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Editorial

The European Union has to deal with a complex set of environmental problems at a time when unemployment is at record-high levels, and as it is just beginning to emerge out of one of the worst post-war recessions. Despite these difficulties there is little evidence of a wish to roll back environmental protection. The challenge the Union now faces is to reconcile the two tendencies and to ensure that economic growth is environmentally sustainable.

The Treaty of Union places the environmental imperative at the heart of all Community policy areas. Article 2 of the Treaty refers to the promotion of a "harmonious and balanced development of economic activities, sustainable and non-inflationary growth respecting the environment". The Treaty further stipulates that, rather than "actions", a policy in the sphere of the environment should be developed, aiming at a high level of protection, and based on the precautionary principle. Above all, it calls for the integration of environmental protection requirements into the definition and implementation of all other Community policies.

This means that environment policy is at a turning point: environmental issues and costs to the environment are now moving to the centre of economic policy making. As the Commission's White Paper on Growth, Competitiveness and Employment makes clear, to tackle unemployment, there is a need to pursue a twin-pronged approach involving the promotion of a macro-economic policy of non-inflationary, sustainable growth, taking due account of environmental costs as well as shifting the fiscal burden from labour costs to natural resources and the environment.

The Fifth Environment Action Programme, adopted by the Commission in 1992 and the broad strategy of which was agreed by the Council in 1993, is the process by which Community environment policy is moving forward. It lays out a strategy for reconciling economic development to the protection of the environment (sustainability). The Programme recognizes for the first time the need for a comprehensive and targeted approach towards environmental issues at Community level. It takes as its starting point the need to involve all the relevant "actors" in society in a spirit of shared responsibility to achieve sustainable development. It focuses on five main target areas - industry, agriculture, energy, transport and tourism - where the environmental problems are the most profound and where action can have most benefit for the environment as a whole. It recognizes the need to ensure that environmental considerations are fully integrated into all other policies. It also recognizes that the legislative or regulatory approach is not sufficient and recommends a broadening of the range of instruments, to include economic/fiscal instruments, financial support mechanisms, and horizontal instruments such as information, education, research and development, and data gathering. There is also a need to develop indicators which will allow the Union to quantify costs of environmental damage.

Given the changes that Europe and the world are undergoing, given the cross-roads at which environment policy finds itself, given the uncharted territory that is sustainable development, regular progress reports on the Programme, and above all a review of the Programme itself, are indispensable tools for policy-makers to gauge where and what progress has been achieved under the banner of the Fifth Action Programme, and what have been the major challenges and problems encountered so far. The Commission is finalizing the first of such progress reports.

The overall conclusion of the Report after eighteen months of action is likely to be one of cautious optimism: some progress has been achieved and considerable efforts are being made in several areas. Above all, despite the recession that has been at its most severe during the period under review, sustainable development remains on the political agenda and is increasingly seen as an important part of the economic debate. However, the report recognizes that there still remains a failure to get to the real heart of some of the key issues.

1995 will see a review of the Programme and this will go one step further that the progress report in examining to what extent has the Programme been implemented at Community, Member State, regional and/or local levels. This is considered necessary since the initial phase of the Programme was to be a "priming period, changing the sense of direction and commitment" whereas the period 1996-2000 will be one of "getting the operation under full steam". Although the review is unlikely to not change the overall strategy of the Programme, it will provide the possibility for sharper focus on certain topics.

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Programme News

Green light by the EU Research Council to the 4th RTD Framework Program

On December 1st, 1994 the EU Research Council has approved the remaining ten Specific Programmes of the Fourth Research and Technological Development Framework Program (1994-98).

The programmes and corresponding allocated budget were:

Environment and Climate	852 MECUs
Biotechnologies	552 "
Diffusion and Valorisation of Results	330 "
Training and Mobility of the Researchers	774 "
Transport	240 "
Targeted Socio-economic Research	138 "
Biomedicine and Health	336 "
Nuclear Fission Safety	414 "
Joint Research Centre (EC Treaty)	600 "
Joint Research Centre (Euratom Treaty)	300 "

The approval procedure, as by the Maastricht treaty, has thus been completed, allowing to give the green light to the implementation of the whole Framework Program.

It is recalled here that the total budget allocated to the Framework Program amounts to 12,300 MECUs with additional 700 MECUs, kept in reserve, to be allocated in 1996.

Open competitions for participation in the above programmes with EC funding are scheduled to be published in the EU Official Journal four times per year, i.e. on 15 March, 15 June, 15 September and 15 December, respectively, the first launch of the bid having been fixed to take place on December 15, 1994.

As far as the Environment and Climate, and the JRC (EC Treaty) Specific Programmes are concerned, the share of funds among the various activities is as it follows:

Programme Environment and Climate.

Total budget 852 MECUs

Natural Environment, Environmental Quality and Global Change	~ 400 MECUs
Technologies for the Environment	~ 213 "
Space Techniques	~ 175 "
Human Dimension and Environment Change	~ 64 "

Joint Research Centre (EC Treaty) Programme.

Total budget 600 MECUs

Environment and Climate	~ 294 MECUs
Agriculture and Fisheries	~ 48 "
Measurement and Testing	~ 105 "
Industrial and Material Technologies	~ 90 "
Targeted Socio-economic Research	~ 33 "
Non-nuclear Energy	~ 18 "
Information Technologies	~ 12 "

Second European Stratospheric Arctic and Mid-latitude Experiment (SESAME) 1994-1995

In the framework of the ENVIRONMENT research programme, a major European campaign, the European Arctic Stratospheric Ozone Experiment (EASOE) was organised to study the north polar regions during the winter of 1991/92. EASOE studies have demonstrated quantitatively the extent of ozone depletion in the Arctic regions and that this ozone loss is consistent with stratospheric chlorine activation under particular meteorological conditions. Despite these findings, many intriguing questions remain: What are the causes of the mid-latitude loss? How are the losses over the Poles linked to those at mid-latitudes? While CFCs and the bromine-containing compounds known to destroy ozone over the Poles are strongly implicated in the mid-latitude loss, a few doubts remain.

In 1994 and 1995, the Second European Stratospheric Arctic and Mid-latitude Experiment (SESAME) is being organised to investigate the processes occurring at both high and mid-latitudes and to determine how they are linked. SESAME is built upon the experience gained during EASOE. At the same time, a US-led expedition is studying similar processes in the southern hemisphere. These two campaigns are expected to enhance our understanding of the stratospheric ozone layer on a global scale.

The SESAME strategy calls for measurements at a variety of times throughout the year of processes occurring in, and connecting, the lower stratosphere of high and middle northern latitudes. This requires high quality measurements of ozone, active chemical species and stable species which are useful for tracing stratospheric transport processes, in conjunction with detailed meteorological studies. Scientific goals are to study:

- the stratospheric chemistry of the chlorine, nitrogen, hydrogen and bromine families;
- the roles of polar stratospheric clouds and of sulphate particles in abetting the chemical destruction of ozone;
- the evolution of ozone concentrations through the two winters to see exactly when and where the ozone loss occurs;
- the meteorological conditions most likely to favour ozone destruction.

The first phase of SEAME took place in early 1994. Eight balloons were launched from Kiruna and both the TRANSALL and Falcon were also based there for short campaigns. Early 1994 has been quite different from both the EASOE winter (1991/92) and that of 1992/93. The early part of the winter was warmer than the previous winters and the activation of chlorine appears to have been sporadic. However, stratospheric temperatures dropped in early March and more widespread production of ozone-destroying chemicals could have occurred. The SESAME ozone data is now being examined in detail to find evidence of ozone depletion in the late winter.

Environmental Protection

Environmental Chemicals

Risks to the Environment from Chemical Substances (Ecotoxicology)

In the course of the Environment Research Programme (1990-1994) the following ten research projects have been selected for funding which will contribute to improve the environmental risk assessment of chemicals:

Development of physiological and biochemical toxicity tests with freshwater species and their validation in the laboratory and in field microcosms and mesocosms (Contract n° EV5V-CT92-0200)

This project aims to:

- develop relatively simple, sensitive and reliable toxicity tests, based upon physiological and biochemical response criteria, for predicting the environmental hazard of new chemical substances;
- validate these tests in the laboratory and also in stream and pond mesocosms and microcosms which mimic the complex environmental conditions found in natural freshwater ecosystems;
- identify the most useful tests and to formulate "Standard Operating Procedures", in a form suitable for incorporation into the Community procedures for the testing, notification and classification of dangerous substances.

Biochemical and physiological laboratory toxicity tests will be developed, applying cellular and subcellular *in vitro* procedures, and whole organism procedures. The test organisms used will include groups representative of different trophic levels and occurring in pelagic and benthic environments (e.g. gammarids, rotifers, cladocerans, copepods, algae and fishes). The tests will be developed and evaluated applying reference chemicals selected from those (copper, lindane, atrazine, 3,4-dichloroaniline) employed in previous projects in the Environment Research Programmes, which will allow direct comparison of test sensitivities. Further chemicals will be used when appropriate (e.g. 2,4-dinitrophenole, rotenone, malathione, cabaryl, etc.).

Validation of these ecotoxicological tests will be achieved:

- by comparing the physiological/biochemical results (e.g. concerning the endpoints "scope for growth", membrane injury and cytotoxicity, lysis of erythrocytes, uncoupling of oxidative phosphorylation, inhibition of the photosynthetic and/or respiratory electron transport, inhibition of acetylcholinesterase, alkylating and/or SH-inhibiting activity, gill pathology, injury of haem biosynthetic pathway, etc.) to those obtained in previous laboratory studies using conventional indicators of toxicology, and
- in the field, by comparing the physiological/biochemical endpoints which have been identified as sensitive in the laboratory tests with impacts at the population (e.g. invertebrate population densities and drift) and ecosystem level (e.g. community photosynthesis, respiration, carbon and nitrogen flux and cycling) in stream and pond micro- or mesocosms.

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Quantitative structure-activity relationships (QSARs) for predicting fate and effects of chemicals in the environment (Contract EV5V-CT92-0211)

This project aims to develop a predictive instrument for the assessment of environmental risks of chemical substances based on

their structure-activity relationships. It comprises the following tasks:

- To summarize and critically assess existing estimation models for environmental fate and effect parameters, with emphasis on defining the limitations of the models.
- To develop schemes and multivariate models for the classification of chemical compounds. The limitations of the predictive models (see task A) will be translated into classification rules using an expert-system approach. Multivariate techniques will be applied to classify chemicals according to their biologically relevant reactivity and to degradability parameters.
- New QSAR models will be developed for predicting chemical reactivity, biotic or abiotic degradation, and biotransformation. Experimental research will be carried out aiming at the development of new QSAR models for reactivity and transformation processes considered to be important under realistic environmental conditions, and aiming at the validation of newly developed QSARs and to expand the scope and applicability of existing QSAR models.
- The evaluated models and classification schemes will be applied to estimate:
 - adsorption to sediment and soil
 - chemical degradation
 - biodegradation
 - biotransformation
 - bioconcentration
 - toxic effect concentrations (LC50, EC50, NOEC) for aquatic and terrestrial speciesfor organic chemicals from the list of High Production Volume (HPV) chemicals in the EC Inventory of chemicals (EINECS).
- Validation: For a selected group of HPV chemical compounds, the estimated parameters (task D) will be compared with available experimental data in order to verify the applicability and limitations of the developed models.

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Development, improvement and standardization of a test system for assessing sublethal effects of chemicals on the fauna in soil ecosystems (SECOFASE) (Contract EV5V-CT92-0218)

The project will develop a comprehensive scheme of seven standardized laboratory or semifield procedures for the early detection and evaluation of sublethal effects of chemical compounds on representative organisms of the soil fauna of European terrestrial ecosystems.

The test organisms will represent the following taxa: Nematoda (threadworms), Enchytreidae (enchytreids), Lumbricidae (earthworms), Collembola, Oribatida (mites), Gamasida (mites) and Staphylinidae (rove beetles). For characterising the representativeness of the test species, their sensitivity, the exposure routes, their mobility, life stage, life strategy, life form and the habitat will be taken into account.

The test methods to be developed or to be improved will examine survival trends in relation to constant and episodic exposure to three classes of commonly applied chemicals (pesticides, cationic detergents and heavy metals). They will focus in particular on sublethal effects upon reproduction and growth and determine the consequences of these for age structure and population dynamics. Population increase data (e.g. hatchability, timing, success rate and duration of reproduction) will be incorporated within population models and particular attention will be paid to facilitating the use of these data within the full risk assessment scheme (to be developed at a later stage, incorporating also field-based methods).

Novel techniques, such as the use of digital image processing (DIP) to record population size distributions and behaviour of individuals and populations will be developed. The tests will be undertaken under highly controlled conditions, e.g. within light/temperature/humidity cycling incubators, to determine the sensitivity of the test system to climatic factors. Artificial soil and natural soil substrates will be used, as well as artificial surfaces which may permit the examination of the impact of contaminated diet.

All important parts of the testing methodologies will be subject to standardization. They will include laboratory cultures (development stage, manipulation of animals, synchronous cultures, homogeneity of animals), test conditions (soil type, pretreatment, pH, content of organic matter, temperature, humidity, etc.), chemical treatment (chemical formulation, concentration series, application method, incubation period), and results (endpoints, quality criteria, EC50, NOEC, LOEC).

This project represents the core of "SERAS" (Soil Ecotoxicological Risk Assessment System), a European scientific programme to promote the protection of the health of the soil environment. For further contacts on SERAS, please write to Dr. H. Eijsackers of the Netherlands Integrated Soil Research Programme, or to Dr. H. Løkke of Danish National Environmental Research Institute.

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BIOPRINT: Biochemical fingerprint techniques as versatile tools for the risk assessment of chemicals in terrestrial invertebrates (Contract EV5V-CT94-0406)

The project aims to:

- develop biochemical fingerprint techniques (biomarkers) for assessing the exposure and effects of chemicals on soil-living invertebrates.
- establish specific relationships between the biomarker response and adverse effects at the population level of soil-living invertebrates.

