

# Children's health and environment

## Developing action plans



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# Children's health and environment

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# Foreword

*In recent years, children's health has improved significantly in many countries in the WHO European Region. Concurrently, research findings provide a clearer understanding of the hazards children face and of the links between environmental degradation and health. Since 1989, concern for the environment and health in Europe has united the Member States in the WHO European Region, intergovernmental organizations, civil-society organizations and the European Commission in a common commitment to improve our environment and our health.*

*In 2002, Margot Wallström,<sup>1</sup> then European Commissioner for the Environment, stressed that children's health and environment needed to be high on the political agenda. Political attention to environmental and health matters culminated in the Fourth Ministerial Conference on Environment and Health, held in Budapest, Hungary in June 2004. Here, the Children's Environment and Health Action Plan for Europe was agreed at the highest political level, setting the scene for national action and implementation.*

*The political momentum from the still tangible enthusiasm of the Conference should not be lost. To be effective, the Action Plan, with its commitments packed concisely into less than a dozen pages, needs to be adapted to particular national settings. This publication provides the tools for countries effectively to do just that.*

*Today, collaboration between WHO and the European Commission continues to strengthen, with the support of our Member States. We are all committed to channelling our efforts towards a common goal – that of providing a healthier future for our children.*

Marc Danzon  
WHO Regional Director for Europe

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<sup>1</sup> Tamburlini G, von Ehrenstein OS, Bertollini R, eds. (2002). *Children's health and environment: a review of evidence. A joint report from the European Environment Agency and the WHO Regional Office for Europe*. Copenhagen, European Environment Agency (Environmental Issue Report, No. 29; <http://www.euro.who.int/document/e75518.pdf>, accessed 1 January 2005).

# Preface

Since 1989, the unfolding environment and health process in Europe has driven improvements in the environment and health. It has done so through the multisectoral European Environment and Health Committee – a coalition of WHO Member States, intergovernmental organizations and civil-society organizations – and through five-yearly ministerial conferences that set priorities and commitments, such as the WHO Third Ministerial Conference on Environment and Health, held in London in 1999. The European Commission, too, has strengthened its focus on environment and health issues, not only by providing large amounts of funds to its Member States but also by developing policies and action plans, such as REACH (registration, evaluation, authorization of chemicals), SCALE (science, children, awareness raising, legislation, evaluation), the European Union European Environment and Health Strategy and the 2004–2010 Environment and Health Action Plan.

Political attention to environment and health matters has grown slowly across the WHO European Region, culminating in the Fourth Ministerial Conference on Environment and Health held in Budapest in June 2004. Among other processes, detailed consultations and negotiations with Member States on the Children's Environment and Health Action Plan for Europe contributed to this political attention. The next crucial step is to implement the Action Plan.

This publication aims to provide policy-makers with the tools needed to achieve the goals set out in the Action Plan, specifically through national plans. It helps to answer questions about the need for specific actions that address children and provides the evidence base for these actions. It also identifies concrete actions (graded by their effectiveness) that can be introduced into local or national plans. Moreover, it emphasizes the need to set priorities, to build partnerships with the most appropriate stakeholders, and to advocate and communicate in the most effective way. Furthermore, it provides guidance on monitoring and evaluating plans, from drafting to implementation.

A chapter on the precautionary principle offers policy-makers clear guidelines on when and how to apply it. The precautionary approach was keenly debated during the Conference, since its use is central to safeguarding children's health, especially in cases where evidence is lacking.

Finally, as a foundation for all policy-making, the need for comparable and appropriate data is explained. These data are needed particularly to ensure measurable changes in children's health.

Primarily, this publication aims to be a clear user's manual for the different stages of local, national and subregional policy development. It also aims to provide insight into some of the key requirements for a successful plan.

This publication was prepared under the direction of Roberto Bertollini, Director of the Special Programme on Health and Environment at the WHO Regional Office for Europe. We would like to express our thanks to all who contributed their time, effort and expertise to the preparation of this publication. They include Ruth Etzel, Southcentral Foundation, Anchorage, AL, United States of America; Fiona Gore and Eva Rehfuess, Occupational and Environmental Health, WHO headquarters; Joanne Vincenten, European Child Safety Alliance, Amsterdam, the Netherlands; and staff of the Collegium Ramazzini, Bologna, Italy.

In particular, we are grateful to the following experts, who reviewed the manuscript: Philip J. Landrigan, Department of Community and Preventive Medicine, Mount Sinai School of Medicine, New York, New York, United States of America; Hans G. Lindblad, General Paediatrics, Karolinska University Hospital-Huddinge, Stockholm, Sweden; and Benedetto Terracini, Department of Biological Sciences and Human Oncology, University of Turin, Italy.

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# Abbreviations

## Organizations, groups, plans and projects

CEHAP	children's environment and health action plan
CEHAPE	Children's Environment and Health Action Plan for Europe
CEHI	Children's Environmental Health Indicators
CIS	Commonwealth of Independent States
CHILD	Child Health Indicators of Life and Development (European Commission project)
EC	European Commission
EEA	European Environment Agency
EEHC	European Environment and Health Committee
EHAPE	Environment and Health Action Plan for Europe
ENHIS	environment and health information system (project)
EPHA	European Public Health Alliance
EU	European Union
Eur-A	countries in the WHO European Region with very low child and adult mortality
Eur-B	countries in the WHO European Region with low child and adult mortality
Eur-C	countries in the WHO European Region with low child and high adult mortality
HECA	Healthy Environments for Children Alliance
ICFTU	International Confederation of Free Trade Unions
ICLEI	International Council for Local Environmental Initiatives
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFEH	International Federation of Environmental Health
ILO	International Labour Organization
NEHAPs	national environmental health action plans
NGOs	nongovernmental organizations
OECD	Organisation for Economic Co-operation and Development
REC	Regional Environmental Centre for Central and Eastern Europe
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
WBCSD	World Business Council for Sustainable Development
WSSD	World Summit on Sustainable Development

## Technical terms

ALARA	as low as reasonably achievable
DALYs	disability-adjusted life-years
ELF	extremely low-frequency (magnetic fields)
EMFs	electromagnetic fields
ETS	environmental tobacco smoke
HACCP	hazard analysis critical control point (system)
IEC	information, education and communication
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCDDs	polychlorinated dibenzodioxins

PM	particulate matter
PM2.5	PM with an aerodynamic diameter smaller than or equal to 2.5 $\mu\text{m}$
PM10	PM with an aerodynamic diameter smaller than or equal to 10 $\mu\text{m}$
POPs	persistent organic pollutants
SD	standard deviations
UV	ultraviolet (radiation)

# Part I.

## Background



# 1. Scope and purpose

“It is impossible to pursue the health of all, particularly of children, without confronting on a daily basis, issues of poverty, education, gender equality, the environment and global partnership.”

– Dr Lee Jong-Wook, WHO Director-General, 15 September 2003

## The road to Budapest

Investing in children’s health is essential to ensure human and economic development (World Bank, 1993; WHO Commission on Macroeconomics and Health, 2002). Healthy children have the best chances for healthy, productive lives. As citizens of today’s world – not just as future contributors to society – children have the right to health protection and promotion (United Nations, 1989).

The foundation for protecting children from environmental risk factors lies in several international agreements (Box 1). They are designed to ensure that children grow up and live in an environment that is conducive to achieving the highest attainable level of health. The European Union (EU) has also contributed to environment and health policy development in the recent past (Box 2).

### Box 1. International agreements for protecting children from environmental risks

- The 1997 Declaration of the Environment Leaders of the Eight on Children’s Environmental Health
- Establishment by the United Nations Development Programme (UNDP) in 1999 of children’s health as a basic human right and a determinant and indicator of economic and human development
- Declaration adopted at the WHO Third Ministerial Conference on Environment and Health, which draws political attention to children’s rights, their particular vulnerability and the need to respond to emerging environmental concerns (WHO Regional Office for Europe, 1999)
- The United Nations Millennium Declaration, adopted by the General Assembly (United Nations, 2000a)
- WHO’s corporate strategy and general programme of work for 2002–2005, which commit it to promote an effective health dimension to social, economic, environmental and development policy
- The Johannesburg Declaration on Sustainable Development (United Nations, 2002), adopted by the World Summit on Sustainable Development, which lists environmental measures in the areas of water, energy, health and agriculture to protect children
- The Declaration adopted at the fifth Ministerial Conference, “Environment for Europe” (UNECE, 2003), which reiterates the important link between health and the environment

The idea of a children’s environment and health action plan for Europe was born at the Third Ministerial Conference on Environment and Health in 1999, where European ministers committed themselves to developing policies and actions to achieve safe environments in which children could reach the highest attainable level of health. At the Conference, they signed a Declaration (WHO Regional Office for Europe, 1999) that highlighted the urgency of taking action to protect children from environmental risk factors. They also endorsed the children’s health and environment programme, set up by the WHO Regional Office for Europe at its WHO European Centre for Environment and Health. This programme addresses environmental factors that present risks to children’s health and assesses potential health risks associated with emerging problems.

The international agreements noted in Box 1, along with the political climate at the time, helped to influence the agenda of the Fourth Ministerial Conference on Environment and Health, which was held in June 2004 in Budapest, Hungary. An intergovernmental meeting held in Lucca, Italy, in April 2002 had already emphasized the importance of addressing children’s health. Representatives of Member States attending this meeting asked the European Environment and Health Committee – the steering committee for the Budapest Conference – to adopt “The Future for Our Children” as the Conference’s main theme. In the context of sustainable development,

**Box 2. EU contributions to environment and health policy**

- EU policies on chemicals and the environment
- European framework programmes on research and technological development, with a number of research projects financed under the Fourth Framework Programme (1995–1998)
- Support to environment and health by introduction of a focused key action on environment and health (budget of €160 million), which finances research under the Fifth Framework Programme (1999–2002)
- Research on environment undertaken at the Joint Research Centre, an EU research facility
- The Energy, Environment and Sustainable Development Programme's support to key action on water
- The Competitive and Sustainable Growth Programme's emphasis on clean production and the avoidance of health hazards that arise from industrial processes
- Community Strategy on Health and Safety at Work, for occupational health
- EU action programmes and legislation, such as the new programme of Community action in the field of public health (2003–2008) EU health activities for tobacco control, recommendations on electromagnetic fields, guidelines on health impact assessment and legislation on food safety and radiation protection
- Contributions to the follow-up to the Plan of Implementation agreed at the World Summit on Sustainable Development in 2002 (United Nations, 2003)
- Involvement in implementation of the United Nations Economic Commission for Europe (UNECE) protocol on persistent organic pollutants (POPs)
- Development of the Environment and Health Strategy targeted at the enlarged EU, fully involving the 10 new Member States, which seeks a better understanding of the environmental threats to health, in order to identify the disease burden caused by environmental factors in the EU and to plan policy responses to the challenges that emerge

this would allow a concerted effort to address environmental risk factors that affected children's health. At its next meeting, the Committee responded to this request and agreed that a strategic and evidence-based action plan for the WHO European Region would be appropriate to ensure the protection of children's health in the future.

## **Need for a children's environmental and health action plan for Europe**

In the European Region, environmental risk factors are unequally distributed within and between countries, due to different economic standards and public policies. While most of the Region's children today benefit from better food, cleaner water, better preventive health care and a higher standard of housing and living than before, not all enjoy these improved conditions. There are still striking differences among countries in the Region, which includes some of the poorest countries in the world. For these countries and for social groups that experience less favourable trends, the risk factors involved include economic crisis, the disruption of welfare systems, declines in social cohesion and public health systems, and increasing pollution and damage to the physical environment. The direct and indirect consequences of armed conflict and the continued existence of hazardous forms of child labour and sexual exploitation of minors also play a role in causing and perpetuating suffering and worsening health conditions for many children in the Region.

For a number of reasons, developing a children's environment and health action plan was seen to be important.

- Developing organisms, especially during embryonic and fetal periods and the early years of life, are often particularly susceptible and may be more exposed than adults to many environmental risk factors. This is due to windows of vulnerability during the rapid growth and development of organs and systems, to differences in metabolism and to greater intake of air, water, and food relative to their body weight. They may also be more exposed to higher doses of environmental toxicants or be exposed for longer periods of time.
- Children live in a complex and variable environment where, depending on their developmental stage, multiple media and pathways can interact to influence their exposure potential. Children do not control their environment and are largely dependent on adults to determine where they live, learn, play and sometimes work.
- Despite differences in sensitivity and exposure to many toxic agents, safety standards for chemicals and maximum doses of exposure are still based mostly on criteria used for adults.

- Because of children's special situation, they need special attention to protect their health: to prevent, for example, respiratory infections or injuries; to avoid adverse health effects, such as cancer or cardiovascular disorders, in later life; and to avoid intergenerational effects in the future, such as birth defects.

With all these considerations in mind, it became obvious that political commitment to action on a Region-wide front was needed. The Children's Environment and Health Action Plan for Europe (CEHAPE – Annex 1) was drafted to ensure the reduction and, where possible, elimination of children's exposure to environmental risk factors. The CEHAPE is the WHO European Region's contribution to the WHO Healthy Environments for Children Alliance (HECA), and it builds on more recent initiatives by the European Commission (EC), such as its public health and environment programmes and Environment and Health Strategy. Drafted in the spirit of the United Nations Convention on the Rights of the Child (United Nations, 1989), the CEHAPE also incorporates targets, such as the Millennium Development Goals, as well as other processes, such as that of the 2002 World Summit on Sustainable Development (WSSD), and initiatives that derive from this – for example, the WSSD partnerships for sustainable development. Furthermore, it emphasizes the main elements of the fifth Ministerial Conference "Environment for Europe" in 2003.

To ensure maximum ownership of the CEHAPE, an ad hoc working group – comprising senior governmental officials and representatives of the EC, international governmental organizations and nongovernmental organizations (NGOs) – met three times in six months, to draft, negotiate and finalize it. The CEHAPE, drafted by Member States for Member States, was one of two main policy outcomes adopted at the Fourth Ministerial Conference on Environment and Health, after months of discussions and negotiations. At the Conference, European Member States were asked to make specific commitments through the CEHAPE, an important one being that each country address the regional priority goals and objectives listed by producing a corresponding national plan of action. Such a plan would clearly require integrating more child-specific actions into ongoing plans, such as national environmental health action plans, or could be drafted and adopted as a separate and new plan, thereby creating a national children's environment and health action plan (CEHAP). Some countries stated drafting national CEHAPs a few months after the conclusion of the Conference.

The CEHAPE endorsed at the Conference does not provide the guidance and tools needed by the Member States to ensure transposition of this framework document into national CEHAPs, so this book was written to fill the need. It is intended to become the handbook for the WHO European Region, providing guidance on how to implement the CEHAPE on the local, national and regional bases. It aims to facilitate the drafting and implementation of CEHAPs, thereby ensuring that some progress is achieved before the intergovernmental meeting to be held in 2007. This meeting will allow Member States to report back on the state of implementation of the Conference Declaration and the CEHAPE.

To achieve this objective, this publication incorporates the valuable contributions to public health and environmental health made by Member States, the EC, relevant international organizations and NGOs. It recognizes the diversity within and among WHO Member States and that national plans will therefore differ in their environmental health concerns, their priorities and their use of countries' institutions to ensure implementation.

For ease of reference, this publication is organized into three parts: background, moving towards national CEHAPs and tools for implementing them.

Part I provides the background and scientific evidence on children's susceptibility to environmental risk factors. It also provides an overview of environmental risk factors and their effects on children's health.

Part II is the core of the publication: the tables of child-specific actions. These tables propose actions and therefore concrete ways in which a country can work to reduce children's exposure to environmental risk factors and improve their health. To facilitate comparison with the CEHAPE, these actions are organized according to its four regional priority goals. In offering these tables, this publication provides the opportunity for Member States to act on their own priorities while still addressing Region-wide environmental risk factors. Grading the actions in three types provides the reader with the evidence base for each, thus helping the policy-maker or planner to decide whether to take such an action and on its potential success. Part II also discusses international support for CEHAPs.

Part III focuses on the tools required to ensure implementation of national CEHAPs. The main tools identified here include setting priorities and building partnerships. Moreover, because of children's unique nature and the lack of scientific proof on the effect of some environmental risk factors on their health, Chapter 8 discusses the need to act in the presence of uncertainties, giving arguments for dealing with uncertainty by applying a precautionary approach. Chapter 9 describes the relevance and effectiveness of advocacy and of information, education and communication, and how they help to ensure that Member States will be able easily to adapt the CEHAPE to their particular needs. Chapter 10 includes a set of child-specific indicators, to ensure that Member States will be able to monitor the implementation of national CEHAPs and hence the CEHAPE.

Annex 1 gives the full text of the CEHAPE. Annex 2 contains a table of mechanisms for enhancing effective policy-making and Annex 3, definitions of terms used in the book.

## **2. Children's vulnerability to biological and social factors in the physical environment**

Biological, economic and social factors greatly influence children's vulnerability to environmental risk factors in their different developmental stages, from conception to adolescence. Environment and health policies aimed at protecting children (and women of reproductive age) need to account for these factors and their interactions.

### **Biological factors**

#### **Critical windows of susceptibility during growth and development**

Developing organisms are fragile and – due to their rapid growth and development – exceptionally susceptible to various chemical and physical agents. Developing organs and systems typically go through periods of high vulnerability or critical windows of susceptibility. For example, in the embryo, cell growth is particularly rapid and primary differentiation occurs, providing more opportunity for toxicants to cause mutations and congenital anomalies (Selevan, Kimmel & Mendola, 2000). During the prenatal and postnatal periods, structures are developed and vital connections are established. For example, during the first years of life, most of the nervous system develops. The nervous system has a limited capacity to repair any structural damage; the destruction of brain cells by chemicals such as lead and mercury, or failure to establish vital connections between nerve cells, may therefore result in permanent and irreversible dysfunction (Rice & Barone, 2000).

This is why exposure to many external agents during growth and development may produce adverse effects on health, such as birth defects and neurodevelopmental damage, that have no counterpart in adult life. The concept of windows of susceptibility is particularly important since it emphasizes that both the dose and the timing of the exposure may be crucial in determining the nature and amount of the effect.

#### **Immature metabolism**

Children's metabolic pathways, especially in the first 6–12 months after birth, are immature and may therefore be less capable of detoxifying and excreting chemicals than those in adults, which is why lower doses per kg of weight and longer intervals are recommended for most drugs prescribed for infants during the first weeks and months of life (Chemtob, 1991). In some instances, however, metabolic immaturity may be beneficial with respect to toxicity. Children may actually be less sensitive than adults to some compounds, because the metabolic pathways that activate their toxic metabolites are not yet developed. In many other instances, infants are more susceptible, because they do not have the capacity to metabolize (and thus detoxify) toxic compounds (Crom et al., 1987; Bruckner, 2000; Scheuplein, Charnley & Dourson, 2002). The whole sequence of absorption, distribution, biotransformation and excretion of xenobiotics in children differs from that of adults, particularly in the first months of life, and the overall result of these toxicity differences is typically substance specific (Bearer, 1995; Faustman et al., 2000; Scheuplein, Charnley & Dourson, 2002).

#### **Greater exposure**

Children may be more heavily exposed, per unit of body weight or body surface, to environmental risk factors than are adults. There are a number of reasons for this. First, infants and young children drink more water, eat more food and breathe more air than adults in relation to their body weight (Table 1).

Second, the absorption of many chemicals in the intestines is also increased in children. For example, infants absorb as much as 50% of the lead present in food, while adults have an uptake of only 10% (Royce, 1992).



Table 1. Comparison of child and adult intakes

Medium (unit)	Child (< 1 year)	Adult	Ratio (child/adult)
Air (m <sup>3</sup> /kg-day)	0.44	0.19	2.3
Water/Fluids (g/kg-day)	161.0	33.5	4.8
Food (g/kg-day)	140.0	23.0	6.1

*Source:* derived from data from National Research Council (1993), Gephart, Tell & Triemer (1994) and US EPA (1997).

Third, children have particular food preferences, and different dietary choices than adults. For example, children usually consume much more milk and dairy products.

Finally, infants and toddlers show exploratory behaviour and hand-to-mouth activity, exposing them to much higher quantities of toxicants that typically concentrate in dust and soil, such as lead, pesticides and other chemical compounds. They also spend a good deal of time crawling on the floor. The surface of floors and the layer of air near the floor are major sources of chemical and physical agents, including several air pollutants, compounds in environmental tobacco smoke (ETS), and radon.

### Early environmental exposures leading to later harm to health

Children have more years of life ahead of them than do adults, so they have more time to develop chronic diseases that take several decades to appear and that may be determined by:

- very early environmental exposure (Kuh & Ben-Shlomo, 1997; Barker, 1998, Gunnell et al., 1998);
- continuous and thus cumulative exposure, such as lung cancer; or
- both, such as sunlight-induced skin cancer (Autier & Doré, 1998).

Early exposure to neurotoxicants causes adverse effects on health that can be detected over a decade later (Needleman et al., 1990).

The effects of exposure to environmental risk factors often manifest themselves over generations. Congenital anomalies are examples of effects on children's health from parental exposures during adulthood.

Many chemicals are also transferred from adults to children: over time, chemicals that the body has difficulties in metabolizing and eliminating tend to accumulate and can then be passed on to the next generation across the placenta or in breast-milk. This is the case, for example, for lead (US EPA, 1986) and for polychlorinated biphenyls (PCBs – Walkowiak et al., 2001).

### Multiple exposures

Multiple exposures can be aggregate or cumulative. Children may be exposed to the same chemical from multiple sources (aggregate exposure); they may also be exposed simultaneously to several compounds with similar modes of action (cumulative exposure) and with additive or multiplicative toxic effects. This also holds true for adults but, due to the differences in both susceptibility and exposures described so far, there are several circumstances in which children may have a greater cumulative risk derived from combined exposures.

For example, multiple residues in baby foods are a specific concern, particularly for pesticides that share a common mechanism of toxicity, such as cholinesterase inhibitors, which include carbamates and organophosphates (Curl, Fenske & Elgethun, 2003). An analysis based on more than 80 000 government laboratory tests and detailed data on children's food consumption in the United States revealed that, every day, 9 out of 10 children aged 6 months to 5 years were exposed to combinations of 13 different organophosphate insecticides in the foods they ate (Wiles, Davies & Campbell, 1998).

Air pollutants provide another example of combined exposure. Young children often spend most of their time at home and may be exposed to ETS and combustion products from heating and cooking devices, as well

as to outdoor air pollutants, such as particulate matter and others that concentrate indoors. Their increased air intake per kg of body weight, combined with the increased susceptibility of their developing lungs to air pollutants, ultimately lead to a higher risk of respiratory effects, as can be seen by the documented higher incidence of acute lower respiratory infection in children exposed to high concentrations of indoor pollutants (Bruce, Perez-Padilla & Albalak, 2000; Ezzati & Kammen, 2001).

### **Taking account of children's unique vulnerability in toxicological risk assessment**

Owing to children's unique susceptibility, accurate assessments need to be made of the risks and hazards to children presented by exposure to chemical and physical agents. A number of factors may make this task particularly difficult:

- the large number of new chemicals and new technologies on the market;
- varying susceptibilities among populations due to genetic, social or environmental factors;
- the complexity of interactions, leading to many possible causes of a given effect;
- separation of cause and effect over space (such as widely dispersed pollution) and time (such as inter-generational effects); and
- synergistic and cumulative effects, such as failure to take account of already existing body burdens of toxic substances or the combined effects of toxicants.

