



EUROPEAN  
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Community Research

# **OPEN STAKEHOLDER CONSULTATION PRIORITIES FOR ENVIRONMENT AND HEALTH RESEARCH IN FP7**

**Monday 22 May 2006  
(And comments after the meeting)**

**Centre de Conférences Albert Borschette (CCAB)  
Rue Froissart 36  
1040 Brussels  
Room 0A**

**STAKEHOLDER STATEMENTS**



EUROPEAN COMMISSION  
RESEARCH DIRECTORATE-GENERAL

Directorate I - Environment

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**A. Ahlbom**  
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## **EMF (ELECTROMAGNETIC FIELDS): RESEARCH RECOMMENDATIONS FROM SCENIHR**

**Monday 22 May 2006**

**The Scientific Committee for Emerging and Newly Identified Health Risks (SCENIHR) has updated a previous opinion on health risks from electromagnetic fields. The updated opinion identifies very important gaps in knowledge and has issued the following research recommendations:**

### **Radio frequency fields (RF) fields:**

- A long term prospective cohort study in international collaboration. Such a study would overcome problems that were discussed in relation to existing epidemiological studies, including the Interphone study. These problems include recall bias and other aspects of exposure assessment, selection bias due to high proportions of non-responders, too short induction period, and restriction to intracranial tumours.
- Health effects of RF exposure in children. To date no study on children exists. This issue can also be addressed by studies on immature animals. This research has to take into consideration that dosimetry in children may differ from that in adults.
- Exposure distribution in the population. The advent of personal dosimeters has made it possible to describe individual exposure in the population and to assess the relative contribution of different sources to the total exposure.

There are quite a number of experimental studies that are also warranted particularly based on recent results that need to be replicated. Examples are some results on genotoxicity and some cognitive results particularly involving sleep quality parameters.

### **Inermediate frequency (IF) fields:**

- Data on health effects from IF fields are sparse. Therefore, research in this area is a priority since new and emerging technologies result in increasing exposure to the population and in occupational settings. This issue should be addressed both through epidemiologic and experimental studies.

### **Extremely low frequency (ELF) fields:**

- The conflict between epidemiological results indicating an increased risk of childhood leukaemia for children exposed to high levels of ELF fields and the lack of support for this from established mechanisms or experimental data is intriguing and requires a better understanding and clarification. Research on ELF fields needs to be intensified and should focus on this issue.

### **Static fields:**

- Cohort study on personnel dealing with MRI-machines. The start of this would have to be a thorough feasibility study.
- Relevant experimental studies such as studies on carcinogenicity, genotoxicity as well as developmental and neurobehavioural effects would have to be conducted as well.

The key concern is the newly developed MRI machines, often with static fields exceeding current guidelines.

**A-M. Andersson**

**University department of Growth and Reproduction, Rigshospitalet (Denmark)**

## **THE FUTURE OF HUMAN FERTILITY**

**Monday 22 May 2006**

The decreasing trends in fertility rates in many industrialized countries are now so dramatic that they deserve much more scientific attention. Although social and behavioral factors undoubtedly play a major role for these trends, it seems premature, and not based on solid information, to conclude that these trends can be ascribed to social and behavioral changes alone. There are several observations pointing to adverse trends in the biological fertility:

- There is a high demand for infertility treatment – During 2002-04 more than 6% of Danish children were born after assisted reproduction. In addition, many couples adopted foreign children. Thus, a total of approx. 7% of all Danish children born during the last few years were not conceived 'naturally'.
- Results of a coordinated European research effort have revealed that Danish men were among those with the poorest semen quality in Europe. More than 30% of young Danish men have a subfertile semen quality and more than 10% have a semen quality in the infertile range. Remarkable differences in semen quality are found between different European populations.
- The incidence of testis cancer has been rising in western industrialized countries during the past half century. This trend has been very consistent among Caucasian populations although significant geographical gradients exist.
- Coordinated European research has also shown that geographical differences in the prevalence of malformations of the male genitalia (e.i. cryptorchism and hypospadias) exists within Europe and that the prevalence at least in some countries seems to be increasing.

These biological factors may also contribute to the low fertility rates. We have proposed that testicular cancer, male infertility hypospadias and undescended testis may all be symptoms of one underlying pathology, namely a testicular dysgenesis syndrome (TDS). There is evidence to suspect that changing lifestyle and increasing environmental exposures, e.g. to endocrine disruptors, are behind the trends in occurrence of male reproductive health problems. However, the necessary research is complex and requires non-traditional collaboration between demographers, epidemiologists, clinicians, biologists, wild life researchers, geneticists and molecular biologists. This research effort can hardly be carried out without major support from governments and granting agencies making it possible to fund collaborative projects within novel research networks of scientists.

**I. Andersson**  
**European Environment Agency (Denmark)**

**EEA PERSPECTIVE ON ENVIRONMENT AND HEALTH IN FP7**

**Monday 22 May 2006**

Some challenges

- Multi customer perspective (supplementing the “full chain approach”)
- More contextual knowledge
- Combined exposures
- Multi-causality
- Expanding the causal chain
- Estimation of health impacts
- Europe in a global context and Europe’s impact on developing countries

E&H research priority process can be facilitated by EEA/ JRC review Environment and health

- Health impacts and associations with some environmental exposures
- Strengths of associations

**A. Bartonova**  
**NILU (Norway)**

## **NORWEGIAN INSTITUTE FOR AIR RESEARCH**

**Monday 22 May 2006**

The Norwegian Institute for Air Research (NILU, a non-profit private research foundation) has been active in the E&H area since its establishment in 1969. Our activities span from national and European research and research –based assessments to knowledge transfer and institutional capacity building. Our main areas of expertise are:

- Environmental monitoring (local, national, international)
- Research into atmospheric composition and processes relevant to the DPSIR, including multimedia fate and transport of pollutants
- Exposure assessment including environmental toxicology methods, also for the needs of in environmental epidemiology
- Capabilities in environmental chemistry including high throughput methods.

**The main research needs, assessed on the basis of our collective experience, are related to extending the information basis for the environmental health assessment. Environmental monitoring for environmental health purposes should be further innovated using newly developed technologies (for monitoring/surveillance devices as well as for data transfer, sharing and connecting through databases). An important area is issues around extreme events, both natural and man-made, intentional or accidents.**

Exposure assessment is one part of the environmental health assessment that needs further development both in methods and the data generation part monitoring and biomonitoring, information about population subgroups and their habits and lifestyles). Further research into development of relevant biomarkers and their use is also needed, including research into high throughput methods in environmental chemistry and toxicology.

Supporting research would be of limited interest to the society if it did not have wider societal implications. Making research results known and used in an appropriate way is therefore an integral task in areas such as environmental health. We see several research dissemination needs. Informing relevant stakeholders and making them understand research results is perhaps the most common task, however not simple at all. Further complications arise when the research implies an active participation of other stakeholders, and communication is essential. Ultimately we would like to empower the public to make informed environmental health decisions, and to allow users to change their behaviour. We also need to support collective actions to enable authorities to make informed decisions to reduce pollution loads and impacts.

A variety of implementation modalities is needed to support the above needs. While we can see the benefits of the new instruments implemented in the FP6, we would advocate a more extended use of smaller projects such as STREPS where focused funding per partner is more efficient. Support to projects with limited partnership and excellent though risky ideas without direct societal use at the moment is also necessary. Support to networking within science and between science and society should take into account the increase in administrative and managerial burden on coordinators with increased number of partners (this increase is not linear). It should also be recognized that networking projects are relatively difficult to establish and run. Participation of third countries is essential to global scientific communication, however we need to take into account that third country partners have limited experience with the sophisticated EU research system.

**C.R. Bridges**  
**Fish Ecophysiology, HHU Düsseldorf (Germany)**

## **ALARM SIGNALS IN THE MEDITERRANEAN – ENDOCRINE DISRUPTION IN MARINE FISH - A CASE FOR CONCERN FOR FUTURE GENERATIONS**

**Monday 22 May 2006**

The **Mediterranean** and the **North Sea** represent enclosed or semi-enclosed Seas, which have highly developed Marine Fisheries. In the large, socio-economically important, Mediterranean marine fishery for the **Swordfish (*Xiphias gladius*)**, this fishery accounts for a yearly financial turnover of well over 300 million €'s within the combined fisheries of the EU. If the even larger fishery for the Bluefin Tuna, ***Thunnus thynnus*** is added to this then a combined sum of over 1000 million €'s can be reached. In the **mixed demersal fisheries of the North Sea** UK landings alone, for 2001, account for over 800 million €. These **three fisheries** are therefore responsible for a **dominant proportion** of the income derived from the **marine area of the EU**. All of these fisheries are **"highly overfished"** and any **synergistic effect** of **environmental parameters**, which increase the **"risks"** to these three species, will have a **direct economical effect** with **far-reaching influence** on the **sustainability** of such **fisheries** in the future. In the last **ten years** it has been recognized that a number of **waste products** which are derived from our industrial civilization have been **effecting** the endocrine system in a number of species. These **"endocrine disruptors" (ED)** were defined by the European Commission in (1996) *"An endocrine disruptor is an exogenous substance that causes adverse health effects in an intact organism, or its progeny, consequent to changes in endocrine function"*. These **"gender-bending"** chemicals have been one of the most **actively pursued** areas in **environmental toxicology** in the **freshwater** rivers and lakes in FP6 and number of **strategic programs** were dedicated to **detection** of EDs and **model organisms** for testing **new chemicals** (fathead minnow and Zebra fish are already OECD test species). There has however been **little or no work** on the effect of ED on **marine fisheries directly** or on the **health** aspects of **consumption** of such fishes which is a **major omission** from FP6.

Recently a **disturbing trend** has been reported from the Mediterranean in that the endocrine disrupter **biomarkers** Vitellogenin (Vtg) and Zona radiata (ZR) and a high percentage of **intersex** (13% of the male fish) have been reported in one of the **top pelagic** predators the swordfish and there are signs that this may be the case in another **top food chain predator** the bluefin tuna. Similar evidence for the induction of Vtg genes under endocrine disruption in Mediterranean top predators has also been presented. In some new research in the North Sea there is also clear evidence that one of the **major demersal** fish stocks, the **cod** which has been **devastated** by fishing is now **under threat** from endocrine disrupters.

Since both the North Sea and the Mediterranean fisheries are **truly European** in structure, no one nation has the **interdisciplinary expertise** or the necessary **financial resources** to address this **alarming development**. FP7 could provide the **necessary link** between **Health** and **Environment** to look at one of the major **problems** not only the **fisheries** and **food** industry but also its role in **human fecundity**, environmental **traceability** and **welfare**.

The occurrence of endocrine disruptions at its presently known scale (**which is growing**) in marine fisheries, especially in the top-predators, should act as a **warning** that is to be disregarded at **our peril** for **future generations**.

### **Further Literature and Information**

Do endocrine disrupting chemicals threaten Mediterranean swordfish? Preliminary results of vitellogenin and Zona radiata proteins in *Xiphias gladius*. M. Cristina Fossia, Silvia Casinib, Stefania Ancorab, Alessandra Moscatellic, Antonella Ausilid, Giuseppe Notarbartolo-di-Sciarad. *Marine Environmental Research* 52 (2001) 477–483.

Evidence of a high percentage of intersex in the Mediterranean swordfish (*Xiphias gladius* L.) G. De Metrio, A. Corriero, S. Desantis, D. Zubani, F. Cirillo, M. Deflorio, C.R. Bridges, J. Eicker, J.M. de la Serna, P. Megalofonou, D.E. Kime. *Marine Pollution Bulletin* 46(3) (2002) 358–361

Vitellogenin in the blood plasma of male cod (*Gadus morhua*): A sign of oestrogenic endocrine disruption in the open sea? Alexander P. Scott, Ioanna Katsiadaki, Peter R. Witthames, Ketil Hylland, Ian M. Davies, Alistair D. McIntosh, John Thain. *Marine Environmental Research* 61 (2006) 149–170

Relationship between Sex Steroid and Vitellogenin Concentrations in Flounder (*Platichthys flesus*) Sampled from an Estuary Contaminated with Estrogenic Endocrine-Disrupting Compounds.

Alexander P. Scott, Ioanna Katsiadaki, Mark F. Kirby, and John Thain. *Environ Health Perspect* 114 (suppl 1):27–31 (2006). <http://www.ehponline.org/members/2005/8049/8049.pdf>

**Analysis of vitellogenin gene induction as a valuable biomarker of estrogenic exposure in various Mediterranean fish species. M. Barucca, A. Canapa, E. Olmo, F. Regoli. *Environmental Research* 101 (2006) 68–73.**

**P. Boffetta**  
**International Agency for Research on Cancer**

**OPPORTUNITIES FOR RESEARCH ON ENVIRONMENT AND  
HEALTH IN CENTRAL AND EASTERN EUROPE**

**Monday 22 May 2006**

The health gap between old and new EU member states is partially closing, but disparities in mortality and morbidity still exist and in some cases are widening. Environmental exposures contribute to this gap, together with lifestyle and genetic factors. A quantification of the contribution of different risk factors to health disparities within Europe would have a major impact in terms of (i) defining preventive strategies and public health policies, (ii) quantifying the causes of major chronic diseases in understudied European populations, and (iii) contributing to the identification of new causes and mechanisms of chronic diseases and their interactions with genetic factors.

Large-scale longitudinal prospective studies have been initiated in several of the old member states (e.g., Norway, United Kingdom, France, Sweden): each of these studies has a different focus but they all contribute to public health research and to prevention of chronic diseases. With a few exceptions (e.g., Estonia Genome Project), similar studies are lacking in new member states. A priority in the Environment and Health of FP7 should be the establishment of a large-scale prospective epidemiological study in new member states and candidate countries, with focus on environmental exposures and risk of chronic diseases. Such study should be conducted according to a standard protocol in selected areas, preferably those covered by good-quality health information systems (e.g., population-based cancer registries). It should put emphasis on the assessment of environmental exposures and lifestyle factors, and include collection of biological samples for the determination of genetic factors and biomarkers. It should be linked (e.g., via a consortium) to existing projects in old member states and to relevant EC-sponsored projects (e.g., ECNIS, Cascade). A pilot study should be funded as first step.

In addition, a large-scale survey of biomarkers of exposure to environmental toxicants should receive high priority. This project should parallel the NHANES survey conducted by CDC in the United States, which has been an invaluable source of information on environmental exposures and risks in that population.

**S. Colgan**  
**Environmental Protection Agency (Ireland)**

**ENVIRONMENT & HUMAN HEALTH RESEARCH IN IRELAND**

**Monday 22 May 2006**

***Background***

Human health protection is a fundamental aspect of environmental protection. The level of environmental public health protection in Ireland is widely regarded as being high although some issues continue to cause concern for example, considerable investment has been made in improving drinking water quality but high microbiological levels are found in many of the smaller private rural water schemes. With regard to air quality, following the success of legislation in dealing with the problems associated with emissions from coal burning in major cities, a primary cause of outdoor air pollution is now motor vehicle emissions. Overall, increased development and prosperity brings intensified impacts on the environment (including water quality, air quality, noise, encroachment of urban areas into the countryside etc.) which in turn can impact on human health.

The EPA plays a health protection role by licensing large-scale / complex industrial activities and all waste activities to prevent or reduce emissions to air, water and land. These licences are actively enforced to ensure that those who flout environmental law and cause environmental pollution as a result of their actions are held to account.

The EPA has established a research theme in the area of Environment and Health to provide knowledge to assist in the development and implementation of effective policy actions to reduce environmental impacts on human health. Research support also aims to build capacity in the area and to build on previously conducted research. A key objective is to complement the initiatives and activities arising from the Environment and Health Action Plan (such as the Environmental Health Information System (ENHIS) project) and research ongoing in this area through other national and international funding sources eg EU Framework or the Health Research Board (IE). A further key objective in establishing this theme is the establishment of cluster projects to develop capacity and critical mass in groups and thereby support Irish involvement in the EU Framework Programme (or other similar initiatives).

***Funding***

The EPA has committed funding of approximately €1.5m in 2005 under the theme 'Environment & Health' and expects to continue to support projects in this area as a priority theme within the research programme. Broadly projects will be supported under two sub-themes as shown below. Within these sub-themes a range of potential research issues have been identified as priority issues for environment and human health research for Ireland that will be addressed in the next few years including:

**ENVIRONMENT & HEALTH I - SCIENCE**

- Air pollution
- Noise
- Water, Sanitation and Health
- Climate Change & Health
- Biomonitoring & Personal Monitoring

**ENVIRONMENT & HEALTH II - ASSESSMENT**

- Quantifying Environmental Health Impacts
- Health impacts associated with IPPC Licensing & Waste Management

***Linkages***

The EPA recognises the cross-cutting nature of Environment & Health and intends to focus funding in this area on interdisciplinary research groups and will encourage international linkages where appropriate. The potential for enhanced non-invasive monitoring offered through advanced sensors technologies is also recognised and will be pursued. Linkages to stakeholders including policy makers, the research community and the public will be critical for these projects and will be promoted through targeted dissemination and communication of research findings.

**J. De Selliers**  
**Greenfacts (Belgium)**

**SCIENCE COMMUNICATION STRATEGY AND FUNDING IN FP7**

**Monday 22 May 2006**

The European Commission and DG Research have often stressed the importance of science communication, as testified by the big annual "Communicating Scientific Research" conference, the new Descartes Communication Prize, and many statements by Commissions officials, notably former Commissioner Busquin. However, it is not clear to us that the commission is providing the means and allocating the funds for such communication. Hence a first and general question:

1. Will research projects and consortiums funded by FP7 have to communicate the results of their research?  
Will they be required to follow certain standard or spend a defined fraction of their budget into science communication?

Also, we believe that science communication is especially important in the field of Environment and Health, notably because these subjects highly concern the public, and because the public can be influenced by scientifically unsubstantiated rumors and misconceptions. However, communicating the results of the latest research does not always help, notably because the latest research generally needs to be confirmed by further research. More than anything, the public needs to be informed by scientific consensus reports which integrate the results of all previous research on a subject and draw conclusions which provide the current state of the scientific knowledge on the issue.

Such scientific consensus reports exist for many Environment and Health topics. They are continually published by the UN agencies as well as the Commission. But they are generally lengthy and written in a specialist jargon, which puts them out of reach of non-specialists. To adequately inform the public, it is therefore a priority to communicate such reports by summarizing them in simpler words. This, we understand, was NOT in the scope of FP6, whose communication actions were mainly geared towards communicating the results of research funded by DG-Research and towards promoting the appeal for scientific careers.

Thus my next questions are:

2. Does FP7 recognize the need for communicating scientific consensus reports to the public?
3. If not, why?  
If yes, will DG-Research be providing some means for this purpose?  
In other words, has DG-Research allocated specific funds for communicating scientific consensus reports that it did not directly fund?  
How and when would such funds be made available?

**C. Farrar-Hockley**  
**European Public Health Alliance – Environment Network (EEN)**

**NGO PERSPECTIVE OF ENVIRONMENT AND HEALTH RESEARCH  
UNDER FRAMEWORK PROGRAMME 7 (FP7)**

**Monday 22 May 2006**

EEN welcomes the Commission initiative to strengthen Environment and Health research under FP7 and the opportunity for all stakeholders to discuss future priorities.

A meeting was recently organized by DG Research to discuss Civil Society Organisations views on the EU public research programme FP7. The conclusions from this meeting were amongst others that:

- NGOs add legitimacy to research policy by reinforcing its societal dimension. DG Research applications should introduce criteria to have genuine NGO involvement (i.e. as a partner) throughout research projects and not just in the final stages to disseminate results.
- NGOs can benefit from research results (sound science) to build up their activities and to support their interventions.
- NGOs have policy and scientific expertise and can contribute to the identification of research priorities and gaps in knowledge.
- NGOs have knowledge to contribute to the research system and some NGOs have research capacities of their own, as well as volunteers and employees motivated to bring forward their own knowledge.
- Adequate resources for communication of research results will ensure information is appropriate and accessible to stakeholders and the wider public.
- Researchers should make more and better use of what NGOs have to offer to research as they provide different visions and knowledge, complementary to the research community and industry, and therefore enrich the research agendas.

**Priorities for the Environment and Health Research agenda should be linked to the goals of the SCALE and EU Environment and Health Action Plan process:**

- Biomonitoring of vulnerable populations exposures;
- Support of a long term child (mother/father) cohort to answer questions particularly around the long term effects of exposures to various pollutants in specific windows of susceptibility is required. Identification of any stages in development where children are more susceptible or primed to be more susceptible to pollutants.
- Coordination and harmonization of approaches and better data on burden of disease to improve HIA and DALYs.
- Research into communication tools such as mapping systems as part of the environment and health information system.
- Prioritize action on environmental risk factors for policy priority setting while also taking into consideration the concerns of the general public in particular research into emerging threats. The study of long term exposure to low concentrations, multiple exposures is also required. The identification of policy needs should to some extent therefore determine the research, while ensuring some flexibility for emerging threats.

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**A. Gies**  
**German Federal Environmental Agency (UBA)**

**RETROSPECTIVE MONITORING OF HUMAN EXPOSURE:  
SPECIMEN BANKING**

**Monday 22 May 2006**

Exposure monitoring in humans is an essential tool to assure appropriate risk management for chemicals that may influence human health. Human biomonitoring campaigns usually can give an overview on human internal exposure at a particular time. Archiving the samples taken provides the possibility to analyse time trends of exposure. Even those substances can be retrospectively monitored for which new or improved methods of analysis have been developed or which have only recently been identified as problematic.

The German Environmental Specimen Bank has been sampling and archiving human and environmental samples for more than twenty years. The samples are placed in deep-freeze storage facilities which largely exclude the possibility of retrospective chemical changes to the specimen characteristics. It was founded at the beginning of the 1980s under the overall responsibility of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and administrative and scientific coordination by the Federal Environmental Agency. The Aim of the ESB is to control and follow the success (or failure) of legal measures or voluntary producer bans on substances, to monitor contamination levels in human tissues and ecosystems, and to identify emerging pollutants and their temporal behaviour in the environment. Beside plant and animal tissue, soil, sediment mainly human samples such as blood and urine are stored. Human samples are taken at 4 different locations in Germany from study groups of about 120 persons mainly aged 20 to 29 years. Up to now, more than 114.000 human and 165.000 environmental samples have been stored in the ESB. All procedures in the framework of the ESB are carried out according to strictly defined standard operating procedures. Data and results are stored and managed in an information system. The ESB homepage [www.umweltprobenbank.de](http://www.umweltprobenbank.de) offers detailed information, reports, and publications as well as possibility for online data retrieval.

