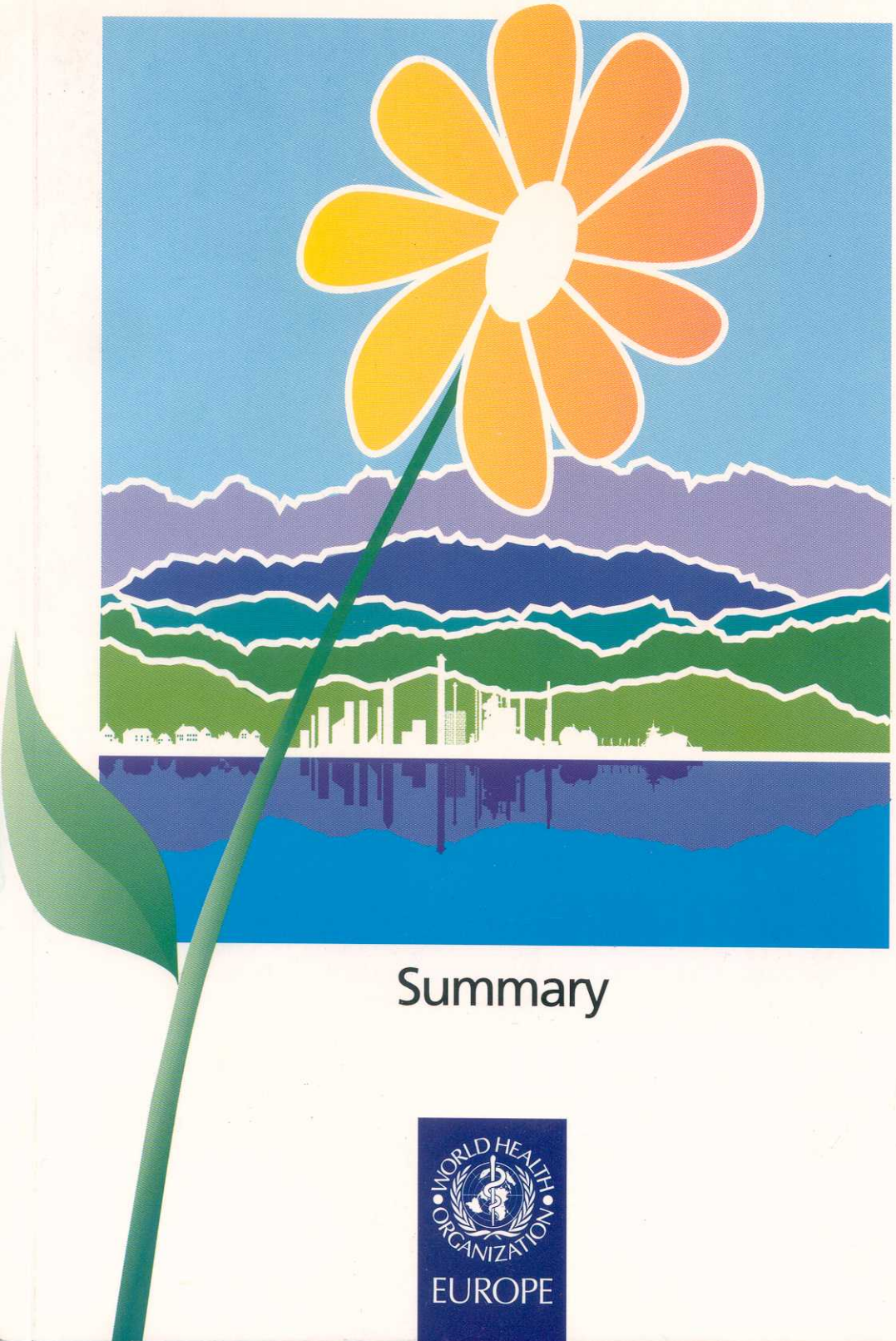
Concern for Europe's Tomorrow



Summary

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Concern for Europe's Tomorrow

Summary

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Concern for Europe's Tomorrow

Health and Environment in the WHO European Region

Summary

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Our Planet, Our Health

"In view of the fact that health issues
are not attracting as much attention
as purely ecological issues
in contemporary discussion of the environment and
development, it might be legitimately asked
whether there is some sort of incompatibility or
conflict between protecting and improving
the environment and protecting
and improving health.
The Commission's conclusions are unequivocal:
not only is there no conflict between these two
objectives, but the kind of development needed to
safeguard health and welfare
will depend on many conditions,
including respect for the environment,
while development without regard to the
environment would inevitably result in
impairment of human health."

Simone Veil, Chairperson,
WHO Commission on Health and Environment

CONTENTS

1

The background for Concern for Europe's Tomorrow and its development

Many of the great advances in public health during the nineteenth and early twentieth centuries resulted from the realization that unsatisfactory water supplies, sanitation, working conditions, food, housing and air were major contributors to disease and short lifespans. More recently, protection of the environment for its own sake and the sustainability of its ecology for future generations have become important political issues throughout the world. The relationship of human health and wellbeing to environmental influences is an important dimension of these issues.

The relationship between environmental factors and health is complex. Many diseases have multifactorial causes and the influence of lifestyles and social and economic factors, which limit choice, may be difficult to separate from environmental exposures.

Over recent decades, much of the WHO European Region has experienced rapid economic growth, but the benefits of increased overall prosperity have not always been accompanied by adequate measures to safeguard the quality of the environment. This has resulted in a wide range of immediate and direct threats to human health, as well as potential indirect effects, including some that may occur in the future as a result of the unsustainable nature of much economic development.

The situation is far from uniform. Basic health statistics show a general improvement in levels of health in the European member countries of the Organisation for Economic Co-operation and Development (OECD), as assessed by infant and total mortality

rates, life expectancy, and the incidence of certain diseases. By contrast, no improvement, and in some aspects a deterioration, in health status has occurred in the countries of central and eastern Europe (CCEE) and the newly independent states (NIS) of the former USSR in the last two decades. In addition, considerable variations occur among different social groups within individual countries of the Region, the poor everywhere suffering more ill health than the better off. If appropriate and cost-effective action is to be taken to create a greater degree of equity in health throughout the Region, a better understanding must be reached of the role of the environment in influencing health, compared with social and economic inequalities, lifestyles and the quality of health care systems.

The definition of environmental health given in the European Charter on Environment and Health should be borne in mind:

> Environmental health ... includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and wellbeing of the broad physical, psychological, social and aesthetic environment, which includes housing, urban development, land use and transport.

While public health policies are understandably mainly directed towards relieving society of disease and premature death, the environment should also be considered as a resource for enhancing health and wellbeing. People aspire to live in communities free of environmental hazards, with decent homes in which to raise their families, with opportunities for employment, education and culture, and with pleasant and harmonious surroundings that facilitate recreation and social intercourse. Effective environmental protection, in its widest sense, provides a framework for many of these aspirations as part of enlightened and sustainable socioeconomic development.

While these are desirable aims, already within the reach of many people in the Region, the far more basic needs of many others must also be recognized and dealt with as a matter of high priority. Many millions of people in the Region still lack at least one of the essential prerequisites for environmental health, namely safe water, clean air, sanitation and shelter. A substantial number are without the first and most fundamental prerequisite for health, namely peace. Rehabilitation of public services essential for environmental health and resettlement of the large number of refugees will be major international tasks when hostilities have ceased.

The genesis of Concern for Europe's Tomorrow

If countries are to improve the health of their people, they must know what environmental conditions prevail. Concern for Europe's Tomorrow was launched to assess the state of environmental health in the Region. To explain fully how this project, and its resulting report of the same name, came about, we must go back a little in time.

In 1980, the Member States of the WHO European Region adopted a common European strategy for attaining health for all. This called for fundamental changes in approaches to health development. It focused on four areas of concern: lifestyles and health, the risk factors affecting health and the environment, the reorientation of the health care system, and the mobilization of political, managerial and technological support to bring about these changes. In 1984, the Member States of the Region approved 38 regional targets encompassing these areas. Their adoption proved to be a decisive event that gave a strong impetus to the wide political acceptance and implementation of the European health for all strategy. In many countries, the concepts, principles and strategies have already become widely reflected in national, regional and local policies. They have also provided a solid basis for health development in CCEE and NIS, which have been greatly affected by political change in the last five years. While retaining their basic structure, the original targets were updated in 1991. As in 1984, nine targets are directly concerned with aspects of environmental health: targets 18–25 concerned with policies on environment and health, environmental health management, water quality, air quality, food quality and safety, waste management and soil pollution, human ecology and settlements and the health of people at work, and target 11 on accidents.

The need to achieve a better understanding of the relationship between environmental factors and the health of individuals and communities, together with the clear need for the environment and health sectors at all levels of government to work closely together, was recognized by the First European Conference on Environment and Health, held in Frankfurt-am-Main, Germany, in December 1989.

The Conference culminated in the adoption, by ministers of health and of the environment and other senior representatives from 29 European countries and by the Commission of the European Communities, of the European Charter on Environment and Health. The Charter sets out a broad framework for action by all levels of government, by all sectors of society and at the international level.

Subsequently, the WHO Commission on Health and Environment was established and produced a report entitled *Our planet, our health*, in preparation for the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. This report analysed, within the global perspective, the various ways in which the environment interacts with health in the context of socioeconomic development and provided a series of broad recommendations for action at international, national and local levels. The Rio Conference endorsed the so-called Agenda 21, an action plan for the twenty-first century that sets a far-seeing course towards sustainable development. Its health component largely reflects the findings of the WHO Commission and acknowledges that, within the overall principle of sustainability, major changes in approach are required if health impairment due to environmental degradation is to be arrested and future adverse environmental impacts on health prevented.

In response to Agenda 21, a global strategy for health and the environment was formulated, and endorsed by the World Health Assembly in May 1993. An environmental programme for Europe, including an action programme for CCEE, was approved by an intergovernmental conference on the European environment held in Lucerne, Switzerland, in April 1993. This action programme for CCEE accepts that health impacts are an important part of the immense environmental problems facing these countries as they move towards parliamentary democracy and market economies, although in many areas concrete information on these health aspects is lacking.

Ministers at the First European Conference on Environment and Health had already acknowledged the inadequacy of the existing database and recognized that its strengthening was a prerequisite for national decision-making and the setting of priorities. As a direct consequence of the adoption of the European Charter, the WHO European Centre for Environment and Health was established as an integral part of the WHO Regional Office for Europe. Its priority mandate was collaboration with Member States on the development of an improved information system, covering all aspects of the relationship between environmental conditions and human health.

The development of Concern for Europe's Tomorrow

At the First European Conference on Environment and Health in 1989, it was agreed that:

European Ministers of the Environment and of Health should meet again within five years to evaluate national and international progress and to endorse specific action plans drawn up by WHO and other international organizations for eliminating the most significant environmental threats to health as rapidly as possible.

In preparation for this Second European Conference on Environment and Health, in Helsinki in June 1994, the WHO European Centre for Environment and Health was asked to assess all aspects of environmental health in the countries of the Region, based on available national data and other information: the project known as Concern for Europe's Tomorrow.

Since this project was first planned in 1991, many political changes have taken place in the Region and the number of Member States has increased from 31 to 50. While it was impractical to collect sufficiently detailed data from NIS, the former Czechoslovakia and the former Yugoslavia for inclusion in the main text of the report, the special conditions obtaining in these countries had to be reflected. A separate chapter in the main report therefore summarizes the main environmental health issues in these countries.

From the outset, it was essential to work in harmony with other international bodies involved in assessing environmental conditions in the European Region, in particular the European Commission (EC). As a result of the United Nations Economic Commission for Europe (ECE) Ministerial Conference, Environment for Europe, held at Dobris Castle in the former Czechoslovakia in June 1991, the development of a pan-European report on the state of the environment (*Europe's Environment '93*) was begun. A close working relationship has been established between the EC secretariat coordinating the preparation of this report and the project office at the WHO Regional Office coordinating the development of *Concern for Europe's tomorrow*. Furthermore, joint use has been made of some of the data available for these two complementary projects.

The major sources of information have been individual countries, international organizations and internal WHO material. Member States were invited to nominate national focal points through whom they responded to the questionnaires developed on various environmental health issues. The development of the project has involved three meetings of the national focal points, which have greatly contributed to its successful completion.

The Scientific Advisory Board of the WHO European Centre for Environment and Health acted as an independent peer

review body for the emerging document and reviewed progress in November 1992, September 1993 and January 1994; peer review of separate chapters was carried out by appropriate specialists.

The scope and purpose of *Concern for Europe's Tomorrow*

The main aim of the project was to provide a balanced and objective overview of the principal environmental issues of present or potential concern for health in the European Region. Of course, not all issues are of equal significance and priority in terms of human health. While *Concern for Europe's tomorrow* does not provide a detailed comparative risk assessment, it is meant to help achieve a better understanding of the more important environmental factors that affect the health of the overall population or of potentially vulnerable groups. The gap between perceived risk and actual risk can hopefully thereby be narrowed by public information and debate. This will have the twofold result that, on the one hand, people's undue worries can be allayed and limited resources devoted to the most important tasks and, on the other, people can be persuaded to take action to prevent risks that they do not now take seriously enough.

It is axiomatic that prevention is better than cure. In terms of environmental protection, the anticipation and avoidance of potential harm not only benefit human health and wellbeing, but are almost always more cost-effective than later clean-up and treatment of disease. Such preventive action involves many different areas of government including agriculture, energy production, housing, industry, land use and urban planning, and transport. At present, the frequent absence of a multisectoral approach to environmental health management and the lack of effective coordination of action result in socioeconomic development having impacts on the environment that adversely affect the health and wellbeing of the population.

Concern for Europe's tomorrow attempts to facilitate the reversal of these practices by presenting an overall picture of the effects on health of environmental conditions throughout the European Region, thus demonstrating the need for the various sectors of government and society to interact if improvements are to be made. In view of the many transfrontier environmental issues that have public health implications, the report also tries to demonstrate the need for countries to share information systems, as an objective basis for decision-making.

The European Charter emphasized that careful environmental stewardship could not only prevent adverse effects on health but also contribute towards wellbeing. It is easier to recognize wellbeing than to provide a rigorous, scientific definition of it, and there are no satisfactory measures of the aesthetic benefits of a wholesome environment in health terms. But a mutually supportive community, within a diverse and sustainable ecosystem, bestows benefits that go beyond the prevention of individual diseases. Epidemiology has not yet succeeded in dealing with these concepts, nor are there satisfactory indicators. *Concern for Europe's tomorrow* tries to develop a perspective whereby "enhancement" is as important as "prevention", although very little quantitative information is available on this difficult but important issue.

Limitations and constraints

From the outset of the project it was accepted that, in view of the short time frame, only existing data should be used in the assessment. The idea was that the limitations that emerged would indicate priority needs and stimulate the longer-term development of an effective information system. The exercise has shown the many shortcomings in existing databases and systems for collection, collation, analysis and dissemination. On many topics, reliable data for assessing health impacts could not be assembled. Much information is fragmented, incomplete and of doubtful relevance and/or validity, and does not undergo proper quality control procedures. Much is collected and remains within separate administrations at central, regional and local levels. Much monitoring seems to lack clear objectives and does not appear to be used in decision-making or for environmental health management. Many single studies have been carried out that have not or cannot be replicated. An ever present danger is that only the positive results of epidemiological studies are quoted, while the results of well conducted studies leading to negative results are not taken into account.

All those taking part in the development of the project, whether at country or international level, were aware of these constraints and difficulties. From the beginning, they realized that it would not be possible to make a comprehensive assessment of environmental health for all parts of the Region. They nevertheless considered that the objective was so important that they were fully justified in making the attempt.

Beyond Concern for Europe's Tomorrow

The investment that is being, and will be, committed to environmental management in the interests of human health and well-being is large, particularly in the context of the limited total resources available. Policies must therefore be based on sound data, and decisions on priorities for action should take the cost–benefit aspects into account. Better data will facilitate a proactive stance, whereby the potential effects on health of different forms of development may be predicted and prevented, rather than waiting until remedial action becomes necessary, which may be very costly even if practicable.

To obtain better data, harmonized and comparable data collection and management are clearly needed throughout the Region, based on the use of core indicators of environmental health. The national focal points have stressed that to achieve this objective, they require technical support from the WHO European Centre for Environment and Health. Such information systems cannot be the prerogative and responsibility of only one authority. They require careful planning and continuing collaboration among the various sectors at all levels. Further, such systems should be designed with clear objectives. Their relevance and effectiveness can be evaluated by their use in resolving practical issues.

However good the information system, data are not always available fully to support a particular course of action. While acknowledging these shortcomings, one must sometimes resist the temptation to delay action while searching for the underlying causes of problems, or for data to define their precise nature. Society must sometimes act on intuition based on experience. Such justification can be found in the sanitary movement in Europe during the nineteenth century, when great advances were made in controlling communicable diseases many years before the etiological agents were identified and the problems precisely defined by epidemiological science.