In assessing the risk of toxicological substances dispersed in the environment, the following set of questions may help to take account of the unique vulnerability of developing organisms (Tamburini & Ebi, 2002).

- Did the toxicity assessment include the reproductive and early developmental stages or did it extrapolate from data on adults?
- Did laboratory tests and epidemiological studies adequately consider sensitive end-points – that is, the impact on learning capabilities – when assessing potential neurotoxicants?
- Have the long-term effects – such as cancer or cardiovascular diseases or chronic lung disease – of exposure very early in life been evaluated?
- Did exposure assessments include exposure patterns at different stages of development, from conception to adolescence?
- Did they consider all sources of exposure, such as diet, water, home, daycare and school environments, neighbourhood and parents' workplaces?
- Did exposure assessments reflect so-called real-world experiences, including such factors as multiple exposure, multiple routes of exposure, chemical mixtures, and additive or synergistic effects?

To answer these questions adequately, the scope of laboratory assays should be expanded to incorporate exposure during the perinatal period and early developmental stages. Given the difficulties in generalizing the results of animal studies to human beings (Brent, 2004), epidemiological studies on in utero, perinatal and childhood exposure are also needed.

Also, data on whether children are more vulnerable to the adverse effects of a particular agent, including whether the target organ in children is more vulnerable, should be collected and incorporated into risk assessments. Risk assessments of agents to which children are exposed must be based on children's exposure patterns (Bearer, 1995). Assessments must use child rates of inhalation and of food and water consumption, and should include adequate sample sizes of age ranges with specific consumption patterns, such as less than 12 months, 1–3 years, 4–10 years and 11–18 years. Since a child may be exposed to hazardous agents from many sources, such as contaminated drinking-water, food, airborne particles and soil, exposure to all of these should be combined in one measure for an assessment of combined risk (Food and Agriculture Organization of the United Nations & WHO, 1997).

Another crucial area is the monitoring of toxic substances in biological materials, such as hair, blood and urine. This kind of biomonitoring will identify population groups at higher risk and help determine whether exposures are changing in the population. Also, less costly methods for biological testing must be developed, so that testing can be applied more extensively. Finally, epidemiological tracking systems, such as disease

registers, are important for following trends in diseases that may be related to the environment. These systems can help evaluate progress and identify areas that require interventions.

The international community has recognized the need to improve methods to assess the risk of chronic and acute hazards posed by chemicals and physical agents to infants and children. It has also recognized the need to revise the procedures for safeguarding their health. In the interim, a precautionary approach is recommended for substances that may present a threat to infants and women of reproductive age, to ensure that they are adequately protected.

### **Age-specific exposure patterns**

A child's exposure and susceptibility to environmental risk factors vary with each developmental stage. To better assess risks and target protective policies, special aspects of susceptibility, which are derived from the biological and psychosocial characteristics of the various developmental stages, need to be understood (Table 2).

### **Economic, social and psychosocial factors**

At the macro and micro levels, a variety of external factors influences the susceptibility and exposure of fetuses, infants, children and adolescents to various environmental threats, and consequently affects their health. These factors primarily include economic and social status, which can carry their effects into adult life (Smith et al., 1997; Gunnell et al., 1998).

The interaction of these factors and others – such as educational background, location of residence, gender, ethnicity, and the knowledge, attitudes and behaviour of parents, teachers and peers – influences exposure and risks and, as a consequence, different and possibly cumulative health effects. For example, exposure to neurotoxicants during early childhood is often associated with low parental socioeconomic or educational level, or both, which in turn imply a higher risk of lack of cognitive stimulation (US EPA, 2000; Vreugdenhil et al., 2002). The risk of being deprived of adequate cognitive stimulation is thus often combined with that of exposure to neurotoxicants, to produce an overall higher risk of intellectual impairment in children in disadvantaged communities (Mott, 1995).

Besides genetic susceptibility, different exposure patterns also influence developmental outcome. These patterns are determined by: parents' and children's degree of awareness of the risks, concomitant exposures (such as alcohol consumption or smoking by parents), access to information and exposure to aggressive marketing of tobacco products and unhealthy foods, and access to protective policies and preventive care. For example, the same concentration of PCBs or (pp'-dichlorodiphenyl) dichloroethylene can be markedly more harmful to one child than another, depending on the protection provided by the home environment during the first years of life (Walkowiak et al., 2001; Ribas-Fito et al., 2003).

### **Unequal distribution of the burden of environment-related disease**

The burden of diseases attributable to environmental factors is greater in children and the poorest sector of society. Globally, 43% of the total burden of environment-related disease falls on children under 5 years of age, even though they make up only 12% of the population (Smith, Corvalan & Kjellstrom, 1999). In the poorest countries, up to 80% of the burden of disease in children under 5 years of age is of environmental origin.

The burden of disease due to environmental factors shows dramatic geographical differences in both quantitative and qualitative terms, particularly for children. For example, in the so-called established market economies, only 16 per 1000 disability-adjusted life-years (DALYs – a summary measure that accounts for the impact of both health problems and premature death) in children under the age of 5 is attributable to major environmental factors, compared with 44 per 1000 DALYs in the Commonwealth of Independent States (CIS) (Smith, Corvalan & Kjellstrom, 1999), where diarrhoeal diseases and acute lower respiratory infection account for most of the burden of environment-related disease for this age group. Within the WHO European Region, the mortality from injuries in the CIS is 4–8 times that in the western countries in the Region (Koupilova et al., 2002; Valent et al., 2004b). Similarly, the estimated burden of disease attributable to lack of water and

Table 2. Environmental exposure, susceptibility and preventive interventions, by developmental stages from preconception to adolescence

Developmental stage	Age-dependent biological and behavioural features	Environmental exposure	Adverse effects	Preventive interventions
Preconception	Young people and adults of reproductive age: lack of awareness of gonadal exposure	All environmental exposures	Potential for genotoxicity	Regulation and control of possible exposures for adults of reproductive age (workplace, waste sites)  Information for adolescents and young people, employers and the general public
Embryo and fetus	Pregnant woman: mobilization of toxins from internal stores, transplacental passage, and subsequent exposure of the fetus  Embryo and fetus: rapid cell growth and organ differentiation	All environmental exposures  Ad hoc diagnostic investigations	Potential for teratogenicity	Regulations on occupational and other environmental exposures (such as ETS) and exposure during pregnancy  Health information for couples
First two years	Organ development  Immature metabolism  Hand-to-mouth exploration  Crawling and beginning to walk  Eating the same foods every day	Pollutants in: food (such as breast-milk, formula milk and infant foods); air (particularly indoor); tap/well water; and mattresses, carpets, floors and soil  Injuries and poisonings	Potential for organ damage, particularly to brain (synaptogenesis) and lungs (developing alveoli)  Allergic sensitization	Regulation and control of water and sanitation, indoor and outdoor air pollutants, lead, pesticides and other chemicals in water and in infant foods  Advice on preventing injuries
Preschool and school-age child	Growing independence  Playground activities  Critical vulnerability (in, for example, orphans, conflict and post-conflict situations, street children, and neglected children)	Injuries and poisonings  Pollutants in: food (such as milk, fruit and vegetables), indoor and outdoor air and water  Ultraviolet radiation and noise  Violence and abuse	Potential for damage to brain and lungs (volume expansion), and carcinogenesis  Injuries	Regulations, control of and information on outdoor and indoor pollutants, water and sanitation, food, ultraviolet radiation, noise and child labour  Information for parents, teachers and children  Prevention of abandonment and provision of social protection
Adolescence	Puberty  Growth spurt  Risk-taking behaviour  Youth employment	Injuries and poisonings  Pollutants in: food, outdoor and indoor air and water  Ultraviolet radiation and electromagnetic fields  Occupational exposure  Violence and exploitation	Potential for damage to pubertal development, to all organs and systems and for carcinogenesis	Regulations on child labour, noise in discotheques, injury prevention, ETS  Health information for young people  Information and social protection

sanitation and to polluted indoor air is much higher in the countries of Eur-B and -C than Eur-A (Valent et al., 2004b).<sup>2</sup>

In poor countries and disadvantaged communities, the consequences of higher environmental exposure add to those of decreased access to high-quality preventive and curative services (Black, Morris & Bryce, 2003).

Even the richest countries show an unequal distribution of major environmental effects on people's health. For example, a 1988 report from the United States estimated that 68% of poor, inner-city African-American children were lead poisoned – that is, had blood lead levels above 10 µg/dl – compared with 36% of poor inner-city White children (ATSDR, 1988). In 1999–2000, the median blood lead level was 2.8 µg/dl for children that lived in families with incomes below the poverty line, and 1.9 µg/dl for children living in families above the poverty line (US EPA, 2003). Blood levels of cotinine, a chemical made by the body from nicotine and a biomarker of exposure to ETS, were three times higher in African-American children than in White children (US EPA, 2003). In the United Kingdom, the poorest families (defined as households with yearly incomes of less than £5000) are twice as likely to have a polluting factory in their immediate area than families with an income of £60 000 or more (McLaren et al., 1999).

In addition to the economic dimension of poverty, socioeconomic status also affects children's health. It is closely associated with parents' educational level, which influences risk awareness and lifestyles. Social exclusion is also a powerful determinant of exposure. Children in particularly vulnerable circumstances – such as orphans, street children and children involved in illegal activities and hazardous labour – are at a much higher risk of exposure to microbiological, chemical and physical agents, as well as injuries and abuse (ILO, 1996). Unequal access to information plays a role in environmental injustice, but policies and effects can also be deeply unjust. Substantive injustices are caused, in part, by procedural injustices. For example, waste disposal policies are not designed to hurt poorer communities, but the decision-making process may result in a favourable bias towards the wealthier groups, who can influence decisions more easily (Stephens & Bullock, 2002).

### **Importance of different factors in shaping behaviour and lifestyle**

Specific environments or settings characterize children's lives and make up the framework within which social and biological health determinants play their roles. These are primarily the family and school, although workplaces may also play an important role in later years. The family has historically been the most important fixed environment for children. The family unit has changed, however, and children now grow up under very different conditions. Because of the increasing number of single-parent families or reconstructed family units, children often see their parents separately (Rutter, 1996). The abandonment of children is on the rise in many CIS countries (UNICEF, 2002); moreover, parents may work in different cities or countries, and children are then reared by grandparents or public or private care providers.

Learning is no longer bound only to the traditional system of education or the family: the kind of general information that the young receive during their school life from peers may influence them to a greater extent than the messages about health and health education delivered by the family and the school. Children's lifestyles and ultimately their health-related behaviour and exposure to health risk factors are also influenced by legislation and regulations, and educational opportunities and information. Thus, driving forces at the macro level, such as the state, the mass media and the private sector, play an important role in influencing the environment that affects children's health.

In many countries in the European Region, decision-making is being decentralized to local communities. This is intended to increase democratization and individuals' opportunities to influence and participate in the

<sup>2</sup> WHO groups the countries of the Region into three strata, according to levels of mortality in children under 5 and men aged 15–59 years. **Eur-A** has very low mortality in both children and adults and comprises: Andorra, Austria, Belgium, Croatia, Cyprus, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, the Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. **Eur-B** countries have low child and adult mortality, and comprise: Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Serbia and Montenegro, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan and Uzbekistan. The third group, **Eur-C**, has low mortality in children but high mortality in adults. It comprises: Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, the Republic of Moldova, the Russian Federation and Ukraine.

decision-making process. At the same time, as market forces increasingly determine policies and opportunities, a significant part of decision-making moves away from the state and the community; this is sometimes at odds with public health interests. Short-term economic profits may then easily become more important than the sustainable development of the environment and the health of the population, particularly when the particular needs of subgroups of the population are not fully recognized or politically represented, as is the case of children and disadvantaged communities.

The mass media are influential vehicles of market forces and of conformist as well as marginal, nonconformist behaviour. They can help or hinder the acquisition of knowledge. As a consequence, they play an important role in influencing knowledge and lifestyles and subsequent environmental awareness and exposures.

The impact of urbanization, too, is increasingly important. It affects human health through three main pathways (McMichael, 1999):

- the social changes that accompany the way of life in an urban environment (urbanism) and the resulting changes in behaviour-based risks to health;
- the microbiological and chemical toxicity risks that come from the physical urban environment; and
- the large-scale effect of urbanization on the biosphere.

All this is particularly relevant when children are either raised in an urban environment from birth or are brought to it by household needs, sometimes caused by such dramatic circumstances as conflict and forced migration.

### **Complex causality: the need for a multisectoral approach**

As noted, health hazards that affect children come from the peculiar mixture of susceptibility and exposure to the many external agents in the physical environment; exposure to these agents is influenced by a variety of factors in the social environment. The pathways of causality are typically complex, and the causes of ill health are always multifactorial, even when they may appear to be entirely biological. For example, the occurrence of neural tube defects is partly influenced by genetic predisposition, but environmental factors (such as the intake of folic acid) and social factors (such as parental educational level) play a fundamental role in determining the risk.

This chapter has given examples of how different social factors, environments and driving forces shape children's lives and consequently influence the way they are directly or indirectly exposed to environmental threats. These examples substantiate the need for a broad multisectoral approach that takes account of biological, socioeconomic and psychosocial factors. This approach is essential to establish sound and effective environmental, social and public health policies that improve children's health.

# 3. Overview of environmental risk factors and their effects on children's health

## Introduction

Some of the environmental risk factors to which children are exposed act in a very specific way and contribute to specific effects on health. Most of the effects, however, as outlined in Chapter 2, are the combined result of many environmental factors and their interactions with social and economic factors. Understanding the hazards prevalent in the various settings for children's lives is a very important foundation for setting-based interventions. Also, understanding the role of each factor and its contribution to specific adverse outcomes on children's health would be very useful in identifying courses of protective action.

Unfortunately, the epidemiological and toxicological studies intended to unravel associations between environmental risk factors and specific conditions have several limitations. These are both external (such as insufficient resources and available information for potentially important studies) and internal (such as inherent or unavoidable limitations in design). An awareness of these limitations might help in understanding the varying strength of the evidence on specific associations. Given these limitations, this chapter provides an overview of the current knowledge of the main environmental risk factors and the main effects on health that result from exposure in childhood, from before conception to adolescence. Current estimates of the burden of disease in children, expressed in deaths and DALYs associated with some of the main environmental factors in the European Region, are also provided. Valent et al. (2004a) describe WHO's methods in estimating the burden of disease attributable to each factor.

## Poor indoor air quality

Burning coal or biomass at home for cooking and heating creates smoke emissions. Such smoke contains carbon monoxide, nitrogen oxides, sulfur oxides, benzene, formaldehyde, polyaromatic compounds, and suspended particulate matter (PM). Indoor sources of air pollution are likely to produce very high levels of exposure (Bruce, Perez-Padilla & Albalak, 2000; Ezzati & Kammen, 2001), and the highest levels of indoor air pollution (up to 2000  $\mu\text{g}/\text{m}^3$  PM<sub>10</sub> – PM with an aerodynamic diameter smaller than or equal to 10  $\mu\text{m}$ ) are produced by use of biomass solid fuel. Since children spend most of their time indoors, they are likely to receive high levels of exposure, even for pollutants with relatively low concentrations in air. Exposure levels are higher in conditions of poor ventilation.

On a global basis, solid fuel use represents the largest source of indoor air pollution. It is still widespread in many countries in the European Region. In eastern Europe and central Asia, an estimated 22.8–41.5% of households still rely on biomass fuel (wood and coal) combustion for heating and cooking (World Bank, 2003).

High levels of indoor air pollution lead to an increased risk of lower respiratory infection in children, resulting in increased morbidity and mortality (Bruce, Perez-Padilla & Albalak, 2000; Ezzati & Kammen, 2001; Black, Morris & Bryce, 2003). In Eur-B and -C, it has been estimated that 1.1–6.6% of deaths and 0.7–5.0% of DALYs in children aged 0–4 years, as well as 3.7–11.5% of the total asthma burden in children aged 5–14 years, are attributable to indoor air pollution due to solid fuel use (Valent et al., 2004b).

Morbidity linked to poor indoor air is observed even in the most developed areas, owing to exposure to ETS, chemicals in furnishing and construction materials, and such biological agents as moulds.

Maternal smoking is associated with adverse outcomes of pregnancy, such as miscarriage premature birth, low birth weight and some congenital anomalies, and with increased risk of respiratory diseases and

developmental delay in the early years of life (DiFranza & Lew, 1995, 1996). Also, exposure to ETS after birth is associated with increased incidence of respiratory infections and wheezing and is likely to cause an increase in chronic respiratory disease and cancer later in life (DiFranza & Lew, 1996; Ji et al., 1997; Strachan & Cook, 1998; Courage, 2002).

High levels of indoor air pollutants may also be due to high levels of outdoor air pollutants. These are particularly common inside homes and schools close to polluting industries and main traffic arteries. Indoor air quality is also of concern in workplaces and play and leisure areas.

Exposure to high levels of sulfur dioxide, nitrogen dioxide and other indoor air pollutants may cause mucocutaneous irritation and respiratory effects, resulting in rhinitis, cough, exacerbation of asthma, headache, nausea and eye irritation (American Academy of Pediatrics, 2003).

## **Outdoor air pollution**

Children may be exposed to various mixtures of air contaminants (PM, nitrogen dioxide, sulfur dioxide, and ozone and other photochemical oxidants) that depend on such factors as proximity to polluting industries, power plants and areas of high traffic volume.

Globally, outdoor air pollution causes cardiovascular and respiratory diseases, and 800 000 premature deaths from lung cancer every year (Ezzati et al., 2002, 2003). Both acute and chronic respiratory diseases in children and adults have been clearly associated with outdoor air pollution, particularly high PM concentrations (Roemer, Hoek & Brunekreef, 1993; Dockery & Pope, 1994; van der Zee et al., 1999; Howel, Darnell & Pless-Mulloli, 2001; Brunekreef & Holgate, 2002; Hoek et al., 2002; Pope et al., 2002; Peacock et al., 2003). Particle size is the primary determinant of the level at which PM is deposited in the lungs, and respirable particles include PM10 and particles equal to or smaller than 2.5  $\mu\text{m}$  in diameter (PM2.5), such as those produced by motor vehicle exhaust. The smallest particles cause the greatest harm: long-term damage to the respiratory and cardiovascular systems (Pekkanen et al., 1997; Marcazzan et al., 2001; ECTWGP, 2003).

Studies estimating the health effects of transport-related air pollution in Austria, France and Switzerland attributed to this cause on the order of 300 000 cases of bronchitis and 162 500 asthma attacks in children younger than 15 years (Künzli et al., 1999, 2000). Increased mortality in the first years of life has been associated with increased levels of outdoor air pollution worldwide (Ostro et al., 2005), which also includes developed countries (Bobak & Leon, 1992). Other sources of outdoor air pollutants include industry, such as coal-based power plants, smelters and paper mills, which are all primary sources of sulfur dioxide. A chemical reaction between polycyclic aromatic hydrocarbons (PAHs) and nitrogen dioxide in the presence of sunlight produces ground-level ozone, one of the most pervasive and harmful air contaminants. Higher ozone levels usually occur in the afternoon hours of sunny days, and are highly irritating to the airways, particularly those of young children (Gielen et al., 1997).

Most air contaminants cause acute damage to the respiratory system, but chronic damage is also observed. The results of a study carried out in 12 communities in southern California provide robust evidence of reduced lung development in children aged 10–18 years who were exposed to levels of air pollution that can be commonly found in urban and peri-urban areas (Gauderman et al., 2004).

Long-term exposure to air pollutants can also result in nonrespiratory chronic effects on health. Many PAHs, for example, are carcinogenic. An association between low birth weight and outdoor air pollution has been shown: the estimated reduction in birth weight was 0.52 g for a 1- $\mu\text{g}/\text{m}^3$  increase in either sulfur dioxide or PM10 in the first trimester of pregnancy (Rogers et al., 2000; Yang, Tseng & Chang, 2003).

In the WHO European Region, the estimated burden of disease for children aged under 5 years from outdoor air pollution is 3861–13 796 deaths (1.8–6.4% of all deaths in this group). The figures come from an analysis that is based on current PM10 levels calculated from World Bank estimates and that uses as the counterfactual exposure a PM10 level of 20  $\mu\text{g}/\text{m}^3$ . The range of results is obtained by applying the relative risk for outdoor air pollution to all causes of mortality (higher value) or only to deaths from acute lower respiratory infection (lower value) (Valent et al., 2004a).



## Poor water supply and inadequate sanitation

Biologically contaminated water causes a range of waterborne diseases. A variety of known viruses, bacteria and parasites can contaminate drinking-water and cause gastrointestinal diseases in infants and young children. Mortality and morbidity due to waterborne gastrointestinal diseases – mainly those that cause diarrhoea – are still high in countries and communities where a substantial proportion of the population lacks access to clean water and proper sanitation (Black, Morris & Bryce, 2003). This is the case in many countries in the European Region, particularly in south-eastern Europe, the Caucasus and central Asia, and for a significant number of disadvantaged minority groups in other countries in the Region.

Overall, in children in the Region aged under 15 years, diarrhoea attributable to poor water, sanitation and hygiene accounts for 5.3% of deaths (13 548) and 3.5% of DALYs (549 940) (Valent et al., 2004a). In Eur-A, estimates of deaths and DALYs are 0.2% and 0.8%, respectively, which indicates that children in Eur-B and -C bear a great proportion of the burden of disease due to lack of water and sanitation. Lack of safe water and sanitation may also have indirect and long-term effects; for example, repeated gastrointestinal infections represent a secondary cause of impaired growth.

## Inadequate nutrition

In spite of widespread improvement in the conditions of the majority of the population in the WHO European Region, undernutrition is still present in areas affected by drought and desertification and disadvantaged population groups, particularly in some CIS countries. Protein-energy malnutrition is relatively rare, but iodine deficiency is widespread, in both western and eastern countries of the Region, as is iron-deficiency anaemia (WHO Regional Office for Europe, 2003c). Overall, 32 000 deaths and 1 650 000 DALYs in young people aged 0–15 have been attributed to reduced dietary intake in the WHO European Region (WHO, 2002).

Poverty is the main cause of inadequate nutrition, but lack of information also plays an important role. For example, as a global public health recommendation, infants should be exclusively breastfed for the first 6 months of life, and those who are not should be given a suitable breast-milk substitute. Thereafter, infants should be given nutritionally adequate and safe complementary foods (Fleischer Michaelsen et al., 2003). This, however, does not always happen in the Region: water (boiled or not), tea with sugar and cereals are introduced as early as 2 weeks in the central Asian republics and other countries of the Region. These inappropriate feeding practices contribute to increased incidence of diarrhoeal diseases, respiratory infections and anaemia in infants.

Undernutrition increases the incidence and severity of all infectious diseases by reducing the immune response, and reduces learning capacity in school-age children. In the long term, malnutrition leads to stunting – defined as chronic reduction in height-for-age to below 2 standard deviations (SD) – and may chronically impair cognitive development, particularly in infants and young children (Grantham-McGregor et al., 1991; Grantham-McGregor & Ani, 2001). Poor nutrition and inadequate intake of iron and folates among pregnant women contribute to low birth weight and congenital anomalies (Medical Research Council Vitamin Study, 1991; Botto, Mulinare & Erickson, 2000; Jensen, 2002). The effects of poor nutrition are intergenerational: adolescent women who are stunted are more likely to have smaller babies (Robertson et al., 2004). Also, adults who are very short, as a result of having been stunted in childhood, may have a reduced capacity for learning and work (Savage & Burgess, 1993).

