

Perspectives for environment and health research activity in FP7

Introduction

The European Commission's Environment and Health Action Plan, adopted in 2004, has as its main aim to improve the understanding of the link between environmental factors and health. The implementation of the goals of this plan through research started in FP6 via funding of several large- and small-scale research projects on topics identified as priorities in the Action Plan.

The efforts will continue and intensify during FP7. Although new knowledge has been or is being generated both in FP5 and FP6 projects, there is still a lack of essential information in many areas on how environmental factors interfere with human health and well-being. We do not know to any great extent how multiple environmental exposures occurring during the whole human lifecycle from the moment of conception to aging and senescence can result in adverse health effects. Due to the complexity of the issues involved, only an integrated approach focusing on multiple stressors, pathways and effects, using scientific advances and tools such as ecotoxicological tools and modelling, can at medium or long term give us more definitive ideas as to the extent of environmental factors' influence on the burden of disease at individual or population level.



Dr. Tuomo Karjalainen.

The NoMiracle Secretariat is pleased to present detailed information about the next European Framework Programme, FP7. It is provided to us by Dr Tuomo Karjalainen, who addressed the NoMiracle Progress Meeting (Antwerp, September 2006). Dr. Karjalainen is with the Environment Directorate within the European Commission Research & Development Directorate. Since 2002 he has mainly managed research projects dealing with health impacts of various environmental stressors such as industrial chemicals, air pollution, or noise.

More details about FP7's innovative structure can be found in Box 1 of this newsletter, or via the internet links provided there.

In FP6 a new approach was introduced for integrated environment and health risk assessment methodologies. FP6 projects such as NOMIRACLE or INTARESE will examine the concepts important to integrated risk assessment and link environment and health data in a more effective way, thereby at term providing better support for environment and health-related policy making. Along this line, the "full-chain approach" was introduced, putting more emphasis on the identification of pollution sources, exposures (including human biomonitoring), links to health effects, and economic valuation. The third new focus in FP6 dealt with economic valuation models and tools to be developed in order to support impact assessment in the area of environment and health.

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Justification and rationale

The draft workprogramme 2007 will continue *implementing the E&H Action Plan* through research. The 'impact pathway' approach adopted in FP6 will be further strengthened. The efforts to be supported in the first two years of the programme will build on work undertaken in previous programmes. In FP7 special attention will be given to combined effects of stressors and the role of confounding factors. The focus will be on vulnerable groups, and emerging issues will not be neglected. The aim will be to generate new evidence and at the same time develop/enhance models that can help us in better understanding and anticipating health and environment interactions.

To continue *supporting informed policy making*, research will focus on new and/or improved tools for prevention strategies with emphasis on air pollution and epidemiological research, with applications in biomonitoring. The ultimate aim will be to aid policy makers in identifying prevention strategies through a better understanding of the full chain of cause effect relationships: sources – emissions – concentrations – exposures and health effects. Research actions such as high-resolution GIS or validation of biomarkers for epidemiological research or biomonitoring, developed through new technologies based on 'omics' methodologies, will aid the understanding of the precise relationships between environment and disease. Ultimately, this information may allow us to identify ways to reduce or prevent disease by pinpointing biochemical and molecular functions that have been perturbed by environmental stressors.

Emerging issues to be tackled include health impacts of global change and certain man-made chemicals, keeping in mind realistic exposure scenarios. On the effect side, focus will be on research dealing with health impacts that continue to be prevalent and may be increasing, such as respiratory and other effects of air pollution, declining reproductive health, the reasons for which remain uncertain, and neurodevelopmental effects. Such issues may be approached by establishing a large European cohort study.

Short-term goals

The first call for proposals in FP7 will continue contributing to the goals of the E&H Action Plan by targeting existing knowledge gaps via small and large-scale multidisciplinary research actions. The efforts to be supported will partly build on work undertaken in previous framework programmes. Priority will be given to issues which were largely neglected in FP6. These issues include the long-term impacts of air pollution –whether outdoor or indoor- and chemicals on human health. Research support for biomonitoring pilot activity – an important activity of the E&H Action Plan – will be provided. Support for new and emerging issues and approaches have not been forgotten, such as the use of GIS approaches to support environmental epidemiology and to investigate the health impacts of drought and desertification. International co-operation will be more strongly favored through linking to international initiatives such as GEO in which environment and health is also a well-identified priority. The 'impact pathway' approach adopted in FP6 will thus be further strengthened.