The national focal points have recommended that the regional environmental health data collected and analysed by the Concern for Europe's Tomorrow project be periodically updated and reviewed.

2

Economic sectors

Economic activities are not only potential causes of adverse environmental impacts on health, but are also the source of national wealth, on which socioeconomic development and associated benefits to health depend. The following overview of economic sector activity provides a useful background, against which the state of health and the environment in the Region can be examined.

There is great diversity in the level of economic development in the countries of the European Region. Of the 50 Member States, 17 were categorized by the World Bank in the lower-middle income group, 14 in the upper-middle and 19 in the high income group of countries. Gross domestic product (GDP) per annum ranges from hundreds of millions to more than a thousand billion dollars, while GDP per head in purchasing power parity ranges from 10% to nearly 99% (taking GDP per head in the United States, in 1991, as 100%).

Economic recession, inflation and unemployment are widespread in the Region, but the problems are particularly severe in countries undergoing transition from centrally planned to market economies. Uneconomic industries have closed, but their replacement is slow. The rate of economic growth is unlikely to increase significantly in the short to medium term. In this period of transition, it is not possible to predict whether these countries will follow the pattern of western industrialized countries and move from traditional, heavy industries to service types of industry. Smaller-scale, private economic activities will probably be important long-term elements.

The legacy of previous practices has made clear the need for economic development to be sustainable. This will require not only substantial changes in the patterns of production and

consumption, but also consideration of the possible impacts of the various economic activities on environment and health at all stages, from planning to operation.

The targets set by the United Nations Conference on Environment and Development in Rio require, in practice, a balanced use of fuels with, in particular, a decrease in the use of coal and an increase in the use of gas. But national energy resources, the ability to pay for imports of alternative sources, as well as public concern in some countries about nuclear power, may restrict choice. Thus, while most western European countries are seeking a balanced use of energy sources, CCEE are likely to be dependent, in the short term, on the use of indigenous brown (high sulfur content) coal, without sufficient capital for investment in equipment to abate pollution. In all countries of the Region, energy conservation and efficiency are crucial if sustainable development and environmental health are to be linked. The rationalization of energy prices will be particularly necessary in transitional economies.

Agriculture is, in general, a less important economic sector in many western European countries than in CCEE and NIS, but productivity per hectare is greater and there is a food surplus compared with a deficit.

Roads have become the most important traffic medium in the Region. Of the 30 countries in the world with the highest number of vehicles per kilometre of road network, 17 belong to the European Region, ranging from 21 per km in Norway to 90 per km in Italy. The number of passenger vehicles in the Region increased by 20–30% between 1980 and 1988. As the economic situation improves in CCEE and NIS, the number of cars on the road is expected to increase markedly. Long-distance goods traffic is expected to increase throughout the Region. Transport, and particularly road transport, is one of the fast growing markets for energy use.

Tourism is expected to continue to increase throughout the Region. In western Europe, the increase is expected to focus on established tourist areas such as the Mediterranean and the Alps, where there are already problems in meeting requirements for safe sewage disposal and drinking-water supplies. In CCEE and NIS, tourism is likely to be a major focus for economic recovery.

Urbanization continues in some parts of the Region. The economic situation in the Region as a whole encourages the flow of people to towns in search of work, and this is likely to make an increasing contribution to the problem of homelessness.

3

State of human health in the WHO European Region

Concern for Europe's tomorrow identifies the main health issues in various parts of the European Region and describes the current health status of the population showing, where possible, the inequalities between different population groups. Despite the limitations of the available health data, significant differences are evident in several aspects of health status between various parts of the European population.

- The health status of populations in the European OECD countries has improved during recent decades, as assessed by infant and total mortality rates, life expectancy (see Fig.1 and 2) and the incidence of selected diseases.
- According to the same indicators, no improvement, and in some areas or age groups a deterioration, in health status has occurred in the populations of CCEE and the former USSR.
- The differences in trends are reflected in markedly higher mortality rates in the eastern parts of the Region compared with those in the European OECD countries. The differences are greater among young and middle-aged people, and especially in males.
- The most pronounced differences between the groups of countries are in premature mortality due to cardiovascular and respiratory diseases and, in males, to injury, poisoning and some types of cancer.
- The limited data on morbidity support the conclusions drawn from the evaluation of mortality patterns.

Fig. 1. Life expectancy at birth in the WHO European Region by group of countries

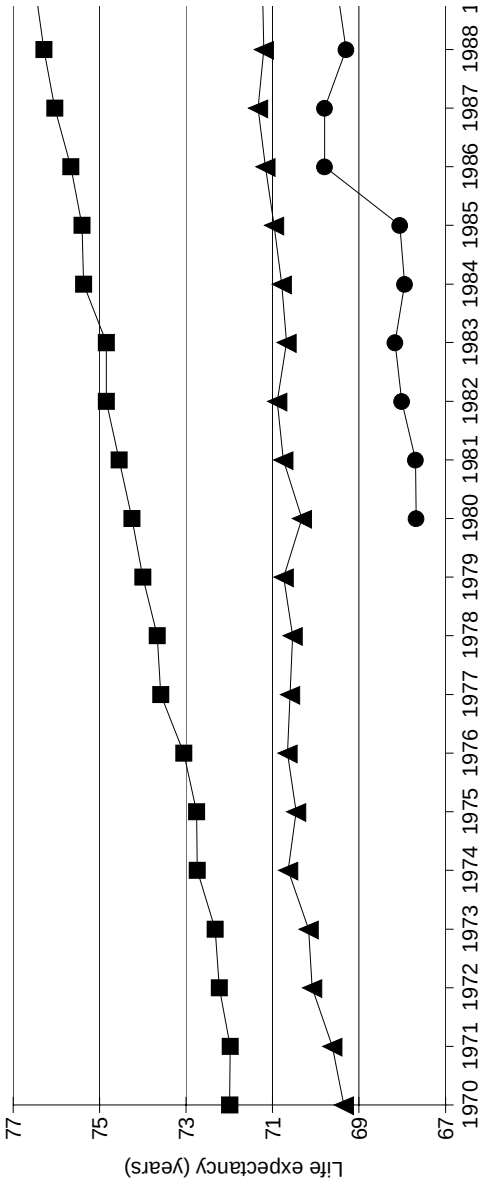
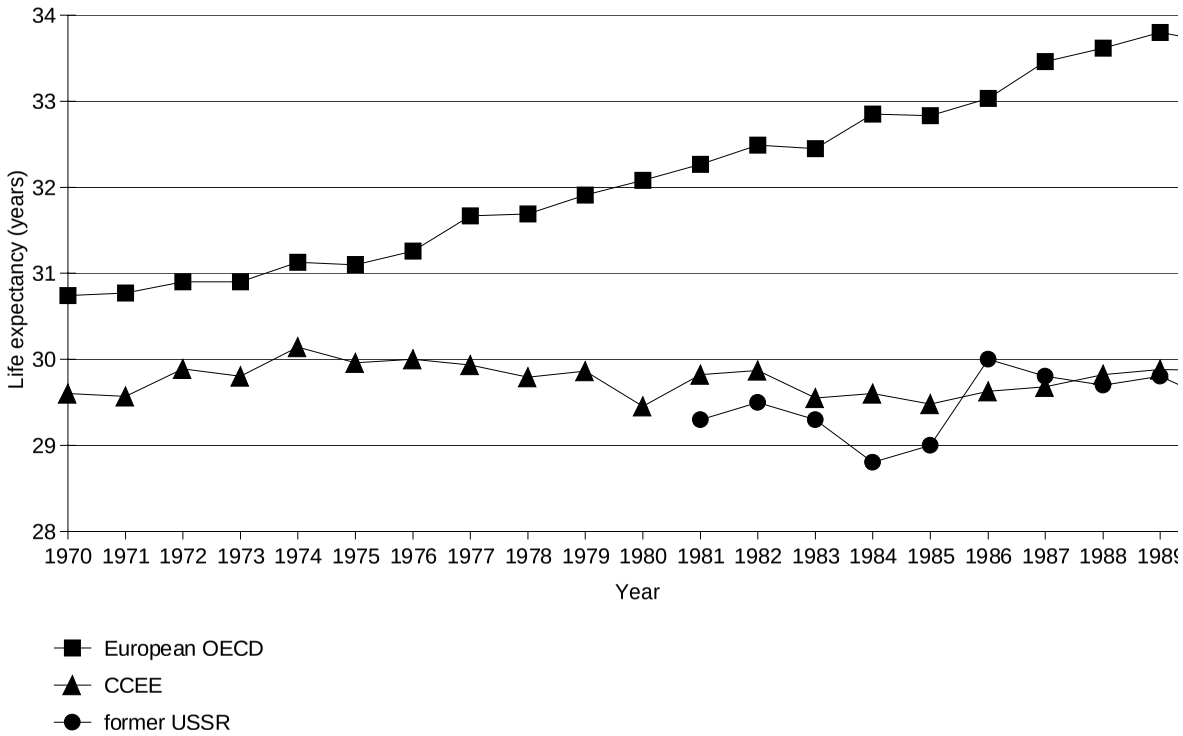


Fig. 2. Life expectancy at 45 years of age in the WHO European Region by group of countries



Thus, the most significant finding is the deterioration in the health status of middle-aged people in CCEE and the former USSR, especially of males.

The causes of these differences, and the possible contribution of environmental factors, are difficult to identify because of the number of factors, in addition to the environment, that affect health status, such as tobacco smoking and alcohol consumption. About 20–45% of the population of the Region smokes; in general, the habit is more prevalent in men than women, though this pattern is changing in some countries, particularly among young people. Overall, cigarette sales are declining, but not in CCEE where the average number of cigarettes sold, per person, exceeded the European average by 30% in 1990.

Alcohol consumption also shows considerable variation between countries, from less than 1 litre (pure alcohol equivalent) per person annually in Israel and Turkey to more than 12 litres in France and Luxembourg in 1990. Since 1980, alcohol consumption has declined throughout the Region, except in the Nordic countries.

It should also be noted that in each of the groups of countries (European OECD, CCEE and former USSR) there is variation in the health status and socioeconomic conditions of the different populations.

Despite these problems, an attempt is made to assess the extent of the impact of environmental factors on the inequalities in health identified in the population of the Region.

4

Effects on health of environmental exposure

Human health is determined by a number of factors including genetic predisposition, lifestyle, nutrition, socioeconomic status, access to adequate health care, and the environment. The continuing availability of environmental resources – air, water, food and shelter – as well as appropriate climatic and socioeconomic conditions are prerequisites for health and survival. Environmental conditions are not always optimal, however, and populations may be exposed to a variety of environmental factors that may adversely affect their wellbeing. These environmental health hazards may result from natural causes and/or human activities, as described in the next section on environmental exposures.

Estimates of the impacts on health of environmental agents require information on exposures and on the quantitative relationship between exposures and effects on health. Precise estimates of exposure are rarely possible, however, owing to the scarcity of monitoring data. The estimates of exposure are, therefore, based on limited information and, whenever feasible, supplemented by extrapolations based on some reasonable assumptions; the resulting uncertainties in the estimates of exposure may be considerable.

Furthermore, knowledge of the effects on human health of various exposures, based on epidemiological and toxicological studies, is far from complete. This leads to further uncertainties. In general, the severity of the impact on health is assumed to depend on the extent of the exposure and the corresponding dose of the environmental agent, but the precise dose–response relationship is often not known. For some environmental agents, doses below a certain threshold level can be accommodated and are not harmful (or may even be beneficial). Others, such as allergens, ionizing radiation and chemical genotoxic carcinogens, are believed to

have no threshold dose and to pose a risk at all levels of exposure. Human response to environmental factors is also not homogeneous in the population, since some subjects are more susceptible than others. This is obvious in the case of allergies, but a variation in response to carcinogens is observed as well. The source of the increased susceptibility may be genetic predisposition, but coexisting environmental or lifestyle factors are also known to influence the response.

In many situations a combination of factors may have a different or worse effect on health than exposure to each factor separately. Further, unfavourable environmental, social and lifestyle conditions coexist in some parts of society. People may have a poorly balanced or inadequate diet, be exposed to occupational hazards, adopt a harmful lifestyle (by excessive alcohol consumption or tobacco smoking, for example) and, at the same time, be exposed to one or more environmental hazards. This combination may increase the risk of disease above the level expected if the factors acted separately. For example, asbestos or radon appear to cause ten times more lung cancers in smokers than in non-smokers.

However incomplete, the available information has been used to estimate the impact of environmental hazards on the health of the population of the Region. Whenever the exposure and epidemiological data allow, the proportion of illnesses or other health impairments in the population that might be attributable to the exposure has been estimated as an "attributable proportion" *(1)*.

This may be an oversimplification of the situation. The risk estimates derived from one epidemiological study may be specific to the population studied (owing to a particular exposure situation or to the characteristics of the population at risk). In this analysis, risk estimates were based on several similar studies conducted in different populations to diminish this problem. Further, for some types of exposure and health effect, the number of studies is large but, for others, reported studies are few. For this reason, too, the estimates should be considered with caution.

The possible role of environmental hazards in each of the nine main disease categories is considered in turn. Since not all deficiencies in health can be classified as a disease, the effects of environmental hazards on wellbeing are also discussed.

Cardiovascular disease

In all the countries of the European Region, the most common cause of death is disease of the circulatory system. The mortality

due to cardiovascular disease is considerably lower in the European OECD countries than in CCEE or the former USSR. Owing to a decreasing trend in western Europe and an increase, or at best stabilization of rates, in the rest of the European Region, the difference in mortality between these two parts increased from a factor of 33% at the beginning of the 1970s to a factor of 100–150% at the end of the 1980s. The main recognized risk factors for cardiovascular disease in general, and coronary heart disease in particular, are hypertension, high blood cholesterol, and tobacco smoking. Interrelated factors, which are correlated with the three main risk factors, include obesity, inadequate physical activity and a diet rich in saturated fats and/or salt. The role of environmental factors in the etiology of cardiovascular disease in the general population is almost certainly small. On the other hand, cardiovascular disease may be aggravated by exposure to elevated levels of carbon monoxide *(2)*. People in certain occupations (garage attendants, tunnel workers and police officers) as well as commuters in heavy traffic are exposed to elevated levels of carbon monoxide. Occupational exposure to other factors have also been associated with cardiovascular disease. Environmental tobacco smoke has also been considered as a risk factor for cardiovascular disease but the evidence is not consistent *(3)*.

A number of studies have shown a statistically significant inverse relationship between the hardness of drinking-water (related to dissolved calcium and magnesium) and cardiovascular disease. According to the recently revised WHO guidelines for drinking-water quality, however, the available data are inadequate to prove that the association is causal *(4)*.

Cancer

In all countries of the Region, cancers are the second commonest cause of death, after diseases of the circulatory system. The differences in cancer mortality between parts of the European Region are less dramatic than those seen for cardiovascular disease. The most common sites of fatal cancer are different in males and females. In males, lung cancer accounts for over 27% of cancer deaths in western Europe and 33% in the former USSR. In females, lung cancer is less frequent than in men but it causes a greater proportion of cancer deaths in western Europe than in the rest of the Region. The main risk factor for lung cancer is tobacco smoking. In females, breast cancer is the commonest cause of cancer death and accounts for a greater proportion of

cancer deaths in the European OECD countries than in the former USSR. The risk factors for breast cancer are not clear but various hormonal and reproductive factors may play a role. The other common cancers in both sexes are of the stomach, colon and rectum; dietary factors are thought to influence the risk of these cancers.

A number of factors are considered to increase the risk of cancer, including lifestyle (smoking, alcohol, diet, reproductive behaviour), genetic and hormonal factors. Environmental agents also play a role, which may be relevant in selected areas and population groups. For instance, special environmental circumstances such as occupations or local practices or conditions may enhance cancer risks, particularly for cancers of the skin and the respiratory and urinary tracts.

In the following sections, attention is focused on ionizing radiation, nonionizing radiation, and selected chemicals present in the human environment. When considering the possible impact of these environmental exposures on cancer causation, an important distinction must be made between genotoxic carcinogens, where no threshold is assumed, and non-genotoxic carcinogens, where evidence suggests that below a certain threshold no cancer risk exists.

Ionizing radiation

The effects on health of ionizing radiation have been a source of public concern for several decades. The potential hazards that need to be considered are: radon from uranium-bearing rocks, occupational exposures, nuclear accidents, and nuclear weapons testing.

The main effect that environmental exposure to ionizing radiation has on health is the induction of cancer, and it is assumed that no threshold dose exists below which there is no risk of an effect.