The prevalence of stunting is high in countries in the eastern half of the WHO European Region; for example, in Tajikistan, over half the children under 5 years are stunted. In Uzbekistan, 31% of children are stunted; in Turkey and the Russian Federation, 16%; in Romania, 8% (de Onis & Blössner, 1997). Also, suboptimal growth patterns may be found among poorer sections of the community in relatively wealthy countries.

Inappropriate diets and eating patterns that include frequent consumption of highly sugared soft drinks and energy-dense snacks, particularly when combined with insufficient physical activity, contribute to the increased prevalence of overweight and obesity (see the section on mobility and transport patterns).

## Microbiological food contamination

Microbiological and chemical agents can contaminate food, thereby giving rise to a variety of diseases or conditions among children. The effects of chemical contamination of food are described in the section on

hazardous chemicals. The main risks for children's health from biological food contamination are gastrointestinal diseases and other infectious foodborne diseases. Contamination by various bacterial and viral organisms, such as staphylococci, *Campylobacter* spp., *Escherichia coli*, *Shigella* spp., *Salmonella* spp. and small round structured viruses (such as Norwalk viruses) cause foodborne diseases (Pond, 2002). Infections due to pathogenic *E. coli* are thought to be the most frequent in developed and developing countries. Owing to immature immunity, younger children are more susceptible to certain pathogens than older people in the population; because children are developing, adverse effects on their health may be more severe.

Despite recent activities and initiatives, the incidence of foodborne diseases continues to increase. In northern and western countries of the Region, in spite of satisfactory drinking-water supplies and sanitation facilities, the incidence of foodborne diseases tripled between the early 1980s and late 1990s (Pond, 2002).

### **Inadequate building standards and unsafe play materials**

Housing in poor suburban and rural areas may not offer adequate shelter from heat or cold, owing to inadequate building materials and scarcity of fuel. In many countries in the WHO European Region, a significant proportion of the population still faces the problem of inadequate housing, including poor neighbourhoods and shanty towns in the most industrialized parts of the Region. Besides housing, heating is also often inadequate in schools and the public places frequented by children.

Other indoor risk factors include dangerous substances in building materials, particularly lead and asbestos. Asbestos was used extensively in public buildings until the 1970s, when its use was banned or limited in many countries. Used mainly as insulation, and in roofing shingles, ceiling and floor tiles, and cement, it becomes a health hazard when the asbestos-containing materials deteriorate and fibres are released in the air and then inhaled. In most parts of the Region, students and school personnel are exposed to asbestos from deteriorating materials. The main effect of asbestos is the long-term development of pleural cancer (Terracini, 2002). Leaded materials (see also the section on hazardous chemicals) have been used extensively in paints, walls, woodwork and window casings. Lead in paint is usually the most important threat to children in countries where leaded paint has been used extensively.

Often overlooked are risk factors in the microclimate, such as dampness, inadequate lighting and inadequate furniture. These are more evident in schools and public places, where children spend most of their day. Lack of safe recreational areas increases the likelihood of injuries and sedentary behaviour. Also, disabled children often find schools, other buildings and play areas inaccessible, which significantly restricts their opportunities for education and social interaction with other children.

Inadequate building standards and materials may also lead to poisoning and injuries. Poisoning may result from the inappropriate storage of hazardous substances, or incorrect use or exposure to medication, chemicals, petroleum products and crafts materials. Among other things, injuries commonly result from unsafe building and play materials, unsafe biomass burning (burns and kerosene ingestion) and unsafe electrical wiring.

Playing with unsafe toys and toxic arts-and-crafts products is a health hazard for children, and even so-called non-toxic art products can cause health problems if ingested or used improperly. Toys may contain potentially harmful chemicals, such as phthalates. Also, wooden playground equipment is often treated with substances containing preservatives, such as arsenic, pentachlorophenol and chromium, which are toxic if ingested (American Academy of Pediatrics, 2003).

Biological contamination is common in any group of people sharing a limited space. Schools and daycare centres are at particularly high risk, due to crowding and the high incidence of infectious diseases among toddlers and children. Biological contamination may be encouraged by conditions of high relative humidity and poorly maintained air conditioners. Moulds (the most common are *Cladosporium*, *Aspergillus*, *Penicillium* and *Alternaria*) proliferate in environments that contain excessive moisture from such sources as leaks in roofs and walls, and can enter the home through heating and air conditioning systems. Moulds are a well-known allergen.

## Hazardous chemicals

In industrialized countries, more than 15 000 high-volume chemicals are produced and dispersed in the environment, mainly in soil and water. Many chemicals in commerce, however, have never been tested for possible toxicity, and only a small proportion has been tested for toxicity to developing organisms.

Although there may be cases of acute poisoning – such as that due to lead – most of the effects on health usually arise after prolonged periods of exposure. Symptoms may not be apparent during childhood, but appear later in life. The possibility of long-latency effects implies that knowledge of them is likely to be incomplete, and any hypothesized cause–effect relationship may be difficult to prove.

Lead is still the single most important chemical toxicant for children, particularly in countries where leaded petrol is still used. There are many other sources of lead contamination, including paints and water pipes, and lead-glazed ceramics. For children, an important source of lead contamination may be child labour in building, mining and smelting, and battery repair. Lead is more likely to dissolve from lead pipes and joints in soft water and water below a neutral pH.

Lead can produce acute toxic effects. Its most important effect, however, is chronic neurotoxicity, which is particularly severe during the early development of the central nervous system during the first 2–3 years of life. It causes impairment of cortical functions and consequently increases the risk of mild mental retardation, attention deficit hyperactivity disorder and other developmental disabilities (Needleman & Gatsonis, 1990; Needleman et al., 1990; Lidsky & Schneider, 2003). Its estimated annual health care cost in the United States is US\$ 43.4 billion (Landrigan et al., 2002). Recently, adverse effects on the intellectual development of children have been shown for blood lead concentrations well below the 10- $\mu\text{g}/\text{dl}$  level hitherto considered safe (Canfield et al., 2003). In the WHO European Region, the proportion of the total burden of disease in children attributable to mild mental retardation caused by lead ranges from 0.8% of all DALYs in western Europe (156) to 3.1% in central and eastern Europe (619), averaging 1.4% of all DALYs in children aged under 5 years (Valent et al., 2004b).<sup>3</sup> Surveys carried out in countries showed that the proportion of children with blood lead levels exceeding 10  $\mu\text{g}/\text{dl}$  is frequently above 10% and occasionally well above 50% (Valent et al., 2004b).

Nitrates are also of concern. High concentrations in drinking-water are of concern because nitrate can be reduced to nitrite, causing methaemoglobinaemia, a condition where the haem fraction of the blood cell is less capable of carrying oxygen. The haemoglobin of young children is particularly susceptible to methaemoglobinaemia. This, along with the increased ratio of water consumption to body weight, makes infants particularly vulnerable to this disease. Cases have been reported in Albania, Hungary and Slovakia (WHO Regional Office for Europe & European Environment Agency, 2002).

Another chemical of concern is mercury. It originates from such combustion sources as coal-burning power plants and municipal waste incinerators and is deposited in lakes and rivers, where sediment bacteria convert it into methyl mercury. Methyl mercury is then accumulated in fish and can be introduced into the food chain. It is a very dangerous neurotoxicant and can produce effects in fetuses through the maternal diet (Marsh et al., 1990) and in children by direct food intake. For a complete review of neurotoxicants, see Grandjean & White (2002).

Organic chemicals such as PCBs, polychlorinated dibenzodioxins (PCDDs), and various pesticides can often contaminate water, soil and food. Pesticides include insecticides, herbicides and fungicides. Some of the older pesticides have been designed to be persistent and can therefore be found distributed worldwide in water and soil. Newer pesticides degrade more quickly, but still contaminate water and soil, and consequently food. The effects of PCBs and dioxins, which are very resistant to biological degradation and remain in the environment for decades, have been investigated extensively. The effects of pesticides include neurotoxicity, carcinogenesis, and the potential for immunotoxicity and endocrine disruption (US EPA, 1997; Tirado, 2002; Ribas-Fito et al., 2003). In recent years, such new chemicals as polybrominated diphenyl ethers, phthalates and bisphenol A have become very widespread in the environment, and there are serious concerns about their developmental toxicity.

<sup>3</sup> If the burden of disease due to lead had been estimated separately for urban and rural populations by using the values for blood lead levels in urban and rural areas, the number of DALYs in the European Region would have been higher (about 480 000 DALYs), with Eur-B carrying a higher burden (300 000 DALYs) than Eur-A (40 000 DALYs) and Eur-C (140 000 DALYs).

Arsenic is produced by a variety of activities, such as smelting and coal burning, most of which are encountered more frequently in countries with an intermediate level of development. Arsenic in drinking-water represents the greatest hazard, since its inorganic form is found predominantly in groundwater. Diseases associated with arsenic include cancer of the bladder, kidney, lung and skin, neurological effects, cardiovascular and pulmonary diseases, skin lesions and diabetes (Smith et al., 1992; Smith, Lingas & Rahman, 2000).

Uncontrolled hazardous waste sites include waste storage and treatment facilities, landfills, former industrial sites, military facilities, waste recycling facilities and unsanctioned discharges of wastewater. Some of the substances found at these sites are heavy metals (such as lead, chromium and arsenic) and organic solvents (such as trichloroethylene and benzene). Children may be exposed to these through groundwater, surface water, drinking-water, surface soil, sediments, consumable plants or animals. Studies of communities near hazardous waste sites have reported adverse effects on health. These effects have included such conditions as respiratory illnesses (ATSDR, 1995), low birth weight, congenital defects and a number of neurobehavioural deficits (Savitz et al., 1997). Most studies have included some children in the populations examined, but only a few have focused primarily on the effects on the health of infants and children. A multicentre collaborative study on the risk of congenital anomalies near hazardous waste sites in Europe showed a 33% increase in risk of non-chromosomal anomalies (Dolk et al., 1998). Like most such studies, this one could not provide conclusive evidence of an association. While the evidence so far is insufficient to initiate action to limit exposure, improved study methods, such as the generation of real-time exposure models via computerized geographical information systems, have greater promise in determining whether exposure to site contaminants is associated with harm to health.

Finally, the possible chemical contamination of breast-milk by pesticides, methyl mercury and PCBs requires special mention. Because the risk of such contamination represents a small part of the overall exposure in contaminated areas, avoiding breastfeeding would deprive babies of its many benefits and reduce exposure only slightly. In addition, under certain circumstances, breast-milk substitutes may also be contaminated, owing to inappropriate preparation or contamination of the water needed for dilution. Breastfeeding is an environment-friendly practice, as it saves fuel, which would otherwise be used to produce breast-milk substitutes; does not contribute to waste from the packaging of substitutes; and avoids contamination from plastic softeners and other products from bottles and babies' dummies. In very rare instances, human breast-milk may be so badly contaminated that the duration of breastfeeding should be less than the recommended six months until the risk for babies can be reduced or eliminated.

## **Ionizing and non-ionizing radiation**

Exposure to ionizing radiation and ultraviolet light creates other health hazards. Significant exposure to ionizing radiation from radioactive fallout (such as that from the Chernobyl accident in 1986) and medical diagnostic equipment (X-ray and radioisotopes) is limited to specific settings. Ionizing radiation has greater effects on the health of children deficient in iodine.

Most background radiation comes from radon gas. Exposure to it is quite common in private and public buildings. Radon gas is formed from the radioactive decay of radium, and it enters homes through cracks in the foundations or in the absence of foundations. Exposure to radiation is obviously higher in basements and first-floor flats. Until recently, there were insufficient data to detect an increased risk of lung cancer after lifelong exposure to residential radon. A meta-analysis of eight epidemiological studies (Lubin & Boice, 1997) shows the existence of a linear dose-response relationship detectable down to 4 pCi/L, the level at which remedial action should be taken.

Exposure to the ultraviolet (UV) component of sunlight is widespread, although strongly dependent on latitude and people's sun-protection behaviour. Exposure to UV radiation during childhood is of particular concern, and exposure to sunlight during childhood and adolescence appears to set the stage for the development of both melanoma and non-melanoma skin cancers (IARC, 1992). Light skin colour, freckling in childhood, a history of severe childhood sunburn, and exposure to recreational sunlight in childhood and adolescence have been identified as major risk factors for basal cell carcinoma (Krickler, Armstrong & English, 1994; Gallagher et al., 1995). Exposure to high levels of sunlight and a history of one or more incidents of sunburn during childhood

can significantly increase the risk for melanoma later in life (Westerdahl, Olsson & Ingvar, 1994; Whiteman, Whiteman & Green, 2001). High exposure to the sun during adulthood aggravates this risk (Elwood & Jopson, 1997; Autier & Dore, 1998). Furthermore, an association between the popular habit of artificial tanning in sunbeds and an increased risk of melanoma was found for young people in Sweden (Wester et al., 1999).

Sources of exposure to electromagnetic fields (EMFs) are ubiquitous in houses and public buildings and are common outdoors. They include high-voltage, long-distance transmission lines, distribution lines that bring electricity to homes and a wide variety of electrical appliances, including television monitors, computer games, radios and other electrical equipment. Although an association between childhood cancer and extremely low-frequency (ELF) magnetic fields has been observed, causality remains uncertain. The International Commission on Non-Ionizing Radiation Protection (ICNIRP, 2005), however, does not address this possible effect. IARC (2002) concluded that ELF fields were “possibly carcinogenic”. The published studies found on average a twofold excess of leukaemia in children exposed to magnetic fields greater than 0.4  $\mu$ T. If confirmed, given the present levels of exposure, this excess risk would imply a very small number of extra leukaemia cases in the Region; for example, Sweden would have one extra case per year, according to the estimates.

Less is known about EMFs in the radio-frequency part of the radiation spectrum. A review in 2000 of the evidence on mobile phones, commissioned by the Government of the United Kingdom (IEGMP, 2000), concluded that it was impossible to say that exposure to radio frequency radiation was totally without potential adverse effects on health, that the gaps in knowledge justified a precautionary approach and that widespread use of mobile phones by children should be discouraged.

## Noise

Noise levels exceeding safe thresholds are widespread in neighbourhoods, schools and daycare centres, particularly in urban and suburban areas. They originate from children themselves, toys and equipment inside buildings, and from heavy road traffic, industrial activities, building and road construction or renovation, and nearby railways, roads and airports outside. Noise levels in rooms depend on the rooms’ design and insulation, and acoustics and environmental noise outside.

Children may be more vulnerable to the adverse effects of noise, because they may be exposed to it more frequently, owing to their lack of control of the environment. In addition, they are more susceptible to the impact of noise. Little is known about exposure in very young infants, although preterm babies in intensive care units have been shown to be exposed to many sources of noise.

Exposure in preschool and school-age children has been investigated more extensively. School-age children may be routinely exposed to more noise than the A-weighted<sup>4</sup> equivalent continuous sound pressure for a 24-hour period (LAeq24) of 70 dB(A), while the WHO *Guidelines for community noise* (Berglund, Lindvall & Schwela, 1999) recommend that during lessons the noise measured in a classroom should not exceed 35 dB LAeq.

The effects on health of noise include damage to hearing from high-level noise impulses, which may damage inner-ear hair cells, and from prolonged exposure to sounds louder than 85 dB(A). Hearing loss may be transient or permanent. Situations where hearing is damaged are becoming more common, owing to young people’s increased use of earphones with portable music players and their increased presence in public places with very loud music, such as youth clubs and discotheques.

In children, the most important and common effects of noise are interference with speech, communication and learning during the earliest years (Bistrup & Keiding, 2002). Speech is normally 100% intelligible at background noise levels of about 35 dB(A) and can be understood fairly well at background levels of 50–55 dB(A). Problems arise when the ambient noise is 60 dB(A) or more, corresponding to traffic noise through slightly open windows. The ultimate effects on children are impaired language development and impaired acquisition of reading skills in both early childhood and primary school. These effects are more likely to occur in children who have a hearing impairment or are not familiar with spoken language.

<sup>4</sup> A-weighting is a correction applied to a measured or calculated sound of moderate intensity to mimic the varying sensitivity of the ear to sound of different frequencies.

Background noise may interfere with concentration and sleep, cause psychological stress, contribute to a reduction in cooperative behaviour and trigger aggressive behaviour (American Academy of Pediatrics, 2003).

## **Mobility and transport patterns**

Children's exposure to current mobility and transport patterns, especially in cities, is an example of a complex situation with simultaneous exposure to numerous health hazards to which children are more vulnerable than adults. Effects on health include those resulting from exposure to air pollution outdoors and inside vehicles, noise and road-traffic injuries, as well as those resulting from reduced opportunities for physical exercise and autonomous mobility.

Several studies, summarized in a WHO review (Dora & Phillips, 2000), indicate that children living close to busy roads have an increased risk of about 50% of suffering from respiratory diseases; these studies also suggest an increased risk of childhood leukaemia from exposure to vehicle exhaust, where benzene may be the agent responsible. Because children have a limited perception of and reaction to the dangers of road traffic, they have a higher risk of being involved in road accidents. Every year, traffic accidents kill about 9000 children under 19 years and injure and additional 355 000 in the WHO European Region, accounting for about 10% of the total number of deaths and 15% of injuries, respectively (Dora & Phillips, 2000). Road-traffic accidents are the main cause of death after 14 years of age. The estimated burden of disease for injuries from road-traffic accidents in the Region for people aged under 19 years is 18 241 deaths (5.6 % of all deaths) and 859 495 DALYs (16.8% of all DALYs) (Valent et al., 2004b).

Fearful of traffic accidents, parents restrict their children's freedom to walk and bicycle. This not only contributes to unhealthy levels of inactivity and to obesity in children but also hinders the development of their independence, reduces their opportunities for social contact and establishes attitudes towards the use of cars that continue into adulthood.

Along with unhealthy diets, the lack of physical activity is one of the main risk factors for obesity (Chinn & Rona, 2001). About 20–30% of adults in the European Region are obese, and the rates of obesity in children are escalating, increasing their future risk of cardiovascular diseases (Robertson et al., 2004). The prevalence of overweight and obesity in childhood is rising significantly throughout the Region, as clearly shown by trend data for 10-year-olds (WHO, 2002). For example, the percentage of overweight and obese children increased from 10% in 1991 to 13% in 2000 in the Czech Republic, from 8% in 1994 to 18% in 2000 in Poland and from 3% in 1963 to 16% in 2000 in France. In 1999, Hungary reported that 20% of children aged 11–14 years were obese and that 6% of them suffered from hypertension. In addition, the adoption of sedentary lifestyles in childhood increases the risk of cardiovascular diseases, diabetes and hypertension and, ultimately, premature death.

## **Natural disasters and climate change**

Natural disasters pose a range of health risks. Death, injuries, acute intoxication and post-traumatic stress are the most frequent direct effects, but indirect effects on infrastructure, agriculture, employment, and health and educational services, and forced displacement, are also important. Along with elderly people, children represent a high-risk group for both types of effect.

The effect of climate change has been recently estimated, although not for the various age groups. The direct effects on health include those spawned by heat and cold; changes in aeroallergen levels, the incidence of infectious diseases and food production; and floods and other consequences of extreme weather events (McMichael et al., 2003). WHO (2002) estimated that around 5000 DALYs were attributable to climate change in eastern Europe in 2000.

All of these problems can affect children, and some are particularly relevant to them. For example, climate change may indirectly affect exposures to air pollutants by inducing alterations in weather patterns that could increase or decrease local concentrations of air pollutants, particularly ozone. A change in the pattern of pneumoallergens was recently documented, and can be attributed to climate change. Also, allergy to pollen accounts for 10–20% of allergic disease in Europe. The burden of allergic diseases is related to the length and intensity of the pollen season, the frequency and height of pollen peaks and the allergen load. These factors may be exacerbated by seasonal variations in temperature and precipitation patterns that alter the range of plant species.

Overall the pollen season is expanding; on average, it has increased by 10–11 days over the last 30 years (WHO Regional Office for Europe, 2003c).

Climate change can also modify the incidence of gastrointestinal, respiratory and other infectious diseases. For example, the analyses of the time series of climate patterns and laboratory-confirmed cases of indigenous *Salmonella* infections from a number of countries in the Region found on average a linear association between environmental temperature and the number of reported cases of salmonellosis above a threshold of 6 °C. Increased temperature contributed an estimated 30% of cases of salmonellosis in the majority of countries investigated. Lyme borreliosis – which is now the most common bacterial cause of encephalitis and facial palsy/paralyses in children in several European countries – has spread into higher latitudes and higher altitudes, and temperature change contributes to an extended and more intense transmission season for the disease in some countries.

Perhaps the most important effect of climate change is the enhancement of desertification and droughts, which can affect food production and result in undernutrition. Vulnerable areas in the WHO European Region include the central Asian republics. Children here may be particularly vulnerable to the effects of global and local environmental changes: in 2000 drought and water shortages affected north-western Uzbekistan, particularly the Republic of Karakalpakstan. These climatic extremes struck an area already severely affected, where childhood mortality rates were four times those in the EU.

In the absence of adequate protection, the reduction of the ozone layer is likely to increase the risk of melanoma and non-melanoma skin cancer.

## Occupational risk factors

Currently, several million adolescents are legally employed in the Region. Many others, including children aged as young as 7–8 years, are employed in a variety of activities, such as farm work, commerce and industry, in violation of international codes and national legislation on age limits or safety regulations (ILO, 1996). Migrant children are increasingly used for illegal activities, some of which are extremely dangerous or immediately harmful. Thousands of female and male adolescents are illegally smuggled into many European countries and forced to work in the sex market (ECPAT, 2000). Occupational risk factors faced by children and adolescents include:

- in agriculture: pesticides, fertilizers, tetanus and other infectious agents, injuries, muscular injuries, lack of fixed hours, and zoonoses;
- in building, masonry: injuries, asbestos, silica dust and lead;
- in auto repair: isocyanates, lead and emissions from engines;
- in restaurants: cleaning agents, tobacco smoke, noise, work at night and stress;
- in petrol stations: benzene and lead;
- in carpentry: solvents, formaldehyde, wood dusts and injuries;
- in textiles, dye works and cleaners: benzene, aniline and methanol;
- in leather crafts: chromium;
- in welding: fumes and eye injury;
- in ceramics and glass: lead and silica dust;
- in mining: coal dust, asbestos, mercury, phosphorus and injuries;
- in indoor jobs: dust, noise and injuries, and ergonomic hazards;
- in outdoor jobs: stress from cold and heat, and noise and injuries; and
- in the sex market: sexual abuse, injuries, sexually transmitted diseases and homicide.

Every year, many hundreds of children die in dangerous workplaces, and work activities poison or injure many more, sometimes irreversibly (Parker et al., 1994; Dunn et al., 1998). Young workers face the same workplace hazards as adult workers, but are less experienced and aware of risks, less apt to ask for and comply with safety regulations, and less likely to receive technical training (Woolf & Flynn, 2000). Injuries, for example, are four times as frequent in adolescent than adult workers. Adverse effects on health, too, are both more frequent and more severe, owing to the enhanced sensitivity of developing organisms to toxicants and to injuries, whose results include chronic musculoskeletal trauma and stress (Runyan & Zakes, 2000).

## **Critically adverse social environments**

The interaction of poverty and decreasing family and societal cohesion in many countries tends to increase the number of children facing critically adverse social environments. Children are particularly vulnerable to intrafamilial violence, trauma and stress and to social exclusion. Under these circumstances, the likelihood of child neglect, violence, abuse and exploitation increases strongly.

