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Book of abstracts

SCIENCE FOR POLICY, POLICY FOR SCIENCE: BRIDGING THE GAP

INTERNATIONAL PUBLIC HEALTH SYMPOSIUM
ON ENVIRONMENT AND HEALTH RESEARCH

MADRID, SPAIN, 20-22 OCTOBER 2008

This book of abstracts contains the abstracts of the presentations to be given at the International Public Health Symposium on Environment and Health Research (Madrid, Spain, 20-22 October 2008). The Symposium is organized by the WHO Regional Office for Europe and the Institute of Health Carlos III of the Spanish Ministry of Health and Consumer Affairs in co-operation with the European Commission Research Directorate-General (EC DG Research). A second version of this book of abstracts, including the Symposium proceedings and recommendations, will be published after the Symposium.

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Table of content

Introduction

The relevance of environment and health (EH) research to policy making is well appreciated by researchers and policymakers alike. The constant progress in EH research provide a challenge to policy makers to find ways to address newly identified EH problems. On the other hand the public's demand for policies to address their concerns requires tailor made research which may not have the same focus as that of the research community.

The WHO Regional Office for Europe has always recognized the need to close these gaps between research and policy making and to strengthen multi-disciplinary research approaches for public health and especially environmental health practice in order to effectively tackle the environmental health challenges. In addition there is a need for adequate communication strategies to address the general public in case of emerging environmental health crises.

For this reason, the WHO Regional Office for Europe and the Institute of Health Carlos III of the Spanish Ministry of Science and Innovation with support of the Spanish Ministry of Health and Consumer Affairs and DG Research, Directorate Environment have agreed to organize an International Public Health Symposium with a special focus on Environment and Health in Spain in 2008. This symposium will provide an opportunity for discussion of the most recent developments in research on environment and health since the 'An environment for better health' conference which took place in Aarhus in preparation for the Fourth Ministerial Conference on Environment and Health in Budapest in 2004. It aims to bring together a wide range of scientists, research professionals, policy makers and representatives from non-governmental organizations from the WHO European Region that will ensure interesting discussions on how to better translate future research into policy making whilst continuing to identify emerging issues and research needs.

Objectives of the Symposium

The symposium aims to provide a platform for mutual collaboration between public health professionals and researchers in the field of public health in general, with a particular emphasis on environment and health. It is expected that the outcomes of the international symposium will provide the evidence base of policy discussions during the preparations for the Fifth Ministerial Conference on Environment and Health in Italy 2009 and it will also contribute to setting priorities for future policy-oriented EH research activities within the context of the next EU Research Framework Programme on Environment and Health.

The specific objectives of the international symposium include:

- to present recent environment and health research and related studies and projects
- to illustrate country experiences in response to emerging environmental health challenges by looking at different national research activities
- to identify missing information and knowledge for adequate policy development in response to environmental hazards (including risk communication and policy in presence of scientific uncertainties)
- to evaluate and discuss different approaches to studying interlinked health determinants

What we need from research and how to effectively translate research findings into policy-making

Robert L. Maynard
Health Protection Agency (England & Wales), London, United Kingdom

Modern policy development depends on cost-benefit analysis. This is a recent development and has replaced easier methods for decision-making used when environmental problems were obvious. Nowadays, the causes of effects are less easy to identify and quantify. Research forms the basis for such work, especially in predicting the benefits delivered by policies. Many diseases are multifactorial in origin: separating out the causal factors is difficult but very important. Defining exposure–response curves is a key function of research and may be difficult especially as regards thresholds of effect. Guidelines and standards are also key to effective policy development – both for providing policy targets and as a basis for assessing progress. These approaches have been developed in the United Kingdom, and the Air Quality Strategy of the United Kingdom is based on health and tested for costs and benefits for each policy measure.

About the author

Robert Maynard leads the Air Pollution and Noise Unit of the Health Protection Agency. He is a medical physiologist and toxicologist and led the Department of Health's work on air pollution from 1990 to 2006. Before that, he led the Medical Division at the Chemical Defence Establishment at Porton Down. He has edited monographs on Air Pollutants, Chemical Warfare Agents and the Scientific Foundations of Trauma. He edited WHO's Air quality guidelines for Europe in 1998. He was a co-organizer of a Royal Society meeting on nanoparticles in 2005. He holds an Honorary Chair in Public Health at Birmingham University and was awarded a CBE for his work on air pollution in 2000.

Is science serving the needs of policy-makers?

Robert S. Lawrence

Director, Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

Policies related to protecting the environment and public health in a time of global climate change, population growth, greater demands for equity, nanotechnology and growing scarcity of water, cropland and other resources will depend more than ever on good science. Although many of the advances of science in recent centuries have come from applying Cartesian reductionism and its distinctions between parts and wholes and between causes and effects, contemporary policy-makers in environment and health must address complex ecological challenges not suited to the science of Descartes. Scientists with expertise in ecology, neurobiology, evolutionary biology and developmental biology are needed to provide new kinds of data for policy-makers to use: 1) in establishing regulations on the discharge of toxins into the environment; 2) when conducting risk-risk trade-off analysis; 3) in making decisions about the optimal use of regulatory budgets to maximize allocative efficiency; 4) in using the precautionary principle to shape policy in the absence of adequate safety data; and 5) when choosing among strategies that rely on regulation versus creating incentives.

Three brief case studies will be used to examine the barriers that often prevent scientists from engaging in policy development and policy-makers from participating in shaping scientific exploration and the potential for bridging these barriers through a shared commitment to an ecological perspective. The case studies are: 1) reducing dioxin in the food supply; 2) developing a common method of measuring health that allows for comparing the cost-effectiveness of regulations designed to protect the environment and/or human health; and 3) assessing the impact on human health and the environment of the industrialization of meat production.

About the author

Robert S. Lawrence is Professor of Environmental Health Sciences, Health Policy and International Health at the Johns Hopkins Bloomberg School of Public Health and is the founding Director of the Center for a Livable Future. A graduate of Harvard College and Harvard Medical School, he trained in internal medicine and then joined the Epidemic Intelligence Service, Centers for Disease Control and Prevention, United States Public Health Service. At the University of North Carolina, he directed a community health services project funded by the Office of Economic Opportunity. From 1974 to 1991, he directed the Primary Care Division at Harvard Medical School. From 1991 to 1995, he served as Director of Health Sciences at the Rockefeller Foundation, overseeing grants to improve health in Asia, Africa and Latin America. He is a founding member of Physicians for Human Rights, which shared the 1997 Nobel Peace Prize for its work to ban anti-personnel landmines. He chairs its Board and has investigated human rights abuses in Chile, Czechoslovakia, Egypt, El Salvador, Guatemala, Kosovo, the Philippines and South Africa. He chaired the United States Preventive Services Task Force from 1984 to 1989 and is an adviser to the Task Force on Community Preventive Services of the United States Centers for Disease Control and Prevention. For the Institute of Medicine, he has chaired committees on Dioxin in the Food Supply and Evaluation of Measures of Health Benefits for Environmental, Health and Safety Regulation.

SESSION I:

ACHIEVEMENTS AND NEEDS OF RESEARCH IN ENVIRONMENT AND HEALTH

Closing the knowledge gap: progress made in research since the Third Ministerial Conference on Environment and Health (1999)

Michal Krzyzanowski

Acting Head, Bonn Office, WHO European Centre for Environment and Health, WHO Regional Office for Europe

In 1999, the Declaration of the Third Ministerial Conference on Environmental Health in London recognized the need for research of the highest reliability and quality as a tool for decision-making. The ministers signing the Declaration encouraged and supported the European Commission, the European Science Foundation and WHO and, where relevant, other international organizations in developing collaboration in the area of environment and health research. It has also encouraged appropriate national bodies to implement the research in the direction proposed in Environment and health research for Europe, prepared by the European Science Foundation in liaison with the European Commission and WHO. The recommended research was considered necessary to improve the risk assessment and risk management process and covered 11 broad topics, all related to the policy agenda of the European environment and health process.

It is difficult to assess to what extent the recommendations contributed to progress in understanding the links between environmental factors and health and in improving the tools used to support decision-making. Thousands of studies were completed in Europe and elsewhere on the topics discussed in the European Science Foundation document. Some of this research has already been used to support important risk assessment reports and policy decisions. However, the availability of research funding and the interests of the research community do not necessary follow the lines of the European Science Foundation programme, and the progress in various topics is very unequal. Important progress has been made in studies on the relationships between health and ambient air pollution and on the relationships between extreme weather events and climate change, but much more has to be done in some other areas. WHO surveyed the opinions of environmental health experts on the most significant research achievements of the last 10 years in summer 2008. The overview of the results of this survey will be presented at the Symposium.

About the author

Michal Krzyzanowski is Acting Head of the Bonn Office of the WHO European Centre for Environment and Health, WHO Regional Office for Europe. His technical work focuses on gathering and evaluating scientific evidence on the health effects of environmental hazards, in particular of air pollution. He led the recently completed global update of the WHO Air Quality Guidelines and coordinates the development of WHO guidelines on indoor air quality. He has also led a series of WHO projects developing a European Environment and Health Information System. Before joining WHO in 1991, Krzyzanowski conducted epidemiological research on the health aspects of air pollution and other environmental factors in Poland, United States and France. He has an MSc in Physics from Warsaw University and ScD and PhD (Dr.hab) in epidemiology from the National Institute of Hygiene, Warsaw, Poland.

Models of science and policy: from expert demonstration to participatory dialogue

Silvio Funtowicz

Institute for the Protection and Security of the Citizen, European Commission Joint Research Centre, Ispra, Italy

Science is the basis of the material culture that has profoundly transformed the world; it is also a primary source of legitimacy for policy arguments. As science-related policy issues have come to be recognized as complex and more inherently difficult to resolve, the concept of the role of science has also developed and matured. Today, when science is deployed in the policy context, facts may be uncertain, values in dispute, stakes high and decisions urgent.

Several conceptual models of the relationship between science and decision-making in policy processes can be defined.

Modern model

Scientific facts, employed in rigorous demonstrations, would determine correct policy. There are no limits to the progress of human control over the environment and no limits to the material and moral progress of humanity.

Precautionary model

It is discovered that the scientific facts are neither fully certain in themselves nor conclusive for policy. Progress cannot be assumed to be automatic, and control over the environment can fail. Because of this imperfection in the science, an extra element in policy decisions, precaution, legitimizes decisions.

Framing model

Scientific information becomes one among many inputs to a policy process. Debate is known to be necessary, as different stakeholders have their own perspective and values shaping their arguments. Hence the framing of the relevant scientific problem to be investigated, even the choice of the scientific discipline to which it belongs, becomes a prior policy decision that is part of the debate among stakeholders.

Demarcation model

People working in institutions with their own agendas create the scientific information and advice. The information and advice cannot be guaranteed to be objective and neutral. A clear demarcation between the institutions (and individuals) that provide the science and those in which it is used is advocated as a means of protecting science from political interference. This also ensures that political accountability rests with policy-makers and is not shifted.

Extended participation model

Defending a monopoly of accredited expertise for providing scientific information and advice becomes ever more difficult. Numerous coordinated legitimate perspectives (with their own value commitments and frameworks) are accepted. Through this co-production of knowledge, the extended peer community creates a democracy of expertise.

The three models of imperfection form a sequence of increasing severity, admitting incompleteness (precaution), misuse (framing) and abuse (demarcation). The final model, of extended participation, involves a change in the form of governance.

About the author

Silvio Funtowicz taught mathematics, logic and research methodology in Buenos Aires, Argentina. During the 1980s he was a Research Fellow at the University of Leeds, United Kingdom. He is the author of Uncertainty and quality in science for policy (1990, Kluwer, Dordrecht) in collaboration with Jerry Ravetz and numerous articles on environmental and technological risks and policy-related research. He has lectured extensively and is a member of the editorial board of several publications and the scientific committee of many projects and international conferences.

Bridging the gap between science and policy-making: a case study of occupational and environmental cancer from Azerbaijan

Colin L. Soskolne[1] and Francesca Racioppi[2]

[1]Professor of Epidemiology, Department of Public Health Sciences, School of Public Health, University of Alberta, Edmonton, Canada, [2] WHO European Centre for Environment and Health, Rome, Italy, WHO Regional Office for Europe

After the dissolution of the USSR in the 1990s, extensive environmental pollution that had accumulated over several decades in the City of Sumgayit, Azerbaijan, was recognized. Sumgayit was brought to global attention primarily through broadcasting a documentary film, The dead zone, featuring graphic videos of the Sumgayit children's cemetery and images of malformed children from a local hospital. These health effects were alleged to be related to occupational and community environmental contamination directly associated with working or living in proximity to the City's chemical complex. Children, it was claimed, had died from a range of congenital and cancer causes; cancer was also said to be killing adults.

Public concern prompted the first environmental cancer study in Azerbaijan in 2001–2003. It addressed concerns that residents of the industrial City of Sumgayit experienced an increased cancer burden subsequent to intense occupational and environmental pollution. Analysis of vital statistics data for the years 1980–2000 suggested that Sumgayit had an increased cancer burden. Poor data quality and suspected underreporting prevented accurate estimates of incidence or mortality rates. A lack of data needs to be remediated if policy-makers are to engage in rational evidence-based (science-based) decision-making.

Because many emerging economies need local expertise for scientific research, capacity-building has become a priority for many international development organizations. The policy gap can only be addressed by developing human resources. In particular, skill sets are needed that include generating scientific knowledge and expertise in establishing and maintaining disease registries and administrative databases and in establishing and maintaining health information systems. Such capacity would benefit not only retrospective assessments but, more importantly, would create a new generation of professionals able to support the prospective development of industrial activities and infrastructural change in these emerging economies.