In a number of countries in Europe, America and Asia cryoarchives of human tissue have proven to be a valuable tool in human exposure monitoring strategies. They can provide decision makers with information on time trends of human body burdens in a very flexible and fast way. Specimen banks may strengthen the ability of national and European authorities to control chemical pollutants and help to assure that the risks of chemicals are properly assessed.

## EDEN – Emerging Diseases in a changing European Environment

The aim of EDEN is to identify, evaluate and catalogue European ecosystems and environmental conditions linked to global change, which can influence the spatial and temporal distribution and dynamics of pathogenic agents. Through a coordinated European approach, EDEN provides predictive emergence and spread models including global and regional prevention, early warning, surveillance, and monitoring tools and scenarios. The network includes third world countries in its operational network and links up with international organizations through its advisory group.

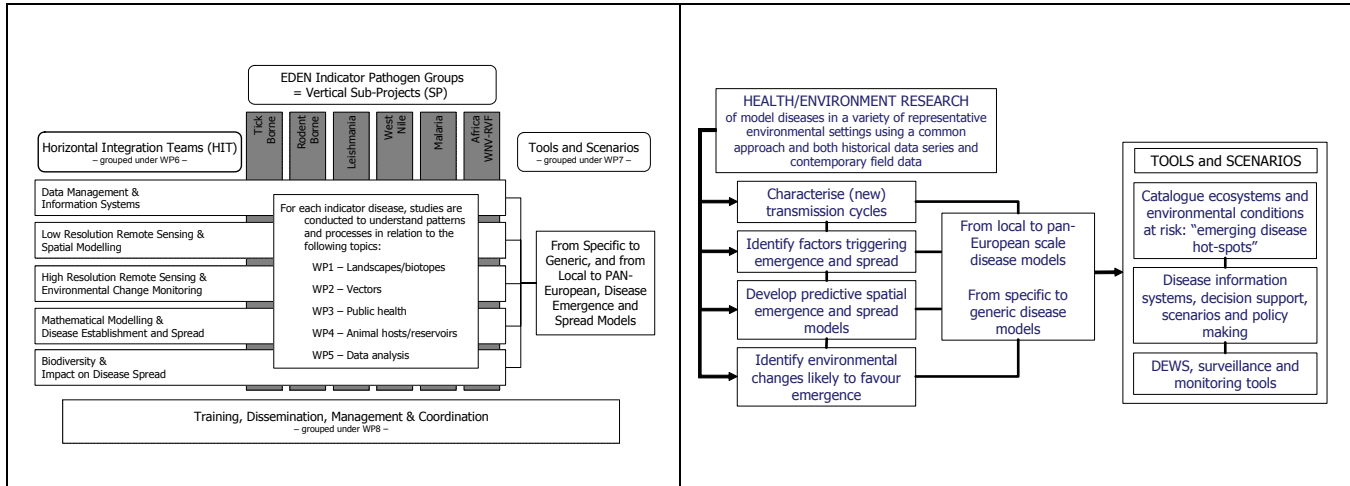


Fig. 1 – EDEN integration structure

Fig. 2 – EDEN research integration

### Relevant FP7 research topics

1. Can the developed EDEN approach be applied to other disease groups?
  - Which disease groups (e.g. zoonoses such as avian flu and TB)?
  - How to adapt?
2. How to include other horizontal themes / information sources such as socio-economics in a more efficient way?
  - Which data are useful and how can they be integrated?
3. How to establish and maintain pan-EU monitoring / validation networks?
  - Geographical extent of field data sources.
  - Need to include extra EU sites: the most effective way to tackle emerging disease threats may be to tackle the problems at the source.
  - Eco-climatic representativity.
  - Specific and generic aspects.
4. What are the minimal and ideal requirements for a DEWS and how to combine scientific and decision support requirements in relation to risk assessment?
5. Further study the impact of biodiversity on disease introduction, establishment and spread.

**In the framework of global change further develop scenarios for adaptation to environmental health risks and threats.**

**M. G. Höfle**

**GBF- German Res. Centre for Biotechnology, Div. Microbiology (Germany)**

## **INFECTIONS AS ENVIRONMENTAL THREAT**

**Monday 22 May 2006**

### **Rationale**

For many epidemics caused by respiratory, waterborne and zoonotic pathogens the etiologic agents have never been determined. This was due to the lack of appropriate **detection methodology** and the polymicrobial nature of the infection. Recent progress in molecular detection of microbial pathogens and their genes should allow studying the ecology of respiratory and waterborne infections, as well as molecular epidemiological aspects related to the pathogen. More specifically, it would be possible to elucidate the complex polymicrobial interactions that occur during explosive outbreaks of respiratory diseases and agent-specific virulence traits, thereby allowing the development of improved diagnostics tools, prevention measures and surveillance strategies for these diseases.

In addition, many incidences of infectious diseases cannot be explained by normal exposure routes. There is therefore a widespread belief that some, as yet undescribed, environmental factors are involved. Globalisation is increasing the exposure of animals and humans to pathogens, change of land use practices may cause mobilisation and proliferation of pathogenic agents from the environment. Research on how our life style affects reservoirs, ecology and evolution of pathogenic traits in the environment is required, and **predictive models** for forecasting and managing infectious diseases at the European scale need to be developed. More specifically, field research should concentrate on the assessment of soil and water management practices that could reduce human health threats by microbial pathogens, such as *Legionella pneumophila* or *Mycobacterium bovis*. Models should integrate both ecological and epidemiological aspects of wildlife, livestock and human diseases, and be designed to be applicable to a wide range of environmental conditions including major issues such as land-use practices and climate change. Models should reflect spatial units and the behaviour of the disease species and their vectors, and should allow for taskforce modelling of actual epidemics.

Conceivable research topic could be:

### **1 Epidemiology and ecology of legionella-induced pneumonia**

*Projects should focus on a thorough understanding of atypical pneumonial infections based on Legionella pneumophila. Research should concentrate on the interplay of the pathogen and its virulence status with the immune status of the receiving host. In addition, correlation with environmental parameters and the drinking water supplies should be studied. Research would lead to improved diagnostics and prevention measures for legionella-induced pneumonia.*

### **2 Molecular epidemiology of animal infections via the environment**

*Projects should aim at the understanding of the environmental components and their regulating factors of animal infections such as bovine tuberculosis and other mycobacteria-related infections. Research should concentrate on the detection and activity assessment of the pathogens involved, their virulence potential and interactions with the host, and the genetic and immune basis of host resistance to infection. Research would lead to improved diagnostic/prognosis tools, in predictive models of the disease, prevention measures and surveillance strategies for respiratory infections.*

**I. Katsiadaki**  
**Cefas (United Kingdom)**

## **WHAT IS THE SIGNIFICANCE OF ANTI-ANDROGENIC ACTIVITY IN SEWAGE EFFLUENTS?**

**Monday 22 May 2006**

Two nationwide surveys on endocrine disrupting activity of final sewage effluents across the UK during 2003 and 2004 indicated that the majority were highly anti-androgenic. The surveys used *in vitro* methods (YAS and YES assays) to produce an integrated value of anti-androgenicity and oestrogenicity expressed as  $\mu\text{g/L}$  flutamide equivalent (FL EQ) and  $\text{ng/L}$  oestradiol equivalent concentrations respectively.

Out of 43 sewage treatment works (STWs) tested, 6 displayed antiandrogenic activity of more than  $500\mu\text{g/L}$  FL EQ, 5 were between 400 and  $500\mu\text{g/L}$  FL EQ, 10 between 300 and 400, and only 7 displayed low activity (less than  $50\mu\text{g/L}$  FL EQ. The TIE (toxicity Identification Evaluation) technique using the YAS assay has indicated that there are at least 4 different effluent fractions that are contributing significantly to the observed activity. It is not yet known if the same trend is observed across European countries but is unlikely that the phenomenon is relevant to the UK only.

Until recently the main focus of research on endocrine disruption in wildlife has been the study of the effects of oestrogens on male physiology. During the 90's there were widespread evidence of species feminisation globally. This was linked in a number of cases with highly oestrogenic natural and man made chemicals. The UK was one of the worst affected countries and as a result a large body of literature in respect to feminisation of fish (intersex, VTG in males) was created.

The recent YES surveys indicated that the remediation process taken in STWs has resulted in a dramatic decrease in oestrogenic activity (more than 10 fold) in the past 10 years. The incidence of intersex fish however does not appear to have decreased in a similar manner. This observation can lead to the hypothesis that inter-sexuality could be a result of de-masculinisation rather than feminisation only and that the high anti-androgenic activity displayed by the effluents might be a causative or at least one of the causative agents.

In terms of the implications of these findings for the wildlife and human health it is not easy to draw conclusions. We have however conducted experimental exposures of sticklebacks to flutamide and found that the level of FL EQ found in the effluents is totally inhibiting reproduction in this species. To make any decisions (or to decide on any legislative actions that could be taken), it is essential that we:

- 1) Confirm the findings by the use of different *in vitro* methods (i.e. AR Calux, a reporter gene assay) in a number of European countries**
- 2) Identify the causative compounds**
- 3) Conduct a risk assessment on the potential presence of these in drinking water**
- 4) Address the biological significance of wildlife exposure to these agents in different stages of development**

## **ENVIRONMENT AND HEALTH IN 7FP** **SOME PRIORITIES AND NEEDS**

**Monday 22 May 2006**

### **Content**

CEFIC see several priority topics for research on the 7<sup>th</sup> FP derived from the position that the Environment and Health Action Plan is unique in its request to integrate two major areas of past research and various contributing scientific disciplines. Understanding the need to move to more mechanistic research on the one hand there is a major need to also perform research in complex systems to see the impact on effects “in real life”. The integration of Environment and Health aspects and the changing trends at the science policy interface in future require some modifications on how projects are developed conceptually, stewarded over time, interpreted and communicated to a broader public. Research into new areas should be balanced with research targeted at consolidating available know how

Research content should focus on

- Work to define health priorities and health trends followed by assessment of potential contributions of relevant environmental stressors to reduce complexity and enable productive research
- Quality ensured and harmonized instruments to evaluate and compare risk contributions of various factors to focus and target further work
- Research to distinct adverse effects from a reaction to change including research on background levels and biological variations
- Reliable biomarkers for physical, biological and chemical (natural and synthetic) stressors to get sufficient and integrated knowledge
- Interpretation of results from new technologies in terms of adverse effects (e.g. epi-genetics, biomarkers of effects, toxico-genomics) – “full chain approach”
- Role of susceptible species and cross over use of data for environmental threshold setting
- Health impact of indoor air quality and contribution of relevant factors (e.g. lifestyle, ETS, energy efficiency, ventilation, hygiene, biological and chemicals exposure)
- Further research on instrument like Health Impact assessment with the focus on sensitivity analysis is recommended
- Intelligent testing strategies with targeted data to be able to devote resource to integrating health and environment aspects (integrating risk assessment and animal welfare, global harmonization of testing strategies)

Regarding the implementation the following aspects are considered to be of importance

- Conceptual development of projects must include elements to ensure sufficiently representative scientific input to avoid pre-defined and thus “non value” research
- Data of findings **and** non-findings to be made publicly available (to be published in peer reviewed journals or at least of EU Commission website)
- Selection criteria for projects should include integration of different disciplines
- During the duration of projects more stakeholder consultation elements should be introduced to re-focus the work in the light of available results and ensure adequate, responsible communication to the public

CEFIC is already and will continue to contribute to tackle several of these questions via its Global Long Range Research Initiative (LRI) ([www.cefic.org](http://www.cefic.org))

**A. Kortenkamp**  
**University of London School of Pharmacy (United Kingdom)**

## **COMMENTS FROM AN ENDOCRINE DISRUPTION PERSPECTIVE**

**Monday 22 May 2006**

It is to be welcomed that **Environment and Health** has been identified as a priority area in the FP7 work programme, and the research topics listed appear to be appropriate and sufficiently wide-ranging.

Urgently required, but missing from the draft text is a continuation of research on the

### **development of integrated environment and health risk assessment methodologies**

which has featured strongly in the dedicated FP5 call on endocrine disruption, and in various FP6 calls. In the endocrine disrupter area, this integration of human health and wildlife research has led to cross-fertilisations in method development and conceptual thinking in areas that were previously considered disparate. Integration of human and wildlife research has proven to be very productive for endocrine disrupter research, and it is to be expected that this will also be the case for other pollutants and risk factors.

It is **suggested to alter** the current draft work programme such that research on viable integrated risk assessment strategies can be continued. Otherwise, Europe is in danger to lose important expertise in this research area which is key for the advancement of new risk assessment strategies.

Ongoing EU-funded research has strengthened the idea that endocrine disruption is a serious problem for human and wildlife health. The challenges posed by endocrine disrupters cannot be solved in the short term and require a **long-term commitment to research** dedicated to characterising human and wildlife exposure and their mechanisms of action and interaction.

To guarantee continuity in this field it is of great importance that the topic of endocrine disruption features strongly in the first call for proposals.

**M. Krzyzanowski**  
**World Health Organization, Regional Office for Europe**

## **RESEARCH IN SUPPORT OF THE ENVIRONMENT AND HEALTH PROCESS IN EUROPE**

**Monday 22 May 2006**

The need for high quality **research on environment and health as the basis for policies** is well appreciated and has been recognized by the declaration of the 4<sup>th</sup> Ministerial Conference on Environment and Health in Budapest, in 2004. Therefore WHO warmly welcomes the inclusion of environmental health as a major topic for research under the 7<sup>th</sup> Framework Programme. We see this research as an important tool increasing effectiveness of the policies, focusing actions on the most important environmental determinants of health and on the most efficient ways to reduce the risk.

The estimated **health burden** of the current and future exposure in European population should be an important factor in selecting priorities for the FP7 research. The Clean Air for Europe programme has demonstrated that the long term exposure to air pollution shortens life expectancy of European citizens by almost one year. The research basis for the risk quantification comes mostly from non-European studies. This certainly points out the **long-term health impacts of air pollution** as a priority topic for European research.

While the quantification of the health burden of the pre- and post-natal exposure of children to various chemicals is hardly possible at the moment, these impacts are potentially significant and may have far-reaching consequences for the society. This calls for **cohort studies on childrens' health** including assessment of impacts of a wide range of environmental exposures on neurological and immunological development. Long term, sustainable funding and involvement of scientists with a broad range of expertise are essential for successful and informative long-term studies.

The FP7 should be fit to respond to the assessment of health significance of **emerging issues** that represent (or not) a new threat to population's health. There is growing concern that the emerging pathogens in the water environment, mostly protozoans and viruses, can pose such risk even if the water meets current quality requirements. Climate change may be one source of such "emerging issues".

The FP7 policy-relevant research should include **intervention studies** on the intended (or collateral) health benefits of the actions affecting environmental quality or preventing adverse health impacts of the lack of actions (e.g. in the context of climate or other global changes). They will increase the society's acceptance of the policies and, hopefully, will provide support to similar risk reduction in other parts of the Europe.

Policy making should be also facilitated by improvement of **health impact assessment**, and of **economic valuation** of the impacts. Also the research on **information and communication** on environment and health should improve the use of evidence in policy making and broaden participation of the public in managing environmental health risks.

According to its mandate and capacities, and following the request of the member states, WHO will be glad to actively participate in the planned research and promote implementation of its results in environmental health policies.

**H. Løkke**  
**National Environment Research Institute (Denmark)**

## **NOMIRACLE GOAL, RISK ASSESSMENT TOOLS PROVIDED – AND IDENTIFICATION OF FURTHER NEEDS FOR RESEARCH?**

**Monday 22 May 2006**

**Novel Methods for Integrated Risk Assessment of Cumulative stressors in Europe – IP co-ordinated by Dr. Hans Løkke**

Understanding and predicting cumulative stress is the ultimate goal that needs to be addressed in order to guarantee human and ecosystem health. It requires solid knowledge about (individual and combined) chemicals, non-chemical stressors, and their combined action. The endpoint of NoMiracle is to provide tools to quantify the exposure and effects of multiple stressors to which humans and ecosystems are exposed under real-life conditions. Tools will be developed to integrate geo-referenced pollution and exposure data with climatic GIS maps.

The main tool from NoMiracle will make it possible to identify deviations of chemical mixtures from conventional concepts such as Concentration Addition (CA) and Independent Action (IA) in order to identify synergistic effects and high risk situations. The model can be used to predict the likelihood and magnitude of deviations for risk assessment purposes (e.g. derivation of safety factors in risk assessment for mixtures). Furthermore, NoMiracle will explore potential mechanistic explanations for the deviations of the CA and IA models.

The toolbox further contains:

- (1) techniques to identify and prioritise realistic cumulative exposure scenarios;
- (2) novel algorithms to predict exposure levels under real-life conditions based on the analysis of matrix-compound interactions;
- (3) novel algorithms to predict the effects of exposure to multiple stressors based on the analysis of interactions between multiple stressors (chemical, biological and physical);
- (4) scientific integration of human and ecological effect assessment by incorporation of mechanistic information on biochemical and molecular processes;
- (5) a paradigm change from substance-oriented to receptor-oriented risk assessment, in which the receptor (e.g. an individual organism) is considered as an integrator of stressors over space and time;
- (6) a comprehensive evaluation of the uncertainties involved in the novel assessment methods and an indication of the implications for decision making, especially in relation to the precautionary principle.

To improve these tools, **more detailed research is needed on the genetic factors and molecular interactions that dominate the toxicokinetic and –dynamic processes of chemicals in organisms.** This information will enable the identification of general patterns, structures and mechanisms that can be used for predictive purposes in risk assessment, e.g. to predict the toxicity of a (cocktail of) chemical(s) in an untested species based on (a) the chemical structure of the substance, and (b) the genetic profile of the organism. Furthermore, **extra research is necessary on the impact of spatial and temporal variations in exposures which are typical for real-life exposure situations.** To achieve better proportionality in risk assessment beyond REACH, further development is needed of **tools to assess the interactions of chemicals and natural stressors**, including mapping of complex risk problems in Europe.

**G. Lücke-Brunk**  
**Federal Ministry for the Environment, Nature Conservation and Nuclear Safety**  
**(Germany)**

**ENVIRONMENT AND HEALTH:**  
**PRIORITY ASPECT INDOOR AIR**

One of our priorities in Environment and Health policy is to address the quality of indoor air. Keeping in mind that we spend about 80-90% of our time indoors, the quality of indoor air plays an important role for our health and well-being. In 1992 the German Government took this into account and developed a concept to improve the air quality in indoor spaces. In 2005 the Federal Ministry of Environment published a report about carefully selected action points in order to improve indoor air quality. Ten issues related to indoor air are mentioned like health related demands of building products and research. If we look to the general frame of the indoor air issue we have a complex matrix:

- Many indoor spaces are private (flats, houses)
- Lifestyle influences indoor air quality.
- Many sources which influence the quality of indoor air
- Interaction between indoor air quality and indoor air climate
- Mixtures of different substances.

Taking into account the complexity we need different appropriate policy instruments like awareness raising, acceptance of responsibilities and regulation.

Now we put our focus on research and health related evaluation of building products. We point out that it is important to carry out research under FP7 in the area indoor air quality and the impact on health.

**E. Negrenti**  
**ENEA (Italy)**

## **THE RELEVANCE OF ADVANCED SIMULATION SYSTEMS FOR E&H POLICIES DESIGN AND ASSESSMENT**

**Monday 22 May 2006**

A significant amount of knowledge is being accumulated on the relationships between environmental stressors (e.g. air pollutants, noise, food contaminants) and related health effects. This knowledge basin needs to be organised, structured, and 'amplified' through its usage in a coherent and general calculation system.

On the other hand, EU countries and the EC need complete and credible Decision Support Tools for designing and assessing European, national and regional policies for reducing the negative effects of Environment on human Health, with a key focus on vulnerable groups (e.g. children). Such policies can act on different rings of the so called 'Full Chain' from Sources to Health Effects. Typical 'rings' on which we can act are population behaviour, mobility, emissions from transport and other sources, pathways leading to human exposure. Planning Environment & Health (E&H) policies implies the accurate modelling of such systems.

These two overall needs can be satisfied by the realisation of advanced, integrated, and reasonably accurate Simulation Systems, capable of incorporating the available knowledge and allowing the representation of integrated policies as coherent sets of actions on the just mentioned 'rings'.

Such Simulation Systems will have to represent all the relevant Sources of environmental stressors, linked Pathways to humans, Population behaviour, Environment characteristics and risk fields, in order to model single and multiple or combined exposure to stressors of population groups, up to the final health end-points. Since the processes to be described have inherently different spatial and temporal scales, the approach to be followed will have to be 'multiscale' including very local (e.g. street level) and more aggregated (e.g. regional level) software modules.

Such integrated simulation systems could have the denomination of 'Regional Simulators', where the term 'region' is not linked to an administrative concept but rather to an 'environmental region' showing specific environmental problems and being inhabited by a well characterised population.

The concept of multi scale regional simulator can wrongly appear to be challenging or too adventurous. In reality several R&D Projects funded under FP5 and FP6 can provide strategic input both in terms of methods and in terms of realisations (e.g. prototypes of full chain integrated tools from Mobility to Health Effects and Cost Benefit Analysis).

The key added value of the proposed approach derives from the disaggregated representation of sources, population groups, risk fields, exposure fields, health effects maps, thus abandoning the aggregated approaches of the past, that assumed the 'environment' to be known simply from the limited measurements available, and population being defined as a static and aggregated entity.

The realisation of Regional Simulators in the optic of E&H planning will show significant overlaps and synergy with other strategic initiatives of the EC, and particularly the Thematic Strategies on Urban Environment and on Air Pollution.