Over the last decade, deregulation, disruption of social protection systems, migration (particularly of young men and women of child-bearing age, with consequent disruption of families), falling salaries and alcohol abuse have caused serious increases in child neglect and child abandonment, which may affect 1 in 30 newborn babies in the poorest countries in the CIS (UNICEF, 2002). As a consequence, such phenomena as street children, child exploitation and trafficking have appeared in countries where they had been practically unknown. Sexual abuse has been identified in as many as 1 in 10 adolescent boys and girls in some countries in central Europe and the CIS.

Children typically exposed to social and family neglect and to violence and exploitation are more prone to increased exposures to polluted air, unsafe water, inadequate nutrition, toxic chemicals and occupational risk factors. In short, they are at extremely high risk of all the adverse effects on health described above – from malnutrition to severe infection, including HIV/AIDS and other sexually transmitted diseases, and from injuries and poisonings to chronic toxicity and long-latency effects such as cancer – and ultimately disability and premature death. Societies often respond with long-term institutionalization of these children, which adds to the damage already done to them.

Among those most heavily exposed to physical and psychological trauma and disease are children and adolescents forced to work in the sex and pornography market, most of whom have been kidnapped and reduced to slavery.

## **Consequences of armed conflict**

Armed conflict has recently afflicted several areas in the WHO European Region, and continues in some. Conflict directly produces a high burden of deaths, injuries and post-traumatic stress disorders, some of which specifically affect children, such as injuries caused by land-mines. To this must be added the long-term residue, such as loss of parents, destruction of basic health and education infrastructure, loss of homes and assets, and forced displacement. These increase the risk of disease, neglect, orphanhood, missed opportunities for basic health care and education, and impaired growth and development.

Conflict caused 2348 deaths and 155 000 lost DALYs among people aged 0–19 years in the WHO European Region in 2002 (WHO, 2002).

## **Summary: effects of main environmental risk factors on children's health**

The effects on health of exposure to environmental risk factors are not completely known. Table 3 summarizes those discussed in this chapter, providing estimates for the burden of disease where they have been made.

In some instances, causal relationships still need research. Even when such a relationship is clearly established, the magnitude of the effect on health may not be known, given the multifactorial nature of most human diseases and the difficulty of establishing the exact contribution of each factor to a particular effect. Also, exposure and risk differ in various developmental stages and are unequally distributed across countries, social groups and communities. Given these limitations, Table 4 provides a summary view of the main effects on health that result from exposure to the environmental risk factors that have been discussed in this chapter. It shows the strength of the associations identified.



Table 3. Summary table: main environmental risk factors, their risks to children's health and the burden of disease

Risk factor	Main health risks	Age group (years)	Burden of disease	
			Deaths (% of total)	DALYs (% of total)
Indoor air pollution	Increased incidence and severity of respiratory disorders, such as acute lower respiratory tract infections, bronchitis and asthma Adverse outcomes of pregnancy, such as low birth weight and congenital malformations In adult life, such effects as chronic respiratory disease and lung cancer Mucocutaneous irritation, headache and discomfort	0–4	9845 (4.6)	340 818 (3.1)
Outdoor air pollution	Increased incidence and severity of respiratory disorders, such as acute lower respiratory tract infections, bronchitis and asthma Long-term effects: chronic respiratory effects and cancer Prenatal effects leading to low birth weight	0–4	3861–13 796 (1.8–6.4)	–
Inadequate water and sanitation	Increased incidence and severity of waterborne diseases, mainly gastrointestinal Indirect effects: impaired growth due to repeated infections and gastrointestinal disorders	0–14	13 548 (5.3)	549 940 (3.5)
Inadequate nutrition	Increased incidence and severity of infectious diseases Low birth weight and growth retardation Reduced cognitive development and impaired learning Iodine deficiency Iron-deficiency anaemia Congenital anomalies Overweight and obesity	0–15	32 000	1 650 000
Contaminated foods	Gastrointestinal diseases and other infectious foodborne diseases	–	–	–
Inadequate building standards and unsafe play materials	Injuries Acute poisoning Increased incidence of respiratory diseases, including allergy and asthma Chronic (neurotoxicity) and long-latency (cancer) effects	–	–	–
Hazardous chemicals	Acute toxicity: lead or organophosphate poisoning, methaemoglobinaemia Chronic neurotoxicity: lower IQ, neurodevelopmental disorders, cancer Reproductive disorders, including birth defects Cancer	–	–	–
Radiation	Melanoma and other skin cancers in adulthood Thyroid cancer in iodine-deficient children from large-scale radiation accidents	–	–	–
Noise	Acute effects: hearing loss Sleep and behaviour disturbances Long-term effects: impaired learning and language development	–	–	–

Table 3. (contd.)

Risk factor	Main health risks	Age group (years)	Burden of disease	
			Deaths (% of total)	DALYs (% of total)
Transport/ Mobility	Injuries	0–18	18 241 (5.6) <sup>a</sup>	859 495 (16.8) <sup>a</sup>
	Overweight and obesity			
	Long-term effects: increased risk of cardiovascular diseases			
	Psychological impact from reduced autonomous mobility and effects of noise			
Natural disasters and climate change	Consequences of floods and droughts: drowning, injuries and undernutrition	–	–	–
	Re-emergence of vector-borne diseases			
	Changing patterns of allergic sensitization			
Child labour	Melanoma and other skin cancers in adulthood			
	Injuries at the workplace	–	–	–
	Acute and chronic poisoning			
	Respiratory disorders			
	Cancer			
Critically adverse social environment	Chronic musculoskeletal disorders			
	Injuries	–	–	–
	Psychological trauma			
	Acute and chronic infections			
	Impaired physical growth and development			
Armed conflict	Neurodevelopmental disorders			
	Injuries	0–19	2348	155 000
	Psychological trauma			
	Acute and chronic infections			
Impaired growth and development				

<sup>a</sup> Data refer to road-traffic accidents only.

Sources: Valent et al. (2004a, 2004b) and WHO (2002).

Table 4. Health effects and exposure to environmental risk factors: whether the association is strong and based on sound epidemiological studies (A) or still inconclusive and based on general and indirect inferences (B), and semiquantitative estimates of the overall burden of disease

Risk factors	Respiratory diseases, including asthma	Diarrhoeal diseases	Neuro-developmental disorders and cognitive impairment	Physical growth, including stunting and obesity	Cancer	Cardiovascular diseases, including adult life	Injuries	Overall burden of disease <sup>a</sup>
Indoor air pollution	A				B			High
Outdoor air pollution	A				B			High
Inadequate water and sanitation		A		B				High
Inadequate nutrition	A	A	A	A		A		High
Contaminated foods		A						Moderate
Unsafe buildings and play materials	A				B		A	High
Hazardous chemicals			A		A			High
Radiation					A			Moderate
Noise			A				A	Moderate
Transport/Mobility	A			A		B	A	High
Natural disasters				B			B	Moderate
Child labour	B		B	B	B		A	High
Adverse social environment	A	A	A	A		B	B	High
Armed conflict			A	B			A	High

<sup>a</sup> High refers to at least 2% of all deaths or of all DALYs in any group among those aged 0–19 years in at least one subregion of the WHO European Region; moderate refers to any deaths or DALYs less than that, or to instances where available information on burden of disease is lacking.

## **Part II.**

# **Towards national action plans**



# 4. Tables of child-specific actions

## Scope and objectives

In this chapter, Tables 5–10 offer guidance to national and local health and environment authorities in developing CEHAPs that address their priorities and needs. The tables were developed with contributions from Member States, international agencies and NGOs, and include actions that have been proven to be effective in protecting children's health and environment. The reader should note that the evidence for taking action in one or a few countries may not necessarily apply to all, and the importance of taking account of many factors, including a country's needs, priorities, resources and institutional context (including the distribution of responsibilities between national and local authorities), as these will greatly influence the extent to which and level at which such actions will be applicable in different countries.

Consequently, the reader should not view these tables as a set of recommendations, but as a menu of possible actions from which national and local authorities can select the most appropriate and feasible combination for inclusion in their plans. Moreover, the tables are expected to be reviewed in the light of new evidence and experience, which will most likely lead to the addition of new actions. A revised version of these tables will therefore be prepared for the meeting to review progress in 2007, using the experience gained from implementing country CEHAPs.

## Structure and terminology

The tables of actions address the main environmental health risk factors covered by the four regional priority goals in the CEHAPE (see Annex 1), and others that fall outside these goals. The actions are grouped by risk factor under the four regional priority goals and are presented by objectives. This gives Member States the flexibility to assess their particular situations, and decide which tasks need attention first, depending on the extent of each problem. Although every attempt has been made to group the environmental risk factors under the relevant goal, actions overlap in some cases. For example, many of the actions proposed to decrease exposure to indoor and outdoor air pollution appear under Regional Priority Goal III, while others appear under Regional Priority Goal II, which addresses the risk factors related to mobility and transport and to inadequate building and construction standards and materials.

The term *children* includes prenatal exposures, and is meant to cover people aged 0–19 years. The settings for action range from the home and surrounding environment to the school, child-care centre and/or workplace.

## Six categories of action

To facilitate identification of the responsible sector(s) in the development of country CEHAPs, the actions have been grouped into six categories; a code letter indicates each in the tables:

Category of action	Code letter
Passing and enforcing legislation	L
Promoting educational programmes and health	E
Promoting active involvement of relevant stakeholders: children, caregivers, health care providers, educators	P
Building knowledge through research, sharing experience and taking action (case studies)	K
Monitoring environmental exposures	M
Improving service delivery and infrastructure	S

Some actions may be the responsibility of national and local authorities other than those responsible for the environment and health, so that implementation may require intersectoral collaboration. In these cases,

as emphasized in the CEHAPE, the role of environment and health authorities is to advocate actions that are outside the scope of their authority.

Tables 5–8 cover the proposed actions that may be useful in addressing the environmental health risk factors that are covered by the four regional priority goals in the CEHAPE and on which Member States agreed to work together. Table 9 presents additional risk factors and corresponding actions. Finally, Table 10, on cross-sectoral issues, groups the previously displayed risk factors under the headings of injuries and urban environments, to provide policy-makers with examples of how to address issues in a multisectoral manner.

### Three types of evidence

This book makes an initial attempt to classify the actions by the type of evidence available to support them. The WHO secretariat, in consultation with eight outside experts, classified the actions listed in Tables 5–9. The results of this initial classification show that the experts often had conflicting views about the evidence base available for the actions proposed, as can be seen by the differences in evidence ratings for each action. The reviewers did not classify actions that were outside their area of expertise, so the ratings vary in number (one is given for each reviewer involved) or include the term *not applicable*. Owing to time constraints, no classification was made of the evidence on the cross-sectoral actions (Table 10), but this will be done later. Many of the actions in Table 10, however, are already present in other tables, in which they were reviewed and classified. For these reasons, and given the evolving nature of the evidence that supports the proposed actions, the process of evaluating the evidence base for CEHAPE actions will continue.

Actions have been classified according to three types of evidence available to support them, on the basis of the criteria summarized below. They are listed in decreasing order of strength.

**Type 1** is evidence that has undergone rigorous scientific evaluation (systematic reviews, randomized controlled trials) and refers to action that has been proven to be effective in achieving a reduction in exposure or an improvement in health outcome. Such evidence supports, for example, action to improve access to water, sanitation and hygiene, which has been proven to be very effective in reducing the incidence and severity of diarrhoeal diseases in children.

**Type 2** is evidence that is based on successful experience in one or more countries, but may not have undergone rigorous scientific evaluation. In several cases, such evaluation is not easy and may not be possible, owing to the multifactorial nature of the intervention and the measurable outcomes. Such evidence supports, for example, the plans implemented in several countries to reduce road-traffic accidents or to improve the safety of buildings.

**Type 3** is used where scientific data remain insufficient to make conclusive statements about the effectiveness of particular actions. This type of evidence relates to hazards with poorly established effects, as in the current debate on the effects on children's health of exposure to phthalates. To avoid possible severe and irreversible effects on health, however, a precautionary approach is proposed.

## Regional Priority Goal I: safe water and adequate sanitation

Regional Priority Goal I (Table 5) is to prevent and significantly reduce the morbidity and mortality that arises from gastrointestinal disorders and other adverse effects on health. This aim will be achieved by ensuring that adequate measures are taken to improve access to safe and affordable water and adequate sanitation for all children. Also, the Goal will be achieved in accordance with the commitments made in the Millennium Development Goals (United Nations, 2000b) and the WSSD Plan of Implementation (United Nations, 2003).

Table 5. Regional Priority Goal I

Risk factor	Objective	Code	Action	Type of evidence
Poor water supply and inadequate sanitation	Improve children's access to sufficient quantities of safe and good-quality water	L	Ensure that the setting of child-specific targets is included in national measures to implement the Protocol on Water and Health	1,1,NA, <sup>a</sup> NA
		L	Enact/Enforce legislation to ensure that all public buildings where children spend time have access to safe water	1,1,1,2
	Improve children's access to basic sanitation	L	Enact/Enforce legislation to ensure that all public buildings where children spend time have access to a basic sanitation infrastructure	1,1,1,2
		S	Develop programmes to improve the access of all private homes to safe water and a basic sanitation infrastructure	1,1,1,1,1
	Increase children's and caregivers' awareness of the importance of water quality for health and of appropriate hygienic practices	E	Educate caregivers, school administrators, teachers and children on the importance of water quality for health and of appropriate hygienic practices	1,1,1,1,1
		L	Ensure disposal of wastewater away from play areas, schools, recreational areas and public beaches	1,1,1,2

<sup>a</sup> NA = not applicable.

## Regional Priority Goal II: injury prevention and supportive environments

Regional Priority Goal II (see Table 6) aims to prevent and substantially reduce accidents and injuries and to pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure and supportive human settlements for all children. This section addresses the overall mortality and morbidity due to external causes in children and adolescents.

Table 6. Regional Priority Goal II

Risk factor	Objective	Code	Action	Type of evidence
Mobility and transport <sup>e</sup>	Increase road safety for children	L,E	Promote and enforce the use of safety devices (such as seat-belts, child car seats, safer car fronts and bicycle helmets) for children using the roads	1,1,1,1,1
		L	Enact/Enforce legislation to reduce speed limits and use traffic-calming measures around schools, to achieve appropriate vehicle speeds	1,1,1,1,2
		E	Provide road safety education, particularly to increase drivers' awareness of children	1,1,2,2
		E	Provide skill training and education on road safety and use of public transport for school-age children	1,1,2,2,2
	Promote safe and autonomous mobility of children	L,S,E	Develop infrastructure and implement programmes to promote safe walking and bicycling to school	1,2,2,2,2
	Integrate children's needs in planning of human settlements, transport and infrastructure	S,E,K	Promote sustainable modes of transport (such as walking, bicycling and the use of carpools) and develop mobility-management plans that take account of the specific needs of school-age children	1,2,2,2,2
		P	Facilitate the participation of children and their caregivers in urban and transport planning processes	3,NA,NA,NA
	Promote physical activity	E	Improve physical activity programmes in school curricula	1,1,1,1,1
		E	Promote physical activity for children in the community	1,1,1,1,1
		S	Provide safe and accessible facilities for social interaction, play and sports for children	1,2,2,NA
Increase policy-makers' and communities' awareness of the health effects, costs and benefits related to transport, with a particular focus on children	K	Promote assessment of the health effects, costs and benefits related to transport, with a particular focus on children	2,3,NA,NA,NA	
	K	Incorporate the evaluation of health costs in decision-making and planning for transport and infrastructure	2,3,NA,NA,NA	



<b>Risk factor</b>	<b>Objective</b>	<b>Code</b>	<b>Action</b>	<b>Type of evidence</b>
Inadequate building and construction standards and materials	Prevent and reduce children's exposure to unhealthy and unsafe building standards and materials	S	Ensure that public buildings where children spend time meet health and safety requirements (for cold, heat, humidity, light, and the risks of falls, electric shocks and fires)	1,2,2,2
		S	Develop programmes to improve the health and safety requirements of private homes	1,2,2,2,NA
		L	Enact/Enforce legislation on safety requirements around swimming pools, such as installation of fencing and gates, and use of personal flotation devices	1
		S	Ensure the adoption, implementation and quality of local programmes to prevent water-related deaths, including those to provide education and foster awareness	2

<sup>a</sup> Many actions listed under mobility and transport were assessed by a multilateral case study of Austria, France, Malta, the Netherlands, Sweden and Switzerland for the WHO/UNECE Transport, Health and Environment Pan-European Programme (THE PEP) (BMLFUW, 2004).

### Regional Priority Goal III: reduced disease from air pollution

Regional Priority Goal III (Table 7) aims to prevent and reduce respiratory disease due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks. The aim is to ensure that children can live in an environment with clean air, and to achieve a substantial reduction in the morbidity and mortality from acute and chronic respiratory disorders in children.

Table 7. Regional Priority Goal III

Risk factor	Objective	Code	Action	Type of evidence
Indoor air pollution	Prevent and reduce exposure of children and pregnant women	S	Develop programmes to make available to households healthier cooking and heating systems and safer fuels	1,2,2,2,NA
		L	Ban smoking in public areas, especially schools and health facilities	1,1,1,1
		L,E	Enforce Article 12 of the Framework Convention on Tobacco Control (WHO, 2005) on promotion of effective and appropriate training or sensitization and awareness programmes on tobacco control	1,1,NA,NA
		E	Educate caregivers, health care providers and school personnel on ways to prevent or reduce children's exposure to indoor air pollution (pollutants from cooking and heating systems, indoor allergens and ETS)	1,2,2,NA
		M	Include questions about children's exposure to indoor air pollution in health and household surveys	2,NA,NA,NA,NA
Outdoor air pollution	Prevent and reduce exposure of children and pregnant women	L	Define and ensure implementation of minimum requirements for indoor air quality in schools and in public buildings where children spend time	1,2,2,2,2
		L	Establish pollution-free school zones, by limiting the access of vehicles, especially those with diesel engines, and by restricting the placement of pollution-emitting sources	2,2,2,2
		E	Raise awareness of/Educate schoolteachers, parents and children about the hazards of outdoor air pollution and levels of air pollution from harmful chemicals, including protective measures for days with high levels of smog	2,2,3,NA
		L,M	Establish monitoring and smog-alert systems in cities to inform caregivers and school personnel when high levels of outdoor air pollution present a risk	2,2,2,3
		P	Involve children, schools and communities in advocating and disseminating information on clean-air policies	NA,NA,NA,NA

## Regional Priority Goal IV: reduced risks from chemical and physical agents

Regional Priority Goal IV (Table 8) is a commitment to reduce the risk of disease and disability that arises from exposure to hazardous chemicals (such as heavy metals), physical agents (such as excessive noise) and biological agents, and hazardous working environments, during pregnancy, childhood and adolescence. This goal aims to reduce the proportion of children with birth defects, mental retardation and developmental disorders, and to decrease the incidence of melanoma and non-melanoma skin cancer in later life and of other cancers in childhood.

Table 8. Regional Priority Goal IV

Risk factor	Objective	Code	Action	Type of evidence
Hazardous chemicals	Protect children and adults in the reproductive period from exposure to hazardous chemicals	L	Enact/Enforce legislation on the content of lead in petrol and building materials, to protect children from exposure to lead	1,1,1,1
		M	Monitor the chemical contaminants of water and soil that are most hazardous to children, such as heavy metals, organochlorine pesticides and PCBs	1,2,2,NA
		L	Enact/Enforce regulations to minimize risks from hazardous building materials, such as lead, asbestos, wood preservatives (particularly creosote and arsenic), polybrominated flame retardants and volatile organic compounds	1,1,1,2,2
		E	Develop, provide and update dietary recommendations to limit intake of mercury, PCBs and PCDDs for at-risk women of childbearing age	1,1,2,2,2
		M	Biomonitor lead, PCBs and organochlorine pesticides in at-risk infants and mothers	1,1,1,2,NA
		M	Monitor reproductive health indicators, including birth weight, congenital malformations and time to pregnancy, to detect potential hazards to reproductive health	1,1,2,3
		L	Enact/Enforce legislation to establish safety thresholds for the workplace, to protect people in the reproductive period from chemicals harmful to the reproductive system	1,1,1,3
		L	Taking account of the most up-to-date literature, consider the use of alternatives to phthalates (such as di(2-ethylhexyl) phthalate), in medical equipment such as catheters and endotracheal tubes, particularly for long-term use in children	1,2,3,3,3
		L	Enact/Enforce legislation to protect children from exposure to hazardous chemicals in toys and other products	1,2,3,NA
		E	Educate caregivers, teachers and children on the prevention of accidents, including acute poisoning	1,2,2,2,3
L	Enact/Enforce legislation on the use of childproof safety caps on medications and household cleaning agents	1,1,1,1,2		
L	Ensure that the Stockholm Convention, <sup>a</sup> the Basel Convention <sup>b</sup> and Rotterdam Convention <sup>c</sup> are applied	1,NA,NA,NA		

Table 8. (contd)

Risk factor	Objective	Code	Action	Type of evidence
Noise	Prevent and reduce exposure to hazardous and disruptive noise and noise-related injuries	L	Ensure the safe collection, storage, transportation, recovery, disposal and destruction of non-hazardous and hazardous waste, with particular attention to toxic waste	1,1,2,3
		E	Raise awareness of/Educate caregivers about preventing children from playing around waste sites	1,2,2,3
		L	Enact/Enforce legislation on the composition, labelling and information for the public on do-it-yourself products and materials, taking account of the risks to children's health	2,2,2,3
		M	Monitor noise and exposure to noise in public buildings where children spend time	1,2,2,NA
		S,E	Incorporate measures to reduce exposure to noise in urban planning and infrastructure planning, considering the needs of school zones	1,2,2,2
		E	Educate parents, students and school personnel about hazards of individually controllable and other sources of noise	2,2,NA,NA
Occupational risks	Prevent and reduce exposure to hazardous working conditions and reduce injuries in the workplace	S	Implement preventive infrastructure measures, such as proper insulation of buildings where children study and sleep, to protect them from noise	2,2,2,2
		L	Ratify International Labour Organization (ILO) Convention 182 <sup>d</sup> on the worst forms of child labour, including "Determination of hazardous types of work"	1,1,NA,NA
		L,E	Create programmes to raise awareness and enact legislation to eliminate hazardous forms of child labour or remove children from hazardous working conditions	1,1,1,2
		L	Ensure the protection of adults from reproductive risks arising from hazardous working conditions	1,1,1,3
		E	Promote awareness among employers of workplace safety and the specific occupational risks to children and adolescents	2,2,2,3
E	Promote awareness among young working people of their safety rights, injury prevention in the workplace and the occupational risks present in various forms of work	2,2,2,3		

Risk factor	Objective	Code	Action	Type of evidence
Non-ionizing radiation	Reduce exposure to ionizing radiation	L	Enact/Enforce legislation to ensure that diagnostic radiation reference levels are not exceeded, to protect children and people in the reproductive period from ionizing radiation	1,1,2,2,NA
		S	Develop programmes to prevent or alleviate the consequences of major accidents at nuclear power plants, taking into consideration the needs of children and people in the reproductive period	1,2,2,2,3
	Reduce exposure to radon	M	Monitor radon levels in public buildings where children spend time	1,2,2,3
	L	Establish and enforce construction standards and promote remedial measures to minimize exposure to radon	1,2,2,3	
Ionizing radiation	Reduce exposure to UV radiation	S	Provide year-round information to the public on the level of UV risk	1,2,2,2,3
		E	Educate children, caregivers and school personnel about the hazards of excessive exposure to the sun and ways of reducing exposure	1,1,2,2,3
	Reduce exposure to EMFs	L	Taking account of the most up-to-date literature, consider the application of prudent avoidance policies to reduce exposure to EMFs	2,3,3,3
	E	Educate children, caregivers and teachers about the desirability of limiting exposure to EMFs in childhood, particularly that associated with the use of mobile phones	2,3,3,3	
	L	Enact/Enforce legislation on safety thresholds and basic restrictions on nonionizing radiation, as established by ICNIRP	2,3,3,NA	

<sup>a</sup> The Stockholm Convention (UNEP, 2001) is a global treaty to protect human health and the environment from POPs: chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to human beings and wildlife. POPs circulate globally and can cause damage wherever they travel. In implementing the Convention, governments will take measures to eliminate or reduce the release of these pollutants into the environment.