Biomarkers, such as stress proteins, metal-binding proteins or esterases, act as integrators of exposure to environmental contaminants. They have the potential to bridge the enormous gap between chemical analyses of contamination and the impairment of physiological reactions of organisms which may lead to effects at the population and ecosystems levels. The biomarker approach is directly related to the bioavailability of a specific chemical compound or class of compounds, and may be used as a sensitive early warning of chemical stress before sublethal effects, such as inhibition of growth or reproduction, become apparent. Even combined effects of various chemical compounds and unexpected toxicants may be integrated in the biomarker response.

The BIOPRINT project will characterise and quantify the induction of heat shock proteins (HSP) in gastropods, isopods and collembola, the induction of metallothioneins and of other metal-binding proteins in isopods, collembola and gastropods, and the induction/inhibition of esterases in oligochaetes, isopods and collembola as reaction on sub-lethal exposure to copper and dimethoate. Other metals (Cd, Zn, Pb) may be used as further test chemicals. Also novel biomarkers, e.g. on the basis of relationships between metabolic dysfunction and sub-lethal effects will be developed.

The biomarkers reaction will be correlated to sensitive sub-lethal effects, such as growth and reproduction, and the potential applicability of the biomarker approach in the field will be investigated.

The BIOPRINT project is closely related to the SECOFASE project (Contract EV5V-CT92-0218) which is developing, improving and standardizing a test system for assessing sublethal effects of chemicals on the fauna in soil ecosystems.

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BIOMAR: Biological markers of environmental contamination in marine ecosystems (Contract n° EV5V-CT94-0550)

The BIOMAR project intends to:

- develop a better knowledge about biological mechanisms developed by marine organisms in the coastal environment under the effects of contaminants by *in vitro* and *in situ* experiments;
- investigate the relationship between biochemical markers measured in marine organisms and chemical pollutants (aromatic compounds, polychlorobiphenyls, pesticides) determined in the marine environment (sediment, waters, biota);
- characterise criteria and physiological/biochemical/cellular parameters for an efficient coastal contamination biomonitoring programme based on biomarkers.

Biological markers are measurements at the molecular, biochemical or cellular level in either wild populations from contaminated habitats or in organisms experimentally exposed to pollutants that indicate the magnitude of the organism's response to the contaminants.

Biomarkers of exposure (MFO systems, Acetylcholinesterase activity), biomarkers of pollutant effects (DNA adducts, DNA damages) and non-specific toxicity tests (immune response, phagocytosis, reproduction parameters, Mutatox), will be studied in various marine/estuarine organisms (mussels, fish, marine plants, sea stars, sea urchins, crayfish). In addition, chemical measurements of organic pollutants associated to body burden (polycyclic aromatic hydrocarbons, PCE, pesticides) will be measured in sediments, waters and organisms to investigate relationships between chemical concentrations and biological effects.

Laboratory experiments will be performed to establish dose-dependent relationships between exposure, biomarker responses and toxic effects in sentinel species. A number of field sites (Western Scheldt estuary, Elbe estuary (North Sea), Arcachon Bay (Atlantic Ocean), Cannes Bay, Costa Dorada, Napoli Bay (Mediterranean Sea) have been selected to test the power of the biomarkers to identify the contribution of different levels and character of exposure.

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Evaluation of harmful effects of pollutants in marine ecosystems using biomarkers (Contract EV5V-CT94-0398)

The project aims to develop a new strategy for the assessment of adverse effects of pollution on marine organisms using the biomarker approach, and to evaluate the usefulness of biomarkers for predicting ecological risks.

Biochemical, physiological and behavioral biomarkers of pollutant exposure and effect will be identified in marine invertebrates. Two key questions will be addressed:

- Can biomarkers (together with tissue pollutant residue concentrations) measured in laboratory test systems be used to predict responses *in situ*?
- Can the expression of biomarkers responses *in situ* be used to estimate the extent to which populations and communities are impacted by chemicals in marine ecosystems?

Laboratory studies will focus on the development of biomarker assays. A range of invertebrate species will be utilised with most emphasis being placed on *Carcinus spp.* (mobile crustaceans), *Mytilus spp.* (sedentary, suspension-feeding molluscs) and *Nereis spp.* (suspension feeders-omnivorous polychaetes). These organisms will be exposed to metals (Cu, As, Hg and organotin) and to polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). Biomarkers to be measured will include (in response to metals) free SH groups, metallothioneins, glutathione-S-transferases and stress proteins; (in response to PAHs and PCBs) monoxygenase activity, cytochrome P-450s, glutathione-S-transferases, porphyrins, fingerprints. Physiological biomarkers will include heart rate, ventilation and oxygen consumption, scope of growth, as well as a range of haemolymph parameters. Behavioral studies will focus on altered activity levels (speed and distance

travelled, turning frequency, etc.). Following validation of techniques in the laboratory, biomarkers will be measured in invertebrates distributed along pollution gradients in the Baltic region, the North Sea and in the Mediterranean Sea. Transplant experiments will also be conducted in which animals are exchanged among clean and polluted sites. Biomarker responses will be related to ecologically-relevant changes in populations and communities.

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Validation of sediment toxicity test for poorly water-soluble substances - Phase II (Contract EV4V-CT94-0405)

The project aims to:

- develop and to intercalibrate standard methods for assessing the long-term effects of sediment-bound insoluble chemical substances to marine and freshwater invertebrate species;
- validate standard laboratory methods towards field conditions;
- prepare draft standard guidelines for sediment toxicity tests of poorly watersoluble substances.

The project is a continuation of the two-year project MAST-CT91-0080 (implemented in the STEP Programme) which aimed to develop and intercalibrate short-term *lethal* toxicity test methods for the assessment of sediment-bound insolubles.

This project will develop *sublethal* test methods and will validate in the field lethal and sublethal methods developed during the two phases of the project.

Three laboratories will develop, standardise, intercalibrate and validate a sublethal marine test, using an arthropode species such as *Corophium volutator*, three laboratories will devote their efforts to a freshwater sediment test using a chironomid species such as *Chironomus riparius*, and three will investigate a freshwater bivalve species such as *Sphaerium corneum*. Sub-lethal endpoints will include growth, reproduction and the induction of stress protein and detoxification enzymes. The effects of sediment-bound contaminants on bacterial genotoxicity will be investigated. A method developed in phase 1 of the project for assessing sediment mutagenicity will be further developed, intercalibrated and validated.

The two model substances to be spiked into natural, well-characterized sediments will be selected among the previously tested compounds (benzo-(a)-pyrene, PCB-118, HCH).

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METIER (Modular Ecotoxicity Tests Incorporating Ecological Relevance): Assessing the toxicity and bioavailability of poorly water-soluble compounds in aquatic ecosystems (Contract EV5V-CT94-0422)

The project intends to develop a series of ecologically relevant toxicity tests to assess under realistic exposure scenarios the full breadth of responses of aquatic organisms to chemical contaminants.

METIER will build upon the results obtained within a preceding project in the STEP Programme (Contract EV5V-CT91-0009) which involved the development of a standard flow-through exposure system and a series of toxicity tests linked to a mechanistic physiological model of contaminant effects in the aquatic environment, to support the development of regulatory guidelines for poorly water-soluble compounds (pre-normative research) in relation to EC Directives 76/548/EEC and 88/379/EEC.

Specifically METIER will:

- further develop the *Daphnia magna* model, including transfer options to other species (e.g. *Carassius auratus*, *Chironomus riparius*);
- investigate an artificial sediment matrix to allow manipulations of the bioavailability of poorly water-soluble compounds, and the development of a standardised sediment toxicity test using *Chironomus riparius*;

- examine the role of the binding of contaminants in the water column on particulate matter for the effective exposure estimates;
- continue developing the flow-through system for the testing of "difficult" substances;
- validate the test system using two EC Priority List I chemicals (3,4-dichloroaniline and parathion);
- develop rapid-test endpoints (e.g. feeding inhibition) which can be mechanistically linked to long-term life-cycle endpoints (e.g. inhibition of reproduction) using model simulations, with potential application in effluent "end-of-pipe" testing.

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Effects of chemicals on benthic micro-algae in pristine and polluted European rivers: Physiological tests or community analysis? (Contract n° EV5V-CT94-0402)

The project will assess the validity of results of short term single species ecotoxicological tests with physiological endpoints for the protection of aquatic communities or ecosystems against chemical pollutants.

The project tackles a major uncertainty in assessing the environmental acceptability of chemicals, i.e. the extrapolation of results of short-term single species tests to the community or ecosystem level.

The chain of direct or indirect toxicity effects of three model compounds - representative for metals, substituted polyaromatic hydrocarbons and herbicides - will be analyzed from the species to the community level on micro-algae based benthic communities of rivers in northern, western and southern Europe.

The project is subdivided into three parts:

- 1) development of a rapid short-term toxicity test with physiological endpoints (¹⁴C-bicarbonate incorporation during photosynthesis, ³H-thymidine incorporation during bacterial growth), using field populations of riverine benthic micro-algae, to be validated against algal communities in Swedish, Dutch and Spanish rivers.
- 2) assessment of whether or not chemical pollution of rivers provokes a succession towards tolerant life-forms (specifically within the micro-algal community). On such structural/functional changes, assessed with the methodology described in part (1), a new detection method for *in situ* response induced by chemicals will be based.
- 3) performance of long-term (1-10 weeks) experiments on benthic communities to assess the direct or indirect effects of the above-mentioned classes of chemicals at the community level. Observations on toxic effects on these benthic communities will be compared with the results of the approaches (1) and (2) to derive recommendations whether the application of physiological or community tests are more appropriate.

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Development and validation of organ specific in vitro test systems as an instrument for environmental toxicity testing (Contract n° EV5V-CT94-0418)

The objective of this project is to develop or to optimise multi-species *in vitro* test systems for aquatic and terrestrial exposure, and to validate these test systems for their application in hazard assessments after low dose chronic exposure to environmental chemicals.

Differentiated organ and cell culture systems, representing a range of crucial biological functions (ion regulation, respiration, metabolism, haemopoiesis, immune response, bone mineralisation), will be developed or improved to study *in vitro* responses on low dose

chronic exposure to three classes of organic compounds (PCBs, mono- and polyaromatic hydrocarbons).

To assess sublethal risks of aquatic or terrestrial pollutant exposure the following bioassays will be investigated:

- rapid screening system based on the early development of fertilized fish eggs, incubated *in vitro*;
- *in vitro* culture of fish gill epithelial cells in which ion transport properties will be evaluated;
- genotoxicity assay, based on the UDS (unscheduled DNA synthesis) method, for lung epithelial cells in culture;
- assay, involving isolated rat hepatocytes, to detect binding of the Ah receptor to a DNA receptor binding sequence;
- bone marrow culture systems to evaluate blood cell production by colony forming assays and osteogenic differentiation of bone precursor cells;
- osteoblast cell culture system in which altered gene expression and apoptotic cell death will be quantified.

The test systems and the endpoints under study will be validated if specific pollutant related effects at dose levels below those causing general cytotoxicity in a non-differentiated cell line can be detected. This experimental approach is expected to allow a hazard ranking of the tested contaminants which will be compared to available *in vivo* toxicity data.

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Water

EC Research Programme and Support Activities to the Commission

1. Assessment of Environmental Quality and Monitoring

The R&D Programme in the field of Environment 1991-1994, included within its 2nd phase 1993-1994 in Area II. 1 "Assessment of Environmental Quality and Monitoring" the development of practical analytical methods for measuring pesticides and their conversion products in the aqueous medium and the identification of methods for monitoring by-products of chemical disinfectants/oxidants used for drinking water treatment.

Three projects were selected for EC funding under this topic:

Pesticides and their metabolites - characterisation and monitoring in surface and groundwater by combined chemical analysis and bioassays

The objective is to develop new and selective extraction and fractionation techniques, which in combination with specific mass spectrometric techniques allow the determination of anthropogenic compounds and their biochemical degradation products, in particular polar compounds.

Bioassays systems and concentration, fractionation techniques are developed and optimized simultaneously in order to investigate the possibility to combine analytical techniques with bioassay systems for a better characterisation of the polar compounds. The biodegradability of toxic components is also evaluated.

The coordinator of the project is Dr. H. Schroder, RWTH Aachen.

Development of analytical and sampling methods for priority pesticides and relevant transformation products in aquifers

This project includes the following research tasks:

- the development and validation of practical analytical methods for the determination of low concentrations of priority pesticides and their transformation products in aquifer material;
- the specification of optimum sampling and monitoring methodologies for these pesticides;
- the application of the analytical methods and monitoring protocols to specific regions of the Community with different agricultural practices and pesticide pollution problems.

The coordinator of the project is Mrs. L. Guzzella, IRSA/CNR, Brugherio (MI).

On-line monitoring of organic species in the aquatic environment using infra-red optical fibres

Instrumentation involving Fourier transform infra-red spectroscopy and wavelength tunable laser sources is applied to determine the presence of selected organics at trace levels in the aqueous environment.

A direct, in-situ and an indirect, vapour phase approaches are adopted, both applying mid infra-red fibres as sensors with remote operation of the analytical instrumentation.

The range of investigated species includes organohalides, pesticides, aromatic solvents and volatile hydrocarbons.

The coordinator of the project is Dr. W. Neuberger, Ceram Optec, Bonn.

A contractors meeting on Environmental Analysis of Pesticides and their Conversion Products in the Aquatic Environment has been held in Barcelona, 20-21 June 1994, to discuss the activities and first research results of the ongoing projects that have started either in January 1993 (1st call for proposals) or January 1994 (2nd call for proposals). The proceedings, report EUR 15940, ISBN 92-826-8875-5, are being published.

Further information can be obtained from:

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2. Biogeochemical Cycles and Ecosystem Dynamics

In the framework of the Environment Research Programme (1990-1994) a series of projects have been launched to cover biogeochemical cycles in and the dynamics of aquatic and wetland ecosystems. They are complementing those projects described in ERN n° 12 (December 1993).

