scientists, technology producers and technology users during two big international events:

- International Trade Fair
- International Scientific Conference

HELECO '93 aims at taking advantage of Athens geographical location and the excellent relations of Greece with the countries of Middle East, Africa and Eastern Europe and benefit from the fact that Greece as member of the EEC may become the "bridge" for the transfer of technology and know-how to the non-EEC countires.

For additional information please contact:
HELECO '93, c/o HORIZON LTD.
14, Nikis Street, 105 57 ATHENS
Tel. ++30-1-32 33 144, Fax ++30-1-32 47 048

SCI agriculture & environment group officers and committee 1992-93

Meetings planned by the agriculture an Environment Group of SCI

19 January 1993
Census and survey of rural land use in Britain

16 February 1993
Trace components of animal feeds

9 March 1993
Composting waste

30 March 1993
Novel aspects of crop nutrition

25 May 1993
Visit to AFRC rothamsted experimental station, Harpenden, Herts

Further information can be obtained from:
John Wren MA PhD FRSC FIFST
14/15 Belgrave Square, London SW1X 8PS
Tel. ++44-71-235 3681, Fax ++44-71-823 1698

Geology and confinement of toxic wastes

Montpellier (F) - 8-11 June 1993

Organized by:

- Association Internationale de Géologie de l'Ingénieur (AIGI)
- Agence de l'environnement et de la maîtrise de l'énergie

In collaboration with:

- Commission of the European Communities
- Agence Nationale pour la Gestion des Déchets Radioactifs

The purpose of this symposium is to promote the exchange of scientific knowledge and technical know-how concerning the behaviour of barriers and their confinement effectiveness.

Further information can be obtained from:
M. Barrès, BRGM, BP 6009, 45060 Orléans Cedex 2, France
Tel. ++33-38 64 34 14, Fax ++33-38 64 30 13

MAST-days. EUROMAR market 15-17 March 1993

The CEC, DG XII-E/MAST together with the EUREKA/EUROMAR Secretariat organises the 1993 MAST days and EUROMAR market from 15 to 17 March 1993 in the Palais des Congres, B-1000 Brussels.

During the meeting there would be scientific sessions, discussion meeting and workshops on a variety of topics like ecosystem modelling, neural networks for marine technologies, biosensors, deep sea stations, AUVs, coupling of physical and ecological models, exchange processes at sea surfaces, benchmarks and intercalibration of models, etc.

In parallel to that, there will be a permanent exhibition of posters of MAST-I, MAST-II, and EUROMAR projects.

More detailed information on the meeting could be obtained from:

Ms. D. Efthimiadou, CEC
DG XII/E, MAST Programme, SDME 3/78
75 Rue Montoyer, B-1040 Bruxelles
Tel. ++32-2-2953104, Fax ++32-2-2963024

Publications

(All scientific and technical reports published by the Commission of the European Community are available at the Office for Official Publications of the EC, L-2985 Luxembourg)

Lettres des programmes interdisciplinaires de recherche du CNRS

Edited by Centre national de la recherche scientifique
Environnement - 15, Quai Anatole-France, 75700 Paris
Tel. (1) 47 53 13 62, Fax (1) 47 53 12 21

Objectives for Next Generation of Practical Short-Range Atmospheric Dispersion Models

May 6-8, 1992, Risø Denmark
Edited by Helge R. Olesen and Torben Mikkelsen

This publication can be obtained on request from the

National Environmental Research Institute
Department of Emissions and Air Pollution
P.O. Box 358, DK-4000 Roskilde

"Modelling Lake Pollution"

EUR 13998 EN - X, 144 pp.

After a short general introduction, Parts I and II of this monograph are devoted to the modelling concepts currently used in the field of lake eutrophication and heavy metal pollution of lakes respectively.

In Part III the application of such concepts to problems concerning three subalpine lakes is presented: the phosphorus cycle in Lake Lugano, the sediment-water interaction in Lake Varese, the evolution of copper concentration in Lake Orta, all included in the environmental research programmes of JRC in the past years.

A italian version of this monograph is also available: "Modellistica Ecologica dei Laghi" - EUR 14490 IT - XII, 134 pp.

People interested in these publications are invited to contact the author:

Giovanni Rossi, Environment Institute, TP 300 - JRC Ispra
Tel. ++39-332-789856.

Organisation des entreprises et communication avec le public en matiere d'environnement

Rapport Technique N° 6

Edited by United Nations Environment Programme
Industry and Environment Programme Activity Centre

Available from:

PNUE CAP/IE, 39-43 quai André Citroën, 875739 Paris Cedex 15
France, Télex 204997, Fax (33-1) 40588874, ISBN 92-807-1312-4

Treatment and use of sewage sludge and liquid agricultural wastes

Review of COST 68/681 programme, 1972-90

Edited by:

J.E. Hall and P.J. Newman
WRC-Medmenham, Marlow, Bucks (UK)
P. L'Hermite
Commission of the European Communities, Brussels (B)
EUR 14330 EN

Composting and compost quality assurance criteria

Edited by:

D.V. Jackson
Saltwood, Hythe, Kent CT21 4QS (UK)
J.-M. Merillot
Les Transformeurs - Anred, Angers (F)
P. L'Hermite
Commission of the European Communities, Brussels (B)
EUR 14254 EN

Ecosystem Research Report N° 1 Decomposition and accumulation of organic matter in terrestrial ecosystems: Research priorities and approaches

Edited by:

N. Van Breemen
EUR 14318 EN

Ecosystems Research Report N° 2 The NITREX project (Nitrogen saturation experiments)

Norwegian Institute for Water Research
Box 69 Korsvoll
0808 Oslo, Norway
EUR 14319 EN

Pesticides in ground and drinking water

Edited by:

M. Fielding, WRC, Medmenham, UK
ISBN 2-87263-068-6

Newsletter/N° 5 Sept.-Oct. 1992

Edited by:

International Sociological Association
Thematic Group "Environment & Society"

For more information, please contact:
Denis Duclos, 16 rue Moreau, 75012 Paris France
Tel. ++33 1 43 43 45 75, Fax ++33 1 49 28 04 78

Land use change: the causes and consequences

Edited by:

M.C. Whitby, University of Newcastle upon Tyne
ISBN 0 11 701553 9

Feilschen im Treibhaus

Weltwirtschaft, Entwicklung und Umwelt

Helf Nr. 27

Edited by:

Jacob Radioff, Cosimastr. 4, 8000 München 81

"From Ideas to Action"

Published by ICC - International chamber of Commerce available from:

38 ICC Albert 1er
75008 Paris, France

Note from the Editor

The information contained in this Newsletter has been drawn from material supplied by the same persons indicated in each chapter as possible correspondants for further information.

Text have been checked and apologies are given for omissions or errors.