<sup>b</sup> The Basel Convention (Secretariat of the Basel Convention, 2005) is a global treaty that aims to protect human health and the environment by minimizing hazardous waste production, whenever possible, through environmentally sound management. Such management means addressing the issue through an integrated life-cycle approach, which involves strong controls from the generation of hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal.

<sup>c</sup> The Rotterdam Convention (United Nations, 1988) makes the prior informed consent procedure legally binding. The Convention establishes a first line of defence by giving importing countries the tools and information they need to identify potential hazards and exclude chemicals that they cannot manage safely. If a country agrees to import chemicals, the Convention promotes their safe use through labelling standards, technical assistance and other forms of support. It also ensures that exporters comply with the requirements.

<sup>d</sup> ILO Convention 182 (ILO, 1999) concerns the prohibition and immediate action for the elimination of the worst forms of child labour.

## Additional environmental health risk factors

Table 9 covers the additional environmental health risk factors to be considered for action. Links still need to be established at the national level with other action plans, such as the WHO First Action Plan for Food and Nutrition Policy (WHO Regional Office for Europe, 2000).

Table 9. Additional environmental health risk factors to be considered for action

Risk factor	Objective	Code	Action	Type of evidence
Food contamination	Improve infant and child food safety	M	Develop programmes and databases to monitor microbiological and chemical contamination of foods for risk assessment	1,1,2,2,3
		M,K	Develop toxicological tests to assess perinatal and childhood toxicity (address developmental neurotoxicity and the functioning of the endocrine, reproductive and immune systems)	Unavailable
		M	Monitor chemical contamination of food for children and monitor their total diet, as well as data on POPs in breast-milk	Unavailable
		L	Enact/Enforce legislation to ensure that the hazard analysis critical control point (HACCP) <sup>a</sup> system is applied to foods produced for infants and young children	1,2,NA,NA
		E	Educate food handlers and family members, particularly children, about the principles of food safety	1,2,2,3
		L	Enact/Enforce legislation that ensures limits on chemicals, food additives, pesticides and contaminants, particularly in foods for infants and young children, and takes account of cumulative and aggregate exposure	1,2,2,NA
		L	Enact/Enforce legislation to ensure appropriate labelling of foods for infants and young children	2,3,3,NA,NA
Dietary intake	Improve the quantity and quality of dietary intake	E	Educate caregivers, health care providers and school personnel about adequate dietary intake for infants, children, adolescents and pregnant women (including appropriate energy and micronutrient levels)	1,1,2,2,2
		L	Enact/Enforce measures that encourage consumers to select healthy food options and the food industry to make such foods available to children, particularly in schools	2,2,2,2
		S	Provide nutritionally balanced school meals for children	1,1,1,1
		S,L	Ensure fortification of appropriate food vehicles with iodine, iron, vitamin D, and similar supplements, according to national or subnational needs	1,1,1,1
		E	Provide mothers with access to skilled support to initiate and sustain exclusive breastfeeding for 6 months and the timely introduction of adequate and safe complementary foods, with continued breastfeeding up to 2 years or beyond (WHO, 2003a)	1,1,1,2

Risk factor	Objective	Code	Action	Type of evidence
Natural and man-made environmental disasters	Develop plans for emergency preparedness	M	Establish systems for systematic monitoring of child height and weight, using international standards, including body mass index	1,1,1,2
		S,E	Develop disaster plans and educational programmes that take account of the needs of infants, young children and particularly pregnant women	2,2,2,NA
		E	Educate children about preparedness for natural disasters, such as earthquakes, floods and other extreme weather events, as well as man-made disasters	2,2,2,NA
Critically adverse social environments	Improve protective policies for highly vulnerable children, such as poor children, orphans and refugees	S,L	Develop programmes to reduce child abandonment	2,3,3,3,3,NA,NA
		S,L	Develop programmes to encourage alternatives to institutionalization (foster care and adoption)	2,3,3,3,NA,NA
		S,L	Develop programmes to eliminate the phenomenon of street children	2,3,3,3,NA,NA
		S,L	Ensure access for all children (including migrants, asylum seekers and unaccompanied children) to preventive and curative health services and to social protection services	2,2,3,3,NA,NA
Direct and indirect consequences of armed conflict	Reduce or alleviate the consequences of armed conflict for children	S	Establish mine-removal programmes in at-risk areas	1,1,1,NA
		E	Provide education on land-mine risk	1,2,2,2
		E	Develop specific programmes on psychosocial relief for children and caregivers	1,2,3,NA
		S	Give priority in reconstruction programmes to infrastructure relevant to children, such as schools and child-care centres	2,3,NA,NA

<sup>a</sup> HACCP is the universally recognized and accepted method to ensure food safety; for further information, see the WHO headquarters web site ([http://www.who.int/foodsafety/fs\\_management/haccp/en](http://www.who.int/foodsafety/fs_management/haccp/en), accessed 15 February 2005).

## Cross-sectoral issues

Member States may wish to develop comprehensive plans that address cross-sectoral issues. To facilitate the development of such plans, Table 10 offers two examples: protecting children from injuries and promoting child-friendly urban environments. Owing to time constraints, the types of evidence supporting these actions were not classified; this will be done later.

Table 10. Addressing cross-sectoral issues: examples of comprehensive plans

Issue	Main objective	Code	Action
Protecting children from injuries	Prevent and reduce children's exposure to unhealthy and inadequate building standards and materials	M	Systematically collect data on home, school and leisure injuries in national registers
		S	Ensure that public buildings where children spend time meet health and safety requirements for cold, heat, humidity, light, and the risk of falls, electric shocks and fires
	Prevent and reduce injuries from accidents at home	S	Develop programmes to improve the health and safety requirements for private homes
	Prevent and reduce poisoning	E	Provide education to caregivers, teachers and children on the prevention of accidents, including acute poisoning
		L	Enact/Enforce legislation on use of childproof safety caps on medications and household cleaning agents
	Prevent and reduce injuries from inadequate building standards, materials and recreational environments	E	Develop programmes to educate parents and children on the prevention of accidents, injuries and poisoning
		L	Enact/Enforce legislation on playgrounds (for example, on materials used, equipment standards, condition of equipment and distances from roads) to decrease childhood injuries
	Prevent and reduce injuries from burns	L	Enact/Enforce legislation to impel the use of smoke alarms and the practice of regular fire drills
		E	Educate children, caregivers and teachers to raise their awareness of the hazards of excessive exposure to the sun and the need to prevent sunburn
		L	Enact/Enforce legislation to eliminate the use of flammable material and drawstrings in clothing for infants and young children
	Prevent and reduce exposure to hazardous and disruptive noise and noise injuries	M	Monitor noise and exposure to noise in public buildings where children spend time
		S,E	Incorporate measures to reduce exposure to noise in urban and infrastructure planning, considering the needs of school zones
E		Educate parents, students and school personnel about the hazards from individually controllable and other sources of noise	
S		Implement preventive infrastructure measures, such as proper insulation of buildings where children study and sleep	



Issue	Main objective	Code	Action
	Increase road safety for children	L,E	Promote and enforce the use of safety devices (such as seat-belts, child car seats, safer car fronts and bicycle helmets) for children using the roads
		S	Reduce speed limits and use traffic-calming measures around schools
		E	Provide education on road safety, particularly to increase drivers' awareness of children
		E	Provide education on road safety and use of public transport for school-age children
	Promote safe and autonomous mobility for children	L,S,E	Develop infrastructure and implement programmes to promote safe walking and cycling to school
	Prevent and reduce deaths from drowning	L	Enact/Enforce legislation on safety requirements around swimming pools, such as fencing, gates and use of personal flotation devices
		E	Promote swimming lessons for children
		S	Ensure the adoption, implementation and quality of local programmes to prevent water-related deaths, including those that provide education and foster awareness
	Prevent and reduce injuries from natural disasters	S,E	Develop disaster-preparedness plans and educational programmes that take account of the needs of infants, young children and particularly pregnant women
		E	Educate children about emergency preparedness for natural disasters, such as earthquakes and floods
	Prevent and reduce the consequences of accidents at nuclear power plants	S	Develop programmes to minimize the long-term consequences of major accidents, such as that at Chernobyl, taking into consideration the needs of children and people in the reproductive period
	Prevent and reduce injuries that result from war, land-mines and violence in schools	S	Develop specific programmes on psychosocial relief for children, parents and teachers
		S	Give priority in reconstruction programmes to infrastructure relevant to children, such as schools, child-care centres and orphanages

Table 10. (contd)

Issue	Main objective	Code	Action
Promoting child-friendly urban environments	Improve children's access to sufficient quantities of safe and high-quality water	L	Enact/Enforce legislation to ensure that all public buildings where children spend time have access to safe water
	Improve children's access to basic sanitation	L	Enact/Enforce legislation to ensure that all public buildings where children spend time have access to a basic sanitation infrastructure
	Increase children's and caregivers' awareness of the importance of water quality for health and appropriate hygienic practices	E	Educate caregivers, school administrators, teachers and children on the importance of water quality for health and of appropriate hygienic practices
		L	Ensure disposal of wastewater away from play areas, schools, recreational areas and public beaches
	Prevent and reduce exposure to outdoor air pollution	L	Establish pollution-free school zones by limiting the access of vehicles, especially those with diesel engines, and restricting the placement of pollution-emitting sources
		E	Raise awareness of/Educate schoolteachers, parents and children about the hazards of outdoor air pollution and levels of air pollution from harmful chemicals, and about protective measures for days with high levels of smog
		L,M	Establish monitoring and smog-alert systems in cities to inform caregivers and school personnel when high levels of outdoor air pollution present a risk
		P	Involve children, schools and communities in advocating and disseminating information on clean-air policies
		S	Ensure that public buildings where children spend time meet health and safety requirements for cold, heat, humidity, light, and risks of falls, electric shocks and fires
	Prevent and reduce children's exposure to unhealthy and inadequate building standards and materials	S	Develop programmes to improve the health and safety requirements for private homes
		E	Educate caregivers, teachers and children on the prevention of accidents, including acute poisoning
	Prevent and reduce exposure to hazardous and disruptive noise and noise injuries	L	Enact/Enforce legislation on the use of childproof safety caps on medications and household cleaning agents
		M	Monitor noise and exposure to noise in public buildings where children spend time
		S,E	Incorporate measures to reduce exposure to noise in urban and infrastructure planning, considering the needs of school zones
		E	Educate parents, students and school personnel about hazards from individually controllable and other sources of noise
		S	Implement preventive infrastructure measures, such as proper insulation of buildings where children study and sleep

Issue	Main objective	Code	Action
	Promote safe and autonomous mobility of children	L,S	Enact/Enforce legislation to develop infrastructure and implement programmes to promote safe walking and bicycling to school
		E	Improve physical-activity programmes in school curricula
		E	Promote physical activity for children at the community level
		S	Provide safe and accessible facilities for social interaction, play and sports for children
	Integrate children's needs in planning of human settlements, transport and infrastructure	L,S	Promote sustainable modes of transport such as walking, bicycling and the use of carpools, and develop mobility management plans that take account of the specific needs of school-age children
		P	Facilitate the participation of children and their caregivers in urban and transport planning processes
	Increase awareness of policy-makers and communities of the health effects, costs and benefits related to transport, with a particular focus on children	K	Promote the assessment of the health effects, costs and benefits related to transport, with a particular focus on children
		K	Incorporate the valuation of health costs in decision-making and planning for transport and infrastructure
	Promote physical activity	E	Improve physical-activity programmes in school curricula
		E	Promote physical activity for children and adolescents at the community level
		S	Provide safe and accessible facilities for social interaction, play and sports for children and adolescents
	Promote safe mobility and, in particular, increase road safety	L,E	Promote or enforce the use of safety devices (such as seat-belts, child car seats, safer car fronts and bicycle helmets) for children using the roads
		L	Reduce speed limits and use traffic-calming measures around schools
		E	Provide education on road safety, particularly to increase drivers' awareness of children
		E	Provide education on road safety and use of public transport for school-age children

## 5. International support for CEHAPs

### **The European Environment and Health Committee (EEHC)**

Achieving national and global health objectives requires new resources and unprecedented cooperation among multilateral agencies, national authorities, communities, the private sector and other stakeholders (WHO, 2003b). This cooperation ensures that governments of Member States are appropriately equipped to draft and implement national CEHAPs and transnational policies. Making use of organizations or alliances that already provide international support is important.

The WHO Regional Office for Europe plays an important role in facilitating, promoting and coordinating such international cooperation. It provides opportunities for interested Member States to come together to share experiences and exchange good practices on a regular basis. It has invested considerable human and financial resources in the process of improving the environment and health by acting as secretariat for the EEHC, providing information and technical support, and facilitating international partnerships.

The EEHC (2005), a unique coalition of representatives of countries, intergovernmental organizations and international civil society in the WHO European Region, brings together different actors – including representatives of health and environment ministries, intergovernmental and international organizations, and civil-society organizations – to pursue a common agenda. It served as the steering committee in preparations for the third and fourth ministerial conferences on environment and health. The EEHC not only coordinates and implements the outcomes of the environment and health process, such as the CEHAPE, but also facilitates and promotes partnerships with relevant stakeholders and promotes intersectorality in the field of environment and health, which leads to sustainability.

Before the Fourth Ministerial Conference on Environment and Health, the EEHC included eight members that represented countries: the four who represented the health sector were elected by Member States at a session of the WHO Regional Committee for Europe and the other four were elected by the UNECE Committee for Environmental Policy. The international and intergovernmental organizations represented on the EEHC were the EC (the directorates-general for Health and Consumer Protection and the Environment), the European Environment Agency (EEA), ILO, the Organisation for Economic Co-operation and Development (OECD), the Regional Environmental Centre for Central and Eastern Europe (REC), UNECE, the United Nations Environment Programme (UNEP), the United Nations Children's Fund (UNICEF), the World Bank and WHO. The civil-society organizations represented on the EEHC were the European ECO-Forum, the European Public Health Alliance (EPHA), the International Confederation of Free Trade Unions (ICFTU), the International Council for Local Environmental Initiatives (ICLEI), the International Federation of Environmental Health (IFEH) and the World Business Council for Sustainable Development (WBCSD). The EEHC met twice a year, with WHO supplying the secretariat, and reported back to the WHO Regional Committee for Europe and the UNECE Committee for Environmental Policy.

The four WHO ministerial conferences on environment and health (in Frankfurt, 1989; Helsinki, 1994; London, 1999; and Budapest, 2004) have had a positive influence on policies and processes at the national level. As a distinct European initiative, they have inspired similar processes in other WHO regions, such as the Americas and Western Pacific. In general, however, the process was more effective in addressing environmental aspects than health aspects, and it did not sufficiently involve other economic sectors in joint action on the environment and health. The importance of international support from other sectors, such as education, has only recently been recognized. Ways to ensure more active public participation in implementing the decisions of the environment and health process must be sought at the international, national and local levels. On the other hand, the long-standing participation of civil society in the environment and health process in Europe has brought new perspectives on and ways of implementing the outcomes of the process. Moreover, new

mechanisms that provide further international support from economic sectors need to be developed; WHO can play a key role in developing a platform for involving these sectors.

Furthermore, the EEHC has served as a platform for enhancing support from WHO and other international organizations and stakeholders. In particular, it has improved the collaboration between the EC and WHO, facilitating the cooperation of WHO Member States on implementing the EC Environment and Health Action Plan 2004–2010, which followed the 2003 EU European Environment and Health Strategy, and other common areas of work. In light of the enlargement of the EU, the roles of the different actors definitely need further development.

Following the fifty-fourth session of the WHO Regional Committee for Europe in September 2004, a renewed EEHC is setting out to support the CEHAPE more actively. This will be done by setting up a task force to provide information, to exchange training opportunities and materials and implementation tools, and to establish cooperation to build capacity. Chapter 7 (see p. 53) provides further information on the EEHC in the section on building partnerships at the level of the Region.

At the Budapest Conference, ministers called for the EEHC to investigate the option of setting up a task force that would include Member States willing to begin drafting and implementing national CEHAPs and hence host pilot projects. These countries, through the task force chairperson, would report regularly to the EEHC and be responsible for reporting to the first intergovernmental meeting following the Conference, to be held in 2007.

To ensure the success of such a body, WHO advised that it make use of the existing WHO European network of national counterparts for children's environment and health. Countries, however, could still freely nominate people for the task force who would serve as national focal points and be expected to return home and continue to advise and drive national processes. The task force would be responsible for involving all relevant stakeholders in the area of children's environment and health. The WHO Member States with pilot projects would join this task force in an attempt to lead the drafting of national CEHAPs and hence the implementation of action on priorities relevant to them and their part of the Region.

The CEHAPE task force would need specific terms of reference to ensure transparency and the delivery of objectives. These were discussed at a first meeting held in April 2005. Suggested terms of reference include:

- exchanging information on legislation and charters adopted by Member States or major organizations; and
- disseminating main advances in knowledge, encouraging collaboration on research and sharing information on upcoming meetings and other matters.

Information exchange, technical cooperation and monitoring are important to Member States and will require additional technical input from the WHO Regional Office for Europe through its WHO European Centre for Environment and Health, as well as through the experts from the countries that are members of the task force. The Centre can continue to ensure regular exchanges of information and documentation on technical and policy matters that relate to children's health and environment. This evidence base will ensure the development of standardized tools, such as indicators. Training methods will be developed where needed and provided where possible through workshops, organized according to the requirements of the Member States.

### **Partners for collaborative research or implementation of plans**

The task force will also help establish partnerships for cooperation in similar projects or plans, or possibly for cooperation on a subregional level. The establishment of an electronic information platform or databank in the European Centre for Environment and Health will be a step towards ensuring this, by not only facilitating the exchange of best practices but also stimulating the development of bilateral partnerships or twinning of projects.

### **Common focus for accessing resources from international organizations**

The task force will act as an advocate for successful partnerships between countries, intergovernmental organizations and NGOs, by constantly informing members of the opportunities available for securing funding for particular initiatives.

# Part III.

## Tools for implementation



# 6. Setting priorities

## Introduction

It may be difficult to agree on the root causes of environmental problems, because of the diversity of opinions held by different cultures and people. Problems may be ascribed to a combination of factors – such as a lack of environmental responsibility in the private sector, insufficient policy development and implementation by government and a lack of environmental awareness in society – or even seen as the inevitable result of technological development. Rather than debating this issue, it is usually more productive to concentrate on what the problems are today and what actions are needed to address them effectively. Though radical solutions are easy to conceive, they are very difficult to implement. At the very least, a consensus is needed on the small steps required to deal with the issues involved.

Such small steps can only be identified by setting priorities (Yassi et al., 2001). This usually involves a range of techniques that are sometimes participatory, some being more inclusive than others. Some of these techniques emphasize data collection, which is an important factor, along with public consultation; others emphasize building consensus to reach the desired goals.

Although there is no agreement on which approach works best, studies on setting priorities provide valuable information. They reveal that the effect of setting priorities will be limited if public sentiment or the particular political, financial and institutional context of a country is ignored. To translate objectives into tangible improvements, political support, timing and an emphasis on cost-effective solutions are therefore necessary.

The studies also reveal that setting priorities may be less effective if the people most affected – for example, the poor – lack the means to articulate their needs. The role of stakeholders and citizens in setting priorities is thus important in ensuring effective implementation. Citizens demand both lower health risks and more and better environmental health services. Although they are reluctant to finance these services through taxes or additional fees, they are more willing to do so for priorities that they themselves have identified. A sense of participation in setting priorities and hence ownership of and involvement in policy make the role of stakeholders more relevant in the later phases of implementation. By allowing a thorough evaluation of all possible and proposed options and taking account of resource constraints, long-term planning provides policy-makers with the strategy they require to make informed and productive decisions.

## Two approaches to setting priorities

The two main approaches to setting priorities are the informal and the formal. The informal approach involves the allocation of resources based on perceptions, political concerns, traditions or customs, the preferences of leaders and managers, and the influence of key stakeholders. This approach does not follow a standardized set of procedures and is not objective. Although it is an integral part of the political process and will always play an important role in government decisions, this approach creates several obvious problems. It depends heavily on the judgement or intuition of key individuals and provides few opportunities to accommodate different viewpoints. It also lacks transparency, leaving it open to possible public mistrust and suspicion.

The formal approach relies on objective information and is therefore a more traditional process for setting priorities. It helps policy-makers address some of the weaknesses of the informal approach by infusing a degree of objectivity and rationality into decision-making. More specifically, this approach provides more and higher-quality information to decision-makers, thereby justifying the decisions made and helping to increase the public's understanding of government operations. In a formal approach, different criteria for setting priorities are applied to different scenarios. Some lessons can be learned from the criteria used in setting priorities in research, even though not all of them can be used for setting priorities in environmental health. Research criteria that are applicable and can be used for validating the choice of priorities in environmental health include:

- the severity (degree of incapacitation) and magnitude of the problem (number of people affected);
- the expected cost–effectiveness of the interventions researched;
- the effect on equity: that is, the likely effect of the research on the poorer segments of the population;
- the probability of finding a solution;
- the scientific quality of the research proposed;
- the feasibility of the proposed research: the availability of human resources, funding and facilities;
- its ethical acceptability; and
- its effect on the strengthening of capacity.

Whatever the criteria, priorities must be set at several levels, with different implications and different approaches at each level. At the national level, the budget for public health services is determined largely by the fiscal policy of governments, influenced, it is hoped, by the will of the people. Within countries, allocation decisions are potentially influenced by policies of both national and regional governments.

### **Setting priorities for national CEHAPs**

When national governments begin to discuss drafting and implementing CEHAPs, it will be a challenge to apply criteria for setting priorities in health care to environmental health issues. The WHO Regional Office for Europe first issued guidelines for setting priorities in the field of environment and health as part of the Environment and Health Action Plan for Europe (EHAPE), which was endorsed by all Member States at the Second Ministerial Conference on Environment and Health, held in June 1994 (WHO Regional Office for Europe, 1994).

The EHAPE was drafted as a framework action plan and faced the challenge of formulating ways of setting priorities according to the diverse needs of the countries in the WHO European Region. As a framework action plan, it had to be useful to countries differing in levels of economic, political and social development and cultural background. It also had to allow Member States to develop national action plans addressing their particular priorities, formulated as sets of short-, medium- and long-term objectives. Moreover, these objectives had to be achievable in a realistic time frame, and to be based on particular national priorities, which in turn needed to match the technical and financial resources available. The framework approach used in the EHAPE was successful because it enabled Member States differing in their stages of development, environmental health priorities and economic and technical capacities to achieve the agreed long-term European targets within realistic periods.

#### **Types of action**

The EHAPE classified the actions for implementation into three groups according to:

- the nature and severity of the effect on health that arose from the environmental exposure, and the numbers of children at risk;
- evidence of a worsening trend in the severity of an environmental health problem;
- the technical feasibility of the action required;
- the affordability of the solution in terms of financial and human resources;
- the likely health benefits in relation to the input required for effective environmental intervention: that is, the cost of intervening as compared to the cost of inaction; and
- considerations of environmental justice, where choices may be influenced by who should pay the costs and who will benefit from the suggested actions.