Disturbance of european salt marsh ecosystems: the impact of environmental pollution (eutrophication) in relation of sedimentation patterns (Contract n° EV5V-CT93-0265)

Salt marshes are wetland ecosystems at the edge of land and sea. The soil is built from clay, including organic matter, deposited by

tidal water movements. The decay of plants and the deposited organic matter results in mineralization and hence an increase in plant available nutrients. Thus succession and ecosystem dynamics strongly link up with natural processes like frequency and duration of inundation, rates of sedimentation and nutrient accumulation, and feature characteristic patterns of zonation of different plant communities related to their biogeochemical cycles. During the last decades anthropogenic eutrophication took place by an increased amount of suspended organic matter and from atmospheric deposition. The combined effects of natural and anthropogenic eutrophication might have disturbed the biogeochemical cycles to such an extent that the whole salt marsh ecosystem has dramatically changed resulting in the dominance of a few nitrophilous plant species in all sections of salt marsh zonation with a subsequent decrease in biodiversity both at the level of species and plant communities. The species complex of *Elymus athericus*/*Elymus repens* and their hybrid is regarded to be a good indicator for this disturbance.

The project envisages to better understand the mechanisms behind the eutrophication by the increase of knowledge about of biogeochemical cycles at the transition zone between land and sea. The amounts of organic matter and nutrients stored in different compartments of the salt marsh ecosystem and the fluxes between these compartments will be quantified. The fluxes towards and out of the system will be estimated. The methods involved will include work in the field in the Wadden Sea and in Portugal with supposed higher fluxes, and under controlled conditions in mesocosms, glass house and laboratory. Advanced techniques using ^{210}Pb isotope for measurements of sedimentation rates and $^{15}\text{N}/^{14}\text{N}$ isotopes for measurements of fluxes will be used. The results enable the prediction of the effects on salt marsh ecosystems of nutrient input by sediments as a result of expected sea level rise, of an envisaged reduction in the nutrient input from atmospheric deposition and of nutrients dissolved in inundation water, and of the impact of heavy metals or management practices like grazing and cutting.

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Abiotic controls of the germination, establishment, and species distribution of woody riparian vegetation (Contract n° EV5V CT93-0261)

The project intends to investigate:

- the relationships between germination and growth of shrub and tree species in the floodplains of small rivers;
- the timing, frequency and duration of wetland inundation;
- the rates of water table recession following inundation;
- the moisture stresses induced by rapid drawdown in coarse sediments.

It will also evaluate the relative importance of moisture stress and nutrient supply by overbank flow and sediment deposition.

The research will be implemented by a combination of field and laboratory experiments as well as by numerical modelling of the processes. The field studies (in the French Alps) will relate the community structures of floodplain vegetation in 3 contrasting areas to measured variation in floodplain microtopography and flood hydrology (both historical and current). In addition, on the River Drac field experiments will determine the role of nutrient status, water quality, soil characteristics and hydrology on the germination of woody riparian vegetation.

Greenhouse-based laboratory experiments will use "rhizopods" (after Mahoney and Rood, 1991) to study the influence of declining water levels on the germination of seeds and the growth of seedlings of riparian woodland species under controlled conditions.

The field and laboratory results will be combined in a GIS-model to determine the critical factors for germination and seedling growth of floodplain trees.

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Coupled ecological and socio economic modelling in the Rhone river basin (CEcoSEcoM): A socio economic sub-project in EROS 2000 on the NW-Mediterranean Sea (Contract: EV5V-CT94-0547)

After the execution of six years of natural science work on the land/sea interface of the northwestern and western Mediterranean Sea within the EROS 2000 (European River Ocean System project) this new sub-project has been launched to build a coupled socio-economic and ecological dynamic model of the Rhone river basin and the Gulf of Lions in order to examine the risk of eutrophication in the river basin and the adjacent gulf as well as to test the effectiveness of public policy options for the long-term (30-40 years) sustainable development of this land-sea interface.

The major work within this project represents the adaptation and coupling of several existing models of the particular situation of the Rhone river catchment and the Gulf of Lions. The time scale chosen as modelling target (30-40 years) corresponds to the scale required to achieve new water policies as well as to the time where climatic or demographic changes may become significant. It is expected that the coupled ecological/socio-economic model will produce coherent scenarios for the future under well defined hypotheses. In this sense, it should be regarded as an analytical rather than as a predictive tool.

The river basin model will be based on the SENEGAL and SCHELDT-models described by SANGLIER & ALLEN (1989) which considers geographically distributed economies in the watershed, simulating agricultural population and production, overall population and urban concentration, various industrial activities distribution and production, pollution transfers, etc.

The coastal/estuarine ecological model will be based on the AQUAPHY biological model described by LANCELOT & BILLEN (1990), and to the 3D LODYC hydrodynamical model of the Gulf of Lions.

The sociological aspects of riverine/coastal pollution will at present be limited to the analysis of reactions of the social actors in the catchment (decision makers and public representatives) on eutrophication scenarios.

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EROS 2000. Pilot Phase (1994-1995): The interaction between the river Danube and the north western Black Sea (Contract EV5V-CT94-0501)

EROS 2000 (European River Ocean System) is a long term interdisciplinary research project on biogeochemical processes in the European coastal environment of the Danube Delta and the North Western Black Sea. This area represents one of the ultimate examples of deterioration of the coastal marine environment where dramatic eutrophication, pollution and erosion problems are observed. The extrapolation of the results obtained in this area will be of great value for determining measures to be taken to prevent such catastrophic situation in other semi-enclosed seas. It further represents a key area for understanding the production of biogases of climatological significance such as methane.

The following questions will be addressed by the project:

- What would be the consequences of a reduction of the river input of nutrients for the eutrophication and the ecosystem structure of the North-Western Black-Sea?
- What are the riverine and atmospheric sources, levels and fates of key organic/inorganic pollutants in the Black Sea environment?
- What are likely to be the short -and long- term consequences of the regulation of river discharge for sediment transport/erosion/deposition and water stratification?
- What is the significance of the Black Sea source of important key greenhouse gases?

The geographical area under study will roughly be the North-Western Black Sea continental shelf (offshore limit at the 200 m isobath, from Sebastopol to Burgas) but processes whose understanding requires an extension of the domain will be examined at

the appropriate scale (e.g. sediment dispersion, methane seepage, hydrodynamical circulation ...).

Main emphasis will be given to the interactions between the Danube river and the Black Sea. However, more specific studies of the other large rivers discharging into the area such as the Dnepr and Dnestr rivers will be carried out especially by the institutions belonging to the riparian countries.

The project methodology will involve the following tasks:

- Analysis of existing data
Many data have been already gathered by the participating institutions. Existing physical, chemical and biological data will be collected and analyzed for their quality and archived in a unique datafile in the EROS data bank. These data will be used essentially to:
 - determine the interannual variability of biogeochemical elements and their long term feature;
 - validate the results generated by the coupled hydrodynamical/biogeochemical models developed by the modelling group of EROS.
- Field work
Cruises will be undertaken to collect data needed to evaluate seasonal variability and to quantify the rate of processes involved in transfers between major biogeochemical compartments (atmosphere, water column, sediments and biota). Results of these investigations will allow to set up and calibrate the different categories of mathematical models described in this project. As far as possible, the cruises will be organized on board research vessels from the region, although western vessels have already been requested to fulfil the objectives of the project. At the moment two cruises for 30 days are planned in the north-western Black Sea and two 45 days cruises in the Delta and Danube river during periods of contrasted river discharge and biological production. Furthermore altimetric data will be collected and analyzed from existing (NOAA-AVHRR) and new (SeaWiFS) satellite images.
- Training activities
It is intended to organize a field training course in the North Western Black Sea and to train young romanian, bulgarian, russian and ukrainian scientists in the western institutions.
- Numerical experimentation
Coupled hydrodynamical-biogeochemical models of various complexity levels will be developed to simulate biogeochemical cycles in the North Western Black Sea and to predict the ecosystem functioning in response to several policies of nutrient reduction scenarios by the Danube river. Model results will be compared with field data. From this comparison, new research topics will be identified to improve the mathematical description of key processes. This goal will be achieved by establishing a continuous dialogue between field and process-oriented experimenters and modellers.

The EROS 2000 project is intended to represent a pan-european contribution to the LOICZ Programme (Land-ocean Interactions in the Coastal Zone) within the International Geosphere-Biosphere Programme (IGBP); it will allow to investigate the significance of coastal zone processes for global biogeochemical cycles and global change.

In addition, the EROS 2000 project will provide the informations required to resolve management uncertainties. The scientific informations supplied by the EROS 2000 project will contribute to the development of comprehensive and coordinated plans for the restoration, conservation and management of living natural resources in the region.

In order to better integrate scientific and management issues, a close coordination mechanism will be established between the EROS 2000 project and the more management oriented projects implemented in the region (GEF-Black Sea Programme, Environmental Programme for the Danube river Basin, etc.).

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Functional analysis of European wetland ecosystems (FAEWE) (Phase II) Contract n° EV5V-CT94-0559)

Phase I of the FAEWE (Functional Analysis of European Wetland Ecosystems) project (Contract STEP-CT90-0084, see ERN n° 12, December 1993) has enabled considerable scientific advancement to be made towards understanding process dynamics and the use of the improved science base in developing a methodology for wetland functional analysis.

This second phase will capitalize on the achievements of Phase 1, to resolve questions arising from this work and enlarge its scope by extension to the catchment scale and applying the work more directly to EC environmental policy. Natural and man-made environmental changes and socio-economic variables will be integrated into the functional analysis procedures for wetland ecosystems, in particular targeted towards river corridor systems.

The following tasks are included in Phase 2 of the project:

- investigation of the effects of environmental change on processes operating in river marginal wetland ecosystems and their linkages to functioning, developing further the knowledge base established in FAEWE phase 1;
- confirmation of the key biological and physical environmental indicators as measures or predictors of environmental change in wetland ecosystems and evaluation of their sensitivity in relation to ecosystem functioning at a variety of scales from site level to the entire catchment;
- integration of the evaluation of the effects of environmental change, resulting from both anthropogenic and natural disturbance, into the system of functional analysis as a means of consolidating findings to date;
- integration of socio-economic criteria in the functional assessment methodology, facilitating the formulation of sustainable development strategies for river marginal wetlands; and
- establishment of a GIS format for the representation of wetland ecosystem functioning at site, catchment and broader scales.

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3. Regional Aspects of Ecosystem Protection

BINOCULARS: Biogeochemical nutrients cycling in large river systems (Contract n° EV5V-CT94-0495)

During their transfer from land to sea, nutrients are involved in very active processes which lead to their transformation, immobilisation or elimination. However, human management has resulted in a considerable reduction of riparian interactions altering the retention capacity of the river systems. This is the main cause of the increase of nutrient contamination and coastal eutrophication problems.

The project will therefore focus on the development of a coupled hydrological-ecological mathematical model which will take into account the role of hydrological annexes and riparian zones in the overall functioning of river systems. This model will be used to study the relationship between nutrient levels and fluxes in response to hydraulic and land management in the watershed. The model will be tested on 7 European river systems (Exe, Severn, Aliakmon, Seine, Loire, Scheldt, Rhine) which are representative of various climatic conditions, and which are differing by their hydrological regime, the size of their basin area, the degree of management and land use in the watershed.

For each river system a data base specifically adapted to the structure of the model will be constituted with both published data or data gathered in the course of the project. Field and laboratory experiments will be carried out on ecological processes in order to increase the validity of the model in view of its ability to reproduce the present situation in the different river systems. Then the model

will be used to test the effects of previous human impacts (including hydraulic management, land use changes, urban development) on the ecological functioning and nutrient transport. This retrospective use of the model will help to define scenarios of future management of the hydrological landscape.

The approach proposed in this project will contribute to the scientific basis for a European policy of integrated river management aiming at improving the water quality of surface waters and of coastal zones.

Further information can be obtained from the project coordinator
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4. Aquatic Ecosystems

Final results of the project

A standardized approach for investigations of the vulnerability of a Mediterranean benthic ecosystem (Contract EV5V-0101-F)

The project has been developed, in cooperation, by:

- Centre d'Océanologie de Marseille, Station Marine d'Endoume, Marseille (F);
- Université de Marseille, Laboratoire d'Hydrobiologie et Molysmologie Aquatique, Marseille (F);
- Università di Catania, Istituto Policattedra di Oceanologia e Paleoeologia, Catania (I);
- Greek National Center for Marine Research, Athens (GR).

The objectives of the project were:

- to develop/improve/test a methodology for *in situ* chemical and biological regeneration of altered benthic sediments;
- to separate general from local physical, chemical and biological phenomena;
- to identify critical processes governing regeneration, and synergistic effects within benthos regeneration;
- to identify data treatments and indices allowing the quantification of benthic responses on their surrounding aquatic environment including pollution.

The experiments carried out in three Mediterranean countries (France, Italy, Greece) under similar conditions show that the placing of polluted sediment in experimental modules does not fundamentally alter their behaviour with regard to environmental factors.

Chemical change occurs both in solid phase and in interstitial water. It depends mainly on the nature of the organic load, particle inputs involving granulometric and chemical alterations and the interactions between the surrounding medium and the content of the modules, governed for the most part by climatic, hydrological and biological factors.

Biological change is evidenced by the very rapid colonization of the sediment in experimental modules. The dynamics of these newly-settled populations is not dependent on the chemical composition of the sediment used in the experiment. The sediment from the polluted site tends to develop chemical and biological characteristics that are very similar to those of the experimental and natural reference samples from the experimental site.

Exchange through the sediment-water interface and the resulting elimination of the contaminant load are related to the bioturbation processes, which are the main mechanisms involved in regeneration of polluted sediments.

The duration of the experiment and frequent sampling over a period of more than an annual cycle make it possible to determine most of the phenomena that result finally in the steady state.

The multiplicity and synergetic effects of the various factors of chemical and biological kinetics mean that a wide range of param-

eters need to be studied, while restricting them to those that best explain the fluctuations in the experimental medium and the development of the steady state.

Even if one particular factor might play a determining role at a given moment, the state of the medium is the result of the whole set of reactions that take place there. Only by analysis based on a wide variety of parameters is it possible to investigate the combined effect of these reactions and to determine which factor plays the dominant role at any stage in the process of change.

While we cannot claim to have provided the answer to all the questions facing the managers of the coastal environment, the method of investigation presented here, which is cheap and simple to put into practice and is based on natural environmental processes, can provide valuable information on the duration, the stability and the processes involved in the regeneration of sediment exposed to short-term or chronic pollution.