**G. Oberfeld**  
**Public Health Department Salzburg (Austria)**

**PUBLIC HEALTH RESEARCH -  
THE NEED FOR NEW APPROACHES IN  
COMPLEX EMF-ENVIRONMENTS**

Monday 22 May 2006

**Problem**

Classical environmental epidemiology has focused mainly on single risk factors. This approach is justified when the risk factor under study is not surrounded by other risk factors of similar effect estimates with respect to the endpoint.

However our environments are becoming more and more complex with respect to various environmental risk factors. Especially human exposure to microwave radiation from mobile & cordless phones and their base-stations, wireless wide, local, personal area network etc. (WAN, LAN, PAN) is on the rise and epidemiological research in this areas is still at the beginning. Further examples are exposures to electric and magnetic fields in the ELF- and kHz-range from electric wiring and electrical appliances.

The situation of complex exposures may lead to non differential exposure misclassification and to reduced and even severely diluted effect estimates. Public Health needs reliable answers on risk factors.

**Key measures for improvement**

There is a need for better exposure assessment in future epidemiological studies taking the various risk factors, the different places of exposure (at home, at work etc.) and the various time courses of exposure into account. This has to be analysed by multivariate statistical methods.

Exposure matrix - example:

<b>Long term Exposure: <u>At home</u></b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>La-tency Years</b>	<b>Exp-hours</b>	<b>Cumm. Dose</b>
<b>Mobile Phone</b> mean number calls x duration (min) per year	10x3min x 365d= 10950min =182,5h	10x3min x 365d= 10950min =182,5h	10x3min x 365d= 10950min =182,5h	10x3min x 365d= 10950min =182,5h	4	730	
<b>Mobile Phone Base Station A</b> sum BCCH GSM bed at night <b>peak detector max hold</b>	12h x 365d =4380h x <b>1,4 mW/m<sup>2</sup> = 6132mW/m<sup>2</sup>.h</b>	12h x 365d =4380h x <b>1,4 mW/m<sup>2</sup> = 6132mW/m<sup>2</sup>.h</b>	12h x 365d =4380h x <b>2,8 mW/m<sup>2</sup> = 12264mW/m<sup>2</sup>.h</b>	12h x 365d =4380h x <b>2,8 mW/m<sup>2</sup> = 12264mW/m<sup>2</sup>.h</b>	4	17520	<b><u>36,8W/m<sup>2</sup>.h</u></b>
<b>Mobile Phone Base Station B</b> sum all CPICH UMTS bed at night <b>peak detector max hold / rms detector max hold</b>	-	12h x 365d =4380h x <b>1,4 mW/m<sup>2</sup> = 6132mW/m<sup>2</sup>.h / 0,14mW/m<sup>2</sup>= 613mW/m<sup>2</sup>.h</b>	12h x 365d =4380h x <b>1,4 mW/m<sup>2</sup> = 6132mW/m<sup>2</sup>.h / 0,14mW/m<sup>2</sup>= 613mW/m<sup>2</sup>.h</b>	12h x 365d =4380h x <b>1,4 mW/m<sup>2</sup> = 6132mW/m<sup>2</sup>.h / 0,14mW/m<sup>2</sup>= 613mW/m<sup>2</sup>.h</b>	3	13140	<b><u>18,4W/m<sup>2</sup>.h</u></b> <b><u>1,84W/m<sup>2</sup>.h</u></b>
<b>Cordless Phone</b>	-	-	-	-	-	-	-
<b>Cordless Phone Base Stations</b>	-	-	-	-	-	-	-

**M. Prendergast,  
Environmental Change Institute, NUI, Galway (Ireland)**

**EMERGING PRIORITIES IN ENVIRONMENT AND HEALTH  
RESEARCH IN THE ATLANTIC UNIVERSITY ALLIANCE (AUA)  
REGION OF IRELAND – FROM A IR TO Z OOLOGY**

**Monday 22 May 2006**

During my presentation I will deal with two issues: A) The development of a 4<sup>th</sup> Level Graduate School in 'Environmental Studies for Sustainable Development', and B) the major issues emerging in the AUA region in the areas of Environment and Health.

**A) Graduate School in 'Environmental Studies for Sustainable Development'.** The Atlantic University Alliance (AUA) is a cooperative initiative involving three Irish universities (National University of Ireland Galway, University of Limerick and University College Cork). These are the only universities on the Irish Western Seaboard: a unique location from which to study accelerated anthropogenic effects on the environment. The AUA is proposing to establish a 4<sup>th</sup> Level Graduate School in 'Environmental Studies for Sustainable Development' which will involve the three environmental research institutes in the aforementioned universities. Discussions are well underway among this group in regard to the emerging priorities for research in the areas of Environment and Health. It is proposed to pool the collective strengths of the three universities in the area of environmental change research and build a 'Knowledge Region' for environmental research expertise along the Western Seaboard of Ireland. Funding is to be made available through the Irish Research Council for Science Engineering, and Technology during 2006 for the planning of 4<sup>th</sup> Level Graduate Schools. The Irish University Association's document on 'Reform of 3<sup>rd</sup> Level and the Creation of 4<sup>th</sup> Level Ireland' calls for the creation of a new 4<sup>th</sup> level graduate with a formalised career development that includes training in key technologies, management and communication. The document lauds the benefit of targeted skills' enhancement which will produce a better quality graduate.

B) Last year the Environmental Change Institute conducted a consultation exercise within NUI, Galway on the major emerging areas considered of highest importance in the area of 'Environment and Health' Research. Topics discussed can be subdivided into four main categories: Water Quality, Air Quality, Waste, and Social Perspectives. As the time for the presentation is limited, I can discuss any one of the issues outlined below in more detail, or I can cover more than one issue in less detail. A major strength of the ECI is the area of Waste Management and Environmental Technologies. In the past year, the ECI has attracted almost €3 million in the area of environmental technologies. Also, the ECI attracted in 2005 the first ever largescale grant in the area of 'Environment and Human Health' (€1.2 million) from the Irish Environmental Protection Agency for a project entitled 'Enhancing Human Health through Improved Water Quality'. The project will examine the microbial contamination of drinking water.

**Water Quality**

The issue of most concern is thought to be the link between contaminated water supplies and public health. Studies in the following areas are considered to be of high importance:

- Microbial contamination of drinking water.
  - o Identification of sources of contamination in group water schemes.
  - o Rising incidence of cryptosporidium. Contamination of drinking water with cryptosporidium has increased this year and is a national problem.
  - o Agricultural impacts on water quality. Source tracking – identifying sources of microbial contamination using veterinary data.
  - o Linking clinical data with monitoring data.
  - o Using GIS to map epidemiological data with other variables. Use of GIS may pinpoint

gaps in the existing data.

- Mapping pollutants. Ecological evaluation studies which map the physical and chemical pollutants of water bodies, terrestrial and marine environments. Using GIS to import information into a meaningful geospatial environment.
- Wastewater treatment. New solutions to treat wastewater and improvement in sanitation methods.
- Generation of bioaerosols from wastewater systems, slurry spreading, and landfill sites. Impact to human health.
- Landfill – While much of the design and monitoring has been carried out, the health impacts have not been carried out. Monitor background measurements such as water runoff, aerosol generation.

### **Air Quality**

- Monitoring baseline air quality. Assessment of the physical, chemical, and aerosol contaminants of air. Important to monitor baseline level of air quality so as to differentiate total levels of contamination from background levels. Expertise and infrastructure available at Mace Head Atmospheric Research Station.
- Identify the sources of particulate matter in air.
- Linking physical/chemical data on air quality with epidemiological data, e.g., can some hospital admission data be linked to specific air pollution incidents? Linking HYPE data to events.
- Increased traffic/transport due to upturn in economy. Exhaust fumes, more gridlock, people spend more time in cars – does this have an adverse effect on health?
- Indoor air pollution. Sick Building Syndrome. What factors are contributing to indoor air pollution, e.g., air fresheners.
- Pollen studies – Aerosol measurements of pollen and relationship to respiratory health. Is there a link to asthma?

### **Waste**

- Incineration – It is important to conduct prestudies of the levels of dioxins, fly ash, heavy metals, volatile metals in air prior to the commission of municipal incinerators. Baseline data is essential so that increases in levels of contaminants can be monitored.
- Population health studies in areas where incinerators are to be built. Assessment of state of health of those living near incinerators.
- Develop technical expertise in incineration. Training of personnel in the development, design, use of incinerators.
- Develop infrastructure and capability in dioxin analysis. Build an accredited facility for dioxin analysis with dedicated staff.

### **Social and Health Areas**

- Effects on human health of the rapid expansion of built environment
  - o Effect of improved housing on health. Linking the social and physical environment together.
  - o Mapping transport times to work.
  - o Adverse health effects caused by largescale development.
- Health Impact Assessment. Similar to Environmental Impact Assessment but with a focus on development of disease due to largescale development. Include impacts to people already living in areas that are being developed, identifying problems and effecting change as development proceeds.
- Contribution of the built environment on increasing levels of obesity.
- Public attitudes to environment. Conduct studies on public perception of environmental issues. Is there a mismatch between these perceptions and scientific reality?
- Diseases – identifying if there are environmental switches contributing to the development of certain diseases such as Coeliac disease and Leukemia. The application of new molecular biological methodology is revolutionising the understanding of disease pathophysiology. Malignant diseases which were previously considered to be homogeneous entities (eg acute leukaemia) can be subclassified based on their unique genetic profile. An environmental/geographical study of the subclass distribution of common tumours may help to identify potential tumorigenic precipitants.

**Other**

- Pollution bioindicators. Using biological species to identify effects of pollution, e.g. seaweeds can be used to assess the health of an ecosystem (ecophysiology).
- Adverse health effects generated from low frequency electromagnetic radiation, e.g., power lines, mobile phones, transmitters. Mapping radiation using GIS.
- Attitudes to alternative energies such as wind power e.g., visual impact studies.
- Application of appropriate standardisation and quality assurance methods in food industry, in composting, anaerobic digestion, animal by products testing, organic fractions of domestic waste etc.

**V. Ragnarsdottir**  
**Department of Earth Sciences, University of Bristol (United Kingdom)**

## **TRACE METALS AND THEIR LINK WITH HEALTH**

**Monday 22 May 2006**

Trace element deficiencies (e.g. Zn, Cu, Se, Fe and Mn) and malfunction have been linked to a number of brain diseases, including prion diseases, Parkinson and Alzheimer disease, depression, ADD, ALS and dementia. Depression is the fourth leading cause of disease burden, accounting for almost 12% of total years lived with disability worldwide, the disease shows a distinctive geographical distribution across Europe and in 2005 the UK government admitted that depression costs £10bn (15 billion Euros) per year. At any time 1 million people in the UK suffer from clinical depression and 4 million from clinical anxiety states.

Trace metals are also linked with the geographical distribution of viral diseases. For example HIV infections in Africa develop into AIDS where Se is low in soil, whereas countries that have young Se rich soils (e.g. Senegal) have next to no AIDS sufferers. Similarly Chinese scientists have recently demonstrated that regions where bird flu outbreaks have occurred are areas where soils are poor in selenium.

Whilst the importance of the structure of trace metal complexes and proteins, as well as their reactions in many important life processes are known, numerous questions remain. Future work is needed to apply a multi-disciplinary approach to the investigation of the interaction of trace metals with proteins, enzymes and cell function. Needed are a blend of fundamental investigations of trace metal speciation, reaction mechanism and bonding in proteins, cell division mechanisms and environmental observations of trace metal availability at a regional scale and their link with disease distribution.

It is now possible to undertake risk assessments by comparing for the first time new maps of European soil trace metal geochemistry and disease distribution (WHO, EURODEP, ODIN) using Geographical Information Systems (GIS) and statistical methods. The studies would demonstrate whether there is a link between disease distribution and regional soil geochemistry.

As example studies would focus on:

- Bioavailability of trace metals;
- Metal status and resistance to oxidative stress in neurones;
- Effect of metal status in rodents on expression of antioxidant proteins, metalloproteins and amyloidogenic proteins;
- Assessment of metal status and antioxidant expression in patients with a variety of neurodegenerative disease;
- Molecular basis of metal entry into cells and the effect of disease state on the expression of metal uptake proteins;
- The permissive nature of metal transporting proteins;
- Linking of lipome to proteome to metallome (ionome);
- Determining the speciation of metals in membranes and metabolites.

**Additional comments after the meeting**  
**30 May 2006**

While it is important to be aware of possible health implications of polluted soils, what is even more important today, is to be aware of current trace metals deficiencies in soils. This is because conventional farming only adds artificial fertilisers to the soils (P:N:K), and not essential trace metals. As a result, soils have been "mined" for their trace metals for the past 50 years. This has led to UK vegetables, grain and meat having up to 50-80% lower trace metals content than during World War II.

Examples of trace metal deficiencies linked to health problems are given below:

Selenium deficiency:

Depression, asthma, allergies, cardiovascular disease, viral diseases including AIDS, cardiomyopathy and avian flu, cancer, alcoholism, thyroid function, autism.

Zinc deficiency:

Attention deficiency disorder (ADD), viral diseases, night blindness, liver cirrhosis.

Copper deficiency:

Alzheimer's disease, Parkinson disease, CJD, Cardiovascular disease, osteoporosis.

However, the biochemistry of these trace metals is poorly understood.

In view of these diseases and the facts that soils in Europe are degrading at an alarming rate, it is imperative to:

1. Instigate a research programme that focuses on understanding the life-cycle of soils, soil composition and soil protection.
2. Use new geochemical maps of Europe generated by FOREGS (FORum of European Geological Surveys) to investigate whether certain diseases have a geographical distribution that can be linked with soil chemistry.
3. Fund multidisciplinary work that links geochemistry, biochemistry, as well as medical and veterinary sciences. One such successful study was funded by the FP5 Quality of Life Programme (<http://www.arp-manchester.org.uk/FatePride.htm>). The final meeting of this consortium will be held in Iceland on June 26-29, 2006. See programme at [http://www.arp-manchester.org.uk/documents/FINALProgrammeandRegistration\\_001.pdf](http://www.arp-manchester.org.uk/documents/FINALProgrammeandRegistration_001.pdf)

The study mentioned above focussed on investigating whether trace metal imbalances have a role to play in the development of prion diseases (CJD in humans, scrapie in sheep, BSE in cattle).

**L. Ribeiro**  
**Mining Department, Instituto Superior Técnico (Portugal)**

## **IMPACT OF GEOGENIC FACTORS ON PUBLIC HEALTH**

**Monday 22 May 2006**

Public health intervention seeks to establish some degree of control over sources of risks to human health and well-being.

The impact of geological factors on human health have been recognized for thousand years.

More and more there is a growing need to know how the geological, physical and biological processes of the Earth systems are functionally interrelated and how rocks, soils and groundwater and their interrelated processes affect directly or indirectly the health of local populations.

Only a multidisciplinary team consisting of geologists, engineers and medical researchers interacting for a unique objective could contribute to development of prevention strategies and priority support on the environment and health research.

From the experience acquired from some Portuguese R&D projects in the field of geosciences, environmental sciences and public health, the following main priorities for future environment and health research are identify:

1 - Effects of abandoned exploitation mines and their consequences (acid mine drainage, toxic heavy metals, As, Cd, Pb, Hg, U) on water and air quality. Risk evaluation includes consumption by local populations of agricultural and other foods where polluted water was used in their production process;

2 - Arsenic poisoning caused by severe water table drawdown in areas with As rich content rocks. As the water table has fallen, the arsenic bearing sulphid rocks dry out, oxygen penetrates rocks, oxidizing the sulphur minerals. This has freed the arsenic to become dissolved in the groundwater and washed into the wells. Groundwater over pumping frequently occurs during long droughts were surface water supply is insufficient. A plausible scenario of water availability reduction that also can occur due to rainfall decrease as an effect of climate change;

3 - Other geo-environmental and health R&D include: low Zn water concentrations associated to the development of childhood onset diabetes; low Se content associated to the development of some cancers and cardiovascular diseases; low fluorine concentrations provokes caries and high ones, dental mottling and skeletal fluorosis; water hardness and the occurrence of cardiovascular diseases;

4. Thermal waters and their curative and therapeutic qualities. The environmental problems associated with the use of low-temperature thermal waters are different, in many aspects, from those of utilizing high-temperature geothermal resources. Spas are very dependent on both constant temperature and water quality. Thus, the existence of mixing between thermal waters and local shallow groundwaters is one of the main issues. The development of reliable management practices to preserve thermal water quality and remediation plans (in situations were thermal resources are already polluted), requires the identification of the sources of pollution and the processes affecting (in each particular situation) local concentrations.

**KEYWORDS:** Medical geology; Groundwater; Uranium; Arsenic poisoning, Thermal wasters

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**N. Runnalls**  
**UK Natural Environment Research Council**

**UK ENVIRONMENT AND HUMAN HEALTH RESEARCH  
PROGRAMME**

**Monday 22 May 2006**

The Environment and Human Health Programme draws funding and scientific support upon a wide range of the major research funding bodies of the UK. The mobilization of this wide range of interest and expertise reflects a consensus that the challenges of human health and the environment require significant resources and a multi-disciplinary approach.

A core objective of the UK EHH Programme will be to build the capacity of experts to be able to undertake interdisciplinary research.

The EHH Programme covers the key emerging issues - Pathogens, Pollutants, Pathways & People

- Transport and dynamics of micro-organisms, chemicals and particles of different sizes and compositions of human health importance in the natural environment
- Emerging infectious diseases
- Technologies providing new capabilities for establishing and predicting the impact of the environment on human health
- Social, economic and behavioural factors in the genesis and health impact of environmental hazards

For information about the UK Environment and Human Health Programme, contact  
Lucy Parnall, NERC (lcpa@nerc.ac.uk)

The UK Environment and Human Health Research Programme will provide an excellent complementary action along with those supported by FP7. UK research funders, and the research community will be seeking partnerships with EU partners in maximizing synergies between FP7 and other national programmes.

The UK has considerable research expertise across a wide range of EHH areas. The EHH programme will bring together research centres and universities with strong interest from the pharmaceutical industries.

NERC Research Centres with particular expertise in EHH are :

- Centre for Ecology and Hydrology – contact Neil Runnalls (nrr@ceh.ac.uk)
- British Geological Survey – contact Pauline Smedley (pls@bgs.ac.uk)
- Plymouth Marine Laboratory – contact Jim Readman (jwre@pml.ac.uk)

We have distributed a handout providing entry points to the UK research community for researchers from other EU member States. We will be pleased to respond to any requests for collaborative research partnerships within FP7, or on a bilateral basis.

FP7 contacts: Natural Environment Research Council – Mary Thornton (math@nerc.ac.uk)

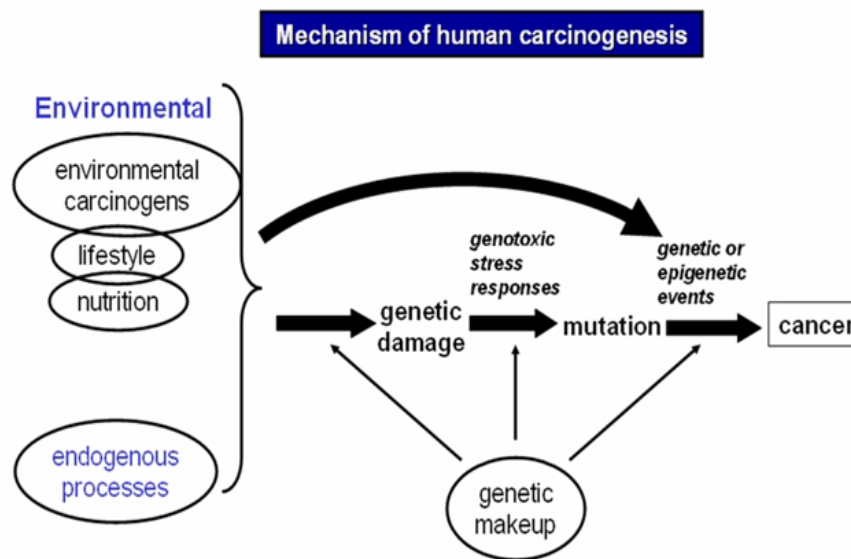
DEFRA – Zitouni Ould-Dada ([zitouni.ould-dada@defra.gsi.gov.uk](mailto:zitouni.ould-dada@defra.gsi.gov.uk) )

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**Environmental Cancer Risks, Nutrition and Individual Susceptibility (ECNIS)**

## ENVIRONMENTAL CANCER: IS IT STILL A PROBLEM IN EUROPE?

Monday 22 May 2006

**Cancer is the second leading cause of death** in Europe. Almost 3 million new cases of cancer and more than 1.7 million cancer deaths in Europe (25-EU) were reported last year. Ageing of the European population will likely cause these numbers to increase. **Tumours of the lung (13.2%), colon and rectum (13%), breast (12.8%), prostate (8.2%) and stomach (5.9%)** occur most frequently and are variably **associated with environmental factors**. It is estimated that environmental (non-endogenous) factors may contribute to as much as 70-90% of cancer risk.



The recently (February 2006) published Eurobarometer 238 on "Risk issues" revealed that a relative majority of European citizens find it likely that they will be the victims of environmental pollution. Six out of ten (61%) European citizens consider that this is "very" or "fairly likely" that environmental pollution will damage their health. This survey also showed that scientists are one of the most trustful groups when it comes to providing information on the potential health risks. In this context, it seems to be absolutely essential to support research which will allow to more precisely assess the relationship between exposure to different environmental hazards, as well as dietary components and the role of individual susceptibility in modifying this relationship. Recently, any attempt to estimate the proportion of all cancers that might be avoided through the control of different environmental factors is still largely a guesswork. We are even more ignorant when we try to evaluate the effects of combined exposures (nutritional and environmental factors) in different genetically susceptible populations. Many of these gaps in knowledge may be filled in by joint efforts of epidemiologists, toxicologists, food specialists and molecular biologists. The identification of new carcinogens, characterized by weak effects and complex exposure circumstances, has become increasingly difficult using traditional epidemiological approaches. In parallel, the increasing knowledge of the mechanisms of early steps in the carcinogenic process has led to the identification of relevant metabolites and their interaction with other biologically active compounds. Moreover, the technical advancement in molecular biology, including the use of robots, high throughput methods etc, has allowed application of these recent research developments to large-scale assays, which would otherwise be very resource-extensive, or even impossible. The intensive work performed thus far under the ECNIS NoE project has prepared firm grounds for such cancer research activity on a pan-European scale.