Medium-term goals

Later calls for proposals will continue supporting environment and health research by focusing on environmental stressors of greatest importance for European populations. Particular focus will be on vulnerable population groups such as children, ageing population. The approach taken is practical, combining projects on specific targeted issues (e.g. health impacts of electromagnetic fields) with those taking a more integrated approach in support of policy making (e.g. integrated health risk assessment of exposure to multiple urban risk factors such as noise, air pollution, and chemicals, taking into account socio-economic factors). The general aim will be to generate new evidence and at the same time develop/enhance risk and impact assessment models and tools that can help us better understand and decipher health and environment interactions. The ultimate aim will be to aid policy makers identify prevention strategies

Box 1 EU – Framework Programme

The Framework Programme (FP) is the European Union's main instrument for funding research and development. The FP is proposed by the European Commission and adopted by Council and the European Parliament following a co-decision procedure.

FP7 will run for seven years. It will be fully operational as of 1 January 2007 and will expire in 2013. It is designed to build on the achievements of FP6 towards the creation of the European Research Area, and carry it further towards the development of the knowledge economy and society in Europe. In real terms, the budget will increase by 60% as compared to FP6, for a total of €48bn over 7 years.

FP7 has a significantly new structure. It is composed of four programmes (Cooperation – Ideas – People – Capacities) that will provide many new opportunities for research. Fresh elements in FP7 include the following:

- Emphasis on research themes rather than on "instruments"
- Significant simplification of its operation
- Focus on developing research that meets the needs of European industry, through the work of Technology Platforms and the new Joint Technology Initiatives
- Establishment of a European Research Council, funding the best of European science
- Development of Regions of Knowledge
- A Risk-Sharing Finance Facility aimed at fostering private investment in research

For details about the four programme components, see http://cordis.europa.eu/fp7/spe_programmes.htm

Or consult the NoMiracle website <http://nomiracle.jrc.it/Lists/Announcements> and choose "European Framework Programme, FP7".

through a better understanding of the full chain of cause-effect relationships: sources – emissions – concentrations – exposures and health effects – economic valuation.

Cross-thematic approaches and links

In FP6, environment and health research was implemented through three thematic areas: "Health", "Food Quality & Safety", and "Environment" research.

In FP7, environment and health research has been identified as an activity in itself under Theme 6 "Environment (including Climate Change)". The aim is to focus on *multidisciplinary research activities* on interactions of environmental risk factors and human health, taking into account exposures via different exposure routes.

In Theme 1 "Health", focused research on major diseases, such as cancer and cardiovascular diseases, including chronic diseases and pub-

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lic health research on disease prevention, will complement the E&H research activity. In addition, research on food, nutrition and diet-related diseases and disorders will be the subject of Theme 2 "Food, Agriculture and Biotechnology". These areas are seen as complementary to the approach taken in the environment and health area. In specific cases, coordinated calls between the E&H activity and the other two themes could be envisaged.

International collaboration will be enhanced via specific topics especially relevant to third countries. The research efforts will also support the goals of international initiatives such as GEO or other international activities, such as sustainable development or water and health initiatives. Efforts will be made to enhance synergies between the EC Environment and Health activity and similar efforts elsewhere, e.g., in the USA, possibly via co-ordinated calls.

Workprogramme 2007

To build up the Workprogramme for 2007, the environment and health research activity in FP7 is divided into three areas:

1. Health effects of exposure to environmental stressors

Indicative topics for 1st call

- Indoor air pollution in Europe: an emerging environmental health issue
- Environmental factors and their impact on reproduction and development

2. Integrated approaches for environment and health risk assessment

Indicative topics for 1st call

- European network on human biomonitoring
- European cohort on air pollution
- Drought and desertification; related public health and socio-economic impacts

3. Delivery of methods and decisions to support tools for risk analysis and policy development

Indicative topics for 1st call

- Geographical information systems in support for environment and health research
- ERA-NET for environment and health

Conclusion

Taken together, the *multidisciplinary* research efforts to be supported in FP7, linking environmental issues to health, should contribute in a significant manner to the main aim of the E&H Action Plan, namely understanding the links between environmental stressors and health impacts, taking into account individual susceptibilities and focusing on certain priority health outcomes. Other key driving forces behind the adopted research strategy are the Earth Observation initiative, and

the Sustainable Development Strategy with its focus on health impacts of environmental chemicals. Thematic Strategies on the Urban Environment and Air Pollution as well as the Programme of Community Action in the Field of Public Health are also important initiatives identifying future research needs.

The first calls are likely to be launched at the end of 2006 or the beginning of 2007.

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Note: The indicative topics and priorities given in this article are subject to change.

NoMiracle holds First Open Workshop in Verbania



Scientists from several FP6 projects meet to discuss scenario selection and applications to risk mapping

*by Dr. Hanne Bach, NERI
Leader of NoMiracle Research Pillar 1*

The first open NoMiracle workshop was organised on June 8-9, 2006 by Research Pillar 1 (Risk Scenarios) and hosted by NoMiracle partner Joint Research Center (JRC) Ispra. The venue was the very beautiful city of Verbania on the Lago Maggiore close to Milan, Italy.