In addition, this technique constitutes an effective tool for the predictive study of both the immediate and long term effects of accidental pollution, using artificially contaminated sediments.

Modelling Phaeocystis blooms, their causes and consequences (Contract STEP-CT90-0062)

The project has been developed jointly by:

- Université Libre de Bruxelles, Groupe de Microbiologie des Milieux Aquatiques, Bruxelles (B);
- IFREMER, Centre de Nantes (F);
- Cranfield University, International Ecotechnology Research Centre, Bedford (UK);
- Water Quality Institute, Hørsholm, (DK);
- Netherlands Institute for Sea Research, Den Burg/Texel (NL);
- Institut für Meereskunde an der Universität Kiel (D);
- Niedersächsisches Landesamt für Ökologie, Forschungsstelle Küste, Norderney (D);
- Unité de Gestion du Modèle Mathématique de la Mer du Nord et de l'Estuaire de l'Escaut, Bruxelles (B).

The project was aimed at developing an integrated framework, involving natural and socio-economical sciences, contributing to solve the eutrophication problem of the continental coastal waters of the North Sea, characterised by the massive bloom of the undesirable colony-forming *Phaeocystis* alga.

The project comprised the following research steps:

- Execution of synchronised seasonal field surveys on the development of *Phaeocystis* blooms along the coastal areas of the southern North Sea between France and Denmark in relationship to macronutrient inputs.
- Experimental and field investigations of the biological mechanisms determining the wax and wane of *Phaeocystis* blooms, including successional studies of diatoms and *Phaeocystis*, temperature and light adaptation of diatoms and *Phaeocystis*, autolysis of phytoplankton cells and colonies, grazing by protozoa, copepods and zooplankton on *Phaeocystis*, sinking behaviour of *Phaeocystis*, role of phosphate and nitrate limitation in *Phaeocystis* growth experiments.
- Establishment and calibration of a suite of mathematical models describing biogeochemical transfers of nutrients and organic matter along the aquatic continuum, from land to North Sea:
 - a conceptual drainage network model to be applied to the different rivers discharging into the SE North Sea;
 - an ecological box model describing the development of *Phaeocystis* blooms along the continental coastal waters of the Channel to the North Sea;
 - a two-dimensional fine-resolution hydrodynamic model;
 - a two-dimensional ecological model describing the fate of *Phaeocystis* blooms along the Channel and the North Sea.
- Establishment of a prototype socio-economical model of the Scheldt River basin through the coupling of the drainage network model (ecological model of the river system) with a dynamic spatial socio-economic model of Belgium.
- Exploration of the impacts of several policies (land use and waste water treatment) applied to the different watersheds on the eutrophication level of the continental coastal waters of the North Sea.

An ecosystem approach to understanding pollutant inputs, algal blooms and mucilage problems in the Adriatic Sea (Contract STEP-CT90-0061)

The project has been executed in cooperation by:

- ANSALDO Industria S.p.A., Genova (I);
- Queen Mary and Westfield College, University of London (UK);
- Centro per lo Studio e il Monitoraggio dell'Ambiente Padano-Adriatico (COMPA), Bologna (I);
- Mott MacDonald Civil Ltd., London (UK) (Consultant).

The objectives of the project were:

- to investigate the processes underlying algal growth and mucilage formation in the northern Adriatic Sea;
- to develop/improve an ecosystem model for coastal waters of the northern Adriatic Sea;
- to identify climatic scenarios for the Po River - northern Adriatic basin.

The mechanisms of mucilage formation were studied through in field and laboratory experiments.

The factors which cause mucilage production are not necessarily the same as those which control mucilage aggregation, which is principally influenced by the concentration of divalent cations, particularly calcium. Aggregation of mucilage increased markedly with temperature in both static and mixed cultures.

Small enclosure experiments in the natural environment and laboratory experiments showed nitrogen to be the primary limiting nutrient whereas phosphorous limitation became detectable in late July 1992 only.

The C:N ratio of the seston in all field surveys was higher than the Redfield Ratio; the N:P was lower. In either case was the deviation strong enough to clearly indicate nutrient limitation.

Using *Skeletonema costatum*, isolated from the Adriatic Sea in April 1993, it was shown that the principal stimulant of mucilage production is nitrogen. Phosphorous limitation caused less mucilage production and light limitation the least mucilage production.

A mesocosm deployed in the northern Adriatic Sea in July 1992 showed that isolating portions of the water column from advective transport raised surface chlorophyll concentrations, decreased light penetration and increased the rate of succession from diatoms to dinoflagellates.

In 1993 diatoms were dominant during all four field surveys. Algal biomass in 1993 was lower than in 1992, with chlorophyll-a maxima of ca. 12mg/l and 60mg/l, respectively. Primary productivity measurements showed that the phytoplankton was shade adapted. Measurements of oxygen evolution and water column respiration indicated that the coastal waters of the northern Adriatic Sea oscillate between oxygen surplus and deficit. Bacterial densities in 1992 and 1993 were less variable than chlorophyll concentrations and similar to the seawater average of 10^{-6} 10^{-7} /ml.

Laboratory experiments showed that bacterial mucilage production was insignificant compared to that of *Skeletonema costatum*.

Satellite imagery revealed no clear differences in weather pattern between the years 1985-1992, as measured by the number of clear days from March - August.

Conditions for the development of stable mucilage aggregates in the northern Adriatic are likely to occur in the following sequence:

- low flow in the Po River leads to the onset of nutrient limitation offshore;
- mucilage production by nutrient limited phytoplankton;
- stable hydrographic conditions (this is consonant with low river flows) allow the development of large aggregates under conditions of low $[Ca^{2+}]$;
- hydrographic mixing causes stabilisation of the aggregates on contact with full seawater and its higher $[Ca^{2+}]$.

An Ecosystem Model for the coastal waters of the northern Adriatic Sea has been developed to help predict the incidence and severity of spring and summer phytoplankton blooms, and their impact on dissolved oxygen concentrations in the water column.

As a result of the field and laboratory studies, the Ecosystem Model includes key processes to stimulate the effect of variation in surface and underwater light on phytoplankton growth and photo-acclimation, which is modelled as adaptive changes in the carbon:chlorophyll-a ratio as a function of irradiance history as well as actual growth; the effects of changes in temperature and salinity on maximum specific growth rates; and the effects of concentrations.

The model includes also submodels to simulate nutrient interactions, with variable cell nutrient quota, and various processes which affect dissolved oxygen level, including exchange of the water-air interface and benthic oxygen demand.

A land-based marine mesocosm was constructed and inoculated with *Skeletonema costatum* isolated from the Adriatic to obtain data for calibrating parts of the Ecosystem Model.

Different weather regimes over the northern Adriatic Sea and the meteorological variability of the winter season have been clearly identified and studied. There are two kinds of anomalous conditions, one involving the precipitation field and the other one to large scale circulations. In both cases, the northern Adriatic Sea is potentially suffering a major algal bloom in the summer. Algal blooms are observed only when anomalous winter seasons in the precipitation field are not followed by anomalous spring and summer precipitation, as for instance 1992.

Major anomalies in the precipitation field can be induced by large scale flows, although these vents are not considered as very likely.

The conclusion is that anomalous precipitations are "local" in character, i.e. the decrease of average precipitation observed during winter 88/89 and 89/90 are not induced by large scale anomalous flows, rather they fall within the natural variability of the climate of the Padana Region.

An integrated approach to the development and validation of ecologically relevant toxicity tests for the impact of poorly water-soluble compounds on aquatic ecosystems (Contract EV5V-CT91-0009)

The project has been developed jointly by:

- Universidade de Coimbra, Dept. de Zoologia, Coimbra (P);
- University of Stirling, Institute of Aquaculture, Stirling (UK);
- University of Sheffield, Dept. of Animal and Plant Sciences, Sheffield (UK);
- Instituto Nacional de Engenharia e Tecnologia Industrial, Lisboa (P);

with the following objectives:

- development and application of "modular" toxicity tests in a simple flow-through system to assess the toxicity of poorly water-soluble substances on physiological and biochemical endpoints of aquatic organisms;
- development of a predictive ecotoxicology model representing toxic effects of chemicals on the physiology and biochemistry of organisms;
- validation of model predictions with results from laboratory toxicity experiments.

The following main results have been achieved:

- A simple, yet novel flow-through system was designed, which was used to examine the toxicity of two compounds: 3,4-dichloroaniline, which is of intermediate water solubility, and chlorpyrifos, which is poorly water-soluble. The system was composed of a series of independent channels each consisting of a test chemical reservoir connected to an exposure chamber via a peristaltic pump. The system avoided the need for a costly and complex mixing apparatus by isolating the mixing and spiking processes from the delivery system. Exposure chambers were customised from a simple standard design to suit the particular requirements for each test organism, using inexpensive materials.
- In all tests, standard media were employed. Artificial water (Elendt M7) was used routinely as both culture and test medium. An artificial/formulated sediment was developed composed of clay, peat and sand, based on an OECD standard soil recipe. This artificial sediment compared favourably with natural sediment as a substrate for sediment-dwelling organisms, and had the additional advantage of allowing controlled manipulation of test compound bioavailability.

- Techniques for the preparation and delivery of exposure media (water and sediment) were explored using both compounds. 3,4-dichloroaniline could be successfully prepared and delivered without carrier solvent, and in general partitioned 50/50 between water and sediment. In marked contrast, preliminary work with chlorpyrifos indicated that stable exposure concentrations could only be achieved by the use of a carrier solvent (propan-2-ol). In general, using this method, almost all (ca. 98%) of the chlorpyrifos partitioned into the sediment.

- A series of modular tests was devised, encompassing the major aquatic microhabitats viz. the surface layer (or neuston), water column and sediment.

A test was designed, using water-column dwelling sac fry of the goldfish *Carassius auratus* (Comet variety). Tests were run with sac fry in the flow-through system for each of the above mentioned compounds.

A test was designed using 2nd instar larvae of the sediment-dwelling midge *Chironomus riparius*. Tests were run with four day-old larvae in both static and flow-through systems with and without sediment.

In addition to standard *Daphnia magna* tests with each of the test compounds in static systems, tests of varying duration were run in the flow-through system with and without suspended algal cells in the test medium.

A test was designed using 1st instar larvae of the mosquito *Aedes aegypti*. These larvae, which live in the water surface layer and the water column, were used to develop a static exposure test using both compounds.

- In addition to a series of range-finding tests using lethality as an endpoint, nonlethal physiologically-based endpoints were chosen, based on the toxic effects of test compounds on energy metabolism.

For *Carassius*, yolk utilization and oxygen consumption were examined as potential nonlethal endpoints.

For *Daphnia*, in addition to the standard nonlethal endpoint of reproductive inhibition, an examination was made of growth and enzyme activity (for enzymes linked to energy metabolism).

For *Chironomus*, growth in both length and wet/dry biomass was examined as a potential nonlethal endpoint.

For *Aedes*, nonlethal endpoints based on growth and developmental rate are currently under development.

- A mechanistic model was constructed, using *Daphnia*, which described the effects of toxic chemicals on physiological performance, in relation to the above processes of resource acquisition and allocation. Key model assumptions were validated by a series of laboratory experiments (carried out in conjunction with linked Contract B/STEP913010) using different life stages of *Daphnia magna*. The conceptual model, which exhibited considerable biological realism without sacrificing simplicity, was used to develop a computer simulation model, which could be used to make testable predictions of nonlethal effects of the type described above.

- Nonlethal endpoints were obtained from tests with 3,4-dichloroaniline in both static and flow-through systems. An observed similarity in lethal response among the test organisms was not reflected in nonlethal endpoints for this compound: the sediment-dwelling *Chironomus riparius* was considerably less sensitive than either *Daphnia* or *Carassius* in terms of physiological performance endpoints.

- In contrast to 3,4-dichloroaniline, great differences in lethal endpoints were observed among the test organisms exposed to chlorpyrifos. *Carassius* proved several orders of magnitude less sensitive than the invertebrate species tested, although it should be emphasised that this compound was extremely toxic to *all* organisms tested. The greater sensitivity to chlorpyrifos exhibited by the invertebrates is likely due to the acetylcholinergic mode of action of this compound (typical of organophosphates), to which arthropods are particularly sensitive.

In general, these results clearly demonstrate the importance of considering routes of exposure and bioavailability in assessing the ecotoxicity of test chemicals, particularly when considering poorly water-soluble, biodegradable, volatile or other so-called difficult substances.

Sediment toxicity tests for poorly water-soluble substances (Contract MAST-CT91-0080 within the STEP-Programme)

The research work has been carried out in cooperation by:

- Water Research Centre (WRc plc), Medmenham (UK);
- Rijkswaterstaat, Tidal Waters Division, Middleburg (NL);
- Institute for Inland Water Management and Waste Water Treatment (RIZA), Lelystad (NL);
- Rijkuniversiteit Utrecht, Beheerscluster Organismale Zoölogie, Utrecht (NL);
- Universität Hamburg, Institut für Hydrobiologie und Fischereiwissenschaft, Hamburg (D);
- Instituto Português de Investigacao Maritima (IPILAR), Lisboa (P).

The project was aimed at:

- the establishment of practical methods for preparing stock solutions of poorly-soluble substances and for spiking such solutions into sediments;
- the development and intercalibration of standard methods for assessing the toxicity of sediment-bound insolubles to marine and freshwater infaunal invertebrates;
- the preparation of draft standard test guidelines from the results of the above activities.

The following main results have been achieved:

- Toxicity test protocols were developed for the estuarine amphipod *C. volutator* and the freshwater midge larvae, *C. riparius* both of which are infaunal in habit. Two ring tests were performed with the model substances lindane and PCB118. Both test protocols gave repeatable and replicable results in different laboratories over time when exposed to lindane-spiked sediments. For the second ring test the coefficient of variation for the *C. volutator* test was 25% and for the *C. riparius* test was 12,85%. Both tests will therefore be submitted to the appropriate bodies as draft standard guidelines. LC₅₀ values were not obtained with PCB118 at the concentrations tested.
- A protocol was developed for the exposure of the freshwater bivalve *S. corneum* to sediment-bound insolubles and the subsequent measurement of the detoxification enzyme glutathione-S-transferase (GST). No significant results were achieved throughout the programme and so the use of this test will not be recommended further. The anoxia stress test, also developed for *S. corneum*, shows promise at this stage and should be investigated further.
- Further developmental work is required before the sediment-spiking protocol developed can be submitted as a draft standard guideline. Variability in spiking efficiency was found at different times and in different laboratories even though the same protocol and sediment from the same source was used on each spiking occasion. This may have been due either to the inadequacy of the protocol or small changes in physico-chemical characteristics of the sediment over time.
- Mutagenicity tests have been developed for BA9 and BA13 strains of *S. typhimurium* and performed on sediments spiked with benzo(a)pyrene and 1-nitropyrene. The tests were less sensitive than those carried out with pure compounds or sediment extracts. Further work is recommended.

