



Environmental Research Newsletter

Contents

Editorial	1
Programme News	2
Environmental Protection	
Environmental Chemicals	3
- EC Research Programme and Support Activities to the Commission	3
Environmental and Human Health	4
- EC Research Programme and Support Activities to the Commission	4
Water	6
- EC Research Programme and Support Activities to the Commission	6
- EC Regulatory Action	8
Soil	9
- EC Research Programme and Support Activities to the Commission	9
Ecosystems	10
- EC Research Programme and Support Activities to the Commission	10
Other Activities relevant to EC Environmental Programmes	
- EC R&D Programme MAST (DG XII/E)	13
- Protection of the Community's Forests against Atmospheric Pollution	14
- BCR-Programme for Environmental Measurement	14
Climatology	15
Energy and Environment	16
Information	18
Conferences	20
Publications	21

Editorial

Towards a pan-European environmental policy?

The establishment of the European Economic Area covering the EC and EFTA, will entail, i.a., the adoption by the 7 EFTA countries (Austria, Finland, Iceland, Lichtenstein, Norway, Sweden, Switzerland) of the EC legislation on the environment as well as their full participation in the EC environmental research programmes.

With regard to the ex-panified economy countries of central and Eastern Europe, one of the consequences of the political upheaval which has occurred since 1989, was the clear demonstration of the importance of environmental quality for sound economic development.

The European Community was quick to offer help to reconstruct the economy of these countries through the PHARE programme. In addition, on an initiative of President Delors, it agreed to coordinate the aid of the G.24 countries. It soon proved that a substantial part of the funds available had to be allocated to environmental remediation and to the development of sound environmental protection strategies. Indeed in its first year (1990) PHARE contributed over 20% of its funding toward this objective: Poland (22 Mio ECU), Hungary (25 Mio ECU), the Czech and Slovak Republic (30 Mio ECU) and the ex-GDR (20 Mio ECU).

A strategy document covering a 3-year period was subsequently produced by the Commission. It identifies policy objectives and priorities such as strengthening the institutional and regulatory frameworks, and raising public awareness. On this basis the 1991 PHARE environment programmes allocated 35 Mio ECU to Poland, 10 to Hungary, 15 to Bulgaria, 5 to the Czech and Slovak Republic and 1 to Rumania.

The transboundary nature of many environmental problems led the Commission to propose regional projects to undertake comprehensive action across borders in order to tackle such problems as air pollution in the "Black Triangle" and water management in the Danube basin. In 1991 20 Mio ECU are earmarked for this type of action.

Most PHARE environmental projects include R&D components which involve the participation of scientists from EC and EFTA countries jointly with those from the beneficiary states.

These developments are now to be seen in broader context. European environment Ministers met for the first time in Dublin on 16 June 1990 under the Irish presidency and decided to work towards a European-wide policy for the environment implying i.a. the adoption of EC norms.

The Ministers met again at Dobris Castle in the Czech and Slovak Federal Republic in June 1991 on the invitation of Minister Vavrousek. One of their decisions was to produce a report describing the state of the environment in all of Europe by the end of 1993. This report is to facilitate the development of an environmental programme for Europe, which will identify priorities for the repair and restoration of existing environmental damage and the prevention of future problems; to be the basis for the effective implementation of environmental policies and strategies; and to be a useful tool to inform the public and raise awareness about environmental problems.

It was agreed at Dobris Castle that in preparing the "1993 Report" the European Commission in co-operation with the United Nations Economic Commission for Europe will set up a Project Group of individual European Countries and relevant international organizations (OECD, Council of Europe, WHO, etc.). Within the European Commission, the responsibility has fallen to DG XI and, in particular, to the Task Force which is making preparations for the European Environment Agency.

In October 1991 an Orientation Meeting with representatives from Eastern and Western Europe, international and non-governmental organizations was held in Brussels. The meeting agreed on the procedure for producing the report including the composition of the Project Group, and also the guide-lines on the possible contents of the report. The Project Group will now meet at regular intervals to define the detailed work plan.

It is anticipated that the report will be discussed by the European Ministers at next their meeting to be organized by the Swiss government in 1993. In parallel, and based on its findings, the first elements of a European-wide environmental strategy may be proposed and possibly adopted. We may look forward to strongly increased co-operation between EC, EFTA and the rest of Europe not only in the area of policy measures but also in research. The JRC and the EC cost-shared R&D programmes are likely to play a leading role in this exciting enterprise.

Ph. Bourdeau
Head, European Environment
Agency Task Force

Editor

Dr. G. Rossi with the collaboration of
Dr. M. Borlé-Talpaert (presently MURST, Rome)
Eva Presser

Environment Institute
Joint Research Centre
I-21020 ISPRA (VA), ITALY

Programme News

EC R&D Programme in the Field of Environment 1991-1994

(CEC-Directorate General XII)

The adoption by the Council of the European Communities of the new 1991-1994 Research and Development Programme in the field of Environment (**OJ of the EC N° L 192 of 16 July, 1991**) had been anticipated in the preceding issue of Environmental Research Newsletter (N° 7).

More detailed information are given here concerning the programme structure and objectives.

Following the above mentioned Council Decision, a call for proposals for the specific programme for research and technological development in the field of Environment (1991-1994) has been published in the *Official Journal of the EC*, N° C 184 on 16th July 1991 (Ref. 91/C 184/04).

The environment programme is the follow-up to the ongoing research programmes for the period 1989-1992, **EPOCH** (European Programme on Climatology and Natural Hazards), **STEP** (Science and Technology for Environmental Protection), and **REWARD** (Recycling of Waste R&D).

Its purpose is to expand and strengthen the ongoing research activities in the form of more integrated and multidisciplinary transnational projects, taking into account the global aspects of many environmental issues, the increasing importance of Community environment policy and the urgent necessity to improve the environment and the quality of life.

The general objectives of the programme are:

- to provide the scientific knowledge and technical know-how needed by the Community to carry out its new role relating to the environment, according to title VII of the EEC Treaty;
- to further improve the productivity of the overall research effort in the Community, to reduce overlaps and increase effectiveness through the coordination of national RTD programmes in the field of environmental research;
- to provide a basis for the European contribution to major international programmes related to global environmental changes, while focussing on topics of more specific European interest;
- to reinforce the role of the Community within international conventions on the protection of the atmosphere through the improvement of fundamental knowledge on global processes related to the "greenhouse problem";
- to provide the technical basis for, and encourage the development of environmental quality norms, safety and technical norms and methodologies for environmental impact assessment, to support the activities of the future European Environmental Agency;
- to contribute to the strengthening of the economic and social cohesion of the Community, by promoting overall scientific and technical quality and incorporating socio-economic aspects into the field of environmental research.

The specific objectives of the Environment Programme are:

- to contribute to the understanding of the processes governing environmental change and to assess the impacts of human activities;
- to promote better environmental quality standards by encouraging technological innovation at the pre-competitive stage and to protect and rehabilitate the environment;
- to improve the understanding of the legal, economic, ethical and health aspects of environmental policy and management;
- to help solve broad problems of transnational interest through a system's approach and interdisciplinary research.

Research Areas/Research Topics

The Environment Programme is subdivided into 4 areas. Research to be supported in each area is described briefly below.

AREA I

Participation in Global Change Programmes

A. CLIMATE CHANGE AND CLIMATE IMPACTS

I.1 Natural Climate Change

Reconstruction and modelling of long-term Quaternary Climatic variations. Dynamics of the last climatic cycle. Reconstruction of the climate of the last 2000 years.

I.2 Anthropogenic Climate Change

Short- and long-term climate change. Early detection of climate change. Study and modelling of clouds and aerosols. Land-surface processes. Study and modelling of the hydrological cycle. Ocean exchange processes and circulation. Global distribution of sources and sinks for CO₂ and other greenhouse gases. Investigation and modelling of ice sheet dynamics.

I.3 Climate Change Impacts

Sea level changes, climatic impacts on land and water resources. Slope instability and erosion. Storms and floods.

B. GLOBAL CHANGES IN ATMOSPHERIC CHEMISTRY AND BIOGEO-CHEMICAL CYCLES AND THEIR CONSEQUENCES FOR LIFE ON EARTH

I.4 Stratospheric Ozone

Field campaigns and long-term strategic research to understand and forecast processes which lead to the depletion of stratospheric ozone. Effects of UV exposure on human health and on the environment.

I.5 Tropospheric Physics and Chemistry

Role of natural emissions in changing atmosphere composition and of clouds in tropospheric chemistry. Polar tropospheric chemistry and oxidising capacity of the troposphere. Background contributions to European atmospheric pollution. Source-receptor relationships of NO_x emitted by mobile sources. Transport and chemistry of atmospheric pollutants in the Mediterranean and complex terrain regions.

I.6 Biogeochemical Cycles and Ecosystem Dynamics

Biogeochemical cycles and hydrology. Plant response to environmental change. Impacts of pollutants on soils and rhizosphere. Biodiversity.

AREA II

Technologies and Engineering for the Environment

II.1 Assessment of Environmental Quality and Monitoring

Measurement techniques and instrumentation to elucidate stratospheric and tropospheric chemistry. Design and operation of a smog chamber. Analysis and fate of organic pollutants in water. Development of biosensors for environmental measurements.

II.2 Technologies for Protecting and Rehabilitating the Environment

Cleaner technologies. Emission abatement technologies. New waste water treatment systems. Recycling technologies. Treatment and disposal of waste. Risk assessment for and restoration of abandoned disposal sites and contaminated industrial sites.

II.3 Major Industrial Hazards

Technologies for accident prevention and environmental restoration. Chemical and physical hazard phenomena. Risk management.

II.4 Environmental Protection and Conservation of Europe's Cultural Heritage

Relationship between environmental factors and damage to cultural property. Scientific and technical basis for conservation, restoration and maintenance. Environmental archaeometry. Socio-economic and policy issues.

AREA III

Research on Economic and Social Aspects of Environmental Issues

III.1 The Human Being, Nature and Society

Perception of nature and environmental problems, knowledge and behaviour. Cultural, ethical, religious, philosophical and historical aspects.

III.2 Environmental Policy: Conceptualization, Implementation and Monitoring

Crucial elements for sustainable development. The relationship between environment and economy. Optimizing policy instruments. Formal qualities of law of environmental relevance. Integra-

tion of environmental concerns into policies. Identifying effective institutional mechanisms for environmental policy.

III.3 **Environment on the International Scene: the Transformation of International Relations**

International negotiations and agreements. Environmental assessment of technological cooperation and international aid. International relations and the environment.

AREA IV

Technological and Natural Risks

IV.1 **Natural Risks**

IV.1.1 Seismic Hazard

Stress, strain, displacement studies and other physical phenomena related to seismic activity. Seismicity patterns in space and time. Tsunamis hazard. Seismic behaviour of existing buildings and damage to lifeline systems. Site effect analysis. European rapid intervention team and earthquake data networks.

IV.1.2 Volcanic Risk

Behavioural models for active volcanoes. Social, environmental and economic impacts of active volcanoes. Scientific basis of civil defence. Technological developments in volcanological monitoring.

IV.1.3 Wildfires

Physical aspects of wildfires and risk. Relations between physical aspects of fire regime and climatic change. Modelling fire behaviour. Management and conservation practices. Fire prevention and mitigation.

IV.2 **Technological Risks**

IV.2.1 Risks from Agricultural Technologies and Land Use Practices to Soil, Surface and Groundwater Quality

Critical analysis of existing data sets on the use and fate of agrochemicals in different agricultural systems. Review and further development of existing models describing the fate of agrochemicals. Field experiments on the behaviour and effects of agrochemicals. Integrated farming models. Socio-economic issues and land-use practices.

IV.2.2 Regional Aspects of Ecosystems Protection

Development of integrated projects at regional scale with em-

phasis to landscape ecology. Eutrophication control and water quality management for the Adriatic Sea.

IV.2.3 Environment and Human Health

Assessment of exposure and early indicators of health impairment. Development of environmental epidemiology.

IV.2.4 Risks to Health and the Environment from Chemical Substances

Improved methods for early identification of genetic risks of environmental chemicals. Development of improved test systems for assessing the ecological effects of chemicals.

IV.3 **Desertification in the Mediterranean Area**

History and evolution of desertification in specified climatic, geomorphological, cultural and socio-economic contexts. Effects and interactions of biotic and abiotic factors. Extent and progression of desertification. Complex interactive dynamics and prediction of desertification. Prevention, combatting and rehabilitation. Constitution of a European Network of institutions dealing with desertification research. European monitoring and information systems.

The deadlines for the different areas and topics of the programme have already been quoted in Environmental Research Newsletter N° 7.

For further details please contact:

H. Ott, DG XII/E, CEC, 200 rue de la Loi, B-1049 Brussels,
Tel. + 32 2 2351182.

“Towards sustainability”: New 5th Action Programme on the Environment

The new approach in EC environmental policy will also be reflected in the new 5th action programme on the environment, which the Commission will submit to the Council and the Parliament by the end of this year. Under the heading “towards sustainability” it will give special attention to the integration of environmental considerations into other policy areas, to the subsidiarity principle and to the choice of optimal policy instruments.

Further information can be obtained from:

J. Delbeke, DG XI/C-3, CEC, 200 rue de la Loi, 1040 Brussels,
Tel. + 32 2 2368804.

Environmental Protection

Environmental Chemicals

EC Research Programme and Support Activities to the Commission

Detailed information on the EC programme in this field as managed by DG XII/E, on one side, and developed by JRC on the other side, has been given in previous issues of Environmental Research Newsletters (see N° 3 in particular and also N° 6). Emphasis is put here on the activities carried out at the Environment Institute of the JRC Ispra, in support to the Commission's services.

Support Activities

The Environment Institute of the JRC provides technical and scientific support to DG XI for the implementation of Community Directives related to chemicals evaluation and control.

The support in this field focuses, in particular, on the development of the database ECDIN and on the inventory of chemicals EINECS. The most significant results achieved in the framework of the above projects are given below.

1. ECDIN (Environmental Chemicals Data and Information Network)

A very important milestone has been achieved as a first **CD-ROM** version of **ECDIN** data for use with personal computers has come on the market in Europe. This version focused on 1700 compounds of primary environmental and occupational importance.

The retrieval software of the CD-ROM is very powerful and flexible and has encountered a very favourable response by the first users.

The disc will be distributed by professional Companies on behalf of the Environmental Institute.

Agreements for distributing CD-ROM versions abroad (USA, Japan) are under negotiation.

The data content of the ECDIN databank was extended substantially by the addition of an existing database on water solubility (more than 10,000 records for about 4,000 organic compounds). In addition, updating and significant improvements were made in the toxicological, waste legisla-

tion files and chemical economic sector. A new file on abiotic degradation of chemicals has been introduced, too. On-line data are distributed by **DIMDI** (see also "Information" p. 18).