Increases in lung cancer in relation to radon exposure have been observed mainly in uranium miners, but recent data from Sweden indicate that domestic exposure may also increase the risk of lung cancer considerably. The Swedish study showed that, compared with subjects exposed to radon in time-weighted average concentrations below 50 Bq/m^3, the risk increased by some 30% in people exposed to 140–400 Bq/m^3 and by 80% in those exposed to concentrations over 400 Bq/m^3 *(5)*. This study also showed that 16% of all lung cancer cases in the Swedish population may be attributed to radon exposure *(6)*. Since most other

countries in the Region have lower levels of residential radon exposure, the attributable proportion of lung cancer would probably not be as high as in Sweden and other parts of Scandinavia. Furthermore, the Swedish study indicated a strong interaction between residential radon and smoking that is close to a multiplicative effect. This implies that most radon-related lung cancers are likely to appear in smokers.

In general, the exposure of populations in different countries of the Region to domestic radon is difficult to evaluate because concentrations in the same geographical area and the extent of household ventilation vary markedly. Nevertheless, the data reviewed make it possible to estimate the proportion of people living in dwellings with concentrations of radon daughters above the level (100 Bq/m^3 equilibrium equivalent radon as an annual average)[a] at which simple remedial measures should be considered (see Table 1, page 44) *(7)*.

Occupational exposure is another potential source of risk. People affected include uranium miners and workers employed in the nuclear power industry, health care, and research. Uranium miners are particularly at risk. The size of the populations monitored for exposure to radiation in the medical care, research and nuclear power sectors ranges from about 700 subjects in Luxembourg to about 320 000 in Germany. Air crews have not, in the past, been classified as occupationally exposed, but they may receive doses from cosmic radiation that are comparable to those of radiation workers. For several countries in the Region, data are not available on the number of radiation workers, or the doses they receive. The dose limit recommended by the International Commission on Radiological Protection is 20 mSv a year, averaged over five years. The great majority of workers in countries with data receive doses well below 5 mSv annually. If this dose of 5 mSv were received annually for 40 years, then this might result in a 5% increase in the existing probability (of 0.2 to 0.25) of an individual dying from cancer. A very approximate estimate of the number of radiation workers exposed to levels that raise concern for their health is presented in Table 2 (see page 47). A higher risk of lung cancer must be expected in several hundred thousand workers who have worked in uranium mining in central Europe in the past. These mining activities have now largely stopped; where they continue, exposures are far lower than in the past, possibly averaging about 10 mSv a year.

[a] Also expressed as 200 Bq/m^3 radon gas concentration.

The possibility of nuclear accidents is associated with the potential for radiation-induced cancer in the population. Since the Chernobyl accident, health surveys have been conducted in the various populations exposed to the released radionuclides. No increase in the incidence of childhood leukaemia has been observed so far, either in Belarus *(8)* or in various European countries with different levels of population exposure *(9)*. On the other hand, a sharp increase in the incidence of thyroid cancer has been observed in Belarus among children who appear to have been exposed to large doses of radioiodine *(10)*. This increase occurred earlier than would be expected from previous knowledge of thyroid cancer after radiation exposure, and corresponded to an 80-fold rise in the incidence compared with background rates *(11)*.

Radionuclides are unavoidably present in food, from natural sources. Contamination from artificial sources is low in comparison, except for certain foods from areas contaminated by the Chernobyl accident that still contain significant levels of radionuclides. Estimates of any increased cancer risk are hampered by lack of monitoring and food consumption data and reliable cancer statistics, but food contamination is unlikely to lead to observable increases in cancer; the doses received from external contamination are substantially larger.

General environmental exposure to man-made sources of ionizing radiation (other than that resulting from major accidents or, earlier, from nuclear weapons tests) is insignificant in comparison with that from natural sources, such as radon.

Nonionizing radiation

The main sources of nonionizing radiation are ultraviolet radiation (UVR) from the sun and artificial light sources, and electromagnetic fields, both natural and man-made.

Although the link between solar UVR and skin cancers is well established *(12)*, the excess of cancers caused by UVR is difficult to estimate because of lack of exposure estimates and, in the case of cutaneous melanoma, because the exposure–response relationship is complex. The incidence of the common forms of skin cancer is increasing by 2–3% a year. While malignant melanoma is a rarer form of skin cancer, it has a high fatality rate (30–50%). Its incidence has risen markedly in the last few decades (for example, by 50% in England between 1980 and 1986). It is widely feared that depletion, by chlorofluorocarbons and similar agents, of the stratospheric ozone layer, which filters out the more

harmful components of solar UVR, may be causing this increase in skin cancer. But the main risk at present is from excessive exposure to UVR through individual choice, and many of the potential hazards could be countered by changes in behaviour. An annual two-week holiday in the sun can increase the life-time risk of non-melanoma skin cancer five-fold in northern European indoor workers, because it doubles their annual dose of biologically effective UVR. An equivalent change in exposure in northern Europe would require, approximately, a 50% decrease in the ozone layer. In the case of malignant melanoma, intermittent exposure and exposures sufficient to cause sunburn both increase the risk. The effects of small changes (of the order of 10%) in the ozone layer may therefore not be as important in this respect. The International Agency for Research on Cancer suggests that a decrease in sunbathing could reduce the risk of skin melanoma by 40% *(13)*.

At present, it is unresolved whether environmental exposure to electromagnetic fields of extremely low frequency (ELF) has adverse biological effects. Published studies lack consistency: some suggest that cancer, especially leukaemia in children, or in people occupationally exposed to ELF, may be related to the exposure, while other studies show no effect *(14)*. A recent study from Sweden found an increased risk of childhood leukaemia, related to estimated exposure to electromagnetic fields *(15)*. From a public health point of view, the risk was insignificant: less than 1 extra case of childhood leukaemia per year in a population of 9 million, associated with living near high voltage power lines *(16)*.

The high prevalence of exposures to ELF, the inconclusive evidence from epidemiological studies, and strong public concern are arguments for conducting investigations to resolve the issue. Studies of electrical workers are more likely to be helpful than studies based on the general population, with lower levels of exposure. At present, no estimate can be given of the possible impact of exposure on health.

Chemicals

The impact of potentially carcinogenic chemicals is difficult to assess quantitatively because of the scarcity of appropriate data. Assuming there is no safe level of exposure to genotoxic carcinogens, the presence of such chemicals in the environment poses a potential risk.

Air is one of the main carriers of chemical carcinogens to humans. Exposure to products of the incomplete combustion of

fossil fuels that contain possible human carcinogens (polynuclear aromatic hydrocarbons (PAH)) is relatively common. A few epidemiological studies have demonstrated a relation between risk of lung cancer and ambient particulate air pollution *(17,18)*. Assessing the exposure retrospectively and accounting properly for confounders are both difficult. This severely restricts the opportunities for quantitative risk assessment. In a case–control study conducted in Cracow, Poland, about 4% of lung cancer cases in males and 10% in females were attributed to residence in an area with air pollution (black smoke at an annual average concentration over 150 $\mu g/m^3$) observed several years before registration of the cancer cases *(19)*. Other studies suggesting a higher risk of lung cancer related to ambient air pollution were performed in populations living near some types of industry. The evidence was strongest for non-ferrous smelters, where arsenic emissions might be important.

The passive inhalation of cigarette smoke (environmental tobacco smoke (ETS)) has recently been implicated as a contributor to lung cancer among non-smokers living or working closely with heavy smokers. The combined evidence from 25 epidemiological studies indicates an increase in risk of 20–30% in non-smokers married to smokers *(20)*. The limited data on smoking prevalence indicate that about 60% of adults over 15 years of age in the Region, i.e. 340 million people, do not smoke. At least 50% of them (some 170 million) are exposed to ETS. Thus an estimated 9–13% of all lung cancer cases in adult non-smokers are attributable to ETS exposure. In other words, with an incidence rate of 10 lung cancer cases per 100 000 non-smokers, one would expect 3000 to 4500 cancer cases per year to be related to ETS exposure (see Table 1, page 44).

Exposure to certain potentially carcinogenic substances, such as benzene and some PAH, depends to a large extent on lifestyle, since an important source of exposure to both is active cigarette smoking, as well as ETS. Vehicle exhausts may also contribute to exposure. In particular, exhausts from diesel engines, a complex mixture of a number of chemicals including PAH, are considered to be probably carcinogenic to humans *(21)*.

Some epidemiological studies have suggested tobacco smoking has interactive effects, increasing the cancer risk related to environmental agents. The best evidence concerns the risk of lung cancer related to asbestos or to radon exposure, which appears to be ten times greater in smokers than in non-smokers.

Sources that may contaminate food and water with chemical carcinogens range from industrial and human activities to

agricultural practices, food processing, packaging and preparation, and water disinfection practices. The relative contribution of carcinogenic contaminants in food and water to the overall impact of diet on cancer is not known.

Concern about possible carcinogenic risks from chemical contaminants in drinking-water is directed mainly at certain pesticides, halogenated organic compounds (such as tri- and tetrachloroethylene) and inorganic compounds (such as arsenic and nitrate). Though European waters are contaminated by these chemicals over large areas, levels are in general well below WHO guideline values.

It has been suggested that the chlorination of water may give rise to complex mixtures of halogenated compounds with potential carcinogenic effects on people with a lifelong exposure to them; but the evidence is controversial and the issue unresolved.

In large areas of central and eastern Europe (in Hungary and Romania) high levels of arsenic are known to occur in drinking-water as a result of local geology. In other countries (such as Bulgaria), high levels result from industrial contamination. Arsenic ingestion has been associated with an increased incidence of (mostly benign) skin tumours, but no convincing evidence of an increased incidence has been found in the affected areas of CCEE. This may be the result of the trend to use bottled water imported from uncontaminated areas, as has happened in parts of Hungary. The evidence for the role of nitrate in the causation of gastric cancer is weak.

In summary, the pollution of water with potentially carcinogenic pesticides and organic chemicals may, in principle, pose a health hazard. According to available data, however, the exposure levels of the overall population of the Region do not seem to constitute a health risk, although in some places these contaminants may at times exceed levels of concern.

With food, the possible cancer hazards of chemical contamination encompass a number of pesticides, organic compounds (such as polychlorinated biphenyls, polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans), inorganic compounds (such as nitrate and some heavy metals) and natural toxins (such as mycotoxins of the aflatoxin type). In general, the contribution of these factors to the actual cancer risk of the population in the Region is difficult to assess and is probably small. The contribution of aflatoxins to the risk of liver cancer seems to be negligible in most parts of the Region, whereas ochratoxin A is suggested as one of the causative agents for Balkan endemic nephropathy – a condition that appears to be

associated with an increased risk of developing urinary tract tumours *(22)*.

Waste collection, disposal and treatment procedures could also be sources of carcinogenic hazard, if chemical agents are present in the emissions to ambient air of the gaseous and particulate products of waste incineration, or in leachates from landfill sites to surface waters and groundwaters. Several epidemiological studies have explored an association between residence near waste sites and various cancers. There is no convincing evidence of health risks.

The use of appropriate technical and management procedures can minimize, or even eliminate, any potential threat to human health from wastes. Nevertheless, past accumulation of wastes, particularly hazardous wastes, creates a considerable problem and may have an impact on health in the future, owing to the persistence and low biodegradability of the carcinogenic components of the wastes. The inadequate disposal of hazardous wastes in the former USSR is a particular problem, now, for NIS. Waste transported across national borders, sometimes without proper authorization and documentation, may give rise to similar situations.

Over 30 occupations have been associated with an elevated risk of cancer. Recognized carcinogens are relatively effectively controlled in the work environment. Even in Finland, however, where occupational safety standards are well established, some 4% of the workforce may be exposed to carcinogenic chemicals. Such an increased risk of lung or bladder cancer, for example, in a small number of workers, will not usually be detectable in population cancer statistics.

Respiratory diseases

In general, diseases of the respiratory system are a less frequent cause of death than cardiovascular disease or cancer, and their share in total mortality has diminished. In some parts of the Region, however, they are still an important problem. In NIS, respiratory diseases (including infections) are diagnosed as the cause of death in 25% of children aged 1–14 years, and these mortality rates exceed those in CCEE and the European OECD countries threefold and over 20-fold, respectively. Among adults the variation in respiratory mortality rates and in their trends was greater between these groups of countries than for other frequent causes of death.

An important group of respiratory diseases is chronic airways diseases, namely bronchitis, emphysema and asthma. These diseases have tended to be less frequent causes of death in recent years than they were at the beginning of the 1970s. This improvement is most marked in people aged 45–64 years, and especially in western European males. Improvement in mortality rates is less evident in younger people, however, where asthmatic rather than chronic obstructive forms of respiratory disease are more frequent. Owing to their high prevalence and chronic character, their frequent restrictions on normal activities and the costs of medication, chronic airways diseases are a significant burden for affected individuals and for society. The main risk factor for chronic obstructive airways disease is tobacco smoking. In addition to smoking, however, air pollution, both outdoor and indoor, and occupational exposure to dusts have an important role in the etiology of the disease.

The asthmatic form of chronic respiratory disease remains ill understood. Recent studies from Sweden and the United Kingdom indicate that asthma prevalence is on the increase *(23,24)*. Genetic predisposition and a sensitization to allergens (including environmental allergens such as biological contaminants in indoor air) are important determinants of the clinical disease. Some 200 organic and inorganic compounds are known to induce or exacerbate occupational asthma *(25)*, which is rapidly increasing as an occupational disease in industrialized countries. The role of air pollution in asthma is still not clear: while aggravation of the existing disease seems to be related to several air pollutants, the question of whether air pollution increases asthma prevalence remains unresolved *(26)*.

The primary target organ of air pollutants is the respiratory system. The volume of air inhaled regularly (about 6–7 litres per minute, at rest) causes pollutants at relatively low concentrations to penetrate the respiratory system in considerable quantities. The spectrum of possible effects ranges from temporary, reversible changes in pulmonary function, through episodic symptoms that restrict normal activities, to permanent respiratory dysfunction and clinical forms of chronic respiratory disease. The most severe effects may increase respiratory mortality in the most susceptible groups of a population.

Despite the limitations in the data on ambient and indoor air pollution and in the understanding of the etiology of chronic respiratory diseases, an attempt has been made to quantify the effects of air pollution on respiratory health (see Table 1, page 44). The estimates should be treated with caution, however, because of the uncertainties in the data and in the underlying assumptions.

The estimates of the effects of individual air pollutants are presented separately. This allows the health burden to be associated with particular types of contaminant and sources of air pollution. For example, a high prevalence of bronchitic symptoms in children in Leipzig was associated with high particulate pollution levels in this city, while a high prevalence of asthmatic symptoms in Munich was attributed to aeroallergens, possibly linked with pollution from road traffic, which is much more intensive in the western than in the eastern part of Germany *(27–29)*. In most cases, however, populations are exposed to mixtures of pollutants and the impacts on health of the mixture may not be a simple sum of the impacts of individual pollutants; different environmental conditions may result in different patterns of respiratory morbidity.

As estimates presented in Table 1 indicate, the size of the population exposed to ambient air pollution at concentrations of concern to health is rather substantial. Estimates of the consequences for health indicate that these exposures may cause a significant number of respiratory disorders. Currently, exposure to particulate pollution seems to produce the greatest effects.

In considering the impact of environmental factors on the respiratory system, the role of indoor air pollution must be emphasized, since people spend a substantial part of their lives indoors and the exposure to several factors occurs mainly indoors. Energy conservation measures may be associated with low rates of air exchange and increased concentrations of contaminants. The effects of involuntary smoking on the respiratory health of children are probably the best recognized and have been extensively illustrated in recent reviews *(3,30)*. Exposure to nitrogen oxides may also increase the frequency of respiratory illness in young children. Issues of emerging importance include the biological components of indoor air pollution, which may increase allergic sensitization (*31*). Significant determinants of this type of pollution are building construction and ventilation. Warm, damp conditions promote the growth of biological agents (house-dust mites, fungal spores) producing allergens that may provoke allergic respiratory disease, especially in small children *(32,33)*. See Table 1.

To summarize, winter-type smog episodes are clearly related to such conditions as lower respiratory tract illness and the worsening of chronic obstructive lung disease. Current trends in air pollution exposure lead one to expect a general decrease in the incidence of such respiratory health problems. On the other hand, the old problems may possibly be replaced by an increase

in allergic sensitization and allergic diseases, including bronchial asthma, due to more frequent exposure to allergens in the outdoor and (mainly) indoor environments. With the levels of summer-type smog pollutants showing an increase, the incidence of allergic symptoms may increase in the Region.