**R. O. Salonen**  
**National Public Health Institute, Kuopio (Finland) / COST 633**

## **IMPORTANCE OF SOURCE-SPECIFIC CHARACTERIZATION OF URBAN AIR PARTICULATE EXPOSURES AND HEALTH EFFECTS FOR FUTURE POLICIES**

**Monday 22 May 2006**

This presentation is given as a representative of the multidisciplinary COST Action 633 'Particulate matter: properties related to health effects'.

The Clean Air for Europe (CAFE) Programme of the European Commission has recently estimated that current exposures to ambient fine particulate (PM<sub>2.5</sub>; particle size < 2.5 µm) air pollution in the 25 EU Member States cause annually about 350000 premature deaths and a substantial restriction of normal life among tens of millions of subjects with chronic respiratory or cardiovascular disease. The annual costs of health damage were estimated at 270 – 780 billion euros. This state-of-the-art estimation was based on regional PM<sub>2.5</sub> mass concentrations assuming that all fine particles originating from a whole variety of sources (e.g., combustion processes, atmospheric gas-to-particle transformation, natural sources) are equally harmful to health.

However, there is scientific evidence that the mass-based exposure-response relationships of particulate matter may vary in different regions of Europe as well as locally due to larger than average exposures to particles from certain emission sources (e.g. traffic, domestic heating with solid fuels, poorly controlled metal industry). Moreover, coarse thoracic particles (size 2.5-10 µm) and ultrafine particles (size < 0.1 µm) have shown health effects independent of PM<sub>2.5</sub>. The future regulation of particulate emissions and ambient air concentrations as well as the development of environmentally friendly technologies would greatly benefit of integrated, pan-European study approaches on ambient air particulate pollution challenging the whole impact pathway of emission sources - atmospheric dispersion & transformation - human exposure - toxicity mechanisms - health outcomes.

We should strengthen our knowledge about the source-specific impacts at all levels of this chain, because it is primarily the most harmful sources and their particulate compositions as well as human exposure patterns that need to be recognized and more effectively controlled. For instance, we do not know, how much more or less harmful the urban air particulate compositions originating from local source emissions (e.g., traffic, domestic heating with solid fuels, industries) are in comparison with those from aged regional or long-range transported particulate pollution.

Pan-European multidisciplinary collaboration and harmonized study protocols are needed, because the source mixtures, atmospheric transformation of particles, human exposure patterns and susceptibility of the populations are likely to vary with region, climate, socioeconomic factors etc. In addition to health effects of short-term particulate exposures, more scientific evidence is needed on health impacts of long-term particulate exposures in Europe with identification of the responsible sources. Experimental research on toxicities of the same particulate mixtures is needed to support the cause-relationship assessments made on the basis of epidemiological research. Moreover, long-term integrated study approaches can produce scientific evidence about the health significance of various local, regional and community-level interventions reducing the level and changing the composition of urban air particulate mixture.

The Commission has already stated in its Thematic Strategy on Air Pollution up to 2020 that at least the new scientific evidence on PM<sub>2.5</sub> will be incorporated to a 5-yearly update and revision process of the air quality directive. In conclusion, new pan-European integrated study approaches on ambient air particulate pollution and health would produce strong evidence on the causal relationships between sources, composition and health effects. This would help (a) linking the future EU regulation of the highly complex ambient air particulate mixture closer with that of the major sources, (b) promoting local and regional air quality improvements and (c) reducing social inequality in this area of environmental health. There would be also good opportunities for development of new modelling tools for future air quality management.

**K. Savolainen**  
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## **THE SAFETY AND HEALTH IN EXTREME AND UNUSUAL CONDITIONS - CAPABILITY TO MAINTAIN VITAL SYSTEMS IN SOCIETY**

**Monday 22 May 2006**

Recent events such as the Pakistan earthquake, Hurricane Katrina, the Indian Ocean tsunami and the recent European heat waves of 2003 reveal the vulnerability of societies to extreme events. Recent events demonstrate that disaster losses are on the rise with grave consequences for the survival, dignity and livelihoods of individuals and communities, particularly of the poor in the developed and less developed countries, and for development gains. Disaster risk is increasingly of global concern and actions in one region can have impacts on risks in another. This, compounded by increasing vulnerabilities related to changing demographic, technological, and socio-economic conditions, unplanned urbanization, development of high-risk zones, climate variability, geological hazards, and competition of for limited resources, points to a future when disasters could increasingly cause a threat to the world's economy, its populations and the sustainable development of developing countries. In the past two decades, more than 200 million people have been affected, every year by disasters.

Disaster risks especially arise when hazards interact with physical, social, economic and environmental problems and vulnerabilities. Events of hydro meteorological nature constitute the large majority of disasters. Despite the growing understanding and acceptance of the importance of disaster risk reduction and increased disaster response capabilities, disasters, and especially the management and reduction of risks continue to be a global challenge.

There is a growing international consensus that efforts to reduce disaster risks must be systematically integrated into policies, plans and programs for sustainable development and poverty reduction, and supported by regional and international cooperation.

There is an obvious need to develop research funding programs based on concepts presented above within the European Union framework. There is an increasing need to take into consideration catastrophic events in other parts of the globe as they increasingly impact economically and through other means European Union and its member states. Further, since 1976, there have been 559 extreme events in Europe, and the number has been increasing. These events have affected about 16 million persons directly, and caused direct damages worth 190 billion euros. Losses to public infrastructure, including hospitals and roads, lost value of life and disability and damages to historic sites are not included in these figures. Europe is a large and diverse area and exposed to variety of disaster risks. In addition to natural hazards, there are a number of local issues such as level of industrialization, economic activity and its diversification, population distribution and land-use policies. However, shared risks and vulnerabilities are present throughout the whole region.

It would be justified to establish a major research and policy initiative within the 7th framework program to explore extreme events in Europe and to increase capacity building to reduce the consequences of such events. This kind of initiative would benefit from collaboration with more disaster prone areas, especially South-East Asia, in which such events have been about five times as frequent, i.e. 522 (Europe) as compared with 2760 (Asia) during 1975-2004.

**K. Savolainen**  
**Finnish Institute of Occupational Health**

## **BENEFITS AND POTENTIAL HEALTH RISKS OF ENGINEERED NANOPARTICLES IN OCCUPATIONAL AND GENERAL ENVIRONMENT**

**Monday 22 May 2006**

Nanotechnology is a rapidly increasing area of industry providing new and innovative solutions being introduced into many industrial fields including IT-technology, production of car tires, sports equipment, and cosmetics. Nanotechnology, i.e. the production of based on different nano-sized particles, will have a major impact on everyday life of people in the industrialized societies. Therefore, it is clear that there are increasing demands by the society for reliable and understandable information on health effects of engineered nanoparticles, and their applications. The challenge faced by the policy makers and the scientific community as well as the industry producing nanoparticles and nanotechnology products, as well a number of stakeholders, is that very little or nothing is known about the health effects of most of these particles. There are, however, alarming observations that many nanoparticles types may have remarkable toxic potential and thus capability to harm human health. Thus, to assure the safety and health of consumers and workers, as well as wellbeing of the environment, more information on the effects of nanoparticles on these issues shall be available. This emphasizes the importance of conducting focused research to explore and identify potential harmful effects of nanoparticles on human health and the environment. Even though the volume of production of different nanoparticles and products containing these particles is limited at present, the volumes, and consequently exposure of humans and the environment, are likely to increase. The global research investments to nanotechnology were about 8 billion euros in 2005, and industry expects annual turnover of more than 1 trillion US dollar by 2015. The annual business turnover of semiconductors related to nanotechnology was about 300 billions in 2005.

There is a need to incorporate the concept of safety and toxicity research into the development of new nanoparticles and products of nanotechnology to assure the safety of these new innovations to humans and the environment. It would be an important contribution of the 7th framework program if this goal could be achieved.

Immediate needs in terms of developing our knowledge base on nanoparticles in promotion of funding programs exploring chemical and physical characteristics of new nanoparticles as well as exploring surface areas and factors that determine the biological activity of various nanoparticles. Extremely important is also to develop methods for assessing of exposure both in the general and in the occupational environment, and application of these methods in field situations. Key issues are also 1) exploring of the behavior of nanoparticles in the body, i.e. in the blood stream, in the cells, and in the tissues (biological nanokinetics); 2) effects and mechanisms of effects of nanoparticles on the lungs and lymphoid tissue, the heart, kidney, the brain, vessel wall including microcirculation. The emphasis should be in the development and utilization of novel and more traditional in vitro technologies supplemented when necessary with in vivo studies.

Equally important is exploring the behavior of nanoparticles in the environment and effects of these particles on living organisms (flora and fauna) in the environment. The emphasis should be in the development and utilization of novel and more traditional in vitro technologies supplemented when necessary with in vivo studies.

**A. Scott (given by I. Katsiadaki)**  
**Cefas (United Kingdom)**

## **XENOESTROGENS ARE A PROBLEM IN EUROPE'S MARINE FISH**

**Monday 22 May 2006**

Male dab (*Limanda limanda*) and cod (*Gadus morhua*) caught offshore on the European continental shelf contain elevated plasma concentrations of female egg yolk protein (vitellogenin; VTG). The same observation has been made in tuna and swordfish in the Mediterranean.

The size of the fish is very important in dab and cod. The larger the male fish, the higher the level of VTG in its blood. Age per se is not an important determinant.

Since the size of an individual fish is primarily determined by the amount of food that it has eaten, a likely explanation for these results is that, as they grow, marine fish gradually accumulate stable man-made pollutants that are widespread in the marine environment (e.g. DDT and PCB). Some such persistent organic pollutants have already been shown to be weak oestrogens.

The chemicals that have been most implicated in fresh water species and estuaries (female hormones discharged from sewage treatment works) are highly unlikely to be implicated in cod, dab, tuna or swordfish (due to the relative instability of these hormones and the fact that some of sites where affected fish are caught are many miles from land).

There is sufficient data already from dab (and swordfish) to show that the presence of egg yolk protein in large marine fish is NOT part of any natural process.

In terms of the implications of these findings for the health of the fish or other animals that eat them, it is impossible to do anything more at the moment than speculate. **To make any decisions (or to know if they are any legislative actions that could be taken), it is essential to know the identity of the causative compounds.**

If the causative compounds are, as the data appear to show, cumulative compounds, then they or their metabolites are likely to be still present in (and thus extractable and identifiable from) the flesh, liver or bile of large affected fish. This approach is very feasible and, because of the Europe-wide nature of the problem, would benefit strongly from being carried out in a concerted fashion by several European countries (i.e. a co-ordinated EU contract), rather than single countries on their own.

Once the identity of the compounds is known, key questions that can then be tackled by EU scientists and legislators are:

- Is it a problem for the fish?
- Is it a problem for the food chain?
- Is it a problem for the consumer?
- Is there any remedial action that the EU can take?

**S. Stansfeld**  
**Centre for Psychiatry, Wolfson Institute of Preventive Medicine, Queen Mary,**  
**University of London (United Kingdom)**

## **FURTHER RESEARCH ON THE ENVIRONMENT AND CHILDREN'S HEALTH AND COGNITION**

**Monday 22 May 2006**

Chronic exposure to aircraft noise was associated with impairment of reading and recognition memory in linear exposure – effect associations in 9-10 year old children in the RANCH Study. This Vth Framework funded study suggested that highly noise exposed schools were not healthy environments for children's learning and health. The study results have implications for new research on how to prevent these effects in children.

The following topics would be suitable subjects for further research under Framework 7:

- **Sound insulation of schools:** If exposure to high levels of aircraft noise at schools has effects on children's learning, would sound insulation of classrooms help to protect children's learning. It is proposed that a cluster randomised trial of sound insulation is carried out in highly noise exposed schools to assess the effects on children's learning.
- **Long term follow up:** It is not clear whether noise effects on children's learning are short term or represent lifelong impacts on children's learning, education and employment prospects. It is proposed that children examined in the Netherlands, Spain and the United Kingdom in primary school in 2002 are followed up in secondary school to examine the persistence of cognitive impairments in relation to changes in noise exposure.
- **Multiple stressors, multiple outcomes:** Socially disadvantaged children are exposed to multiple stressors that may have interactive effects on child health. There is little research on the combined impact of multiple stressors (noise, air pollution, fear of crime, poor housing) on children's health. It is proposed that there are new longitudinal studies in the future covering a range of environmental stressors examining both physical and mental health.

### **Additional comments after the meeting**

**8 June 2006**

As I mentioned in my presentation I think there is a need for longitudinal studies of noise and children's health, taking into account other environmental stressors such as air pollution, crowding and social stressors.

In terms of noise effects I think I would like to add that there is a need to fill a research gap - that is examining the effects of noise on mental health in adults in a longitudinal study, various unsatisfactory studies have been carried out and there is no clear-cut evidence to show whether environmental noise exposure does cause psychological problems - here cumulative exposure may be very important.

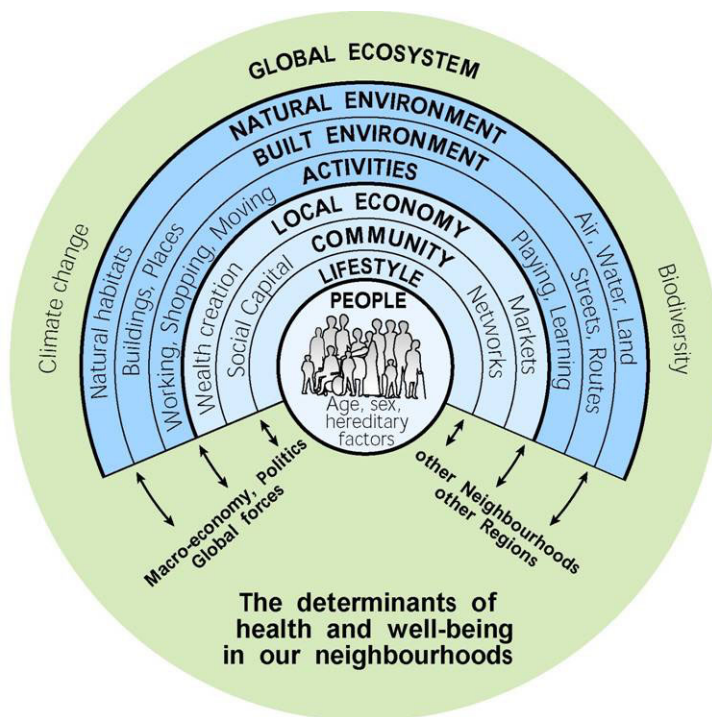
**D. Stone**  
**English Nature - on behalf of Natural England (United Kingdom)**

## POSITIVE ENVIRONMENTAL DETERMINATION OF HUMAN HEALTH

Monday 22 May 2006

### Background

The environment is a well recognised determinant of human health. It is a determinant over which the individual usually has little or no direct influence. The consideration of environment and human health tends to focus on the negative impact of degraded environments.



This diagram<sup>1</sup> teases apart critical components of the environment that act as determinants of health. These components can act as a positive determinant of human health if environments are well managed. EEA report entitled Environment and Health<sup>2</sup>, remind us of the inter-relationship between people and their environment. The WHO Millennium Assessment Report on Ecosystems and Human Health<sup>3</sup> clearly evidences the dependency that people have on functional ecosystems and access to good quality natural environments. Environmental and climatic changes bring a wide range of threats to human health. For example, increases in UV radiation exposure, different air pollution scenarios, heat-and-cold related morbidity, and different vector-borne diseases<sup>4</sup>. Equally, other evidence strongly indicates that quality nature-rich environments and functioning ecosystems can support socially and economically sustainable health outcomes. For example through mitigation of climate extremes,

enhancing physical activity levels (especially amongst children), reduction of aerial particulate loads, and purification of water<sup>5,6,7,8,9,10</sup>.

<sup>1</sup> H. Barton & M. Grant (2006), the determinants of health and well-being in our neighbourhoods. In press.

<sup>2</sup> European Environment Agency (2005), EEA Report 10/2005 – Environment and Health, Copenhagen.

<sup>3</sup> WHO (2005) Ecosystems and Human Wellbeing: a report of the Millennium Ecosystem Assessment.

<sup>4</sup> UK Department of Health (2001), Health effects of Climate Change in the UK, HMSO

<sup>5</sup> J. Pretty, M. Griggin et al, (2005) A countryside for Health and wellbeing: the physical and mental health benefits of green exercise, Report for Countryside Recreation Network.

<sup>6</sup> K. Willis & L. Osman (2005) Economic benefits of accessible Greenspace for physical and mental health: scoping study, published by Forestry Commission.

<sup>7</sup> J. Midgley, N. Ashton et al (2005), Health, Environment and Deprivation in the North West of England, Centre for Public Health, John Moores University, Liverpool

<sup>8</sup> Maller, C., Townsend, M., Brown, P. & St Leger, L. (2002), Healthy Parks, Healthy People: the health benefits of contact with nature in a park context: a review of current literature. Deakin University and Parks, Victoria, Australia.

<sup>9</sup> De Vries, S., Verheij, R.A., Groenewegen, P., and Spreeuwenberg, P. (2003) Natural environments healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning* 35 p1717 – 1731.

<sup>10</sup> Takano, T., Nakamura, K., & Watanabe, M. (2002), Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. *Journal of Epidemiology and Community Health*(56): 913 -918.

By taking a positive holistic view of the environment and ecosystems we can start to address the environmental inequalities that underpin a number of generic environment and health issues.

## **Policy Relevance**

European Environment & Health Action Plan conference in 2004 concluded that research must have policy relevance. Research into environment as a positive determinant of health can, and must, build links with policies and actions related to climate change, EU sustainable development goals, Gotenburg 2010 biodiversity targets, the Water Framework Directive, the Urban and Pesticide Thematic Strategies, flood risk management, CAFE, to name just some.

## **Research Priorities**

Whilst there is a growing body of evidence that links quality environment and human health there is a pressing need for thorough evaluation and analysis to establish the economic and social, as well as the environmental benefits. Many environmental positive initiatives have never been considered from the human health perspective. FP7 provides a timely opportunity to address some the gaps in our knowledge about this important dimension of the environment as a determinant, the outcomes of which should inform the development of future policies across a wide range of areas. Natural England believe that research proposals that address one or more of the following themes should be a priority:

- Human health cost-benefit analysis of environmental interventions;
- Wildlife and functional ecosystems as early warning signals for human health impacts e.g. food chain accumulation of endocrine disruptors;
- Evaluation of the health outcome effectiveness of specific sustainable environmental interventions derived from policy implementation e.g. increasing accessible green space in urban areas.

### **Additional comments after the meeting**

**6 June 2006**

"I do have some additional comments following on from the meeting relating to research requirements around the role of biodiversity and ecosystems, and human health.

Several stakeholder presentations reflected the need to enhance evidence and knowledge about the relationships between biodiversity, ecosystems, and human health with particular regard to climate change, sustainability, and urban development. These relationships may have a positive or negative impact on human health outcomes and FP7 should stimulate work that explores both dimensions. The stakeholder meeting emphasized that an inter-disciplinary approach to natural environment – human health would facilitate synergistic policy development within the EU. The impacts of global change set the context for immediate work in this area, and I would suggest that the political priority afforded to it should promote such work to Call 1 or Call 2 of FP7.

I reiterate the research priorities that I presented at the meeting which fit into this approach:

- Health cost-benefit analysis of environmental interventions., i.e. re-vegetation of urban areas to reduce street level ozone and climate extreme mitigation;
- Wildlife and functional ecosystems as early warning signals for human health impacts e.g. food chain accumulation of endocrine disruptors;
- Evaluation of the health outcome effectiveness of specific sustainable environmental interventions derived from policy implementation e.g. increasing accessible green space in urban areas.

I would suggest that some of the indicative FP7 priorities, presented by Dr Tuomo Karjalainen, could be slightly modified to accommodate the needs in biodiversity and ecosystem arena. The table on the next page indicates some proposed changes to that effect.

<b>Indicative Priority</b>	<b>Proposed Revision</b>
European Network on Biomonitoring	Improve coordinated approach to human biomonitoring and surrogate monitoring in Europe
Global Environmental Change: health and socio-economic impacts	Use GIS approaches to identify populations with potential vulnerability and resilience to global environmental change hazards i.e. water scarcity, temperature extremes
ERA-NET for Environment and Health	Assemble, evaluate and coordinate national programmes in environment (including biodiversity & ecosystems) and health research in the EU
Integrated assessment of urban environment and health	Develop integrated assessment models and methodologies for evaluating cumulative effects, interactions of stressor, and mitigation of stressors in urban environments .....

To summarize my response to the stakeholder meeting:

- The need exists to enhance evidence and knowledge about the relationships between biodiversity, ecosystems, and human health with particular regard to climate change, sustainability, and urban development.
- The priority of global environmental change should promote aspects of this work to Call 1 or 2 of FP7;
- There is a need to research the positive as well as negative natural environment – human health interactions;
- Modification of a few indicative FP7 priorities would facilitate work in this area and build upon extant networks.”