The topic of the first open NoMiracle workshop was the development of risk assessment scenarios and potential use of these in risk mapping and

visualisation. The argument for choosing this subject as the first topic for an open, international workshop is two-fold. The work on methodologies for risk scenarios started full speed at the very beginning of the NoMiracle project. This means that achievements and results could be presented at the workshop. In contrast, the work on risk mapping and visualisation is still developing, thus laying ground for a fruitful interaction at this point in time. External participants had a chance



Lago Maggiore

to see the results and methodologies developed so far, and through the discussion sessions of the workshop they could also influence NoMiracle activities on risk mapping and visualisation.

The aims of this workshop were to discuss criteria for the selection of risk scenarios, and means for mapping and visualising risk and communicating it to the general public, decision makers and scholars in other disciplines.

The workshop was attended by approximately 70 participants from the NoMiracle Consortium, the NoMiracle Advisory Board and experts outside the NoMiracle Consortium.

During the two-day workshop, NoMiracle participants presented about 20 scientific communications organised into coherent sessions. We also heard presentations of related EU-projects ALARM and Erapharm, and ended up with a full afternoon of discussion on challenges and solutions for integrative and cumulative risk mapping.

Scenario selection and design

Interactions between mixtures of chemicals and combinations of stress and fate conditions produce a nearly infinite set of possible risk assessment scenarios. Methods are needed for choosing and designing appropriate scenarios: ones that fit European reality, and that will not lead us in subsequent calculations to underestimate the real risk to the environment (animal species) or human populations.

At Verbania, NoMiracle researchers presented a comprehensive example regarding risk assessment scenario design and selection. The focus was

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on pesticides and biocidal active ingredients (including also parallel uses of the active ingredients in cosmetics and fragrances) in households on the European level. The highly innovative NoMiracle methodology to select risk scenarios with highest risk potential was illustrated (see our Newsletter number 2 for details). It looks very promising for arriving at a systematic, transparent and reproducible scenario selection procedure.

Emission distribution maps

Other NoMiracle presentations illustrated calculation methodologies and resulting European maps for emissions of pesticides, volatile organic compounds (VOC's) and pharmaceuticals, or focussed on more detailed country-specific inventories (for instance pharmaceuticals in Lithuania). The emission distribution data can be superimposed on soil maps or ecosystem maps or even maps showing social factors like population density. This will help us to identify hot spots of risk: the places where emissions might have the greatest effect on things we want to protect (ecological features, animal life or people). The calculation methodologies will be utilised in further research work on risk assessment scenarios and also in the work on risk communication, where maps may play a key role.

Three types of risk that can be displayed on risk maps

Relative risk: risk as compared with a reference risk (expressed as greater or smaller than the reference risk)

Absolute risk: risk estimate expressed in absolute terms (as opposed to relative risk)

Realistic risk: risk according to our best estimate when imagining a situation likely to take place in reality

Some of the questions posed to stimulate discussions were:

- How cumulative should cumulative risk maps be? (How many different substances or stressors should be represented on a single map?)

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- Can human and ecological risks be integrated in one map?
- Should risk maps for Europe present realistic or relative risks?
- How to communicate (realistic and/or relative) risks to policy makers and the public?

The audience was divided into four groups discussing these questions and plenary sessions presented and discussed the results. From these discussions a set of recommendations was derived.

Summary conclusions & recommendations

- Maps can be useful tools to communicate cumulative risks and associated uncertainties to different target groups, e.g. the general public, policy makers and scientists.
- The purpose of the map, the target group, the endpoint and the rationale behind the map should always be clearly defined and explicitly stated. The terminology used should be clear and transparent to the users.
- Absolute risk mapping can be a powerful instrument to inform specific target groups and the general public about the potential impact of human activities, but should be used only when the risks are known in sufficient detail or can be predicted reliably.

Recent NoMiracle scientific articles 2006

Harbers, J.V., Huijbregts, M.A.J., Posthuma, L., Van De Meent, D. 2006. Estimating the impact of high-production-volume chemicals on remote ecosystems by toxic pressure calculation. *Environ. Sci. Technol.* 40: 1573-1580.

Kühne, R., Ebert, R.-U., Schüürmann, G. 2006. Model selection based on structural similarity-method description and application to water solubility prediction. *J. Chem. Inf. Model.* 46: 636-641.

Reichenberg, F., Mayer, P. 2006. Two complementary sides of bioavailability: accessibility and chemical activity of organic contaminants in sediments and soil. *Environmental Toxicology and Chemistry* 25: 1239-1245.

Mayer, P., Reichenberg, F. 2006. Can highly hydrophobic organic substances cause aquatic baseline toxicity, and can they contribute to mixture toxicity? *Environmental Toxicology and Chemistry.* 25: 2639-2644.