Communicable diseases

The role of infectious diseases as a cause of death has fallen over the past 20 years in the Region as a whole, but in the former USSR mortality has been markedly above the average and the decline has been slower. The main infectious diseases causing death are respiratory tuberculosis and various forms of septicaemia. In the Region generally, the incidence of several infectious diseases has decreased substantially owing to effective vaccination programmes. Following the failure to maintain an effective vaccination programme, however, diphtheria has dramatically increased in some countries of the former USSR, mainly the Russian Federation and Ukraine, in recent years.

Tuberculosis continues to present a major problem in the Region. In many European OECD countries, the historical decline in notification has ceased in recent years and in some the trend has reversed. Tuberculosis mortality is steadily increasing in a number of NIS, while no decline is seen in most CCEE. The extent to which this general deterioration is due to social and economic dislocation, multiple drug resistance or, in some countries, the spread of infection with the human immunodeficiency virus (HIV) is unclear and requires research.

A striking variation exists in infant mortality rates from infectious diseases, ranging from 0.4 per thousand live births in the European OECD countries, through 4.7 in CCEE to 9.2 in NIS. These differences in infant mortality indicate clearly that infectious disease in the first year of life is a priority area for intervention in CCEE and NIS.

The quality and availability of data on exposure to pathogenic microorganisms in drinking-water vary greatly across the Region; data are generally inadequate in CCEE and NIS. Nevertheless, it is clear that large populations in CCEE, particularly in rural areas, and more widely in NIS, suffer serious deficiencies in water supply, in terms of both availability and quality.

Waterborne hepatitis A infection remains a public health problem in several countries, with relatively high rates in Poland, Romania and NIS.

While imported cases of cholera occur sporadically throughout the Region, recent outbreaks of indigenous cholera have also been reported in the Russian Federation (1990 and 1991), Ukraine (1991) and Tajikistan (1993). Romania has reported cases in small villages in the Danube delta area in each of the last 4 years. Several other types of waterborne gastrointestinal infection have been reported in the Region (due to *Salmonella* spp., *Shigella* spp., *Escherichia coli*, *Campylobacter* spp. and cryptosporidium, for example).

Foodborne microbiological contamination has increased over the last decade, as shown by a dramatic increase in related diseases *(34)*. Salmonellosis is still the most important foodborne disease. In some countries, however, salmonellosis is no longer the leading gastrointestinal infection. In the Netherlands, for example, *Campylobacter* infections are three times more common than *Salmonella* infections; a similar trend has been observed in England, Wales and Scotland. Cases due to *E. coli* have increased in all countries. Localized increases have been recorded of infection with *Listeria monocytogenes* in some western European countries, of brucellosis in Turkey and of trichinellosis in Bulgaria, Poland, Romania and the former Yugoslavia.

Contamination of meat or freshwater fish with parasites is an increasingly recognized regional problem. Some 2 million people in the Russian Federation, for instance, may be infected with liver flukes.

For both food- and waterborne infections, underreporting is certain to occur, since only the more severely affected individuals will seek medical treatment. Because national standards vary, data on levels of contamination that exceed them cannot be interpreted or used for extrapolation purposes in the same way as has been possible for major air pollutants. On the basis of a study in the Netherlands, however, 130 million people in the Region may be exposed to food or water contaminated with *Salmonella* spp. or *Campylobacter* spp. (see Table 1, page 44): the annual cost of such infections in the Region may be billions of dollars.

For bathing water, links between sewage contamination and gastrointestinal and upper respiratory symptoms have been established *(35)*. Swimming in heavily polluted water carries the risk of contracting infections such as typhoid fever, shigellosis, leptospirosis and hepatitis A. The link between moderately contaminated water and minor infections is more contentious because these conditions are common and multicausal.

The Mediterranean basin, which receives waste and sewage from 18 countries, offers an example of the problems of bathing

water pollution. These problems have been recognized by the launching of the Mediterranean Action Plan. About 130 million people live in the area and 100 million tourists visit annually. The real size of the health effects has yet to be evaluated, but preliminary estimates indicate that, for each million people at risk, 25 000–40 000 will have gastrointestinal symptoms caused by contaminated bathing water. Assuming that at least 100 million people a year bathe in the Mediterranean, a minimum of 2.5 million cases of gastrointestinal infection are to be expected annually.

Waste may contain hazardous biological agents; an accumulation of municipal solid wastes that is not properly disposed of can lead to an increase in the number of rats or insects acting as carriers of infectious disease. Infection from direct contact with waste contaminated with microorganisms is limited but may occur in an occupational setting, particularly where people handle hospital waste containing sharps contaminated with hepatitis B virus or hepatitis C virus and, potentially, HIV. Pathogenic agents from improperly stored or treated wastes may also contaminate drinking-water sources, and in this indirect way constitute a potential source of communicable diseases.

Inadequate housing conditions facilitate the transmission of pathogenic microorganisms. The proportion of dwellings without an indoor piped water supply or not connected to sewage systems or septic tanks exceeds 80% in certain CCEE and NIS, particularly in rural areas. According to the available data, as many as 110 million people live in dwellings without a piped water supply (see Table 1) and this includes 86 million people in NIS. This may increase the risk of communicable diseases, through contact with microbiologically contaminated water and through lack of water for personal and domestic hygiene, especially in densely populated urban areas. The available data are too scarce, however, to provide an estimate of the contribution of these conditions to the incidence of communicable disease. Overcrowding and inadequate ventilation may increase the incidence of infectious (mostly respiratory) diseases, but again, quantification of the risk is difficult.

Thus, the incidence of communicable diseases (and infrequent resulting mortality) is closely related to the microbiological contamination of food and drinking-water in many parts of the Region. Deficiencies in urban and rural development (affecting sanitation and housing) may also have a significant impact on morbidity from communicable disease. The most important health-related problem with bathing water is microbiological contamination.

Injury and poisoning

Among males aged 1–44 years of age and females aged 1–14 years, injury and poisoning are the leading causes of death throughout the Region. In all European OECD countries except Finland, however, the mortality rates have been declining for most of the past 20 years. In CCEE, mortality from injuries and poisoning is also declining but at a slower rate. This mortality rate has been higher in CCEE than in western Europe by almost 100% in males and 70% in females for most of the past 20 years. The main causes of fatal accidents are road traffic accidents, suicide and self-inflicted injuries. Mortality rates due to poisoning are extremely high in NIS, exceeding three-fold those in CCEE and over ten-fold those in western Europe.

Accidents at work resulting in injuries at the rate of 10 million annually are an important public health problem. They result in the death of about 25 000 workers in the Region annually, and cause permanent disability at a rate of 20–30 per 100 000 *(36)*. In high-risk occupations such as construction, accidents at work are experienced by 25% of workers. The cost to the individuals affected and their families is immeasurable; that to society can be measured as a significant economic loss in the region of 1–4% of gross national product.

The existing methods of assessment and registration of accidents at home prevent a precise assessment of the overall size of this health problem. Domestic accidents largely affect the very young and the elderly, with most of the deaths occurring in the elderly. Data from one country indicate that a significant fraction (about 13%) of fatal accidents in the home can be attributed to defects in housing construction.

The number of casualties from road traffic accidents is extremely high, with over 350 people killed and 6000 people injured daily. The number has increased in some CCEE since 1989. Countries with the highest mortality rates also have the lowest number of vehicles per person and therefore the highest number of deaths per 100 000 vehicles. The exposure to traffic is spread throughout the Region although the extent of accident risks, and of those risks affecting health, varies markedly between countries. Annual mortality rates from road traffic accidents range from 9 per 100 000 in the Netherlands, Norway, Sweden and in the United Kingdom to 23–27 per 100 000 in Hungary, Poland and Portugal. Since most accident victims are young or middle aged, the loss to society is particularly significant.

Estimates of the impact of these almost entirely preventable accidents on the Region's population are given in Table 3, page 49.

Major industrial (including nuclear) accidents with large-scale environmental impacts on health are a serious potential hazard. All possible measures should be taken to prevent their occurrence and to mitigate the consequences of any such accidents that may still occur.

Effects on the nervous system and mental disorders

The prevalence of mental disorders ranges from 6% to 22% in various parts of the Region. Common mental disorders, such as depression, anxiety, aggressive behaviour or alcohol abuse, precede most suicides, which are the cause of 1.5% of all deaths and 23% of deaths due to injury and poisoning. Suicides are more frequent in males than in females by a factor of 2.8. The possible role of environmental factors in causing or aggravating these disorders is rather uncertain.

Several chemicals may be a hazard to the nervous system. An overview of environmental exposures to selected chemicals concludes that exposures to lead are at levels of concern for health in several parts of the Region. A threshold for the neurobehavioural effects of exposure to low levels of lead is difficult to identify, so it is prudent to assume there is no safe level *(37)*. Exposure to elevated levels of lead can still be caused by plumbosolvent drinking-water in lead pipes, flakes of old lead-containing paint, dust and contaminated soil, including the deposition of emissions from vehicles using leaded petrol and from lead in air in areas around some industrial emission sources, such as metal smelters and processing plants, particularly in CCEE and NIS. Some 2 million people, including 400 000 children, are estimated to be exposed to levels of lead in ambient air exceeding WHO air quality guideline levels (see Table 1, page 44). The most important potential effect is impaired mental development in children *(38)*. Lead deposited on the soil around industrial hot spots will persist in the environment. The exposure of children and the related effects on their health may therefore continue even after industrial emissions are controlled. The exposure can be significantly reduced, however, for example by appropriate soil recultivation and exclusion of food production from the contaminated areas. The exposure of populations to lead, especially in eastern European cities, may be expected to increase owing to increasing traffic density, unless unleaded petrol is introduced on a significant scale. This is indicated by the experience of western European countries from the 1970s, when leaded petrol combustion was the major source of lead exposure.

A risk of neurological effects may be linked with exposure to methylmercury: blood levels of 200 μg/l may be associated with an approximate 5% risk of mild neurological effects *(39)*. People who consume large amounts of fish may be exposed to high levels of methylmercury. The effects of methylmercury exposure on the developing nervous system are more difficult to assess. The lack of adequate data has not permitted the setting of a tolerable intake level. Thus, a potential but unquantifiable risk to the fetus is associated with pregnant women and nursing mothers who consume large amounts of fish contaminated with methylmercury.

Effects on the developing nervous system in babies might be expected from exposure to polychlorinated biphenyls in mothers' milk. The potential risk may be expected in population groups that consume large amounts of fish *(40)*.

Several occupational factors may have an impact on the nervous system or mental health (see Table 2, page 47). Noise at intensities exceeding safety levels is associated with a number of occupational activities and is estimated to affect 20–50% of workers. Besides noise-induced hearing loss, exposure is known to produce psychological stress and sleep disturbances. Psychological stress, significantly affecting the wellbeing of workers, has become an important issue in increasingly competitive societies. Psychological overload, reported by 30–50% of surveyed workers, time pressures at work and job dissatisfaction create strains that may also affect the somatic health of employees and contribute to cardiovascular morbidity *(41)*.

Mental health can also be affected by emergency situations; in the 1980s, the term post-traumatic stress disorder was introduced to describe the repeated findings in survivors of various types of catastrophe *(42)*. The chemical accident in Seveso was followed by an increase in cardiovascular mortality in the early post-accident period. This has been interpreted as most probably due to the aggravation, under severe stress, of existing ill health *(43)*.

Various psychosocial effects were described in the aftermath of the Chernobyl accident, both in the areas close to the accident and in other countries affected by the radioactive cloud that followed the explosion at the reactor. These effects ranged from anxiety and psychosomatic disorders among people living in the areas close to Chernobyl *(44)* to behavioural changes that led, for instance, to a decrease in the conception rate and an increase in induced abortions in some other populations *(45,46)*.

Haematological effects

Methaemoglobinaemia in infants may be associated with exposure to nitrates in drinking-water exceeding 100 mg/l (the WHO guideline is 50 mg/l). Such concentrations of nitrates have been detected in several countries. For example, in 2000 Romanian locations, nitrates exceed 100 mg/l in 17% of the samples; in Bulgaria, this value is exceeded on a regular basis.

Exposure to elevated levels of carbon monoxide, with the formation of carboxyhaemoglobin, may similarly impair the oxygen-carrying capacity of the blood. Reference has already been made to the resulting aggravation of cardiovascular disease. Other effects, which can occur in domestic situations, range from mild symptoms of drowsiness to unconsciousness and death. Data on non-fatal outcomes are limited.

Musculoskeletal disorders

Musculoskeletal disorders are a frequent outcome of inadequate ergonomic conditions at work, including physical overload or strain. Such conditions are estimated to affect 16% of workers in the European Union. In many countries, growing mechanization and automation is decreasing the number of exposed people, but harmful work conditions may still prevail in certain parts of the Region (see Table 2, page 47). Some 5% of labour forces are exposed to vibration; besides aggravating the effects of noise, it produces musculoskeletal disorders and affects the peripheral nervous system.

Birth defects and reproductive effects

Exposure to environmental contaminants before or after conception may affect reproduction by causing cell death or damage. This can lead to infertility in the adult, or spontaneous abortion of the conceptus and low birth weight, birth defects or structural or functional defects later in life in the offspring. The cause of a large proportion of birth defects is unknown *(47)* and environmental exposure may play an important role *(48)*.

Exposure to various environmental factors, such as methylmercury, polychlorinated biphenyls and pesticides, has been associated with reproductive effects. The heterogeneity of the prevalence of the birth defects selected for study may be attributed largely to differences in ascertainment among registries of birth defects. The role of other factors, however, including

environmental exposure, cannot be ruled out. In some cases, accidental environmental exposure to, for example, pesticides has been suspected of causing clusters of congenital malformations, as reported from Hungary *(49)*.

Wellbeing

Besides impacts on physical or mental health, various environmental factors may, and do, have an impact on wellbeing.

Some groups of people may be directly affected by wastes, which diminish the aesthetic value of the environment. The visibility of litter and waste is the main worry for local populations, both urban and rural; odours from waste disposal sites may also be detrimental to wellbeing. The perception of a health hazard, even without environmental contamination, may also be significant as it impairs wellbeing by promoting anxiety. The problem of anxiety induced by misunderstanding or uncertainty about risks applies also to other environmental factors, particularly radiation.

The feeling of wellbeing is determined, to a large extent, by living conditions. In general, the population of the Region does not suffer from obvious, severe deficiencies of housing, as seen in other parts of the world, where massive shanty towns surround large cities and inner cities show gross deterioration. The problem of homelessness does exist, however, although statistics are not always available. This problem can be expected to increase owing to the greater mobility of people within and between countries, and the unsatisfactory economic situation in many of them as well as, in some countries, the influx of war refugees. The average space per person in houses in the Region mostly exceeds minimum hygienic requirements, although in some CCEE and NIS this average may be less than or very close to the minimum.

Recreational activity can also be an important factor for wellbeing. Physical exercise may promote a feeling of wellbeing, accompanied by measurable improvements in physical fitness.

The frequency of complaints about noise indicates that a significant proportion of town residents in the Region feel it affects their wellbeing and quality of life (see Table 1). Road traffic is the major source of residential noise but, increasingly, complaints are about the behaviour of neighbours, and this is a much more difficult source to control. The tendency over time shows a degradation: the percentage of the population exposed to levels above 65 dBA was estimated at around 15% at the beginning of the 1980s and 26% by the early 1990s *(50,51)*.

The main adverse effects of such noise are general annoyance, and disturbance of sleep and communication. Prolonged exposure may possibly have long-term consequences for health. Whether or not leisure noise, such as loud music, may permanently impair hearing is still unclear.

Effects on health of non-environmental factors

Environmental factors are only one of the known causes of health problems, and only rarely are they the single cause. This can be the case for communicable, foodborne or waterborne diseases, for example, or for very specific but rare effects of exposure to high levels of radiation or toxic chemicals, usually resulting from occupational exposure or an accident. The registered occupational diseases are, in the vast majority of cases, fully attributable to environmental conditions at work.

Many factors are known to increase the risk of diseases linked to environmental exposure. Probably the most important is tobacco smoking. Active smoking at least doubles the risk of chronic obstructive airways disease and significantly affects lung function. In populations where smoking prevalence exceeds 40%, the proportion of this disease attributable to it approaches 30%. This exceeds, by at least a factor of two, the maximum contribution of urban air pollution to the prevalence of chronic obstructive airways disease. Tobacco smoking has been recognized as a significant risk factor for cancers at various sites, and the elimination of smoking is estimated to have the potential to reduce mortality due to these cancers by 30% (for cancer of the pancreas) to 90% (for lung cancer in males) *(13)*. Smoking is known to interact with some environmental exposures. For example, as previously mentioned, the risk of lung cancer in smokers exposed to asbestos or radon is greater than in non-smokers. A part of the excess mortality in males compared with females is interpreted as resulting from the difference in smoking prevalence between the sexes *(52)*. The unfavourable trends in cardiovascular and cancer mortality observed in middle-aged men in CCEE and NIS can also be attributed, to a large extent, to smoking.