Prediction of toxic effects in freshwater ecosystems: Validation of multi-species tests in lake and river mesocosms (Contract EV5V-CT91-0010)

The project has been developed, jointly, by:

- Shell Research Limited, Sittingbourne, UK;
- Fraunhofer Institut für Umweltchemie und Ökotoxikologie, Schmallenberg, D;
- State University of Ghent, B;
- University of Wales College of Cardiff, UK.

The following objectives were set:

- to develop and establish multi-species laboratory toxicity tests with freshwater organisms based upon predator-prey and competitor interactions;
- to evaluate the test procedures using selected reference chemicals;
- to validate the laboratory procedures by comparison of threshold toxicity values obtained using them with those determined in multi-species stream and pond mesocosms.

Laboratory multi-species toxicity tests have been developed by the Universities of Wales and Ghent based on predator-prey and competition interactions. In particular prey capture rates and population development with the cnidarian, *Hydra oligactis* (predator) and the cladoceran, *Daphnia magna* (prey) and with the copepod, *Acanthocyclops robustus* (predator) and the rotifer, *Bachionus calyciflorus* (prey).

Competition for food and associated effects on growth and population development with the amphipod, *Gammarus pulex* and the isopod, *Asellus aquaticus* and with the cladoceran, *Daphnia magna* and the rotifer, *Brachionus calyciflorus*.

Concentrations affecting these interactions have been determined for reference chemicals; copper, lindane and 3,4-dichloroaniline (3,4-DCA).

Small (300 l) microcosms have been established by the Fraunhofer Institut for assessing the effects of chemical exposure on communities of periphyton, phytoplankton, zooplankton and macroinvertebrates. The effects of lindane and copper on the communities were evaluated following 1-2 week exposure periods.

The range of endpoints which can be evaluated in artificial streams at Shell Research has been extended to include effects on species interactions, pool communities (including zooplankton and phytoplankton) and growth and early life stages of fish. The effects of 3,4-DCA on the artificial stream community has been assessed.

The results have led to the following conclusions being achieved:

- Effects of reference chemicals on predator-prey and competitive species interactions have been demonstrated by the Universities of Wales and Ghent.
- The sensitivity of the multi species tests to the reference chemicals was not greater than that of the single species test developed in CEC contract EV4V-0110-UK(BA).
- Indoor microcosms at the Fraunhofer Institut have been shown to provide a sensitive test system for assessing effects on phytoplankton, periphyton, zooplankton and invertebrate communities. A comparison with complex outdoor pond mesocosms shows comparable sensitivity but with the advantage of allowing all year round testing with lower resource demands.
- Modifications to the Shell Research streams and the development of new sampling techniques have enabled effects on an extended range of endpoints to be examined. The effect concentrations of 3,4-DCA for the extended range of endpoints were within the range obtained in a previous study conducted under CEC Contract Number EV4V-0110-UK(BA).

Phaeocystis blooms in the coastal waters of the North Sea

In the framework of the STEP project on "Modelling Phaeocystis blooms, their causes and consequences" (Contract n° STEP-CT90-0062) a feasibility study has been funded (included in the project) by the EC for assessing the social and economic implications of coastal eutrophication and development of algal blooms in the southern North Sea. The present document gives a summary of the results achieved during the above-mentioned project.

Report of International Ecotechnology Research Centre Cranfield University, Cranfield, Bedford MK 43 OAL England

Element Stocks and Fluxes in the Posidonia oceanica Ecosystem of the Mediterranean

The project, funded under contract STEP 0063-C, focused on the exchanges that take place between and within the organic (living and dead materials) and inorganic (water and sediment) compartments of the Posidonia ecosystem of the Mediterranean. Its major goals were to establish a Box-Flux model of the carbon dynamics in the ecosystem, to quantify nitrogen and phosphorous stocks in its main compartments, and to measure the level and consider the transfer of some trace elements within the ecosystem. Five main topics were considered that are:

- the spatial analysis of the microstructure of Posidonia beds,
- the carbon dynamics in the ecosystem,
- the assessment of mineral stocks and the role of nitrogen and phosphorous in the structure of Posidonia meadows,

- the biological activity of the litter, and
- the levels and dynamics of pollutants (heavy metals).

Further information on these projects can be obtained from:

H. Barth, EC DG XII-D1
200, rue de la Loi - B-1049 Brussels
Fax ++32-2-2963024

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 to the Directorate General XI and to Third-Party Work.

MITO Project

The JRC-Ispra has promoted, a Joint European Project on algal blooms, i.e. MITO Project (Microphyte TOXins (see also ERN n° 8). The project focusses on the characterization of algal blooms in fresh and marine environments, the prediction of toxin-occurrence and the impact on the ecosystem. The project includes the development of fast and easy-to-use monitoring systems (flow-cytometry based) to be used at Community level and will also highlight the processes, involved in Di-Methyl-Sulphide (DMS) production.

As regards the development of fast and easy-to-use systems for the enumeration of phytoplanktonic populations, JRC-Ispra organized an experimental campaign in the central Adriatic Sea (Italy) in June 1994. The main goal was the study of the horizontal pigments comparing classical (microscopic inspection) and innovative (flow cytometry) methods of analysis. The quantification and identification of phytoplankton in sea waters were carried out by a flow cytometer Partec PAS III, a portable instrument and by fluorescence microscopy on fresh (live) samples. The campaign was carried out in collaboration with Partec Industry and Munster University (Germany) and the Istituto Ricerca Pesca Marittima (CNR-Ancona).

As regards the production of DMS in aquatic environments, the JRC is carrying out a study project to identify and describe source and sink processes for DMS in freshwater lakes (e.g. lakes Varese, Monate and Maggiore). Particular attention is paid to the algal component, as biogenic DMS source, studying the phytoplankton autofluorescence and total biomass by flow cytometric techniques. The chosen lake may also allow to compare the bacterial DMS source of aerobic and anaerobic conditions.

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. As regards the implementation of the new Ecological Directive relating water surface bodies, the JRC is carrying out a project for the definition of uniform criteria for the minimum vital flow of running waters in order to guarantee a long-term safeguard of natural conditions of waterbodies, the occurrence of natural and undisturbed biocenosis and the maintenance of a good ecological quality of running waters in Member States. The project will define environmental quality classes in relation to the water status and protection needs of biotopes and, finally, will set up reference values for different European ecoregions.

Work for Third Parties

Within a contract (n° 18597 of August 25) with the Provincia of Varese the safeguarding plan and prevention of pollution schema (including restoration) and the rational management of lake Varese has been set up. Provisional mathematical models have been also applied to evaluate the benefits of the restoration plan.

Further information can be obtained from:

G. Premazzi
Environment Institute, EC-JRC Ispra (VA), Italy
Tel. ++39-332-789266 - Fax ++39-332-789352

Waste

Soil Research at the Environment Institute of the JRC-Ispra

In the frame of the Chemical Wastes Programme a major research is carried out for the assessment of mobility of contaminants in soil.

In order to provide data for assessing the fate and transport of PCBs in the environment, sorption on soil constituents (K_d), the bioaccumulation (BAF), the partition between octanol and water (K_{ow}) for a number of PCBs congeners has been studied extensively. In order to approach reality in these investigations we have used PCB mixtures in the experiments rather than single congeners. In the environment PCBs are always present in complex mixtures and important processes such as adsorption, evaporation, bioaccumulation proceed to equilibrium states where interactions between the single congeners cannot be excluded. The key to obtaining meaningful congener specific data when using complex PCB mixtures in these studies has been thorough investigations of new stationary phases for the separation of PCB congeners by high resolution gas chromatography.

Another group of important contaminants in chemical waste are *surfactants*. In the recent years, *surfactants* are receiving considerable attention due to their solubilizing effects on hydrophobic compounds. Apart from concern over the environmental fate of surfactants *per se*, their interest stems from principally two opposite appreciation's:

- The utilisation of the strong solubilizing effects by aqueous solutions of surfactants above their critical micellar concentration (CMC) in contaminated soil remediation by aiding desorption and/or biodegradation of the relatively water insoluble organic contaminants and
- the potential of surfactants at concentrations below their CMC to facilitate unwanted transport of other hazardous chemicals in the environment. The importance of soil components like organic carbon content, clay, sand, silt and soil properties like cation exchange capacity (CEC) and pH, on the partition-like interaction of hydrophobic compounds with different classes of surfactants i.e. anionic, non-ionic, and cationic, in soil-water systems has also been studied.

The results of our recent studies on hexachlorobenzene and polychlorinated biphenyl's (PCBs) underline the potential of surfactants, at concentrations below their CMC, on mobilising otherwise strongly sorbed hydrophobic compounds in soil-water systems. For soils which do not interact with the surfactant a four-phase distribution model satisfactorily describe the soil/water/surfactant monomer/surfactant micelle interactions, similar to a three-phase distribution model developed for the water solubility enhancements of hydrophobic compounds by surfactants.

Further information can be obtained from:

A. Payá Pérez
Environment Institute, EC-JRC Ispra (VA), Italy
Tel. ++39-332-785414 - Fax ++39-332-789328

Information

Environmental management association branches out. EEMAA becomes EEMA

Less than one year after its foundation in Varese in October 1993, the European Environmental Management Alumni Association (EEMAA), had evolved into a fully professional body by welcoming members other than Alumni for the first time and, simultaneously, dropping the word "Alumni" from its title. The amendment has enabled the Association to invite those who have demonstrated a commitment to Environmental Management to join the Association as Affiliate Members. This resolution was adopted unanimously at the second General Assembly, held in Brussels on October 8th 1994, when the Association dedicated itself, more than ever before, to becoming a network for professionals involved in environmental management.

EEMA's growing membership includes the majority of the graduates of the first two years of the Masters degree in environmental management organised by EAEME in a number of universities across Europe. The network of members can be accessed through a database consisting of 130 member profiles which is published in the form of an annual directory, the next edition of which is planned for March 1995.

EEMA publishes a tri-annual journal called EEMA REVIEW which is fast becoming recognised as an important source of pan-European environmental management information. Each issue is built around a theme of contemporary environmental management relevance. The first, on "Multidisciplinarity" was sent to over 1.000 organisations and institutions, whilst the second and third concentrated on the themes of "New Roles and Responsibilities" and "Making it Happen" respectively. Subscription to EEMA REVIEW, with its unique views and approach, is open to all.

As well as holding its own events, EEMA is invited to attend others, such as the European Renewable Energy Conference held in Thessaloniki (October 1994). In order to keep its members up to date,

EEMA has organised a number of conferences, seminars and recycling events. The first was held in Brussels on October 8th 1994, at which F. Roleants du Vivier, director of GLOBE, spoke on the subject of "The driving Forces for Sustainability".

With its first few milestones well behind it, EEMA, invigorated by its new constitution, looks forward to the new and ambitious goals ahead.

Further information can be obtained from:

Karim Zein, Vice President EEMA
39 Bd de Grancy, c/o General Waters
CH-1006 Lausanne
Tel. ++41-21-6177382 - Fax ++41-21-6179015

European Environmental education research database

The European Research and Training Centre on Environmental Education (ERTCEE) of the University of Bradford (UK), is compiling a database of research projects on environmental education in Europe. ERTCEE, which is Europe's reference point for environmental education research, is the result of the up-grading of a research unit established in 1992 as a follow-up to the United Nations Conference on Environment and Development (UNCED). Its aim is to promote research on environmental education in Europe, as well as in developing countries. It also undertake training programmes, organise courses, seminars and workshops on environmental education, with a view of raising the environmental awareness of various target groups.

The new database fulfills one of the main objectives of the Centre, namely the co-ordination of research initiatives in the field of environmental education in Europe and in developing countries. It is hoped that the provision of a point of reference for research projects specifically focusing on environmental education in Europe will contribute to the reduction of overlaps and duplications. The

new database is also expected to guide research priorities and policies in the European Union and Council of Europe in the area of environmental education, to which ERTCEE plays an advisory role.

A preliminary draft of the database will be made public in 1995, when ERTCEE is hosting the European Colloquium on Environmental Education Research, to which researchers from throughout Britain and Europe, as well as officials from the European Union and Unesco are expected to attend.

Further information can be obtained from:

European Research and Training Centre on Environmental Education, University of Bradford
Bradford, BD7 1DP, United Kingdom
Tel. ++44-274-385391 - Fax ++44-274-384231
E-mail: ertcee.bradford.ac.uk

International Institute for Aerospace Survey and Earth Sciences

Postgraduate diploma course

- Rural and land ecology survey 1995
- Forestry for rural development

Postgraduate diploma and MSc degree course

- Forest survey 1995
- Urban survey and human settlement analysis 1995
- Soil survey and applications of soil information 1995
- Geoinformation systems for cadastral, urban and rural applications 1995
- Socio-economic information for natural resource management 1995

MSc degree course

- Rural and land ecology survey 1995
- Environmental systems analysis and monitoring 1995

Further information can be obtained from:

ITC Student Registration Office
Attn. Ms. A. Scheggetman
P.O. Box 6
7500 AA Enschede, The Netherlands
Tel. ++31-0-53874205 - Fax ++31-0-53874238
Telex 44525 itc nl
E-mail: scheggetman@itc.nl

Education and Training Programmes

Centre de Médecine et Hygiène du Travail et de l'Environnement
Ecole de Santé Publique - Université Catholique de Louvain
Certificate (1 year) and Master degree (2 years) in Industrial Toxicology.

A flexible training programme for biologists, physicians, hygienists, research scientists and any one interested in toxicology on the health impact of industrial and environmental pollutants. All the courses are given in french.