Environmental epidemiology training courses were conducted in Azerbaijan in the year prior to this research: 2000. The project, an extension of this training, demonstrated that international collaboration can result in the successful completion of health research in an emerging economy. While international collaboration is useful for imparting expertise to local researchers, comprehensive capacity-building programmes, providing ongoing professional development, support and an enabling environment, rather than scientific training alone, are required to achieve long-term sustainability and measurable outcomes. Developing and implementing policies and institutional arrangements that encourage health impact assessment related to economic development will create a demand for professionals skilled in health research.

About the author

Colin Soskolne has been Professor of Epidemiology in the Department of Public Health Sciences at the University of Alberta since 1985. In 1999, he completed a sabbatical year as Visiting Scientist with the WHO European Centre for Environment and Health in Rome, Italy. He has published more than 300 books, peer-reviewed papers, letters and reports. His interests have spanned the fields of occupational cancer epidemiology, HIV and AIDS, professional ethics, environmental epidemiology and, most recently, sustainability. His most recent book Sustaining life on earth: environmental and human health through global governance brings together his work as an interdisciplinary scholar. He is concerned about current policies globally that are degrading life-supporting ecosystems, with dire consequences for human health and well-being.

Have the gaps between the science and policy decreased? The role of nongovernmental organizations in identifying knowledge gaps and in making policy

Genon K. Jensen[1] and Sascha Gabizon[2]

[1] Executive Director, Health and Environment Alliance, Brussels, Belgium, [2] Executive Director, Women in Europe for a Common Future, Utrecht, the Netherlands

The vital role of nongovernmental organizations (NGOs) in highlighting knowledge gaps and connecting research results with policy opportunities has increasingly become recognized. NGOs add legitimacy to the political debate by bringing forward society's concerns and values and reaching out to local groups. NGOs also help to ensure that research is communicated to a broad set of stakeholders, including policy-makers, other scientists and the mass media. NGOs also provide a watchdog function in alerting society to emerging environmental health risks and raising general awareness. However, significant gaps still exist in ensuring that environment and health research is used for evidence-based policy changes in the European Union (EU) and the wider European Region of WHO despite the substantial money spent for this purpose.

Women in Europe for a Common Future (WECF) and the Health and Environment Alliance (HEAL), as representative stakeholders for the environmental NGOs and the health and medical community within the European Health and Environment Committee, have actively contributed to building up NGO participation in research and will highlight examples of their work.

Since its inception in 2003, HEAL and its member networks have advocated for the inclusion of environment and health in research and policy in Europe, which has earned HEAL a lead position within the NGO sector, particularly on EU research policy. It sits on the advisory groups of many EU-funded research projects such as INTARESE (Integrated Assessments of Health Risks from Environmental Stressors in Europe), the NewGeneris Project and HENVINET, thus actively contributing to ensuring research results are considered in EU environmental policy-making.

Three examples illustrate HEAL's efforts: a) ensuring that the REACH implementation process considers the latest research on endocrine-disrupting chemicals and related diseases such as breast cancer; b) bringing new scientific understanding of the health effects of pesticides to EU policy reform; and c) carrying out community research on mercury levels in women to raise awareness of the health effects of low-level exposure. Within chemical safety, pesticides and mercury policies, HEAL has worked to reduce the research into policy lag by commissioning science, providing accessible summaries of emerging evidence and disseminating information at strategic policy junctures.

Since 1995, WECF has worked to bring policy and science closer together, in particular on the four issues of safe chemicals, safe food, safe water and safe energy. Working in coalitions with other NGOs and scientists, WECF contributes to policy development in particular on how the observed increase in developmental abnormalities in children (diabetes, attention deficit disorder and childhood cancer) can be linked to exposure to hazardous chemicals in consumer products and food.

The networks of WECF and EcoForum provide a platform to identify and call public attention to environmental health issues on which governments should take urgent measures, such as the wide-scale use of asbestos in eastern Europe, the Caucasus and central Asia or the risks from nanotechnology in the EU.

About the author

Génon Jensen is Executive Director of the European NGO network, Health and Environment Alliance (HEAL), which she created in Brussels, Belgium in 2003. HEAL now brings together more than 50 groups representing organizations of health professionals, health advocates, patients, women and consumers. HEAL has established a strong record in bringing key research findings to European policy-makers on how contamination of the environment is affecting people's health. Génon Jensen has been an official member of the European Environment and Health Committee since 2000. She is also on the Steering Committee of the International POPs [persistent organic pollutants] Elimination Network. Before setting up HEAL, she was the Director of the European Public Health Alliance. She frequently contributes articles on environmental health policy, including on children's health, pesticides, mercury and climate change, to various specialist publications and newsletters. She is a co-author of several publications and reports, such as Halting the child brain drain: why we need to tackle global mercury contamination and Cutting back on pesticides for healthier lives.

Sascha Gabizon is Executive Director of Women in Europe for a Common Future, a network of 90 women's and environment organisations based in 30 countries in the WHO European Region. She worked for an international consultancy in Spain and then joined the Wuppertal Institute for Climate, Energy and Environment in Germany, where she was the co-founder of the Wuppertal Institute's FrauenWissen (Women Scientists). In 1994, she joined Women in Europe for a Common Future to prepare the WECF contribution to the Fourth World Conference on Women in Beijing in 1995. Since 1996, she has been the director of WECF and developed the network and its activities. In 1999 she founded WECF offices in Germany and France, which work in close cooperation with the Netherlands WECF office, serving as secretariats for the network activities of WECF. As Executive Director of WECF, she is responsible for the EU policy work of WECF. WECF works in four thematic areas, one of which is chemical safety. In recent years, WECF's focus has very much been on the new EU chemicals legislation REACH. But WECF also works with partners in eastern Europe on finding solutions for problems of obsolete pesticide burials and of asbestos in building materials. The other thematic areas are safe energy, safe water and sanitation and safe food and sustainable rural development. WECF sustainable development programmes involve some 30 000 beneficiaries in the WHO European Region, who receive access to safe water supply and sanitation, safe renewable energy and are trained on agriculture with low chemical inputs. Sascha Gabizon has published many case studies and articles.

SESSION II:

LATEST RESEARCH AND TRENDS IN SCIENCE-POLICY INTERFACE

Ambient air pollution and health: should we do more?

Sylvia Medina
InVS (French Institute for Public Health Surveillance), Saint Maurice, France

Policy-makers, research scientists and representatives of intergovernmental and nongovernmental organizations keep asking: “Do we have enough information to justify tightening standards further on air quality?” and “Do we need more evidence?”.

Air pollution has decreased in some locations through the implementation of clean-air policies. Yet air pollution continues to be a health hazard, as seen in new studies we will present on the detrimental effects it has on our lungs, heart and arteries and on children’s central nervous systems.

Accountability studies conducted to measure the benefits of clean-air policies reveal that reducing air pollution can indeed improve health, as we will show. And health impact assessment can quantify the potential health benefits of future strategies to reduce air pollution; we will use findings of Apheis (Air Pollution and Health: A European Information System) to illustrate these potential benefits at the European and local levels.

What this means is that the latest scientific evidence, the policy successes achieved in Europe and elsewhere, and the potential health benefits shown by health impact assessment demonstrate that the impact of air pollution on health can be reduced further. There is thus good reason to continue reducing emissions and tightening air-quality standards in Europe.

For those needing more evidence, European research and public-health projects such as ESCAPE (European Study of Cohorts for Air Pollution Effects), Aphekom (Improving Knowledge and Communication for Decision Making on Air Pollution and Health in Europe), INTARESE (Integrated Assessment of Health Risks from Environmental Stressors in Europe) and others will provide more-detailed information on active components in particles; better knowledge on the long-term health effects of air pollution in Europe; integrate policy-relevant road traffic indicators, evaluate the incorporation of chronic diseases and susceptibility factors in health impact assessment and calculate related costs; and stimulate dialogue between stakeholders in Europe.

About the author

Sylvia Medina is an epidemiologist dedicated to improving public health through research on the effects of ambient air pollution on health, with special emphasis on the practical application of her work. In particular, the projects she coordinates seek to understand and cross the last mile that too often separates scientists and their findings in this area from the minds and actions of policy-makers, health professionals and the general public. She currently coordinates European activities at the Department of Environmental Health of the French Institute for Public Health Surveillance (InVS) in Paris, including the new Aphekom project. She coordinated health impact assessment of environmental risk factors from 2004 to 2007 under the ENHIS (European Environment and Health Information System) project co-funded by

the European Commission and coordinated by the WHO Regional Office for Europe; the Apheis project on air pollution and health involving 26 European cities from 1999 to 2004; and the ERPURS (Evaluation des Risques de la Pollution Urbaine) surveillance programme health in Paris from 1992 to 1997. She participates regularly in European research projects, such as Airnet, Aphena, Aphea, Phewe and INTARESE, co-funded by the European Commission. She won the Epidaure Prize for Research in Medicine and Ecology in 1996, and the Generation 2000 Doctors Prize, awarded to her for enabling the general public to better understand scientific information on environmental health.

Climate change, energy and health

Andy Haines
Director, London School of Hygiene & Tropical Medicine

Access to plentiful supplies of energy has underpinned the development of industrialized society and made an essential contribution to the high levels of public health enjoyed by high-income countries today. However, about 1.6 billion people still lack access to electricity and 2.4 billion depend on combusting solid fuels (such as dung, wood and coal) for cooking and other household functions. Lack of access to clean and affordable energy affects health in several ways. These include causing about 1.6 million annual deaths from indoor air pollution and an additional 800 000 annual deaths from outdoor air pollution, particularly in urban centres, to which transport emissions make an important contribution.

Largely as a result of the work of scientists involved in the Intergovernmental Panel on Climate Change, it is now widely accepted that climate change is occurring as a result of anthropogenic (human-induced) factors, in particular the combustion of fossil fuels but also greenhouse gas emissions from land-use change, agriculture and livestock production. Climate change is likely to have wide-ranging and mostly adverse effects on health, particularly in low-income countries. Cold-related deaths will decrease and heat-related deaths will increase; the balance will vary according to geographical location. Other health effects include: those due to the likely increase in the frequency and intensity of climate-related disasters such as floods, droughts and wind storms; changes in the incidence of water-related diseases; changes in the distribution of vector-borne diseases; and probable increases in malnutrition.

Key challenges include developing and implementing policies that reduce emissions of greenhouse gases, achieving co-benefits for health, such as through reductions in air pollution, and addressing the unmet needs of disadvantaged populations by improving access to adequate supplies of clean energy. Improving access to energy supplies and the services they provide for disadvantaged populations can also help to improve their capacity to adapt to climate change, for example by providing electricity for refrigeration, pumping of water and improved communication. Research to assess the health effects of climate change, the potential cost-effectiveness of adaptation strategies and the magnitude of health co-benefits from greenhouse gas mitigation strategies in sectors such as transport, power generation, the built environment and agriculture can make important contributions to policies that lead to reductions in greenhouse gas emissions while improving public health.

About the author

Andy Haines became Director of the London School of Hygiene & Tropical Medicine in 2001. He was previously Professor of Primary Health Care and Director of the Department of Primary Care and Population Sciences at Royal Free and University College Medical School, London. He was formerly Director of Research & Development at the NHS Executive, North Thames and a member of the Council of the Medical Research Council. He has also worked internationally in Jamaica, Nepal and the United States of America. His research interests are in epidemiology and health services research. He has many publications on these topic areas. He was a member of the Intergovernmental Panel on Climate Change for the Second and Third

Assessment Reports in 1996 and 2001. He sits on many national and international committees, including the WHO Advisory Committee on Health Research.

The emerging issue of cumulative exposure to chemicals – reason for concern?

Andreas Kortenkamp

Professor and Head, Centre for Toxicology, University of London School of Pharmacy, London, United Kingdom

The last few years have seen considerable improvements in knowledge about combination effects between chemicals, in particular those with endocrine activity. Determinants of (additive) cumulative effects are now quite well understood. Experiments under controlled laboratory conditions have shown that the joint effects of endocrine disrupters are (dose) additive, both with in vitro and in vivo test systems. Demonstrations of significant combination effects with mixtures in which all components were present at ineffective doses have highlighted the possibility of underestimating risks with the traditional chemical-by-chemical approach. These findings have lent urgency to demands that combination effects need to be taken into account in chemicals regulation. This presentation will briefly review recent findings related to endocrine-active chemicals with the aim of assessing how this new knowledge can be used productively to improve the risk assessment and regulation of chemicals. One of the key issues to be resolved will be to establish rational criteria for the grouping of chemicals for cumulative risk assessment.

About the author

Andreas Kortenkamp's research focuses on predicting and assessing the effects of multi-component mixtures of endocrine-active chemicals. The goal of this work is to validate models that allow quantitative predictions of mixture effects on the basis of information about the potency of individual mixture components. He is involved in a European Union–funded project on endocrine disruption and has been responsible for coordinating the European Union CREDO cluster on endocrine disruption as well as the EDEN project (Fifth Framework Programme). His research interests include environmental factors in breast cancer and unravelling the mechanistic detail of estrogen and antiandrogen action. More recently, he has begun to explore options for regulating chemical mixtures.

The European Union commitment to environment and health research: from the Fifth to the Seventh Framework Programme

Tuomo Karjalainen

Climate Change and Environment and Risks Unit, Directorate-General for Research, European Commission, Brussels, Belgium

The European Union (EU) has been at the forefront of research in environment and health since the start of the Fifth Framework Programme of Research (FP5: 1998–2002), which included an environment and health key action. The recent finalization of more than 90 multinational multidisciplinary projects funded by FP5 has greatly expanded understanding of the complex links between environmental risk factors and their effects on the health of individuals and populations.

This knowledge has been key to developing national and EU policy initiatives designed to protect the environment and promote human health throughout the EU, such as the European Environment and Health Action Plan 2004–2010, adopted in 2004. Its main aim is to improve the understanding of the link between environmental factors and health.

The implementation of the goals of this action plan through research started in the Sixth Framework programme (FP6: 2002–2006) via the funding of many large- and small-scale research projects on health topics identified as priorities in the Action Plan. The EU has spent more than €200 million on FP6 environment and health projects, and the results should start to become available soon.