**J. Urbanus**  
**CONCAWE (Belgium)**

## **SHAPING POLICY-RELEVANT RESEARCH ON THE HEALTH EFFECTS OF AIR POLLUTION IN EU FRAMEWORK PROGRAMME 7**

**22 May 2006**

CONCAWE is the oil companies' European association for Environment, Health and Safety in refining and distribution ([www.concawe.org](http://www.concawe.org))

Our main objectives are:

- To acquire pertinent scientific, economic, technical and legal information on environmental, health and safety issues relating to the refining of crude oil and distribution and use of petroleum products
- To communicate the findings in order to improve understanding of these issues by all stakeholders including the industry, authorities, and the public at large

We are committed to:

- Support and promote research for a clean and healthy European environment to maximise people's overall quality of life
- Help shape the FP-7 research theme Health and Environment
- Make our expertise available in the fields of toxicology, epidemiology, air quality modelling and emissions assessment

We are concerned that the scientific basis for establishing European ambient air quality levels remains weak in a number of key areas. The main points of critique are:

- The current assessment of health risk relies heavily on studies from the USA (with a substantially different 'pollution mix' from Europe)
- The key study being used to describe air quality ambitions – the so-called ACS study – has several unexplained findings and lacks robustness
- The focus of the epidemiological studies is on common diseases (e.g. cardiovascular) with multi-factorial aetiologies. This constrains the ability to relate findings to a single environmental causal factor, such as particulate matter in ambient air

We believe that FP7 provides the opportunity to develop integrative, cutting edge studies that can serve as a basis for European policy decisions on protection public health:

- Geographically relevant epidemiological studies on air pollution in the wider context of overall health impact from environmental factors
- Studies to consider all risk factors and better understand their relative contribution to health disorders
- Seek to reconcile data from all relevant disciplines, i.e. exposure assessment, source apportionment, clinical, experimental and mechanistic data, as well as environmental epidemiology
- Provide answers within a policy-relevant time frame
- Engage new scientific partnerships across the EU to bring fresh perspectives and science to the debate

As stakeholders we ask for proper governance of environmental health studies:

- the opportunity to comment on the scientific content of research proposals prior to taking any final decision by DG RTD, for example through the Commission's Consultative Forum on Environment and Health
- a mechanism to continue to be informed on the progress of projects
- communication and dialogue with stakeholders at key project milestones

Your contacts in Concawe are:

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**C. Van Stappen**  
**GA<sup>2</sup>LEN (Global Allergy and Asthma European Network)**

**ALLERGIC DISEASES, RESEARCH PRIORITY  
IN ENVIRONMENT AND HEALTH**

**Monday 22 May 2006**

GA<sup>2</sup>LEN, *Global Allergy and Asthma European Network*, is an EU funded FP6 network of excellence. It is a consortium of leading European research teams, selected for their scientific excellence, with evidences of multidisciplinary working, training and educational activities and international collaboration.

The past 40 years have witnessed a dramatic increase in the prevalence of allergic diseases and asthma, which now represent an increasing public health problem in Europe. The economic and social burden of “allergic diseases” is dramatic. 1 child in 3 is allergic today in Europe.

The reasons for the rise in allergy and asthma remain unclear, but epidemiological evidence indicates that this rise has also been driven by changes in the environment.

There is strong evidence that there has been a substantial increase of the population becoming sensitized to common allergens. The rapidity of this change demonstrates clearly that it is a result of a changing environment. Understanding the environment role and influence is essential to best organize allergic diseases care and prevention

**This is the reason why it is so important that environmental causes (indoor and outdoor pollution / climate changes) related to allergic diseases are further addressed and considered as priorities in the health research in FP7.**

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## **LONG TERM EFFECTS OF EXPOSURE TO AIR POLLUTION: USE OF EXISTING LONGITUDINAL STUDIES IN EUROPE**

**Monday 22 May 2006**

Although recent cohort studies in Europe and the US suggest that long-term exposure to air pollution is associated with an increased risk of lung cancer and cardiovascular disease, it is not clear to which pollutants the excess is related. US studies tend to indicate PM10 as the main responsible, whereas European studies are more generally positive for NO<sub>2</sub>. In addition, there is not much evidence for the effects of ultrafine particulate.

There are several mature cohorts in Europe that are suitable for the study of air pollution, including several millions subjects and relatively long follow-up. Linking these cohorts to ambient air pollution measurements affords an opportunity to further examine the association between long-term exposure to air pollution and population health.

We propose to take advantage of large suitable longitudinal studies in Europe, to investigate the long-term effects of air pollution.

A case-cohort design is proposed, to allow cost-effective exposure assessment. Cases would be subjects died from any cause, although particular emphasis could be put on cardiovascular and respiratory deaths. Controls would be a random sample of each cohort at inception, of equal size as the case series. Assuming a conservative estimate of prevalence (5%), we need 1415 deaths in order to find an odds ratio of 1.5 (95% C.I. 1.36-1.65), and 4909 to identify an odds ratio of 1.25 (95% C.I. 1.13-1.38).

### **Strengths of existing cohorts**

- Large cohorts affording the ability to detect small risks
- Diverse spectrum of geographic, demographic, dietary, and cultural regions
- Large air pollution exposure gradient on which to base an assessment of exposure response
- Diverse multiple pollutant exposure profiles may permit disentanglement of particulate and gaseous air pollutant effects
- Extensive covariate information at the individual level, including diet, smoking status, job title, and educational attainment
- Limited population mobility in Europe, thereby minimizing exposure misclassification
- Availability of registry based cancer incidence data, including histological subtypes of lung cancer
- Biomarker data provide an opportunity to conduct whole genome scans and examine genetic susceptibility to the adverse health effects of long term exposure to air pollution (including cardiopulmonary morbidity and mortality as well as lung cancer)
- Availability of multiple monitoring measurements within urban centres will facilitate adjustment for exposure measurement error using regression calibration

### **Linkages with ACS Cohort**

- Comparisons of European and American (ACS) results will help to understand the health effects of air pollution
- Joint analyses of ACS and European cohorts could serve to provide more precise estimates of air pollution health risks, and to describe heterogeneity between Europe and North America

**A-C. Viso**

**AFSSET French Agency for Environmental and Occupational Health Safety**

## **WHY IS COORDINATION OF NATIONAL PROGRAMMES STILL NEEDED**

**Monday 22 May 2006**

The assessment of health impacts is based either on scarce exposure data and limited information on the relationship between exposure and health or on data generated with different methodologies. There is therefore a need to strengthen research in this area in Europe, in particular in new Member States, to generate new knowledge and reduce uncertainties, but also to develop methods and tools which will improve comparability of data. Member States have developed skills and expertise using very different mechanisms to fund Environment & Health research. In order to tackle the broad and complex problems encompassed in E&H, there is a need to mobilise not only the environmental science community, but also public health communities. Up to now the scientific boundaries created by the remits of different funding organisations has frequently acted as a disincentive to collaborative working. Although claims for organising are towards pertinence and efficiency, the results remained dispersed, and not of actual support for policy making.

The coordination of national programmes will provide a significant contribution to the establishment of the European Research Area and will build lasting cooperation between MS. In 2005, based on information from 18 programme managers and programme owners from 10 countries (Italy, UK, Poland, France, Belgium, Ireland, Slovakia, Norway, Finland, The Netherlands, more than 350 on-going projects were identified for an approx total value is 30 M€/year for E&H project funding. What do we know about these projects? We know far more about the EC funded projects (better dissemination at the EU level)

As soon as 1997, CREST had identified the need for enhancing coordination through cooperation in E&H Research. In all EH policy documents, research is recognised as a key component (WHO 4<sup>th</sup> Ministerial Declaration, European Strategy and Action Plan for Environment and Health, National Action Plans for E&H...). Even though cooperation was implemented thanks to the Framework programmes, cooperation between national programmes per se had not been set up while it could have been most relevant.

Based on the CREST report in 1997 and on information gathered by AFSSET in 2005 on national research programmes, the following characteristics were identified:

- E&H not always a priority in national research agendas
- Development of regional E&H agendas which include research actions
- Framing issues in E&H research: what are the frontiers? Very often E&H is a cross cutting issue in national research programmes unless dedicated programmes or initiatives exist. There is a lack of integration of all the results generated in these programmes, sometime even at the national level.
- Different types of strategically planned programmes and different types of programme owners. The motivations for funding a programme differ from one organisation from another.
- Wide range of objectives from programme owners' point of view
  - Provide scientific evidence to support policy development and the quality of decision making (EU, national regulations and policies, international conventions)
  - Support to NEHAP
  - Provide new knowledge to reduce uncertainty in risk analysis and risk communication
  - Prepare integration of scientific teams in larger European or international projects
- Great diversity of institutional arrangements for E&H research funding (Research, Env, Health Agencies/Ministries)

The consequences of the present situation are at minima:

- Lack of visibility of national programmes at the EC level but also between MS, even for neighbouring MS)
- Limited access to research results of national programmes (web access, translation not always available)
- Lack of cooperation between national programmes
- Lack of cooperation between projects funded at the national level while relevant

The potential impacts of the coordination of national programmes should be:

- An improved understanding of the complexity of a wide range of E&H issues – Development of efficient mechanisms to interface science to policy which is identified as a priority by most funding organisations and policy makers.
- An improved information on work programmes and calls across the different MS
- The possibility to facilitate access to infrastructure relevant to E&H research
- The possibility to cluster programmes and projects from different MS (improved validation of results, multinational projects which gather a critical mass of resources while keeping the size of the consortium reasonable enough to manage)
- An improved dissemination of results and easier access to results for all stakeholders in particular thanks to summarised information provided by the network of programme managers
- A facilitated access to scientists for expert advice thanks to the network of programme managers who are fairly closed to the project coordinator and associates.
- Improved practices in terms of programme governance and planning, holistic view of project funded, identification of new topics
- A Mutual adjustment of the research agendas and shared understanding about E&H priorities,
- The strengthening E&H research at the national level
- The evaluation of a portfolio of E&H programmes and development of a more coherent E&H policy

Such coordination and cooperation could lead to joint activities and joint calls which would complement EC research effort.

**R. Wennersten**  
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**Royal Institute of Technology, Stockholm (Sweden)**

## **INDUSTRIAL ECOLOGY – AN INTEGRATED PLATFORM FOR SUSTAINABILITY RESEARCH**

**Monday 22 May 2006**

When painting the future on a global scale we can clearly distinguish some developing patterns:

- Dramatic increase in global population
- Population concentration in Mega cities
- Low birth rate/low death rate demographic state
- Increase in income
- Increased demand on services/resources
- Rapid societal transformation
- Dramatic environmental degradation
- Signs of dysfunctions in planetary processes
- Vigorous reliance on technology

To tackle these mayor threats to a sustainable global development there has to be a radical change in the way R&D is carried out and implemented. The European R&D programs are reflecting the difficulties in creating true interdisciplinary frameworks starting from the relevant societal questions. The programs still reflects very much the scientific disciplinary oriented research from the 19<sup>th</sup> century with a division in different topics rather than tackling the issues from a system view. There is still a tendency to view environment as a factor outside the industrial society, a factor that has to be “protected”. In contrast to this Industrial Ecology is a fast developing interdisciplinary framework for designing and operating industrial systems as living systems interdependent with natural systems. It seeks to balance environmental and economic performance within emerging understanding of local and global ecological constraints. Some of its developers have called it "the science of sustainability".

To mention some of the important issues to be tackled in R&D are:

- Development of industrial production and consumption patterns towards cyclic more than linear systems minimizing waste, and the development of sustainability and quality of life indicators using a combination of top down and bottom up perspective
- Development of frameworks for a practical approach to the formulation of environmental objectives and targets on national, regional and local levels
- Sustainable urban development with an integrated view of economic, social and environmental issues including conflict resolution strategies
- The role of technological development and innovation in sustainable development and innovation of systems more than innovation of products
- Creating arenas for true triple helix interactions between university, industry and government to reveal the relevant underlying questions using creative work shop and scenario techniques



EUROPEAN  
COMMISSION

Community Research

**Open Stakeholder Consultation: Priorities for Environment & Health Research in FP7**

## **VIEWS OF OTHER STAKEHOLDERS**

**J. Angerer**  
**Institute of Occupational, Social and Environmental Medicine**  
**Friedrich-Alexander University Erlangen (Germany)**

## **ASSESSMENT OF EXPOSURE OF THE POPULATION DUE TO ESPECIALLY HAZARDOUS SUBSTANCES USING BIOMONITORING**

Biological monitoring (BM), the determination of chemical substances in human body fluids, is an ideal link between the occurrence of those substances in the environment and human health outcome. BM measures the dose really taken up so that no further assumptions are necessary to calculate human uptake from environmental data. Actual results show that phthalates (P), acrylamide (AA), aromatic amines (AROAM) and polyaromatic hydrocarbons (PAH) are those chemicals with the highest priority for the health of the general population.

P are the most potent endocrine disrupting chemicals. Background exposure to P is in many cases higher than tolerably daily intake (TDI). Unborn and young children are especially vulnerable. AA a known carcinogen is taken up in amounts that lead to unacceptable cancer risk as calculation show. Most of P and AA is taken up with diet. Diet is also a source for AROAM and PAH which are well known human carcinogens.

So diet today seems to be a most important source of human exposure to many hazardous chemical substances. Further research in the field of human exposure to chemical substances should have a focus on diet and on the above mentioned substances.

**E. Banos**  
**City of Sheffield**  
**(Current chair of the Eurocities Working Group on Environment and Health)**

We would like to know if the Commission is looking to respond to the earlier comments of the plan by including issues which might deliver concrete actions in a shorter time frame. Some MEPS felt that much of this work was so long term and lacking in concrete outcomes within a reasonable time period that it did little to assist with major environment and health issues facing us.

Across Europe, city centers are being redeveloped and more people are moving back to previously run down areas in the heart of cities. We urgently need research on how best to provide acceptable internal environments in urban dwellings where noise levels and / or external pollution are such that people cannot naturally ventilate their homes. Many schemes rely on mechanical ventilation but we have limited knowledge on the long term efficacy of such schemes. 'Healthy' low energy solutions which prevent solar gain in the summer are required.

## **NOISE: COMBINED EXPOSURES AND COMBINED HEALTH EFFECTS**

The EC has stated as a goal for the future that no person should be exposed to noise levels, which endanger health and quality of life. A “sustainable (health) development” presumes that the residents in the noise-exposed surroundings should be able to benefit from improvements in *urban environmental quality*.

European directives act against noise at the source (emission) or in the environment (immission). Health-based guideline values refer to actual noise exposures in the environment (from all kinds of sources) whereas current legislation refers to emission from specific sources, one at a time. The environmental noise directive (2002/49/EC) regulates noise from road, railway and air traffic as well as industrial noise. Each type of noise is treated separately such that residents in urban areas are exposed to up to “three times” the exposures allowed by one limit value. According to the directive, noise maps should be provided for large European agglomerations, one map for each type of traffic noise. These maps should include levels from 55 dB LDEN and up. Several European cities have already started this work and provide GIS data, at least for parts of cities. Research is lacking on how to combine noise exposure data and its validity.

Environmental noise shows an increasing trend, which has to be reversed. Apart from the noise maps, Directive 2002/49/EC therefore stipulates action plans against noise. Together these present great opportunities for cross-country environmental health studies targeted at abating noise *and* preserving and creating restorative green areas in urban and sub-urban areas. Noise is a strong stressor accomplishing sympathetic stimulation, which leads to elevated catecholamine and cortisol levels within the brain, which in turn frequently leads to sleep disturbances, anxiety and depression. Such psychophysiological effects follow “stress-inducing” traffic noise, involving annoyance, speech interference and learning difficulties. Children are especially vulnerable and their lifetime exposure to noise lack the periods of recovery in quiet environments, which were prerequisites for current limit values.

### **Topics of research for Framework 7:**

1. Comprehensive studies on the *combined* health effects of *combined* traffic noise, with emphasis on the distribution of sound levels over time and over population sub-environments (time-activity-patterns) as well as on vulnerable groups (children, hearing impaired, presbycusis inclusive).
2. Integrative studies targeted on *action plan involving environmental* (area layout, architecture) *and traffic planning* (e.g., rerouting, speed restrictions, whispering asphalt) *interventions* on annoyance, speech interference and sleep disturbance as well as the *restorative potentials* of “quiet areas”.
3. Comprehensive targeted studies of accuracy and *effectiveness of various remedial activities* (e.g., sound insulation, facade absorbents) *and changes in behavioral patterns* (e.g., win-win situations as traffic split, health-promoting walking/cycling vs. driving/commuting) for reducing noise exposures in urban life as well as the long-term effects of noise on annoyance/sleep disturbance/speech intelligibility.
4. Development of *new tools for the design of supportive acoustic environments* for the general population and for vulnerable groups (e.g., children), with special emphasis on *time periods that are sensitive* from physiological, psychological and socio-cultural perspectives.
5. School studies on the *effectiveness of noise policies* in maintaining and improving soundscapes and reducing human exposures and adverse health effects, integrated with studies of *the effectiveness of indoor-air quality policies* in maintaining and improving indoor air quality and reducing human exposures of indoor air pollutants and adverse health effects. This conflict concerns vulnerable children: the needs of the hearing impaired vs. the needs of allergic and asthmatic children.

## **BELGIAN POSITION ON EH RESEARCH PRIORITIES**

Belgium wants first to thank the Commission for the quality of the propositions and the presentations made during the open stakeholder consultation « Priorities for EH research in FP7 » held in Brussels on May 22. The opportunity given by this consultation to meet policy makers, scientists, NGO and industries was an added value for the EH process.

Belgium agrees on the necessity to establish priorities for the EH research during the implementation period of the FP7 (2007-2013). Different approaches have to be used for this difficult exercise such as opinion of CENHIR, stakeholder consultations, confrontation of EH national research programmes in a future Eranet framework and MS inputs.

Regarding our input, Belgium recalls his position regarding the importance of the implementation of the EU EH action plan 2004-2010 and of the Budapest commitments: the actions 2 (EHIS), 3 (Biomonitoring), 5 (Eranet on EH) and 12 (IAQ) are priorities agreed by the Belgian competent ministers in the fields of the environment and health (gathered in the Joint-Interministerial Conference on Environment and Health – JICEH), followed by the EH cell and recalled in our different position papers.

Belgium supports also fully the statement of WHO presented during this consultation and insists to target specific research on children when this seems pertinent.

Your propositions regarding nanoparticles and cancer/environment during critical period for the development of children are high on our priorities list.

Belgium recommends to associate closely policy makers and scientific community at MS level for the following steps of the FP7 : before the launching of the call, during the call and after the call.

Such an association between EH research ([www.belspo.be](http://www.belspo.be)) and EH policy making ([www.nehap.be](http://www.nehap.be)) is putted in place in Belgium and is a win-win opportunity to better define projects, find contractor and follow the realization and the use of the results, with a full respect of the culture of both actors.

As stated in the conclusions of the Conference on EH which has taken place at Egmond-aan-Zee, Belgium recalls finally the necessity to strengthen dissemination and exploitation of research results along the entire process.

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## **ENVIRONMENT & HEALTH - RESEARCH NEEDS FOR FP7**

### **Cost Benefit Analysis**

#### **Research Needs:**

- Work on a quick, practical, and accepted tool by networking with other parties and resolve fundamental scientific differences related to the various methodologies applied and using age-based lifestyle influences: VSL (Value of Statistical Life); VOLY (Value of Life Years Lost); Application of premium of life insurances.

#### **Reasons:**

- ❖ VOLY and VSL was used in the CAFÉ-Cost Benefit Analysis.
- ❖ VOLY appears to be the right metric to apply as confirmed by EC, RTD-Projects (NewExt, NEEDS).
- ❖ VSL provides an overestimation of health impacts and data is lacking.
- ❖ Uncertainties are large and differences in VSL (Median & Mean) and VOLY (Median & Mean) had a clear influence on selecting the final scenario for the Thematic Strategy on Air Pollution.
- ❖ Cost benefit analysis based on premium of life insurances not assessed in all details linked to the VSL and VOLY approaches.

### **Biomonitoring**

#### **Research Needs:**

- Build upon existing work, EC-Projects and networks by first agreeing and harmonising an accepted and validated approach for different types of biomarkers (i.e. of effect, susceptibility & exposure).
- Integrate the fact that the personal lifestyle in Europe changed and is still changing taking into account citizens own increased interest & action in improving their own health and safety.

#### **Reasons:**

- ❖ EC-Projects (e.g. AIRNET, Anemone, Inuendo) and European Technology Platforms (ETPs) generated essential results, acceptance criteria, performance testing approaches, and networks (e.g. FOSIE, EU Biomarker Centre, the 2005 Innovative Medicines Initiative, Nano-medicine ETP).
- ❖ Scientific committees of various organisations provided a number of opinions/docs to help in generating an accepted and validated approach.
- ❖ Lifestyle of citizens is changing over time & was & is documented by various studies & EC, projects.

**S. Ceccatelli**  
**Institute of Environmental Medicine**  
**Karolinska Institutet, Stockholm (Sweden)**

## **IDENTIFICATION AND QUANTIFICATION OF HEALTH EFFECTS RELATED TO ENVIRONMENTAL FACTORS IN EUROPE**

The Institute of Environmental Medicine at the Karolinska Institutet, Stockholm, Sweden, is an interdisciplinary organization conducting research, education, and risk assessment pertaining to physical and chemical aspects of environmental medicine and health protection. The Institute also provides assistance to national and international public authorities through consulting and training of personnel in the field of environmental medicine. Different groups affiliated to the Institute have been involved, as coordinator or participant, in a large number of projects (25) financed by the European Commission. Based on the knowledge and competences developed at our Institute, we have identified certain relevant issues related to European Health and Environment that require research and development activities. The growing demand for a safer and healthier environment pose the need for research aimed at identifying environmental risk factors of chemical and physical nature that can produce detrimental effects on human health, especially on vulnerable populations such as children. In particular, the effects of exposure to low levels of chemicals with potentially neurotoxic or endocrine disrupting properties need to be investigated and the mechanisms of toxicity clarified to identify mechanism-based end points. Physical agents including noise and electromagnetic fields are also among the priorities. Development of alternative methods, (in vitro and in silico) and of mathematical models for the analysis of the results and extrapolations for risk assessment purpose are also necessary. The application of nanotechnologies will be important to generate new knowledge in the field.

A major effort is required in the research field of air pollution, particularly regarding health effects of long-term exposure. Establishment of several large cohort studies in European collaboration focusing on health effects related to different types of environmental factors would greatly strengthen the risk assessment. This would also facilitate studies of interactions between various environmental factors, as well as with life style factors, such as nutrition.

**C. Falugi**  
**University of Genova**  
**Group of Developmental Biology and Cytotoxicology (Italy)**

## **THE FP5 EXPERIENCE**

**22 May 2006**

I would like to express great appreciation for the European Community multidisciplinary approach to research: The multinational consortium allows to consider the problems object of the research by multiple points of view. In our case, i.e. development of the project SENS-PESTI QLK4CT-2002-02264, after 1 year and half of hard work, the results came easily from the amount of knowledge put together and different experiences of the partners.