Further information can be obtained from:

R. Lauwerys
Centre de Médecine et Hygiène du Travail et de l'Environnement
Ecole de Santé Publique - Université Catholique de Louvain
30.54 Clos Chapelle-aux-Champs
1200 Bruxelles (Belgique)
Tel. ++32-2-7643220 - Fax ++32-2-7643228

Cumulative abridged versions of the 1992/1993 annual reports of the federal environmental agency in english and russian

The Federal Environmental Agency is presenting cumulative abridged versions of its 1992 and 1993 annual reports in English and Russian.

The English- and Russian-language reports, comprising 68 and 74 pages, respectively, provide 16 chapters of information about the agency's activities, research it has commissioned, model projects on green technologies, and literature published.

In publishing the English- and Russian-language annual reports the Federal Environmental Agency hopes that the results they contain will be made use of abroad and that further contacts between staff members of the agency and foreign experts will develop.

Further information can be obtained from:

Umweltbundesamt
Zentraler Antwortdienst
Postfach 330022
14191 Berlin
Fax ++49-30-89032285

Africa and global change

International School - Nairobi (Kenya), 13-25 February 1995

From space-based observation to modelling: a contribution to sustainable development.

Organised by CNES

With the sponsorship and contribution of:

- MEDIAS-FRANCE
- The Kenya Meteorological Department
- The Kenya Department of Resource Surveys and Remote Sensing
- The Kenya National Academy of Sciences
- The University of Nairobi
- The ENRICH Office of the European Commission
- Centre National de la Recherche Scientifique (CNRS, France)
- METEO-FRANCE
- ORSTOM
- The French Ministry of Cooperation
- The French Ministry of Foreign Affairs
- The African Centre of Meteorological Applications to Development (ACMAD)
- The African Academy of Sciences
- The International START Secretariat
- The International Geosphere-Biosphere Programme (IGBP)
- The World Meteorological Organisation (WMO)
- The United Nations Environment Programme (UNEP)
- The International Centre for Research in Agroforestry (ICRAF)
- The International Laboratory for Research on Animal Diseases (ILRAD)
- The Regional Centre for Services in Survey, Mapping and Remote Sensing (RCSSMRS)
- The United Nations Institute for Training and Research (UNITAR)

The Nairobi International School is taking place as part of the MEDIAS Network programme. MEDIAS is aimed at coordinating the development of research activities, observation, modelling, training and data management projects in the Mediterranean Basin and Subtropical Africa regions. Several French institutions established in 1993 a non-profit making, public corporation called MEDIAS-FRANCE, with a view to contribute to the MEDIAS Network activities. The School is also part of the ACMAD (African Centre for Meteorological Applications to Development) programme, which enables the African Meteorological services to contribute to reducing the loss of life and property from the damaging effects of weather-related hazards, and to acquire the scientific knowledge needed to understand the climatic trends having impact on the environment and economy of African countries.

The International School of Nairobi is intended to provide to a selected group of participants: a comprehensive view of the aims and objectives of the major international research programmes devoted to global environmental change (IGBP, WCRP, HDP), with particular emphasis on the most critical issues of relevance to Africa; an update on the most recent advances and results, in particular with respect to satellite observation, numerical modelling, data management, GIS, etc.; and, an opportunity for post-graduate training and for exchange of experience and knowledge with other colleagues from the African continent, with a view to stimulate fur-

the collaboration and design of new projects. About thirty-five African participants (University teachers, researchers, engineers) of graduate/post-graduate level in all disciplines of natural and social sciences will be offered an opportunity to attend during two weeks a series of lectures, conferences and practicals on the issues of global change, and especially its causes and consequences in Africa.

LECTURES

Dynamics of atmosphere and ocean:

atmospheric general circulation, energy budget of the tropical system; ocean circulation, ocean-atmosphere interactions

The water cycle: surface-atmosphere hydrological exchanges; atmospheric water cycle in the tropics

The carbon and trace gas cycles: sources and cycle of minor atmospheric constituents; carbon cycle in the ocean and terrestrial ecosystems

Interactions between terrestrial ecosystems and climate: characteristics and evolution of African terrestrial ecosystems; land cover changes

Coastal zones: coastal processes in Africa

Climate variability: past climate changes at geological time scales; at instrumental time scales; global modelling

Human dimensions: social and economical impacts of global environmental change in Africa; issues of sustainable development

CONFERENCES

- **Climate impacts in Africa** - J. Kinuthia (KMD, Nairobi)
- **Africa and global change** (public event) - S.I. Rasool (JPL, Pasadena)
- **International programmes for global change** - H. Virji (START)
- **European Commission programmes/activities for global change** - A. Ghazi (ENRICH)
- **The activities of ACMAD** - M.S. Boulayha (ACMAD)
- **Can we extrapolate environmental change from local to regional scale in Africa?** - R.S. Reid (ILRAD)
- **Training activities in Africa** - E.A. Mukolwe (KMD)
- **Drought monitoring in Africa** - R.S. Masika (DMC)
- **Sources and impacts of aerosols** - A. Podaire (MEDIAS-FRANCE)
- **Biomass burning** - J.P. Lacaux (Lab. d'Aérodologie, Toulouse) or P. Frost (Univ. of Zimbabwe)

Further information can be obtained from:

MEDIAS-FRANCE
CNES - BPI. 2102
18, Avenue Édouard-Belin
31055 TOULOUSE Cedex - France
Tel. ++33-61-282667 - Fax ++33-61-282905

Establishment of a Marine Habitat and Wildlife Sanctuary for the Gulf Region

Final Report for Phase II

Editors: Eva Feltkamp and Friedhelm Krupp

General objectives of the reporting period

The following general objectives were set for the second phase of the Project, which started in 1991 and has been funded by the EC budget:

- The assessment and monitoring of marine and coastal habitats and biota, which had been initiated during Phase I, continued. Special emphasis was laid on possible longer term effects of the oil spill. The research and development programme continued, it included compilation of resource inventories, physiological and ecological studies on the effects of oil pollution on biota, trial remediation projects and habitat restoration in the Project area. Supportive research programmes on more specific topics were also included.
- Selected intertidal habitats, which have suffered from the oil pollution, were cleaned and restored by contractors of MEPA and IMO at an experimental level, applying methods which are least harmful to the environment. These clean-up operations were monitored by the Project. The ultimate goal is the restoration of the area to pre-war ecological conditions.
- A contingency plan to protect the area from future oil spills was outlined in the framework of Saudi Arabia's National Contingency Plan. Training of Sanctuary personnel in oil spill response started. These activities were coordinated with MEPA and ARAMCO.
- The protection and management plan for the area was further developed and implemented. A specific programme for the training of rangers in a Marine Wildlife Sanctuary was developed and training activities have started.
- A Marine Research Visitors' Centre, which will be built opposite Qurma Island, has been designed and the actual construction work will start soon. It includes exhibits, aquaria, an information desk, a lecture room, research and teaching laboratories, a wildlife rescue unit, offices, workshops, store rooms, outside facilities etc. An extensive educational programme has been initiated. It focuses around the Visitors' Centre and includes lectures, videos, field trips and training courses.
- Scientific and management personnel is being trained in research and surveillance methodologies, environmental education and conservation management.

Further information can be obtained from:

Dr. Friedhelm Krupp, Project Manager
Forschungsinstitut Senckenberg, Senckenberganlage, 25
D-60325 Frankfurt a.M.

Conferences

Conference Announcement

Joint Symposium on "Stratospheric Ozone", May 15-19, 1995, Halkidiki, Greece.

Topics

- Ozone Trends - tropics, mid-latitudes, and polar, total ozone and profile
- Aerosol Observations and Interpretation - includes polar and mid-latitudes
- NO_y Observations, Interpretation and Sources - includes chemical partitioning and sources

- HO_x Observations, Interpretation, and Sources
- ClO_x Observations, Interpretation, and Sources
- Transport and Dynamics
- New Chemistry - includes laboratory and modelling studies of new gas-phase or heterogenous chemistry
- Radiation - includes climate coupling and radiative budget

Organisation:

EC, NASA, WMO, NOAA and IOC/IAMAP

Local Organiser

Prof. C.S. Zerefos
Laboratory of Atmospheric Physics
Aristotle University of Thessaloniki
GR-54006 - Thessaloniki Greece
Tel: ++30-31-998041
Fax: ++30-31-248602
E-mail: 03-symp@olymp.ccf.auth.gr

EC Contact person

G. Amanatidis,
European Commission
DG XII - D-1
200, rue de la Loi
B-1049 Brussels
Tel: ++32-2-2958815
Fax: ++32-2-2963024

25th Annual Meeting of the European Environmental Mutagen Society

Noordwijkerhout The Netherlands, June 18-23, 1995

The EEMS was founded 25 years ago and is focused on the research on mutagenic and carcinogenic effects of chemical and physical agents in man and other organisms also in relation to the (natural) environment. Important aims of the Society are:

- proposing acceptable levels of human exposure to mutagenic agents,
- estimation of genetic risks from exposure of man to mutagenic agents;
- informing government officials, the press and the general public.

The Annual meetings provide an important international forum for the exchange of the newest information in the field.

Sponsored by:

- European Commission (Environment Programme), Brussels, Belgium
- J.A. Cohen Institute, Interuniversity Research Institute for Radiopathology and Radiation Protection, Leiden, The Netherlands
- Shell Nederland B.V., Rotterdam, The Netherlands
- MGC - Department of Radiation Genetics and Chemical Mutagenesis, Leiden University, The Netherlands
- L'Oréal, Clichy, France
- Sandoz Pharma AG, Basel, Switzerland
- Elsevier Science B.V., Amsterdam, The Netherlands
- Central Toxicology Laboratory, Zeneca Ltd., Macclesfield, UK
- Netherlands Society for Toxicology, The Hague, The Netherlands
- Section Genetic Toxicology, Netherlands Society for Toxicology, The Hague, The Netherlands

The meeting consists of plenary lectures followed by parallel symposia and poster sessions.

The tentative list of invited lectures includes:

- 25 Years of Environmental Mutagenesis: Past, Present and Future - B.A. Bridges, UK;
- Mapping of DNA lesions, repair and mutation hot spots - G.P. Holmquist, USA;
- DNA adducts in human carcinogenesis: structure activity relationships and etiological relevance - H. Bartsch, Germany;
- Gaps in our knowledge to estimate genetic risk due to exposure to genotoxins - L. Ehrenberg, Sweden;
- Genetics and cancer - H.J. Evans, UK;
- Inter-individual variations in response to genotoxic agents (detection of susceptible individuals, sub-populations) - D. Scott, UK;
- Oncogenes and tumor suppressor genes - C.F. van Kreijl, The Netherlands;

Symposia will cover:

- Molecular nature of spontaneous and induced mutations in vivo
- Sequence specific DNA damage and repair;
- Biomonitoring (environmental, occupational, chemical and radiation exposures, molecular epidemiology):

- Genetic and cancer risk estimates (methodologies and results; case studies);
- In vitro and in vivo cytogenetics (fluorescent in situ hybridization);
- Transgenic mice systems - and evaluation;
- Antimutagens, effects of combination treatments, oxygen species etc.;
- Transgenerational carcinogenesis;
- Mutagenicity testing - Regulatory point of view;
- Mutagenicity testing - Industrial point of view;
- Bioactivation of carcinogens (implications in testing);
- Eco-genotoxicology;

Further information can be obtained from:

EEMS'95
c/o Leids Congres Bureau
P.O. Box 16065
2301 GB Leiden, The Netherlands
Tel. ++31-71-275299 - Fax ++31-71-275264
E-mail: steenbergen@medicine.leidenuniv.nl

2nd IAWQ Specialized Conference on Hazard Assessment and Control of Environmental Contaminants in Water

The Interface between Environmental Engineering and Environmental Science

Copenhagen (Denmark), 29-30 June 1995

(To be held following the annual meeting of the SETAC-Europe, Copenhagen 25-28 June 1995)

With a universally growing emphasis on preventive and holistic environmental management the integration of environmental engineering and environmental science becomes increasingly important - in particular for the interdisciplinary field of hazard assessment and management of chemical contaminants.

This second IAWQ conference organized by the specialist group on Hazard Assessment and Control of Environmental Contaminants in Water will focus on wastewaters (industrial and domestic) and on leachates (e.g. from dump sites) as the pollution sources and on surface waters (including sediments) as the receiving environment being impacted or considered restored. The important interface between environmental control technology and environmental risk assessment and monitoring will be addressed in particular. Specific topics will include:

- Wastewater (industrial and urban) - minimization, treatment, toxicity reduction, characterization, impact assessment
- Surface water pollution by leachates from waste sites - remedial measures, characterization and risk assessment
- Contaminated sediments - control strategies, restoration, and risk assessment
- Cleaner technology and waste minimization in industry - its link to water quality objectives
- Mutagens in water - detection, risk assessment, and control
- Degradability of chemicals and wastes - characterization and environmental management
- Regulatory approaches - water quality criteria, emission standards, technology standards, chemicals and chemical products
- Environmental economics - valuation of environmental resources as a factor in setting water quality and cleanup goals

Further information can be obtained from:

Dr. Niels Nyholm
Institute of Environmental Science and Engineering
Technical University of Denmark, Bld. 224
DK-2800 Lyngby, Denmark
Fax ++45-45886307

Healthy Buildings '95 an international conference on healthy buildings in mild climate

Milan 11-14 September 1995

The awareness about the problems related to design, construction and maintenance of healthy buildings has greatly grown since 1988

when the first Healthy Buildings conference was organised in Stockholm. The scientific community, the professional association as well as industry and the public administration have shown increased attention to healthy building issues and this in turn has led to investment of resources, research, and discussion about policy and regulation.

Healthy Building '95 will further widen the perspectives of this field of science and focus the attention on transfer of scientific knowledge into professional practice.

Specific objectives of the conference are:

- exchange information between researchers and practitioners
- exchange interdisciplinary information between architects, engineers, hygienists, and medical doctors
- develop common strategies and recommendations for promotion and creation of healthy buildings.

The conference will include sessions with oral presentations, posters, workshops for interactive discussions among the participants, and a technical exhibition.