2. EINECS (European Inventory of Existing Commercial Chemical Substances)

Comments received from competent authorities after the publication of the **EINECS** Inventory in the Official Journal of the EC (*N° C 146 A, 15.06.1990*) were evaluated and the necessary modifications introduced. In the context of the updating of Annex I of the *Dangerous Substances Directive (79/831/EEC)*, a meeting was held at Ispra (July 1991) with experts from member states and the chemical industry for the classification, labelling and packaging of organic peroxides.

In continuation of the exploration and validation of Structure-Activity Relationships (**SAR**) a Eurocourse was organised in June 1991 under

the title "*Applied Multivariate Analysis in SAR and Environmental Studies*" and the proceedings were published.

A study aiming at grouping approximately 10,000 compounds of the EINECS Inventory according to chemical structure was completed successfully.

Results have been published by (a) J. Devillers, W. Karcher (1991), (eds) under the title: "*Applied Multivariate Analysis in SAR and Environmental Studies*." and (b) W. Karcher, J. Devillers, Ph. Garrigues and J. Jacob (eds.) "*Spectral Atlas of Polycyclic Aromatic Compounds*" - Vol. 3.

Further information can be obtained from:

- W. Karcher Tel. +39 332 789983,
- M. Boni, Tel. +39 332 789720 (regarding ECDIN)
Environment Institute, CEC-JRC Ispra, I-21020 Ispra (Va)

Environment and Human Health

EC Research Programme and Support Activities to the Commission

Detailed information on the activities included in this programme area has been already given in past issues of the Environmental Research Newsletter. It is recalled here that shared-cost actions and concerted actions managed by DG XII/E and, in part, by JRC are implemented by the research activities carried out at the Environment Institute of the JRC within the framework of the specific multiannual research programmes of the JRC.

1. Biomonitoring of Human Populations Exposed to Genotoxic Environmental Chemicals

In the framework of the **STEP Programme (1989-1992)**, four coordinated projects started in 1991. Twentyfive Institutions from the 12 European countries plus Finland, Norway and Sweden participate in the development of biomonitoring systems to quantify the exposure to potential mutagenic chemicals in the environment and to detect possible early effects.

Project 1: Biomonitoring Human Exposure to Environmental Genotoxic Chemicals

(Project coordinator: P. Farmer, MRC Toxicology Unit, Carshalton, GB)

Emphasis will be placed on populations exposed to urban pollution and in particular to the genotoxicants present in such samples that result from petrochemical combustion or processing. Blood and urine samples from individuals in urban locations will be collected and distributed amongst the programme's participants. Air samples will also be collected and analysed. Samples from rural areas will be used as negative controls.

It is intended that the project should allow (a) a thorough interlaboratory comparison of the application of different biomonitoring procedures for genotoxic exposure, (b) assessment of the relationship between the internal dose of the genotoxic agent (determined from adduct levels) and the subsequent genetic damage associated with the exposure (measured by mutation and cytogenetic effects), (c) study of interindividual variation amongst the subjects in a population, (d) development of novel, more sensitive, specific, and practical methods for biomonitoring such exposures, (e) comparison of the relative sensitivity of different techniques within individual laboratories, (f) evaluation of interlaboratory variability of established techniques.

The information obtained by the use of these methods may enable us to decide where reduction of human exposure to environmental genotoxic chemicals is required, taking into account the existence of "background" exposure due to industrial or life-style related factors.

Project 2: Biomonitoring of Human Populations Exposed to Pesticides

(Project coordinator: N. Loprieno, University of Pisa, IT)

This project deals with the investigation for the definition of the analytical methods to identify people exposed to pesticides (professional exposure) and for the evaluation of the level of their exposure. Different methodologies, both biological and chemical, will be defined in order to evidence the most adequate methodologies to be applied in relation to pesticides or to their metabolites' residues.

Special professional groups will be identified and analysed in the regions of Campania (Italy), Liguria (Italy), Maresme (Spain), Helsinki (Finland). A group of ca. 3,000 unexposed people already submitted to a large biomonitoring programme since 5 years for clinical end points will be submitted to an analysis of MN, SCE and CA in peripheral blood lymphocytes. At the end of the analysis it will be possible to discriminate different subgroups with spontaneous frequencies of such chromosome damages correlated with other chemical parameters.

Project 3: Assessment of Environmental and Occupational Exposures to Butadiene as a Model for Risk Estimation of Petrochemical Emissions

(Project coordinator: M. Sorsa, Institute of Occupational Health, Helsinki, SF)

This project involves the development and validation of methods applicable for human biomonitoring, using an experimentally established genotoxic and carcinogenic agent 1,3-butadiene as a model; the comparison of environmental and biological monitoring methods applicable for low level exposures; the comparison of the results obtained with different endpoints analysed in the cooperative study, particularly between cytogenetic effects and macromolecular binding; the comparison of adduct levels between environmentally and occupationally exposed humans; the characterization of individual variation of the target dose as measured by binding to hemoglobin/albumin as a surrogate for critical targets at a given external exposure.

The final goal is the development of a critical approach to cancer risk estimation of human environmental and occupational exposure to butadiene.

Project 4: Development of New Molecular Procedures for the Detection of Genetic Alterations in Man

(Project coordinator: A. Lehman, MRC Cell Mutation Unit, Sussex University, GB)

The Restriction Site Mutation system, which is proposed to develop, is a procedure for detecting mutations of a DNA sequence at any unselected locus. The mutations are identified as alterations of the DNA

sequence at any chosen site (which is normally the target for digestion by a restriction enzyme).

The final goal will be the use of this procedure to detect mutations in cultured human cells after mutagen treatment, in experimental animals and in exposed human populations.

In the framework of the Programme Environment (1991-1994) these activities will be continued and enlarged.

Further information can be obtained from:

- A. Sors, DG XII/E-1, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 2357659;
- E. Marafante, Environment Institute, CEC-JRC Ispra, I-21020 Ispra (Va), Tel. +39 332 789144.

2. Concerted Action "Indoor Air Quality and Its Impact on Man" (IAQ&IM)

Over the past year, the following four reports (N° 7 - 10 of those issued by the Concertation Committee "Environment and Quality of Life") have been published (see also "Publications"):

"Indoor air pollution by formaldehyde in European countries". (p. 22 EUR 13126 EN). The report includes a short review of: the effects on health of formaldehyde, of existing air quality guidelines and standards and of indoor sources of formaldehyde. For those countries for which information was available, occurring indoor concentrations are reported and national policies are outlined. Preventive measures are briefly discussed and unresolved problems are identified (Report N° 7).

"Guideline for the characterization of volatile organic compounds (VOC) emitted from indoor materials and products using small test chambers". (EUR 13593 EN). The guideline describes and makes recommendations for: test chambers and ancillary equipment, sample collection and analysis, experimental design and analysis of the data. The techniques described are useful for both routine product testing and in depth investigations by indoor air quality researchers (Report N° 8).

"Project inventory - 2nd updated edition". (EUR 13838 EN). Two years after the 1st edition the inventory gives an up-to-date situation of indoor air quality research in 14 European countries and at the Joint Research Centre. Short descriptions of 326 research projects are given including: a descriptive project title, keywords, name and address of the principal investigator(s), year of the start and of the expected end of the project. Lists of the projects by keywords and by investigator name, useful for information retrieval, are included (Report N° 9).

"Effects of indoor air pollution on human health". (EUR 14086 EN). The report contains a summary discussion of human health effects linked to indoor air pollution (IAP) in homes and other non-industrial environments. Rather than discussing the health effects of the many different pollutants which can be found in indoor air, the approach has been to group broad categories of adverse health effects in separate chapters, and describe the relevant indoor exposures which may give rise to these health effects. The following categories have been considered: effects on the respiratory system; allergy and other effects on the immune system; cancer and effects on reproduction; effects on the skin and mucous membranes in the eyes, nose and throat; sensory effects and other effects on the nervous system; effects on the cardiovascular system, and systemic effects on the liver, kidney and gastro-intestinal system. For each of these categories, effects associated with IAP, the principle agents and sources, evidence associating IAP with the effect(s), susceptible groups, the public health relevance, methods for assessment, and major research needs are briefly discussed (Report N° 10).

A workshop on *"Methods of risk assessment for the indoor environment"* has been organized jointly with the NATO-CCMS pilot study "Indoor Air Quality". Proceedings of the workshop will be published mid 1992.

An interlaboratory comparison experiment for the validation of the above mentioned guideline for the characterization of VOC emissions (report EUR 13593 EN), organized by the JRC's Environment Institute, started in September 1991. 23 laboratories in Europe and in the USA are participating. The experiment consists in determining, at each laboratory, of the organic vapours emitted into small test chambers from three different materials. Aliquots of the same materials are distributed and the agreement in the results obtained in the participating laboratories is being analysed. The experiment is expected to reach its conclusion in Spring 1992.

Further information can be obtained from:

- H. Knöppel, Environment Institute, CEC-JRC Ispra, I-21020 Ispra (Va), Tel. +39 332 789204.

3. Research on Indoor Air Quality at the Environment Institute of the JRC Ispra

The research activities at the Environment Institute related to indoor air quality were focused on a) the development of a method for the determination of semivolatile organic compounds (SVOC) in indoor air, using combined supercritical fluid extraction-gas chromatography/supercritical fluid chromatography (SFE-GC/SFE-SFC) and b) the assessment of potential artifacts in sorbent trapping of volatile organic compounds (VOC). The latter investigation aimed at evaluating recently published criticism of this technique, which is essential for indoor exposure and source characterization. For none of 16 model compounds ranging from non polar to strongly polar any artifact could be attributed to Tenax, a synthetic polymer widely used as VOC adsorbent.

Studies of the emission of VOC from various materials were continued, partially committed by external customers. ("Small chamber tests and headspace analysis of volatile organic compounds emitted from household products", A. Colombo, M. De Bortoli, H. Knöppel, H. Schauenburg, and H. Vissers. 1991. *Indoor Air*, 1 (1991), 13-21).

For information see above.

4. Trace Metal Exposure and Health Effects Research at the Environment Institute of the JRC Ispra

The aims of the activities on Trace Metal Exposure and Health Effects, which have already been outlined in Environmental Research Newsletter N° 6 (see also ERN N° 3), consist essentially in establishing, on a scientifically sound basis, dose-effect relationships in view of preventing potential health hazard from the exposure to trace metals.

To achieve this goal, two topics, linked to each other and covered by this more comprehensive theme, are being investigated, i.e.:

- trace metal levels in human tissues of EC population;
- metabolism and biochemical effect of trace metals.

The first topic is addressed, on one side, to establish baseline values in general population as the fundamental parameter for the assessment of the biological effects of trace metal exposure on humans.

The availability of accurate trace element reference values in human tissues represents an important indicator in relation to the health status of a population and the quality of the environment:

- 1) to understand opportunely pathological states in connection with environmental factors and to identify anomalous trends of essential/toxic elements in the general population;
- 2) to verify and eventually reconsider legal limits of exposure for the protection of the general population.

In this context, two projects are being investigated:

- EURO TERVIHT project (Trace Element Reference Values in Human Tissues)
- TRACY project (Database for Toxic Metals in Human Tissues and Fluids).

The EURO TERVIHT project aims to establish and compare trace element reference values in tissues from inhabitants of the European Community as baseline values for clinical/toxicological assessment studies. The project foresees an international cooperation of specialized chemical/toxicological laboratories in Western Europe.

The activity includes the integrated use of reference analytical techniques (neutron activation analysis) in connection with spectrochemical routine techniques (graphite furnace atomic absorption spectroscopy, inductively coupled plasma atomic emission spectroscopy, inductively coupled plasma mass spectrometry) and it is carried out with well defined guidelines and considering carefully the following steps:

- 1) critical re-evaluation of existing literature on trace element reference values in blood, serum and urine in each Member State;
- 2) the selection of "reference population groups" with the adoption of well defined protocols (extended epidemiological data plus clinical status);
- 3) assessment of the influence of parameters affecting the analytical determinations including preanalytical factors (sampling procedure, container material, storage conditions) as well as analytical quality control procedures to obtain precise and accurate analytical data;
- 4) statistical treatment of the data and the expression of the analytical results.

Depending on the number of subjects analysed and the degree of information acquired "tentative reference values" (e.g. 12 elements in blood of more than 350 subjects), "indicative values" (25 elements in lymph nodes of more than 25 subjects) and "informative values" (37 elements in cerebrospinal fluid of a small number of subjects) have been suggested.

The **TRACY project** is to be undertaken in the framework of EUREKA projects in the field of environmental studies (EUROENVIRON EU 618). It has been jointly developed by Norway (Dag Brune Consultant), Swedish (University of Umea and National Institute of Occupational Health, Solna) and CEC Joint Research Centre - Ispra in close cooperation with the Scientific Committee on the Toxicology of Metals within the International Commission on Occupational Health (ICOH) and has been further recognized by the International Union Pure and Applied Chemistry (IUPAC) - Commission on Toxicology.

The aim is the critical evaluation of publications in the international scientific literature. The results will be judged and graded according to criteria established in accordance with an IUPAC reference group prior to the assessment of selection data for reference values production.

The data will be stored in a computer, making retrieval of desired accessible to users. Elements to be implemented in the database subsequent to evaluation comprise e.g. Cd, Cr, Pb, Ni and Se.

On the other side the determination of trace metals in body fluids and tissues of individuals exposed professionally has provided meaningful information on the potential role of some elements in inducing metal related diseases. Monitoring of Co, W and Ta by neutron activation analysis in bronchoalveolar lavage, urine, blood, toenails and pubic hair from hard metal workers engaged in the production of hard metal tools or in grinding hard metal components of tools by diamond-cobalt discs suggest that no relation exists between internal dose of metals and symptoms of disease. These findings further support the theory of an individual susceptibility towards the hard metal pneumoconiosis based on immunological response. Since it is not possible at present to propose sensitive and specific tests for the early identification of hypersusceptible individuals, in the medical surveillance of hard metal workers, the aim

should be to detect early respiratory alterations. Lung function tests and BAL in selected cases should be at present the methods of choice.

For the development of the second topic, studies on metabolic pathways and on the toxicological effects of trace metals are required being performed both *in vivo* on laboratory animals and by *in vitro* toxicity testing as alternative to animal testing.

In particular, the recent progress in cellular biology, biochemistry and bioanalytical tools has yielded a new methodology known as *in vitro toxicity testing* that ultimately would be able to test chemicals in cultures of human cells from various tissues so that the question of human toxicity would be answered more directly. In order to give new insight into the hazard identification from exposure to trace metals, to provide data estimating the quantitative exposure-effect relationships for trace metals in human beings and to meet economical and ethical requirements (reduction of animals for toxicity tests) *in vitro* testing methods, including subcellular preparations (human lung intracellular fractions and sperma), isolated cellular components (superoxide dismutase, glutathione peroxidase, catalase and peroxidase enzymes) and cell culture systems (BALB/3T3, PC 12, melanoma B 16 pigmented and non pigmented, human hepatoma, Heat Shock Protein 70 KD cell lines) have been developed and applied to toxicological studies of trace metals.