The efforts are continuing in the Seventh Framework Programme (FP7: 2006–2013), which has a dedicated environment and health sub-activity in the environment theme. Many projects of interest to the general public, scientific community or policy-makers on environment and health links have already been selected from the first two calls for proposals.

About the author

Tuomo Karjalainen received a DMD degree from Karolinska Institute in Sweden in 1983 and a PhD degree in Experimental Pathology from Indiana University in 1990. After a 10-year academic and research career in the Department of Microbiology of the University of Paris-Sud in France, he joined the European Commission's Directorate-General for Research in 2002 as a Scientific Officer. He has since worked on issues related to environment and health, participating in preparing calls for proposals and managing multi-partner, multi-country EU-funded projects on environment and health. He is currently in the Climate Change and Environment and Risks Unit, which is in charge of the environment and health sub-activity in FP7.

SESSION III:

PARALLEL SESSION A: EMERGING ISSUES IN ENVIRONMENT AND HEALTH

Emerging issues and the role of the Scientific Committee on Emerging and Newly Identified Health Risks of the European Union

Jim Bridges
Chair, Scientific Committee on Emerging and Newly Identified Health Risks

A crucial aspect in maintaining a high level of health and environmental protection for citizens in the European Union is to recognize the implications of relevant emerging issues and take appropriate actions sufficiently early.

To inform the procedures needed, the causes of past failures must be considered, such as inadequate monitoring and surveillance, failure to make important relevant information available to the risk assessors and risk managers, incorrect interpretation and extrapolation of the scientific information available, inability to communicate the risks to risk managers, inappropriate action or inaction by risk managers and the failure to anticipate the consequences of new technical developments or changes in legislation. The Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) is charged with highlighting emerging issues that it considers may have significant implications for human health and/or the environment and with evaluating the risk associated with emerging and newly identified issues given priority by the European Commission services. Three aspects of this work will be considered: identification of issues, priority-setting process for assessment and methods for evaluation.

Identification. Picking up emerging issues at an early stage requires knowledge of:

- research and technical advances that open up the prospect of new products and/or processes and/or raising concerns about end-of-use fate;
- monitoring programmes or episodic observations;
- changes that may result from alterations in price and supply of materials and commodities;
- substantial modifications in legislation, public welfare measures or other sociocultural or demographic elements;
- mass-media, political and public concerns; and
- security developments.

An active network or networks of experts in each of these aspects has to be built and maintained to ensure early recognition. There is an ongoing effort to put such networks in place involving several European Union agencies and scientific committees.

Priority-setting for assessment. An effective network is likely to result in the identification of many issues of potential relevance. It is therefore essential that a transparent and suitable process be put in place to set priorities for issues for in-depth assessment. The starting-point for this has been to introduce a system for classifying and ranking the importance of emerging issues based on: knowledge of the agent or factor involved, the population or area likely to be affected, the anticipated rate of change in effects and the nature of the potential consequences of the effects. This system needs to be developed further, including testing it in actual

examples. It will then need to be reviewed by stakeholders and be regularly updated or reappraised.

Methods. Assessing emerging issues inevitably means that full risk assessment using conventional methods will be thwarted by lack of data. Instead, a tiered approach is required, and an issue-specific framework may be necessary. SCENIHR has adopted this approach for nanotechnology and is developing this for electromagnetic fields.

Next steps. As identified above, progress depends on a high level of continuing collaboration between many key organizations. However, a dynamic and somewhat informal structure is essential to meet the needs of this highly challenging and continually changing field. The more bureaucratic the system, the less likely it is to provide the prompt responses that are required.

About the author

Jim Bridges has published almost 400 research papers and reviews, particularly on mechanisms of toxicity and risk assessment. He is Emeritus Professor of Toxicology and Environmental Health at the University of Surrey, having previously served as the Head of the European Institute of Health and Medical Sciences. He was previously the Dean of Science and, before that, founding Director of the Robens Institute of Industrial and Environmental Health and Safety. He is the Chair (since 2004) of SCENIHR. Previously he was chair (1997–2004) of the European Union Scientific Advisory Committee on Toxicology, Ecotoxicology and the Environment. He also advises the European Food Safety Authority (emerging issues) and Directorate-General for Research (environmental health). He is also a past member of a number of committees in the United Kingdom. He has served as Chairman of the British Toxicology Society and the Federation of European Societies of Toxicology. He also founded the European Drug Metabolism Workshops. He has held visiting appointments at the University of Rochester, University of Texas (South West Medical School), the United States National Institute of Environmental Health Sciences and the National Research Institute (Mexico City). Jim Bridges currently chairs Research for Sustainability, a research and consultancy organization based in the United Kingdom.

Nanoparticles and health

Charles Vyvyan Howard
Professor of Bioimaging, University of Ulster, Coleraine, United Kingdom

People have always been exposed to nanoparticles, mainly comprising marine aerosol. However, relatively few other inorganic nanoparticles of less than 100 nm were in the air throughout human prehistory. The main biological nanoparticles were viruses. Human defence mechanisms against nanoparticles evolved principally to cope with the biological threat posed by viruses.

Nanoparticles can gain entry to the body by a number of routes, including inhalation, ingestion and across the skin, and can then travel around the body into various organs, including across the blood–brain barrier (1). It has been shown that insoluble nanoparticles can be toxic and therefore potentially hazardous (2). Nanoparticles have a potential for toxicity that appears to be related primarily to their small size rather than to the type of material from which they are made, although much research still needs to be done before this question is fully understood. One area of concern that is still inadequately researched is the ability of nanoparticles to cause protein misfolding (3).

Epidemiological evidence shows that exposure to particulate aerosols leads to long-term health effects, primarily of the cardiopulmonary system (4). Evidence also indicates that short-term effects from poor air quality are due to particle overloading.

Several expert working groups have met under the auspices of the European Union, and it appears that new legislation will be considered in the near future (http://europa.eu.int/comm/health/ph_risk/events_risk_en.htm). Although it is easy to appreciate how nanotechnology is being harnessed to positive uses in the pharmaceutical, electronic, food and water industries, the generation of unnecessary nanoparticles, especially insoluble ones, urgently needs to be controlled and minimized in the ambient environment. For example, there are early indications that some types of carbon nanotube can mimic asbestos and induce mesothelial tumours (5). It seems important that the long-term environmental fate of such products be determined before mass production proceeds.

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About the author

Charles Vyvyan Howard is a medically qualified toxico-pathologist and is Professor of Bioimaging at the University of Ulster. He is a Fellow of the Royal College of Pathologists and held the Presidency of the Royal Microscopical Society from 1996 to 1998. Since 2003, he has served as a member of the United Kingdom Government's Advisory Committee on Pesticides and is a Member of their specialist Medical and Toxicology Panel. He is currently the President of the International Society of Doctors for the Environment. His research team is making investigations into the toxicology of nanoparticles under grants from the European Union Sixth and Seventh Framework Programmes. He co-edited Particulate matter: properties and effects upon health in 1999. He has sat on two EU expert groups considering the health hazards posed by nanotechnology.

Emerging issues in environment and health – the case of vector-borne diseases in Europe

Guy Hendrickx
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The introduction, establishment and/or spread of vector-borne diseases depends on complex relationships between hosts, vectors and pathogens.

Vertebrate hosts include humans, domestic and wild mammals and birds. The numbers are influenced by the availability of food, which depends on soil and climate. Seasonal availability of resources may trigger migration movements (livestock transhumance and bird migration). The hosts are warm-blooded; low ambient temperatures are not a main factor restricting spread.

Invertebrate vectors include mainly mosquitoes, midges, sandflies and also ticks. Their metabolism depends on ambient temperature. Optimal conditions of temperature and humidity and the availability of sites for egg-laying and the development of intermediary stages are needed to obtain sufficiently dense adult populations. During adverse conditions, the vectors go into diapause (hibernation, aestivation) as adults, eggs or larvae. Medium- or long-range spread or migration of flying arthropods may be favoured by wind. Invertebrate vectors may be disseminated through local or global transport networks.

Pathogens (virus, bacteria and protozoa) are essentially parasites, and their survival depends on the maintenance of the host-vector cycle (contact between both), the availability of sufficient numbers of hosts and vectors and a sufficiently high ambient temperature enabling the development in the vector. Hosts develop immunity. Young become new hosts after loss of maternal immunity. During adverse conditions for the vectors, pathogens may persist in the host as a chronic infection associated with certain tissues or they may be carried across the placenta. In the vector, pathogens may persist in the surviving adults or be transmitted transovarially. Pathogens may also be carried into or out of an area by migrating hosts or vectors.

Key factors having an impact on host-vector-pathogen cycles in continental Europe therefore are:

- factors affecting the presence and abundance of hosts and vectors;
- factors affecting contact between hosts and vectors;
- ambient temperature and moisture enabling or affecting the development of vectors;
- ambient temperature enabling or affecting the development of pathogens in hosts;
- mechanisms enabling the survival of vectors during the adverse season; and
- mechanisms enabling the persistence of pathogens in hosts or vectors during the adverse season.

Based on the results obtained in three projects: EDEN (Emerging Vector-borne Diseases in a Changing European Environment (EU Framework Programme 6), V-

borne (assessment of magnitude and importance of vector-borne diseases in Europe) and TigerMaps (development of *Aedes albopictus* risk maps (European Centre for Disease Prevention and Control)), examples are given that highlight public health research priorities in emerging vector-borne diseases.

About the author

Guy Hendrickx graduated as doctor in veterinary medicine in 1985 and has more than 20 years of experience in spatial epidemiology, livestock geography and decision support systems. From 1986 to 2000 he completed a series of long-term assignments in Burkina Faso, Rwanda, Togo and the United Republic of Tanzania. His main research activity was the development and implementation of countrywide geographical information systems (GIS) applied to integrated vector-borne disease control. In 1997 he was a laureate of the Belgian National Academy of Overseas Sciences. In 1999 he obtained his PhD. In 2000 he created Avia-GIS, a consulting company specializing in spatial agro-veterinary and public health information systems. In 2004, collaboration with ERGO, Environmental Research Group Oxford, United Kingdom, was formalized through the establishment of Euro-AEGIS. CIRAD contracted Avia-GIS to write and manage the EDEN project. Recently, two short-term projects were finalized for the European Centre for Disease Prevention and Control: V-borne and TigerMaps.

Chemical hot-spots and environmental health – from assessment to action in the Russian Federation

Boris Revich

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Hot-spots are a public health and environmental policy priority in many countries of the world. It is assumed that the number of hot-spots in the Russian Federation is quite significant. There has been a certain shift in the understanding of the hot-spot situation in the Russian Federation during the past 15 years. The law on natural environment protection states that hot-spots are territories where sustained negative changes in the health of the population have been identified. The state environmental expertise classified 12 cities as corresponding to this status. This list may be complemented by about 50–70 localities. Special territory and population health rehabilitation programmes have been developed in previous years in the cities with official hot-spot status at the federal or regional level. These programmes are financed through the federal budget as well as regional budgets. For example, in Krasnouralsk (the Urals), lead emission at copper melting plants was reduced and the lead concentration in the blood was measured in day-care centres. Repeated measurement of the concentration of lead in children's blood showed considerable reduction. An effort has also been made in another city with lead industry in the eastern part of the Russian Federation, where the lead concentration in the blood of 70% of the children examined exceeded the WHO-recommended norm of 10 µg/dl. Currently the lead industry has suspended operations in connection with this. The experience of other cities in the Russian Federation in reducing the lead concentration in the environment and children's blood is not known, although more than 20 smelting plants and accumulator production and processing plants function in the Russian Federation.

In the cities with the greatest environmental dioxin or polychlorinated biphenyl (PCB) contamination, the concentrations of these substances in breast-milk and in blood were reduced. The case–control method showed the relationship between infertility and PCB concentration in women's blood, breast cancer and local fish and pork consumption, dioxin concentration in boys' blood and locally produced fruit and vegetables.

Federal programmes aimed at reducing the environmental contamination of chemicals are practically nonexistent in the Russian Federation. Engagement of the Russian Federation in European environmental efforts on human health assessment projects should contribute to new scientific bodies forming that master modern epidemiological techniques and to the development of scientifically based action plans for policy-makers.

About the author

Boris Revich's main research projects since 1996: lead and children's health, Save the Children (1996–1997); PCB and infertility: Serpukhov study, United States National Institute of Environmental Health Sciences and Harvard School of Public Health (1996–1997); principal investigator, biokinetic lead model, United States Environmental Protection Agency (1998–1999); dioxins and male sexual development: Chapayevsk case study, principal investigator from the Russian

Federation, grant from Harvard School of Public Health (1998–); National Environment and Health Action Plan of the Russian Federation, project with the WHO Regional Office for Europe and the Ministry of Health, Russian Federation (1998–1999 and 2002–2003); environmental capacity-building in the newly independent states, Environmental Defense Fund (2004–2007); dioxin and breast cancer: Chapaevsk case study, MacArthur Foundation (2000-2001); lead author, chapter on health, the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2004–2007); climate change and public health in the Russian Federation, Russian Foundation for Basic Research (2003–2005); climate change and mortality in Moscow, Environmental Defense Fund (2005–2007); and climate change and public health in the Arctic part of the Russian Federation, Russian Foundation for Basic Research (2008).

Strategy for scientific cooperation and networking on emerging risks for food safety

Hubert Deluyker

Director of Scientific Cooperation and Assistance, European Food Safety Authority, Parma, Italy

Several food safety incidents in the last decade have raised concerns about the modern food production chain. This has resulted in a decline in trust in food safety regulations and management. The European Union (EU) has responded to this by issuing Regulation (EC) No 178/2002 of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority (EFSA) and laying down procedures in matters of food safety. This clearly describes the food safety framework in the EU, including the role and responsibilities of its partners in the establishment of efficient tools for the early prevention of foodborne outbreaks.