At the end, we obtained several instruments (biosensors and alternative models) able to detect in fast and easy way both the risks and the benefits of the exposures to different compounds. These models and tools are ductile and usable for different species of compounds, with endocrine disruption effects, mainly on embryonic-like development of different human tissues and organs. In all these tools, we used adult human stem cells, mimicking not only development of embryonic tissues, but also the correct function in regeneration/recovery after injury

I think that the study of risk/ benefit of drugs by use of adult human stem cells is the correct way to undergo not only environmental, but also pre-clinical study of pharmacs.

## **IDENTIFICATION OF DEVELOPMENTAL HEALTH EFFECTS RELATED TO ENVIRONMENTAL FACTORS IN EUROPE**

**1 June 2006**

The Group of research on Developmental Biology and Cytotoxicology at the University of Genova, Italy, is an interdisciplinary group conducting research, education, and neurotoxic risk assessment, related to neurogenesis, embryonic damage and neurorecovery, pertaining to biological, molecular, pharmacological, metabolic and physiological aspects of possible developmental anomalies related to environment state.

In particular, the group has set up different alternative models to the use of vertebrates, ad hoc for this kind of research: A) non-vertebrate developing models, by use of early stages of sea urchin and protochordate organisms, developing out side the maternal body; B) adult human stem cells co-cultures, addressed to differentiation and at different differentiation stages.

The group has been involved, as coordinator, in FP5 projects (SENS-PESTI, QLK4-CT-2002-02264 and EASYRING, QLK4-CT-2002-02286). Based on the knowledge developed in our group, we have identified relevant issues related to Environment effects on organism and human Health that require research. In particular, neurogenesis and effects exerted by neurotoxic substances on embryonic development. Actually, from the reported cases of environmental contamination regarding air, water or food, it is evident that the first relevant impact on populations is represented by the dramatic increase of developmental anomalies. The most fragile systems are represented by the neuromuscular system and the endocrine regulation.

An aspect not yet covered by the European research on health environmental effects is to identify the most fragile neurodevelopment/neurotransmission steps, that are interfered by contaminants. Also in the case of endocrine disruption a not enough examined risk is the one related to nervous regulation: actually, the first regulators of hormone release is represented by the part of brain called hypothalamus, and by the pineal gland. The influence of the nervous system on the endocrine disruption, and all the related diseases is further demonstrated by the stress-related deficiencies in hormone release.

A major effort is required in the research field of neurotoxicity, and in the design of subsequent molecular studies on adult human stem cells differentiating towards cell types responding to neurotransmitter signals, in order to obtain innovative and fast methods (e.g. kits, biosensors) to identify the compounds able to interfere with neurodevelopment and to detect the possible risk linked to the use and release in the environment of such contaminants. This will be of significant relevance for Industry, in that they permit the development of test systems for biological screening of products prior to marketing.

## **Infections as Environmental Threat**

The focus will be a development of predictive models and simulations for forecasting and managing infectious diseases. Traditional methods which represent ecological aspects in an oversimplified way or which are only designed for specific regions should be overcome by modeling on a European scale. Models will comprise ecological and epidemiological aspects taking into account small spatial units and the behaviour of the disease species and their vectors. The models will be designed to be applied to a wide range of environmental conditions across Europe and under conditions of climate change and changes in land-use.

The models will be compiled from re-usable building blocks, which will allow for taskforce modelling of actual epidemics. The aim is to create a toolbox of building blocks will allow addressing wildlife, livestock, and human diseases. A main purpose of the models will be to develop and test the reliability and cost-effectiveness of control programs.

### **Rationale:**

Throughout Europe there is an increased occurrence of viral and bacterial infections. With increasing life expectancy and a growing population of elderly people with partially compromised health conditions, susceptibility to pathogens in the environment is of true concern. As some incidences of infectious diseases cannot be explained by normal exposure routes, there is widespread belief that some, as yet undescribed, environmental factors are involved. Globalisation is naturally increasing the exposure of animals and humans to pathogens, but land use practices are also possibly mobilising and proliferating pathogenic traits in the environment. Research on how our life style patterns affect the reservoirs, the ecology and evolution of pathogenic traits in the environment is required, and predictive models for forecasting and managing infectious diseases at the European scale need to be developed. Models should integrate both ecological and epidemiological aspects of wildlife, livestock and human diseases, and be designed to be applied to a wide range of environmental conditions including different land-use practices and climate change. Models should reflect spatial units and the behaviour of the disease species and their vectors, and should allow for taskforce modelling of actual epidemics. They should also enable development and testing of reliability and cost-effectiveness of control programmes.

**A. Gatti**  
**Laboratory of Biomaterials**  
**University of Modena & Reggio Emilia (Italy)**  
**Coordinator of the EC Nanopathology (QOL-2002-147)**

The unintentional dissemination of nanoparticles in the occupational site or in the environment represents a risk for the human health as demonstrated by the EC "Nano- pathology" project in 400 pathological samples cases of chronic fatigue, lymphomas, leukaemia and solid cancers.

Some pathologies of unknown origin are related to the exposure of humans and animals by inhalation or ingestion to submicronic pollution, not biodegradable and not biocompatible. Some examples are represented by the Balkan and Gulf War Syndromes and by the pathologies of the survivors of the Twin Towers Collapse in New York.

**Prof. Dr. Martin Göttlicher**  
**GSF National Research Center for Environment and Health, Germany**

**Pathomechanisms and analysis of biological systems as a key component in integrated approaches to understanding risks inflicted by environmental factors**

Understanding risks for human health from environmental factors requires a truly interdisciplinary and integrated approach including definition of environmental factors, studying large human cohorts, understanding response pathways in relevant subjects, i.e. humans and ecosystems, as well as interpreting these data in terms of risks to develop specified diseases. Research of recent years has identified molecular targets in the organism that are addressed by components or contaminants of our environment, such as nuclear receptors being targets of endocrine disrupting compounds. However, the relationships of these molecular targets to the development of certain diseases remained in many cases only poorly understood and attempts were made to understand their roles in terms of linear signaling cascades. These efforts have to be intensified by recognizing the multiple responses triggered even through one or a few cellular receptors of an environmental factor and understanding mechanisms of action as well as their dose-response-relationships for that are critical for the development of defined diseases. At best, such approaches will recognize the complexity in response pathways and the organism's capacity to counteract perturbations of its homeostasis by environmental factors. This will lead in the end to a comprehensive understanding of the organism's homeostatic systems as well as its perturbations that eventually lead to the development of diseases – a bona fide systems environmental biology approach.

### **Comments after the meeting**

Based on experience with overviews of selected environmental health issues in the framework of the ASPIS and ARHENA projects, I missed two areas of growing attention:

- Social inequalities and environmental health. There is growing evidence that exposure conditions related to indoor pollution, air, soil, and water pollution that are relevant for environmental health are unevenly distributed over society. Particular groups might need specific prevention measures. The phenomenon is currently described and the driving mechanisms are not understood. During the workshop few, if any attention, was given to this human ecological aspect of environmental health.
- Positive health effect of living conditions. Access to green urban areas was show to result in better health conditions, less and shorter hospitalization periods and less consumption of medical drugs. Here too, the real drivers and responsible phenomena are poorly understood. It is important however, to pay attention to these positive impacts of the environment n human health too.

I hope this might contribute to discussions in the future.

**I. Ispas**  
**Ministry of Education and Research (Romania)**

**RESULTS OF THE BALKAN MEDICINE TOWARDS FP7 CONFERENCE**

The Conference entitled „Balkan Medicine Towards FP7„ took place in Bucharest, Romania on 4 and 5 May for discussing regional research priorities for FP7 Health theme .The event was organised by Ministry of Education and Research through the National Authority for Scientific Research and a consortium of Romanian institutes with the support of European Commission. The event included delegates and speakers from science, industry, academia and government from Albania ,Austria,Bulgaria,Bosnia and Herzegovina, Croatia, FYROM, Greece, Republic of Moldova, Serbia and Montenegro, Slovenja, Turkey to discuss the exploitation of new and emerging research opportunities in the following areas:

a) public health; b) medical research infrastructures; c) regenerative medicine; d) technological platform: Innovative Medicine ;e) combating major diseases; f) ethical approach of bio-medical research.

Please find attached the topics proposed for FP7 by scientists from conference, relevant for Environment and Health Action Plan :

**National Authority for Scientific Research**

Ioana Ispas

[iispas@mct.ro](mailto:iispas@mct.ro)

Tel: +4021 212 77 91

<b>Project title:</b>	<b>Environmental factors targeting epigenetic events; complex interplay between toxic agents and protective phytochemicals</b>
Research area:	Innovative medicines
Coordinator <input checked="" type="checkbox"/>	Looking for partners <input checked="" type="checkbox"/>
<b>Institution/person making the proposal</b>	<input type="checkbox"/> Public <input type="checkbox"/> University <input type="checkbox"/> NGO's <input type="checkbox"/> SME's <input type="checkbox"/> Industry "Victor Babes" National Institute of Pathology
Address	Spl. Independentei, No. 99-101, Bucharest
Phone	+4021 319 27 33
Fax	+4021 319 45 28
E-mail	imunotox@vbabes.ro
Web page	www.vbabes.ro
<b>Brief description of project :</b>	
Abstract (Objectives, Expected results, Impact, Key words)	Sensitivity to environmental toxic agents may vary the preexisting genetic variants that can challenge methyl metabolism and predispose a person to epigenetic changes, indicated as characteristic early stages of the associated clinical consequences – increase the risk of atherosclerosis, immunity disorders and cancer. Preclinical and clinical studies provide evidences that part of the anticancer properties attributed to several bioactive food components, both essential and non-essential nutrients, may relate to DNA methylation patterns. <b>Objective</b> is to evaluate how bioactive food components regulate DNA methylation or other epigenetic events, compensate and restore gene function pathways altered by toxic aggression. Expected results Cuantification of DNA methylation changes in chemical aggression in relationship with dietary flavonoids employing immunoprecipitation, immunoblot analyses, and kinase assays of cell extracts; in vitro cell proliferation and cell apoptosis, cell growth / cell death studies.
Contribution to the EU or regional policy	Since epigenetic events are susceptible to change they represent excellent targets to modulate toxic aggression by bioactive nutrient that

	might represent potential new alternative in prevention and therapy of the associated clinical consequences of environmental factors – increased risk of atherosclerosis, immunity disorders and cancer
European research potential	The project may lead to the elucidation of mechanism(s) by which dietary factors influence epigenetic processes, as well as increasing the understanding of these processes in prevention of chemical mediated pathologies, including cancers.
European added value	It is anticipated that the information gained will provide guidance for the development of dietary intervention strategies for toxicity and associated pathology prevention.

<b>Project title:</b>	<b>Genetic abnormalities and environmental exposure</b>
Research area:	Translating research for human health
Coordinator <input checked="" type="checkbox"/>	Looking for partners <input checked="" type="checkbox"/>
<b>Institution/person making the proposal</b>	<input type="checkbox"/> Public <input type="checkbox"/> University <input checked="" type="checkbox"/> NGO's <input type="checkbox"/> SME's <input type="checkbox"/> Industry
Address	Florescu Silvia, 31 Vaselor street, National Institute for Research and Development in Health
Phone	++ 40 21 2520425, extension 123
Fax	++ 40 21 2523014
E-mail	<a href="mailto:florescu.silvia@gmail.com">florescu.silvia@gmail.com</a>
Web page	<a href="http://www.incds.ro">www.incds.ro</a>
City	Bucharest
Country	Romania
<b>Brief description of project :</b>	
Abstract (Objectives, Expected results, Impact, Key words)	<p>To measure the association between environmental exposure and genetic abnormalities and to set up appropriate preventive strategies</p> <p><b>Objectives:</b> To measure the occurrence of genetic abnormalities strongly related to environmental exposure, the trends in the last 15 years in correlation with the environmental risk factors levels</p> <p><b>Expected results are:</b> the map of genetic abnormalities the map of mortality rates for these conditions the map of risk factors the list of most frequent genetic abnormalities and risk factors in Romania to elaborate a strategic plan aimed to prevent the genetic abnormalities due to environmental exposure, including pregnancy surveillance and monitoring scheme, recommendations for reducing the exposure to risk factors.</p> <p><b>Impact:</b> The preventive measures influencing the risk factors responsible for genetic abnormalities can reduce the frequency of these disorders and consequently can decrease the economic and emotional burden for the family and society.</p> <p><b>Key words:</b> genetic abnormalities, environmental risk factors</p>
Contribution to the EU or regional policy	To elaborate evidence based intervention model
European research potential	Disseminate and convert the finding results into health benefits
European added value	To increase public and private investments

<b>Project title:</b>	<b>Interdisciplinary Balkan Centre to use the ionizing radiation technologies for the early diagnosis of diseases and efficient therapy.</b>
Research area:	PT 11 Innovative medicines
Coordinator <input checked="" type="checkbox"/>	Looking for partners <input checked="" type="checkbox"/>
<b>Institution/person making the proposal</b>	<input type="checkbox"/> Public <input type="checkbox"/> University <input type="checkbox"/> NGO's <input type="checkbox"/> SME's <input type="checkbox"/> Industry
Address	Str. Atomistilor 407, Com. Magurele, jud. Ilfov, PO box MG-6, cod 76900
Phone	+40/21/4042300
Fax	+40/21/4574440
E-mail	dirgen@nipne.ro
Web page	www.nipne.ro
<b>Brief description of project :</b>	<p>The partners are planning to pool their expertise and most advanced equipment to conduct studies and experiments aimed at optimizing radiation physics-assisted methods and technologies for the early diagnosis of diseases and health disorders, and minimizing the harmful effects of ionizing radiation on healthy body tissue.</p> <p><b>Objectives:</b>  the research and optimum criteria for the accelerators and production of short-lived radioisotopes that are used in pet diagnosis;  the search for new biological vectors with high affinity for tumor receptors labeled with alpha and beta emitters.  feasability studies for borono, protono and hadrono-therapies using dedicated particle accelerators;  studies on laser applications in therapies key words: nuclear reaction, nuclear yields, stoping power, life time, radioisotopes, dose distributions, radiochemistry, laser beam</p>
Abstract (Objectives, Expected results, Impact, Key words)	<p><b>Objectives:</b>  the research and optimum criteria for the accelerators and production of short-lived radioisotopes that are used in pet diagnosis;  the search for new biological vectors with high affinity for tumor receptors labeled with alpha and beta emitters.  feasability studies for borono, protono and hadrono-therapies using dedicated particle accelerators;  studies on laser applications in therapies key words: nuclear reaction, nuclear yields, stoping power, life time, radioisotopes, dose distributions, radiochemistry, laser beam</p>
Contribution to the EU or regional policy	Developing a Nuclear Medicine Center nearby our Institute is based on facts like: researches of physics using particle accelerators experience of about 50 years, radiochemistry and radiolabeling researches and production experience of about 30 years, more than 200 scientists of all ages involved in National Research Programms, experience in detection, dosimetry and nuclear spectrometry, collaboration with research centers worldwide (e.g. Dubna-Russia, CNRS-France, JRC-CE, CERN-Geneva; Max Planck Inst.-Germany, etc). In the future, it is expected that young doctors, biologists, chemists may be atracted to work in interdisciplinary work teams for new diagnosis and therapies development.
European added value	Results of the project are connected to new jobs and career opportunities for young researchers. New market possibilities will be realised.

## **IFREMER CONTRIBUTION FOR SUB-PRIORITY "ENVIRONMENT AND HEALTH", BOX 6 'ENVIRONMENT' – COOPERATION – FP 7 (2007-2013)**

This text adopts a general vision of research priorities in environment and health. The marine environment is not mentioned. Because of the strong links existing between the marine environment and food health, the marine dimension should be appropriately mentioned.

The marine dimension in environment and health is particularly crucial when addressing the following issues:

### **1/ Assessing human exposure to chemical and/or bacteriological contaminants in the marine environment is particularly difficult.**

- In order to assess human exposure to chemical contaminants, it is necessary to assess the risks of human exposure to contaminants via consumption of marine products. In this regard, it is necessary to have monitoring data and to understand the bioaccumulation process.
- The assessment of human exposure of microbial contaminants requires, based on tools for detecting pathogen micro-organisms, to study the behaviour in water/ sediment compartments and shellfish, to study the upholding of pathogen capabilities as well as to evaluate the pertinence of indicators and the origin of sources of pollution.
- Concerning the evaluation of human exposure to phyto-planctonic contaminants, there is a need to describe and create models concerning the accumulation process of phycotoxins as well as their metabolism in commercial bivalves, in vitro and in situ. This process entails to know the sources of contamination as well as to evaluate of the respective role of shellfish and environmental factors in the accumulation.

These approaches necessitate to develop and to enhance tools for detection and quantification.

### **2/ In the marine environment, emerging risks must be taken into account.**

Such risks refer to those categories of contaminants which origin/ structure/ mid term effects on humans or means of introduction are not or not adequately known and therefore justify a particular process for risk assessment consistent with the precautionary principle. For zoonoses, there is a need to prevent health risks linked with the proximity of intensive agricultural farming in coastal areas. For pharmaceutical products, it is necessary to identify the health risks linked to urban dumping and pisciculture farming in coastal areas. As for emerging phycotoxins are concerned, it is necessary to assess the risks associated with the presence of known toxins but whose origin is unclear and that of unknown toxins resulting in positive bio pilots.

### **3/ There is a need to elaborate and develop a real-time alert system for an identified health risk.**

This alert system, which must focus on the viral risk in a small number of key coastal areas, must enable to determine in real-time the flow of pollutants and measurable sensitive parameters. The development of such detection systems is a major European stake for the effective implementation of the European Thematic Strategy on the Protection and Conservation of the Marine environment and the recommendation of the integrated management of coastal zones.

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**Department of Health Risk Analysis and Toxicology,**  
**Maastricht University (The Netherlands)**

**M. Kirsch-Volders**  
**Laboratory of Cell Genetics, Vrije Universiteit Brussel (Belgium)**

**MATERNAL EXPOSURE TO DIETARY COMPOUNDS WITH CARCINOGENIC  
AND IMMUNOTOXIC PROPERTIES MAY RESULT IN *IN UTERO* EXPOSURE  
AND MOLECULAR EVENTS IN THE UNBORN CHILD LEADING TO  
INCREASED RISK OF CANCER AND IMMUNE DISORDERS IN LATER  
CHILDHOOD**

**NEWGENERIS: *NEWBORNS AND GENOTOXIC EXPOSURE RISKS***  
**(FOOD-CT-2005-016320)**

Development and application of biomarkers of dietary exposure to genotoxic and immunotoxic chemicals and of biomarkers of early effects, using mother-child birth cohorts and biobanks NewGeneris will test the hypothesis that maternal exposure to dietary compounds with carcinogenic and immunotoxic properties results in *in utero* exposure and molecular events in the unborn child leading to increased risk of cancer and immune disorders in later childhood. Biomarkers of exposure, carcinogenic and immunotoxic risks and of susceptibility will be developed and applied using high throughput techniques. Existing European mother-child birth cohorts will be used while new biobanks will be set up in different European regions to generate specific information, and to collect umbilical cord blood samples. Training and educational activities will be carried out. NewGeneris will address the following objectives: (1) Dietary exposure of pregnant women to dietary carcinogens and immunotoxins will be assessed using available questionnaires from existing mother/child birth cohorts (2) Epidemiological surveys of mother/child birth cohorts will be used to study associations between maternal dietary exposure, and childhood cancer risk factors and immune disorders (3) Paternal exposure to dietary toxins will be considered as an additional genetic risk. (4) An *in vitro* model of transplacental perfusion will be used to better understand *in utero* exposure to selected toxins. (5) In cord blood samples from existing cohorts and newly initiated biobanks biomarkers will be used to assess fetal exposure to these compounds and compared with maternal exposure. (6) In the same samples, genetic pathways indicative of risks of cancer and immune disorders in later childhood will be studied by analysis of lymphocytic gene expression and proteomics profiles. (7) Inter-individual variability in responses will be evaluated by genotyping of infants' DNA, and by phenotyping for DNA-repair activities. (8) Overall public health implications as well as ethical issues, will be addressed. (9) Results will be disseminated to EU food industry, advisors, regulators, and consumer organisations.

## **COMMENTS ON OPEN STAKE HOLDER CONSULTATION – PRIORITIES FOR ENVIRONMENT AND HEALTH RESEARCH IN FP7**

**In respect of presentations made on Monday the 22<sup>nd</sup> of May, associated stake holder consultation and presentation by Dr Tuomo Karjalainen.**

We agree strongly with the need for the integrated exposure assessment, which crosscuts sub areas 1, 2 and 3, and the associated validation of human exposures through the measurement and study of appropriate biomarkers of pollutant uptake and disease. As a consequence we also agree with the need for a number of well-focussed cohort studies to be developed at an early stage in the work programme.

As a geological survey our main involvement with activities under the topic of environment and health is through the provision of information relating to the presence of potentially toxic (or essential) trace elements/substances (from either anthropogenic or natural sources) in environmental media (soil, rock, sediments and surface and groundwater) and the determination of the bioaccessibility and mobility of such substances. Having undertaken such studies in the UK and overseas for more than 20 years we feel that the key areas for further specific emphasis within the proposed work programme should include: the development of robust methodologies to determine the bioavailability and bioaccessibility of pollutants, especially those with neurotoxic effects and harmful to young children e.g. lead; understanding the health consequences of exposures to mixtures of contaminants; and improvements in the integration of bio-kinetic models covering exposure by ingestion and inhalation.