The timing of actions was also important, since those that could be carried out reasonably soon were likely to take precedence over those that could only be undertaken after delays caused by time-consuming planning and development of special infrastructures. Actions were therefore divided into three groups.

**Group 1** concerns the basic requirements for environmental health. These actions aim to prevent or mitigate conditions whose environmental causes are well established and can give rise to widespread and often acute effects on health. If not brought under control, these conditions would worsen with time. Control may yield immediate benefits – roughly in proportion to the magnitude of the investment – which the public will easily recognize.



**Group 2** addresses the prevention and control of medium- and long-term hazards. Causal relationships may be more difficult to establish at existing environmental concentrations, but the potential for adverse effects on health is recognized. They include long-term effects from both chronic and shorter-term exposures. Some of these effects may be irreversible, associated, for example, with increased risks of cancer. The benefits of these actions may only appear after many years.

**Group 3** concerns the promotion of human well-being and mental health, rather than the prevention of disease. The perception of the environment as unpleasant imposes stress on the population affected. Different groups of people may perceive different factors as unpleasant, so attempting to satisfy everybody could entail considerable expense. Thus, even more than with group 2, setting priorities here is crucial to ensure the most effective investment of resources. Since setting these priorities will involve consideration of public perception, public education and information are essential if the limited funds available are to be invested appropriately. Public willingness to pay is also relevant.

The CEHAPE is also a framework action plan, containing Region-wide goals determined and negotiated by all 52 Member States. Achieving its regional priority goals relies heavily on the Member States' good will and their capabilities to set priorities to maximize their resources. Resources are always the main problem when considering implementing objectives that might improve the environment and health in a country.

In Tables 5–9 (see pp. 29–37), the evidence that supports specific actions is divided into three types. This provided a way for Member States to set priorities according to the weight of evidence or success of implementation behind each action. Setting priorities, however, also requires identification of the environmental risk factors that need to be addressed first. Different countries would therefore address the same action plan from different angles, because of their individual strategies. With this approach, implementation should be more effective and hence successful.

### Criteria for setting priorities

With such a diverse process under way in different Member States, various criteria may be chosen to determine priority. These criteria may include best value for money, in terms of health benefits and inputs needed for different options for environmental intervention, best chance of achieving the change desired or both. Ultimately, the overall effect would be a common and successful outcome that reduces the environmental burden of disease in the Region.

Using criteria to set priorities has the advantage of providing fertile ground for the establishment of bilateral or multinational partnerships. Common priorities can be identified among a number of countries in a subregion. Every country understands that, to make a difference in a subregion, a group-1 priority must be addressed across borders.

Ultimately, the most welcome decisions are those based on identifying actions that give the greatest net economic benefit or best economic efficiency. Thus, a cost–benefit analysis is undoubtedly an important tool in priority setting. Although decisions based purely on health, cultural and environmental consequences, giving little weight to economic efficiency, may reduce the risk of adverse effects to a socially acceptable level, including both realms of concern in the process of setting priorities is always wiser.

A cost–benefit analysis (WHO Occupational and Environmental Health Team, 2000) takes the following steps:

- identification and cost analysis of the control action;
- assessment of population exposure, with and without the control action;
- identification of benefit categories, such as health effects, material damage and damage to ecosystems;
- comparison of effects on health and environment, with and without the control action;
- comparison of estimated costs and benefits of the control action; and
- sensitivity and uncertainty analysis.

The importance of involving all stakeholders, as a means of providing social equity to all involved, has been noted. In general, citizen involvement is a key element in the many efforts under way to create better and healthier communities and cities: in deciding which problems to tackle and how to tackle them.

While citizens' views may help to determine which risks will be addressed first, which programmes will be delivered and for whom, the discussion about the legitimacy of the role of community preferences in setting priorities is not straightforward and has been highly polarized. Sceptics warn of the risk of establishing a so-called dictatorship of the uninformed, while advocates proclaim the legitimacy of the participatory process.

This is why good communication about health risks plays an important role in ensuring that they are prioritized in a straightforward and undistorted manner. The acceptability of a risk depends on the expected incidence and severity of the potential effects on health, the size of the population at risk, the perception of related risks, and the degree of scientific uncertainty that the effects will occur at a specific level of exposure. Acceptability may vary among countries because of the differences in social norms, the degree of perception in the general population of adversity and risk, and the influences of the various stakeholders. In summary, advocacy, information, education and risk communication (see Chapter 9) all contribute to effective priority setting.

# 7. Building partnerships for implementation

## Introduction

One function of partnerships is to pursue joint decisions by a range of sectors and agencies with different responsibilities and activities; this is essential to the success of a plan that requires action from many stakeholders. The most obvious advantages of building partnerships include: mobilization and optimal use of resources by all partners concerned, thus avoiding duplication; more effective delivery of plans, policies and programmes; and more cost-effective implementation of actions. Building partnerships is also important because it increases access to information and communication between stakeholders. Partners, such as civil-society organizations, help as advocates and by keeping other stakeholders informed, which contributes to a sense of ownership of and a more positive influence on the implementation phase.

Successful implementation of a Region-wide and multisectoral plan, such as the CEHAPE, and its effective translation into national plans require building partnerships in a coordinated manner, involving a comprehensive network of local, national and international organizations covering several sectors. Partnerships are also required at the national and local levels; to develop the popular and political will to support successful implementation, they should involve all groups in society, including the community.

## Building partnerships at the national level

Achieving sustainable development for the future of the European Region's children therefore depends on building the right partnerships. Such partnerships are needed to ensure the integration of the goals for health, the environment, education, and social and economic development. The development of national environmental health action plans (NEHAPs) in the late 1990s and their evaluation process clearly demonstrated that careful consideration should be given to appropriate stakeholder involvement, including that of young people, by providing the right links and forums for discussion (Perlstadt & Ivanov, in press). This also emphasized the need for information to be conveyed upwards, from the community and local level to policy-makers. These concerns were addressed by the Aarhus Convention (UNECE, 1998), which stresses the need to strengthen the public's rights of access to information, participation in decision-making and access to justice in the context of environmental health.

Linking local communities and decision-makers at all levels, however, is not easy. The NEHAP process, though successful in implementing many government policies and plans on the environment and health, did not ensure in all instances a constant flow of information to the stakeholders at the subnational or local levels.

Community involvement in policy-making and implementation can be improved in many ways. Some examples are described in the following five sections on the local community, the education sector, professional and lay associations, civil-society organizations and NGOs, and children and young people.

### The local community

To work towards ensuring sustainable development, local authorities (such as mayors and city councils) need the support of the wider community, with its myriad groups and their diverse backgrounds and requirements. Community participation and support facilitate the development and implementation of national plans, such as CEHAPs, by improving the understanding of the rationale for different decisions, developing a sense of identity and fostering a sense of place in the community. They also provide an opportunity for individual stakeholders to see that they can make a difference and that everyone's view is important.

Providing such opportunities for a wide range of partners is therefore advantageous. Partners will come from interest groups, community organizations, the mass media, business and industry, and other levels of

government, and include elected officials, interested individuals and families. Careful planning is needed to involve and communicate effectively with so many different groups. This is where a community profile can help, since it determines how best to communicate information about the process, to involve people and to promote the process. Table 11 lists some elements of a community profile. The extent of this profile depends on the resources available to compile such information.

Table 11. Elements of a community profile

Element	Why it is important
Population size	Enables comparisons with other local authorities of a similar size
Population breakdown by age and gender	The age and gender distribution of the community affects the community's needs
Indigenous and ethnic composition of the population	Communication methods that take account of diverse cultures and languages are important
Communication systems for the population	Allows for effective use of communication systems; information might include readership of local papers, access to the Internet, radio and television, and use of resource centres, libraries and community meetings
Number and type of NGOs and the number of community members in these groups	Identifies how NGOs in the community could be involved in the process
Community interest in environmental, economic and social matters	Information on the relative support for these different areas of responsibility for the local authorities helps to promote the process to the community

Source: Cotter & Hannan (1999).

Involving the community also requires a strategy, to determine not only the method of involving the community in each stage in the process but the degree of involvement. Issues include:

- how many people to involve
- how representative they will be
- what level of input they will have in decision-making
- how involved they can be in the implementation, monitoring and review stages
- which involvement or communication mechanisms to use.

Communication with the community needs to be both interactive and responsive, rather than just a one-way stream of information from the local authority. Communication also needs to be continuing – not just a single consultation – thus allowing participation throughout the cycle of planning, implementation and review.

### The education sector

The education sector is an important partner in the field of environment and health and can be influential through the development of comprehensive and integrated programmes for schools. Curricula for school-age children may need to be modified or extended, but the education system needs to recognize the role that environment and health professionals can play in increasing young people's direct contribution to planning and policy. Schools can play an important role: they not only educate the young and hence influence the future but also provide a window of opportunity for the involvement of children and young people in policy-making.

Similarly, the curricula for a wide range of other professionals (such as teachers, paediatricians and other health care workers, and urban planners) may need to be considered and modified accordingly.

### Professional and lay associations

Professional and lay associations can help by providing a better understanding of important economic, technological, sociocultural and other trends. The participation of professionals allows them to improve the assessment

of a community's needs, as well as educating, advocating and building partnerships that address these needs. This group includes experts who can play a key role by advocating the protection of children, and professionals from fields outside environmental health and children's health, such as scientists, engineers, urban planners and policy-makers.

Groups such as parent–teacher associations, the Girl Guides and Boy Scouts, and sports clubs help to ensure improved dialogue within the community and the consideration of specific needs of population subgroups.

### **Civil-society organizations and NGOs**

Civil-society organizations and NGOs, especially those focused on children's environment and health, can often provide support for initiatives and apply pressure at all levels of government.

### **Children and young people**

Children and young people are a resource for change. They should be invited to participate in the debate on the effects of a poor environment on health and should be actively involved in developing approaches and projects that can be shared with other young people. WHO-led projects for young people clearly indicate that they welcome the opportunity to be involved in the preparation of CEHAPs (European Network of Health Promoting Schools et al., 1997; Simovska and Jensen, 2003). Young people can improve the quality and relevance of such plans by airing their needs; they have the greatest stake in the state of the environment and health.

For this to occur, countries need to create a safe and supportive environment in which young people can participate in the planning process. This requires the following.

- Child-friendly documents that use language appropriate to the age group addressed should be developed and widely disseminated, for example, by radio, the Internet and other means.
- Special opportunities should be created to involve as many children and young people as possible in the process, for example, by using existing forums, stimulating local and regional debates and publicizing activities by visiting schools.
- Schools should be actively involved as key settings for developing integrated curricula, gathering and sharing information, encouraging debate and bridging the gap between decision-makers and children and young people.
- The use of peer groups should be considered to engage young people in supporting the process. Young adults experienced with similar processes can work in dialogue with experts to help children and young people turn their ideas into practical proposals, using appropriate language and procedures to communicate their ideas to the appropriate audience.
- Government officials should be aware of the United Nations Convention on the Rights of the Child (United Nations, 1989), to be ready to understand the importance of children and young people's involvement, and to know how to support it. This approach is particularly important for administrations, such as the ministries responsible for education and for children and young people, which have particular responsibility for this population group.
- Special consideration should be given to ensuring equity in the participation process, which means ensuring that all young people – no matter what their gender, social status or physical condition – are involved. This would prevent a bias towards groups of higher socioeconomic status, which are more likely and ready to make their voices heard.

### **Young Minds for healthier environments**

In 2004, the Young Minds school-based project on environment, health and being young involved young people in the Fourth Ministerial Conference on Environment and Health. As part of the Conference, the project aimed to ensure that students:

- participated and took action
- engaged in international collaboration
- used information technology as a communication tool.

The project looked at the following questions.

- What impact does the environment have on health?
- What differences are there between global and local actions?
- What role can young people take in environmental health issues?

The eight schools involved in the project worked at the national level and across borders, exchanging information and the experience gathered in the process. At the Conference, Young Minds enabled participating young people and their teachers to play a part in the debate on environment and health. Throughout the Conference, they demonstrated the use of information technology as a communications tool. Schools throughout the Region were able to participate through an interactive web site during the Conference, and all benefited from the products and lessons learned throughout the process, which were disseminated in a report (Jensen et al., 2005).

### **Making partnerships effective**

The involvement of a wide range of partners calls for the establishment of a mechanism, such as a committee, that can steer the process effectively. Setting up a national or local committee would help to determine all the outcomes sought by a country and therefore define the responsibilities of all those involved. Such a committee can either advise on the management of the process or be directly in charge its implementation, including:

- developing and facilitating a long-term vision that encourages involvement and consensus;
- setting directions in goals, indicators, targets and actions;
- developing partnerships by identifying and implementing effective ways of involving local communities in policy development and implementation;
- identifying and implementing the gathering of resources (such as funds and technical expertise) to support the process;
- coordinating an education and awareness programme for local authorities and the community, monitoring community attitudes and promoting activities within the process;
- globalizing the process, by encouraging communities or local authorities to form links at the national and international levels; and
- promoting new ways of integrating the policies and operations of the local authority.

Given the complexity of the issues involved, it may be necessary to create select working groups or other mechanisms to deal more effectively with all issues. Establishing various technical working groups can help to ensure a greater focus on the details of specific problems and the consideration of solutions, which would be reported to the national committee. Working groups are useful in dealing with specific or unique elements of the process. They should reflect the diverse views of the community and cut across sectors in their identification and research of issues. These groups should include people with the knowledge and experience to provide workable outcomes, and representatives of:

- local businesses
- community-based organizations, such as religious and residents' associations
- government departments and agencies
- educational institutions
- environmental and health groups
- organizations of indigenous people and ethnic minorities
- young people.

### **Building partnerships within the European Region**

The issues associated with identifying and involving relevant stakeholders and partners in Region-wide efforts are similar to those associated with local efforts. Owing to the difference in scale, however, the issues are more complex, because of the additional agendas and interests involved and resources required. Regional partnerships require the involvement of intergovernmental and international organizations, national governments and civil-society representatives.

In western Europe, partnership with the EC is particularly important for implementing policies on environment and health, because it can lead to the development of directives, which have legal force in EU Member

States and often constitute a model for other countries. In addition, the EU may provide financial help to countries in need and facilitate research and development through its programmes. In the context of the CEHAPE, the EU European Environment and Health Strategy and its Action Plan for 2004–2010 are of particular relevance. The Plan is an effective mechanism for ensuring the implementation of the commitment made by the environment and health ministers at the Budapest Conference. This requires a careful fine-tuning of the Action Plan with the CEHAPE, and continuous coordination that will allow the effective use of existing resources within the framework agreed in Budapest.

The major international partners in the field of environment and health that are relevant to the implementation of the CEHAPE include, in addition to WHO, the World Bank, UNEP, UNDP, UNECE, OECD, UNICEF, ILO, and the United Nations Industrial Development Organization (UNIDO). The implementation of the CEHAPE will also involve closer collaboration with international professional associations and child-focused NGOs.

International collaboration requires flexibility, sophistication, an understanding of cultural differences (including those in lifestyle) and knowledge of political systems and economic resources for health. Moreover, mechanisms to help ensure effective cooperation between the various partners need to be developed. Furthermore, bringing together countries and relevant organizations requires a clear understanding and acceptance of the strengths that each partner brings to the process, joint terms of reference for cooperation and explicit commitments from each partner.

A model that demonstrates the possibility of building international partnerships in the area of environment and health is the EEHC (see also pp. 43–44). It is a unique coalition of countries and organizations in the WHO European Region that involves representatives from health and environment ministries, intergovernmental and international organizations, and civil-society organizations. Established in 1994 by the ministerial conference held in Helsinki, the EEHC created a forum for the discussion of environment and health policy. Its main task was to monitor, facilitate and promote the implementation of commitments made at the WHO-organized ministerial conferences on environment and health. It was also asked further to develop the environment and health process in the Region by facilitating and promoting partnerships and intersectorality at all levels that lead to sustainability.

The EEHC now has five members representing the health sector, elected by the WHO Regional Committee for Europe, and five members representing the environment sector, elected through the UNECE Committee for Environment Policy. They serve a term of two and half years. Other members of the EEHC include WHO (which also supplies a secretariat), the EC, EEA, UNECE, UNEP and OECD. In addition, two networks of NGOs are permanent members of the committee and are led by EPHA (representing health NGOs) and the European ECO-Forum (representing environment NGOs). WBCSD represents the business sector, and ICFTU is also represented. In addition, any country may ask to send a representative to a particular EEHC meeting.

The EEHC meets about every six months and reports on its work to the annual session of the WHO Regional Committee for Europe. Acting mainly as an advisory body, it helps to influence the direction of the environment and health process in the Region by identifying priority areas that require more attention from countries, thereby ensuring a common Region-wide focus.

## **8. Dealing with uncertainty: using the precautionary principle**

When developing CEHAPs, some communities may face risks that are poorly defined and uncertain in nature and magnitude, but nevertheless raise anxiety in the population. This is not uncommon; examples in recent years include such issues as exposure to mixtures of chemicals or genetically modified organisms. This chapter presents an approach to these problems that aims to support decision-making in the presence of uncertain scientific evidence. This approach addresses citizens' concerns while supporting technological development and protecting public health and the environment.

### **The context of precautionary action to protect children**

Many environmental risks to public health are well established, such as unsafe drinking-water, indoor and outdoor air pollution, and inadequate sanitation. At present, these are arguably the most serious. Public health interventions should be strengthened to prevent these established risks. Other risks to modern society that affect the population at large and children in particular, however, are often highly uncertain and complex. These risks are related to, for example, exposure to dangerous chemicals, hazardous wastes, non-ionizing radiation and industrial pollutants through food, water, air and everyday products. This can result in effects that appear long after exposure, hindering the establishment of causal links. These effects can be irreversible and costly to health and the environment.

Limitations in the ability to characterize causal relationships are occasionally misinterpreted as evidence of safety. Thus, the need for more scientific information has sometimes been used as a reason for inaction. Rigid policy structures that require strong evidence of risk often result in policy-makers' having to wait for unreasonable periods before they can commit themselves to preventive action. The former uncertainties related to tobacco, asbestos and other agents provide ample evidence of the high costs associated with waiting for more definite proof of harm.

The precautionary principle has arisen as part of the discussions of the most effective ways to protect health and the environment in the face of highly uncertain risks. Since the early 1980s at least, policy-making on issues of considerable concern and great scientific uncertainty has progressively adopted precautionary approaches to achieve high levels of public health, environmental protection and consumer safety without compromising the scientific method or technological innovation.

The precautionary principle is one of the tools for guiding and supporting the identification, selection and adoption of actions to prevent damage to health and ecosystems in the presence of uncertain scientific information about risks. Principle 15 of the Rio Declaration on Environment and Development (United Nations, 1992b) gives a common definition of the principle: "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

Arising in the 1970s in response to concerns about the environment, the precautionary principle has been invoked and applied in many circumstances in national and international settings: for example, in the protection of fisheries. It inspired, for example, bans on use of chlorofluorocarbons in aerosols in the United States in 1977 and on imports of hormone-treated beef from the United States to the EU in the 1990s.

### **Scope and history**

Given the susceptibility of children and their potential to develop lifelong effects from exposures at critical stages, protecting them and future generations from environmental health risks is a compelling reason to



develop precautionary approaches that are rational, consistent with available scientific information and mindful of society's needs and values. The precautionary approach is grounded in the ethical principle of protecting the most vulnerable members of society, who cannot protect themselves. Protecting the most vulnerable, however, ensures the more effective protection of the entire population. A broad application of the precautionary approach to protect the health of children and future generations and achieve sustainable development is particularly important, given the growing interdependence of economies and the global threats caused by industrial and other human activities, such as climate change.

There is no single approach or recipe for taking precautions. What is considered an acceptable risk or sufficient evidence to act is a function not only of the level of risk and the strength of evidence and uncertainty but also of the magnitude, reversibility and distribution of the risk, the availability of opportunities to prevent it, the public's aversion to it and society's culture and values. Consistent with the WHO definition of health, what constitutes a threat to health should be broadly interpreted: for example, to include such effects as the disruption of social networks and the indirect effects of interventions or technologies. Attention to potential, poorly established risks, however, should never divert resources from existing public health action addressing well-established risks.

The idea of precaution has a long history in medicine and public health, but it was established as a principle in Germany as *Vorsorgeprinzip* – literally, the foresight principle – to deal with serious, emerging (though not proven) risks to ecosystems and health. It is based on the idea that society should seek to avoid environmental damage by carefully planning to stimulate innovation, job creation and sustainable development. The 1992 (Maastricht) Treaty on European Union established precaution, prevention of pollution at its source and the principle that the polluter pays as central elements of EU environmental health policy. An EC (2000) communication states that application of the precautionary principle is of critical importance for its policy of achieving a high level of protection for human and ecosystem health, particularly under situations of uncertainty. The communication establishes guidelines for the EC's application of precaution, such as non-discrimination and consistency of action. The precautionary principle is now widely accepted as an underlying principle of international environmental policy.

## **A framework for precaution**

The Treaty on European Union, as amended in 1996, does not define the precautionary and preventive policies that must be adopted. The distinction between the two is important. Prevention consists of actions taken to reduce known risks, while precaution aims to anticipate and reduce more uncertain risks. This area of policy-making is constantly evolving in response to new scientific, technological and political challenges. Further development of a framework for integrating the precautionary principle into decision-making on environmental health issues has thus become a necessity. Such a framework should be consistent with public health values and WHO's mission to promote health. The goal of this framework is to ensure that decision-making on preventive public health takes place in a transparent and democratic manner under conditions of complexity and uncertainty. It provides a concrete approach for decision-makers and society at large to implement the precautionary principle and make rational decisions under these conditions.

The precautionary principle is one of the tools of risk management, but is also relevant to the whole process of characterizing a problem, assessing the risk, evaluating and applying policy options, following up after implementation and setting an agenda for further research. An effective precautionary approach can be based on simple steps and policy actions, such as:

- improving and expanding the range of scientific tools and perspectives in decision-making, and developing methodologies capable of analysing complex systems, including cumulative and interactive effects, and their relationships with health;
- increasing the transparency of decision-making by more explicitly characterizing the nature and extent of uncertainties and scientific and ethical assumptions in analyses, and by expanding the range of stakeholders and values involved in decision-making processes;
- increasing the ability of public health professionals to identify early warnings of risks and to understand the effectiveness of interventions by establishing surveillance programmes; and

- establishing research and education programmes to identify gaps in knowledge and to develop and implement safer and cleaner production processes, products, consumption patterns and preventive interventions.

Through the early identification of threats, this approach may be instrumental in anticipating their emergence and drawing scientists' and decision-makers' attention to the need to identify and develop options to anticipate and prevent risks before they occur. Analysis of alternatives is essential and can help prevent the often contentious debate over what level of risk is acceptable, as well as conflicts between environmental and health protection interests and economic interests. The principle thus serves as a compass, pointing towards decisions that favour more health protective measures under uncertain conditions. This function of the precautionary principle builds on and expands its use as a risk management tool, and encourages action when a particular scientific threshold is reached.

### **Application of the precautionary principle**

Applying the precautionary principle should encourage decision-making that uses the broadest possible range of information, stakeholders, and scientific and policy tools. This broad-based approach focuses on a series of procedural steps to ensure sound health and environmental decision-making, by examining all of the evidence on threats as a whole and by learning from accumulated experience and understanding. Flexibility is critically important, since each decision is different, with different types of risks, evidence, uncertainty, affected communities and available alternatives. Policy-makers should encourage entities that create risks to be responsible for providing full information on them and on alternative options. Governments and entities dealing with risks should adopt this fact-finding framework in their decision-making processes and institute a cautious approach towards uncertain environmental and health risks.