Potential threats to consumers can be reduced if new hazards and (increased) exposure to known hazards are detected at an early stage and information is rapidly exchanged between partners engaged in maintaining food safety. The clear need to set up a structured reliable system for early warning of emerging risks was indicated as a priority for the EFSA after its establishment. This has ultimately led to the creation of a dedicated Emerging Risks Unit in 2008.

The mission of the Emerging Risks Unit is to "undertake action to identify and characterise emerging risks in the field within EFSA's mission". Setting up efficient structures for identifying emerging risks will enable more confident predictions of the likelihood of an emerging risk at an early stage. Alert signals can thus contribute to prevention and support management of risks at a population level. The presentation will give an overview on the strategy and current state of activities related to the identification of emerging risks in food safety undertaken by the EFSA.

About the author

Hubert Deluyker has been EFSA's Director of Scientific Cooperation and Assistance since 2008. His directorate supports EFSA's risk assessment work and develops the EFSA's scientific cooperation with Member States in a range of fields covering the peer review of pesticides, data collection and emerging risks. He joined the EFSA in 2004 and was formerly Head of the EFSA's Assessment Methodology Unit. Before working for the EFSA he was a clinical research scientist in animal health from 1989 to 2004 for Pfizer in Puurs, Belgium, where he led a range of multidisciplinary and multinational research and development projects. He was also Associate Professor in Epidemiology from 1991 to 2000 at the School of Veterinary Medicine of the University of Ghent, Belgium. He previously worked as District Veterinary Officer for Belgium's Ministry of Agriculture. He is a Diplomate of the European College of Veterinary Pharmacology and Toxicology and a Diplomate of the European College of Veterinary Public Health.

Energy choices and health

Paul Wilkinson
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Energy is critical for all aspects of modern living, and access to inexpensive energy resources, mainly in the form of fossil fuels, has been key to economic development. Although access to energy resources has delivered many benefits, the combustion of carbonaceous fuels also causes substantial current health burdens, mainly arising through pollution of the outdoor air and accident risks. Excessive dependence on energy resources also contributes to unhealthy lifestyles in relation to the diet, levels of physical activity and methods of production, while greenhouse gas emissions related to fossil fuels are a principal cause of anthropogenic climate change, with all the consequences this may entail for population health. Current fossil-fuel dependence is therefore not only unsustainable but also contributes to major public health burdens and is a driver for many forms of inequity in health. Concerns with energy have been accentuated by the recent price volatility of oil, the spectre of dwindling supplies of the cheapest energy reserves and related issues of energy security. These concerns provide added impetus to the pursuit of energy efficiency and the switch towards energy sources that are not based on fossil fuels. Such changes are likely to have appreciable benefits for public health through a variety of routes. Feasible gains in the efficiency and technology of energy use in towns and cities and in homes can potentially improve health by protecting against temperature-related morbidity and mortality and alleviating fuel poverty. A shift towards renewable energy production would also put increasing focus on cleaner energy carriers, with particular benefits to urban air quality. Further, transport systems that reduce dependence on private motor vehicles and encourage walking and cycling are likely to benefit health in multiple ways. Although there are formidable social, political, economic and technological barriers to achieving more equitable and sustainable use of energy, the potential benefits to health are substantial.

About the author

Paul Wilkinson is Reader in Environmental Epidemiology, Public & Environmental Health Research Unit, London School of Hygiene & Tropical Medicine. He trained in clinical medicine and public health in the United Kingdom, principally in Oxford and London. He began epidemiological research at the National Heart & Lung Institute, from which he moved to the London School in 1994. He has long-standing research interests in environment and health links, especially in relation to climate change and energy, and in the research methods for investigating those links. He is a member of the Centre on Global Change and Health, a WHO Collaborating Centre on Global Change and Health based at the London School.

Health impact of the waste cycle in the Provinces of Naples and Caserta, Italy

Pietro Comba and Lucia Fazzo
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The awareness of the health risks associated with the uncontrolled export of hazardous waste from countries where specific regulations are operating towards those where such regulations are lacking or inadequately enforced has led the Organisation for Economic Co-operation and Development and the United Nations Environment Programme to adopt the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal to face this problem, avoid illegal activities and develop mitigation strategies (1).

The stringency of enforcement of regulations may also vary within a country, based on differences among regions and local authorities. This is the case that determined the widespread illegal practice of dumping toxic waste in the Provinces of Naples and Caserta in Italy.

At the request of the Department of Civil Defence of the Government of Italy, a multidisciplinary study group including scientists from the WHO European Centre on Environment and Health, National Research Council, Istituto Superiore di Sanità, in cooperation with the Campania Region Epidemiological Observatory and the Environmental Protection Agency, performed an epidemiological study aimed at assessing the likely health effects of the waste cycle in Campania (2).

Clustering analysis of cancer mortality and occurrence of malformations in 196 municipalities in the Provinces of Naples and Caserta, standardized by socioeconomic deprivation index, led to the detection of clusters of mortality by lung, liver, gastric, kidney and bladder cancer and of the prevalence of total malformations and malformations of the limbs and the cardiovascular and genitourinary systems, mainly concentrated in the area where most of the illegal practice of dumping toxic waste took place (3).

A correlation study showed that, at the municipality level, total mortality, all-cancer mortality, mortality from some specific cancer sites and anomalies of the internal genitourinary system showed increasing risks from increasing exposure to a waste exposure index with statistically significant linear trends (4).

Although more research is needed to assess the causality of the observed association, the study findings are useful for setting priorities for environmental remediation and for identifying populations suitable for analytical epidemiological studies and biomonitoring and may contribute both to decision-making and to a transparent information process.

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About the author

Pietro Comba has current research projects including epidemiological studies in contaminated sites and in areas with high levels of exposure to 50 Hz magnetic fields. He is interested in the ethical aspects of environmental health and the precautionary approach to public health policies. He has some experience in cooperation with countries in Latin America in these domains.

SESSION III:

PARALLEL SESSION B: USING RESEARCH FINDINGS TO IDENTIFY PRIORITIES FOR POLICIES

Knowledge evaluation: the Health and Environment Network HENVINET

Alena Bartonova
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The main objective of HENVINET is to establish long-term cooperation between researchers, policy-makers and other stakeholders in the area of environment and health. To fulfil the objective, work is done pursuing two tracks: (1) organizing and assessing knowledge on environmental causes related to the HENVINET health topics and (2) building a communication web portal for linking scientific and user communities.

The HENVINET health topics are broadly defined by the European Environment & Health Action Plan 2004–2010 and the preceding SCALE process: asthma and allergies, cancer, neurodevelopmental disorders and endocrine-disrupting effects. The consortium has reviewed the scientific basis with the aim of constructing causal diagrams based on the DPSEEA (driving forces–pressures–state–exposure–effects–actions) framework identifying environmental factors relevant to these topics.

The causal diagrams serve two purposes: as a logical framework for knowledge evaluation of policy-relevant questions and for describing tools available to practitioners who make decisions in environment and health. Several tools for professionals have been described and included in a database to provide inspiration and concrete help to users.

The causal diagrams (supported by the scientific review) are now being prepared for knowledge evaluation by the consortium and by other stakeholders. An evaluation framework has been developed, asking the evaluator to estimate the probability or precision with which he or she believes a certain element of the diagram can be assessed or predicted. Simplified diagrams are being constructed for a limited set of policy questions, asking for the respondents' opinions on knowledge status and prediction possibilities for each element or link in the diagram and for the causal chain diagram as a whole.

The aim is to submit the diagrams to various groups of users and to analyse the similarities and dissimilarities of their evaluations. Such analysis may provide insight into the perceptions and views pertinent to the selected policy questions and will serve as gap analysis of relevant knowledge. A limited evaluation has been performed for climate change and a respiratory health–related diagram. Diagrams and evaluation results will soon be available for other policy questions.

In addition to the scientific activities, HENVINET is constructing a web portal for social networking of the environment and health community with the aim of allowing easy access to experts, a knowledge base, projects and issue-related information. We hope to achieve a wide interest in and subscription to the portal. Project information can be found at http://www.henvinet.eu.

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About the author

Alena Bartonova, Senior Scientist at the Centre for Ecological Economics, Norwegian Institute for Air Research, has received her scientific training in mathematical statistics at the Charles University, Prague, Czech Republic. She has worked in environmental health for 25 years. Her key expertise includes statistical modelling, data analysis, data management, uncertainty and sensitivity analysis, assessment of human environmental exposures, environmental PSIR analysis (related to air quality) and assessment of the socioeconomic aspects of emission abatement measures including evaluation of costs and benefits. She participated in Norwegian and international studies of the effects of air pollution on respiratory health, human well-being and material damage, with special interest in exposure to air pollutants and the externalities of air pollution. Currently, she is participating in or leading several research projects related to the development of methods for integrated environmental health impact assessment and for assessing exposure at the individual and population levels.

EnVIE – European Union policies on indoor air quality and health

Eduardo de Oliveira Fernandes
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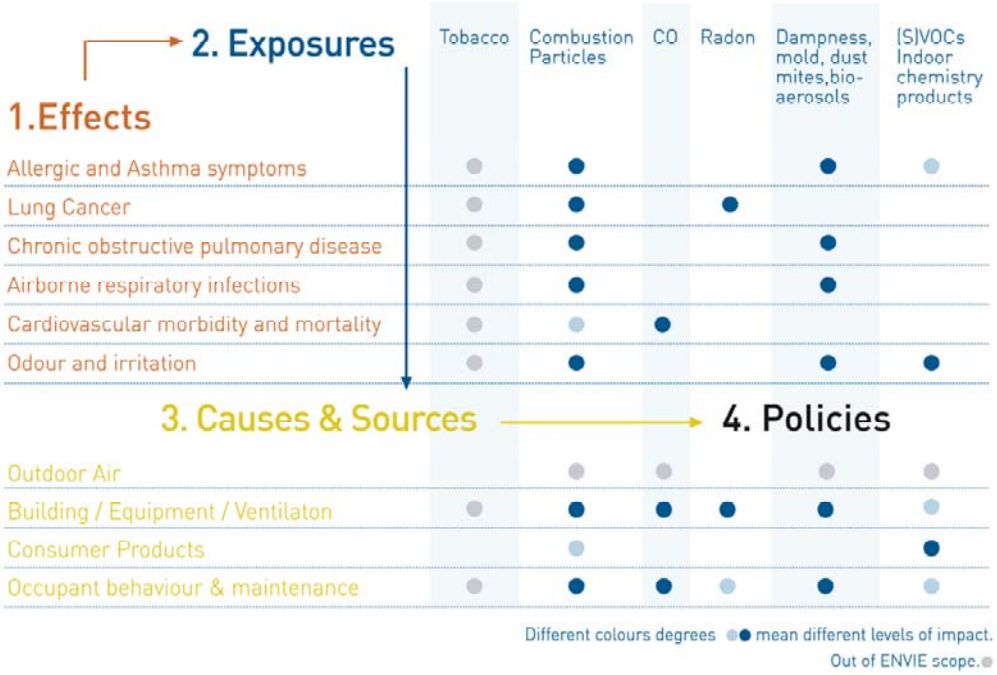
EnVIE is a coordinated action on indoor air quality and related health effects supported by the Sixth Framework Programme of the European Commission. EnVIE involves 18 institutions from 11 countries, with a proportion of almost 50:50 between the technical and the health side, and the purpose is to produce a set of policies for EU on indoor air quality and health. This will be the basic content of a report to be submitted to the European Commission by the end of October 2008.

The policies with which EnVIE is dealing are for non-industrial buildings such as homes, schools and offices, but the same principles apply to enclosed spaces such as vehicles. Industrial and other regulated environments are excluded.

The EnVIE concept (Fig. 1) is a methodological attempt to respond to the difficulties usually associated with the numerous and diversified parameters claimed to be involved when trying to characterize the status of indoor air and, even more, when the relationship between indoor air quality and health effects is at stake. The sequence of the method starts from a selected shortlist of highest-priority health effects (i) that can be associated with the indoor air and is used to try to identify from the literature the key types of indoor exposure (ii). From the latter, EnVIE will proceed to identify causes and related sources (iii) and will end with the assessment of the existing, missing and recommend policies to control these sources and, eventually, health outcomes. New research needs are also identified.

Fig. 1. The EnVIE concept



CO: carbon monoxide. (S)VOCs: volatile and semivolatile organic compounds
Source: EnVIE Co-ordination action on Indoor Air Quality and Health Effects, SSPE-CT-2004-502671 (2004-2008). Reproduced with permission of the author

Several possible approaches to improving indoor air quality are considered, including: assessing the impact of specific indoor air pollutants by appraising hazard, exposure and risk; source control and ventilation; exposure guidelines; emission standards for products and appliances; legislation; disseminating information (such as guidance for the public), education and training; and influencing designers, builders, managers and operators of buildings.

Despite the attempt to simplify the approach to the issue, the complexity of indoor pollution and the multitude of parties responsible for generating and potentially acting to control indoor air pollution make the coherent development of risk reduction strategies difficult. To be effective, any policies directed at improving indoor air quality need to be part of a comprehensive overall management strategy involving governments, institutions, professional bodies and individuals. Plans need to be target both new and existing buildings.

About the author

Eduardo de Oliveira Fernandes has devoted the past 30 years of his career to teaching, research, consulting and public activities on various topics related to energy and environment. He founded a research and technological development group on building thermal physics with major pioneering activities in Portugal on solar technologies and thermal behaviour of buildings, indoor air quality, energy and environment in the urban space and energy planning at the regional and urban levels. Some positions held: Chair, Department of Mechanical Engineering (1980–1982); Vice-Rector (1986–1991); Secretary of State for Environment of the Government of Portugal (1984–1985); Chair, Portuguese Mechanical Engineers (1992–1994); Vice-President, PLEA (Passive and Low Energy Architecture) (1987–1991); Vice-President (1991–1995) and President of International Solar Energy Society (1995–1997). Responsible for the concept energy/environment of EXPO'98 in Lisbon (1993–1998). Secretary of State for Energy of the Government of Portugal (2001–2002). Chair, Advisory Board, Energy Agency of Lisbon (2003–2006). President, Energy Agency of Porto (2006–).