The topics of interest include:

- Healthy buildings in temperature climates
- Healthy office buildings
- Healthy hospitals
- Heating, Ventilating, Air Conditioning Systems in mild climate: design, operation and maintenance
- Assessment of emissions from construction products
- Controlling indoor exposure to toxic chemicals
- Environmental tobacco smoke
- Radiation in buildings
- The energy-efficient healthy building (workshop)
- Quality assurance and certification of healthy buildings (workshop)
- Economics of "healthy" and "sick" buildings (workshop)
- Indoor Air Quality Guidelines: beyond TLVs? (workshop)
- Policies, public information and regulations (workshop)
- ISTAQ Task Force on: Guidelines for Control of Moisture Problems Affecting Indoor Air Quality
- ISIAQ Task Force on: Guidelines for Conducting Indoor Air Quality Investigations.

More than 300 authors from 50 countries are expected to present papers. Deadline for abstracts is January 31, 1995.

Healthy Buildings '95 is organized by the International Council for Building Research, Studies and Documentation (CIB), International Society of Indoor Air Quality and Climate (ISIAQ) with the scientific and technical support of Università degli Studi di Milano - Institute of Occupational Health "Clinica del Lavoro Luigi Devoto", Politecnico di Milano, International Centre for Pesticide Safety (ICPS) Busto Garolfo, Milano and cosponsored by the European Commission, and other organizations. Healthy Buildings '95 will be held at the Università degli Studi e Politecnico di Milano.

Further information can be obtained from:

Dr. Maria Grazia Colombo
Via Magenta, 25
20020 Busto Garolfo (MI)
Tel. ++39-331-568091 - Fax ++39-331-568023

Working Conference on long-term perspectives for effects of rural land use changes on soil contaminants

Arona (Italy), 8-10 June 1995

Aims

- To assess the possible implications of land use changes on mobilization and immobilization of contaminants in the soil
- To provide a state-of-the-art review of the underlying processes and their modelling, aimed especially at indirect non-linear responses
- To provide a set of guiding principles on management options for policy makers
- To identify important gaps in knowledge requiring research.

Organization

- Joint Research Centre (JRC), European Commission, Ispra, Italy.
- National Institute of Public Health and Environmental Protection (RIVM), Bilthoven, The Netherlands.

Further information can be obtained from:

G. Bidoglio
Environment Institute, Joint Research Centre
I-21020 Ispra (VA), Italy
Tel. ++39-332-789383/789954 - Fax ++39-332-789328

10th World clean air congress and exhibition

Espoo (Finland), May 28-June 2, 1995

The Congress is to be convened by the International Union of Air Pollution Prevention and Environmental Associations (IUAPPA), and hosted by the Finnish Air Pollution Prevention Society (FAPPS).

The Congress will be held at the Dipoli Congress Center in ESPOO, located in the Helsinki metropolitan area, from May 28 to June 2, 1995. The Congress will involve daily plenary sessions and several parallel sessions for oral and poster presentations on all facets of pollution control. The plenary sessions will feature invited key-note speakers representing a broad range of current scientific perspectives and addressing the various session topics.

Key topics for the sessions

A Emissions and Control

- A1 Specific emissions from stationary sources
 - energy production
 - waste incineration
- A2 Specific emissions from mobile sources
 - cars, non-road vehicles and working machinery
 - sea and air traffic
- A3 Control technologies
 - aerosols, SO₂, NO_x, air toxics
 - CO₂ and other greenhouse gases, VOC
- A4 Measurement and monitoring
 - advances in measurement techniques
 - air toxics and aerosols
- A5 Integrated approach to pollution prevention and non-waste technologies
 - pulp, paper, chemical industry
 - mining, minerals, etc.

B Atmospheric Chemistry and Physics

- B1 Instrumentation
- B2 Local air quality
 - gases, aerosols, odour, visibility
 - measurement and monitoring
 - dispersion modelling
 - chemical accidents
- B3 Regional air pollution
 - photo-oxidants, acid deposition
 - measurements, dispersion and chemical modelling
- B4 Stratospheric ozone depletion
 - monitoring techniques
 - stratospheric ozone trends
 - UV-radiation
- B5 Climate change
 - observed variations
 - climate models
 - carbon cycle

C Pollutant Impacts

- C1 Ecological effects of pollutants
 - critical levels of ground level ozone, SO₂ and NO_x
 - bioaccumulating pollutants
 - accidental releases

C2 Climate change impacts

- effects of increased CO₂, on crops and natural ecosystems
- greenhouse gas budgets and fluxes within ecosystems
- from national to global scale

C3 Plant response to increased UV-radiation

C4 Human responses

- health effect assessment and control strategies
- annoyance reactions to outdoor air pollution
- health effects of smog episodes, urban pollutants, UV-radiation, point and mobile sources
- health effects in developing countries
- human exposure and risk assessment

C5 Material effects

D Pollution Management

D1 Air quality management on the local level

- air pollution monitoring, indices and warning systems
- air quality and urban traffic planning

D2 Regional pollution control strategies

- results of national air pollution prevention policies
- transboundary environmental impact assessment
- waste minimization

D3 Tools for pollution prevention

- national guidelines and legislation
- international guidelines and conventions
- economic instruments, bubbles
- voluntary agreements and industry initiatives
- environmental management policies and their tools, e.g. auditing, life-cycle analysis
- green accounting

D4 Combined management of air, waste and water pollution

D5 Mitigation of, and adaptation to, air pollution and climate change

Further information can be obtained from:

Ms. Merja Tolvanen
P.O. Box 57
FIN-02151 ESPOO, FINLAND
Fax 358-0-4567022

CO₂ - A challenge for mankind

On 20th/21st April 1995, the University of Berne will be hosting an interdisciplinary symposium on the problems relating to CO₂. An international circle of highly qualified speakers will participate. The General Ecology Committee of the University of Berne is in overall control.

The symposium will be pursuing the following goals:

- Research findings from natural and social sciences
- Discussion of the actions required
- Measures and their implementation in politics, economy and society.

The programme will cover:

- CO₂ and climate
- Effects on plants
- Effects on mankind
- Response strategies
- Implementation possibilities

Further information can be obtained from:

Lic. phil. Catherine Kost, Sabine Tschäppeler
Systematic-Geobotanical Institute, University of Berne
Altenbergrain 21, 3013 Berne
Tel. ++41-31-6314940 - Fax ++41-31-3322059

Global Analysis, Interpretation, and Modelling

The First GAIM Science Conference

25-29 September 1995

Garmisch-Partenkirchen, Germany

GAIM is an Activity of the International Geosphere-Biosphere Programme (IGBP)

The first GAIM Conference focuses upon:

- analysing current models and data,
- interpreting the capability of current models and experimental programmes against the demands for knowledge and,
- synthesizing our understanding of the global biogeochemical cycles and their links to the hydrological cycle and, more generally, to the physical-climate system as a whole.

Further information can be obtained from:

Prof. Dr. Berrien Moore II
Chair of GAIM Task Force

Dr. Dork Sahagian
GAIM Task Force Officer
Institute for the Study of Earth, Oceans and Space (EOS)
University of New Hampshire, Morese Hall
39 College Road
Durham, NH 03824-32525, USA
Tel. ++1-603-862-1766 - Fax ++1-603-862-1915
E-mail: gaim@unh.edu

Healthy Buildings '95

Milano, 11-14 September 1995

Organized by:

- International Council for Building Research, Studies and Documentation
- International Society of Indoor Air Quality and Climate

with the scientific and technical support of

- Università degli Studi di Milano - Institute of Occupational Health "Clinica del Lavoro Luigi Devoto"
- Politecnico di Milano
- International Centre for Pesticide Safety - Busto Garolfo, Milano

Specific objectives of the conference are:

- exchange information between researchers and practitioners
- exchange interdisciplinary information between architects, engineers, hygienists, and medical doctors
- develop common strategies and recommendations for promotion and creation of healthy buildings.

The location of the Conference in a South European country will provide the opportunity to discuss healthy issues of mild climate.

The conference will include sessions with oral presentations, posters, workshops for interactive discussions among the participants, and a technical exhibition.

The scientific programme covers:

- Healthy buildings in temperate climates
- Healthy office buildings
- healthy hospitals
- Heating, Ventilating, Air Conditioning Systems in mild climate: design, operation and maintenance
- Assessment of emissions from construction products
- Controlling indoor exposure to toxic chemicals
- Environmental tobacco smoke
- Radiation in buildings
- The energy-efficient healthy building
- Quality assurance and certification of healthy buildings
- Economics of "healthy" and "sick" buildings
- Indoor Air Quality Guidelines: beyond TLVs?
- Policies, public information and regulations
- ISIAQ Task Force on: Guidelines for Control of Moisture Problems Affecting Indoor Air Quality
- ISIAQ Task Force on: Guidelines for Conducting Indoor Air Quality Investigations

Further information can be obtained from:

Dr. Maria Grazia Colombo
International Centre for Pesticide Safety
Via Magenta, 25
20020 Busto Garolfo (MI), Italy
Tel. ++39-331-568091/499371-2 - Fax ++39-331-568023

International Symposium SAMO '95

Theory and applications of Sensitivity Analysis of Model Output in computer simulation

Hotel Villa Carlotta, Belgirate (Italy), 25th-27th September 1995

Organised by
European Commission DGXII/F, RTD Action Energy

and by the
Joint Research Centre, Environment Institute

The objective of the symposium is to bring together people from different disciplines involved in practical and theoretical aspects of sensitivity analysis and to review the present state of the art. Sensitivity Analysis of Model Output (SAMO) investigates the relative importance of input model parameters in determining model predictions. This usually involves numerical experiments performed on computational models. SAMO is often performed together with, or as part of, uncertainty analysis, whereby the uncertainty in model predictions is characterised. It can also be used for screening active factors in systems with many uncertain parameters. SAMO may be crucial in model verification and quality assurance, model calibration in the presence of uncertainties, and model comparison and benchmarking.

Sensitivity analysis can be applied to all branches of modelling and computer experiments. Its development is very much application driven. New strategies for numerical experiments in SAMO are being put forward by mathematicians and statisticians, as well as from chemists, physicists, engineers and economists.

The symposium is intended as a cross-fertilisation exercise, bringing together scientific communities active in SAMO and in its field of application from different disciplines and countries.

The symposium is organised by the European Commission, DG XII/F5, Nuclear Fuel Cycle - Radioactive Waste, and by the Environment Institute of the Joint Research Centre. The provisional outline of the conference sessions is:

- Identifying active factors in large batches. Sampling strategies and parameter screening
- Importance measures, Fourier Amplitude Sensitivity Test and sensitivity indices
- Correlation/regression based techniques and response surface replacement

- Other strategies for sensitivity analysis, eg FORM (reliability analysis applied to SAMO), differential analysis, two sample tests, sensitivity analysis for stochastic differential equations,...).

Further information can be obtained from:

A. Saltelli
JRC - TP 325 - Environment Institute
I-21020 Ispra (VA), Italy
Tel. ++39-332-789696 - Fax ++39-332-785466

International Conference on Environmental Pollution

Budapest, 15-19 April 1996

Following the tradition of the ICEP series of conferences, ICEP.3 has two major objectives: assessment of the impact of research results and policy measures on the alleviation of environmental degradation; and to provide a common forum on which discussion and exchange of views can take place between teachers, scientists, engineers, researchers, lawyers, policy-makers, managers and other working in diverse environmental disciplines. His Excellency Otto von Habsburg is the patron of the event.

ICEP.3 is being sponsored by:

- European Centre for Pollution Research, Barcelona, London, Padua
- Hungarian Ministry for Environment and Regional Policy, Budapest
- The Hungarian Academy of Sciences, Budapest
- United Nations Environment Programme (UNEP), Nairobi
- United Nations Educational, Scientific and Cultural Organisation (UNESCO), Paris

In order to derive maximum benefits, the conference format would comprise presentation of key-note and refereed papers in four parallel sessions; and dedicated workshops. An exhibition is also being planned.

Further information can be obtained from:

Professor B. Nath
Chairman of the Organising Committee
ICEP Conference Office
253 Kilburn Lane
London W10 4BQ, UK
Tel. ++44-81-9606823 - Fax ++44-81-9601597

Conference Report

"Environment for Europe" Process

In the course of the second Ministerial Conference "Environment for Europe" held in Lucerne (Switzerland) on April 28-30, 1993, it had been decided to accept the offer of the Bulgarian Government to host in Sofia the next conference in 1995.

A working group composed of senior officials has been set up within the United Nations Economic Commission for Europe (ECE) to act as the central co-ordinating body for the further development of the "Environment for Europe" process, to oversee the follow-up to the Lucerne Conference, and to prepare the next Conference. The European Commission (EC), international organisations, financial institutions and the international informal sector organisations active in the ECE region would be invited to participate.

A Task Force had been established on the occasion - including representatives of eastern and western governments, of international organisations and of financial institutions - to facilitate the implementation of the Environmental Action Programme (EAP) and to provide for an effective exchange of experience. The Task Force is co-chaired by a central or eastern European country (on a rotating basis) and EC, the Organisation for Economic Cooperation and Development (OECD) serving as secretariat.

A work programme consisting of the following four main activities was set up by the Task Force in the course of its meetings (Paris, September 1993 and May 1994):

- Assistance to disseminate the EAP approach enabling central and eastern European countries to develop their own action programmes;
- Training programmes to build up capabilities to identify, prepare and manage priority projects;
- Engaging the private sector in promoting environmental improvements in enterprises;
- Enhancing the management of priority conservation areas.

The Task Force liaises with the Project Preparation Committee (PPC, set up at the above Lucerne Conference) to help with project preparation and investment. This Committee includes international financial institutions, the EC and bilateral donors, and is intended as a networking mechanism for bilaterally identified projects worth of co-financing.

The four PPC meetings held so far have focused on goals and criteria for project selection and implementation, matching projects and procedural matters. The PPC's interim secretariat is assured by the European Bank for Reconstruction and Development (EBRD) in London.