The most important results achieved so far by *in vivo* experiments concern, on one side, the study of toxicokinetics and distributions of radioactively-labelled thallium, cobalt, tungsten, barium, strontium and calcium compounds in rat and rabbit tissues as well as intracellular components.

On the other side the *in vitro* bioassays, mainly by cell cultures, provided information on general and specific cell toxicity (screening tests) of metal compounds as well as on the concurrent uptake, intracellular distribution, biotransformation and biochemical effects of selected metal compounds such as arsenic, manganese, selenium and vanadium compounds.

Further information can be obtained from:

E. Sabbioni, Environment Institute, CEC - JRC Ispra, I-21020 Ispra, Tel. +39 332 789070.

Water

EC Research Programme and Support Activities to the Commission

In the following some relevant developments in this programme area are presented. One can refer to preceedings issues of Environmental Research Newsletter (in particular issue N° 6 of December 1989) to get detailed information on the objectives of the EC R&D Programme on Protection of the Environment complemented by the JRC specific research programme related to water quality.

1. Assessment of Environmental Quality and Monitoring

The new Environmental Research Programme 1991 - 1994 includes in Area II.1 "**Assessment of environmental quality and monitoring**" (see above "Programme News") 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.

2. Concerted Action "Organic Micropollutants in the Aquatic Environment"

The Concerted Action COST 641 "**Organic Micropollutants in the Aquatic Environment**" has been formally terminated at the end of 1990 and the final report published (doc. OMP/85/91).

3. Shared-cost contracts

Within **STEP**, in the field of analysis and transformation of organic micropollutants in water, two shared-cost contracts are being implemented:

- N° STEP-0043: Abiotic photodegradation of chemicals in aqueous solution and natural water. Participating Institutions: University of Bonn; Centro Tecnica, Chimica e Biologica, Università Nova de Lisboa.
- N° STEP-0045: Chlorophyll fluorescence as a possible tool for low cost and continuous bio-monitoring of pesticides in aquatic ecosystems. Participating Institutions: University of Mainz and CNRS Paris.

Further information regarding items 1, 2 + 3 can be obtained from:

G. Angeletti, DG XII/E-1, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 2358432.

4. Water Quality - Ecological Effects of Pollutants

4.1 Eutrophication-related Phenomena in the Adriatic Sea

The phenomenon of water deterioration has been evident for many years in the Adriatic Sea and in other parts of the Mediterranean coastal zone

(e.g. south of France, Spain and Greece). It has had important consequences for human activities, such as fishing, aquaculture, tourism and recreation, and as a result has been brought to the attention of local, regional and national authorities, managers of tourist organisations and researchers.

Therefore, the Italian National Academy of Lincei, the Water Research Institute of the Italian National Research Council and the Commission of the European Communities organized in May 1990 a workshop in Rome to examine this problem in detail. The workshop reviewed available scientific knowledge on eutrophication and related phenomena in the Adriatic Sea, such as algal blooms, massive gel production and phytoplankton toxins, and made recommendations on actions to be taken to resolve the problem of water quality deterioration.

On the basis of a comparison of various environmental situations and experiences in different EC countries with regard to processes causing eutrophication phenomena and poor water quality, short and long-term measures to reduce eutrophication phenomena and to improve the water quality were discussed.

The workshop results and the conclusions drawn by a group of various experts have been published by the EC as Water Pollution Research Report N° 16 and can be obtained from H. Barth (see below).

4.2 Dynamics of Phaeocystis blooms in nutrient enriched coastal zones

In the framework of the 4th Environment R&D Programme the Commission started in 1988 the collaborative research project on the "**Dynamics of Phaeocystis blooms in nutrient enriched coastal zones of the Channel and the Southern North Sea**" which has recently been prolonged in the framework of the **STEP** Programme.

In March 1990 a project workshop in Plymouth (UK) synthesized the results obtained during the first two project years.

The project aims to establish a predictive mathematical model of the alterations of North European coastal marine waters in response to the cumulative nutrient discharges from terrestrial origin. This model intends to give particular attention to the events occurring during spring phytoplankton blooms where a major part of the annual primary production is concentrated and the phytoplanktonic community in the well-mixed coastal area is dominated by Phaeocystis species.

The proceedings of this "mid-term" project workshop have been published as N° 23 of the Commission's *Water Pollution Research Reports series*. It assesses the current knowledge about the riverine inputs of nutrients and their distribution in the coastal zone between Brittany and the Southern Bight of the North Sea; the distribution, taxonomy, morphology and physiology of Phaeocystis; the food web structure and functioning of Phaeocystis-dominated ecosystems, and finally discusses the structure of the ecological "**MIRO Model**". The proceedings can be obtained from H.Barth (see below).

Beginning of 1991, an EC workshop has been organized in Brussels to better understand the overall ecological functioning of Phaeocystis-dominated marine ecosystems and to evaluate their global significance.

The marine haptophyceae Phaeocystis is one of the most widespread phytoplankton genus. It regularly forms dense, nearly specific blooms in eutrophic temperate, polar and sub-polar waters and has recently been reported from the sub-tropical waters of the Arabian Gulf, which indicates its potential cosmopolitan character.

In all these areas, Phaeocystis contributes to more than 60% of the annual primary production. In spite of numerous investigations on this important primary producer the factors controlling the inception and regulation of Phaeocystis blooms are still not well understood. This partly results from the complex physiology that characterizes this species, i.e. Phaeocystis is one of the few aquatic phytoplankton taxa that exhibits phase alternations between free-living solitary cells and gelatinous colonies. These two morphological stages cohabit in the natural environment but have different impacts on the higher levels in the marine foodweb. For example, solitary cells are ingested by protozoan organisms whilst large colonies escape grazing by most herbivorous organisms. This can result in mass deposition onto sediments, accumulation on beaches as layers of sea foam and slow bacterial degradation in the water column.

In addition, Phaeocystis constitutes one of the main phytoplankton producing dimethylsulphopropionate (DMSP), the chemical precursor of dimethyl sulfide (DMS). This volatile sulphur compound is known to have impacts on the chemical quality of the atmosphere (as a major precursor of the background acidity of the atmosphere, in the absence of direct

human perturbation) and on climate changes (as contributor to cloud condensation nuclei).

Therefore, the workshop was addressing the following questions:

- Which are the main physiological properties of Phaeocystis in the different geographical areas where it occurs?
- Does the same species develop in all areas (under the various climatic, hydrological and ecological conditions)?
- Which factors trigger Phaeocystis colony formation?
- Do grazing activities control Phaeocystis development?
- What is the fate of ungrazed Phaeocystis colonies in the water column under the various environmental conditions?
- What is the global significance of DMS release by Phaeocystis into the atmosphere?
- What is the status of Phaeocystis-dominated ecosystems at the global scale (e.g. regarding global C-, N- and S- cycles)?

Some of the above questions were addressed by confronting the experience gained by joint multidisciplinary research projects carried out in Europe, namely the EC project on the dynamics of Phaeocystis blooms in nutrient-enriched coastal zones (see above) and the Norwegian "Pro Mare"-project carried out in the Barents Sea.

The scientific papers presented during this very fruitful workshop will likely be published in 1992 as a special issue of the "*Journal of Marine Systems*" (Elsevier, Amsterdam).

An executive summary of the workshop conclusions is in press in the *Marine Pollution Bulletin*.

Further information and the above publications can be obtained from:
H. Barth, CEC, DG XII/E-1, 200 rue de la Loi, B-1049 Brussels,
Fax. +32 2 236 30 24.

5. 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 (see also Environmental Research Newsletter N° 6).

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.

The project mainly addresses the characterization, identification and quantification of algal blooms with particular emphasis on the phytoplanktonic species producing toxins. Algal genera considered in the proposed project are *Alexandrium*, *Gymnodinium*, *Prorocentrum* (for marine waters); *Prymnesium* (for brackish waters) and *Microcystis* (for freshwaters).

More specifically, the MITO Project focuses 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 toxin occurrence, distribution and ecosystem effects.
- a) A tentative method for analysis of phytoplankton by flow cytometry as well as a manual for algal biotoxins detection will be published by the EC in July 1992.
 - b) JRC-Ispra organized the first joint exercise at Corfù in September 1991. The main goal was the study of the horizontal and vertical distribution of phytoplanktonic communities and their pigments in a dense net of stations, comparing classical (microscopic inspection)

and innovative (flow cytometry) methods of analysis. The quantification and identification of phytoplankton in sea waters were carried out by flow cytometry and optical plankton analyser on fresh (live) and fixed samples. The field work included a net of 20 sampling stations located in the Corfù Sea at standard depths where biological (chlorophyll, phytoplankton), chemical (nutrients) and physical (CTD, Secchi) measurements were performed. Preserved samples were analysed at JRC Laboratories using flow cytometry and fluorescence microscopy in collaboration with Partec Industry (Germany). The results of this campaign will be published by the JRC in February 1992.

Further information can be obtained from:

G.Premazzi, Environment Institute, CEC-JRC Ispra,
I-21020 Ispra (Va), Fax +39 332 789352.

6. Support activities

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

In support to the **Council Directive on the quality of water intended for human consumption (80/778 EEC)**, two reports have been completed concerning the Annexes to the Directive. Comparison of drinking water quality standards in Member States and outside the Community is presented. A case-by-case analysis for parameters listed in Annex I is summarized, considering relevant elements for health assessment. Recommendations for regulation of contaminants currently grouped under single parameters, for new parameters to be considered for addition and for parameters to be considered for a better specification are also reported.

An updating of the reference methods of available analysis in Member and non-Member States and of the initiatives in the field of Standardization at Community and International level is presented.

The reports have been published by the EC in the series "*Environment and Quality of Life*" as EUR 12427 EN and EUR 13600 EN and may be obtained from G. Premazzi (see above).

EC Regulatory Action

The information given here updates the most recent actions in the framework of the new Community water policy in the 90's. These take into account the new orientations resulting from the Ministerial Seminar in Frankfurt on June, 27-28, 1988. At this meeting the Ministers identified six main areas of work for the Commission. These are: the ecological quality of surface waters, wastewater treatment, dangerous substances, diffuse sources, water resources and integration with other policies.

Ecological quality of Community waters

This aims to ensure that Community surface waters, including marine waters, are restored and/or maintained at a high level of ecological quality. To achieve this objective, Member States will be requested to guarantee the preservation or restoration of biological diversity, sediment quality and self-purification capacity.

The work already carried out by the Commission to elaborate a directive project was the establishment of a scientific Network, the organization of the Como Seminar in May 1989 and the convocation of two meetings (September 1989 and June 1991) with national experts from Member States who provided a broadly favourable response. The Commission has now defined some of the basic principles of this Directive. They are:

- to protect the existing quality of the surface waters of the Community by means of an ecosystem approach;
- the definition of high ecological quality;
- Member States must establish and put in operation integrated programmes, aiming at reaching this high ecological quality;
- Member States must compile and publish progress reports every three years.

7. Work for Third Parties

- a) A contract has been signed with the Italian Ministry of the Environment in the framework of the project for the recovery and management of the Po river basin (**MAPO Project**).

The project aims at:

- supplying the different decisors with a synthetic, easily comprehensible picture of the basin situation, using available data and models;
- elaborating predictive scenarios for programming different action plans and for the evaluation of their impact;
- supplying a decision support system through the use of a multiobjective decision model taking into account cost-efficiency analysis of the action plans and the priority of the actions.

The work on needed background information, choice of necessary parameters and functional specification of the Expert System for the Decision Support (ESDS) is being jointly carried out between the JRC Environment Institute and the Institute for Systems Engineering and Informatics.

- b) Within a cooperative agreement with the Italian Ministry of the Environment the trophic conditions of Lake Garda, the largest lake of the European Communities, have been assessed.

The research concerned the principal ecosystem components, i.e.:

- physical, chemical and biological characteristics of lake waters,
- structure of the phytoplanktonic and zooplanktonic populations,
- fish populations with particular reference to the presence of any pesticide bioaccumulation phenomena in more prized fish species (PCB, HCB, DDT),
- lake sediments with reference to the content of eutrophicating substances (P, N), heavy metals (Cd, Cr, Cu, Hg, Pb, Zn), organochlorinated compounds (PCB, HCB, DDT) and radionuclides (¹³⁷Cs).

This study represented a reference point for setting up a correct safeguarding plan and pollution prevention scheme, and for the rational management of the waterbody.

The results have been published by the EC in the series "*Environment and Quality of Life*" as EUR 12925 It and may be requested from G. Premazzi (see above).

The basic principles of the Directive will be discussed in the course of the *International Conference on River Water Quality: Ecological Assessment and Control* (Brussels, 16-18 December 1991).

Waste Water Treatment

The importance of the provision of adequate treatment of municipal and industrial waste waters was recognized (see Environmental Research Newsletter N° 4).

The Council has adopted the **Directive concerning urban waste water treatment (91/271/EEC; OJ NL 135/40, 30.05.91)**. This Directive concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from adverse effects of the above mentioned waste water discharges.

Member States shall ensure that all agglomerations are provided with collecting systems for urban waste water

- by 31 December 2000, at the latest, for those with a population equivalent (p.e.) of more than 15,000 and
- by 31 December 2005, at the latest, for those with a p.e. ranging from 2,000 to 15,000.

For urban waste water discharging into receiving waters which are considered "sensitive areas", Member States shall ensure that collection systems are provided by 31 December 1998, at the latest, for agglomerations of more than 10,000 p.e. Requirements for urban waste water are described in *Annex I*, while criteria to identify sensitive areas one laid down in *Annex II*.

Diffuse sources

At the Environment Seminar of Frankfurt, Ministers agreed on the special attention deserved by the problems connected with diffuse source of pollution and with intensive agriculture.

The Commission has prepared a proposal to control diffuse sources of nitrate which cause problems for groundwater and eutrophication of Community waters. The proposal includes measures to control the spreading of animal manure, the application of chemical fertilizer, certain

other land management practices, and nitrogen emission limits for certain municipal waste water plants.

The Commission is also considering a proposal to deal with pollution caused by phosphates and is examining a number of different measures in relation to the control of use of pesticides.

Further information can be obtained from:

G.Premazzi, Environment Institute, CEC-JRC Ispra,
I-21020 Ispra (Va), Fax +39 332 789352.

Soil

EC Research Programme and Support Activities to the Commission

Environmental Research Newsletters N° 4 and N° 6 included relevant information on shared-cost and concerted actions managed by DG XII/E in the framework of the EC R&D Programme on the Protection of the Environment as well as on the JRC-Ispra contribution through the chemical Waste activity.

In the following emphasis is given to the progress achieved in shared-cost actions on Soil Quality and to new issues emerging from the project.