The dioxin crisis in Belgium: from crisis to scientific knowledge and a new policy

Herman Diricks

Director-General, Federal Agency for the Safety of the Food Chain, Brussels, Belgium

At the end of January 1999, a mixture of polychlorinated biphenyls (PCBs) and dioxins was unintentionally added to a stock of recycled fat used in the manufacture of feedstuffs for poultry, pig and bovine farms in Belgium. The incident caused a massive international recall operation, a temporary export ban on Belgian products and enormous economic damage.

After the incident was discovered, a large monitoring programme for PCBs and dioxins was launched to trace contaminated products and to restore the Belgian quality label. Belgium's authorities still closely monitor PCBs and dioxins.

The Ministry of Agriculture commissioned a scientific study to compile all data available and to review the main sources of PCDD/PCDF and PCBs to determine the origin and extent of the contamination and to identify which ones may influence the accumulation and metabolism of PCBs and dioxins in the different matrices monitored. This study was based on more than 55 000 analyses.

The study showed that the total amount of PCBs accidentally mixed could be estimated at 50 kg/100 litres of PCB oil containing about 1 g toxic equivalent of dioxins and two times more dioxin-like PCBs. The incident could be attributed to a single source of contamination limited to the first quarter of 1999. Significant secondary contamination, which might have occurred as a result of animal fat recycling, could be excluded. The incident affected poultry, especially reproduction animals, and to a much lesser extent pig farms, whereas the bovine livestock was largely spared. The analysis of the ratio of PCB to dioxins revealed significant metabolic differences between animal species.

It has been estimated that the daily consumption of highly contaminated meals during 60 days would theoretically double the current PCB and dioxin burden, to a level similar to that of subjects living in the 1980s or of people regularly eating contaminated seafood.

The knowledge built during the crisis was used to revise not only Belgium's food safety policy but also the European policy. It also enabled authorities to quickly master subsequent incidents with PCBs and dioxins.

Belgium's inspection services were merged into one agency. Since contamination dissipates in a very complex way through the whole food chain, one agency responsible for the whole food chain can carry out rapid and efficient crisis management.

The incident demonstrated the need for a credible, independent structure capable of giving sound scientific advice. Along with the new agency, a scientific committee was founded. This was done not only at the national level in various countries but also at the European level by the creation of the European Food Safety Authority. The constant need for data led in Belgium to a national control programme based on a

scientific approach. This facilitates the use of data from the official control programme for research purposes.

About the author

Herman Diricks has been Director-General at the Federal Agency for the Safety of the Food Chain since 2002 and responsible for control policy. He graduated as an engineer for chemistry and agricultural industries at Ghent University in 1983. After a short stay at the Free University of Brussels as a scientific collaborator, in 1986 he started at the Ministry of Agriculture, first as an adviser, then as the Director of the Information and Communication Technology department and finally becoming staff member of the Secretary-General. Subsequently he worked for a year as an adviser to the Minister for Agriculture and then two years as an independent consultant before starting at the Federal Agency for the Safety of the Food Chain.

London Congestion Charging Scheme: evaluation of impact

H. Ross Anderson (on behalf of the HEI Investigation team: Frank Kelly (principal investigator), Ross Anderson, Ben Armstrong, Richard Atkinson, Ben Barratt, Sean Beevers, Dick Derwent, Dave Green, Ian Mudway, Cathryn Tonne & Paul Wilkinson)

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The London Congestion Charging Scheme (CCS) was implemented on 17 February 2003 to restrict traffic entering central London from 07:00 to 18:00 Monday to Friday. The Congestion Charging Zone (CCZ) comprises only 1.4% (22 km^2) of Greater London and has a resident population of less than 400 000 (London population 6.8 million). The impact of the scheme has been evaluated by direct measurement of traffic and pollutant concentrations and by modelling. There was a sustained reduction of 20% in traffic entering the zone, but the initial 30% reduction in congestion has not been sustained. Several other changes in traffic management and public transport were implemented over the same period. The effect of the scheme on air quality was evaluated by direct measurement of roadside and background concentrations of the main pollutants using the existing monitors and by emission-dispersion modelling. The results of modelling suggested small reductions in particulate matter with an aerodynamic diameter of less than 10 µm (PM10) and nitrogen dioxide, which were larger in the CCZ than in the rest of London. These models controlled for weather conditions and the characteristics of the vehicle fleet. The reductions were greater in more socially deprived areas. Monitoring data during the days and hours of operation of the CCS were compared between the CCZ and an outer London control area for two years on each side of the implementation date. This found that, in the CCZ, background concentrations of PM10, carbon monoxide and nitric oxide were reduced while nitrogen dioxide was increased. An analysis of weekends, when the CCS does not operate, obtained similar results, suggesting that any link between the CCS and changes in air quality is complex. No direct assessment of health effects has been done, but modelling approaches indicate benefits in proportion to the small changes in pollutants. Traffic control schemes are likely to increase in cities across the world and evaluation should be encouraged. The methods will involve both modelling and empirical investigation. Both present considerable challenges in terms of data availability and in the interpretation of results.

Acknowledgement: The Health Effects Institute supported this work.

About the author

H. Ross Anderson qualified in medicine in Melbourne. From 1966 to 1972, he worked in Papua New Guinea, where he investigated chronic lung disease and asthma and their relationship to indoor air pollution and other factors. This was followed by two years at the United Kingdom Medical Research Council's Pneumoconiosis Unit in South Wales and two years on an MSc at the London School of Hygiene and Tropical Medicine. In 1976 he was appointed to St George's, University of London and has been Professor of Epidemiology and Public Health since 1985. His main research is in the epidemiology of asthma and the health effects of air pollution.

Policy interpretation of human biomonitoring research results in Belgium: priorities and complexity, politics and science

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Key challenges in environment and health are interpreting research data and translating them into policy measures. We describe a process in which these two challenges are integrated in the Flemish Centre for Health and Environment, working directly for and in close collaboration with the Flemish Government: the interpretation of human biomonitoring results for policy-making. From 2001 to 2006, the Centre investigated the relationship between environmental pollution and human health by measuring pollutants and health effects among more than 4000 Flemish inhabitants. A major challenge concerns translating these human biomonitoring data into concrete policy priorities and measures.

Within the context of the Centre, medical, environmental and social scientific experts and policy-makers cooperatively developed an action plan for interpretation and policy uptake of the human biomonitoring results with three successive phases, each focusing on different aspects. The first phase focuses on setting priorities for the results for policy uptake: how severe are specific results in public health risks? The second phase focuses on two questions. What are the causes of a specific monitoring result? Can a (local) source for the pollution be identified? In the third and final phase, the focus is on which policy measures are feasible to effectively tackle the environmental problems. In the beginning the discussions in the action plan steering group mainly focused on environmental and medical scientific interpretation of the monitoring data. Consultation of scientific experts as well as the literature was considered sufficient to produce the necessary knowledge and answers. The limitations of an exclusively scientific endeavour became clear while trying to build bridges towards policy interpretation. Setting policy priorities when factors other than (medical and environmental) scientific ones had to be taken into account proved to be very complex and initially hard to realize. Social scientists introduced other relevant assessment criteria (such as social preferences and the feasibility of policy measures) and proposed creating a stakeholder jury that would judge relevant data and knowledge from a broader perspective. Including this step, the government can make a decision informed by both expert and jury advice. In 2007, the action plan was successfully put into practice to give advice on priority-setting to the Ministers of Environment and Health.

About the author

Hans Keune worked as a researcher at the Research Institute on International Industrial Relations in Amsterdam in 1999–2000. In 2000, he started working at the University of Antwerp. Until 2002, he worked on a research project on the work-life balance (the development of an instrument of social audit) at the Faculty of Applied Economics. From 2002, he started working at the Research Department for Technology, Energy, Environment on the Centre of Expertise for Environment and Health, a project funded by the Flemish Government for 2001–2006. In 2007, he moved to the Sociology Department at the Faculty of Political and Social Sciences to work on the extended project on the Centre of Expertise for Environment and Health (2007–2011). His expertise is mainly related to environment and health (science, social issues and policy-making), risk (perception, communication and assessment), knowledge (production, integration, interpretation and application), complexity, inter- and transdisciplinarity (boundary between work science, government, society and participation), action research and group assessment and decision support methods (such as multi-criteria decision analysis, Delphi method and focus groups). He has published articles in several national and international peer-reviewed journals and books.

Soil contamination from motor vehicle pollution and its health effects

Mirza A. Kazimov

Head of the Department of General Hygiene and Ecology, Azerbaijan Medical University, Baku, Azerbaijan

Pollution from motor vehicles has become a major environmental problem in recent years. Road traffic has been growing in Azerbaijan, especially along the international highways. Every year the flow of motor vehicles increases by 25% or more.

We have studied chemical soil pollution in areas adjacent to one of Azerbaijan's international highways, taking into consideration the effects on soil pollution of such factors as the distance from the road, soil cultivation, availability of a roadside plantation zone and the predominant wind direction. Samples of soil were tested for total petroleum hydrocarbons, aromatic polycyclic hydrocarbons, 3,4-benzo(a)pyrene and heavy metals (Pb, Zn, Cd, Hg and As). Also studied were the status of chemical pollution of plants, including those used for food, mutagenicity of soil and population morbidity (particularly among pregnant women).

Soil and plants (wild plants, potatoes and wheat) were found to be contaminated, with the degree of contamination hazard categorized as "very high" and "high". The degree of motor vehicle pollution of areas adjacent to the roads was found to manifestly depend on soil cultivation, availability of roadside plantation zones, the distance from the road and the prevailing wind direction. The presence of chemical mutagens in automotive emissions leads to increased soil genotoxicity, which results in greater defectiveness of pollen grains, particularly in perennial plants.

Contamination of soil with chemical pollutants from motor vehicle emissions in areas adjacent to international highways has a significant public health impact. A high percentage of pregnant women (the most vulnerable population) are reliably referred to high-risk groups – those with a disease history. Anaemia and spontaneous abortions were very common among this population.

The evidence and practical results obtained through research have been used for decision-making in public health and environmental protection. The President of Azerbaijan has issued two decrees on improving the environmental situation in the country. Relevant ministries and agencies have developed measures intended to clean up areas of anthropogenic contamination, to reduce environmental pollution in populated areas and to undertake health monitoring with a view to identifying and assessing public health risks.

About the author

Mirza A. Kazimov graduated from Azerbaijan Medical University in 1974. In 1974–1977 and 1982–1988 he took a postgraduate course and a doctorate course, respectively, at the Central Institute of Advanced Doctors' Training in Moscow. He has been a Doctor of Health Sciences since 1988, and since 1990 he has been Professor of Common Hygiene and Ecology. Since 1992, he has worked as head of the Department of Common Hygiene and Ecology at Azerbaijan Medical University. Kazimov has provided scientific supervision for 12 PhD dissertations in environmental health. He has written more than 200 research papers, including 4

monographs and 6 textbooks on common hygiene and ecology. Kazimov is the focal point for environment and health at the Ministry of Health of Azerbaijan.

Toxic oil syndrome: lessons learned from interdisciplinary collaboration

Manuel Posada de La Paz[1], Emilio Gelpi, Benedetto Terracini, Bénoit Nemery, Arne Svejgaard, Stanislaw Tarkowski, Carlos Lahoz, Edwin M. Kilbourne, Rossanne M. Philen and Luis Soldevilla as the WHO/CISAT Scientific Committee for the Toxic Oil Syndrome

[1]Head, Research Institute for Rare Diseases (IIER), Institute of Health Carlos III and Director, WHO Collaborating Centre for the Epidemiology of Environment-related Diseases, Madrid, Spain

Toxic oil syndrome (TOS) is a unique episode in medical history for at least two reasons: first, its occurrence in Spain in 1981 was unprecedented; second, no similar outbreaks or even similar patients have been reported, with the possible exception of eosinophilia-myalgia syndrome.

The hypothesis that a contaminated food oil caused the illness was formulated thanks to the observations of an astute clinician and the criticizable (but not necessarily wrong) results of “shoe leather” epidemiology. The decision to effect public heath interventions based on limited but high-quality epidemiological evidence is a classic example of public health epidemiology at its finest.

Even though about 20 000 people were affected within the first three months and more than 300 people had died within the first seven months of the outbreak, the national public health care system demonstrated both its ability to deliver services to the victims and the epidemiological capacity to develop the appropriate research on the causes.

Fatty acid anilides and the fatty acid esters of 3-(N-phenylamino)-1,2-propanediol were epidemiologically implicated as possible causal agents of TOS. Analytical oil chemistry results show that people with TOS ingested many interrelated compounds. However, the exact chemical agent or agents responsible for TOS have not been identified and, despite considerable research efforts using a variety of experimental systems, confidently reproducing the human disease in animals has not been possible. This failure to identify the exact causal agent is not only frustrating from a scientific viewpoint of view but also worrying for public health because it means that a repetition of similar food-related poisonings cannot be excluded or prevented.

The creation of ad hoc close collaboration with WHO through the TOS Scientific Committee has been crucial for clarifying the cause and pathogenesis of TOS.

Nevertheless, international scientific support for investigating TOS has ended. The lessons learned from this episode include the importance of early interventions in public health emergencies, even in the absence of full scientific evidence, and the indispensability of close and continuous communication among investigators from all scientific backgrounds as well as with the victims of the episode. In addition, several messages should remain on record for future outbreaks. These include the need for: 1) a nominal roster of victims, 2) well-designed repositories of biological materials, 3) a multidisciplinary scientific approach and 4) the participation of victims in research.

TOS is slated to be a landmark example of interdisciplinary collaboration that can serve as a model for food security and other future outbreaks of previously unrecorded diseases and other environmental disasters.