- In cases of limited data availability or when detailed knowledge about cause-effect relationships is lacking, relative risk mapping can be a useful instrument to identify potential high risk situations.
- Aggregation of human and ecosystem health endpoints is not recommended for communication to the public because the aggregated endpoints are difficult to interpret and not easily related to real world effects.
- Additional research is required to develop a firm knowledge base to map cumulative risks and communicate them to different target groups.

In between the sessions, at lunch, breakfast, coffee breaks etc., the participants working in the NoMiracle project found time to discuss project matters, e.g. coordination of next steps, data gaps, and possible refinements.

Alberto Pistocchi and his team from JRC, Ispra hosted us in style in a beautiful setting and venue, facilitating all logistics.

A boat ride to one of the islands in Lago Maggiore, where champagne, a three-course fish menu and a beautiful small, old village waited, concluded the impression of a very nice and fruitful seminar.

Participating at the first open NoMiracle Workshop were scientists from EU projects

ALARM – Assessing LARge scale Risks for biodiversity with tested Methods

<http://www.alarmproject.net/alarm/>

Coordinator:

Dr. Josef Settele, Department of Community Ecology, UFZ Centre for Environmental Research Leipzig-Halle, Germany.

ERAPHARM – Environmental Risk Assessment of Pharmaceuticals

<http://www.erapharm.org/>

Coordinator:

Dr. Thomas Knacker, ECT Oekotoxikologie, Flörsheim am Main, Germany.



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Ph.D. students Mieke Broerse (front) from Institute of Ecological Science, Vrije Universiteit Amsterdam (Holland) and Joanna Zietara (back) Department of Ecotoxicology, Institute of Environmental Sciences, Jagiellonian University Kraków (Poland) seated around teacher Silvia Díaz Cruz Department of Environmental Chemistry IIQAB-CSIC, Barcelona (Spain) in the laboratory at CSIC.

Training in analysis of pesticides and metabolites

Three NoMiracle Ph.D. Students visits partner CSIC in Barcelona for Research Training in analysis of pesticides and metabolites in samples from the NoMiracle project. Samples include soil, invertebrates, animal food and mouse organs, i.e. kidney and liver. The training course took place at Department of Environmental Chemistry, IIQAB-CSIC (NoMiracle Partner 36) in Barcelona (Spain), 9-20 January 2006.

Theoretical concepts on the extraction of the analytes from solid samples, enrichment and purification, as well as Gas Chromatography and Mass

Spectrometry for the separation and detection were included in parallel to the practical part.

An example of the application of the analytical methodology employed to sludge and agricultural sludge-fertilized soils can be found in:

M. Silvia Díaz-Cruz and Damià Barceló. "Highly selective sample preparation and gas chromatographic-mass spectrometric analysis of chlorpyrifos, diazinon and their major metabolites in sludge and sludge-fertilized agricultural soils". *Journal of Chromatography A* (2006). In press.

Survey on what NoMiracle Novel Methods should be able to do

WP 4.3 has developed a survey using innovative internet tools. Experts and key stakeholders involved in risk assessment and management, including all NoMiracle partners, will be asked via e-mail to participate in October 2006.

The purpose of the survey is to highlight aspects of integrated risk assessment of cumulative stressors that experts and stakeholders see as particularly important. The analysis will focus on challenges for the communication of results from novel methods of risk assessment. We hope that all NoMiracle partners will react favourably to the survey and ensure a high response rate.

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DEB course 2007

Fourth international tele-course on Dynamic Energy Budget Theory

NoMiracle partner Bas Kooijman and his colleagues of Vrije University Amsterdam and an international team will organize a ten-week tele-course on the biological fundamentals of Dynamic Energy Budget (DEB) theory. Registration is open now.

200 hundred hours to be spent from Thursday 8 February 2007 through Thursday 19 April 2007

The course will be attractive to persons with a background in biology, mathematics, engineering, chemistry or physics with an interest in the logic behind the quantitative aspects of the metabolic organisation of living systems. It is primarily meant for graduate students, but advanced undergraduates as well as confirmed scientists are also welcome. Several professors participated in earlier courses, and their valuable input contributed greatly to the level of the course.

Basic knowledge of DEB theory is a pre-requisite and introductions (very brief as well as extended ones) can be found at

www.bio.vu.nl/thb/deb/

Surf on from that page to enrol in the course now.

Key words: dynamic energy and mass budgets, homeostasis and stoichiometry, surface area-volume interactions, body size scaling relationships, evolution, structured population dynamics, life histories, bioreactor engineering.

NoMiracle co-ordination

Visit NoMiracle at: <http://nomiracle.jrc.it>

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*Articles in the NoMiracle Newsletter do not necessarily
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