At its second session (Geneva, 1-3 June 1994) the ECE working group reviewed the progress in various international activities relative to the "Environment for Europe" process, in particular, the activities of the EAP Task Force, PPC, the Council of Europe, and the World Health Organisation Regional Office for Europe (WHO-EURO) which organized the second European Conference on Environment and Health (Helsinki, 20-22 June 1994). The Senior Governmental Officials considered the modalities for the involvement of relevant informal sector organisations in the preparation of the Sofia Ministerial Conference to be held in October 1995. The possible substantive items covered by this conference were discussed, together with the approaches to the further development of the EPE in the light of "the Europe's Environment 1993" report recently published by the EC European Environment Agency Task Force.

Ecology of Phaeocystis-Dominated Ecosystems

Proceedings of an EC workshop, Brussels, January 1991

edited by C. Lancelot and P. Wassmann

Special Issue of the Journal of Marine Systems Volume 5 n. 1 - April 1994

Elsevier, Amsterdam; 100 pp.

A limited number of copies can be ordered from

H. Barth

EC DG XII/D-1:

200, rue de la Loi

B-1049 BRUSSELS

Fax ++32-2-2963024

ELOISE (European Land-Ocean Interaction Studies)

Science Plan

Report of an international workshop organized jointly by the ENVIRONMENT and MAST Programmes of DG XII of the European Commission and the Netherlands Institute of Ecology, Centre for Estuarine and Marine Ecology

Roosendaal, The Netherlands, January 10 to 14, 1994

Edited by N. Cadée, J. Dronkers, C. Heip, J.-P. Martin and C. Noaln - EUR 15608 EN

The ELOISE project (European Land-Ocean Interaction Studies) aims at developing a coherent European research programme of high scientific value and relevance to human society, that will contribute to LOICZ. The objectives of ELOISE, developed by an ad hoc group of European experts and representatives of LOICZ and the EC, are:

- To determine the role of coastal seas in land-ocean interactions (including shelf - deep sea interactions along the shelf break) in the perspective of global change
- To determine the regional and global consequences of human impact through pollution, eutrophication and physical disturbance on land-ocean interactions in the coastal zone
- To formulate a strategic approach to the management of sustainable coastal zone resource use and development, and to investigate information, policy and market failures that hamper sustainable coastal resources management
- To promote the development of a European scientific infrastructure for coastal zone research and data management that can optimise both national and regional research and the benefits accruing from it.

The coastal zone is a major component in global budgets and resources, despite the fact it represents only about 15% of the surface and less than 0.5% of the volume of the world ocean. A

knowledge of the functioning of the coastal zone is vital to our understanding of how the human population is affecting the planet. More than 60% of the world's population lives within 60 km of the sea, and the transfer of matter from the continent to the coastal ocean is changing rapidly due to human activity. In addition, the consequences of global climate change, for example sea level rise, for the coastal zone are uncertain but could be severe. Without an adequate understanding of the nature, scale and extent of these changes, future management and uses of coastal areas and resources will be extremely difficult.

The IGBP Land-Ocean Interactions in the Coastal Zone (LOICZ) Project was designed to elucidate issues concerning the role of coastal areas in the global climate system and the potential response of coastal systems to all sources of global change. LOICZ is a Core Project of the IGBP Global Change Programme, and will operate through national and international research efforts to provide scientific data necessary to manage coastal environments and resources in a sustainable manner.

The variety of coastal types found in Europe offers unique opportunities for comparative studies of the interactions of natural factors. To achieve a more general understanding of coastal systems, an integration of the present studies of river and coastal processes within Europe is needed. The development of scientific concepts in the framework of ELOISE could contribute significantly to LOICZ worldwide.

ELOISE research projects focus on:

Global cycles, i.e. establishing and quantifying the role of the coastal ocean as a modifier of the fluxes between land and ocean. The origin and fate of organic matter should be an ELOISE research focus since it influences most of the other biogeochemical processes. The balance between production and consumption of organic matter also depends critically on the structure of the food-web. Biogenically produced trace gases can have important impacts on climate through their influences on the Earth's atmosphere. These gases should be studied in the coastal zone, since the coastal zone as a significance in biogas cycles that far exceeds its proportional area of the total marine environment.

Human Impacts

Human activity may change the transfer of matter from the continent to the coastal zone, which can result in physical, chemical and biological changes of the system. Eutrophication, contamination, and physical disturbance - three epiphenomena influenced by human activity - and their interactions are to be investigated. An important focus should be the reconstruction of recent environmental change in coastal systems, in which available time series of nutrient, particle and pollutant loads are combined with analyses of high resolution sedimentary archives. ELOISE research should also focus on different types of land use, that can form powerful tools in manipulating the quality of the coastal zone.

Socio-Economic Development

In coastal zone management, information "failures" on the interface between research in the natural and social sciences, market "failures" where decisions fail to reflect the real value of resources in the coastal zone, and policy "failures" where intervention deficiencies occur in coastal zone management frequently occur. The ELOISE research focus should be on studies that apply, test and modify the Coastal Zone Management Strategy (CZMS) Common Methodology of the Intergovernmental Panel on Climate Change, in order to evaluate the impacts of sea level rise in a variety of vulnerable coastal zones. Mitigation strategies for human impacts on the coastal zone should be developed, and alternative mitigating options should be reviewed.

New Publications

"Gérer l'environnement"

This is a collection, including nine books, directed by Prof. Lucien Yves Maystre and published by Presses Polytechniques et Universitaires Romandes, EPFL - Centre Midi CH-1015 Lausanne.

The books are conceived for use by students, as well as by engineers, planners, geographers, biologists, ecologists, medicine doctors and all those concerned with public health and environment protection.

Each book provides a detailed description of methods and procedures with the help of a number of examples which can be checked by the reader. Through the examination of more complex case studies, socio economical and political considerations are derived.

- Initiation aux calculs économiques pour les ingénieurs by L.Y. Maystre - ISBN 2-88074-087-8
- Energétique du bâtiment - Interaction entre le climat et le bâtiment by C.A. Roulet - ISBN 2-88074-113-7
- Energétique du bâtiment - Prestations du bâtiment, bilan énergétique global by C.A. Roulet - ISBN 2-88074-113-3
- Santé et pollution de l'air by J. Martin, L.Y. Maystre et al. - ISBN 2-88074-159-9
- Sylviculture - Principes d'éducation des forêts by J.Ph. Schütz - ISBN 2-88074-186-6
- Physique du sol by A. Musy and M. Soutter - ISBN 2-88074-211-0
- Système d'information géographique en mode image by C. Collet - ISBN 2-88074-239-0
- Méthodes multicritères ELECTRE, Description, conseils pratiques et cas d'application à la gestion environnementale by L.Y. Maystre, J. Pictet and J. Simos - ISBN 2-88074-267-6
- Déchets urbains, Nature at caractérisation by L.Y. Maystre, V. Duflon et al. - ISBN 2-88074-256-0

Further information can be obtained from:
Presses Polytechniques Universitaires Romandes
EPFL - Centre Midi
CH-1015 Lausanne
Tel. ++41-21-6934131 - Fax ++41-21-6934027

Environment Programme DG XII-D-1

- "Ecology of Phaeocystis - dominated Ecosystems", Ed. C. Lancelot and P. Wassmann. Special Issue of Journal of Marine Systems. Vol. 5, n. 1 April 1994. Elsevier.
- Proceedings of the "2nd European Workshop on Biosensors for Environmental Monitoring", Ed. Turner et al. Technologies for environmental protection Research Report n. 3. EUR 15622 EN.
- "Evaluation and improvement of Bioremediation Processes for Contaminated Soils", Ed. F. Colin and M. Jauzein. Technologies for environmental protection Research Report n. 4. EUR 15740 EN.
- "Infrared Spectroscopy of Ozone and Related Atmospheric Constituents (ISORAC)". Ed. D. Hausamann and J.M. Flaud. Air Pollution Research Report n. 52. EUR 15688 EN.
- Proceedings of a "Joint EC-ESReDA Seminar on Operational Safety", Lyon, France, 14/15 October 1993. Eds. S.T. Cole, J. Berman and P. Wicks. EUR 15724 EN.

Further information can be obtained from:
J. Acevedo, EC, DG XII-D-1
200 Rue de la Loi
1049 Brussels
Fax ++32-2-2963024

Chemistry of Aquatic Systems: Local and Global Perspectives

Based on the lectures given during the Eurocourse on "Chemistry of Aquatic Systems: Local and Global Perspectives" held at the Joint Research Centre, Ispra, Italy, September 27-October 1, 1993

Edited by **Giovanni Bidoglio**, European Commission, Joint Research Centre, Environment Institute, Ispra, Italy, **Werner Stumm**, Swiss Federal Institute for Environmental Science and Technology, EAWAG, Dübendorf, Switzerland.

The objectives of this course were:

- to illustrate how land, water and atmosphere are coupled by hydrogeochemical cycles and how these cycles affect the chemistry of natural waters;
- to strengthen our understanding of the cycling of nutrients, metals and organic carbon in marine and lacustrine systems;
- to give an account of current research and water technological applications of the processes occurring at the solid-water interface;
- to illustrate how pollutants are transformed, degraded and transported, and how to link processes occurring at different spatial and temporal scales.

The course programme included the following lectures:

I: Atmosphere-Rock-Water Interactions

- Acquisition of Solutes and Regulation of the Composition of Natural Waters; W. Stumm
- Regulation of Drainage Water Composition by Biotic Processes in Terrestrial Ecosystems; N. van Bremen
- Aquatic Carbonate Systems: Chemical Processes in Natural Waters and Global Cycles; R. Wollast, J.P. Vanderborght
- Modeling of heterogeneous Chemistry in the Global Troposphere; J. Lelieveld

II: Metals, Nutrients and Organic Carbon

- Biogeochemistry of Organic Matter in Coastal Waters; G. Cauwet, A. Saliot
- Microbial Transformation of Metals in Relation to the Biogeochemical Cycle; F. Baldi
- Metal Speciation: Concepts, Analysis and Effects; L. Sigg, Hanbin Xue
- Light-Induced Processes in the Aquatic Environment; B. Sulzberger, S.I. Hug
- Trace Metal/Phytoplankton Interactions in the Sea; W.G. Sunda
- Optical Remote Sensing of Marine Ecosystems: Bio-Geochemical Implications of Ocean Colour, Marine Productivity and Atmospheric Interactions; C.N. Murray, V. Barale

III: The Solid-Water Interface

- Reactions at the Mineral-Water Interface; L. Charlet
- Surfaces Processes in Water Technology; S.A. Banwart

IV: Transformation, Degradation and Transport of Pollutants. Spatial and Temporal Scaling

- Sources and Reactivity of Reductants Encountered in Aquatic Environments; A.T. Stone, K.L. Godfredsen, Baolin Deng
- Abiotic Transformation pathways of organic Chemicals in Aquatic Ecosystems; E.J. Weber
- Coupled Processes in Reaction-Flow Transport of Contaminants; G. Bidoglio
- Scale Effects in the Transport of Contaminants in Natural Media; Ph. Behra
- Modeling the Hydrologic and Biogeochemical Response of a Catchment Area to Anthropogenic Inputs; T. Paces
- Spectral Properties of Soils and the Use of Optical Remote Sensing Systems for Soil Erosion Mapping; J. Hill.

Further information can be obtained from:
Kluwer academic publishers

Evaluation and Improvement of Bioremediation Processes for Contaminated Soils

Final report of the STEP contract CT90-0103 (DSCN) coordinated by: IRH Génie de l'Environnement, F
Université de Technologie de Compiègne, F

Université Catholique de Louvain, B
Water Quality Institute, DK

Edited by F. Colin, M. Jauzein

ISBN 92-826-8220-X

The main objective of the study has been the evaluation and the improvement of soil bioremediation techniques including:

- the identification and study of factors limiting the efficiency and implementation of bioremediation techniques;
- the performances optimization of laboratory-scale bioreactors both in aerobic and anaerobic conditions;
- the design, construction and adjustment of solid-phase biotreatment simulators allowing to study quantitatively the influence of field limiting factors;
- the definition of a general procedure for the optimization of on-site and in situ biological treatment performances which can be a tool for process improvement and design of simple and economical field biotreatment processes.

Main results obtained concern:

- degradation of polycyclic aromatic hydrocarbons (PAHs) in coal tar polluted soils;
- degradation of phenols in aqueous or soil media;
- selection of a methanogenic microbial consortium adapted to phenols;
- degradation of phenols in fixed-film aerobic or anaerobic bioreactors;
- design of a specific activity test for the quantification of the methanogenic activity of a soil media;
- design of a model-soil bioreactor;
- design of a soil-phase soil biotreatment simulator.

Published by EC, DG XII, Environment Research Programme

Further information can be obtained from:

H. Barth, EC, DG XII-D-1
200 Rue de la Loi
1049 Brussels
Fax ++32-2-2963024

Humor/Humex Newsletter

This scientific newsletter on the STEP-project "Humic substances, modifiers of the response of aquatic ecosystems to acidification (HUMOR)" and its extension in the Environment Research Programme (1990-1994), as well as on the linked international project "Humic Lake Acidification Experiment (HUMEX)", funded by the Norwegian Institute for Water Research (NIVA), Oslo, is publishing twice per year most recent project results. Available so far: 1/1992, 1/1993, 2/1993, 1/1994.

Further information can be obtained from:

Dr. E.T. Gjessing
NIVA
P.O. Box 173 Kjelsås
N-0411 OSLO
Fax ++47-22-185200 or 952189

Humor/Humex: Experimental Acidification of a Catchment and its Humic Lake

Edited by E.T. Gjessing and R.C. Petersen, Jr.

Special Issue of the scientific journal *Environmental International* Volume 18, n. 6, 1992

Pergamon Press, New York-Oxford-Seoul-Tokyo, pp. 533-676.

EASOE - European Arctic Stratospheric Ozone Experiment

The European Arctic Stratospheric Ozone Experiment (EASOE) took place in the winter of 1991/92 with the participation of over 60 research groups mostly from European countries, but also from North America, Japan and Australasia.

More than 70 papers describing the first results of EASOE are collected in a special issue of *Geophysical Research Letters* (N° 13, Vol. 21, June 22, 1994) the cost of which has been largely covered by EC, DG XII budget.

Geophysical Research Letters (ISSN 0094-8276) is published semi-monthly by the American Geophysical Union from 2000 Florida Avenue, N.W., Washington DC 20009.

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.