About the author

Manuel Posada de la Paz is a graduate in Medicine and Surgery from the Universidad Autónoma de Madrid and a PhD in Medicine. He has received a Special Award, Specialist in Internal Medicine (Res. Phys. System) and is also a Specialist in Preventive Medicine and Public Health. He has led more than 15 research projects addressing several fields such as specific rare diseases (such as toxic oil syndrome and scleroderma), autistic spectrum disorders, rare diseases epidemiology as well as gene-environmental issues. He has collaborated with more than 30 projects at the national and European level and published more than 100 papers in national and international peer-reviewed journals. He is a member of the International Society for Biological Environmental Repositories focused on biobanks and a member of the Rare Diseases Task Force.

SESSION III:

PARALLEL SESSION C: TOOLS FOR ASSESSING HEALTH RISKS AS A MEANS FOR POLICY MAKING

Using a sufficiency of evidence for timely prevention in multi-causal, complex and uncertain biological systems

David Gee
Head of Group Science, Policy and Innovation, European Environment Agency

Expanding knowledge is providing us with insights into the complex, multi-causal, and uncertain world of biological systems wherein much disease and dysfunction arises from multi-stage, multi-pathway causal webs, often initiated at the foetal stage of development. Preventing such harm involves timely action on appropriate strengths of evidence, using the precautionary principle and causal inferences that are relevant to multi-causal, complex systems.

As such decisions involve ethical choices, as well as the best available science, stakeholders need to be involved at all stages of risk assessment, management and communication. Efficient and effective dialogue on hazards and risks requires clear and consistent approaches to evaluating evidence and associated terminology.

About the author

David was educated in politics and economics and has worked for over 30 years at the science/policy interface of occupational and environmental risk assessment & reduction, with UK Trade Unions: with the Environmental Group, Friends of the Earth, where he was Director; and, since December 1995, with the European Environment Agency (EEA), an EU information-providing body in Copenhagen, where he is responsible for "Emerging Issues and Scientific Liaison" and Group leader for science, policy and innovation. He has published reports and lectured on many issues, including scientific uncertainty; the precautionary principle; environmental health; environmental taxes and ecological tax reform; and clean production/ eco-efficiency. He is initiator, co-editor and contributor to the widely cited and used EEA report, "Late lessons from early warnings: the precautionary principle 1898-2000" (2001) which is now going into vols 2, 3 and 4.

Integrated assessment of systemic risks to human health

David Briggs
Imperial College, London, United Kingdom

The environmental health issues facing policy-makers are growing in their complexity and scale. Faced with these new, systemic issues, policies to protect human health from environmental threats are necessarily becoming more precautionary and integrated in approach. To help develop and evaluate these policies, decision-makers (as well as other stakeholders) need more comprehensive and balanced information both on the magnitude and origins of the problems they are trying to address and on the implications of their actions. Traditional methods of risk assessment, which focus on singular hazards with direct implications for health, are inevitably found wanting in this respect. Instead, more integrated and flexible methods of assessment are needed that take account of the broader context within which policy is carried out, the multifactorial nature of the problems that have to be solved and the far-reaching effects of policies and other interventions. Drawing on research undertaken in two large European Union–funded projects – INTARESE (integrated assessment of health risks from environmental stressors in Europe) and HEIMTSA (health and environment impact methodology and toolbox for scenario analysis) – this paper outlines the concept of integrated environmental health impact assessment as a tool for analysing complex, systemic risks. It presents a rationale for integrated assessment, describes a framework for analysis, illustrates how this approach can be used better to inform policy and discusses some of the scientific and conceptual challenges that have to be met.

About the author

David Briggs is Professor of Environment and Health Science in the Department of Epidemiology and Public Health at Imperial College London. A geographer and environmental scientist by background, his research focuses on applying geographical information systems techniques for exposure modelling and risk and health impact assessment. Currently he is coordinating the 34-partner INTARESE integrated project, which is aimed at developing methods for integrated assessment of health effects from environmental stressors and is principal investigator on a range of other projects including studies of air pollution, mobile phone masts, power lines, multiple deprivation and pesticides. He was until recently a member of the Scientific Committee of the European Environment Agency and has been a long-time consultant to the European Commission and a regular consultant to WHO. He has published more than 100 peer-reviewed articles and about 20 books and research monographs and reports.

Experience on risk assessment in environment and health in the Russian Federation

Simon L. Avaliani

Department of Community Hygiene, Centre for Risk Assessment, Russian Academy of Advanced Medical Studies, Moscow, Russian Federation

Traditionally in the Russian Federation, environmental regulation to ensure health safety was based on a set of hygienic norms. Unfortunately, quantitative methods of assessment of health damage were not widely used. This creates a barrier to formulating environmentally sound health policies. A key problem is defining priorities in environmental decision-making, which is especially important in the Russian Federation. Environmental health research and management both require multidisciplinary approaches. Experience in the United States and the European Union shows that the implementation of risk assessment and risk management methods in environmental decision-making process has been very successful. These methods have been extensively tested in the Russian Federation during the past decade. The results of these studies demonstrated the advantages of environmental risk regulation for policy-makers.

This presentation is mainly based on the results of regional risk assessment studies that have taken place in more than 20 regions of the Russian Federation during the past decade. As a result of these studies, about 50 comprehensive, community-based risk assessments with cost-effectiveness and cost-benefit analysis and policy recommendations have been completed. In this study, the main task was to select a short-list of priority pollutants that are typical for the Russian Federation. These substances must have clearly documented dose–response relationships that can also be used to estimate the expected incidence of adverse health effects. Since several pollutants generate multiple and sometimes not comparable risks, it was decided in this analysis to focus on two types of health risks affecting the general population of the Russian Federation: excess risk of cancer; and excess mortality risk from inhalable particulate matter with an aerodynamic diameter of less than 10 µm (PM10) and 2.5 µm (PM2.5). The exposed population was defined using ambient air quality monitoring data and dispersion modeling.

Previous studies showed the following.

- Particulate matter (PM10 and PM2.5 fractions) was identified as the major substance posing health risk in the Russian Federation. Additional mortality related to these fractions in the ambient air vary from 45 000 to 90 000 annually for the Russian Federation.
- The lifetime individual carcinogenic risk from exposure to air and water pollutants in most large cities of the Russian Federation is on the order of 0.5 per 1000 population.
- Large cities with population exceeding 1 million have risk levels of nearly 1 per 1000 population, and some cities exceed this level.
- In some extremely polluted areas (“zones of emergency ecological situation”) the risk may reach 10 per 1000 population.
- Priorities have been set for the risk factors and sources for regulation.
- The economic value of reducing human health risk has been assessed.

Current application of risk assessment and risk management methods includes the following.

- Risk assessment and risk management methods are being used to ensure the safety of the population in the areas of possible impact of industrial facilities – for substantiating the sanitary-buffer zones and to inform the federal and local authorities and population about their environmental quality.
- Large industrial companies (Gazprom, refineries, etc.) are exploring risk assessment methods to improve environmental management.
- Cities have used risk assessment to mitigate health risk from mobile sources (Moscow).

About the author

Simon L. Avaliani received a Physician's Diploma in Internal Medicine, MD and PhD from the Tbilisi State Medical Institute. He currently specializes in risk assessment for human health, toxicology and hygiene. His fields of interest include risk assessment for human health, ecological risk assessment and environmental impact assessment, the environmental health hazard pathway, environmental monitoring and exposure assessment, the development of environmental health indicators, health and environment analysis for decision-making, risk management and risk communication.

Novel methods for human and ecological risk assessment of combinations of stressors

Hans Løkke[1], Gerrit Schüürmann, Saby Dimitrov, Philipp Mayer, Mark Huijbregts, Dave Spurgeon, Martin Holmstrup, Kees van Gestel, Jan Baas, Uwe Schlink, Mikael Hildén

[1] Director of Research, Department of Terrestrial Ecology, National Environmental Research Institute, University of Aarhus, Silkeborg, Denmark

Living organisms are never subject to single stressors at set doses but rather to a complex array of physical, chemical and biological environmental stressors. The project NoMiracle: Novel Methods for Integrated Risk Assessment of Cumulative Stressors in Europe under the Sixth Framework Programme of the European Union addresses the problems of combined risks to health or the environment from multiple stressors.

A survey of risk experts across Europe and beyond pinpointed uncertainty and ambiguity in complex risk management using novel representational and data-collecting methods. Two master cases will demonstrate to policy-makers and other stakeholders the utility of the new knowledge and methods developed in NoMiracle.

NoMiracle focuses on polar and bioactive compounds and offers paradigm-shifting methods within environmental chemistry, toxicology and ecotoxicology for ranking priorities, estimating exposure, assessing effects and calculating risk. The project has developed novel models and methods:

- to address partitioning in soil organic and biological matter in terms of fundamental interaction forces and to characterize well-defined availability aspects of the compound concentrations in various environmental media; and
- to predict biodegradability patterns, to simulate metabolic pathways and to consider spatial variation for multimedia fate predictions.

These new tools can reduce uncertainty in both human and ecological exposure assessment of contaminants. Other NoMiracle developments include:

- a series of effect parameters in test organisms or cell systems (ranging from bacteria to higher vertebrates) whose measurement enables the identification of dysfunction at all levels of organization after multiple chemical exposure;
- new experimental designs and models to quantify the impact of natural stressors in combination with chemicals;
- new approaches in toxicokinetic modelling, including time series assessment of uptake and effect in different species using resource allocation concepts;
- integrated tools for elucidating the molecular mechanisms of mixture toxicity, thus offering the potential to detect effects occurring at the biochemical level;
- a better model to describe mixture toxicity, integrating toxicological, toxicodynamic and molecular data; the dynamic energy budget model may diminish the experimental effort that is needed to describe mixture effects; and

- an algorithm for human and wildlife mobility to enable individual-level and spatially explicit risk assessment of cumulative stressors, with the results to date suggesting strong implications for the future structure of ecological and human random walk models.

NoMiracle will provide a more solid scientific basis for setting safety factors and implementing guidelines and regulations for chemicals.

About the author

Hans Løkke has long experience of research, research management, risk analysis and education, primarily on the ecotoxicology of pesticides and chemicals. He has been involved in developing test guidelines and assessing the risk of polluted sites. From 1992 to 1997, he coordinated the Danish Centre for Ecotoxicological Research within the Danish Environmental Research Programme with participation from 14 institutions. Since 1974, he has served as an expert for the European Commission in various areas, such as a member of the Scientific Pesticide Committee from 1986 to 1994. Since 1984, he has been a member of the Danish Pesticide and Biocide Council and Vice Chair since 1992. Since 2004, he has coordinated NoMiracle.

HEIMTSA: extending health impact assessment and cost–benefit analysis to European policy scenarios

Fintan Hurley
Scientific Director, Institute of Occupational Medicine, Edinburgh, United Kingdom

The idea behind HEIMTSA is to extend available health impact assessment (HIA) and cost–benefit analysis (CBA) methods and tools to enable evaluation at the European level of the environmental health effects of real-life policy scenarios in such key sectors as transport, energy, agriculture, industry, households and waste treatment and disposal. This will support the work of the European Commission, especially the European Environment & Health Action Plan.

Drawing on past HIA and CBA studies, HEIMTSA will follow the effects of policies from emissions to air, soil and water through changes in environments and human exposure, to effects on health and their monetary value (the full-chain or impact-pathway approach). The project will also develop an associated set of tools, or a modular integrated assessment system, for implementing the method Europe-wide.

HEIMTSA will pay particular attention to the health effects of mixtures of pollutants and to effects in susceptible subpopulations, such as women, children and people with pre-existing illness. It will also address the assessment and representation of uncertainty; issues of spatial scale in the development and application of HIA methods; and the use of mapping as a means of communicating results. HEIMTSA will actively liaise with policy users and with other researchers and projects, especially 2-FUN and INTARESE.

HEIMTSA is a four-year project that started on 1 February 2007. Following initial set-up and scoping work, we are now developing and applying methods at the same time. We are doing this by integrating the methodological work (such as on uncertainty, spatial scale and developing an exposure scenario approach) with the practical work of four case studies (outdoor air pollution; air pollution from indoor sources; noise; and pollution from complex pathways) selected to cover a range of practical and methodological issues. Multidisciplinary teams are carrying out these case studies and will report by 31 January 2009. A second set of case studies will start in February 2009.

We intend that HEIMTSA will help to develop HIA and CBA capability in Europe by improving methods and tools, through dissemination and training, and more generally, by raising the profile of HIA and CBA methods in developing policies that protect public health from environmental pollution.[1]

About the author

Fintan Hurley is an epidemiologist with a background in statistics. He has worked for many years at the Institute of Occupational Medicine and is involved in the Institute's new Centre for Health Impact Assessment. Since the early 1990s he has been active in health impact assessment of outdoor air pollution, including the long-term ExternE (External Costs of Energy) European Research Network funded by the European Commission and the cost-benefit analysis of the European Commission's flagship Clean Air for Europe (CAFE) Programme. He now leads the EU Sixth Framework

[1]

Programme Integrated Project HEIMTSA, including health impact assessment of a wide range of environmental pollutants and stressors. He chairs the quantification subgroup QUARK of the United Kingdom Committee on the Medical Effects of Air Pollutants, and is, from time to time, a member of various working groups on health effects and/or health impact assessment of air pollution for WHO, the United States Environmental Protection Agency, the European Commission and other international bodies.

Strengthening technical capability for health impact assessment: the case of HIAir

Piedad Martín-Olmedo
Andalusian School of Public Health, Granada, Spain

The WHO Regional Office for Europe and the European Commission endorse health impact assessment (HIA) as a relevant instrument for developing evidence-based recommendations to support decision-makers in protecting and improving community health and well-being.

The procedure of HIA is usually described as following the steps listed:

- screening: determining whether HIA is warranted or required;
- scoping – determining which effects will be considered and the plan for the HIA;
- appraisal: determining the magnitude, nature, extent and likelihood of potential health effects;
- decision-making and recommendations: making explicit the trade-offs to be made in decision-making and formulating evidence-informed recommendations; and
- evaluation and monitoring: process and impact evaluation of the HIA and the monitoring and management of health effects.