Certain cancers may be associated with alcohol consumption. A significant proportion of injuries and deaths caused by road traffic accidents, home accidents and accidents at the workplace is also related to alcohol consumption. In such cases, the external environmental conditions combine with people's reduced ability to cope with them.

Dietary factors (including fat, fibre and vitamin intake) are crucial in the etiology of cardiovascular disease and may also be important contributors to major types of cancer, particularly of the stomach, colon, rectum and breast.

The inequalities in various indicators of health status relate to socioeconomic factors, particularly lifestyle factors and the quality of the environment. Extreme poverty is associated with restricted access to adequate food, water, housing and health services; with living in highly polluted urban areas; and with a lower level of education, which influences the choice of lifestyle, the understanding of hygiene, and the use made of health care services. There are strong and obvious associations between poverty and health. On a global scale, poverty is a less severe problem in the European Region than in some other parts of the world *(51)*. In many European countries, however, the proportion of people living close to, or even below, the social minimum income level is considerable.

This situation may be aggravated by economic recession and unemployment, social change and the unstable political situation in some areas of the Region, which in extreme cases has resulted in war. Inadequate social support systems to assist people in these circumstances can result in a significant deterioration in their health status. Ineffective preventive medicine and health services may have the same effect. An example is the dramatic increase in diphtheria incidence in some NIS. The deterioration in the economic situation of a country may also reduce the ability of governmental organizations to protect the population effectively from exposure to environmental health hazards.

Discussion

According to existing data, several environmental hazards occur at levels of concern to health in the European Region. Tables 1–3 summarize the extent of the estimated exposures. Wherever possible, the data have been extrapolated to entire populations. The precision, or uncertainty, of these estimates also depends on the quality and availability of the data. Even allowing for the considerable uncertainties, the estimates indicate that a substantial proportion of the population of the Region is exposed to environmental factors that are a potential risk to some aspect of health. The most common outcomes are mild illnesses, which are difficult to register by existing systems. Fatal outcomes, on the

other hand, are well registered in most countries and provide the main basis for comparisons of health status. Fatalities are rarely attributable to environmental exposure, except in the case of accidents. The magnitude of the impact, in terms of morbidity, of environmental conditions on the health of the population of the Region is hard to estimate at present.

As a number of uncertainties remain about exposure patterns and impacts on health, no assessment can provide a complete and exact picture. In particular, local environmental problems are not sufficiently documented and a number of hot spots (where levels of pollution are such that adverse effects on health are to be expected) have therefore probably not been recognized. Although hot spots may significantly increase the risks to a large number of people, their impact may be diluted to the point of concealment in overall population data. Furthermore, the range of health effects considered may be limited owing to a lack of appropriate monitoring data and/or insufficient quantitative risk assessment of certain potential hazards *(13)*. For example, the extent of population exposure to potentially carcinogenic air pollutants, such as PAH, is impossible to assess, although estimates of their emissions to the environment or of their ambient concentrations may be known in selected areas.

The recent developments in the methodology of environmental health, including molecular biomarkers, promise to provide better tools for assessing exposure and detecting early health effects. An example of this is a study conducted in Poland, where a higher rate of genetic alterations in somatic cells was observed in people living in Silesia, a heavily industrialized part of the country, compared with predominantly rural control areas *(53)*. Intensive research work is also being carried out to assess the possible role of genetic changes in the etiology of cancers *(54)*. These developments may help to resolve the present difficulties of establishing a causal relationship between long-term, low-dose (and often ill defined) exposures to environmental agents and the occurrence of various common cancers, the cause of which is probably multifactorial. Work is also needed to identify vulnerable subgroups in the population and elucidate the basis for their increased susceptibility to environmental agents. The extent to which such groups are unprotected by existing guidelines also needs to be established.

The estimates of people's exposure to environmental factors and the related effects on their health (presented in Tables 1 and 2) indicate a number of environmental hazards that potentially affect the health of the Region's population, in addition to the

important effects of lifestyle or socioeconomic factors. The analysis has emphasized measurable data and recognized effects but, for the reasons discussed above, large degrees of uncertainty inevitably exist in the estimates of the impact on health of environmental factors in the Region. Recent experience indicates that much environmental exposure, and the morbidity related to it, can be reduced.

As far as we know, the dominant risk factors for the most common severe diseases, such as cardiovascular disease and most cancers, are related to individual characteristics or to lifestyles, including smoking habits and diet; certain occupations may also be important determinants. Mortality from these diseases is also inversely correlated with national income. It seems likely that these factors are major causes of the differences in mortality between eastern and western European countries. The state of the environment can, however, be an important determinant of morbidity and have a positive or negative influence, even if indirect or secondary, on the development of many other diseases. Assessing the risk attributable to environmental factors is the first step in risk management aimed at promoting an environment supportive to health in the Region. To reduce uncertainties in risk assessment, better information on population exposures and better understanding of the links between health and environment are needed.

Priority issues

This section of the summary has provided an integrated account of the effects on health of environmental exposure in the Region. In so doing, it has taken account of the interaction of the environment, as defined in the European Charter on Environment and Health, with personal, social and economic influences. The conclusions reached, when read with the recommendations at the end of this report, should provide a framework within which each Member State can identify its own environmental health priorities. The European Region contains over 850 million people, stretches from Greenland to the Pacific Ocean, and embraces a rich variety of cultures, terrains and climates and different states of socioeconomic development. It would be vain to expect that a single set of priorities would be relevant to all. The provision of a universal, safe and convenient water supply may well be the top priority in one Member State, radon exposure within buildings in a second, and the problems of rapid

urbanization or inner city decay in a third. Nevertheless, a number of the issues that have emerged from the Concern for Europe's Tomorrow assessment are of such actual or potential importance to so many people in the Region that, in the interests of equity and solidarity, they are considered worthy of the urgent attention of all Member States.

Lack of information about environmental health

Lack of comparable data of an appropriate quality is a major obstacle to priority setting and environmental health management in the Region. A set of core environmental health indicators needs urgently to be agreed and developed for use on a Regional basis. This will help in the assessment of impacts and the formulation of feasible interventions to improve both environment and health. Better information for the public is also needed to promote understanding of environmental health risks and priorities.

Microbiological contamination of water and food

Without ready access to a supply of safe water, 110 million people in the Region, principally in CCEE and NIS, are at risk of serious health problems. The situation is aggravated by poorly maintained distribution systems and lack of water treatment plants. The microbiological contamination of food is a more general and increasing problem in the Region. Contamination originates principally from the farm, but can occur at any stage from production to consumption.

Deaths and injuries due to accidents

When considered together, accidents on the road, at work and in the home are the biggest single cause of death and disability among young people in the Region, with a correspondingly heavy burden of social and economic loss to society. Although lifestyle factors also play a part, appropriate environmental interventions to increase safety and reduce this burden are available and cost-effective.

In *World development report 1993* the World Bank *(55)* introduced a measure for the burden of disease that takes into account both loss of life expectancy and disability. According to this approach, 473 million units of disease burden per year are attributable globally to selected environmental threats. Of the 50 million of these units that can be averted by feasible interventions, the largest

number, 22 million, comprise the burden due to road traffic and occupational accidents. (Accidents in the home were not specifically included in the analysis.)

Measures to prevent major accidents that would affect the health of large numbers of people should be built into the systems of all potentially hazardous installations, and contingency plans should be developed to deal with emergencies.

Air pollution

Ambient urban air pollution due, for example, to particulates and sulfur dioxide remains at an unacceptable level, particularly in some southern European cities and CCEE and NIS, and requires urgent national and international action. The rapid expansion of road traffic generally throughout the Region is increasing air pollution from nitrogen oxides, volatile organic compounds (with resulting formation of ozone) and, where unleaded petrol is not used, lead. More attention should be given to the impacts on health of indoor air pollution. The effects of environmental tobacco smoke, particularly on the health of children, and of radon are particularly worrying.

Road traffic

While the impact of energy production and industry on environmental health is understood, the impact of road traffic is less well acknowledged. In addition to the mortality and disability due to accidents on the road and the increase in air pollution related to road traffic, the growth in the number of private motor vehicles causes increasing congestion, noise and delays in most cities in the Region. Although these effects on physical and mental health must be balanced against the advantages of private motor cars, an overall transport policy should be urgently considered from the point of view of environmental health.

Housing and urban development

In a Region where more than two thirds of the population live in towns, the complex environmental problems of the urban environment deserve urgent attention. In addition to urban traffic, these problems include rapid urbanization without proper infrastructures in the south, and inner city decay in the west, as well as homelessness, substandard housing, lack of facilities for recreation and inadequate municipal waste disposal. An integrated

approach is needed that builds on the WHO Healthy Cities project initiative.

Transboundary issues

Finally, the title of the report, *Concern for Europe's tomorrow*, requires the consideration of issues that, even if they have little impact today, may, if not checked, exert a significant impact on the health of future generations in the Region.

Some of these environmental health issues are of global concern: possible climatic change due to the production of greenhouse gases and ozone depletion by chlorofluorocarbons. While the role of the industrialized countries in the Region as major contributors to these environmental effects is clear, the impact of these changes on the health of the overall population is at present uncertain.

Predictions of climatic change and of the effects of global warming on health are difficult. But the indirect consequences of any such changes on human health, by the end of the next century, are likely to be great. They could result, for instance, from adverse effects on food production, changes in the distribution of vectorborne diseases, and increased migration *(50)*.

Changes in terrestrial levels of ultraviolet radiation, as a result of the continuing depletion of stratospheric ozone, directly increase the risks of skin cancers and probably of cataracts (both preventable by simple protective measures) and may indirectly affect human health by disturbing the normal food chain (by inhibiting the growth of crop plants and phytoplankton). Changes in ultraviolet radiation could also enhance the effects of global warming.

Both these potential hazards to the health of future generations require action now, at least to prevent further deterioration.

Other transboundary issues, such as acid deposition and the pollution of river basins, are of more obvious and immediate environmental health concern but also have possible long-term effects on human health. Major rivers, such as the Rhine and the Danube, and hundreds of smaller rivers that either cross national frontiers or form natural boundaries require joint management by all the countries concerned to protect the availability and quality of water supplies. Management must take into account the vulnerability of downstream populations to uncontrolled activities in the higher reaches of such watercourses. Inland lakes and seas with coastlines shared between two or more countries also require joint management for the protection

of water supplies, fishing resources and recreational waters, all of which are important for health and wellbeing.

International migration and its often associated homelessness also have short- and long-term implications for human health.

Another potentially important category of transboundary problem relates to trade, whether of contaminated food, industrial goods or hazardous waste. These activities may have adverse and more immediate effects on health. But for these problems, too, steps need to be taken now to change existing trade patterns and avoid handing on a much degraded environmental situation, with future risks to health.

Tables: exposure to known environmental risk factors

Tables 1–3 show selected environmental risk factors that various population groups in the Region may be exposed to and the potential related effects on their health. The tables are not a list of the priority environmental health issues in the Region (these are discussed on pp. 38–42). The environmental risk factors in the tables have been selected on the basis of the availability of data, not of their importance in the Region. The size and type of the various populations considered are as follows:

- the total population of the WHO European Region – 852 million;
- the working population of the Region – 400 million;
- the population of the Region west of the Ural Mountains – 700 million;
- the non-smoking adult population west of the Urals – 340 million;
- the urban population west of the Urals – 314 million;
- the child population west of the Urals – 170 million;
- the schoolchild population west of the Urals – 31 million;
- the infant population west of the Urals – 7 million (or 1% of the 700 million in that area).

Where possible, the available data have been extrapolated to provide an estimate of the probable exposure of these populations. The nature, frequency and intensity of the potential effects on health will depend on the extent of the exposure, as well as on individuals' characteristics and lifestyles.

Table 1. Estimated exposure of the general population to selected environmental risk factors and their potential health effects

Environmental factor	Level or circumstance of concern for health	Size and type of reference population (million)	Estimated people exposed at level of concern		Potential health effects	Comments
			Number (million)	Percentage of reference population		
Air pollution (ambient)						
SO_2 – short-term exposure	> 24-hour WHO air quality guideline level for at least 1 day/year	700 Total west of the Urals	200	29	Transient respiratory disorders, aggravation of (existing) chronic respiratory diseases potentially precipitating death	The number of people exposed is extrapolated to all cities from the mean number exposed in areas with data
SO_2 – long-term exposure	Annual mean > 100 $\mu g/m^3$ (twice the WHO air quality guideline level)	314 Urban west of the Urals	6	2	4–7% decrease in average level of pulmonary function	The level of concern for health is based on a multicentre study conducted in France. The number of people exposed is extrapolated to all cities from the mean number exposed in areas with data
Total suspended particulates – short-term exposure	> 24-hour WHO air quality guideline level for at least 1 day/year	314 Urban west of the Urals	29	9	Transient respiratory disorders, aggravation of (existing) chronic respiratory diseases potentially precipitating death	Only the people exposed in cities with data were included in the analysis. The number of exposed may be up to 10 times higher if other cities have similar exposure to total suspended particulates.
Total suspended particulates – long-term exposure	Annual mean > 140 $\mu g/m^3$	314 Urban west of the Urals	5	2	5% decrease in pulmonary function, increased incidence of chronic airways disease	

NO_2 – short-term exposure	> 24-hour WHO air quality guideline level for at least 1 day/year	314 Urban west	31	10	Lower respiratory illness in children, throat and eye irritation in adults	The number of people exposed is extrapolated to all cities from the mean number exposed in areas with data
O_3 – short-term exposure	1 hour mean > 200 $\mu g/m^3$ (the WHO air quality guideline level) at least once a year	170 Children west of the Urals	85	50	Cough and eye irritation; small, transient changes in pulmonary function in children	
Lead	Annual mean > 0.5 $\mu g/m^3$ (the WHO air quality guideline level)	170 Children west of the Urals	0.5	0.3	Impaired mental development of children	
Air pollution (indoor)						
Environmental tobacco smoke	Mother smoking at home	7 Infants west of the Urals	2	30	Lower respiratory illness in infants	Effects are also seen in schoolchildren but it is more difficult to assess the extent of their exposure
	Being married to smoker	340 Non-smoking adults west of the Urals	85	25	Lung cancer in non-smokers	
NO_2	Use of gas stove, equivalent to + 30 $\mu g/m^3$	31 Schoolchildren west of the Urals	15	50	Lower respiratory illness in schoolchildren	
Water and food	Occurrence of microbiological contamination (*Salmonella* spp., *Campylobacter* spp.)	852 Total in the WHO European Region	130	15	From mild gastrointestinal disturbances to severe gastroenteritis	Extrapolation to the entire population of the Region based on data from the Netherlands

Table 1 (contd)

Environmental factor	Level or circumstance of concern for health	Size and type of reference population (million)	Estimated people exposed at level of concern		Potential health effects	Comments
			Number (million)	Percentage of reference population		
Housing	Lack of piped water	852 Total in the WHO European Region	110	12	Waterborne infections	86 million out of 110 million are in NIS
	Dampness	852 Total in the WHO European Region	170–250	20–30	Allergies, including asthma, and respiratory infection	Extrapolation from data from the United Kingdom
Ionizing radiation Radon gas concentration	> 200 Bq/m^3	852 Total in the WHO European Region	43	5	Lung cancer	Estimate based on information on population exposure to radon provided by 12 countries
Noise	> 65 dBA	700 Total west of the Urals	180	26	Annoyance and sleep disturbances	

Table 2. Estimated exposure of the working population to selected environmental risk factors and their potential health effects

Environmental factor	Level of concern for health	Size and type of reference population in the WHO European Region (million)	Estimated people exposed at level of concern		Potential health effects	Comments
			Number (million)	Percentage of reference population		
Radiation	15 mSv per year	? 1–2 Radiation workers	< 0.01 to 0.02	< 1	Cancer	Data not available for many countries on radiation workers/doses. Percentage based on data from Germany and the United Kingdom
Chemicals	Above occupational limits	400 Working	40	10	From acute intoxications to permanent health impairment or death	Based on surveys in Finland and the Netherlands and a questionnaire study in the countries of the European Union
Carcinogenic agents	Occurrence	400 Working	16	4	Increased risk of cancer, e.g. lung or bladder	The potential to be exposed to carcinogenic agents at work exists but cannot be estimated. The estimated exposure is based on the Finnish register of workers exposed to carcinogens.
Allergens	Occurrence	400 Working	52	13	Sensitization or allergic reactions of respiratory system, skin or mucous membranes	The potential to be exposed to allergenic agents at work exists but cannot be estimated. The estimated exposure is based on a survey in Finland.