**In respect of “gaps” we feel the following additional points need to be considered:**

- 1) The programme focuses on exposure to potentially toxic substances, but fails to address the issue of population and individual exposure to essential trace elements. This is important, and a subject that becomes even more so as our understanding of the potential for synergistic effects increases. A specific example from the UK is selenium deficiency, which affects the majority of the population and that has been demonstrated in model systems to increase the potential impact of a wide variety of potentially toxic contaminants.
- 2) There is a need not only to focus on a few specific exposure pathways (such as air pollution) but also to provide a more integrated assessment of all potential exposures including those from ambient (predominantly natural, but also including diffuse long range sources) and activity (predominantly occupational and site specific sources) based scenarios. Only in this way will it be possible to accurately determine and hence mitigate the dominant exposure pathways, and investigate the impact of co-exposure to contaminant mixtures. The opportunity for elevated exposures to a wide range of major and trace elements from the natural environment is clearly demonstrated by the regional geochemical baseline survey of the UK (G-Base) carried out by the British Geological Survey; the recent publication of Volume 1 of the Geochemical Atlas of Europe, produced by the Forum of European Geological Surveys (FOREGS), and the Environmental Geochemical Atlas of the Central Barents Regions published by the Geological Survey of Norway.
- 3) In respect of exposure modelling there is a clear need for sensitivity analysis in risk assessment to deal with parameter uncertainty. No one risk assessment model will fit for all of the diverse cultures found within the EU. For example: geophagia, a deeply rooted, culturally accepted behaviour, in some ethnic communities is widely practiced in some member states. It is felt that changing land use will also impact on exposure. These changes include those induced by global warming (i.e. climate and environmental change), societal restructuring (i.e. post industrial redevelopment, and population

demographics) and energy (i.e. redevelopment of local agriculture, potential wide scale development of nuclear power and waste disposal requirements and the greening of industrial processes and technologies).

- 4) The development of a cross Framework response in the area of Environment and Health should be given a higher profile to facilitate the inclusion of the impacts of new Directives and an integrated response to existing Directives. This is essential; no one directive covers all potential exposure/pollutant pathways that need to be considered in respect of human health. There is an overwhelming need to foster the establishment of multidisciplinary networks of medical professionals, social anthropologists, and environmental scientists to holistically address the issue of Environment and Health. Single discipline groups, working in isolation, will not have the same const benefit outcome.

**A. Leetz**  
**Friends of the Earth Europe**

**NGO PERSPECTIVE ON NANOTECHNOLOGY AND IMPLICATION FOR THE  
FP7**

Research into the health and environmental effects of nanotechnology needs to rapidly become one of the research priorities of the FP7. Research has shown that special features of nanoparticles which make them so useful in applications from cosmetics to cancer research could also pose a hazard to human health and the environment. Lab animal studies have already shown that some carbon nanospheres and nanotubes may cause fatal inflammation in the lungs of rodents, organ damage in fish and death in ecologically important aquatic organisms and soil-dwelling bacteria. There may be a risk of accumulation of nanoparticles, while some studies suggest their cytotoxicity, namely in the case of prolonged exposure. The British Royal Society recommended that “Until more is known about environmental impacts [...] the releases of manufactured nanoparticles and nanotubes into the environment should be avoided as far as possible” (2004).

The most recent study, conducted by Friends of the Earth US shows that nanoparticles have entered just about every personal product on the market, including deodorant, soap, toothpaste, shampoo, after shave lotion etc. Disturbingly, the report has identified seven face creams that list carbon fullerenes as ingredients – a substance found to cause brain damage in fish and toxic effects in human cells. We need adequate, publicly available, peer-reviewed safety studies in order for regulation to be put in place to protect the general public and the workers manufacturing these products. Research needs to focus on the risks emerging from nanotech. Until research provides safety data on the use of nanoparticles, they should not be allowed in consumer products. Thus research into the health and environmental effects of nanotechnology should provide guidance for EU policy makers.

**W. Lichtensteiger**  
**University of Zurich (Switzerland)**

## **NEED FOR CHEMICAL RISK ANALYSIS ON NEURO-ENDOCRINE BRAIN DEVELOPMENT**

Fitness and survival of populations depends not only on the integrity of reproductive organs, but also on the proper functioning of brain centers governing gonadal functions and reproductive as well as non-reproductive behaviors. The importance of enhanced attention to children's development has recently been recognized (Children's Environmental and Health Action Plan for Europe, CHAPE). Research on developmental neurotoxicity so far has focused on classical neurochemical processes.

However, the developing brain is an important hormone target. Sex and thyroid hormones influence developmental processes also in non-reproductive centers involved in cognitive processes (hippocampus, cerebral cortex), and they influence brain ageing. Information on effects of endocrine disrupters (EDC) on these processes is insufficient, in particular at the mechanistic level. Also, classical risk assessment protocols such as the Two Generation assay do not provide direct information on potential hazards at brain level. However, the limited experimental data available today indicate that the developing brain is a very sensitive target for EDC.

Hence, there is an urgent need for

1. Development of tools and protocols for large-scale risk assessment of effects of EDC on neuro-endocrine brain development,
2. Research on effects of environmental chemicals on the developing neuro-endocrine brain at molecular and functional levels.

### **Further Comments on Research Needs**

#### **1. Development of tools for risk assessment**

The system of test guidelines, which provide the main basis for regulatory decisions on chemicals, needs continuous updating to incorporate new scientific knowledge, and improvements with respect to animal welfare (3R). Areas where such improvements are urgent, in particular in view of the REACH process, are protocols designed for reproductive/developmental risk assessment in mammals (e.g., enhancement or replacement of One, Two Generation assays). While new methodological approaches would be available, the development of new and enhancement of existing test protocols is greatly hampered by insufficient funding. The OECD provides a global platform for development of protocols into guidelines, but work on test protocols fully depends on external funding. In order to cope with the demands that will be posed on experimental toxicology by the REACH process and by new technologies, there is an urgent need for financial support of experimental studies for the development of new test protocols.

#### **2. Non-invasive chemical exposure monitoring in humans**

Assessment of risks posed by chemicals depends on data about internal human exposure, in order establish relationships between human exposure and tissue levels and corresponding toxicological findings from experimental animal studies. This is particularly important for chemicals in food, care products and environmental chemical from other sources, since it is difficult to obtain reliable estimates of internal exposure from levels in food or environmental compartments. However, there is a paucity of data on internal exposure of human populations, except for a few types of chemicals such as dioxins and PCBs. Monitoring of human exposure needs increasing support, as a tool to assess present risks, and in order to obtain information on changes of exposure with time. Chemical-analytical studies of human milk represent a non-invasive tool that provides quantitative information on maternal exposure levels and transfer of chemicals to the infant.

### **3. Investigations on developmental toxicity of environmental chemicals, in particular endocrine disrupters**

In addition to the specific problem addressed in (1), there is a general need for research on effects of chemicals on pre- and postnatal development until puberty, since this represents a most vulnerable life stage. Data are available on classical agents such as psychoactive drugs (tobacco), lead, mercury, and PCBs, but the potential impact of other types of chemicals, in particular endocrine disrupters, cannot be assessed on the basis of presently available data. Research should be supported along two lines, experimental studies in in vivo and in vitro model systems, and epidemiological studies. An important aspect is developmental effects of mixtures of chemicals, which represent the real world scenario. Methods to assess long-term effects of mixtures in vivo need to be developed.

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INRA (France)**

## **EFFECTS OF IN-UTERO EXPOSURE TO ENVIRONMENTAL CHEMICALS VIA MATERNAL PASTURE INGESTION ON FETAL DEVELOPMENT**

Over recent decades, a dramatic increase in the production of industrial and agricultural chemicals and heavy metals has coincided with widespread reports of breeding problems in domestic and wild animals. Disruption of fertility and reproductive development in several wildlife species have been directly or indirectly associated with exposure to environmental chemicals (ECs) and it has been established from rigorous toxicological studies in rodents that many chemicals, especially EDCs, can have adverse effects on fetal reproductive development and adult fertility. Many studies have briefly exposed short-lived rodents to high doses of single compounds, which do not reflect the risks experienced by humans. However, the crucial question is: how long term exposure to a complex cocktail of environmental chemicals and heavy metals can disrupt fetal development and decrease subsequent adult reproductive function. This is why this proposal is important; it builds on solid pilot data using "natural" exposure in a pertinent animal model: a long-lived species with a long gestation period (sheep). It will shed light on potential risks, and mechanisms of effect, in an important farm mammal and thus elucidate health impacts of long term exposure to environmental/dietary pollutant contamination in the human population. This "real life" model will expose developing fetuses by pasturing the mothers on fields treated with inorganic fertiliser or a sewage sludge fertiliser before and during pregnancy. This will enable us to determine the stage of pregnancy at which fetal development is most disrupted and measure the degree to which fertility is affected in exposed offspring after puberty.

## **GREEN REHABILITATION OF LONG TERM SICK-LISTED PEOPLE**

Nature in itself has a positive impact on people's wellbeing. The so called "Attention Restoration Theory" by mr/ mrs Kaplan claims that the ability to concentrate increases by peoples visits to nature. So called directed attention is very energy consuming and often the cause of stress. Spontaneous attention or fascination has the opposite effect. By visiting nature we recover from stress symptoms and have a possibility to charge our batteries.

In the project Green Rehabilitation, groups of people suffering from long sick leaves, several years sometimes, are rehabilitated by staying in nature in a specific program where key words are: Motivating, Supporting, Target oriented and Social community.

The patient is offered work in nature as a therapy (forests, green space or culture) based on their personal preferences and interests. They may learn how to use the compass, be part of archaeological inventories, haymaking or flora inventories. By way of a solution focused working group, individual work plan and goals are identified. The other patients of the group have a supportive role. The main goal is to find new jobs or new education for these patients and they stay in the program during 4 days a week during 10 weeks. After this time the majority of patients have reached their goal. Effects are very good and the project, initiated by the Regional Social insurance entity and the Regional Forest Agency in Sweden is spreading into other regions. To go from sick leave to work follows a 7 step program from structuring your daily routines, regain self confidence, increased communication, motivation, plan for future and Work or studies.

## ENDOCRINE DISRUPTERS. HUMAN EPIDEMIOLOGY

Our understanding of the risks that endocrine disrupters (EDs) pose to human health is limited by our inadequate knowledge of the effects of **chronic exposure to low levels** and **mixtures** of chemicals and of the relationship between early-life exposure and its impact in adult life.

- **Human epidemiological studies** have to be conducted with sufficient rigor to adequately address cause-and-effect relationships between ED exposure and disease.
- Human **maternal-infant exposure** during pregnancy is of special importance as a likely window of high susceptibility associated with severe and irreversible effects during critical developmental periods.
- Development of more **specific and sensitive biomarkers** for detecting endocrine-mediated effects in individuals and populations.
- Assessment of the role of EDs in the health of populations in relation to **other environmental stressors**.

**PEER comments and proposal for priority  
"Environment (including Climate change)":**

**Examples of important research topics for the Workprogramme FP7 (15/03/2006)**

- I) Climate change, pollution, and risks
  - A) Pressures on Environment and Climate p.2
  - B) Environment and Health p.6
  - C) Natural hazards P.10
- II) Sustainable Management of resources
  - A) Conservation and sustainable management of natural and manmade resources P.17
  - B) Evolution of marine environments P.34
- III) Environmental technologies
  - A) Environmental technologies for sustainable management and conservation of the natural and man made environment P.36
  - B) Technology assessment, verification and testing P.41
- IV) Earth Observation and assessment tools
  - A) Earth Observation P.44
  - B) Assessment tools for sustainable development P.48

**I) Climate change, pollution, and risks**

**B) Environment and Health**

*Environment and health*<sup>11</sup>: Interaction of environmental stressors with human health including identification of sources, biomonitoring research for environment related health, indoor air quality and links to indoor environment, urban environment, car emissions and impact and emerging risk factors; integrated risk assessment methods for hazardous substances including alternatives to animal testing; quantification and cost-benefit analysis of environmental health risks and indicators for prevention strategies.

**1) Rationale**

Health impacts of environmental changes are a source of growing concern for European citizens. Recent estimates attribute 25% of global disease burden to environmental factors. Environment-related diseases like water borne diseases, allergies or respiratory problems affect the well-being of European citizens and cause significant losses to European economic growth and productivity, thus hindering sustainable development. Future research should aim at assessing the impact of environmental factors on human health and providing the knowledge base for developing ways of reducing those risks for the benefit of public health and citizens. Some of the recent (potential) major pandemics (AIDS, avian influenza) have crossed from the natural environment into the human population. Research is required in the natural environment to better understand potential sources and pathways.

Research on "environment and health" has to cover and combine both areas: the impact of environmental pollution on human and on ecosystem health. Some years ago, the potential impact of environmental pollution on ecosystem functions and ecosystem health became obvious by discovering the effect of endocrine disrupting compounds on the reproduction of aquatic species. However, even today the knowledge about the effects of compounds released to the environment, especially in lowdose concentrations and on long-term time scale, is still quite limited for a wide variety of substances and stressors, as well as their resulting impact on human health. Furthermore, the cumulative risk from chemicals, physical factors and other environmental stressors on ecosystems, ecosystem functions and

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<sup>11</sup> According to the Commission's proposal (COM(2005) 440 final 2005/0185

human health is still not thoroughly analysed and understood, and risk assessment methodologies need to be further developed.

Until recently, the methodologies for assessing risk to human health on the one hand and to ecosystem health and ecological integrity on the other hand developed independently, driven by separate scientific disciplines and traditions and a lack of trans-sector communication. As a consequence, the recent knowledge about the impact of environmental pollution on ecosystems' and human health is still largely separated and comprehensive risk assessment and management tools taking into account risks to human and ecosystem health altogether are not yet existing. FP6 made very first steps to bring together the different areas. Research in FP7 should develop knowledge in the separate sectors, and bring together the different approaches and methodologies from the different sectors and foster the development of comprehensive risk assessment and management tools.

## **2) Suggestion of research themes**

### **Topic: Development of new tools for human risk assessment**

Pathological immune reactions provoke or contribute to most of the environment-associated diseases (e.g. allergies, infectious and respiratory diseases). In particular at low exposure levels toxic agents can act by damaging cellular function or causing dysfunction. Traditional toxicological approaches fail to detect functional deficiencies on sub lethal level and thereby may underestimate resulting health risks, in particular long-term effects. Research should be focused to a better understanding of the mechanisms of action underlying environmental-related pathological immune reactions for a better understanding of environmental-related health risks, the characterization of risk factors, the development of novel diagnostic concepts and the development of new biomarkers with a predictive value for disease development. Although most of the environmental stressors are supposed to act via induction of inflammatory signals, only a few of them are characterised in terms of the underlying mechanisms. The response of the immune system and adverse effects have to be investigated on molecular and cellular level in animal and human populations, and experimental models have to be developed that allow to characterize the impact of environmental factors on the immune system. Effects of multiple stressor exposure have to be considered.

### **Topic: Impact of environmental risk factors on human health**

By influencing the quality of air, water and soil changing environmental and living conditions impact public health. Risk assessment approaches have to be developed which allow a complex evaluation of the multitude of contributing factors to environment related diseases. Taking regional differences in living conditions into account the link between human activities, exposure and related health risks has to be investigated. Epidemiological studies at the European level should provide the data basis for a risk assessment considering environmental stressors as much as social factors. Especially sensitive groups like children should be regarded. In particular long-term exposure to low-dose concentrations of environmentally derived substances not covered by regulations has to be investigated. This implicates the need for the development of new, more sensitive methods for analyzing exposure scenarios and the characterization of internal exposure. New biomarkers have to be identified suitable for the detection of exposure effects and the prediction of disease risks. Based on the new knowledge and data, information and guidelines on prevention measures for environmentally derived diseases should be given to the population, to policy makers (e.g. European, national and regional public authorities) and practitioners (e.g. hospitals).

### **Topic : Cumulative risk assessment for ecosystem and human health**

Create a risk-directed European-scale inventory of toxicants affecting aquatic and terrestrial ecosystem health as well as human health for cumulative risk assessment. This requires the development and application of novel tools for a risk-directed analysis including specific high-throughput biological detectors in combination with innovative dosing techniques simulating field exposure as well as advanced chemical analytical tools for fractionation and structure elucidation. A central European database on key toxicants including sources, environmental fate, ecotoxicological and human toxicological properties, spectrometric and chromatographic data combined with a system of computer tools for toxicant identification integrating

QSAR models, advanced multivariate statistics, and tools for structure generation will be provided. New concepts of cumulative risk assessment of complex contaminations will be developed considering ecosystem functioning, joint effects of trace contaminants, the interaction of toxic effects and chemicals bioavailability with habitat characteristics and human health effects.

#### **Topic: Improving human health by forecasting and management of infectious diseases**

Throughout Europe there is an increased occurrence of viral and bacterial infections. With increasing life expectancy and a growing population of elderly people with partially compromised health conditions, susceptibility to pathogens in the environment is of true concern. There continues to be incidences of infectious diseases that cannot be explained by normal exposure routes, and there is widespread belief that some, as yet undescribed, environmental factors are involved. Globalization is naturally increasing the exposure of animals and humans to pathogens, but land use practices are also possibly mobilizing and proliferating pathogenic traits in the environment. Research on how our life style patterns affect the reservoirs, the ecology and evolution of pathogenic traits in the environment is required, and predictive model(s) for forecasting and managing infectious diseases at the European scale need to be developed. Models should integrate both ecological and epidemiological aspects of wildlife, livestock and human diseases, and be designed to be applied to a wide range of environmental conditions including different land-use practices and climate change. Models should reflect spatial units and the behaviour of the disease species and their vectors, and should allow for taskforce modelling of actual epidemics. They should also enable development and testing of reliability and cost-effectiveness of control programs.

#### **Topic: Development of toxicity evaluation procedures**

Risk assessment for hazardous substance is a fundamental undertaking in the protection of human and environmental health. Alternatives to animal experimentation shall be developed for both human and ecotoxicology for a wide range of toxic endpoints, including acute and chronic as well as reproductive toxicity. These can be based on a combination of *in vitro* and *in silico* methods in addition to strategies for the refinement of animal use. For *in vitro* methods, cell culture models need to be characterized on a genome and proteome-wide level in order to identify the models most suitable for toxicity identification and prediction. As well, combinations of cell culture models need to be developed that make use of respective differentiated functions and well reflect a chemical's target site. For *in silico* methods, the large data bases available need to be investigated to identify species sensitivity as well as parameters of chemical structure responsible for certain modes of toxic action. *In vitro* and *in silico* methods need to be combined in order to come up with a sensible strategy to refine and validate alternative toxicity evaluation procedures.

#### **Topic: Pharmaceuticals, personal care products and household chemicals: a framework to manage the trade-off between benefits to society and environmental health**

The use of chemicals these days is an integral part of the human economy. Such substances range from medicinal products, contraceptives and fragrances to detergents and fire retardants. Over the past years many of these compounds have been detected in environmental matrices and biota, often at low concentrations. There is increasing concern about the consequences of long-term exposure to these pollutants for human health and ecosystems. For example, veterinary pharmaceuticals such as antibiotics reduce disease and suffering in domestic animals. Their release in the environment, however, potentially leads to the disruption of beneficial microbial soil processes and spread of resistance genes to humans or non-domestic animals.

Existing scientific knowledge and risk assessment methodologies are not sufficient to allow an accurate analysis of the costs and benefits of the use of the compounds and measures to counter environmental health effects. And at present there is no framework to provide the scientific basis for such trade-off considerations in environmental policy and decision making. Such framework should not only include integrated human and ecological risk assessment but also provide a basis for risk mitigation through guidance for sustainable use of beneficial chemicals and best management practices. These schemes should be developed and implemented in close collaboration between scientists and stakeholder groups such as consumers.

**Topic: Understanding the interrelation between social change, environmental conditions and human health in the cities of an enlarged European Union**

Europe currently faces a historically unique phase of growing and integration, representing both chances and risks for the involved nations. A core prerequisite for the successful implementation of the European coalescence is to ensure an equivalent living standard. Since the majority of European citizens (around 80% of the population) live in cities, urban environments get a key function to achieve this goal. Sound political strategies to govern the ever more differentiated European space in an enlarged Union are urgently needed, being derived from scientific knowledge on the sensible interaction between environmental conditions, urban structural changes, and persistent social change.

Research is required which is grounded on urban and regional sociology as well as on health and social systems research. It has to take the diversity of both living and environmental conditions throughout the various European regions into account. The various pathways need to be analysed through which urban social change is affecting environmental health and wellbeing of different social groups as well as of various age groups (social justice and health). Additionally the social distribution of environmental burdens throughout urban regions is to be assessed (environmental justice and health).

**Topic: Novel approaches and instruments for evaluation, forecasting and management of environmental disease risks**

Innovative epidemiological investigations demand novel techniques to analyse, assess, forecast and manage environmental diseases at the level of the enlarged European Union. Temporal and spatial computational models have to be advanced for health and well being as well as for potential environmental stressors (climate, air pollution, noise, etc.). Emphasis is on modelling low-dose, cumulative, short- and long-term effects of multiple exposures. An important subject is assessing the sensitivity of predictive models to uncertain and incomplete input data. Advanced techniques for the observation and the recognition of spatial patterns (including source identification) have to be developed for risk assessment and management and the specification of indicators for preventive strategies and measures. Modelling and simulation of risk scenarios should include vulnerability and mobility of individuals, comprising not only (urban) outdoor stressors but also indoor conditions. The interaction of infectious and environmental diseases needs consideration in epidemiological models at individual and population level. Techniques for the up-scaling of models and for data aggregation have to be explored to facilitate the visualisation and communication of the outcome of risk assessment and epidemiological data exploration to the public, to policy makers and practitioners.

**Topic: Spatially explicit assessment of environmental and human risks of contaminants**

Due to changes in demography, economic prosperity and time expenditure of people, there is an increasing demand for areas for nature conservation/development and for recreational use. However, nature development and enhancement of recreational functions will often need to be achieved in conjunction with other functions, or in areas with currently low-quality functional land use, which may be upgraded. Large areas in Europe, for instance floodplains and brownfields, are contaminated with different kinds of contaminants, which often obstructs (re)-development of derelict areas. Current methods for the assessment of risks of contamination to ecological receptors and humans have not been developed as such that the resulting information can be used directly in spatial planning processes. The methods lack spatial information, so the results from such assessment are hardly applicable in spatial planning processes. Furthermore, stakeholder participation is generally low.

Hence, there is a growing demand for novel methods assessing environmental and human risks in an integrated and spatially explicit way. Spatially explicit risk assessment methods should include geostatistic methods, foraging modelling of ecological receptors (higher organisms like mammals and birds) and food web interactions for ecological receptors. For human exposure, methods for risk assessment should incorporate human exposure models (including occupational exposure, but also children which are generally most vulnerable). It should be stressed that development of a similar framework for environmental and human risks will lead to an integrated approach towards the risks of environmental pollution.