1. Shared-cost Contract on Soil Quality - Nitrate in Soils

DG XII/E funded a joint project on **Soil and Groundwater Research: Nitrate in Soils** within the framework of the Fourth R&D Programme of the CEC on Environmental Protection (see also Environmental Research Newsletter N° 6). This project formed from three separate proposals involving some 12 organizations to examine different aspects of nitrate behaviour in crops, soils and groundwater. The desirability of improved understanding of the movement and transformation of nitrate arises from increasingly intensive agricultural systems which can lead to problems of water quality both of ground and surface water. The need for the development of practical modelling techniques, usable at field, farm and catchment level, was recognized at an early stage in the definition of the joint project.

The objective of this project was to develop practical sampling, measuring and modelling techniques to characterize movement and transformation of nitrates in soil and groundwater at field and regional level. Data generated were used to assess impacts of different agricultural practices on nitrate leaching from the rootzone. Criteria were developed to obtain standard data sets for model testing and evaluation, including nitrate and ammonia contents in soil, water and crops, inputs and losses of N from the soil-plant system and determination of the water balance. Eight datasets from five countries were generated, which are now available for general use. Validation and formatting of new or archive data has been a major activity. Nine models for simulation of water and nitrate movement in soil were examined according to criteria established as part of these project activities. Five models were used by different groups for testing datasets from different countries. These models are now all well documented and can be used by other researchers. Leaching figures for nitrates from the rootzone were obtained although it was still difficult to simulate the separate nitrification, mineralization, denitrification and uptake processes. Groundwater studies have concentrated on predicting nitrate levels in the groundwater as a function of pumping strategies and land management schemes. A statistical procedure was developed to predict loading rates into the aquifer from the unsaturated zone as a function of soil type and land use.

New Research Results and Developments Generated during this Project

New achievements realized within the project can be summarized as follows:

Water and solute transport

- A procedure to define and test soil functional layers, derived from soil horizons as used in soil survey, which act as "carriers" of physical information. This approach was tested under field conditions.

- Characterization of macropore flow by field monitoring techniques and by simulation modelling, using morphological and physical techniques.
- Development of a new suction crust infiltrometer method to measure the saturated and unsaturated hydraulic conductivity of soils.

Modelling solute and water movement in the unsaturated zone

- Development of pedotransfer functions, using available soil data to predict denitrification parameters.
- Definition of minimal data sets for model testing and validation and generation of eight sets of well described data to be used by modellers.
- An independent, systematic comparison of nine models for transport of nitrate in soils using independent data sets.

Implications for soil management

- Development of field methods that allow a quantitative representation of soil variability on the field scale and that: (1) were applied to derive more efficient fertilizer application strategies, and (2) were used to identify areas where crop water stress did occur.

Groundwater modelling

- Linkage between the unsaturated and the saturated zone can be achieved by defining loading rates into the groundwater by regression analysis, using measured field data for nitrogen fertilization and leaching as a function of soil type and land use.

A final report has been published: *Soil and Groundwater Research Report II: Nitrate in Soils* (EUR 13501), ISBN 92-826-2757-8.

Further information can be obtained from:

P. Reiniger, DG XII/E1, CEC, 200 rue de la Loi, B-1049 Brussels.

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.

3,4,5-Trichloroaniline (3,4,5-TCA) has been used as a model compound for chloroanilines which are found in waste streams from tanneries and pesticide industries. Sorption/desorption experiments were set up for 7 natural soil horizons having a broad range of organic carbon content (0.15%-6.13%) and 3,4,5-TCA distributions between soil and soilwater (K_d) were measured. Linear and Freundlich sorption isotherms were derived for concentrations in the ppm range. The organic carbon distribution coefficient was determined (K_{OC}=2766±126 L/kg). The water solubility and the octanol/water partition coefficient of 3,4,5-TCA were measured at pH 3, 5, 7 and 9. Soil sorption (K_{oc}) of chloroanilines can be predicted reasonably well from experimental models based either on the compound water solubility or on the octanol/water partition coefficient.

In order to evaluate potential groundwater pollution originating from vinclozolin (a broadly used pesticide) application, the degradation intermediates and 3,5-dichloroaniline (3,5-DCA) had also to be considered. Vinclozolin showed higher mobility in the soil-water system than did 3,5-DCA, suggesting that a possible source of 3,5-DCA groundwater

contamination could derive from the degradation of vinclozolin in the deeper soil horizons rather than from direct migration of 3,5-DCA from the top soil.

Uptake of polychlorinated biphenyls (PCBs) by earthworms (*lumbricus rubellus*) from a soil contaminated with a commercial PCB formulation (Askarel at 150 ug/g) and later release of PCBs by the contaminated earthworms into a low contaminated soil (1.5 ug/g) have been studied. The uptake and release rates were similar for all PCB congeners notwithstanding their different chlorine substitution pattern, suggesting that bioaccumulation of PCBs in earthworms is governed by passive, possibly diffusion controlled processes. The soil to earthworm bioconcentration ranged from 4 to 20 for tetra- to octachlorinated biphenyls and was weakly dependent on the octanol-water partition coefficient.

Soil sorption of atrazine was studied in 110 different soil horizons from 24 different soil profiles all deriving from granodioritic materials. The soil sorption was statistically correlated by multiple linear regression analysis with organic matter of the soil, aluminium oxides and iron oxides. Clay did not correlate with soil sorption of atrazine. It is speculated that coating of the clay by organic matter may mask sorption sites in the clay.

(Work performed by Mrs. A. B. Paya' Perez)

Further information can be obtained from:

L. E. Götz, Environment Institute, CEC-JRC Ispra, I-21020 Ispra, Tel. +39 332 789588.

Ecosystems

EC Research Programme and Support Activities to the Commission

As for the past programme, the new **R&D Programme** of the Commission of the European Communities in the environmental field (1991 - 1994) and the ongoing **STEP Programme** (1989 - 1992) are both putting special emphasis on ecosystem research.

In the following detailed information are given on the objectives of the programme and special features are highlighted as referred to Terrestrial and Aquatic Ecosystems as well as to the Effect of Air Pollution on them.

Ongoing Research in the STEP Programme (1989-1992)

1. Terrestrial Ecosystems

As already mentioned in Environmental Research Newsletter N° 6, the **STEP** programme focuses on basic researches for the protection and the management of terrestrial ecosystems with special emphasis on specific ecosystems of relevant significance for Europe.

1.1 Research Contracts

The catalogue of ongoing **shared-cost projects** in the framework of the STEP programme (and their Project leaders) includes:

- STEP 0035 - *Interacting effects of drought and pollution on whole-tree physiology (ECOTREE)*
(T.A. Mansfield, University of Lancaster - UK)
- STEP 0036 - *Survival growth and dispersal of indigenous and engineered bacteria mediated by soil invertebrates*
(J.M. Anderson, University of Exeter - UK)
- STEP 0037 - *Internal cycling of nitrogen in deciduous and evergreen forest trees*
(P. Millard, MacAulay Land Use Res. Institute, Aberdeen - UK)
- STEP 0038 - *Experimental manipulations of forest ecosystems in Europe (EXMAN)*
(L. Rasmussen, Technical University of Denmark, Lyngby - DK)
- STEP 0039 - *Nutrient cycling in degenerate natural forests in Europe in relation to their rehabilitation*
(H.G. Miller, University of Aberdeen, UK)
- STEP 0040 - *The effect of habitat fragmentation on the loss of genetic diversity*
(A.A. Dhondt, Univ. Instelling Antwerpen, Wilrijk - B)
- STEP 0041 - *Interception losses and transpiration rates in Eucalyptus globulus and Pinus pinaster stands in Central Portugal*
(J. Soares David, Inst. Super. de Agronomia, Lisboa - P)
- STEP 0042 - *Dynamics of biochemical and physiological signatures and leaching in a spruce stand in clean and ambient air under natural sites conditions - BIOPHYL-ECOTREE*
(F. Horsch, Kernforschungszentrum Karlsruhe - FRG)

- STEP 0044 - *Influence of ammonia and ozone on stress sensitivity of forest trees (ECOTREE)*
(J.N.B. Bell, Imperial College of Scientific Technology & Medicine, Ascot - UK)
- STEP 0046 - *Fluctuation of biodiversity patterns following reafforestation with indigenous versus exotic tree species*
(L. Deharveng, Université Paul Sabatier, Toulouse - F)
- STEP 0048 - *Weathering process and rates in relation to acidification and vulnerability of forest ecosystems in Northern Europe*
(O.K. Borggaard, Royal Veterinary and Agricultural University, Frederiksberg - DK)
- STEP 0049 - *Biological criteria for sustainable development in natural degenerate forests of Mediterranean Europe*
(F. Romane, C.N.R.S.-C.E.P.E., Montpellier - F)
- STEP 0050 - *Water stress, xylem dysfunctions and dieback mechanisms in European oak trees (ECOTREE)*
(E. Dreyer, INRA - Centre de Recherches de Nany, Seichamps - F)
- STEP 0052 - *A multinational multidisciplinary cooperative project on alpine forest and mixed grass-woodlands ecosystems*
(M. Dubost, Centre International pour l'Environnement Alpin, Chambéry - F)
- STEP 0055 - *Assessment of the direct and indirect effects of air pollutants on the growth, quality and metabolism of agricultural crops (open-top chambers project)*
(University of Nottingham, Loughborough - UK)
- STEP 0056 - *Nitrogen Saturation Experiments (NITREX)*
(N. van Breemen, Agricultural University Wageningen - NL)
- STEP 0059 - *Role of ectomycorrhiza in stress tolerance on forest trees (ECOTREE)*
(D.L. Godbold, Universität Göttingen - FRG)
- STEP 0075 - *Biogeochemical cycling in Agroforestry systems*
(D. Atkinson, University of Aberdeen - UK)
- STEP 0087 - *Forest fire prevention through prescribed burning*
(J.A. Vega Hidalgo, Centro de Investigaciones Forestales de Lourizan, Pontevedra - E)
- STEP 0113 - *European Network of Catchments Organised for Research on Ecosystems (ENCORE)*

(M. Hornung, Natural Environm. Res. Council, Grange-over-Sands - UK)

STEP 0117 - *Interactions between air pollutants, climatic and nutritional factors on coniferous tree physiology (ECOTREE)*

(D. Dizengremel, University de Nancy, Vandoeuvre - F)

STEP 0118 - *Mechanisms of nutrient turnover in the soil compartment of forests*

(P. Ineson, Institute of Terrestrial Ecology, Grange-over-Sands - UK)

1.2 Collaboration with the European Science Foundation Science Programme "Forest Ecosystem Research Network (FERN)"

The European Science Foundation Scientific Programme "Forest Ecosystem Research Network (FERN)" will be completed by the end of this year after six years of activity. It was launched in January 1986 by the European Science Foundation. Prof. Ph. Bourdeau, Director for Environmental and Non-Nuclear Energy Research at the Commission of the European Communities was the Chairman of a Steering Committee of recognized, directly involved experts.

The major aim of FERN was to address the basic scientific problems associated with the stability and destabilisation of forest ecosystems with special emphasis on Europe. The FERN project was planned to co-ordinate national research activities and to establish a network of European research groups active in this field.

In its first phase the FERN project consisted of gathering and critical analysis of the relevant information available, but dispersed in various forms and places. A Directory registering more than 300 European research teams, including some Central and Eastern European countries, was computerized and regularly updated. A world database with universities, institutes, administrations and companies involved in forest ecology research has been set up in collaboration with the Commission of the European Communities. A modest newsletter was also started as a means of spreading information throughout the scientific community.

As anticipated in the original proposal, the main thrust of FERN was to link European research groups by arranging workshops on particular topics, discussion meetings and by improving the exchange of information. Since 1986, there have been 18 topical workshops and one symposium organized jointly with CEC. For most meetings, proceedings have been published.

As to the effectiveness of FERN in being multidisciplinary, there has been a broad involvement of scientists coming from disciplines ranging from plant physiology, history, geography, biology, soil science, forestry, computer science, etc. This was largely favoured by the structure of the FERN project which enabled forest science to be tackled from a very wide angle. In addition to the primary emphasis of FERN activities on the strengthening of the scientific understanding of forest ecosystems in Europe, gaps in the research coverage of the subject were to be identified. Areas of research such as the use of ^{15}N methods in nutrient cycling experiments, the use of prescribed fire technique in Mediterranean ecosystems, the process of denitrification, the process of decomposition of organic matter in forest soils, the ecological history approach in ecosystem studies, etc. have been identified as areas of which little is known and strong recommendations for the support of further research on these matters in future research programmes have been made.

The structure of the FERN project allowed for considerable flexibility in operational modes which changed over time as work in the FERN framework progressed. Since 1987, substantial progress was made in designing specific research projects and in bringing the interested research groups together to achieve practical objectives. Two research projects have been launched: one on *organic matter decomposition along a climatic transect in Europe*; the other on *pine stand modelling*. This was an important venture in that it helped create a structure whereby scientists from many specialized laboratories are brought together to assist in the development of specific research on forest ecosystems, to agree on common protocols, to exchange data, etc.

In total, about 400 scientists have participated in the workshops, training courses and research projects involving a significant number of scientists from Eastern Europe. In conclusion of the former co-operation between EC and ESF, the success of the joint undertakings and the valuable scientific expertise gathered and made operational within FERN, a new EC Concerted Action on Terrestrial Ecosystems has been proposed as a way of continuing and expanding former FERN activities.

1.3 Concerted Action "Effects of Air Pollution on Terrestrial and Aquatic Ecosystems" - COST 612

This Concerted Action was launched as a Cost project in 1984 (COST 612). 15 workshops and 1 symposium were organized within the framework of the 3 Working Parties (WPs) of this Concerted Action (WP 1: Effects on terrestrial ecosystems, in particular forests; WP 2: Effects on aquatic ecosystems; WP 3: Effects on agricultural productivity - see Environmental Research Newsletter N° 6).

It is now widely recognized that air pollution interacts with other environmental factors. In particular, it can act in synergy, as a triggering or aggravating factor when temperatures or water supply deviate outside their normal ranges. Deposition of N and S compounds can also perturb biological and physico-chemical processes, with particularly harmful consequences on nutrition of biocoenoses established on poor, desaturated soils.

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.

2. Aquatic, Coastal, River Margin and Wetland Ecosystems

2.1 The European River-Ocean System (EROS) Project

Estuarine and coastal zones are certainly the sites of major discharges of urban and industrial pollutants, many of which have well established effects (e.g. eutrophication, anoxia) while others (e.g. organic pollutants) have still poorly known impacts. An understanding of the physical, chemical and biological processes occurring in these areas is therefore of major importance for the evaluation of the exchange of material between the continent and the ocean and is a critical requirement for the establishment of global budgets of organic and inorganic natural and man-made substances.

A better knowledge of the impacts of these biogeochemical processes is also essential for the interpretation of possible consequences of anthropogenic modifications of discharges and for the evaluation of the capacity of receiving waters to accept wastes without detrimental effects.

For this purpose, the project is addressed to:

- specify the sources and pathways of natural and anthropogenic nutrients and other organic and inorganic compounds in the European coastal environment;
- investigate the mechanisms and rates of processes controlling both the land-sea-air exchanges and internal cycling and fluxes of these compounds in coastal waters, and
- develop process-specific (e.g. eutrophication) and regional biogeochemical models to predict the long term consequences of man-induced changes.