Specific steps in such an approach to applying the precautionary principle include:

1. determining whether the problem merits a precautionary review: whether there is sufficient evidence to indicate a potential problem or whether the cost of review is out of balance with the cost of the actions considered;
2. broadly defining problems to capture the root causes of risks;
3. examining all available evidence on exposure, hazard and risk through an interdisciplinary lens, to take account of variability and direct, indirect, cumulative and interactive effects;
4. considering the use of simplified rules of thumb, safety factors or default values when information is lacking;
5. comprehensively examining uncertainties and gaps in information, performing sensitivity analyses and identifying ways to reduce these uncertainties and gaps;
6. examining a wide range of risk-reducing options and their trade-offs, advantages and disadvantages;
7. determining an appropriate course of action based on the scientific evidence, examination of alternatives and input from the public;
8. considering a wide variety of policy tools to implement preventive or protective actions, including their economic, technical and political feasibility; and
9. instituting post-implementation follow-up measures to ensure continuous risk reduction and avoid unintended consequences.

The steps may differ, depending on whether the activity under review is new or established. For new activities, the economic investment has yet to be fully made and more emphasis can be placed on evidence of safety and consideration of alternatives. This is particularly important for the CIS, where opportunities exist for mobilizing sufficient support from other countries with technologies that can prevent contamination and reduce risks. In contrast, the economic benefits of an established activity may already be realized, and greater consideration of mitigation strategies is warranted.

Decisions under the precautionary principle should be based on the best evidence available and on informed judgement and common sense. The use of the principle demands rigorous science that is explicit about limitations and gaps in knowledge. It calls for new approaches to science that choose methods and tools to fit the nature and complexity of the problem. Thus, the use of the precautionary principle does not exclude but

advocates the need to improve the scientific basis for decisions, including tools for assessing risks, improving the surveillance of health and interventions, and evaluating alternative technologies and activities.

Different tools can be used to reduce known and unknown risks. One is prudent avoidance, a risk management strategy based on taking simple, easily achievable, low-cost measures to reduce exposures, even in the absence of a demonstrable risk. ALARA (the acronym for as low as reasonably achievable) is a tool used to minimize well-known risks, by keeping exposures as low as reasonably possible, taking into consideration costs, technology, benefits to public health, safety and other societal and economic concerns. Today ALARA is used mainly for protection against ionizing radiation, where the basis for setting limits is not a threshold, but acceptable risk.

### **Types of precautionary action**

Precautionary actions can be diverse, depending on many factors, such as the existence and weight of evidence, the feasibility and costs of action, the sociocultural background and preferences of the population affected and the magnitude and severity of potential adverse consequences of mistakes. Action can also take a short or long time.

Applying the precautionary principle does not necessarily mean stopping an activity. Instead, it can result in a range of actions, from informing the public about risks and uncertainties while further study is undertaken to characterize them, to restricting potentially harmful activities and phasing out activities where evidence indicates they might be particularly dangerous. An important part of precautionary action deals with assigning responsibility and incentives in a way that stimulates the proponents of potentially hazardous activities to understand the associated risks and to take protective action. Precautionary action should take many forms and be case specific, depending on:

- the nature, magnitude, preventability and reversibility of the risk;
- who is exposed: for example, disproportionately affected or highly vulnerable communities; and
- the technological and economic feasibility and benefits of action.

The goals of precautionary action should be:

1. continuously to reduce and eliminate exposures to potentially harmful substances, activities and other conditions, where feasible;
2. to evaluate and improve production processes, products and human activities, to minimize risks in the first place: for example, through the use of integrated pest-management strategies, land-use planning and cleaner production;
3. to establish public health goals for protecting and restoring human and ecosystem health;
4. to provide information and education to citizens, to promote their empowerment and policy-makers' accountability;
5. to integrate precautionary considerations in the research agenda, to make possible rapid interventions to prevent damage to health; and
6. to avoid as far as possible unintended adverse consequences of precautionary action.

### **Conclusions**

In conclusion, taking precautionary action should be a continuous, iterative process of seeking out sustainable ways of reducing the adverse effects of industrialization on public health. Implementing precautionary action that is cost-effective and has synergistic effects will result in a win-win situation for the policy-maker and the public. A proactive approach to precaution, directed towards creating the conditions for sustainability and health, rather than simply responding to problems after they occur, is invaluable in the struggle for a world that protects children and future generations (Martuzzi & Tickner, 2004).

# 9. Advocacy, information, education and communication

This chapter provides guidance on how strategies for advocacy and for information, education and communication (IEC) can be used to improve children's health and environment. Where possible, it gives examples to provide a clearer picture of what can be done, how and by whom. Much of this chapter is based on the results of a recent WHO workshop (WHO Regional Office for Europe, 2004d).

## Definitions

Advocacy can be defined as the “pursuit of influencing outcomes – including public policy and resource allocation decisions within political, economic, and social systems and institutions – that directly affect people's lives” (Cohen, de la Vega & Watson, 2001). It is aimed at changing the status of a policy or strategy and can involve persuading others to support an issue of concern to an individual, group or community (Clift, 2001). It can also be used to change policy by building and mobilizing partnerships and alliances on a specific issue.

Advocacy can assume a number of forms, such as performing research to clarify issues and set strategic directions, providing information to stakeholders, engaging in discussion and negotiation with individuals and organizations, and networking with groups of similar interests to share experience (WHO Regional Office for Europe, 2004d).

IEC comprise a package of planned interventions that combine informational, educational and motivational processes as a component of a programme. The aim, based on an assessment of needs, is to achieve measurable change in or reinforcement of behaviour and attitudes in specific audiences, which may be policy-makers, health professionals, educators or caregivers. This work requires multidisciplinary skills and borrows techniques and methods from various disciplines (Clift, 2001).

Once advocacy has begun, IEC strategies can change or reinforce a set of desired behaviour and/or changes in social or community norms, health education and communication to empower a target audience to gather social and political support for specific action. For children's health and environment, this means closer contact and collaboration with the education sector (for example, teachers and administrators), the health care sector (particularly doctors and other health care professionals), and families and communities, to provide them with the instruments needed to prevent and address the risk of children's exposure to environmental risk factors. IEC might involve transforming a scientific message – for example, that exposure to outdoor air pollutants may cause acute damage to the respiratory system and a variety of chronic respiratory health effects – to one that can easily reach a specified audience, to bring change or increase knowledge, attitudes and practices.

## Importance to children's health and environment

Since the unique vulnerabilities of children are not always at the forefront of public policy and scientific research, advocacy and IEC are vital to protect children from environmental risks. At the local level, they can do this by bringing about favourable changes in the behaviour of parents, teachers, caregivers and industry. The various settings for this work are:

- national and international policies
- public education
- the mass media and other communication channels
- research and academic institutions
- the community.

National and international policies, for example, can require action such as passing new legislation or adopting protective regulations on harmful environmental risk factors. In addition, bilateral or multilateral agreements can be made, such as those to phase out leaded petrol. Public education can provide opportunities for developing and disseminating tools and information for primary and secondary schools, public awareness campaigns, and social marketing (the use of commercial marketing techniques to plan and carry out programmes for social change). Because of their role as educators, investigators and advocates, health professionals can make another important contribution in public education. The mass media and other communication channels can contribute by broadcasting public service announcements and paid advertisements, and publishing press stories in major news outlets and opinion pieces written by well-known experts. The research community can provide a setting or means for testing new hypotheses on the synergistic effects of environmental risk factors, evaluate links between environmental exposures and children's health outcomes and examine children's susceptibility to risk factors. Finally, the community is the setting for interventions to change individuals' behaviour.

IEC activities for children's health and environment differ according to the target audience and cover the following range:

- school-based initiatives, such as the European Network of Health Promoting Schools (2005);
- training journalists to make them aware of issues related to children's health and environment, and helping to provide them with the latest data for accurate reporting;
- pilot studies or research that can provide examples of successes, challenges and lessons learned in implementing interventions;
- workshops on children's health and environment issues for teachers and the role they can play;
- community meetings with parents to raise their awareness of the environmental risk factors that affect their children most; and
- capacity building for health professionals by including environmental health in pre-service and in-service training.

To be effective, advocacy must go hand in hand with IEC, and government, NGOs, the private sector and communities must be involved in developing strategies and disseminating information. The combination of advocacy and IEC is an integral part of all public health and environmental health programmes and should be included in their planning and implementation (Box 3). The combination is also an important tool in promoting sustainable development. It stimulates access to information and the participation of all concerned citizens in environmental issues that affect their health, a principle supported by Agenda 21 (United Nations, 1992a). It also helps to uphold everyone's right to information on the environment and participation in environmental decision-making, two of the key features of the Aarhus Convention (UNECE, 1998). Because of the multisectoral nature of the CEHAPE and its proposed actions, developing or strengthening an advocacy and IEC strategy for it in each country is critical. Finally, this work must be planned within a comprehensive strategy and considered at every step of the continuum of planning, implementation, monitoring and evaluation.

**Box 3. How to use advocacy and IEC to improve children's health and environment***Aims of environmental health and children's health and environment programmes*

Environmental health and children's health and environment programmes should:

- consider the cost of advocacy and IEC at the beginning of project planning, include them in overall resource mobilization and explore innovative mechanisms (such as insurance incentives) that can support them;
- integrate into existing programmes and processes (such as the WHO strategy for Integrated Management of Childhood Illness and NEHAPs) that can serve as entry points for advocacy and IEC messages or activities related to children's health and environment;
- consult different sectors, including target groups, children and general populations, in all stages of the advocacy and IEC process;
- build partnerships between the mass media, policy-makers and professionals at the outset;
- actively exchange knowledge and products related to advocacy and IEC throughout the WHO European Region and strengthen the collection and dissemination of case studies and examples of best practice, such as the case studies by the WHO Regional Office for Europe on poverty (Ziglio et al., 2003; WHO Regional Office for Europe, 2005a);
- ensure partners' and communities' access to information;
- assess advocacy and IEC initiatives to demonstrate their effectiveness and the considerable economic benefits they bring to governments; and
- build partnerships among influential groups, including the mass media, policy-makers and health and environment professionals to increase the efficacy of advocacy and IEC.

*Advocacy strategies*

Advocacy strategies should:

- provide good evidence that justifies the action or change being sought;
- involve the most appropriate messengers and stakeholders as influential voices, including the mass media, governments and health care providers;
- describe solutions and success stories, as well as problems and health risks; and
- propose the specific policy changes needed to address risk factors and protect children.

*IEC strategies*

IEC strategies should:

- have clear parameters, including the information/message to deliver, the target group/audience and therefore the best style of presentation and channels for communication, including the mass media, the Internet, direct marketing, billboards and wrapper displays;
- define the behavioural and environmental change to be achieved or the environmental risk factor to be addressed;
- identify mechanisms and messages that can ensure that change lasts;
- integrate environmental health into the professional curricula for doctors, nurses, midwives and other relevant health professionals;
- strengthen the involvement and training of educators and managers at the beginning of each project;
- involve children as communicators and in testimonials;
- ensure materials are presented in easily comprehensible language and remember the importance of conveying scientific information to the target audience;
- ensure the consistency of messages;
- evaluate the processes and channels used to reach target groups, as well as the outcomes of the initiative; and
- ensure a professional approach to all activities, observing guidelines and best practice used to address other public health topics.

Source: WHO Regional Office for Europe (2004d).

# 10. Monitoring the CEHAPE: children's environmental health indicators

## Environmental health indicators

In recent years, the WHO Regional Office for Europe, working with several Member States, EEA and the EC Directorate-General for Health and Consumer Protection, has made substantial progress towards creating a harmonized environment and health information system based on common indicators. The environmental health indicators that have been developed and pilot tested use solid scientific evidence about the links between health effects and environmental exposures to foster policy development. The work resulted in:

- methodological guidance for generating and analysing key environmental health indicators and using them in policy-oriented reporting;
- after a check of the indicators for compatibility with EU legislation, the proposal of a core set of 17 to become part of the EC health indicators (WHO Regional Office for Europe, 2003a, 2004b); and
- World-Wide-Web-based tools bringing together the data necessary to construct selected indicators from different information sources and to facilitate access to information.

Demonstration products applying the environmental health indicator methodology were prepared for the Budapest Conference: a pilot report (WHO Regional Office for Europe, 2004c) and a prototype Web portal (WHO European Centre for Environment and Health, 2004).

Along with the CEHAPE, the Budapest Conference participants endorsed the development of a pan-European environment and health information system to support policy-making in this field, and enhance communication. The specifications for the system serve as a guiding principle for the development of indicators.

## Children's environmental health indicators

The development of a set of key children's environmental health indicators – for countries to use in monitoring environmental exposures, relevant health outcomes and the implementation of child-focused environmental policies – is an essential step in the effort to improve children's health through safer environments. Several international statements, particularly the WSSD Plan of Implementation (United Nations, 2003) and the Banff Ministerial Statement on the World Summit on Sustainable Development (Government of Canada, 2002), have called for building and strengthening partnerships and more effective collaboration among stakeholders on such indicators. Responding to these calls for action, a Global Initiative on Children's Environmental Health Indicators (CEHI) was launched at the WSSD in September 2002, further to reinforce partnerships between several national and international entities, including UNEP and WHO. The overall methodological approach bases priorities for indicator development on the five main killers of children under 5 years: perinatal illnesses; respiratory, diarrhoeal and vector-borne diseases; and injuries (Briggs, 2003).

CEHI is an independent effort that contributes to achieving the objectives of the Healthy Environments for Children Alliance (HECA), particularly to inform and influence policy-makers and to judge the effectiveness of programmes to improve children's environmental health. CEHI's objectives are:

- to develop and promote the use of children's environmental health indicators;
- to improve the assessment of children's environmental health and monitor the success or failure of interventions; and
- to strengthen policy-makers' ability to improve environmental conditions for children.

WHO leads CEHI's implementation. It builds on existing international, regional and national work on child health and environmental indicators by initiating a series of regional pilot tests to develop, collect and report children's environmental health indicators. The aim is to ensure equal relevance of the indicators for the health and environment sectors, so that both can monitor their efforts towards realizing healthy environments for healthy children. CEHI encourages a feasible, low-cost approach that maximizes the use of existing data and indicators and works towards a more harmonized and complete assessment of the state of children's environmental health in the longer term.

The call for a European initiative on environmental health indicators focusing on children dates from the Third Ministerial Conference on Environment and Health in 1999, which stressed the need to develop child-focused policies and specific monitoring tools for environmental protection. Following up, the WHO Regional Office for Europe and EEA (Tamburlini, von Ehrenstein & Bertollini, 2002) reviewed the evidence on the relationships between the physical environment and children's health, identifying both research needs and policy priorities, and making an initial proposal of monitoring tools and indicators (WHO Regional Office for Europe & European Environment Agency, 2002). In 2004, the Regional Office prepared the first assessment of the impact of the environment on child health in the European Region, showing that environmental exposures are important contributors to the burden of disease on children and identifying the most important gaps in knowledge on the magnitude and geographical distribution of the environmental burden of disease on the young. The report shows that indoor and outdoor air pollution, unsafe water, lead exposure and injuries account for a third of the total burden of disease on people aged 0–19 years; it also estimates the number of lives that could be saved and disabilities prevented in the Region by reducing children's exposure to these hazards (Valent et al. 2004b).

The WHO Regional Office for Europe contributes to CEHI. The WHO European initiative on children's environmental health indicators aims to address the priorities of the 52 Member States in the WHO European Region within existing environment and health information systems.

### **Purpose and users**

The purpose of children's environmental health indicators is to help policy-makers:

- assess the state of children's health and environment in the Region, and at the national and local levels;
- monitor temporal trends, geographic hot spots and vulnerable groups for selected environmental risk factors, in terms of both exposure and health outcomes;
- assess relevant policies and monitor progress in policy implementation;
- advocate the development and implementation of new policies; and
- communicate with experts and policy-makers from other sectors, the public and relevant NGOs.

Furthermore, the indicators will enable WHO and other international and intergovernmental organizations: to assess the state of children's health and environment throughout the Region, to make international comparisons, to suggest appropriate policies for the Region, to assist countries in dealing with problems and to promote international collaboration and the sharing of lessons learned.

Users of such indicators will include policy-makers at various levels in the health and environmental sectors; other sectors, such as transport, education, agriculture and energy; NGOs; the mass media; and teachers and parents. The broad, largely multidisciplinary range of users should be taken into account when the desired features of children's environmental health indicators are identified. The indicators should be understandable to a broad audience, not just specialists.

### **Development of indicators to monitor the CEHAPE**

The guiding principles for indicator development follow the specifications for a shared environment and health information system, as outlined in the Declaration of the Fourth Ministerial Conference on Environment and Health (WHO Regional Office for Europe, 2004a). The specifications were elaborated by working groups involving both the health and environmental sectors and representatives of many Member States, and were accepted by consensus.

To develop children's environmental health indicators, the Regional Office's European Centre for Environment and Health is coordinating the ENHIS (environment and health information system) project, co-financed



by the Directorate-General for Health and Consumer Protection and partner institutions from 11 European countries. The main objective is to establish a harmonized information system to support policies in Europe by allowing international and interregional comparisons on the leading environmental health issues. The system will be based on a set of environmental health indicators developed and updated through the project, and will use the methods of health impact assessment.

One of the project's work packages is intended to develop a core set of children's environmental health indicators to monitor progress in implementing the CEHAPE, focusing on the key action items of the regional priority goals. To harmonize and standardize the process of generating indicators in different institutes and countries, methodology sheets for each indicator summarize the issues in technical definitions and data availability, interpretation and calculation. Another work package is developing hands-on guides for each indicator on data retrieval from international sources.

To be successfully used, children's environmental health indicators should form a strand of a comprehensive environment and health knowledge base. Initially using existing information, this base is to be developed progressively, according to a scientific rationale, policy needs and feasibility.

The ENHIS working group used two approaches to develop indicators. First, a subset that had already been tested for policy relevance and feasibility, and recommended by a previous WHO project, was adopted to monitor the CEHAPE's regional priority goals. Second, the group identified and developed new indicators by reviewing the evidence linking children's health to environmental exposure and policy actions, and consulting Member States and technical experts to identify gaps in the existing indicators. A brief questionnaire was prepared to test the newly developed indicators for their policy relevance and the availability of data in partner countries. The feasibility of using a subset of still untested indicators is being checked in 11 countries.

The results will be used to identify a core set of children's environmental health indicators to be recommended for implementation in the pilot countries in October 2005 (Table 12). This will conclude the ENHIS project. The recommended indicators will be used in the pilot countries in 2007 as part of the second ENHIS project. It is envisaged that the indicators will help provide the information base for an assessment report on the CEHAPE's implementation, which will be prepared for the intergovernmental meeting in 2007.

### **Importance of policy action indicators**

Indicators on policy actions will play an important role in monitoring the CEHAPE and its regional priority goals. They will enable policy-makers and communities to assess political commitment and to monitor progress in policy implementation. Action indicators could provide information on:

- the existence of official policy (for example, on how to reduce exposure to ETS), laws, norms and regulations (for example, banning smoking in public places), and specific programmes (for example, health education for parents on the effects of ETS);
- the enforcement of laws and regulations (for example, enforcement of legislation forbidding smoking in schools) and implementation of programmes; and
- the effectiveness of policies (for example, attributable rates of change in the percentage of households where at least one adult smokes regularly).

In most cases, policy development and implementation cannot be expressed in quantitative terms, but only in qualitative and semi-quantitative terms through ordinal scales or combined scores. The development of action indicators is a relatively new area, and it will be important to evaluate the validity and usefulness of the information they provide.

### **Integration of indicators with a pan-European environment and health information system**

As requested in the Declaration of the Budapest Conference (WHO Regional Office for Europe, 2004a), the development of children's environmental health indicators in the ENHIS project was integrated into the process of developing a pan-European environment and health information system. This will help minimize the additional burden on statistical offices and environment and health authorities and place the CEHAPE indicators in

Table 12. Proposed children's environmental health indicators for monitoring progress towards the CEHAPE regional priority goals

<b>Regional priority goals</b>	<b>Initial core set of indicators<sup>a</sup></b>	<b>New indicators being tested</b>
I. Safe water and adequate sanitation	Wastewater treatment Compliance with standards for recreational waters Compliance with standards for drinking-water Access to safe drinking-water Water safety plans Management of bathing waters	–
II. Injury prevention and supportive environments	Childhood mortality from traffic accidents Childhood mortality from external causes, excluding traffic Percentage of physically active children Prevalence of childhood overweight and obesity	Policies to promote safe mobility and transport for children Policies to reduce unintentional childhood injury unrelated to traffic accidents Policies to prevent childhood obesity
III. Reduced disease from air pollution	Policies to reduce children's exposure to tobacco smoke Children's exposure to air pollutants Children living in homes with dampness problems Children exposed to tobacco smoke Prevalence of allergies and asthma in children Postneonatal infant mortality due to respiratory diseases	Children living in homes using hazardous energy sources for cooking and heating Children living in proximity to roads with heavy traffic Children going to schools with indoor air problems
IV. Reduced risks from chemical and physical	Incidence of melanoma in people under 50 years old Percentage of children exposed to harmful noise at school Incidence of childhood cancer: leukaemia and solid tumours Injuries among child labourers Children's exposure to chemical hazards in food POPs in breast-milk Adoption of international conventions	Action to reduce children's exposure to UV radiation Blood lead level in young children

<sup>a</sup>These indicators were extensively tested and recommended by previous WHO projects; information on them can be retrieved from existing international data sources.

the framework plan of action for a harmonized environment and health information system in Europe, ensuring coherence with the EU strategies for public health and the environment and health. Furthermore, the experience gained and lessons learned from the European Region's participation in the Global Initiative on Children's Environment and Health Indicators will be available to share with other WHO regions.

A pan-European mechanism for information exchange and policy-oriented reporting on and assessment of environmental health must be dynamic, implemented in cycles and incremental in scope. To ensure the progressive development, implementation and continuity of the environment and health information system, a coordinated movement, involving all relevant actors at the national and international levels, was launched as part of the work to implement the decisions made at the Budapest Conference.

A framework plan of international and national action for 2004–2009 was prepared, focusing on the development of information to support the CEHAPE. The EEHC will provide overall policy guidance for implementing the framework plan, with support from a coordination group leading the technical development of the environment and health information system (WHO Regional Office for Europe, 2005b). An assessment report on environment and health in Europe in the context of CEHAPE and applying the developed indicators is planned for the intergovernmental meeting in 2007.

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# **Annex 1. Children's Environment and Health Action Plan for Europe (CEHAPE)**

## **Introduction: background and rationale**

1. We, the Ministers and Representatives of Member States in the European Region of the World Health Organization responsible for health and the environment, together with the WHO Regional Director for Europe and in the presence of the Commissioners for Health and the Environment of the European Commission, recognize that many European children today benefit from better nutrition, cleaner water, more effective preventive health measures and a higher standard of living than ever before and that, on the whole, the health of children in the 52 countries of the European Region shows continuous improvement. However, we understand that improvement is not homogeneous across the Region and within countries, and that the health of a substantial and increasing proportion of children is threatened by the consequences of poor environmental conditions, poverty, disruption of social protection and health systems, armed conflict and violence.