Development of these methods should involve the active participation of potential end-users to ensure that the methods will deliver the proper output.

**Topic: Apply system and functional biology to avoid environmental health risks and protect humans and the environment (*Topic not for the first call of FP7, but later*):**

Human beings and the environment are confronted with the release of an ever increasing amount of chemicals. Engineered to support human life and health it cannot be ruled out that these chemicals may also have potential adverse effects. However, standard hazard testing approaches are not applicable to identify adverse impacts since these chemicals – such as pharmaceuticals, personal care products as well as many industrial chemicals - are discharged in very low amounts and their potential risk will be mediated through a long-term low-dose exposure. Therefore, sensitive testing strategies able to identify subacute and predict potential long-term effects are required. System biology bears the possibility to integrating genomics, proteomics and metabolomics for the detection of the initial molecular events that can be anticipated for every hazardous chemical. These techniques should be optimised, developed and applied in order to identify robust markers for low-dose subacute effects.

The correlation of molecular alterations with physiological, individual or finally population-related effects will not be possible without functional biology. Integration, interpretation, networking and modelling according to the tools of system and functional biology shall produce genuine knowledge in order to predict potential adverse effects and thus protect humans and organisms in the environment as well.

***Threats to ecosystems***

**Topic: Ecosystem services and human and environmental health**

Develop an approach to harmonize risk assessment for human and environment health. The approach should be consistent for the setting of environmental targets with respect to sustainable use as well as for environmental remediation targets. Both lines of targeting should include 'suitability for use' criteria with respect to the use the environment. As all types of use benefit from ecosystem services, the management of environmental compartments and resources should optimize these benefits in a sustainable way. The approach should enumerate and prioritize ecosystem services in relation to land use (agricultural, forestry, nature, urban, recreational, ...). Consequently, environmental targets may be differentiated in view of relevant ecosystem services. Targets should account for environmental fate and chemistry, and for impacts of long-term exposure to low concentrations of (mixtures of) toxicants. The approach will link structure and function of ecosystems with land use, and contribute to a framework linking human and environmental health.

On the 10th of August 2001 in Helsinki five leading national environmental research centres in Europe decided to found the "Partnership for European Environmental Research Initiative" (PEER) with the aim of combining their forces in order to follow a joint strategy in environmental sciences and to enhance research on ecological sustainability. Presently, PEER has seven member organisations employing together more than 4500 persons and having an overall annual budget of 340 Million Euro:

- **Alterra - Green World Research Centre (The Netherlands)**
- **CEH - Centre for Ecology and Hydrology (United Kingdom)**
- **Cemagref - Centre for Environmental Research (France)**
- **JRC-IES - Institute for Environment and Sustainability (European Commission)**
- **NERI - National Environmental Research Institute (Denmark)**
- **SYKE - Finnish Environment Institute (Finland)**
- **UFZ - Centre for Environmental Research (Germany)**

All PEER members are extra-university research centres with scientific autonomy financed mainly by national and/or European public budgets. The outstanding strength of the PEER members is to aggregate, synthesize and integrate knowledge from the most diverse disciplines from natural and social sciences with

the aim to offer interdisciplinary expertise for complex environmental problems through basic and applied research.

**Among the specific aims of PEER are to develop and promote joint strategies in environmental research in support of both EU and national policies, to improve the competitiveness of European environmental research, to create opportunities for the exchange of scientific personnel and the training of young scientists, and to develop large-scale and long-term European research projects and programmes.**

For more information: [www.peer-initiative.org](http://www.peer-initiative.org) or contact [secretary@peer-initiative.org](mailto:secretary@peer-initiative.org)



Swedish Association of Local  
Authorities and Regions (SALAR)

## OPEN STAKEHOLDERS CONSULTATION – FURTHER COMMENTS ON THE PRIORITIES FOR ENVIRONMENT AND HEALTH RESEARCH IN THE SEVENTH FRAMEWORK PROGRAMME (FP7)

South Sweden attended the Open Stakeholder Consultation “Priorities for Environment and Health Research in FP7” on the 22th May, 2006 in Brussels, arranged by Directorate I – Environment in DG Research. We want to compliment the Directorate for a well-organized consultation, and we appreciate to have the opportunity to give further comments. We also welcome the Commission’s initiative to strengthen Environment and Health in FP7. These areas include challenges, which we as public stakeholders have to handle, for example to reduce social inequality related to environment and health.

### Comments

South Sweden and SALAR together wish to give the following comments.

#### *Research utilization:*

At the open consultation many of the stakeholders and other speakers discussed the problems concerning dissemination and utilization of research. The director, MR Valette, stressed that the cross cutting issues in FP7 should be integrated, when relevant. “Dissemination and knowledge transfer” is one of these cross cutting issues. Our main point is, that in relevant research projects, which are connected to societal challenges, public stakeholders may be involved in very early stages of the research process, such as to identify the need of new societal knowledge. This argument is based on that public stakeholders identify the need of new knowledge together with researchers and NGO: s, citizens etc. Then they are also more capable to implement and use the research results. In this way policy-makers will be empowered to make informed decisions based on research in which they have been involved.

#### *Societally Motivated Research Platforms - SMRPs*

Stakeholders who take part in identifying the need of new knowledge and stress the utilization of research results are two of the main criteria for the Societally Motivated Research Platforms (SMRPs), which Sweden and Poland among other Member States have argued for to be a part of FP7. SMRPs are seen as an important way to handle great societal challenges in Europe, such as environment and health, sustainable development, but also migration and the ageing population in Europe.

This type of research requires multidisciplinary research as stated in the Cooperation part of the Specific programmes. A criterion for SMRPs is transdisciplinarity, which means that researchers from several disciplines and public stakeholders are involved in the research process together. South Sweden and SALAR can see a lot of possibilities for “Environment and Health” to be inspired of SMRPs, because this theme have to handle major societal challenges.

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## **THE ENVIRONMENT AGENCY'S SCIENCE PROGRAMME ON ENVIRONMENT AND HUMAN HEALTH**

The Environment Agency's thematic science programme on Environment & Human Health specifically addresses human health issues related to the processes and activities that the Environment Agency regulate. The programme underpins decision making for a wide range of environmental legislation connected with air quality, contaminated land, recreational waters and waste.

The programme also considers wider social issues, that include less privileged populations, exploitation of the environment to improve health and risk perception/risk communication. It is based on the risk framework and in particular improved understanding of variability and reducing uncertainty. Risk is considered in both the predictive mode, for example determination of quality standards for protection and in the retrospective mode to unravel impacts such as endocrine disruption, and contaminated land.

We are keen to be involved in partnership arrangements that bring together sciences that have not traditionally worked closely together in the UK such as environmental sciences, health experts, medical sciences and socio-economic science.

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## **HUMAN BIOMONITORING OF NEW POPS**

Several studies indicate that current concentration levels of already restricted pollutants still pose health risks for the European population. For example, recent publications show the underestimation of PCB related health risks during the last decades.

Vreugdenhil et al. 2002 concluded that neurotoxic effects of prenatal PCB and dioxin exposure may persist until school age, resulting in subtle delays of cognitive and motoric development. These results are consistent with findings from studies from the United States, Germany and the Czech Republic. Over the last years concerns about the “new PCBs” the polybrominated diphenylethers (PBDEs) increased. Like their chlorinated correspondents (PCBs) they are expected to be neurotoxic and interfere with the hormone system. PBDE concentrations, even if still far below PCB levels, are rising, and PBDEs are found worldwide in all kinds of environmental compartments, accumulating in animal und human tissues and milk. Due to their extensive use their concentrations in Europe will not decline although specific compounds were restricted within the European Union. Perfluorinated compounds, i.e. perfluorooctane sulfonate (PFOS), were also found to occur ubiquitously in the environment and bioaccumulate in the food webs. PFOS binds to plasmatic proteins. It qualifies as a POP by all applicable criteria. It should be investigated to which extent the European population is exposed to these new POPS and other upcoming pollutants. Further efforts should be taken to examine the health risks of these substances. Human Biomonitoring is an extremely valuable tool for exposure assessment as well as Risk Management.

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## **NEW APPLICATIONS OF SILVER A THREAT TO HEALTH AND ENVIRONMENT**

Silver is a rare but naturally occurring element, whose properties have been used in a wide variety of applications. While extracting silver mercury is often used, and the silver industry has been a major contaminator of mercury and other heavy metals in the environment. The antibacterial effect of silver has been noted for centuries, but the scientific documentation of its toxicity, mechanisms of action and clinical usefulness is still limited. With the emergence of multiresistant bacteria, the interest in silver has increased. So far, the photographic industry has been the largest consumer of silver, but now a new market is developing. Silver has quickly spread from soaps to full room concepts in hospital wards. Silver is used in textiles, ceilings, walls, floors, furniture, clothes, shoes, telephones and accessories. It can be found in almost any medical device. It is therefore of outmost importance to initiate research on silver in environment and health straight away, before the presently emerging usage has grown too large and got firmly established in society. This would result in the same problem to phase out the usage of silver as we all are familiar with when trying to phase out usage of mercury in society.

The estimated yearly growth of the antimicrobial market is 40%, and silver is marketed as an alternative to antibiotics. However, bacteria can become resistant to both silver and antibiotics, and the use of silver can actually mediate the antibiotic resistance. The medical consequences of the use/misuse of silver cannot be underestimated."

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### **Additional comments after the meeting**

**5 June 2006**

## **SILVER – A THREAT TO OUR HEALTH AND ENVIRONMENT**

- Silver is toxic to all living cells
- Silver contributes to antibiotic resistance
- Silver is deposited around nerves and in deeper skin layers and may cause permanent skin damage
- Silver is intimately associated with environmental contamination of other toxic heavy metals such as mercury and lead
- Silver sticks to fish gills, potentially choking them to death
- Silver disturbs bacterial activity when cleaning sewage
- Silver prevents the use of sludge as fertilizer, needed for nutrient recycling

### **New uses for silver**

Our emerging problems with antibiotic resistance and fear of multiresistant bacteria have opened the door for toxic heavy metals. Silver has quickly spread from soaps to full room concepts in hospital wards in recent years. It can now be found in:

- Wound dressings, Band-Aids
- Catheters, endotracheal tubes
- Grafts, implanted heart valves, bone cement
- Sutures
- Soaps, disinfectants
- Sanitary ware, toilet seats, door handles, furniture, paints
- Textiles, carpets, clothes, shoes
- Refrigerators, washing machines, telephones, keyboards, pocket calculators
- Children's toys, pacifiers

The most toxic forms of silver are added to these products. This development coincides with a pronounced decrease (25-40%) in silver use by the photo industry due to digital cameras.

With a wide and uncontrolled use of silver products, it is likely that not only silver-resistant but also antibiotic- and biocide-resistant bacteria will emerge. These bacteria would certainly pose a threat to the public health. Furthermore, if we kill the good bacteria, the ecosystem will collapse.

### **Mining and largest consumers**

Only one third of silver produced originates from dedicated silver mines and two thirds is received as a by-product from production of copper, gold, lead, and zinc. Most silver production results in large emissions of mercury to air, soil, and water. Where silver is extracted by small-scale miners, large quantities of mercury are used, resulting in large health and environmental damages.

Hospitals are large consumers of specific products with silver added. In five years the silver-based wound dressing market has gone from zero to 200 million Euros in Europe, and the estimated yearly growth of the 'anti-bacterial market' is 40% with specified areas such as wound care and foreign bodies leading the trend. Most silver is still used for electronics, jewellery, silverware, mirrors, but the risks from this usage are much smaller than the newly emerging usages due to already established recycling.

### **How to act?**

Buy products free of silver. The silver added has generally no positive effects, and can be more detrimental for your health than the same product without silver. Consumers should be informed and demand clear and easily visible labelling when silver has been added.

To educate the general public and health care staff about the potential negative health and environmental effects is central. To confront purchasing staff with the selling strategy of commercial companies should be included in the training.

Municipalities, governments and EU need to take appropriate actions.



Do not ingest colloidal silver sold as food supplement in health food stores, unless you want your skin to have an incurable greyish taint like the lady to the left in the picture above.

## **PRIORITIES FOR ENVIRONMENT AND HEALTH RESEARCH IN FP7**

### **1. Air pollution & noise**

We strongly support the recommendation of the EU<sup>12</sup> to develop a network of superstations to improve the air pollution monitoring and link this with a cohort-study on long-term health impacts. The latter will also provide an excellent opportunity to study impacts of air pollution in combination with other exposures such as traffic noise. Further evidence is needed to establish exposure-response relationships for long-term health impacts of traffic-related noise exposures.

In addition, we would welcome long-term fundamental research into (a) the molecular biochemical reaction leading to the detrimental effects of fine particle exposure and (b) long-term health impacts of air pollution, including impacts on neonates.

Numerous epidemiological studies have demonstrated health effects related to short- and long-term exposure to ambient PM concentrations, expressed as the mass of particles. Yet it is unlikely that particles of different composition have similar toxic actions in vivo. Much attention has recently been directed toward identifying the toxic components of PM. As PM toxicity is likely to reflect the sum of multiple toxic components, approaches focusing on single factors are unlikely to be fruitful. Rather, a biologically meaningful measure of PM toxicity that integrates PM composition and size distribution is a more logical strategy, with the long-term aim of establishing a 'biologically-active' PM metric for ambient air. By relating this 'integrative' measure of PM activity to source specific emissions, targeted strategies to abate health-relevant components of PM will become successful.

Studies from several countries (e.g. USA, Chile and some older studies in the Czech Republic) are suggesting an association between exposure to air pollution during pregnancy and neonatal effects (birth weight, infant mortality etc). At this stage the magnitude of this problem at EU-level is not known. There is also a need for better characterization of the exposures during pregnancy. Recent developments in GIS enable a better exposure characterization at address-level.

#### **Type of research needed:**

- Cohort-study on health impacts of chronic exposure to **air pollution**. Combine this with study on combined exposures (eg noise)
- Cohort-study on neonatal impacts (birth weight, mortality, pregnancy duration)
- Fundamental research into the biologically meaningful fraction of PM (size, composition and effect (e.g. radical generating behaviour)), in vivo and in vitro.
- Research into the possible synergistic effects of filtering dust and fine dust. Due to the removal of the larger particles the reactivity of the finer fraction might be enhanced. The larger particles are easier for the body to remove.
- Multi compound, source related research: studies into contribution of car-emissions (instead of individual components) on health impacts.
- Passive and active sampling technique development and support. Currently, it is difficult to mimic real life situations while using these techniques due to characteristics of these devices (size, weight, sampling time etc).
- Study long-term consequences of **noise** exposure.
- Study into **noise** sensitivity as risk factor for cardiovascular effects of chronic noise exposure.

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<sup>12</sup> EU Commission staff working paper. Environment and Health Information. Review and implementation plan in the context of the European Action Plan 2004-2010. DG-Environment, June, 2006.

## **2. Emergency guidance levels for acute exposure to chemicals**

In our industrialized society with a high density of production, transport and use of chemicals the risk of (accidental or terrorist) chemical incidents is high. In the EU, the Seveso-II and other regulation requires Member States to control the hazards in terms of land-use planning, emergency planning and response, and occupational hazards.

Successful chemical hazard control requires the ability to assess the short- and long-term human health consequences of emergency exposure to chemicals. Because of the application in a.o. emergency response, human health risk assessment information with sufficient scientific authority needs to be accessible in an end-user friendly form for most of the commonly encountered chemicals. For this purpose the derivation of Emergency Guidance Levels for selected airborne chemicals has been proposed. Guidance for inhalation exposure requires the most attention because of the relatively high urgency of the emergency response.

In the USA, two programs for deriving such values exist. In Europe, an EU funded research program to develop a methodology for derivation of such levels has been finalized (ACUTEX). The knowledge and data in all three programs needs to be harmonized and collated to optimize the methodology, the data availability and application of the values.

The availability of scientifically valid Emergency Guidance Levels is a crucial prerequisite for land-use planners, emergency planners and emergency responders to provide the best possible health-based advice for action regarding acute chemical emergencies, and can therefore contribute significantly to human environmental health.

### **Type of research needed:**

- Development & application of methodology to derive these limit-values.
- Special interest in to acute combined exposures, high doses of several substances due to explosions.

## **3. Residential environment**

There are some indications for the restorative function of environmental amenities in the urban environment, suggesting the need for spatial planning and health promotion measures specifically aimed at potential vulnerable groups such as children.

The elderly are a vulnerable population group that should also receive particular attention in health policy. They are a group of considerable and growing size that contributes disproportionately to the total disease burden. Although residential environment is likely to influence health and well-being among the elderly, the evidence-base for appropriate policy and practice is lacking. Improved understanding of the role of relevant environmental factors could lead to substantially reduced morbidity and mortality (and associated costs) for the key outcomes: falls, and cardiovascular and respiratory disease. Results will contribute to the international evidence-base in this increasingly critical area of research, policy, and practice.

### **Type of research needed:**

- Research into social and physical health of children in relation to accessibility and quality of playgrounds. Special focus on costs and benefits. Possible focus on ethnic minority girls of different age groups.
- Study into the association between health and residential environment in the elderly, particularly the effects of 1) traffic-related pollution (air, noise) on health outcomes (e.g. cardiovascular disease); and 2) housing-design and -condition on falls.
- Study of (a) restorative function of environmental amenities (green, quietness, aesthetics) in the urban environment in terms of immediate stress reduction (b) long-term health effects of positive environmental amenities. The findings of *a* and *b* need to be applied in terms of consequences for planning and health promotion specifically aimed at potential vulnerable groups.

#### 4. Indoor Air Quality

- At European level, construction products in particular are now under evaluation. The second generation of harmonized product standards under the Construction Products Directive (CPD) requires harmonized test methods for release or emission of dangerous substances to satisfy the requirements of Essential requirement 3 (ER 3) of the CPD. The European Commission has issued Mandate M/366 to CEN. In this mandate there is a request for horizontal standards on emission scenarios in indoor air, planned to be developed by CEN/TC 351. The actions on IAQ and on child exposure need extensive research and coordination from DG Environment and DG Sanco

#### 5. Methodology & monitoring

- **International Monitoring System Health and Environment** :There is a need for better linkage and systematic monitoring of health-indicators in relation to the environmental situation at different geographical levels, eg (parts of) the municipalities. It is important in this type of studies to take into account socio-economic and lifestyle factors. Efforts are made to realise such monitoring systems across the borders (eg. EU-regio Maas-Rijn). This type of monitoring needs to be linked to a fine mazed detailed measuring system of air quality in the region. Such a EU-region pilot project can concomitantly serve as a case study into the different policy responses in the participating countries. This may provide insight whether participating countries are able to effectively create a cross-border intervention policy for air pollution situations (e.g. summer smog, or inversion situation or calamities). It will also provide data for a meta-analysis of studies into cost-effectiveness of measures.
- Further development of GIS and Space-time models to improve: (a) population exposure assessment at small area level and (b) environmental disease mapping
- Further development of (harmonised) Health Impact Assessment and Cost-Benefit Analysis methodology for environment and health applications, to enable better comparison of national and local studies into environment-related disease burden and cost-effectiveness of abatement and prevention measures.

Suggestions from the Netherlands (T van Teunebroek, Ministry of Housing, Spatial Planning and Environment and B Staatsen, National institute for Public Health and the Environment, email: [tom.vanteunenbroek@minvrom.nl](mailto:tom.vanteunenbroek@minvrom.nl), [Brigit.Staatsen@rivm.nl](mailto:Brigit.Staatsen@rivm.nl) )

**F. Williams**  
**The University of Newcastle upon Tyne**  
**Institute for Research on Environment and Sustainability**

**Areas that appeared to be omitted in proposals that might receive consideration;**

1. Risk assessment of contaminated soil- man made or natural and implications for human health. Impact on vulnerable groups such as children playing. Impact of legislation and evaluation of health improvement following clean up or relocation\
2. Environmental effects of water quality -chemicals in the environment - routes of exposure e.g. drinking water ingestion versus contaminated bathing such as water metals in spa waters, metals in personal products.
3. Novel local biomarkers of exposure, tape stripping non-invasive approach to measuring dermal exposure

**Institute for Research on Environment and Sustainability:**

Recognising the diversity and interdisciplinarity of research needed to transform the environment and improve human health our strategic focus is to progress integrated systems level research in each of six key areas: health, water, social, energy, bioresources, earth

**Health System Research director:** Professor FM Williams, **Mission statement:** Promoting interdisciplinary research on the interactions between environment and human health.

**Current research priorities:**

- Advancing the understanding of genetics, susceptibility and environmental factors implicated in human disease related to chemical exposure
- Application and development of modelling to environment and health problems and risk assessment
- Aetiology of the effect of contaminated land and particulate matter on human health
- Relating UV interactions to health and ageing of skin
- The importance of clean water for health
- Comparative toxicity mechanisms in plant microbes and human

**Bioresource Systems Research Director:** Professor AMB Gatehouse, **Mission statement:** Sustainable development, exploitation and management of bioresources

**Current research priorities:**

- Microbial resources
- Plants and animal resources
- Soils and Marine environments
- Wildlife and Ecosystems

**Water Systems Research Director:** Professor PL Younger **Mission statement:** To address the sustainable management of the natural water environment **Current research priorities:**

- Water, people and governance
- Hydro-ecological conflicts and justice
- Managing quality and quantity of water

**Earth Systems Research Director:** Professor PE O'Connell, **Mission statement:** to deliver Earth Systems Engineering and Management strategies under global climate change. **Current research priorities:**

- Earth Systems Observation
- Earth Systems Understanding
- Earth Systems Engineering and Management

**Energy Systems Research Director:** Dr C French, **Mission statement:** Delivering future Global Energy Solutions **Current research priorities:**

- International Energy Policy
- Energy-related Techno-Economics
- Fuel Poverty
- Energy efficiency
- Energy in Urban, Rural and Marine environments

**Social Systems Research Director:** Professor ND Laurie, **Mission statement:** To find solutions to key environmental challenges by interrogating how social systems interact with, shape and constitute possibilities for sustainability cities. **Current research priorities:**

- Environmental Knowledge Production for a Sustainable World
- Representing the Environment
- Sustainable Cities
- Technologies and policy making for energy and water

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