In 1988 the Commission of the European Communities launched the multi-disciplinary long-term research project **EROS 2000** (European River Ocean System, see also Environmental Research Newsletter N° 6). The first project phase, implemented in the northwestern Mediterranean Sea (Bay of Lions) has been completed in 1990. The wealth of scientific results, gained by 27 laboratories from 12 European countries collaborating in the EROS project, have been presented at a workshop at the Centro de Estudios Avanzados de Blanes, Spain in February 1990. The independently reviewed scientific articles presented in Blanes, based on three major seagoing research cruises in the NW-Mediterranean and four research cruises in the Rhone estuary and delta outflow, as well as five atmospheric coastal sampling stations located around the NW-Mediterranean, have been included in a proceedings report of nearly 700 pages, published as Water Pollution Research Report N° 20 (see also "Publications", p. 22)

2.2 Concerted Action "Coastal Benthic Ecosystems" - COST 647

This Concerted Action dates from 1979 when it was recognized that benthic ecological studies tended to be short-term, uncoordinated and incomparable from one site to the next. The general inability to set data in a geographical context and an inadequate awareness of the extents and timescales of natural variation precluded any attempts to ascertain

whether or not changes ascribed to local conditions were, in reality, part of a broadscale natural pattern. The new approaches which emerged as the specific objectives of COST 647 were aimed at replacing the old "baseline" concept with a broader range of knowledge encompassing (a) an understanding of community dynamics (using the ideas of key species and functional groups) in selected habitats, (b) an appreciation of the causes of biological change, and (c) investigation of spatial and temporal scales of natural variability in pristine environments. Knowledge of this natural "background noise" is essential if the effects of human activities on coastal ecosystems are to be evaluated.

The second phase of the project ended in 1991. The project was implemented by four working groups investigating (a) subtidal sediment, (b) intertidal sediment, (c) rocky habitats, and (d) Mediterranean Posidonia communities. The latter groups are partially funded by the STEP Programme. Ten workshops and two symposia were held within the frame-

work of the project. The printing of the proceedings of the most recent symposium "Space and time series data analysis in coastal benthic ecology" and the Activity Report for the period 1988 - 1991 is in progress. It is planned to hold a meeting of the Concertation Committee in April 1992 to evaluate these reports and to recommend future actions.

Within the project, it is recognized that changes are due. Long-term data-sets need to be extended and a larger geographical coverage, to integrate the observations on a regional scale, is desirable. Technological developments have improved the effectiveness of the survey methods and improved models have shown that consolidation of the biological data with related physico-chemical parameters is needed. An important aspect that needs to be addressed is the coupling of ecosystems. Benthic habitats cannot be studied in isolation. We need more information on their interactions with the pelagic, and with terrestrial and fluvial ecosystems.

The New R&D Programme in the Field of Environment (1991-1994)

The new programme will be implemented by means of shared-cost contracts and concerted actions.

1. Shared-cost contracts

Call for proposals for the specific programme for research and technological development in the field of environment (1991-1994) (OJ 91/C 184/04 of 16. 7. 91)

In conformity with the **Council Decisions 90/221/Euratom, EEC (OJ N° L 117, 8. 5. 1990)** and **91/354/EEC (OJ N° L 192, 16. 7. 1991)** on the specific programme in the field of environment, the Commission of the EC is inviting proposals for research and technological development projects.

A work programme has been drawn up setting out the detailed objectives and types of projects to be undertaken, and the financial arrangements to be made for them. The research areas and topics will be addressed, in general, by shared-cost research and technological development projects. The Community's contribution will normally not exceed 50 % of the total costs (see also Environmental Research Newsletter N° 6).

Regarding new objectives of ecosystem research, the work programme 1991-1994 proposes:

Area I - Participation in global change programmes **Topic 6: Biogeochemical Cycles and Ecosystem Dynamics**

The goals are to increase the understanding about sources, pathways and chemical/biological transformations of natural and anthropogenic compounds including the processes controlling the cycling and exchanges of these substances in terrestrial, aquatic, wetland, estuarine and coastal ecosystems in order to

- develop a comprehensive scientific basis for pollution control and habitat protection policies for terrestrial, aquatic, wetland, estuarine and coastal ecosystems;
- define indicators of environmental change and damage at different ecosystem levels, suitable for the analysis and prediction of the effects of natural and anthropogenic perturbations;
- develop or modify existing process-based models to predict the response of ecosystems to such perturbations.

The results should ultimately allow to recommend normative measures and appropriate management and protection practices enabling soil fertility, water regime, environmental quality, and biological diversity to be preserved or restored.

Research will emphasize investigations at the ecosystem or catchment scale, and will address in particular processes and pathways at transition zones between different ecosystem types (e.g. terrestrial/aquatic, land/ocean interfaces, etc.).

Research actions should be implemented by means of research networks and case studies.

These actions are intended to provide a major contribution to the achievements of the objectives of the IGBP, in particular the core project GCTE.

Area IV - Technological and natural risks **Topic 2.2: Regional aspects of ecosystems protection**

The fundamental research on ecosystem dynamics focusing on problems related to global change is addressed in area I; many aspects of ecosystems protection and landscape ecology, however, are limited to a European dimension but require a specific research effort. The fundamental research described in area I needs to be complemented by regional multidisciplinary research projects.

In many regions the evolution of agricultural, forestry and pastoral practices have progressively modified the ecosystem patterns and the functioning in a peculiar way. Air pollution and acid deposition patterns, combined with other local or regional ecological factors, such as mineral deficiencies, limiting meteorological conditions or unadapted ecosystems management practices have led to particular situations which have to be addressed through well-defined research projects. Research has to be geared also to aspects of nature protection, sustainable development in the context of EC regulations and landscape ecology.

Specific homogeneous ecosystems will have to be seen in the context of landscape, region or larger non homogeneous ecological systems like for instance mountainous areas (alpine region), large abandoned agricultural areas. Mediterranean rural systems, river basins or biogeographical zones. These systems combine several, sometimes very different ecosystem types, offering in most cases a very contrasted mosaic. Results from research on fundamental ecological aspects addressing the various components of the mosaic have to be interpreted and integrated at the level of coherent socio-economical or larger ecological units.

The objectives of the regional projects will be

- to develop an approach to "landscape ecology" by characterizing regional ecological patterns (mainly spatial and temporal biodiversity patterns) and quantifying regional ecological processes, taking into account the mosaic of specific ecosystems in the regions;
- to identify for each region a set of criteria which should be considered as standards to be respected in regional socio-economical development processes (identification of environmental conditions for sustainable development), insuring long-term conservation of soils, hydrological regime and biological diversity;
- to identify regional structures which suffered from deterioration due to human activities, to assess the ecological consequences and to explore the potential for remediation; an example is the eutrophication of the northern Adriatic basin with its consequences ("algal blooms").

Dates of submission of the proposals to the Commission of the EC:

- **Topic I.6:** 31 January 1992;
- **Topic IV.2.2:** 31 March 1992.

2. Concerted Action

In the past Concerted Actions have often been an appropriate forum for the identification of research priorities and the development of projects subsequently funded by national agencies or within the EC R&D Programmes. Examples of these actions developed in COST 612 are the European Network of Open-Top Chambers, the projects **ECOTREE** (European Collaborative projects on tree physiology) and **ENCORE** (European Network of Catchments Organized for Research on Ecosys-

tems). Further to the development of research projects, the Concerted Action also provides an appropriate framework for the coordination and the scientific management of those projects, as well as initiating interdisciplinary collaboration.

This specific function of the Concerted Action complements the traditional exchange among scientists of information through workshops and the coordination of national research activities. It becomes all the more important as the research on ecosystems in Europe is progressively being given an increasing importance, notably in relation to Global Change research.

2.1. Objectives of the Concerted Action in the field of Ecosystem Research

- Reviewing the available knowledge of the effects of environmental changes on terrestrial and aquatic ecosystems and the biological and

non biological components of these systems. Identifying major gaps in knowledge and suggesting ways to fill these gaps.

- Exchanging information between the participants, coordinating and orientating the overall research effort in Europe in order to (1) respond to European Community policy needs in the field of ecosystems protection, management and rehabilitation and (2) contribute at the European level to the achievement of the objectives of international research programmes on global change, in particular **GCTE-IGBP**.
- Coordinating and managing the EC research projects on ecosystems in close cooperation with related national projects.

Further information can be obtained

- for Terrestrial Ecosystems from: P. Mathy, Tel. +32 2 2358160
- for Aquatic Ecosystems from: H. Barth, Tel. +32 2 235652
- for FERN activities from: A. Teller, c/o CEC, Tel. +32 2 2358446, Fax +32 2 2363024
DG XII/E-1, CEC, 200 rue de la Loi, B-1049 Brussels.

Other Activities Relevant to EC Environmental Programmes

EC R&D Programme MAST (1989-1992) - DG XII/E

On 20 June 1989, the Council of Ministers of the European Community adopted the pilot R&D Programme in Marine Science and Technology (**MAST**) 1989-1992, with a total budget of 50 MECU (*OJ N° 200/13. 7. 1989*).

The main objectives of the programme are to contribute to establishing a scientific and technological basis for the exploration, exploitation, management and protection of the marine environment, and furthermore to introduce the necessary Community dimension to various on-going research activities.

The programme comprises 4 areas (details were given in Environmental Research Newsletter N° 7) :

- Marine science, directed at the study of the structure, stability and dynamics of the marine environment, with special emphasis on the seas surrounding the Member States of the Community.
- Coastal zone science and engineering, concerned with coastal problems and processes and with the development of better design for coastal engineering.
- Marine technology, focused mainly on the development of new instrumentation and enabling technologies necessary for the advancement of science.
- Supporting initiatives, aimed at improving coordination, avoiding duplication of work, achieving more cost effective use of facilities, improving specialized training and contributing to pre-standardisation.

Of the 200 proposals received in areas I, II and III, 46 were selected for funding (area IV was not open to the call for proposals).

Titles are given below for projects in marine and coastal zone science, i.e. all projects in area I and most projects in area II. Two of the contracts (e.g. MAST 0008 and 0009) straddle the boundary between areas I and III. Contracts 0026 and 0027, listed under the topic Sediments, could clearly too be listed under Ecology/Biology.

Titles of selected projects (and their coordinators):

1) Physical oceanography and modelling (Mediterranean, Atlantic, North Sea)

- MAST 0008 - Enhanced acoustic tomography and its application to circulation and deep convection in the western Mediterranean (F. Schott, Universität Kiel, Kiel - D)
- MAST 0009 - Barotropic and baroclinic flow measuring station deep sea electrometer and VCTD-YOYO (BABAS) (P. Tarits, Institut de Physique du Globe de Paris, Paris - F)
- MAST 0031 - European coastal transition zone - Islas Canarias (E.D. Barton, University of Wales, Menai Bridge - GB)

- MAST 0033 - Mixing processes at the sea surface (M. McDonagh, Warren Spring Lab., Hertfordshire - GB)
- MAST 0039 - Mediterranean eddy resolving modelling and interdisciplinary studies (MERMAIDS) (N. Pinardi, IMGA-CNR, Modena - I)
- MAST 0041 - Upper ocean structure and circulation and its response to atmospheric forcing (S. Marullo, Telespazio Spa, Roma - I)
- MAST 0042 - An operational wave model for the Mediterranean for hindcast and forecast applications. Organisation of a data base for regional modelling (L. Cavaleri, CNR, Venezia - I)
- MAST 0043 - Hydrodynamic modelling of the western Mediterranean (EUROMODEL) (P.M. Lehuicher, CETIIS, Aix en Provence - F)
- MAST 0050 - Integrated modelling and measurement of physically controlled fluxes and plankton dynamics in coastal seas (J. Huthnance, NERC-POL, Birkenhead - GB)
- MAST 0051 - Determination of the dispersal of Rhine water in the North Sea and N. E. Atlantic by measurement of fluorescent xenobiotic substances (J.M. Suijlen, Rijkswaterstaat, 's-Gravenhage - NL)
- MAST 0052 - Studies on the transport of coastal water from the English Channel to the Baltic Sea using radioactive tracers (H. Dahlgaard, RISØ National Laboratory, Roskilde - DK)
- MAST 0053 - Hydrodynamics and biogeochemical fluxes in the eastern Channel-exports into the N. Sea (FLUXMANCHE) (L. Cabioch, CNRS, Roscoff - F)
- MAST 0063 - European river ocean system (EROS 2000): regional modelling of the biogeochemical cycles in the western Mediterranean (J.M. Martin, Ecole Normale Supérieure, Montrouge - F)

2) Ecology/Biology

- MAST 0017 - The control of phytoplankton dominance (J. W. Patching, Univ. College, Galway, Galway - IE)
- MAST 0020 - Structure and function of coastal ecosystems (SAFE) (B. Riemann, Water Quality Institute, Hørsholm - DK)
- MAST 0021 - A generic European regional seas ecosystem model (ERSEM) (J. Baretta, Ned. Inst. Ond. Zee, Den Burg - NL)
- MAST 0024 - Major biological processes in tidal estuaries (C. Heip, Delta Institute, Yerseke - NL)

MAST 0037 - Natural variability and the prediction of change in marine benthic ecosystems
(A. Rice, IOS, Deacon Lab., Surrey - UK)

3) Biogeochemistry

MAST 0015 - Geochemical investigations of hydrothermal processes in relation to the formation of marine mineral deposits in a convergent plate environment
(S. Varnavas, University of Patras, Patras - GR)

MAST 0016 - European river ocean system (EROS 2000) - Particles and sediment-water interactions
(J.-M. Martin, Ecole Normale Supérieure, Montrouge - F)

MAST 0018 - Transfer pathways of iron and related elements in the northern Adriatic Sea
(N. Price, University of Edinburgh, Edinburgh - GB)

MAST 0019 - Biogeochemical carbon cycling in coastal zones
(M. Frankignoulle, Université de Liège, Liège - B)

MAST 0022 - Biogeochemical fluxes in the ocean-sediment system
(T. Wilson, IOS, Deacon Lab., Surrey - GB)

MAST 0044 - Sulphide and methane based ecosystems
(P. Dando, Marine Biol. Assoc., Plymouth - GB)

4) Sediments (coastal and shelf)

MAST 0025 - Relationship between sea floor currents and sediment mobility in the southern North Sea
(G. De Moor, Rijksuniversiteit Gent, Gent - B)

MAST 0026 - Wadden sea project (WASP)
(W. Rosenthal, GKSS, Geesthacht - D)

MAST 0027 - Microbially mediated processes in tide-influenced deposits and their importance in stabilisation and diagenesis of sediments
(W. Krumbien, Universität Oldenburg, Oldenburg - D)

MAST 0034 - Three-dimensional numerical modelling of cohesive sediment transport processes in estuarine environments
(W. Zielke, Universität Hannover, Hannover - D)

MAST 0035 - G6 - Coastal morphodynamics
(H.J. de Vriend, Delft Hydraulics, Emmeloord - NL)

MAST 0036 - Circulation and sediment transport on sand-banks on the European shelf
(B. O'Connor, University of Liverpool, Liverpool - GB)

Exact descriptions and other details about these projects are given in EUR-Report N° 13437: "Marine science and technology (MAST)", edited by W. Weydert and J. Boissonnas.