Table 2 (contd)

Environmental factor	Level of concern for health	Size and type of reference population in the WHO European Region (million)	Estimated people exposed at level of concern		Potential health effects	Comments
			Number (million)	Percentage of reference population		
Physical workload/ ergonomic conditions	Physical overload, objectively assessed	400 Working	108	27	Overload of cardio-respiratory or musculo-skeletal system, strain injury, accident or sudden death	Number of workers exposed are those in occupations where (*a*) the oxygen consumption is at an average $\geq$ 30% of maximal value, (*b*) the maximal duration of static muscular contraction occurs up to exhaustion, or (*c*) repetitive movements at frequency > 30/min are performed for several hours a day
Psychological overload	Perception of stress	400 Working	120	30	Stress symptoms, psychosomatic	In systematically validated questionnaire or interview surveys, the population exposed to some type of psychological stressor is assessed as suffering substantial psychological strain, measured by the occurrence of stress symptoms
Noise	> 85 dBA	400 Working	60	15	Transient threshold shift in hearing, permanent hearing loss, psychological reaction	Based on surveys of noise levels in various industries in Finland and a questionnaire survey in countries of the European Union. In the countries of the European Union, 10% of workers are continuously exposed to hazardous noise levels and 27% for at least a quarter of the time.

Table 3. Estimated number of accidents and their health effects

Accident	Health effect	Cases per year		Comments
		Number (thousand)	Rate per thousand	
Home	Injury treated in a clinic	50 000	56	Extrapolation of rates from the United Kingdom to the entire Region
	Fatal injury	61	0.07	
Road traffic	Injury	2 150	3	
	Fatal injury	120	0.14	
Occupational	Notified injury	10 000	25	Estimated from data reported by 22 countries to the International Labour Organisation
	Fatal injury	25	0.06	

5

Environmental exposures

Air quality

Ambient air

Some urban areas in the Region, where high levels of pollution would be expected, had no adequate data. Data available from other areas were therefore used to construct models that allowed pollution levels to be estimated for such areas without data. These models provide estimates averaged over relatively large areas, so local areas with high concentrations cannot be identified. Despite these intrinsic limitations, the analysis indicates widespread exposure in the Region to air pollution at levels exceeding the WHO air quality guidelines.

For sulfur dioxide, an improvement in air quality can be reported in all parts of the Region in recent years, but especially in western Europe. This improvement is due to the reduction in the combustion of sulfur-containing fossil fuels and effective emission controls. It further reflects the international agreement on a 30% reduction in sulfur dioxide from 1980 levels. Sulfur dioxide remains a serious problem in large parts of the Region, however; altogether, one third of the population may still live in urban areas where ambient levels continue to exceed the WHO air quality guidelines. The problem is greatest in CCEE and NIS, but also exists in cities in southern Europe.

Concentrations of particulates in urban areas have tended to decrease in the last decade in a number of cities in the Region. The large agglomerations of southern Europe, however, showed no significant improvement in the 1980s. This also seems to be the situation in cities in CCEE for which data are available. Little monitoring information is available for NIS but levels of pollution in some industrial areas are known to be excessive.

Winter-type smog episodes still occur in some cities, characterized by high levels of pollution with sulfur dioxide and particulates.

Air pollution from lead has decreased significantly in most parts of the Region. Levels have not exceeded the air quality guidelines in western Europe, and have only relatively rarely done so in the eastern parts of the Region. The improvement, particularly in western Europe, is due to the introduction of lead-free petrol and effective control of sources of industrial particulate emissions. The remaining hot spots in the eastern part of the Region are usually found around lead and other metal smelters. Vehicle exhausts from the combustion of leaded petrol also contribute to exposures.

Elevated urban nitrogen dioxide levels are of widespread concern and 8% of people in the Region are estimated to be exposed to concentrations in excess of the air quality guidelines. The principal source of population exposure is road traffic. This exposure will increase unless strict emission controls on vehicles are implemented, and unless current traffic density in city areas is limited. Vehicle emissions also include volatile organic compounds, which react with nitrogen dioxide in the presence of ultraviolet radiation to form ozone, associated with summer-type smog episodes. Exposure to ozone above accepted guideline values is a widespread problem in the Region affecting both urban and rural populations; more than half the people in the Region may be exposed in the short term to levels that exceed the upper limit of the range of the air quality guidelines.

Indoor air

Most people spend more time indoors than outdoors, and some population groups, such as small children and elderly people, may spend up to 90% or even more of their time indoors. The effort in many countries to conserve energy has resulted in a marked reduction in air exchange rates and, consequently, in an increase in indoor air pollutant levels.

The naturally occurring radioactive gas radon and its decay products may accumulate indoors, mainly from the ground beneath a given building but sometimes from the building materials themselves and even, in high radon areas, from drinking-water. The exposure to indoor radon varies geographically and depends on the presence of uranium-bearing rocks.

Unvented combustion and the evaporation of solvents can result in substantial releases of gaseous and particulate pollutants,

including carbon monoxide, carbon dioxide, nitrogen dioxide, sulfur dioxide, volatile organic compounds and water vapour. The principal combustion sources are tobacco smoke, gas cooking stoves and unvented heaters (such as kerosene heaters), as well as wood-burning stoves and open fireplaces.

New materials used in the construction and furnishing of buildings have resulted in exposure to a number of potentially harmful substances.

Only limited data are available on levels of exposure to indoor air pollutants. Average nitrogen dioxide concentrations do not appear to exceed the air quality guidelines, but far higher peak values have been measured in kitchens equipped with unvented gas cooking stoves.

Average carbon monoxide concentrations are generally well below the short-term WHO guideline values, but exposure of concern for health may result from the use of faulty gas equipment or from accidental fires.

In houses with smokers (estimated as one third to two thirds of all households) the level of respirable particulate pollution is 2–3 times higher than in houses without smokers. The exposure of children to tobacco smoke is a major environmental health problem throughout the Region.

In addition to chemical (and physical) contaminants, diverse biological agents that may affect human health are often present. Many indoor environments provide moisture and temperatures suitable for the growth of house dust mites and fungal spores. Tight insulation and reduced air exchange, aimed at energy conservation, promote these conditions.

Conclusions

From the public health standpoint, the priority areas for improvement must be in CCEE and NIS, where emissions of sulfur dioxide and particulate matter are at an unacceptable level in many places. Similar though lesser problems also exist in some southern European cities. Winter-type smogs still occur in the Region. The main sources are power generation and other industrial plants, with some contribution from domestic coal burning. Control legislation should be introduced and enforced, using the WHO air quality guidelines as a scientific basis. Whereas new emissions should be controlled adequately from the outset, improvements to existing plants and processes will have to be phased in, based on a rational system of priority-setting that takes full account of public health considerations. Emphasis should be

placed not only on capital investment but on high standards of operation and maintenance.

In the rest of the Region, progress must continue in reducing emissions to achieve compliance with the WHO air quality guidelines.

The rapid expansion of road traffic in most parts of the Region is increasing air pollution from nitrogen oxides and volatile organic compounds (with resulting formation of ozone and creation of summer-type smogs in many cities of southern and western Europe), as well as particulates from both diesel and petrol emissions. Where lead-free petrol is not widely used, lead pollution is also important. Control of emissions from road vehicles needs improvement. This must be backed up by well defined transport policies, to prevent such improvements being offset by the continuing rapid expansion in the number of private vehicles on the roads. Heavy goods vehicles are also likely to increase as trade between countries in the Region grows.

Exposure to a variety of indoor air pollutants has a significant effect on health. These exposures are aggravated by low rates of air exchange, which have resulted from the insulation of buildings in the interests of energy conservation.

Water supply and quality

The quality of a substantial proportion of the drinking-water resources in the Region is endangered by increasing pollution. In many areas, contamination results from the absence or misuse of methods for the disposal of industrial, agricultural and municipal wastes. Such contamination may prevent the use of water resources for drinking-water, because the treatment needed would be quite unrealistic in practice.

The microbial contamination of surface waters by bacteria, viruses and protozoa remains widespread in the Region. The extent of exposure to microbiologically contaminated food and water is more difficult to assess than the effects of this exposure on health. For example, monitoring surface waters (analogous to ambient air monitoring) provides very little information about exposure to microbiological agents through drinking-water. Monitoring is, in general, intended to control and prevent exposures, rather than to assess actual exposures. Epidemics of waterborne infections (hepatitis A, parasitic diseases, typhoid fever, cholera and other gastrointestinal infections) occur sporadically in the Region, most frequently in CCEE and NIS where hepatitis A is a

particular public health problem. Outbreaks result from one or more of the following: poor quality of source water, inadequate treatment, treatment breakdown, or contamination by sewage during distribution, particularly in aging and poorly maintained networks. Infections with the parasite cryptosporidium, which is resistant to chlorination, appear to be increasing. Pollution of drinking-water sources by farm wastes has been implicated in some outbreaks of disease.

Eutrophication of lakes and reservoirs from inputs of fertilizer, with resulting blue-green algal blooms, has been reported in several countries. These algae produce toxins and may cause allergic skin reactions.

Apart from rare cases of methaemoglobinaemia in infants in some CCEE, due to high levels of nitrate in the drinking-water, acute symptoms from chemical contamination are confined to accident situations. High levels of arsenic in drinking-water, such as occur in CCEE from natural or industrial sources, may be associated with skin and peripheral vascular lesions. The question of the long-term effects on health of common low-level exposures to a variety of chemical contaminants (such as pesticides or chlorination by-products) is difficult to resolve.

Water shortages are an important problem in some Mediterranean countries, aggravated by influxes of tourists. In some areas, irrigation needs compete with domestic requirements.

A lack of continuous and convenient supplies of safe drinking-water particularly affects rural areas in some CCEE and most of the NIS, where 86 million people are without a piped supply of drinking-water.

Conclusions

For sustainable improvements in environmental health protection, the provision of safe drinking-water throughout the Region must be considered an essential element of water resources management. Policies must also take account of wider pollution control. Progress in integrating these elements is particularly needed in the eastern parts of the Region, where industrial expansion has not been matched by monitoring capabilities or pollution control.

Land-use planning, particularly agricultural planning, is urgently needed, especially to protect groundwater resources.

Enforcement strategies are unevenly developed in the Region; particular attention should be given to economic tools for pollution control and cost recovery for drinking-water supply.

Major population groups in CCEE, particularly in rural areas, and more widely in NIS suffer serious deficiencies in both the quantity and quality of water for domestic use. Chronic problems with the contamination of deteriorating distribution systems are combined with poor raw water quality and treatment difficulties. The public health consequences and hence the effects on overall socioeconomic development are likely to increase with time, unless urgent steps are taken. These should consist of emergency measures to ameliorate the worst situations, and systematic investment programmes to provide adequate water sources for the whole population, backed up by effective management and maintenance. This is inevitably a long-term undertaking, requiring major resources, that deserves substantial international support.

Wastewater and surface water

The European Region is characterized by densely populated cities and urban industrial areas where surface waters can be seriously contaminated, and rural areas where diffuse agricultural pollution over many years has contaminated rivers and groundwaters. The contamination of surface waters by various types of waste may affect health by lowering the quality of raw water and of bathing water. Poor quality raw water may have important direct effects on health through its use as drinking-water and indirect effects through its impact on aquatic ecosystems.

In general, the proportion of the population served by adequate sewage treatment facilities is smaller than that provided with safe drinking-water. Improvements have been made over the last 20 years and adequate sanitation is expected to be available throughout the Region by the end of the century. Progress is slower, however, in providing a suitable degree of treatment to protect human health and to meet quality objectives. Many bodies of water, particularly those in urban areas, are under strain because they contain excessive amounts of wastewaters that have received too little or no treatment. Not only does this increase the risk of microbial infection from direct contact with surface waters, it also degrades the quality of raw water and requires more treatment of drinking-water. People may be exposed, through drinking-water, to the whole range of chemical and microbial contaminants found in wastewater and surface waters.

The links between direct exposure to contaminated surface waters and gastrointestinal infections have been established. The presence of particular microbial indicators are used to indicate whether waters are suitable for bathing, but the effectiveness of such screening measures in improving health protection is difficult to evaluate. A regression analysis of gastrointestinal symptoms and microbial contamination concluded that potentially all the diseases spread by the faeco-oral route and whose microbiological agents are shed in faeces, could be contracted by swimming in sewage-polluted water. All these diseases can also be contracted by consuming raw or inadequately cooked shellfish. The exploitation of bathing water resources is difficult in many countries because of pollution with sewage.

Heavy investment is required in CCEE and NIS to build new urban sewage treatment plants, not only to benefit these countries but also to protect international rivers and enclosed seas. These requirements will place heavier burdens on these countries than they did on western European countries, where capital expenditure on treatment plants was spread over long periods of time. Similar problems exist in parts of southern Europe.

At the same time, the amount of industrial pollutants reaching wastewater needs to be reduced to avoid the costs of their subsequent removal. The benefits of treating and reusing wastewater have to be seen in the context of the socioeconomic development of the countries concerned.

Agricultural activities give rise to substantial non-point sources of pollution, but they are traditionally subject to fewer planning restrictions and regulations than industry. Many countries regulate pesticide use and there is a growing tendency to have regulations or guidelines on fertilizer use, planning controls for agricultural waste and land-use controls to protect vulnerable water sources. The use of land for urban or industrial, as well as agricultural, development should take the preservation of water resources into account.

Conclusions

Many surface waters and groundwaters throughout the Region continue to be unacceptably polluted, with potential implications for public health through the public water supply, irrigation, fisheries and recreational use. Improvements in most parts of western Europe have not been reflected in CCEE and NIS. Investment programmes are needed, carefully prioritized according to public health considerations. The effective management

and maintenance of all water and waste treatment facilities must be strongly emphasized. The integrated management of water should be based preferably on a river basin catchment area. The users of the catchment area need to agree on water quality objectives. The relevant governments will need to collaborate on transboundary issues.

Wastes

There is considerable public concern about the impacts of waste disposal on the environment and health. Few studies of the effects on people's health of living near waste disposal sites have been carried out in the Region; they provide little evidence of disease, but nuisance (particularly from odours and noise) is a serious problem that undermines wellbeing.

Technological improvements in the last 15 years, both for landfills and incinerators, mean that properly managed, modern waste disposal causes negligible population exposure and environmental health impact. As a result of decades of inappropriate waste disposal, however, and the creation of numerous "problem sites" throughout the Region, many potential environmental health hazards exist. These range from microbiological hazards associated with uncollected or uncovered disposal of municipal solid wastes, to toxic hazards from uncontrolled hazardous waste disposal and contaminated industrial areas.

Leakages from landfill sites have contaminated soil and groundwater, and the long timescales for changes in groundwater quality and for environmental transport mean that potential future risks to health cannot be dismissed.

Waste disposal was not considered a public health priority in the former USSR and serious problems now exist in NIS. Industrial, hazardous and municipal wastes have been dumped on land or in lagoons, from which leaching to surface waters and groundwaters has occurred, including those used for public supply. Remedial measures will take time and may be costly. Radioactive waste disposal is referred to on pp. 64 and 73–74.

The few occupational studies that have been carried out suggest that both working conditions and equipment may be inadequate to protect the health of waste disposal workers. For example, workers handling hospital wastes containing infected "sharps" are at risk of contracting hepatitis.

Waste management practices vary widely across the Region. Incineration is increasingly used to dispose of hazardous waste,

but the amounts so treated vary widely between countries. The disposal of hazardous waste along with municipal waste is still practised, accompanied increasingly by treatment before landfilling to reduce potential mobility. Similarly, some countries operate effective waste recycling schemes, but others make no provision for separating municipal wastes. A common and important problem for the future is the unsustainable growth in waste production. Municipal solid waste production is steadily increasing in the European OECD countries. In some countries, it is increasing at a rate that will outstrip the existing capacity for treatment and disposal. Waste reduction will require the joint acceptance of responsibility by government, industry and individuals. This is particularly true when the successful implementation of such measures as maximizing the recycling and reuse of waste depends on public information and cooperation. It is also required to maintain competitive prices for recycled products.

Conclusions

The careful disposal of industrial, domestic and other forms of waste is essential to safeguard public health. In view of the high investment required, the generation of unnecessary waste should be prevented where possible. What waste is produced should be segregated in ways that allow its reuse or recycling. Rational priorities should be developed for the rehabilitation of contaminated sites. The public should be helped to understand that the potential hazards from the proper application of modern methods for waste disposal are low. Misplaced fears may prejudice developments that are in the clear interest of public health.

Contamination of food and drink

Microbial foodborne diseases have markedly increased in recent years in most of the Region. In addition to effects on individuals, the costs to society, as reflected in medical and industrial sector costs, are estimated to be of the order of several billion dollars annually. A study in the Netherlands suggests that each year about 15% of the population may suffer gastrointestinal symptoms as a result of foodborne or waterborne infectious disease due to *Salmonella* and *Campylobacter* spp.