2. We recognize that children are entitled to grow and live in healthy environments, in the spirit of the Convention on the Rights of the Child of November 1989, then emphasized at the United Nations General Assembly Special Session on Children in May 2002 and at the World Summit on Sustainable Development (WSSD) in September 2002. We are well aware that protecting children's health and environment is crucial to the sustainable development of countries.

3. We recall the commitments made by the international community concerning a healthy environment for children, in particular the Declaration adopted at the Third Ministerial Conference on Environment and Health held in London in 1999, and especially its follow-up actions such as the WHO/United Nations Economic Commission for Europe (UNECE) Transport, Health and Environment Pan-European Programme (THE PEP), which places special emphasis on the vulnerability and needs of children in transport. We also recall the importance of the Environment Strategy for Countries of Eastern Europe, Caucasus and Central Asia with respect to the Environment and Health process, as a major result of the fifth Ministerial Conference "Environment for Europe" (Kiev, Ukraine, 2003). We commend the efforts of the European Commission (EC) to ensure a healthier environment for children through the development of an Action Plan 2004–2010, as a means of ensuring implementation of the EC Communication on the Environment and Health Strategy. We also commend the Declaration of the Ministers of Health of the Countries of the Commonwealth of Independent States on Environmental Health that was adopted in Cholpon-Ata, Kyrgyzstan, on 1 and 2 April 2004.

4. We are increasingly concerned about the effects on children's health of unsafe and unhealthy environments. We understand that developing organisms, especially during embryonic and fetal periods and early years of life, are often particularly susceptible, and may be more exposed than adults, to many environmental factors, such as polluted air, chemicals, contaminated and polluted water, food and soil, radiation risks, unhealthy housing, environmental noise, risks related to transport, and the consequences of armed conflict and environmental disasters. Boys and girls may also differ in susceptibility and be differently exposed to environmental factors. We realize that *all* children suffer from the consequences of polluted and unsafe environments but also that children living in the poorest countries and belonging to the most disadvantaged population groups are at the highest risk. Underdevelopment and poverty are strongly related to the burden of environmentally attributable disease, and this is even more true for children.

5. Finally, we recognize that children in particularly adverse conditions, such as poor and abandoned children, street children, children who are exploited or trafficked and those suffering from the consequences of armed

conflict, are at highest risk of injuries, psychological trauma, acute and chronic infections and noncommunicable diseases, impaired growth and development, disability and death. Special emphasis should be placed on preventing these conditions and fighting their underlying causes.

6. We note that in the European Region, according to the Children's Environmental Burden of Disease study, about one third of the total burden of disease from birth to 18 years can be attributed to unsafe and unhealthy environments in the home and the broader community, resulting in significant social and economic costs.

- (a) Injuries alone represent the first cause of death in this age group and account, on average, for about one sixth of the total burden of death and disease, but this proportion can be as high as one third in some countries.
- (b) Exposure to contaminated water, air, food and soil can cause gastrointestinal and respiratory diseases, birth defects and neuro-developmental disorders, all of these accounting for another one sixth of the total burden of disease.
- (c) Safe and balanced nutrition is still an unmet need for too many children, and at the same time the prevalence of obesity and the risk of later development of metabolic disease, including diabetes, and cardiovascular diseases are increasing as a consequence of both unhealthy diet and inadequate physical activity.
- (d) Finally, there is concern regarding the potential for long-term toxicity, including the carcinogenic, neurotoxic, immunotoxic, genotoxic, endocrine-disrupting and allergenic effects of many chemicals. We are particularly concerned about the effects of environmental tobacco smoke (ETS), persistent organic pollutants (POPs), heavy metals and physical agents (such as ultraviolet (UV) radiation, ionizing radiation and noise) that contaminate the environment and to which men and women of reproductive age as well as children may be exposed.

7. We recognize that our understanding of the nature and the amount of health effects produced on developing organisms, from the prenatal period to adolescence, by exposure to environmental agents is still incomplete. However, the evidence we already have of the role played by several environmental factors in determining disease and injury in children, and in inducing effects that may become manifest only in adult life, makes it mandatory to commit ourselves to coordinated and sustained action now to protect children's health, today and for the future.

8. We realize that when there are knowledge gaps, more effort has to be put into research, to improve our knowledge of causal links, the nature and magnitude of effects and effective interventions. Simultaneously, not to delay the implementation of policies that may protect children's health and minimize the risk of severe and irreversible health effects, measures based on the precautionary principle should be applied, taking into account paragraph 17 in the Budapest Ministerial Declaration.

9. We recommend that effective action should be based on systematic reviews of interventions designed to prevent and reduce risk, whenever this information is available, and built on existing experience and best practices. Effective action also requires multisectoral approaches, such as those needed to ensure clean air, safe food and water, safe industrial products and safe and supportive human settlements, and full information and involvement of communities, parents and young people themselves.

10. We recognize the need to focus our actions on health and environment priorities that are associated with a substantial disease burden in children and for which feasible and effective action is possible within a reasonable time frame. We therefore agree to aim at reducing the burden of disease caused by major environmental risk factors by committing ourselves to four Regional Priority Goals, through the implementation of a series of actions for each goal.

11. We recognize that effective actions fall within the responsibility of different ministries, as well as of sub-national and local governments and agencies. Therefore we will advocate the implementation of the actions listed below within our decision-making bodies and their integration into existing long-term action plans.

### **Regional Priority Goals, actions and expected health outcomes**

12. We recognize that children's exposure to environmental hazards is influenced not only by the state of the physical environment but also by socioeconomic conditions and individual and group behaviour. Effective action for protecting children's health should therefore emphasize:

- primary prevention, i.e. policies, programmes and plans aimed at improving the state of the physical environment (air, water, soil, noise), in particular through the integration of children’s needs into housing, transport, infrastructure and planning;
- equity, i.e. giving priority to protection of children at highest risk, and particularly of children who are neglected, abandoned, disabled, institutionalized or exploited, or who are suffering the consequences of armed conflict and forced migration, by improving access to preventive health and social protection services;
- poverty reduction, i.e. policies addressing the multidimensional aspects of poverty among children;
- health promotion, i.e. actions aimed at preventing and reducing exposures to environmental health hazards by adopting healthy lifestyles, achieving sustainable consumption patterns and helping to create healthy and enabling human settlements.

The above principles, together with the need to focus on the main causes of the environment-related burden of disease, will frame the contents of the four Regional Priority Goals.

**13. Regional Priority Goal I. We aim to prevent and significantly reduce the morbidity and mortality arising from gastrointestinal disorders and other health effects, by ensuring that adequate measures are taken to improve access to safe and affordable water and adequate sanitation for all children.**

We aim to achieve this goal in accordance with the commitments made in the Millennium Development Goals and the WSSD Plan of Implementation by:

- (a) ensuring that all child care institutions and schools are provided with adequate safe water and basic sanitation, ensuring safe and affordable water and adequate sanitation infrastructure and service development and better implementation of the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes;<sup>1</sup>
- (b) implementing national plans to increase the proportion of households with access to safe and affordable water and adequate sanitation, thereby ensuring that all children have access to clean water and sanitation by 2015;
- (c) raising awareness among the population, particularly caregivers, and ensuring the provision of education on basic hygiene.

**14. Regional Priority Goal II. We aim to prevent and substantially reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure and supportive human settlements for all children.**

We will address the overall mortality and morbidity due to external causes in children and adolescents by:

- (a) developing, implementing and enforcing strict child-specific measures that will better protect children and adolescents from injuries at and around their homes, playgrounds, schools and workplaces;
- (b) advocating the strengthened implementation of road safety measures, including adequate speed limits as well as education for drivers and children, and enforcement of the corresponding legislation (in particular the recommendations of the WHO world and European reports on road traffic injury prevention);
- (c) advocating, supporting and implementing child-friendly urban planning and development as well as sustainable transport planning and mobility management, by promoting cycling, walking and public transport, in order to provide safer and healthier mobility within the community;
- (d) providing and advocating safe and accessible facilities (including green areas, nature and playgrounds) for social interaction, play and sports for children and adolescents.

We aim to bring about a reduction in the prevalence of overweight and obesity by:

- (a) implementing health promotion activities in accordance with the WHO Global Strategy on Diet, Physical Activity and Health and the WHO Food and Nutrition Action Plan for the European Region of WHO for 2000–2005;<sup>2</sup>

<sup>1</sup> Turkey has reservations on this paragraph since it is not a signatory to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes or to its Protocol on Water and Health.

<sup>2</sup> Endorsed by the WHO Regional Committee for Europe in 2000 (resolution EUR/RC50/R8).



- (b) promoting the benefits of physical activity in children's daily life by providing information and education, as well as pursuing opportunities for partnerships and synergies with other sectors with the aim of ensuring a child-friendly infrastructure.

**15. Regional Priority Goal III. We aim to prevent and reduce respiratory disease due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks, in order to ensure that children can live in an environment with clean air.**

We aim to achieve a substantial reduction in the morbidity and mortality from acute and chronic respiratory disorders in children and adolescents by:

- (a) developing indoor air quality strategies that take into account the specific needs of children;
- (b) implementing the Framework Convention on Tobacco Control, by legislative measures, through the drafting and enforcement of the necessary regulations and by setting up health promotion programmes that will reduce smoking prevalence and the exposure of pregnant women and children to environmental tobacco smoke;
- (c) improving access of households to healthier and safer heating and cooking systems as well as cleaner fuel;
- (d) applying and enforcing regulations to improve indoor air quality, especially in housing, child care centres and schools, with particular reference to construction and furnishing materials;
- (e) reducing emissions of outdoor air pollutants from transport-related, industrial and other sources through appropriate legislation and regulatory measures which ensure that air quality standards such as those developed under EU legislation take into account the values set by the WHO air quality guidelines for Europe.<sup>3</sup> In particular we call upon car manufacturers to equip new diesel motor vehicles with particle filters or other appropriate technologies in order to drastically reduce emissions of particles, and to that effect we will continue to develop legislative and regulatory measures as well as economic incentives.

**16. Regional Priority Goal IV. We commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (e.g. excessive noise) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence.**

We will aim to reduce the proportion of children with birth defects, mental retardation and developmental disorders, and to decrease the incidence of melanoma and non-melanoma skin cancer in later life and other childhood cancers by:

- (a) passing and enforcing legislation and regulations and implementing national and international conventions and programmes to:
  - i. reduce exposure of children and pregnant women to hazardous chemical, physical and biological agents to levels that do not produce harmful effects on children's health;
  - ii. protect children from exposure to harmful noise (such as aircraft noise) at home and at school;
  - iii. ensure appropriate information on and/or testing for effects on the health of developing organisms of chemicals, products and technologies before their marketing and release into the environment;
  - iv. ensure the safe collection, storage, transportation, recovery, disposal and destruction of non-hazardous and hazardous waste, with particular attention to toxic waste;
  - v. monitor in a harmonized way the exposure of children, as well as men and women of reproductive age, to hazardous chemical, physical and biological agents;
  - vi. ensure that the Stockholm Convention on Persistent Organic Pollutants, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade are applied;
- (b) implementing policies to raise awareness and endeavour to ensure reduction of exposure to UV radiation, particularly in children and adolescents;
- (c) promoting programmes, including those for the adequate dissemination of information to the public, that will prevent and minimize the consequences of natural disasters and major industrial and nuclear accidents such as Chernobyl and that take into consideration the needs of children and people of reproductive age.

<sup>3</sup> *Air quality guidelines for Europe*, 2nd ed. Copenhagen, WHO Regional Office for Europe, 2000 (WHO Regional Publications, European Series, No. 91).

We commit ourselves to advocating the elimination of the worst forms of child labour by applying International Labour Organization (ILO) Convention 182.<sup>4</sup>

### **International collaboration**

17. To effectively pursue the four Priority Goals, we, the Ministers, recognize the need to commit our governments to increased intercountry collaboration and solidarity, in order to support the efforts of countries whose children bear the greatest part of the environmental burden and that may need additional, technical and financial support to act effectively.

18. We recognize the need for assistance from international organizations. We invite WHO and the European Commission, as well as the United Nations Environment Programme, UNECE, the United Nations Children's Fund, the Organisation for Economic Co-operation and Development (OECD), the World Bank, the European Environment Agency (EEA), ILO, and the regional environmental centres, as well as other international and nongovernmental organizations, to promote and strengthen international collaboration among themselves on common priority issues and to identify new partners for the future of the Environment and Health process.

19. We, the Ministers, ask that such collaboration should ensure implementation of the CEHAPE by:

- (a) ensuring coordination between, and technical support for, countries and facilitating the identification of financial resources, particularly for those countries most in need;
- (b) developing and providing training opportunities and materials and promoting the incorporation of child health and environment issues in the training curricula of child and adolescent health professionals;
- (c) supporting evaluation of the social and economic costs and benefits of action and inaction, taking into account children's particular needs. In doing so, the internalization of externalities in cost-benefit analyses will be advocated, in order to facilitate policy development;
- (d) ensuring the exchange of information, experience and best practices on relevant existing and effective health and environmental measures and their implementation;
- (e) identifying partners and funding sources for collaborative research and development;
- (f) developing child participation models.

20. We invite WHO to develop, collect and disseminate information on evidence-based interventions and methodologies for use in child-focused health impact assessments incorporating a clear gender perspective. We also request that WHO should develop guidelines and tools on advocacy, information, education and communication, to ensure the appropriate dissemination of information by countries. We request that WHO and EEA collaborate with other United Nations organizations, the European Commission and OECD on the further development of a coherent environment and health indicator system which includes child-specific effects, exposures and actions.

### **National children's environment and health action plans**

21. We, the Ministers, commit ourselves to developing and starting to implement national children's environment and health action plans by 2007 at the latest. To ensure this, we will make best use of existing programmes, such as national environment and health action plans (NEHAPs), or develop new child-specific plans. These should include an assessment of the environmental and health impacts on children, an evaluation of the economic impact and the setting of quantitative targets, as well as the suitably phased implementation of actions.

22. We will include child-specific actions in the national plans, which will ensure attainment of the four Regional Priority Goals and of any other goal which responds to national or subnational needs. In doing this, we will refer to and be guided by the Table of child-specific actions on environment and health for possible inclusion in national plans that has been developed by WHO with the contributions of Member States, international agencies and nongovernmental organizations (NGOs). We will use and further develop this evolving tool as a menu of possible actions, from which Member States and subnational authorities can identify the appropriate combination of actions to be included in their national plans.

23. To ensure the development and implementation of national children's environment and health action plans, we commit ourselves to using and adapting existing national bodies on environment and health or to establishing

<sup>4</sup> Monaco has reservations on this paragraph, since it is not a member of the ILO.

new mechanisms that will involve all relevant stakeholders, including the corporate sector, trade unions, child-focused NGOs and parents', children's and youth organizations.

24. We acknowledge the lessons learned from existing policies and interventions and recognize that effective action to protect children's health from environmental threats requires firm political commitment and close collaboration between health and environment authorities, as well as cooperation with other sectors such as finance, transport, education and culture, energy, urban and rural planning, labour and social services.

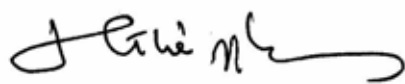
25. We will strengthen the professional capacity of the health and environment sectors by promoting the incorporation of children's environmental health issues into curricula and continuing education programmes of professionals in all cross-cutting sectors, particularly environmental health professionals, environmental specialists, land-use planners, public health officers, family doctors, paediatricians and paramedics. We will make use of a strategy on advocacy, information, education and communication that will ensure adequate dissemination of information with the support of, and in collaboration with, WHO and relevant organizations, including NGOs.

26. We recognize that we need harmonized and comparable monitoring systems, in order to provide policy-relevant information for setting priorities and evaluating the effectiveness of environment and health policies. We will ensure that our existing monitoring systems facilitate the collection of data by using valid and comparable child-specific health and environment indicators to allow for national monitoring of children's action plans and for intercountry comparison at the international level. We will collaborate with WHO, the European Commission, EEA and other relevant organizations to this end.

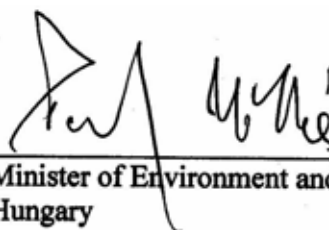
27. We commit ourselves to reporting back to WHO on the development of national children's environment and health action plans and the implementation of actions addressing national priorities and Regional Priority Goals at the midterm review intergovernmental meeting to be held by the end of 2007, as well as to reporting back to the Fifth European Ministerial Conference on Environment and Health in 2009.

28. We call upon WHO, and we ourselves undertake, to ensure an adequate follow-up mechanism to the CEHAPE. To this end we invite the European Environment and Health Committee to establish a CEHAPE task force with the participation of Member States, international organizations and NGOs, in order to facilitate and stimulate implementation of the CEHAPE, with particular attention paid to the sharing of best practices and the dissemination of information and experiences among the Member States.

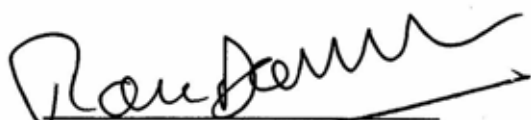
We, the undersigned, on behalf of all the Ministers of Health and the Environment, together with the WHO Regional Director for Europe and in the presence of the European Commissioners for Health and the Environment, gathered here in Budapest on 25 June 2004, pledge to continue to support the initiatives outlined above. We hereby fully adopt the commitments made in this document.



**Minister of Health, Social and  
Family Affairs, Hungary**  
**Co-president of the Fourth Ministerial  
Conference on Environment and Health**



**Minister of Environment and Water,  
Hungary**  
**Co-president of the Fourth Ministerial  
Conference on Environment and Health**



**Regional Director,  
WHO Regional Office for Europe**

## Annex 2. Mechanisms to enhance the effectiveness of policy-making

Mechanisms	Actions	Stakeholders	Expected outcomes
Building international support for the CEHAPE	Ensure that national coordinators liaise with each other and WHO on children's health and environment and play a role in facilitating the implementation of Budapest Conference commitments	WHO, EC, Member States, NGOs, research institutes	Better exchange of information and training materials through improved coordination
	Set up an international CEHAPE task force, to ensure implementation and follow-up	WHO, EC, Member States, other international organizations, NGOs	Exchange of best practices and motivation of Member States to implement the CEHAPE through meetings at various levels
	Develop a databank on children's health and environment	WHO, EC, Member States, other international organizations, NGOs	Regular exchange of information in technical areas and policy-making  A list of sources for funding and aid for Member States
Setting priorities	Identify tools that could help guide countries in setting priorities	WHO, EC, OECD, Member States, NGOs, the World Bank, other international organizations, research institutes	Easier and better process for setting priorities
	Collect relevant data and case studies on setting priorities		Regular exchange of case studies between countries
Building partnerships	Establish partnerships with relevant stakeholders, including children	Ministries for young people, communities, schools, child-focused NGOs, professional and lay organizations, children's organizations	Direct involvement of children as stakeholders in national processes for planning, implementation and monitoring
	Establish partnerships with international organizations in the field of children's health and environment	Member States, EC, WHO, UNICEF, UNEP, UNDP	Better integration of international processes and plans to improve children's health and environment
Advocacy and IEC	Define elements of an advocacy and IEC strategy applicable to children's health and environment	WHO, Member States, children's health and environment national coordinators	Exchange of best practices and development of country action plans for advocacy and IEC
	Develop programmes to build capacity in health professionals, teachers and representatives of other relevant sectors	Health professionals, teachers, school administrators, schools, child-focused NGOs, professional associations	Increased knowledge of actions that can improve children's health and environment

# Annex 3. Definitions of terms used in the text

The following definitions are taken from *Environment and health: an international concordance on selected concepts*<sup>1</sup> and are presented with some minor modifications.

**Children**, according to the United Nations,<sup>2</sup> include all subjects from birth to 19 years of age. For the purpose of this book, since both exposures and health effects may occur before birth, the word children is used to encompass the period from conception through adolescence. For children, good health implies adequate nutrition, care, guidance and cognitive stimulation. Thus, children's environmental health deals with the effects produced by environmental factors on the physical and psychological development of children.

**Environmental factors** are conventionally defined as all non-genetic and non-social factors that affect the organism through environmental media such as air, water and food. This definition is imperfect. First, genetic factors are themselves influenced by the environment: mutation, natural selection and other mechanisms have changed the genetic composition of humanity according to environmental conditions. Second, social as well as behavioural factors (such as diet, smoking, alcohol consumption, physical exercise and stress) are all to some extent influenced by the physical environment. Third, the concepts of environment and environmental factors cannot be restricted to chemical and physical agents, but must include, for example, the infrastructure (such as housing and transport), the uses made of it (such as mobility and urbanization patterns) and climate change. It might be argued that they should also include social factors.

**Environmental health** refers to the aspects of human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health. Environmental health includes both the direct pathological effects of chemicals, radiation and some biological agents, and the often indirect effects on health and well-being of the broad physical, psychological, social and aesthetic environment, which includes housing, urban development, land use and transport.

**Evidence-based medicine** is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients' health, which, as described in the WHO Constitution,<sup>3</sup> means a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.

**Exposure** indicates the concentration, amount or intensity of a particular agent that reaches a target system; it is usually expressed in numerical terms – for example, intake in µg of a toxic agent per unit of body weight or body surface per day.

**Hazard** is an inherent property of an agent or situation capable of having adverse effects on an organism, population or ecological system – hence, the substance, agent, source of energy or situation having that property.

**Healthy environments** for children are the environments that allow and promote their physical, mental and social development. Here, social and psychosocial factors are of the utmost importance, since they directly influence exposure and susceptibility to the classical environmental factors and contribute to the determination

<sup>1</sup> WHO Regional Office for Europe (1999). Copenhagen, WHO Regional Office for Europe (unpublished).

<sup>2</sup> United Nations (1989). *Convention on the Rights of the Child. Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989*. Geneva, Office of the United Nations High Commissioner for Human Rights (<http://www.unhcr.ch/html/menu3/b/k2crc.htm>, accessed 2 January 2005).

<sup>3</sup> WHO (2005). Constitution of the World Health Organization. In: *Basic documents*, 45th ed. Geneva, World Health Organization. ([http://policy.who.int/cgi-bin/om\\_isapi.dll?infobase=Basicdoc&softpage=Browse\\_Frame\\_Pg42](http://policy.who.int/cgi-bin/om_isapi.dll?infobase=Basicdoc&softpage=Browse_Frame_Pg42), accessed 15 April 2005).

## The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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Investing in children's health is essential to ensure human and economic development. Healthy children have the best chances for healthy, productive lives. At the Fourth Ministerial Conference on Environment and Health in 2004, the countries in the WHO European Region committed themselves to building a healthy future for their children by adopting the Children's Environment and Health Action Plan for Europe. It provides a framework for action by the 52 diverse countries in the Region. This book was written to provide the guidance and tools that countries need to carry out the Action Plan at the local and national levels, and Region-wide. The aim is to transform the framework document into national action plans suited to each country's circumstances, priorities and resources.

The book has three parts. Part I provides the scientific evidence on children's susceptibility to environmental risk factors, and an overview of these factors and their effects on children's health. Part II is the core of the publication: tables proposing child-specific actions and therefore concrete ways in which a country can work to reduce children's exposure to environmental risk factors and improve their health. This gives countries the opportunity to act on their own national priorities, while still addressing Region-wide risk factors. Part III focuses on the tools required to ensure implementation of national action plans: setting priorities; building partnerships; taking a precautionary approach to uncertain risks; carrying out strategies for advocacy and information, education and communication; and using indicators to monitor progress at the national and the Region-wide levels. This publication is intended to act as a handbook for countries to use in building a safe and healthy future for all of Europe's children.

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