Further information can be obtained from:

J. Boissonnas, DG XII/E, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 235 6787, Fax +32 2 236 4024.

Protection of the Community's Forests against Atmospheric Pollution

Community measures for the protection of forests against atmospheric pollution are managed by the CEC-DG VI (see also Environmental Research Newsletter N° 6).

Council Regulation (EEC) N° 3528/86 on the protection of the Community's forests against atmospheric pollution (OJ N° L 326, 21. 11. 1989), entered into force on 1st January 1987, was amended by Council Regulation (EEC) N° 1613/86 (OJ N° L 165, 29. 5. 1989).

A budget of 17 MECU for 5 years was allocated. The Community's financial contribution is 50 % (maximum) of the expenditure approved by the Commission. Projects must be submitted by the Member States to the Commission before 1st November each year. Information concerning the application for aid from the Community is reported in OJ N° L 53, 21. 2. 1987.

In November 1991, the Commission has proposed to the Council a prorogation of the Regulation for another five years.

Main actions

- Yearly forest damage survey throughout the Community

Inventory data are collected and transmitted by the Member States before being processed by the Commission. The detailed rules concerning the common methods are laid down by the *Commission Regulation (EEC) N° 1696/87 of 10 June 1987 (OJ N° L 161, 22. 6. 1987)*, and amended by *Commission Regulation (EEC) N° 2995/89 of 4 October 1989 (OJ N° L 287, 5. 10. 1989)*.

- Field experiments, pilot and demonstration projects

Field experiments, pilot and demonstration projects are set up to understand more clearly the effects of atmospheric pollution on forests, to improve methods of monitoring and measuring forest damage and to devise ways of restoring areas damaged by atmospheric pollution. Pilot projects aim at maintaining damage forests.

- Information

A programme for the synoptic processing of information on knowledge of atmospheric pollution in forests and its effects was decided by the Council (*Council Regulation (EEC) N° 1613/89 (OJ N° L 165, 29. 5. 1989)*).

Reports on forest health are periodically established by the Member States.

Progress

The **EC Forest Health Survey** was carried out for the 5th time in 1991. It covers the entire forest area of the Community, 45,000 trees are monitored every year on nearly 2,000 sample plots.

Reports were published by the Commission in November 1989, in December 1990 and in December 1991.

During the first 5 years, Community financial aid was granted to 159 projects.

Further information can be obtained from:

F. Kremer, DG VI/F-II.2, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 2356780.

BCR-Programme for Environmental Measurement

The BCR-programme gives support to laboratories who wish to improve or verify the quality of their data. In environmental analysis often errors occur owing to the complexity of instrumentation and the low contents of relevant species to be measured. Therefore the BCR-programme pays attention to environmental analysis.

In order to obtain a good quality of measurement laboratories may use certified reference materials or they may participate in analytical inter-comparisons, in BCR-organized workshops, etc.

This contribution intends to report briefly on recently certified reference materials and to present some other relevant activities.

Recent certifications:

Chlorinated pesticide contents were certified in pork fat (CRM 340) in order to

- 1) ensure accuracy of measurements made to control maximum residue limits in materials with a high fat content;

- 2) identify pollution sources (e.g. animal feed ingredients) and
- 3) establish trends in environmental contamination.

The contents (ng/g) of the following compounds were certified HCB (392), α -HCH (140), β -HCH (259), γ -HCH (500), β -Hepo (109), dieldrin (124), endrin (20), p,p'-DDT (3400) and p,p'-DDE (820).

The contents of some chlorinated biphenyl congeners in waste mineral oil were certified (CRM 420) to reliably detect illegal disposal of pcb's via waste oils: the presence of pcb in waste oil could lead to formation of chlorinated dioxins and related toxic compounds, in case such oil is combusted. The certified contents of congeners with IUPAC-numbers 28, 101, 118, 153 and 180 are respectively: 0.61, 1.45, 1.69, 0.92 and 0.195 mg/kg.

Major element contents were certified in two samples of fresh water (CRMs 398 and 399) in order to assist laboratories in obtaining accurate results of their analyses carried out as a consequence of Community legislation. The table below presents the certified values:

Sea water is low in trace element content and therefore the problems in analysis are considerable (contamination, losses, blanks...). However, to assess the effect of measures taken to prevent pollution, frequently analyses are made. After careful studies on the stabilisation of sea water samples, their collection at a large scale (4000 l) and bottling without contamination as well as on the analytical methodology, CRM 403 was certified for its contents of Cd, Cu, Mo, Ni, Pb and Zn, which are resp. 0.175, 3.90, 103, 4.36, 0.117 and 25.7 nmol/kg.

In CRM 402 "White Clover" grown on a Se-rich soil the contents of As, Co, Mo and Se were certified to be resp. 0.093, 0.178, 6.93 and 6.70 mg/g.

It is expected that soon a plankton material can be certified (As, Cd, Cr, Cu, Mg, Mn, Ni, Pb, Se, V and Zn) as well as a cod muscle (As, Cd, Cu, Fe, Mg, I, Mn, Pb, Se and Zn).

Purchase orders, catalogues and requests for information can be addressed to:

Community Bureau of Reference, Commission of the European Communities, Rue de la Loi 200, B - 1049 Brussels.

Other BCR-activities

The countries around the North Sea, cooperating under the Paris and Oslo Conventions to prevent pollution, have decided to monitor the contents of key pollutants such as halogenated compounds, trace heavy metals and nutrients over a longer period of time. This is considered to be necessary for the assessment of trends and of effects of legal measures against pollution. A data base containing results of over 60 laboratories obtained over 5 years or more, will be created.

Element	Certified in CRM 398	Certified in CRM 399
Al	36.3 ng/g	207
Ca	30.0 μ g/g	79.2
Cl	10.3 μ g/g	50.5
Fe	29.3 μ g/g	202
Mg	5.03 μ g/g	15.1
Mn	29.8 μ g/g	199
K	1.03 μ g/g	2.99
Na	5.07 μ g/g	30.4
S	3.39 μ g/g	—
P	— μ g/g	1.01

If results in the data base are not accurate, it will not be possible to achieve the goals set for the entire action. Therefore a rigid quality control scheme operating in all participating laboratories is contemplated. It would comprise: learning exercises, workshops for the dissemination of information and expertise, proficiency testing of the participating laboratories and provision of (certified) reference materials. Work on sampling techniques is also envisaged.

The participation will not be restricted to laboratories from countries around the North Sea, but it will be open as well for laboratories from ES, GR, I and P who are involved in marine monitoring.

A workshop has been held in Noordwijk (NL) in May 1990 in which the goals and means for such an action on the QC of a monitoring programme have been discussed and met fair appreciation.

Besides this possible project, topics such as speciation of trace metals, characterization of waste and microbial contamination, e.g. of bathing waters, are intensively being dealt with.

Further information can be obtained from:

B. Griepink, DG XII/C-6, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 235 8812.

Climatology and Natural Hazards

I. Climatology and Natural Hazards R&D Programme 1986-1990

Information on the ongoing shared-cost contracts in the fields of "Physical Basis of Climate", "Climate Sensitivity", "Climatic Impacts" and "Seismic Risk Evaluation" was given in Environmental Research Newsletter N° 4, December 1989. Some projects are already concluded, but final results for the majority of projects are not expected until the end of 1991.

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

Detailed information on the research areas covered by EPOCH was given in Environmental Research Newsletter N° 6, December 1990.

Contracts were signed between the Commission of the EC and a number of European research institutions for undertaking research under the 4 areas of the programme EPOCH:

- Research Area I: Past Climates and Climate Change
- Research Area II: Climate Processes and Models
- Research Area III: Climatic Impacts and Climate-related Hazards

Research Area IV: Seismic Hazard

The list of contracts signed per area is as follows:

AREA I

- EPOCH 0001 - Data Analysis to Detect Trends in Stratospheric Temperature
- EPOCH 0004 - Global Changes over the Last 30 Thousand Years
- EPOCH 0033 - The Greenland Icecore Project (GRIP)

AREA II

- EPOCH 0002 - EUCREX - European Cloud and Radiation Experiment
- EPOCH 0003 - Climate of the 21st Century
- EPOCH 0012 - Fundamental Studies on the Predictability of the Atmosphere and Climate
- EPOCH 0016 - SLAPS - Spatial Variability of Land Surface Processes
- EPOCH 0017 - The Global Carbon Cycle and its Perturbation by Man and Climate
- EPOCH 0024 - HAPEX-SAHEL
- EPOCH 0030 - ECHIVAL Field Experiment in Desertification Threatened Area (EFEDA)

EPOC 0035 - Global Balance of Spitsbergen Ice Mass and Prediction of its Change due to Climatic Change

EV4C 0113 - Arctic Ice Thickness Monitoring Project

AREA III

EPOC 0013 - An Investigation into the Impact of Elevated CO₂ upon the Response of European Forests

EPOC 0014 - MEDALUS - Mediterranean Desertification and Land Use Impacts: Modelling and Evaluation

EPOC 0015 - Climate Change, Sea Level Rise and Associated Impacts in Europe

EPOC 0020 - Forecasting Forest Fire Spread in Mediterranean Ecosystems for Prevention, Planning and Fire Management

EPOC 0022 - An Investigation of the Effects of Increasing Concentrations of Atmosphere CO₂ and Changing Climate on Natural and Managed Grassland Communities in Europe Using Open-Top and Closed Chambers

EPOC 0023 - AFORISM - A Comprehensive Forecasting System for Flood Risk Mitigation and Control

EPOC 0025 - The Temporal Occurrence and Forecasting of Landsliding in the European Community

EPOC 0026 - Weather Radar and Storm and Flood Hazard

EPOC 0027 - Ricerca Integrata sulla Degradazione dei Versanti in Territori Montani

EPOC 0028 - Drought Effects on Vegetation and Soil Degradation in Mediterranean Countries

EPOC 0029 - Rainfall Induced Landslides in Selected Mediterranean Mountainous Zones of Italy, Spain and Greece: the Application of Geographic Information Systems to Hazard Mapping

EPOC 0031 - The Effect of Climatic Changes on Agricultural and Horticultural Potential in the EC

EPOC 0032 - Slope Stability at Mount Etna, Sicily

EPOC 0034 - Physical Processes in the Mediterranean Overconsolidated Clayey Soils

EPOC 0038 - FUTURALP Proposed by ICALPE. A Multinational Multi-Disciplinary Cooperative Project on the Potential Impacts of Climate Change on Alpine Ecosystems

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

EV4C 0112 - A Threatened Mediterranean Landscape: Western Crete

AREA IV

EPOC 0037 - Application of Earthquake Strong Motion Databank to Seismic Risk Analysis and Engineering Design

EPOC 0039 - Seismic Behaviour and Vulnerability of Buried Lifelines

EPOC 0042 - High-Quality Earthquake Strong Motion Measurements for Structural and Seismic Source Studies

Contract negotiations will be completed for:

AREA III - Proposals

PL890068 - Flood Hazard Assessment
107

AREA IV - Proposals

PL 890091 - Earthquake Prediction Studies in Central Italy and Greece
116 - Rapid Transfrontier Seismic Data Exchange Network
152 - Stress and Strain Rate Measurements in the Eastern Alps
187 - Theoretical Research in Earthquake Prediction and Identification of Zones of Seismic Potential

Merged proposals:

PL890008 - Analysis and Mitigation of Earthquake Triggered Landslide Hazard
179 - Affecting Dams, Routes and Lifelines
PL890119 - Seismic Electrical Signals
147
190

EPOCH has a follow-up in the following areas and topics of the Environment Programme:

AREA I: Participation in Global Change Programmes

A. CLIMATE CHANGE AND CLIMATE IMPACTS

- I.1 Natural Climate Change
- I.2 Anthropogenic Climate Change
- I.3 Climate Change Impacts

AREA IV: Technological and Natural Risks

- IV.1 Natural Risks
 - IV.1.1 Seismic Hazard
 - IV.1.2 Volcanic Risk
 - IV.1.3 Wildfires
- IV.3 Desertification in the Mediterranean Area.

Further information can be obtained from:

R. Fantechi, DG XII/E-2, CEC, 200 rue de la Loi, B-1049 Brussels, Tel. +32 2 235 57.35/235.16.86

Energy & Environment

A CO₂ study for the European Community: the "Crash"-Programme of the Commission (Directorate General XII)

The European Community's strategy aims at stabilising CO₂ emissions by the year 2000 at their 1990 level. To achieve this goal the EC Commission proposes a package of three sets of measures:

- the first consists of *regulatory and voluntary steps* mainly aimed at improving energy efficiency at zero or low costs: intensification of R&D programmes and sectoral measures in the power generation, industry, transport and household/tertiary sectors;
- the second comprises *fiscal initiatives*, in particular an energy/CO₂ tax. The energy component of this tax should not exceed 50 %; the tax would be gradually introduced from 1993, to reach \$ 10 per barrel of oil equivalent in 2000; a key characteristic of the new tax is its revenue neutrality in order not to increase the overall tax burden within the Community;

- the third set of measures consist of *complementary national programmes* which, in line with the concept of subsidiarity, would be carried out by the Member States.

The elaboration of such a strategy, which the Commission has recently presented to the European Council of Ministers, has required an in-depth analysis not only to establish the feasibility of the CO₂ stabilisation objective but also to determine precisely the best technological options and the best economic instruments to achieve stabilisation.

The modelling activity of DG XII **Joule-Programme** has proceeded with such a CO₂ study, usually called "Crash"-Programme. The research project focused on three issues:

- a cost effectiveness analysis of the technological options which would allow the stabilisation and reduction of CO₂ emissions at the least cost for the whole energy system; this analysis relies on a bottom-up approach;

- the evaluation of the macroeconomic impacts of energy taxation, combined with the revenues neutrality achievement;
- the evaluation of different taxation models impacts on the level of energy demand and CO₂ emissions. These last two analyses are based on a top-down approach.

The first part of the CO₂ study - "Crash"-Programme is relative to cost effectiveness analysis of the CO₂ reduction options. The methodology applied identifies the least-cost choice of options among fuel switching, energy conservation renewables and efficient supply technologies, that allow CO₂ reduction constraints to be met. Its main contribution is that it produces consistent and quantified results which could constitute a starting point for discussion about potential solutions to global warming.

The models used for such a "bottom-up" analysis is the EC-**EFOM-ENVIRONMENT** model, which is a linear programming model, representing both energy supply and demand sides. It has been applied to all the European countries.