The Effectiveness of Health Impact Assessment project carried out between 2004 and 2007 funded by the European Union Public Health Work Programme examined the use, implementation and institutionalization of HIA across Europe and captured HIA at the national, regional and local levels. This mapping exercise came to demonstrate that HIA has already contributed considerably to better public decision-making, but certain barriers and difficulties were also identified. Lack of capacity and people with the research skills needed to assist in collecting and understanding data and literature related to the appraisal phase of HIA is considered a major barrier to its use in most places. This is especially relevant if, in accordance with the health in all policies approach in Europe, HIA must move from something public health enthusiasts do to something all competent policy-makers do. One solution to this lack of capacity would be providing public databases, establishing relevant indicators that can be issued in the policy evaluation and developing tools that are easy to use in predicting health outcomes.

In this context, HIAir is a tool that enables online calculation of the number of health events that could potentially be prevented from exposure to urban air pollution in a specific population using European databases or local data (public and/or private). This tool intends to provide support in evaluating different policy scenarios for reducing air-pollution levels and assessing new strategies, being accessible to non–public health specialists. HIAir was developed in the course of the ENHIS-2 (European Environment and Health Information System) project, and it will be upgraded during the ongoing EU project Aphekom – Improving Knowledge and Communication for Decision-making on Air Pollution and Health in Europe.

About the author

Piedad Martin-Olmedo is a senior scientist who developed her career in collaboration with multidisciplinary teams at the Spanish National Research Council, Edinburgh University, the United States Agency for Toxic Substances and Disease Registry and the European Union Directorate-General for Health and Consumers. Her research interest has mainly focused on human chemical exposure assessment and identifying potential sources of exposure as well as air pollution health impact assessment. She participated in the ENHIS-1 and ENHIS-2 projects on applying public health risk assessment methods to drinking-water pollutants, developing environmental health indicators and creating a new tool to estimate the burden of disease related to outdoor air pollution. She is also the partner coordinator for the Aphekom project.

Using health impact assessment to compare risk as an illustration of the interface between science and policy

Daniel S. Greenbaum

President, Health Effects Institute, Boston, MA, United States of America

Environmental policy-makers are inevitably faced with the challenge of deciding how to allocate limited resources to address the issues that are likely to have the most significant public health benefits. This can occur within one area of environmental quality (such as air quality and decisions about which pollutants and sources need the most attention) as well as across multiple environmental areas (such as air versus water versus land and ecosystems). Although information can never be perfect for comparing disparate pollution sources and health effects, efforts to conduct systematic and comparative health impact assessments can help to shape the decisions with better and more consistent information and to identify key additional science needs going forward. This presentation briefly describes this challenge and then uses two examples – the challenge of comparing risk among multiple components and sources of particulate matter air pollution (and the Health Effects Institute's response to that) and WHO's comparative health risk assessment of several environmental stressors (the global burden of disease) – to illustrate the strengths and weaknesses of different approaches and to discuss how such information can be made most useful to decision-makers.

About the author

Daniel S. Greenbaum joined the Health Effects Institute (HEI) as its President and Chief Executive Officer on March 1, 1994. In that role, Greenbaum leads HEI's efforts to provide high-quality, impartial, relevant and credible science about the health effects of air pollution to inform air quality decisions in high-income countries and in low- and middle-income countries. Greenbaum has focused HEI's efforts on providing timely and critical research and reanalysis on particulate matter, air toxics, diesel exhaust and alternative technologies and fuels. Greenbaum recently served on the Committee on Estimating Mortality Risk Reduction Benefits from Decreasing Tropospheric Ozone Exposure of the United States National Research Council. He has been a member of the Board of Environmental Studies and Toxicology of the National Research Council and Vice Chair of its Committee on Air Quality Management in the United States. Greenbaum also chaired the Blue Ribbon Panel on Oxygenates in Gasoline of the United States Environmental Protection Agency, which issued the report Achieving clean air and clean water, and the Clean Diesel Independent Review Panel of the United States Environmental Protection Agency, which reviewed technology progress in implementing the 2007 Highway Diesel Rule. He is also a member of the Board of Directors of the Environmental Law Institute. He regularly presents the results of HEI's scientific work to United States and international audiences, the United States Congress, the Asian Development Bank, leaders in several Latin American countries and the European Parliament. Greenbaum has three decades of government and nongovernmental experience in environmental health. Just before coming to HEI, he served as Commissioner of the Massachusetts Department of Environmental Protection from 1988 to 1994, where he was responsible for the Commonwealth's response to the Clean Air Act as well as its award-winning efforts on pollution prevention, water pollution and solid and hazardous waste

SESSION III:

PARALLEL SESSION D: BRIDGING THE GAP BETWEEN SCIENCE AND POLICY MAKING

Evaluation of scientific evidence to support policies

Michal Krzyzanowski

Acting Head, Bonn Office, WHO European Centre for Environment and Health, WHO Regional Office for Europe

The quality and effectiveness of policies and public health decision-making, addressing environmental determinants of health, depends on the reliability of the scientific evidence describing the links between health and its determinants. Solid scientific evidence is essential for ensuring the credibility of environmental health risk assessment and its ability to be used in public debate as a convincing tool, mobilizing policy-makers and the public. The results of many studies from various countries and research disciplines contribute to this evidence base. Creating this evidence base requires systematically retrieving the accumulated literature, evaluating the quality of the research producing individual results and synthesizing the conclusions from the studies gathered. The interpretation of the evidence often relies on the scientific judgement of the reviewing expert groups. Their technical quality and independence is essential for the unbiased evaluation of the evidence and its reliability as a basis for policy development.

WHO has a long and widely recognized record of organizing reviews, synthesizing scientific evidence on the health aspects of environmental exposure and making its conclusions available to policy-makers. Internationally renowned experts contribute to preparing WHO guidelines and other evidence reviews. The WHO Air Quality Guidelines and Guidelines for Drinking-water Quality are examples of the reviews used as the basis for national and international environmental norms and standards. The WHO reviews make the best globally available scientific evidence accessible to all countries, in particular to those with insufficient resources for a comprehensive, critical and timely review of the quickly growing research results. The content and format of the WHO guidelines or recommendations that would be the most effective in supporting policies in various countries will be discussed at the Symposium.

About the author

Michal Krzyzanowski is Acting Head of the Bonn Office of the WHO European Centre for Environment and Health, WHO Regional Office for Europe. His technical work focuses on gathering and evaluating scientific evidence on the health effects of environmental hazards, in particular of air pollution. He led the recently completed global update of the WHO Air Quality Guidelines and coordinates the development of WHO guidelines on indoor air quality. He has also led a series of WHO projects developing a European Environment and Health Information System. Before joining WHO in 1991, Krzyzanowski conducted epidemiological research on the health aspects of air pollution and other environmental factors in Poland, United States and France. He has an MSc in Physics from Warsaw University and ScD and PhD (Dr.hab) in epidemiology from the National Institute of Hygiene, Warsaw, Poland.

Multifaceted consequences of the Chernobyl accident: lessons learned and ways forward

Mikhail Balonov

Professor of Radiobiology, Head of Protection Laboratory, Institute of Radiation Hygiene, St. Petersburg, Russian Federation

The accident at the Chernobyl Nuclear Power Plant in 1986 was the most severe in the history of the nuclear industry, causing a huge release of radionuclides over large areas of Europe. The accident was a human tragedy and had significant environmental, public health and socioeconomic effects.

The immediate victims of the accident were a cohort of several hundred emergency and recovery operation workers who received high radiation doses; of these, 134 acquired acute radiation sickness and 28 died in 1986. Another cohort affected by radiation comprises children and adolescents who received substantial radiation doses in the thyroid gland in 1986 mainly due to consuming milk containing radioactive iodine. About 5000 thyroid cancer cases were detected in this cohort during 1991–2005. Many of these cases were caused by radiation and more are expected in the future; more than 99% were successfully treated.

The majority of the more than 600 000 emergency and recovery operation workers and 5 million residents of the contaminated areas in Belarus, Russian Federation and Ukraine received relatively minor radiation doses that are comparable to the natural background levels. Apart from the dramatic increase in thyroid cancer incidence among those exposed at a young age and some increase in leukaemia in most exposed workers, there is no clearly demonstrated increase in somatic disease due to radiation.

There was, however, an increase in mental problems among the affected population, compounded by the social disruption that followed the break-up of the USSR. After a number of years, along with the reduction in radiation levels, the accumulation of humanitarian consequences, severe social and economic depression in the affected regions and associated mental problems of the general public and the workers had become the most significant problem for the authorities to address.

Radiation caused numerous acute adverse effects on the plants and animals living in the higher-exposure areas: in localized sites at distances up to 30 kilometres from the release point. Following the natural reduction of exposure levels, biological populations have been recovering from acute radiation effects. As a result of the removal of human activities, populations of many plants and animals have eventually expanded, and paradoxically, the present environmental conditions have positively affected the biota in the exclusion zone.

Studying the effects of the Chernobyl accident has made an invaluable scientific contribution to the development of nuclear safety, radioecology, radiation medicine and protection as well as the social sciences. Targeted research on some of the long-term environmental, health and social effects of the Chernobyl accident should be continued for decades to come.

The Chernobyl accident initiated the global nuclear and radiation safety regime. Since the Chernobyl accident, the world has become more cautious towards using nuclear energy and radiation sources. However, the current and future research

programmes of high-income countries should address some knowledge gaps in radiological disciplines. The paper will outline these research areas.

About the author

Mikhail Balonov, DSc has 40 years of experience in radiation protection of humans and the environment. He has expertise and practical experience in setting radiation safety standards, regulations and criteria for controlling public exposure and environmental restoration, radiation monitoring, modelling and dose assessment. He has assessed the effects of environmental releases of radiation due to routine operation of and accidents at nuclear facilities in the Russian Federation, including Chernobyl Nuclear Power Plant, Mayak Fissile Material Storage Facility, the nuclear test sites in Semipalatinsk and Novaya Zemlya and the nuclear fleet. He was a staff member of the International Atomic Energy Agency from 2000 to 2006 and Head of the Unit of Safety of Radioactive Discharges. He developed safety standards and technical reports on control and monitoring of environmental radioactivity, radionuclides in food and drinking-water and organized numerous scientific meetings and training courses. He has substantial experience of successful scientific cooperation in radiation protection of the public and the environment with institutions in western and eastern Europe and the United States. He has long-term involvement in joint projects with the European Commission in environmental dosimetry, radioecology, remediation, dose reconstruction and risk assessment.

Role of industry and the business community in bridging the gap between science and policy-making

Loredana Ghinea

Manager for Emerging Science and Policy Issues, Research and Innovation Team, European Chemical Industry Council, Brussels, Belgium

The business community recognizes and accepts its responsibilities to society in ensuring that its activities are conducted in a manner that enable a healthy future. Bridging the gap between science and policy-making is a major element of a business development strategy.

Europe's chemical industry, in this case, considers environment and health activities to be an important pillar of the work towards ensuring a high level of protection of human health. It has therefore been actively engaged in this area and contributes to integrating health aspects into its approaches and products. This practice also allows for a solid base for sustainable and competitive European industry.

Within this framework, the continual aim of understanding the effects of environmental factors on human health is at the core of the European Chemical Industry Council (Cefic) Long-range Research Initiative (LRI), a complex research programme implemented in cooperation with government bodies, science universities and research institutions. It is following the latest scientific trends, the political needs and the societal concerns such as intelligent testing, complex environments and acceptance of technology.

The LRI was developed for three reasons:

- industry relevance: identifying the needs and priorities for continually refined research in view of product improvement or development, such as resource-efficient production and products;
- policy and society relevance: contributing to the present and evolving knowledge as a basis for the policy debates or developments and public communication, such as interpretation of data; and
- action relevance: providing a robust basis for regulatory and voluntary action to ensure sustainability of products, such as robust test methods.

An important aspect of Cefic's interest in the research agenda is its ability to reach out into reality; it is not only about "risk" research, but also "priority for action" research and, further, "solution" research.

The aspect of priority for action is important for identifying and assessing action options as it supports the policy-makers by making the tools feasible and able to be implemented.

We need cutting-edge scientific work that serves as early warning; however, what we need even more is the baseline research that enables the interpretation of findings to be able to effectively improve the health of the European population.

The solution aspect is essential as part of the stakeholders' responsibility towards a sustainable future; such examples can be found in Cefic's present work on technology development and transfer (within European Union technology platforms)

and on innovative solutions (such as for clean water, clean air and health monitoring).

About the author

Loredana Ghinea's main area of work is environment and health and how science and research on the impact of environmental factors on human health can be translated into European Union policies that ensure a sustainable society in Europe. This general issue encompasses topics such as the impact of chemicals on susceptible populations, indoor air quality, health impact assessment, human biomonitoring as well as emerging science issues such as nanotechnology, climate change and their impact on public health. Loredana has a background in political science with a particular focus on European Union regulatory issues.

European Conference on Human Biomonitoring: from biomarkers to human biomonitoring as a policy support tool in environmental health

Anne-Catherine Viso (on behalf of the conference committee)

Head, European Affairs, French Institute for Public Health Surveillance, Saint-Maurice, France

InVS, the French Public Health Surveillance Institute (www.invs.sante.fr), is organizing the European Conference on Human Biomonitoring with the support of the Ministry of Health, Youth, Sport and Associations on 4–5 November 2008.

The Conference aims at illustrating the usefulness and added value of human biomonitoring for policy and for public health actions. The main sessions will focus on:

- the value of human biomonitoring compared with environmental and health surveillance;
- the communication of human biomonitoring results to study participants, health professionals, nongovernmental organizations and the general public;
- the contribution of research to implementing human biomonitoring programmes and to interpreting human biomonitoring information;
- the role of human biomonitoring in evaluating policy actions;
- the organization of human biomonitoring programmes in various countries, including the United States and Canada, and at the European level in the context of setting up a European pilot study to obtain reference values; and
- the conditions required to ensure the sustainability of human biomonitoring programmes in the different countries: research, capacity including laboratories and biobanks, funding, multidisciplinary expertise, biobanks and coupling biomonitoring with health examination surveys.