Many of the problems arise during the primary production of food, particularly in relation to *Salmonella* and *Campylobacter* spp. and *Listeria monocytogenes*. More attention needs to be given

to animal husbandry practices, rather than concentrating on eliminating pathogens by means of food technology. Application of the hazard analysis and critical control point (HACCP) approach allows the detection and correction of problems before a defective end-product results and is a more cost-effective method of control than end-product inspection.

The contamination of foods with *Salmonella* spp. is still of major concern. Since 1985, cases of salmonellosis have increased considerably in nearly all countries. For example, the number of cases per 100 000 population in 1985 and 1990 were: for Austria 19 and 144; for Germany 50 and 169; for Italy 17 and 34; and for the Slovak Republic 118 and 167. The importance of other microbial agents has recently been recognized: for example, *Campylobacter* spp., *L. monocytogenes*, *Escherichia coli*; as well as hepatitis A virus and certain parasites. For both foodborne and waterborne infections underreporting is certain to occur, since people with mild illness will not seek medical treatment.

Assessment of the impact of the chemical contamination of food on health in the Region (other than in accident situations or following intentional adulteration, of oil or wine for example) is limited by inadequate monitoring and dietary intake data, especially for vulnerable groups such as lactating mothers, infants and young children.

Exposure to chemically contaminated food (and water) seems to be, overall, less of a problem for the general population of the Region than microbiological agents. In part this is because the protection of the population from hazardous chemicals is effective; the multitude of such chemicals used by industrialized societies in the Region would be a potential hazard to health if measures to prevent exposure were relaxed. Contamination of soil and water from the overuse of agrochemicals and uncontrolled waste disposal in the former USSR may be at levels of immediate concern for health. Detecting the long-term effects of low-level exposure on the occurrence of common diseases is difficult.

Mycotoxins such as aflatoxins and ochratoxin A arise from the improper harvesting, storage and transport of food and may be related to an increased risk of cancer.

The radioactive contamination of food as a result of fallout from Chernobyl seriously disrupted food production and trade. Activities in major agricultural food crops have now virtually returned to previous normal levels. In some areas that were severely affected by the accident, however, activities in wild mushrooms, berries and game remain at a high level.

Centralized food production, storage and distribution increase the likelihood of the wide dissemination of contaminated food. The agent and source of any outbreak need rapid identification so that control measures can be introduced promptly. An effective international communication system is also required.

Conclusions

In view of the increasing incidence of microbial foodborne infections local, national and international surveillance and control need strengthening in the areas of the primary production, manufacturing, processing, storage and distribution of food. To avoid microbial contamination at the stage of food preparation and consumption, caterers and members of the public need to be more aware of food hygiene.

Exposure to selected chemicals

Population exposure to environmental chemicals needs to be assessed, to allow the environmentally sound management of chemicals advocated by the United Nations Conference on Environment and Development in its Agenda 21. Such data are, to a large extent, lacking in the Region.

The selected potentially toxic chemicals considered – arsenic, cadmium, lead, mercury, nitrate, pesticides, benzene, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans – are similar to those in the priority list of "harmful chemical substances and processes of global significance" contained in the International Register of Potentially Toxic Chemicals of the United Nations Environment Programme (UNEP). For the general population, exposure to these chemicals does not appear to pose an appreciable risk. For certain population subgroups, however, exposure levels may be higher, resulting in only a small or nonexistent margin of safety. For example, young children's exposure to lead, from smelter emissions, particularly in CCEE and NIS, may be expected to impair their neuropsychological development. Exposures from other sources may also be important: emissions from engines burning leaded petrol; the mobilization of lead into drinking-water from piping, where the water has a low pH: and ingestion of flakes of lead-containing paints in old houses.

The contribution of various sources and media to overall exposures to the various chemicals is often unclear, as is the

correlation between exposures, tissue levels and effects. Relevant health studies are, in general, lacking.

Since occupational exposures to some of these chemicals (such as pesticides or heavy metals) are higher than those of the general public, epidemiological studies of occupational groups could provide further information on the degree of risk associated with low-dose environmental exposures.

Although new chemicals are subjected to toxicity testing, many thousands of chemicals already in use have not yet been adequately tested. The chemicals programmes of the OECD and the International Programme on Chemical Safety (a joint venture between WHO, the International Labour Organisation and UNEP) are organizing the systematic investigation and evaluation of existing chemicals.

Conclusions

The data available on these selected chemicals are derived largely from single studies, which allow no general conclusions to be drawn on exposures in the Region. Further, no comparison can be made between the exposures of the general population in different locations, with different levels of ambient pollution. Research is needed to provide more information on the contribution of various sources and media to overall exposure, both in the interests of public health and as an aid to rational decision-making about cost-effective interventions when reduction of exposure is necessary.

Nonionizing radiation

Ultraviolet radiation

Levels of exposure to solar UVR depend on latitude and season and are markedly affected by human habitat and behaviour, particularly intentional sunbathing. Artificial sources such as tanning appliances and fluorescent lamps can increase individual exposure to UVR; exposures in industry are usually contained and can therefore be expected to be low.

The stratospheric ozone layer now being depleted by, for example, chlorofluorocarbons filters out the more harmful components of UVR. Solar UVR is a recognized risk factor for skin cancer and is probably a major cause of cataracts. Any increase in terrestrial levels of UVR as a result of depletion of the stratospheric ozone layer is likely to be associated with an increased incidence of both conditions.

To date, there is little evidence that depletion of the stratospheric ozone layer in the Arctic has resulted in changes in terrestrial UVR levels in the European Region, but this may be due to the considerable variation in cloud cover and air pollution. A recent study in Toronto, Canada, however, has shown a firm correlation between stratospheric ozone depletion in the northern hemisphere and increased terrestrial levels of biologically active components of UVR in the winter.

Conclusions

The consequences of an increase in terrestrial levels of UVR are potentially great, with possible direct and indirect effects on health. Direct effects on health include immunosuppression as well as the induction of skin cancers and cataracts. Indirect effects would result from interference with the food chain, by impaired photosynthesis in crop plants and phytoplankton, and possibly from a contribution to climatic change. An early ban on substances that deplete the ozone layer is therefore indicated, to reverse present trends and avert the possibility of serious future impacts on health.

The public should be given clear information about the risks of cancer and cataracts from UVR and the need, particularly for those with certain types of skin and for young children, to use protective clothing, skin creams and sunglasses to limit exposure of the skin and eyes to sunlight.

Electromagnetic fields

Exposure to extremely low frequency electromagnetic fields depends on the distribution and use of electricity. Wherever there are power lines, electrical appliances and electrical wiring, some level of these fields is present. Higher frequency fields come from video display terminals, televisions, cellular telephones and radio and television transmitters. The earth also generates natural electromagnetic fields.

Selected occupational groups (such as power line workers, appliance repair workers and electric railway workers) experience higher exposures, as do prolonged users of domestic appliances such as electric blankets.

The public has a strong perception of the risk of exposure to electromagnetic fields. In particular, it is widely feared that living near overhead power lines may increase the risk of a child developing leukaemia or other cancer. On the basis of present

knowledge, a biological mechanism cannot be identified to account for the occurrence of malignant tumours resulting from exposure to electromagnetic fields. Body currents induced by these magnetic fields are more than two orders of magnitude lower than the currents that naturally occur in the body.

Conclusions

When results from further epidemiological studies are available, the question of the long-term effects of exposure to low levels of electromagnetic fields will need to be reviewed.

Ionizing radiation

Natural background radiation contributes most to the average human exposure, and about half the contribution is usually radon irradiation of the lung; but individual doses from radon may be much higher. Other sources, or practices such as nuclear power production in routine operation, contribute doses to the general population that are on average several orders of magnitude lower than total doses from natural sources.

Actual or potential exposure problems are related to the safety of nuclear power facilities, the proliferation of nuclear material and the safe disposal or storage of nuclear waste.

Safety standards need to be implemented, using the best available technology, in all nuclear power plants. The safety of nuclear power is one of the most important issues in radiation protection. An international consensus is urgently needed to provide technical help to countries with less secure power plants.

The proliferation of radioactive material that could be used for the construction of nuclear weapons is a threat of global importance. The problems entailed in the decommissioning of worn out nuclear power plants and the destruction of atomic weapons have not yet been solved. The radioactive material released by these processes needs to be secured. It is now apparent that past practices in radioactive waste disposal have resulted in severe environmental contamination in parts of the former USSR. Meanwhile, no country yet operates a repository for high-level radioactive waste.

In addition to these global problems, the higher than average exposure of special population groups needs attention. These groups include:

(*a*) workers carrying out "dirty" jobs, associated with higher than average doses and/or involving exposure to actinides such as plutonium (dose limits have been tightened in recent years and average exposure levels have been reduced for radiation workers in medicine and in nuclear installations in western Europe);

(*b*) those exposed to higher than average natural radiation levels, including populations living in high radon areas, underground miners exposed to high radon concentrations and air crews exposed to cosmic radiation.

Conclusions

The monitoring of houses in high radon areas is indicated, followed by prompt remedial measures when levels exceed WHO's recommended action level. Fairly simple preventive measures can be taken to secure the foundations of new houses in radon-prone areas against radon inflow.

In CCEE and NIS, the integral and operational safety of certain categories of nuclear reactor need urgent improvement. The potential long-term consequences for public health of major nuclear accidents and radioactive releases, as well as of nuclear weapons testing in the former USSR, also need to be investigated, with well coordinated international support, in the interests both of local populations and scientific understanding.

In general, the public believes that the risks from man-made sources of radiation far outweigh those from natural sources, and that the risks from the routine operation of nuclear power plants far outweigh those from fossil fuels and other sources. Wider availability of relevant information on the actual levels of risk is needed to help correct these misapprehensions.

Residential noise

Residential noise (i.e. noise from external sources that is perceived inside dwellings) is not a health problem in the same sense as occupational noise, where hearing is at risk. But residential noise seriously harms the quality of life. On average, about 15–25% of the population of industrialized countries are exposed to levels of noise that cause serious nuisance. Road traffic noise and neighbourhood noise are the most common causes of complaint.

Most countries have comparable legislation for the control of residential noise, usually aimed at specific sources (such as road,

rail and air traffic). Reducing noise at source has worked extremely well for aircraft noise, where the use of certain types of aircraft has been reduced or stopped. In the case of road traffic noise, the increase in traffic density has largely masked the reduction in noise per vehicle. Other measures are needed, such as urban traffic planning and land-use restrictions, the erection of noise-screening walls, and better sound insulation of houses. Neighbourhood noise is relatively neglected and is more difficult to control. In addition to the nuisance created for other people, hearing may be impaired in those directly exposed to loud music from discotheques and personal stereo systems (where peak levels may exceed occupational limits).

Conclusions

Unwanted noise has a detrimental influence on wellbeing and perceived quality of life. Over a long period, sleep disturbance from high-level road traffic noise may possibly affect physical health. Reducing road traffic noise depends not only on the development of quieter vehicles (particularly motorcycles and commercial vehicles) and the improved sound insulation of buildings, but also on better urban planning and more effective transport policies.

Neighbourhood noise is increasingly the cause of complaints. Sources need to be identified and noise limits embodied in regulations. Even with an appropriate regulatory basis, neighbourhood noise will remain more difficult to control than road traffic noise, with greater problems in both monitoring and implementation.

Housing and the urban environment

More than 70% of the population of the Region live in an urban environment; only in Albania and Portugal does the rural population predominate. While little further urbanization has occurred in the last decade in countries with an urban population of 80% or more, urban growth is notable in some countries in the southern and eastern parts of the Region. Unplanned urban developments, lacking basic public health services, have sometimes resulted. In other cases, inadequate planning has produced unsustainable urban development, with the degradation of inner cities or the creation of suburban slums.

Although the available data cannot determine the extent or causes of homelessness in the Region, the problem is likely to

increase, given the widespread economic recession with related migration of unemployed workers, together with the influx of large numbers of war refugees to some Member States.

The major health-related problems with houses are lack of sanitation, poor indoor climate and air quality, and constructional deficiencies that predispose to accidents.

Basic sanitary requirements include a piped indoor water supply, washing facilities and adequate means for the disposal of human waste. Deficiencies are most pronounced in rural areas.

Dampness, resulting from poor construction or inadequate heating, reduces the resistance of the respiratory tract to infection. In warmer conditions, it encourages the growth of fungal spores and house-dust mites, giving rise to allergens that provoke symptoms in sensitized subjects, including asthmatic attacks. Measures to conserve energy may aggravate this effect by reducing air exchange rates. The prevalence of dampness in the Region is not known, but data from the Netherlands and the United Kingdom suggest that 20–30% of homes may be affected.

Regional data on home accidents are similarly inadequate. In the United Kingdom, home accidents account for about 40% of all fatal accidents. Falls are the largest category, affecting mainly the elderly and the very young. Defects in housing structure are responsible for about 1 in 7 of fatal home accidents.

Conclusions

Inadequate housing often contributes to ill health, and improvements must be a major element of any policy to improve environmental health conditions. Important considerations include the availability of a safe water supply and sanitation, adequate space, heating, ventilation and noise insulation, and the provision of facilities for vulnerable groups – young children, the elderly and the handicapped.

Beyond the individual dwelling, housing must be viewed within the broader context of the community as a whole, where adequate health care, public transport, shopping and recreational facilities, and effective control of pollution and noise are needed. Unsustainable urban development has resulted in excessive urban growth and the loss of community life in cities.

Homelessness is generally believed to be increasing in the Region as a result of economic recession and unemployment. The major causes and therefore the long-term remedies may differ in different countries. But the immediate measures that can be taken to mitigate the health and social impacts are the same: the

provision of free access to temporary shelter (particularly in cold weather), medical care, public water supplies and toilet facilities.

Occupational health

Every country in the Region is committed to a policy of health and safety at work, but the availability of the necessary instruments for implementation varies substantially. Improved standards of occupational health and safety benefit not just the workforce but also the economic development of a country, since there is a demonstrable relationship between overall standards of health and safety in the work environment and productivity and the quality of the end product. From a public health perspective, occupational health services provide a unique opportunity for health promotion.

The workforce of the Region comprises almost 400 million people, 240 million males and 160 million females. About 80–100 million people work in agriculture and other primary production; 120–140 million are industrial workers; about 120–200 million work in several types of service industry; and 20–40 million are in undefined occupations or are unemployed. About half of the workforce is estimated to work without access to special occupational health services.

The relative number of workers in different types of employment differs markedly between countries in the Region. The proportion working in agriculture and industry is higher, and that in the service sectors lower, in CCEE and NIS than in the European OECD countries. In general, there is also less automation and mechanization in CCEE and NIS. These differences mean a heavier physical workload, and a higher prevalence of and exposure to all the traditional occupational health hazards.

Demographic trends show an increase in the average age of workers, in the level of their education and competence, in the participation of women in work, in the mobility of workers through both internal and international migration and, at least temporarily, in unemployment.

Priority problems reported in occupational health are similar in different parts of the Region and in countries at different stages of development: accidents, noise, chemical hazards, ergonomic problems and psychological stress. New issues (such as reproductive health, infectious hazards, and the possible impacts of high technology, new processes and materials) are not yet visible at the level of national statistics. Regional comparisons,

other than for fatal accidents or mortality from particular diseases, are impossible because of differences and limitations in data capture and in registration procedures. Data on working conditions and exposures are also limited.

Accidents due to hazardous machinery or unsafe work environments affect the health of about 10% of the workforce. There is about a 30-fold variation in accidents between high- and low-risk occupations and a wide range in the severity of outcomes. The total number of occupational accidents in the Region is estimated to be about 10 million annually, of which about 25 000 are fatal. The loss of work time and production from injuries has been estimated to cost 3–5% of gross national product.

The number of acute intoxications is decreasing, but some surveys from CCEE report acute poisonings from pesticides and carbon monoxide, as well as heavy metals and solvents. Prevention of pesticide poisoning remains a high occupational health priority in many countries with a strong agricultural component. Underreporting is likely to occur.

Depending on the occupation and the country, 15–50% of all workers may be exposed to levels of noise that exceed the threshold for impairment of hearing.

Despite the growing use of chemicals, occupational exposure limits are exceeded less often than they used to be, although problems still exist in CCEE and NIS. Large numbers of occupational carcinogens have been identified, and about 30 occupations are associated with increased cancer risks. Several countries systematically register workers exposed to carcinogens, and this has stimulated more effective control of exposures. Special efforts are required to prevent exposures to such agents capable of having early irreversible effects, with possible long-term consequences for health.

Injuries caused by heavy physical workload and ergonomic conditions, particularly repetitive tasks, are the leading occupational health problem in many countries. Risks are greater in less industrialized countries.

The importance of psychological stress and job dissatisfaction in occupational health will grow as physicochemical hazards are eliminated. This is particularly relevant in the growing service industries sector.