The type of analysis helps to understand and quantify the main issues of the energy systems in the European Community in connection with global CO₂ strategies. As far as the technologies are concerned, it appears that energy conservation and fuel substitution to the gas are the key options for curbing CO₂ emissions. They are cost-effective and both essential to stabilize energy related carbon dioxide emissions by the year 2000 and to reach significant reduction levels beyond this date.

Because of its large potential, efficiency improvements of energy use is the best strategy for moderating the rate of growth of CO₂ emissions. Moreover the model results indicate that the investment costs entailed by the implementation of energy saving measures are more than counter-balanced by the reduction in costs in the energy supply sectors. Furthermore, using energy more efficiently is an attractive strategy for the economy as a whole, regardless of concern about the greenhouse effect. It cannot only save money but also reduce the stress on oil markets and the environment in general (e.g. SO₂ and NO_x emissions).

Notwithstanding the importance of energy efficiency in carbon dioxide emission stabilization or reduction in CO₂ emissions would require other technological options. More precisely, while efficiency improvements in conversion and end-uses, switch to natural gas and to a lesser extent cost-effective renewable technologies might hold emissions about constant at present level for a few decades, sustained reduction much below the current levels would require a larger development of renewable energy sources.

Nuclear appears also to be an option for meeting significant CO₂ reductions especially in those countries where the share of nuclear is high (e.g. Belgium, France, etc.).

Other important results about the costs (total, marginal or average costs) of the different reduction policies are also established with this approach. Such results are useful to identify more precisely the different economic instruments to take place to ensure the stabilization in the framework of the "top-down analysis" followed in the two other parts of the study.

EC Regulatory Action

Communication by the Commission on CO₂ Stabilisation and Energy Efficiency

In October 1991, the European Commission agreed on a Communication to the Council setting out a strategy to limit CO₂ emissions and improve energy efficiency in line with the decision of the joint Energy-Environment Council of October 1990 to stabilize CO₂ emissions at 1990 level by the year 2000 ("A Community Strategy to Limit Carbon Dioxide Emissions and to Improve Energy Efficiency", SEC(91) 1744 final). The Communication is currently being examined in the Council and a timely agreement on the strategy is considered to play a catalytic role for the adoption of a *Global Climate Change Convention* at the **UNCED** Summit (United Nations Conference on Environment & Development) in Rio in June 1992.

The Communication elaborates a package of EC measures to exploit the existing potential to improve energy efficiency and to encourage fuel switching to fuels emitting less or no CO₂. The package consists of a coherent set of mutually reinforcing instruments with a regulatory, specific (e.g. Research, Development & Demonstration (RD & D) information) and fiscal character. An approach based on one type of measures is con-

The second part of the "Crash"-Programme deals with energy and macroeconomic impacts of a tax increase on energy as a means to reduce CO₂ emissions. The study covers some European countries and it is extended to the description of the accompanying measures which could be implemented to increase the efficiency of the tax, in particular first emissions reduction measures, i.e. energy consumption reductions measures and secondly, general economic measures of compensates with impact on growth, competitiveness, employment, etc.

The "top-down" analysis has been made with the macrosectoral model **HERMES**, which represents the European economies at the macro-economic and sectoral levels, taking into consideration the energy as a detailed level (production factor, consumption goods, trading goods). The bilateral trade exchanges between the countries are also integrated in the model, which allows an in-depth analysis of the mutual impacts of the national economic policies.

In the first stage of the study, no accompanying measures are considered and only the effects of increased taxation are analysed. This allows to study the adaptation of behaviour of the economic agents faced with new energy prices and to evaluate revenue effects, the substitution effects and the macroeconomic consequences in terms of inflation, competitiveness, employment, budgetary surplus, etc.

Accompanying measures, i. e. the redistribution of the budget surplus, are considered in a second stage. Two possibilities are retained: subsidies which induce a more voluntary behaviour in terms of emission reduction and which can be focussed on actions introducing new energy savings; and tax deductions affected to the households (income tax of individuals) or to firms.

The third part of the study is an attempt to quantify the energy system implications of CO₂ related taxes and evaluates their efficiency in CO₂ emissions reduction for some European countries. The analysis is limited to a short/medium horizon (1990 to 2005), it concerns only the energy sector and has a single country view. The approach is introducing "bottom-up" (engineering) information within a top-down analysis. The latter concerns the response of the energy demand sectors to the CO₂ taxes, simulated by means of econometric equations. The analysis is based on the **MIDAS** energy model which is a large-scale model, covering all energy demand and supply sectors and computes the set of energy prices and the energy balances. The main effects of imposing a carbon tax, the dilemma carbon on energy tax, and the role of energy related accomodating policies, regarding investments in energy savings, advanced power generation technologies and renewables have been analysed in this part of the programme.

Further information can be obtained from:

P. Valette, DG XII/E-5, CEC, 200 rue de la Loi, B-1040 Brussels, Tel. 32 2 2356356.

sidered not to be sufficient nor cost-effective. The major part of the stabilization target will be reached with the Community package, to which national measures will have to be added.

The Commission proposes the introduction of a gradually increasing energy/CO₂ tax. In view of the stabilisation target, the Commission considered that the tax should amount in the year 2000 to the equivalent of 10 \$ per barrel of oil, half of which is based on the fuel's carbon content and the other half according to its energy content. In the Commission's view the tax should not increase the tax burden on the economy and should be accompanied by reductions of other taxes by the member states. Given this tax neutrality, the economic impact is estimated to be limited. In absence of similar measures by our main trading partners, energy intensive sectors open to world markets could be exempted in exchange for voluntary commitments to limit CO₂ emissions.

Further information (and the above cited Communication) can be obtained from:

J. Delbeke, DG XI/C-3, CEC, 200 rue de la Loi, 1040 Brussels, Tel. + 32 2 2368804.

Information

ECDIN News

Since 1990 the Deutsches Institut für Medizinische Dokumentation (**DIMDI**) has been operating the database "Environmental Chemicals Data and Information Network" (**ECDIN**). ECDIN has been produced within the framework of the environmental research programme of the Joint Research Centre Ispra of the CEC.

DIMDI has reloaded ECDIN and included it into its convenient user guidance **GRIPS-Menu** and easy-to-use menus provide access to information on more than 100,000 substances, e.g. on

- chemical and physical properties, manufacturing and use
- toxicity, carcinogenicity and mutagenicity
- poisoning and treatment, accident countermeasures
- hazardous potential, concentration and degradation in the environment
- guideline and legislation
- monitoring methods and disposal recommendations.

Furthermore, DIMDI has enhanced search and output facilities in ECDIN. New is the search for concepts in all data fields with textual information and selective output of only those data elements, containing certain search terms.

In the same DIMDI's user guidance GRIPS-Menu the Hazardous Substances Data Bank (**HSDB**) of the US National Library of Medicine and the Physician's Data Query (**PDQ**) of the US National Cancer Institute have been included.

For further information please contact:

G.Winkmann, DIMDI Weissshausstr. 27, D - 5000 Köln 41,
Tel. +49 221 4724 306, Fax +49 221 411429.

European Association for Environmental Management Education

On October 26th, 1991, 13 academic institutions from 8 different European countries have convened in Varese (Italy) to formally establish, under the Italian legislation, a European Association for Environmental Management Education. Founder members of the Association are:

- The Imperial College of Science, Technology and Medicine - London (UK)
- Université Libre de Bruxelles - Bruxelles (B)
- Politecnico di Torino - Torino (I)
- Fondation Universitaire Luxembourgeoise - Arlon (B)
- Université de Genève - Genève (CH)
- Université de Nancy I - Nancy (F)
- Universität Trier - Trier (D)
- Ecole Polytechnique Fédérale - Lausanne (CH)
- Università di Bologna - Bologna (I)
- Katholieke Universiteit Brabant - Le Tilburg (NL)
- Université de Savoie - Chambéry (F)
- University of Athens - Athens (GR)
- Università di Parma - Parma (I)

The Association represents the accomplishment of the first step of a more comprehensive project developed by the care of the Environment Institute of the Joint Research Centre of the Commission of the European Communities and finalized to the launching of a **European Master in Environmental Management**.

By the initiative of the European Parliament, funds have been allocated by the Commission to implement the project which is aimed at meeting urgent and widespread needs of more specific competences for the management of environmental issues in both public and private industries and administrations.

The master courses - which will have open access to postgraduates whichever is their university education - are planned to last one academic year and to comprehensively cover the major issues of an effective management of the environmental problems from the economic to the scientific, from the legislation to the ethical ones.

The head office of the Association is located in Varese, whilst the Master courses - possibly to be started with the academic year 1992/93 in October 1992 - will be given at various academic institutions among those above listed, this implying students' and teachers' mobility.

In addition to the Master courses the Association intends to promote, to support and to harmonize initiatives for the research on didactics methodology and programming for postgraduate education in environmental field.

Further information can be obtained from:

G. Rossi, Environment Institute, CEC-JRC Ispra, I 21020 Ispra (Va),
Tel. +39 332 789981.

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 1992:

Chemical and Environmental Science

- 1) *Chemical, Microbiological and Sensory Aspects of Indoor Air Quality. State of the art in SBS.*
23-27 March 1992
In collaboration with the EC Concerted Action "Indoor Air Quality and its Impact on Man".
- 2) *Quality of Environmental Measurements*
18-22 May 1992
In collaboration with CEC-DG XII/BCR, Brussels.
- 3) *Chemistry and Environment: Legislation, Methodologies and Applications*
1-5 June and 22-27 June 1992 (two weeks)
In collaboration with the Società Chimica Italiana.
- 4) *Technologies for Environmental Cleanup*
21-25 September 1992
In collaboration with the Lawrence Livermore National Laboratory, Ca, USA.

Remote Sensing

- 5) *Remote Sensing for Agricultural Statistics*
January 1992 (date to be defined), Lisboa
- 6) *Imaging Spectroscopy as a Tool for Environmental Observations*
19 - 23 October 1992

Further information and documentation can be obtained from:

Secretariat EUROCOURSES, JRC, I-21020 Ispra (Va).
Tel. +39 332 789819/789308; Fax +39 332 789839.

COMETT Courses

Under the auspices of the European Community's **COMETT II** programme, the **Consortium Padova Ricerche** is organizing a series of courses on environmental themes for technicians, those working in public and private enterprises, and local authorities. In 1992 are foreseen:

- *Statistical methods for evaluating and monitoring the quality of the environment*
14-17 January 1992
- *The reuse of biologically composed waste materials*
5-7 February 1992
- *The management of water resources*
10-13 March 1992.

For further information please contact:

Consortio Padova Ricerche, Course co-ordinator, Galleria Scrovegni, 7, I-35121 Padova - PD (Italy).

52nd International Easter School, University of Nottingham

- *Resource Capture by Crops*
30 March-2 April 1992

For further details, please contact

Caroline Reffin, University of Nottingham, School of Agriculture, Sutton Bonington, Loughborough, Leics LE12 5RD, U.K.
Tel. 0602 484848 Ext. 8145, Fax 0509 674116.

The Institute of Sound and Vibration Research, Southampton run short courses on following subjects:

- *Clinical Audiology*
30 March-3 April 1992
- *Instrumentation and Measurement Techniques for Noise Control*
6-8 April 1992
- *Engineering Applications of Statistical Energy Analysis*
8-10 April 1992
- *Active Control of Sound and Vibration*
13-15 April 1992
- *Adaptive Systems: Linear Filters and Neural Networks*
22-24 April 1992
- *Signal Processing I*
28-29 April
- *Signal Processing II*
23-24 June 1992
- *Introduction to Mechanical Vibration Measurement Techniques*
September 1992
- *Technical Audiology*
7-11 September 1992
- *11th Engine Noise & Vibration Control*
8-10 September 1992
- *21st Advanced Course in Noise and Vibration*
14-18 September 1992.

For further information please contact:

ISVR Conference Secretary, Institute of Sound and Vibration Research, The University, Southampton, SO9 5NH (U.K.)

Exhibition "POLLUTEC 92" - Lyon (France)

8th International Technical Exhibition
Water - Air - Noise -Waste - Industrial Cleaning
3-6 November 1992

Further information can be obtained from :

Technoexpo, 8 rue de la Michodière, 75002 Paris (France),
Tel. (1) 47.92.56 - Fax 42.66.14.28

New EUREKA PROJECTS

EUROENVIRON

This umbrella project supports research and development designed to tackle Europe's major land-based environmental problems, such as industrial, urban and agricultural wastes, air, water and noise pollution, environment management systems, clean production technologies and environmental catastrophes.

1991 has proven to be the "take-off" year for EUROENVIRON, with 17 new projects, totalling over 60 MECU, joining the 8 ongoing projects. Most of these new projects are dedicated to developing cleaner and safer technologies.

Other projects cover the development of sophisticated safety systems, better cleanup technologies and more efficient, environmentally friendly industrial processes and materials, management tools for sewer systems, irrigation networks and controlling agricultural pollution.

EUROCARE

Eurocare is an umbrella project encouraging projects aimed at the conservation, restoration and maintenance of both Europe's cultural heritage and modern building stock.

The 1991 Ministerial Conference saw 5 new projects announced in this area, totalling 5 MECU.

ENVINET

Envinet is the heading of a group of projects aiming to develop innovative environmental monitoring systems involving advanced hardware and software.

There were 4 projects, totalling 15.1 MECU, announced in this area this year.

Among several others, one project has been announced this year, under the **EUROMAR** umbrella project which encourages the development of marine environment management technology.

(Source: EUREKA N° 14, Sept. 1991)

CORDIS: Easy access to European research results and funding

(Community Research and Development Information Service)

The European Commission will provide 5.7 billion ECU to aid European research and development projects over the next four years. This funding forms part of the *third Framework Programme 1990-94* which covers areas of research as diverse as information technology and telecommunications, health research, marine science and aeronautics.

Established under the European Community's **VALUE** programme in December 1990 to exploit all aspects of Community research, **CORDIS** can provide European research centres with essential information on research and help them publicize their own research capabilities and achievements. This computer based service gives access to a mountain of Community documents.

CORDIS is entirely electronic and has a menu driven interface that makes it possible to find what is needed in a matter of minutes.

The CORDIS service is presently free of charge on the Commission's **ECHO** host in Luxembourg. Most types of computers can easily be connected to the service via public or research networks.

Eight separate services are already up and running, covering Research and Technology Development (RTD) i. e.:

- **RTD-Programmes** including details of more than 200 Community sponsored programmes;
- **RTD-Projects** providing about 14,000 records on individual projects;
- **RTD-Publications** giving summaries and other bibliographic details of publications arising outside Community RTD activities;
- **RTD-Results** providing valuable leads and hot tips on prototypes ready for industrial exploitation or research areas requiring further collaborative efforts;
- **RTD-Comdocuments** summarizing Commission's texts on research communications, proposals and recommendations to the Council of Ministers and to the European Parliament;
- **RTD-Acronyms** explaining acronyms and abbreviations like ESPRIT, BRITE and CORDIS, employed in research area.
- **RTD-News** provides short announcements of R&D calls for tenders, events, publications, etc.
- **RTD-Partners** helps you match up with organizations and research centres in Europe for collaboration on project proposals and exploitation of results.