This presentation will allow information to be collected and the views of the participants in the Conference to be compiled, especially for countries in the WHO European Region that are not in the European Union and for which collecting more information on their research programmes and human biomonitoring practices and needs would be useful.

This conference is a follow-up of the actions implemented as part of the European Environment & Health Action Plan 2004–2010 of the European Commission and in particular of the ESBIO (expert team to support human biomonitoring in Europe) coordination action funded by the European Commission (Framework Programme 7, http://www.eu-humanbiomonitoring.org/sub/esbio.htm). Other projects funded by the European Commission will contribute to the Conference.

About the author

Anne-Catherine Viso headed the International Affairs and Risk Assessment Methods Department at the French Agency for Environmental and Occupational Health Safety (Afsset) from 2003 to 2006. She initiated a European network of organizations in

charge of funding environment and health research in support of policy (10 European Union countries represented) with the aim of setting up joint research programmes between more than three countries. At Afsset, she coordinated the working group on improving the performance and interoperability of the environment and health information systems for enhanced data linkage initiated by France's National Environment and Health Action Plan in 2004–2005. From 1994 to 2003 she worked for the world's largest environmental services company (now known as Veolia Environment SA) as European research officer in support of European regulation and standardization related to water quality for the Research and Development Division.

Health at work and healthy environment

Jadranka Mustajbegović
Andrija Stampar School of Public Health, School of Medicine, University of Zagreb, Zagreb, Croatia

Working and living environments are widely recognized as sources of health risks. The purpose and aim of this research is to explore which psychosocial, physical and chemical factors in the environment in which people live and work are responsible for health damage and disease outbreak as well as how and to what extent.

The work of various researchers involved in this project is indispensable in reaching this aim. They will achieve the results and specific goals not only in the laboratories of Department for Environmental and Occupational Health but also in collaborating, adequately equipped institutions. The study is multidisciplinary designed and compound of several research units. Personal and family medical history, data about conditions and their way of life and work, diet and dietary habits, housing conditions and social and economic conditions will be collected through questionnaires. The correct assessment of the influence of work processes on health is a prerequisite for certain disease prevention activities and the protection of health in the workplace. It is therefore important to ascertain the presence of danger and the level of health damage in certain economic activities, occupations and specific work processes.

The specific goals of this research are:

- to explore the presence of physical, chemical and biological factors in water, food and air in the living and working environment;
- to identify the main points of the mutual influence between environment and people in real conditions;
- to identify the sources of pollution with special attention to waste as a potential contaminant and to analyse the points of origin and passages of waste, especially medical waste;
- to determine the risk in certain economic activities, occupations and specific work processes;
- to estimate the effects of long-term exposure of humans to low levels of pollution and low levels of radiation;
- to explore the quality of psychosocial factors, especially of interpersonal relationship on the workplace, work methods and organization;
- to explore how and to what extent genotype and environment are responsible for outbreak of diseases and how to orient health care; and
- to estimate the risk of the exposed population in conditions of professional and non-professional exposure.

Scientific findings should support existing laws or serve as a basis for modifying them. Research will provide data on the content and concentration of examined factors. The work on this project will create a better-connected group of researchers from specific multidisciplinary fields, thus enabling better environment and health management as well as better organization and application of health care, execution of public health projects and more precise legal decrees.

About the author

Jadranka Mustajbegović started her education at the University of Zagreb, School of Medicine (1970–1975) followed by postgraduate study in occupational health at the University of Zagreb School of Medicine (1980–1982) with a specialist Diploma in Occupational Health. She followed several international training courses (Medical School, University of Utrecht, 1992 and School of Public Health, SUNY Albany, 1994). She is Professor and Chair of Environmental and Occupational Health at the Andrija Stampar School of Public Health, Medical School, University of Zagreb. She is working on projects in the areas of: water, food and the living environment – determinants of health; health at work and healthy environment; health at work: health care workers, reproduction and environment; students' nutrition; and effects of organic aerosols on respiratory function.

An environmental and occupational health research programme to respond to policy-makers' needs: the experience of the French Agency for Environmental and Occupational Health Safety

Jean Lesne

Head, Research and Scientific Surveillance Unit, French Agency for Environmental and Occupational Health Safety, Paris, France

The French Agency for Environmental and Occupational Health Safety is a public body reporting to France's Ministries of Employment and Solidarity; Health, Youth and Sport; and Ecology, Energy, Sustainable Development and Territorial Development. The Agency's main mission is to provide scientific advice based on expert assessment of the human health risks related to environmental or occupational exposure. By definition, its activity is based on an interaction between scientists and decision-makers. It has a key position in reducing the gap between research and policy on environmental and occupational health risks. To fulfil its mission of providing independent and transparent scientific advice, the Agency strongly relies on the involvement of researchers who are expected to provide an intelligent and broad contribution despite a lack of incentives for the academic community to engage with the policy-making process. In addition, the Agency hosts a mechanism for funding research, a scientific surveillance unit for providing access to and synthesizing existing knowledge and a specific unit interested in public scientific debate. This operational structure brings together, in the same body, a good understanding of the policy-making process, of targeted science needs and of what is at stake in many public controversies, in particular the public's assumptions, values and concerns.

The Agency started reflecting about mechanisms for defining research programmes that are oriented towards policy support to ensure more policy-relevant research results. Most calls for research proposals even on specific themes result in a mixed bag of projects that do not necessarily amount to anything very useful in policy terms. At the programme definition stage, several difficulties must be addressed: policy-makers can have difficulty in formulating questions for science that will be useful to making choices between policy options, and effective stakeholder involvement is not easy on sensitive issues.

The Agency considers that managing research programmes is part of its role in facilitating the transfer of research findings into policy-relevant scientific advice. Consequently, it emphasizes the need for measuring and evaluating the impact of the research programme in terms of input from science into policy-making. This is an important yet difficult issue that transcends the narrow focus of quality assurance systems. This evaluation needs to be extended to the full science-into-policy process to include formulating research questions, mapping the research community involved and ensuring the actual policy uptake of research material.

About the author

Jean Lesne is Head of the Research and Scientific Surveillance Unit at the French Agency for Environmental and Occupational Health Safety. As a microbiologist, he

was Professor at the French National School of Public Health and Deputy Director of the Laboratory of Research in Environmental Health for 18 years.

Environmental health research in Europe: bibliometric analysis

Stanislaw Tarkowski

Professor, School of Public Health, Nofer Institute of Occupational Medicine, Lodz, Poland

Environmental health research in Europe was analysed bibliometrically as part of the public health literature review element of the SPHERE (Strengthening Public Health Research in Europe) project funded by the European Union Sixth Framework Programme. The aim was to provide an overview of the extent of published environmental health research in Europe and to assess recent output in this field and main research directions. The results also aimed to contribute to the overall objective of SPHERE to provide advice on the future development of public health research both to the European Union and to individual European countries.

The Medline database was accessed using PubMed of the United States National Library of Medicine. Only original, peer-reviewed research journal articles published between July 1995 and June 2005 by authors from 28 countries in the European Economic Area at the time plus Switzerland were retrieved.

The study located 6329 references in the PubMed database and matched them with 11 predefined relevant topics and 31 subtopics. The largest number of articles was in working environment and health (2339) followed by environmental exposure (1314) and environmental illnesses (952); these were the primary focus of 73% of the articles. The number of articles varied considerably between countries. Ten countries accounted for 81% of all articles.

Several disciplines contribute to environmental health impact assessment, including various branches of the biomedical and environmental sciences. Major advances have been made in all of these areas during recent years and have contributed to the progress in understanding the association between health and the environment. The European Economic Area is an important contributor to this field, accounting for 22% of the global input.

Various networks and databases disseminate scientific data and knowledge. Clearly, many research teams have been involved in environmental health research, the results of which have been published in 711 scientific journals. More collaborative research is needed to link these fields of data and knowledge more effectively and to use them better in planning future environmental health research.

This overview suggests that investigations of complex public health–related problems such as exposure to different pollutants at different levels of pollution, duration and frequency and their combined influence on health in different populations should be more strongly emphasized. Public health policy increasingly needs to be based on concepts of multiple causality and complexity.

About the author

Stanislaw Tarkowski headed the Department of Environmental Health Hazards at the Nofer Institute until 2004. He was a Director of the Environment and Health Division of the WHO Regional Office for Europe from 1988 to 1995. His scientific interest is in environmental health and public health. He has been conducting scientific research

on environmental and occupational exposures and health risk assessment. He is President of the Polish Association of Public Health and a member of the Executive Council of the European Public Health Association and of the Committee of Public Health and Epidemiology of the Polish Academy of Sciences.

SESSION IV:

BRIDGING THE GAP BETWEEN SCIENCE AND POLICY MAKING

The gap between science and policy-making: the seven deadly sins of science

Philippe Grandjean

University of Southern Denmark, Odense, Denmark and Harvard School of Public Health, Cambridge, MA, USA

A common concern is that science is not sufficiently conducive to furthering public health priorities, thus widening the gap between science and policy-making. Complaints about ivory-tower scientists suggest that they are indifferent to the welfare of others and rather have an inordinate appetite for credentials and publications that replicate ad nauseam their favourite study designs while ignoring serious societal issues. For example, most articles in environmental health journals focus on a limited, rather stable list of pollutants. Another problem is that the science frequently does not appear as impartially as it should. The Vatican earlier this year deemed pollution a sin, so would it not be fair to ask whether science can be sinful? I have compiled a list (below) of vices in environmental health science as suggested by the traditional seven deadly sins. Virtues are essential to counter these sins. Such virtues have been inspired by the precautionary principle. They might be helpful in bridging the gap between science and decision-making.

Vice		**Precautionary virtue**	
Pride	Preoccupation with methods	Humility	Exploration of uncertainty
Envy	Failure to recognize achievements by others	Fairness	What could be known, given the evidence?
Wrath	Self-righteous intimidation of competitors	Empathy	Weighing in all relevant evidence
Lust	Desire for academic honours	Restraint	Balanced choice of research methods and topics
Gluttony	Excessive craving for publications	Innovation	Limiting attempts of replication
Greed	Benefit from vested interests	Transparency	Involvement of all stakeholders
Sloth	Callousness to injustice	Compassion	Public health responsibility

Source: Grandjean P. Seven deadly sins of environmental epidemiology and the virtues of precaution. Epidemiology, 2008, 19:158–162.

In bridging the gap, science must address the changing needs for documentation and insight. The precautionary principle suggests that resources should not be spent chasing a formal proof but that uncertainty should be explored and its implications characterized. We must ask ourselves what could be known given the (limited) research insights and opportunities. We should not forget that the absence of evidence does not represent evidence of the absence of a hazard. Science planning and reporting is a social activity and part of a dynamic interface with policy-making

and intervention. It therefore must include open discussion of perspectives and uncertainty with stakeholders.

About the author

Philippe Grandjean is Professor and Chair of Environmental Medicine at the University of Southern Denmark, Odense, Denmark. He is also Adjunct Professor of Environmental Health at Harvard School of Public Health and serves as the Consultant in Toxicology for the National Board of Health, Denmark. He is editor-in-chief of the web-based journal Environmental Health and is a member of several other editorial boards of scientific journals. He has served on or chaired committees under the auspices of WHO, the International Agency for Research on Cancer, the European Commission, the International Union of Pure and Applied Chemistry, the Collegium Ramazzini and the United States Environmental Protection Agency, and he is a member of the Panel on Food Contaminants of the European Food Safety Authority. Among the 400 scientific publications, of particular relevance is the research on the adverse effects of environmental contaminants, such as mercury, on child development. He has also initiated discussions of the implications for science due to the adoption of the precautionary principle.

Climate change: bridging the gap between science and policy-making

Jean-Pascal van Ypersele

Vice-Chair, Intergovernmental Panel on Climate Change and Professor of Climatology and Environmental Sciences, Katholieke Universiteit Leuven, Belgium

Climate change is happening now, mostly as a result of greenhouse gases from human activities. The effects will be important, with most damage in low- and medium-income countries, but high-income countries will be affected too.

Human health effects are emerging and could be much more severe in a warmer climate. Adverse health effects will be greatest in low-income countries. Those at greater risk in all countries include urban poor people, older people and children, traditional societies, subsistence farmers and coastal populations.

The Intergovernmental Panel on Climate Change attempts to provide the best policy-relevant information on climate-related issues, including health aspects. Gaps in information persist on trends in climate, health and environment in low-income countries, where data are limited and other health priorities take precedence for research and policy development.

Climate change–related health impact assessment in low- and middle-income countries will be instrumental in guiding adaptation projects and investments.

Some comments on how to bridge the gap between science and policy in this context will be made.

About the author

Jean-Pascal van Ypersele is Professor of Climatology and Environmental Sciences and directs the Master Programme in Science and Management of the Environment at Katholieke Universiteit Leuven. He has specialized in modelling climate and the climate effects of human activities and has recently worked on the effects of climate change. He forecast the death toll of the 2003 heat wave in Belgium. His 2004 report with Philippe Marbaix on the effects of climate change for Belgium, prepared at the request of Greenpeace, drew a lot of attention. He has participated in Intergovernmental Panel on Climate Change (which shared the 2007 Nobel Peace Prize with Al Gore) activities since 1995 and was elected Vice-Chair in September 2008. He participates regularly as a scientific adviser in United Nations conferences on climate issues. He chairs the Energy & Climate Working Group of the Belgian Federal Council for Sustainable Development. He speaks frequently to a variety of audiences and is regularly interviewed by the mass media on climate issues. In 2006, he received the International Polar Foundation special prize and has been awarded the Francqui Chair in 2008 by the Université Libre de Bruxelles.