Further information can be obtained from:

ECHO/CORDIS, P.O. Box 2373, L-1023 Luxembourg,
Tel. +352 34 98 11, Fax +352 98 12 34.

Conferences

CONFERENCE REPORTS

First European Symposium on Terrestrial Ecosystems: Forests and Woodlands

Florence, Italy, 20-24 May, 1991

This successful meeting brought together most of the European experts in forest ecosystem research, including biologists, botanists, ecologists, soil scientists, modellers, foresters, etc. and also outstanding experts from outside Europe (US, Australia, Canada, Japan, etc.). In total, the symposium was attended by more than 500 participants.

Since forest ecosystem research is a very broad topic, the symposium was structured in six plenary sessions under different heading, each consisting of a state-of-the-art review, followed by a discussion, to further explore the concept of ecosystem as central research theme in relation to the most important present problems.

The issues brought forward in the plenary sessions were then illustrated in detail in the four case study sessions which presented field data from the most important forest types in Europe: the nordic forests, the atlantic forests, the central European forests and the Mediterranean forests. This illustration was completed with a review of the existing research networks in Europe on forest ecosystems. On this occasion, the FERN-DECO network was presented.

Finally, the key questions raised in plenary sessions, i.e. changes in atmospheric chemistry, changes in climate, changes in land use and forest responses to fires, were extensively discussed in the four workshop sessions and the resulting gaps in knowledge and future research priorities were identified and reported in the general discussion.

The conclusions were drawn by Ph. Bourdeau who pinpointed the important questions raised during the symposium and attempted to synthesize the main issues which were developed throughout the meeting. Based upon this, some general recommendations for the direction of future research were also suggested.

During the whole duration of the symposium, more than 200 posters were displayed. They presented excellent pieces of individual work and were referred to many times in the plenary sessions.

The organizers consider that their original objectives for the meeting have been fully satisfied. The meeting provided a basis for synthesis of current knowledge together with extensive discussions as important guidelines for future research.

Further information can be obtained from:

A. Teller, European Science Foundation, c/o DG XII/E,
200 rue de la Loi, B-1049 Brussels, Tel. +32 2 2358446.

6th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region

Como, Italy, 6-9 October, 1991

As announced in Environmental Research Newsletter N° 7, this Symposium has been organized by the Mediterranean Scientific Association of Environmental Protection (MESAEP).

Many issues in respect to the environmental pollution in the Mediterranean region have been discussed in detail.

The participants have been asked for assistance in finding answers to the following questions:

- How serious is the environmental pollution in the Mediterranean region at the present time?
- What strategies can be considered to prevent increasing pollution?
- What kind of technologies are needed to solve environmental problems in addition to existing possibilities in the whole region?
- What can be done to make the Mediterranean area a more healthy place to live?

On the basis of the presented papers the following suggestions can be made :

- There is a need for further research and extended monitoring especially for the heavily affected coastal areas. In addition the necessity

for an accurate assessment of the pollution loads received by the Mediterranean Sea was recognized.

- The major primary pollutants should be monitored regularly in all large urban and industrialized areas.
- The formation of photooxidants (Mediterranean areas have a high potential for air pollution, especially photochemical smog) indicated by elevated ozone levels should be measured at several sites in urban areas with respect to the precursors: reactive hydrocarbons and nitric oxides.
- The behaviour of chemicals in soil should be further investigated. Moreover the effect of atmospheric pollutants on soil organic matter should be considered.
- To satisfy the continuously growing needs for reliable ecotoxicological answers, attention should be given to the establishment of valid methodological procedures. This is to be achieved both by revision of current methodologies and by the development of new and valid ones.

Further information can be obtained from:

D. Kotzias, CEC-RJC Ispra, Environment Institute, I-21020 Ispra (Va),
Tel. +39 332 789647.

ANNOUNCEMENTS

Call for Papers:

Materials and Energy from Refuse 4

Oostende (Belgium), 18-20 March 1992

Organized by the Technological Institute of the Royal Flemish Society of Engineers.

Topics of the Symposium: Waste Management Policies, Prevention in Products and Processes, Packaging, Recovery and Recycling, Incineration, Other Techniques and Developments, Hazardous and Special Waste, Contaminated Sites

Further information can be obtained by:

MER 4, c/o Ingenieurshuis, att. Ms. Rita PEYS, Desguinlei 214,
B-2018 Antwerpen (Belgium)

European International Space Year Conference

Munich, 30 March-4 April 1992

Organized by:

- Commission of the European Communities (CEC)
- European Space Agency (ESA)
- German Space Agency (DARA)

For further information please contact:

INTERPLAN, Convention & Visitor Service, Anton Kössl,
Sophienstr. 1, WD 8000 München 2 (Germany)

Call for Papers:

First International Workshop on Neural Networks Applied to Chemistry and Environmental Sciences

Sponsored by the European Group for QSAR Studies

Lyon, 8-10 June, 1992.

Organizing committee: M. Chastrette, Villeurbanne, J. Devillers, Lyon, W. Karcher, Ispra.

There has been a growing interest in applying Neural Networks to derive structure-activity and structure-property relationships in pharmacology, chemistry, toxicology, and environmental sciences. This workshop is aimed at giving the heuristic potency of this method and the state-of-the-art in Neural Networks applications. It is the occasion to define new research axes and seek for the limits of application.

Further information can be obtained from:

W. Karcher, CEC-JCR Ispra, I-21020 Ispra, Tel. + 39 332 789983.

**Third International Symposium on
Gaseous Pollutants & Plant Metabolism**

Blacksburg, VA (USA), 13-16 June 1992

Virginia Polytechnic Institute and State University.

For further information please contact:

Conference Registrar, Donaldson Brown Center for Continuing Education, Virginia Tech, Blacksburg, VA 24061-0104.

First announcement and call for papers:

International Conference on Living with Industry

The Polytechnic of Huddersfield, 7-10 July 1992

Topics of the Conference: The past and present relationships between the urban environment and the quality of life; The role of local government in monitoring, managing and improving local environments - the European experience; Environmental awareness raising and understanding - case studies; The responsibility of industry towards the environment; European legislation and its various interpretations and enforcement.

Further information can be obtained from:

A.S. Trescott, Living with Industry, Dpt. of Geographical & Environmental Sciences, The Polytechnic, Queensgate, Huddersfield, England HD1 3DH, Tel. 0484 422288 ex. 2349, Fax 516151.

**7th International Symposium on Microbial Growth
on C1-Compounds**

Warwick, 15-20 August 1992

Sessions on the following topics are being planned:

Global effects of C1 compounds - Physiology of C1-utilizers - Biochemistry of C1-utilizers - Genetics and molecular biology of C1-utilizers - C1-utilizers in biotechnology - Ecology and taxonomy of C1-utilizers.

Further information can be obtained from:

Mrs. Carol Howes, Dpt. of Biological Sciences, University of Warwick, Coventry, West Midlands, CV4 7AL, U. K., Tel. 203-52517; Fax 203-523 568.

First Announcement:

**EUROSOL: European Conference on Integrated
Research for Soil and Sediment Protection**

MECC, Maastrich, The Netherlands, 6-12 September 1992

Organizers: CEC, DG XII, Brussels, The Netherlands Integrated Soil Research Programme

Further information can be obtained from:

P. Reiniger, CEC, DG XII/E-1, 200 rue de la Loi, B-1049 Brussels, Fax +32 2 236.30.24.

Underwater Acoustics

Luxembourg, 14-17 September 1992

Lectures, papers and posters on: acoustical oceanography, propagation, imaging, acquisition and processing of data, wideband signal processing, noise, reverberation, scattering, Arctic and Antarctic acoustics, large scale models, shipboard noise reduction, use of sonar in fisheries, acoustics in marine geology and geophysics, transducers and instrumentation, etc.

Further information can be obtained from:

CEC-DG XII/E (MAST Programme), Conference Secretariat, SDME 3/46, 200 rue de la Loi, B-1049 Brussels.

European Congress

Cobalt and Hard Metal Disease

Bergamo, 12-13 March 1992

Organized by:

- Institute of Occupational Health, Bergamo (Italy)
- Fondazione Clinica del Lavoro IRCCS, Pavia (Italy)
- CEC, Joint Research Centre, Ispra (Italy).

Further information can be obtained from:

E. Sabbioni, CEC-JRC Ispra, I-21020 Ispra (Va), Tel. +39 332 789070.

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)

New **IGBP** (International Geosphere-Biosphere Programme) Reports:
Global Change N° 16

Report of the IGBP Regional Workshop for South America, Sao José dos Campos, SP, Brazil, 5-9 March 1990 (1991).

Global Change N° 17

Plant-Water Interactions in Large-Scale Hydrological Modelling. Report of a Workshop, Vadstena, Sweden, 5-8 June 1990.

Global Change N° 18:1

Report of the Recommendations of a Workshop, New Delhi, India, February 11-15, 1991, edited by R. R. Daniel (1991)

Copies of these reports are available from the IGBP Secretariat, The Royal Swedish Academy of Sciences, Box 50005, S-104 05 Stockholm, Sweden.

Concerted Action

“Indoor Air Quality & its Impact on Man”

Reports issued by the Community Concerted Action Committee, CEC-DG XII, JRC-Ispra:

Report N° 7

Indoor Air Pollution by Formaldehyde in European Countries.

EUR 13216 EN, 1990

Report N° 8

Guideline for the Characterization of Volatile Organic Compounds Emitted from Indoor Materials and Products Using Small Test Chambers.

EUR 13593 EN, 1991

Report N° 9

Project Inventory - 2nd Updated Edition.

EUR 13838 EN, 1991

Report N° 10

Effects of Indoor Air Pollution on Human Health.

EUR 14086 EN, 1991

Small Chamber Tests and Headspace Analysis of Volatile Organic Compounds Emitted from Household Products

A. Colombo, M. De Bortoli, H. Knöppel, H. Schauenburg, and H. Vissers. 1991. *Indoor Air*, 1 (1991), 13-21.

Numerical Verification Exercises with Different Computer Models for Simulating Sea Circulation Pattern:

The Vertical Diffusion of Momentum in a Forced Barotropic Sea

Final Report by W. Eifler, T. Kupusovic and W. Schimpf - EUR 13370

Marine Science and Technology (MAST) R&D Programme 89-92 Research contracts

47 contracts are listed in this catalogue which gives, for each contract, a brief description of the work to be undertaken, the names and addresses of the project leaders, and a list of the other major participants. EUR 13437 EN - ISBN 92-826-0591-4

A Lagrangian Model of Phytoplankton Growth Dynamics - A Sensitivity Study

Final Report by J.W. Dippner
EUR 13371

Water Pollution Research Report N° 20

EROS 2000 (European River Ocean System)

2nd Workshop on the Northwestern Mediterranean Sea in Blanes, Spain, 6-9 Febr. 1990
edited by J.M. Martin and H. Barth.

Soil and Groundwater Research Report I:

Soil Survey - A Basis for European Soil Protection

EUR 13340, 214 pp. 1991

Soil and Groundwater Research Report II:

Nitrate in Soils

EUR 13501, 544 pp., 1991

Earthquake Hazard Assessment

edited by R. Fantechi, M.E. Almeida-Teixeira
EUR 13407 EN

Climate and Global Change

edited by J.C. Duplessy, A. Pons, R. Fantechi
EUR 13149 EN

The Greenhouse Effect and its Implications for the European Community

R.A. Warrick, E.M. Barrow and T.M.L. Wigley
EUR 12707 EN (2nd ed.)

Climatic Change and Impacts: A General Introduction

edited by R. Fantechi, G. Maracchi, M.E. Almeida-Teixeira
EUR 11943 EN

Catalogue of European Earth-Quakes with Intensities higher than 4

by J. M. Van Gils, G. Leydecker
EUR 13406 EN - ISBN 92-826-2506-0

La Deforestation en Afrique - Situation et Perspectives

by Jean-Roger Mercier
192 pp., Oct. 1991
Edisud, La Calade, RN 7, F-13090 Aix-en-Provence

European Community Forest Health Report 1991 - Technical Report

This report is published by the Commission in December 1991 and gives the results of national forest damage surveys from 1987 to 1990. For the first time it includes results from four non-EC member countries. The aim of the report is to give an overview of the state of forest health in the EC and some peripheral countries.

European Community Forest Health Report - Executive Report, 1991

This report is published by the Commission in December 1991 and contains a summary of the technical report mentioned here above.

Joule Programme 1989-1992 Catalogue of contracts

For each of the more than 200 contracts concluded so far are listed in this catalogue, a brief description is given of the research to be carried out, the names and addresses of the scientific coordinators, and a list of the other major participants.

Available from:

Joule Programme, CEC-DG XII, 200, rue de la Loi, B-1049 Brussels.

Climate Change and Energy Efficiency in Industry

This publication has been prepared by a group of experts from the International Petroleum Industry Environmental Conservation Association (IPIECA) in co-operation with the United Nations Environment Programme - Industry and Environment Programme Activity Centre (UNEP-IE/PAC). It has arisen from international concern over the issue of global climate change, and industry's contribution to this process through its emission of greenhouse gases.

For more information, please contact:

Mrs. J. Aloisi de Larderel, Director, UNEP-IE/PAC,
Tour Mirabeau, 39 - 43 quai André Citroën, F-75739 Paris Cedex 15.

EUREKA Annual Progress Report 1990

Available in the 5 EUREKA languages upon request from the National Project Coordinators in every member country or the EUREKA Secretariat, 19H avenue des Arts, B-1040 Brussels, tel. +32 2 217 00 30, Fax 32 2 218 79 06.

European Arctic Stratospheric Ozone Experiment (EASOE)

Booklet describing a pan-European campaign to probe the Arctic stratosphere.

For further information, write to:

- Dr. J. A. Pyle, EORCU, British Antarctic Survey, Cambridge CB3 0ET, UK; or
- Dr. H. Ott, DG XII/E-1, CEC, Square de Meeus 8, B-1040 Brussels.

Recycling: Energy from Community Waste: A Guide to Sources

Edited by Lesley Grayson

Published by The British Library, ISBN 0781-8, 1991 and available from Publications Sales Unit, Boston Spa, Wetherby, West Yorkshire, LS23 7BQ (UK).

Provisional Atlas of the Larger Brachycera (Diptera) of Britain and Ireland

by C. M. Drake.

Published by Biological Records Centre, Institute of Terrestrial Ecology, - ISBN 1 870393 14 7.

Available from

Mrs. S. Adair, Gifts and Exchanges, Edinburgh Research Station, Bush Estate, Penicuik, Midlothian EH26 0Q

Mapping Critical Loads for Europe

CCE Technical Report N° 1, July 1991

edited by J.P. Hettelingh, R.J. Downing, P.A.M. de Smet

For information: J.P. Hettelingh, National Institute of Public Health and Environmental Protection (RIVM), P.O. Box 1, 3720 BA Bilthoven (NL).

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.