There are severe reporting and registration problems with occupational diseases, but about 2 million cases a year are estimated to occur. The most frequent are noise-induced hearing loss, chemically-induced dermatoses, asthma caused by organic dust, and inorganic dust-induced pneumoconiosis, as well as musculoskeletal disorders where they are recognized.

Some of the occupational health problems emerging in the Region are clearly attributable to the present economic situation, particularly the difficulties of transition in CCEE and NIS. The large industrial complexes of centrally planned economies had large occupational health service teams. Their replacement by smaller-scale market economy industries has weakened the resources to sustain such occupational health services. Furthermore, in the newly privatized, restructured and strongly growth-minded economic sectors, meeting occupational health and safety standards may not seem to be a high priority. Recession affects the development of occupational health services elsewhere in the Region. In addition, economic migrants, mobile workers and refugees from hostilities make up cohorts of workers who are not covered by the normal occupational health services, while frequently exposed to greater risks than the stable workforce of the receiving countries. Throughout the Region, similar smaller-scale problems exist with the workers in the informal sector and in home industries. Thus, the need for occupational health services is growing.

Conclusions

Comprehensive occupational health services should be available for all workers. They should provide programmes and advice for preventive measures and health promotion as well as treatment and rehabilitation. Action is needed in all countries to reduce accidents at work and to prevent occupational exposure to agents that may cause early irreversible damage, associated in the longer term with a greater risk of such conditions as allergies, cancers or reproductive effects.

In contrast to other environmental exposures, the effects on health of occupational exposures can usually be anticipated according to the type of industry and workplace, and procedures adopted to prevent or mitigate their impacts.

Special attention needs to be given to preventing health risks in small-scale industries, including the informal sector and home industries. Migrant and mobile workers have also particular problems with occupational health and safety. Programmes are needed to maintain the work capacity of the increasing number of unemployed workers and prevent health problems.

The occupational health services in CCEE and NIS need further development and reorientation to cover workers in all sectors with both preventive and curative services.

Accidents and man-made disasters

The impact of the Chernobyl accident on the Region has made everyone aware that major accidents that affect the environment are a serious potential threat to the health of large numbers of people. Similar concerns have been generated by a number of accidents in the chemical industry. Measures to prevent such accidents should be built into the decisions about the design, siting, construction, operation and maintenance of chemical industries and nuclear power plants, and the transport of hazardous materials. Important elements include adequate legislation and environmental health impact assessment. Accidents may be caused by human error, and staff training and motivation are also essential measures for preventing accidents. A crucial factor in planning an effective response to an accident is to inform people living near hazardous installations what they would be expected to do in the event of an emergency.

Road traffic accidents cause death and serious injury, particularly among young men. They are of such common occurrence (see Table 3) that, except by those involved, they are accepted as a part of normal life. Such a complacent attitude needs to be replaced by an appreciation of the huge costs to individuals and society. The relative contributions of defects in the traffic environment and in human behaviour to causation are difficult to assess on a regional basis. To some extent, road traffic accidents are caused by the inadequate training of drivers and other users of the roads, as well as by human error and negligence (including alcohol drinking). This situation has to be changed by properly educating and informing the public. A key, however, to the frequency and severity of accidents is the development of better traffic systems and infrastructures: better roads, properly organized traffic (by the separation of pedestrian and bicycle traffic from motor vehicles, for instance), better technical condition of vehicles, adequate legislation properly enforced (on seat belt use, speed limits and alcohol restriction, for instance) and more widely available public transport. All these elements can be considered parts of the ambient environment. Secondary prevention, through the improvement of medical services available for the efficient care of accident victims, should not substitute for the improvement of the environment.

Occupational accidents also affect a large number of younger, economically and socially active members of society; prevention will depend largely on improvements in the work environment. Accidents in the home affect mainly the very young and the

elderly, with most of the fatalities occurring in the latter group. Structural defects have been found to be the cause of about 1 in 7 fatal accidents in the home in the United Kingdom.

Accidental poisonings occur both at work and at home. Prevention in either situation requires information and education on possible hazards, together with the adoption of measures to reduce the risk of exposure to toxic chemicals and the provision of appropriate means of protection for vulnerable population groups, particularly children. Preparedness for and response to chemical intoxications require the availability of information, trained personnel and adequate therapeutic measures. Poison control programmes need to be put in place, with poison control centres as an essential and integral part. The frequency of non-fatal poisonings in the Region cannot readily be estimated. Mortality rates are mostly below 5 per 100 000 population every year, but are markedly higher in Finland and NIS. Accidental poisonings in domestic and occupational environments probably contribute some 25% of the total.

Conclusions

Accidents to individuals are a major cause of morbidity and mortality throughout the Region. Public awareness of the risk of accidents should be improved and safer patterns of individual behaviour promoted.

Road accidents are a major cause of death in young adults. Changes are needed in the attitude of the public towards the drinking of alcohol and driving (and in some countries in the legislation too). Improvements in the safety of vehicles and roads remain a high priority, as do the development of comprehensive transport policies, embodying such elements as the segregation of pedestrians and cyclists from motor vehicle traffic and the provision of effective public transport services.

Adequate contingency planning for an effective response to major technological accidents, with resulting environmental impacts on health, must be in place, with provision for international cooperation where necessary.

Emergencies arising from war and civil unrest are current realities in the Region. International efforts are required not only to promote the overriding priority of peace, but also to meet the basic human needs of the victims for water, food, shelter and medical supplies, both during and after the conflicts. Once hostilities have ended, major efforts will be needed to repair damage to the environment and to public health services.

Environmental exposures in some CCEE and NIS

Of the 50 Member States of the European Region, 22 did not have a national focal point participating in the development of *Concern for Europe's tomorrow* when the environmental health protocols were distributed. Of these 22 countries, 20 provided information later: 15 NIS, Croatia, the Czech Republic, Slovakia, Slovenia and The Former Yugoslav Republic of Macedonia. For obvious and tragic reasons, Bosnia and Herzegovina and the Federal Republic of Yugoslavia (Serbia & Montenegro) have been unable to do so.

The full report *Concern for Europe's tomorrow* contains a detailed summary of the most important environmental health problems reported by these 20 countries. What follows here is a short overview of the situation.

NIS

The major environmental health problems in NIS reflect earlier policies that gave priority to production and little or no priority to environmental health protection. The water supply is inadequate in many areas, particularly in the eastern parts of the former USSR. Water quality is impaired by poorly maintained distribution systems, lack of or inadequate treatment facilities (including sewage) and problems of waste disposal, as well as excessive use of agrochemicals. Waterborne hepatitis A infection is a serious public health problem in many areas.

Large areas of the former USSR have high levels of radioactive contamination as a result of the Chernobyl accident; other radiation accidents and radioactive discharges around Kyshtym in the south Ural region, where the River Techa and Lake Karachi have been heavily contaminated by the activities of military installations; nuclear weapons testing at Semipalatinsk in Kazakhstan; and radioactive discharges from military reactors in the Kraznoyarsk region, where the River Yenisey has been heavily contaminated.

Inadequate attention to waste disposal used to be common practice. Widespread problems have resulted from storing liquid industrial wastes in artificial ponds without insulation and from dumping solid industrial and municipal wastes on the ground. For example, mountains of industrial waste exist in the Ural region, and dumping sites in Moscow are overfilled with sludges of municipal waste.

Air pollution is a substantial environmental health problem in many areas where heavy industries are concentrated, without

adequate technologies for emission control. Air pollution in the former USSR, particularly in the Russian Federation and Ukraine, is generally more severe than in polluted areas of CCEE. The recession that has closed down the most uneconomic industries does not seem to be improving the situation to the same extent as has occurred in CCEE, and respiratory morbidity in exposed populations is to be expected.

In general, adequate health studies of these environmental exposures are lacking, and selected epidemiological studies should be carried out.

Furthermore, the control of infectious diseases is now less effective than before. Diphtheria, hepatitis and diarrhoeal diseases are epidemic and outbreaks of cholera have occurred. In areas of military conflict or where ecological or industrial disasters occur, people may no longer have access to adequate medical care.

CCEE

The environmental health problems reported by the five CCEE (all new Member States) are similar. Thus, urban air pollution is of particular concern in industrial areas of countries such as the Czech Republic and Slovenia. The pollution of water resources, including groundwaters, by industrial and agricultural wastes is a widespread problem. Consequently drinking-water standards are difficult to meet; achieving tolerable levels of arsenic and nitrates will require extraordinary efforts in Slovakia and Slovenia, for example. Improper agricultural practices have also caused serious contamination of the soil. But in the countries of the former Yugoslavia war, indirectly or directly, is the most important factor affecting the quality of life for millions of people.

Conclusions

While environmental health priorities have to be set by individual countries, it is certain that support from the international community will be needed to deal with such major problems as provision and repair of water distribution systems and treatment plants, radioactive contamination, and urban air pollution hot spots. Particular attention should be paid to the disaster areas affected by war, where there is threat of epidemic diseases and major damage to environmental health infrastructures, and to ecological disaster areas such as around the Aral Sea.

6

Environmental health management

In accordance with the European Charter's definition of environmental health, management is concerned not just with air, soil, water and food but with the environment as a whole, including the home, workplace, and recreational and travelling environments.

Environmental health services are still developing in many countries throughout the Region. The types of development vary according to national and local culture and traditions, but there are some common features for implementing environmental health policies effectively at both the national and international level.

Active intersectoral cooperation is important at all levels of environmental health management, primarily between environment and health departments but also involving the integration of environmental health concerns into policy development in other relevant sectors of government, making use of environment and health impact assessment. In countries where transition is introducing new practices in economic sectors, the early adoption of such an integrated approach will support sustainable economic development.

The responsibility for identifying and resolving local environmental health problems is best devolved from central to local authorities, where the involvement of nongovernmental organizations and an informed public in the decision-making processes is both necessary and practicable. This shift in responsibility may present a particular challenge for countries undergoing transition.

Nevertheless, consultation and cooperation between central government and local authorities is needed, particularly to avoid

inconsistent approaches within a country. National authorities will also need to give financial support to local environmental health services, particularly at the stage of setting up the necessary institutional framework and providing multidisciplinary professional training.

7

Recommendations

The present report has summarized the detailed assessment of the state of environmental health presented in the full report, and the analysis of the role of environmental and other factors in determining the state of health in the Region. The recommendations that the Scientific Advisory Board of the WHO European Centre for Environment and Health considered as of highest priority are given here.

Priority environmental health issues have been identified (pp. 38–42) and the most important recommendations extracted from the full report, so that countries can clearly identify the input of the Concern for Europe's Tomorrow project to the Environmental Health Action Plan for Europe presented at the Helsinki Conference. The recommendations do not attempt to address factors that interact with environmental agents in determining health status.

Environmental health management

1. Countries should develop and implement environmental health policies based on strong intersectoral cooperation. This approach should be embodied in appropriate legislation, institutional development and training.

2. The development and management needs of environment and health should be built into the overall programmes for transition in CCEE and NIS, so that their economic transformation and development will be sustainable.

3. Procedures for environment and health impact assessment should be introduced throughout the Region and used at the

earliest possible stage of development of policies, programmes and projects.

4. Accurate information on environmental health issues should be made widely available, to achieve better understanding of the risks and to facilitate informed public participation in the development and implementation of environmental health policies.

The database

5. Strategies should be adopted for comprehensive environmental health monitoring with clearly defined objectives, taking into account all routes of exposure. They should be adapted to local needs but, for data to be comparable and to facilitate regional analysis, a harmonized approach must be taken to sampling, analytical and statistical procedures, quality assurance and reporting.

6. To facilitate the monitoring of changes in health status due to environmental factors, core environmental health indicators should be developed and applied throughout the European Region.

7. For environmental health information systems to be of practical use in decision-making, better data are needed on exposure–response relationships. This requires further epidemiological research.

8. All countries in the Region should aim to provide national and subnational mortality data. Registers of cancers and congenital malformations should be established where they do not already exist. Information on occupation, socioeconomic status, housing conditions, educational achievement and lifestyle should also be collected and made available.

Air quality

Ambient air

9. To safeguard human health, emissions should be controlled so that ambient air quality conforms with the WHO air quality guidelines for Europe.

10. Particularly urgent action should be taken about heavily polluted areas in CCEE and NIS and in some southern European cities. This will be greatly facilitated by practical international cooperation.

11. All countries should adopt measures to prevent air pollution from road traffic, such as the development and implementation of comprehensive transport policies, together with effective urban planning. Such measures should take full account of public health considerations.

12. All countries of the Region should progressively eliminate the use of leaded petrol.

13. Effective emission control should become obligatory in all new cars in countries that do not yet require this.

Indoor air

14. Smokers and their families should be made better aware of the effects of environmental tobacco smoke on the health of others, particularly children. Appropriate control of tobacco smoking should be introduced in indoor environments such as working and recreational environments.

15. Adequate air exchange in buildings should not be prejudiced by energy conservation measures.

Water

16. Urgent steps must be taken to ensure that the entire population of the Region is provided with reliable supplies of safe drinking-water.

17. High priority should be given to preventing the microbiological contamination of drinking-water by:

    – effective protection of water sources and adequate provision and maintenance of distribution networks and sewage treatment plants;

    – improvement of techniques for drinking-water treatment, including disinfection for small communities;

    – development of low-cost and reliable indicators for microbiological contaminants.

18. Effective water resource management throughout the Region is essential in the interests of public health and requires comprehensive surveillance and control of biological, chemical and physical contamination of surface waters and groundwaters.

19. Preventive strategies should be emphasized, including land use planning (for agriculture and industry) and impact assessment.

Wastes

20. Waste production should be minimized, for example by promoting cleaner technology in industry and by increasing public awareness of the need to reduce domestic wastes.

21. Effective systems should be developed and maintained for the segregated collection and safe disposal of wastes, including facilities for proper treatment of hazardous waste. Incentives should be provided to encourage separation, recycling, reuse and reclamation.

22. Given the positive role the public can play in such decisions as the siting of new incinerators or landfills, public understanding of waste disposal issues should be promoted.

23. Areas so contaminated by waste disposal that they are a significant potential threat to public health should be identified and appropriate measures taken for restricted use or decontamination.

24. In some parts of the Region, abandoned military waste disposal sites require special attention, because of chemical and possibly biological hazards. (See also recommendation 32, relating to nuclear materials.)

Contamination of food and drink

25. The HACCP approach should be more widely adopted throughout the Region for preventing food contamination. It should cover all stages of production, processing, storage and distribution from the farm to the consumer.

26. Greater emphasis should be given to reducing microbial contamination at the farm. Preventive measures should cover hygiene, for example, in animal housing, feed and manure handling and vaccination of livestock where applicable. Before new techniques for primary food production are introduced, their public health implications should be fully explored.

27. Efforts are needed to improve understanding of hygiene by all those who handle food at all stages from production to consumption.

Exposure to selected chemicals

28. The use of chemicals or processes that are associated with significant potential hazards to health or with the formation of environmentally persistent substances should be reduced by material substitution or improved technology.

29. The systematic monitoring and assessment of exposure to chemicals from various media should be instituted at the national level to detect significant environmental exposures and/or possible effects on health, including that of vulnerable groups, and to define the contribution of different environmental media to overall exposure as the basis for rational control strategies.

Ionizing radiation

30. International technical aid should be available for countries operating reactors with inherent design or operational problems that are a significant potential hazard to health.

31. Increased, well coordinated investigations should be carried out in relevant areas of NIS, with international support, into the size and effects of the doses of radiation received by populations as a result of nuclear accidents, inadequate disposal of radioactive wastes and nuclear weapons testing.

32. Sites of abandoned nuclear weapons should be identified and radioactive material stored securely until appropriate facilities for disposal become available.

33. Systematic monitoring of radon levels in homes should be established in radon-prone geological areas, followed by remedial action where guideline levels are exceeded.

Housing and the urban environment[a]

34. Priority should be given to the availability of a safe water supply and sanitation, together with the provision of facilities for special groups such as young children, the elderly and the handicapped.

35. Research is needed on the contribution of aspects of the indoor climate, such as cold and damp, to respiratory diseases.

36. Urban planning is urgently needed to rehabilitate community life within cities and their suburbs.

37. The scale and causes of homelessness within the Region should be investigated and the most appropriate measures for mitigation adopted.

Occupational health

38. Legislation, standards and adequate inspection should be developed in all countries of the Region for the prevention and control of health hazards at work (such as accidents, occupational diseases, physical overload, ergonomic hazards and psychological stress). They should apply to all sectors of the economy and to all employees and the self-employed. Special efforts are required to prevent workers being exposed to agents that can cause early, irreversible damage and have possible long-term effects on health.

39. Systems for the notification, registration and reporting of occupational accidents and diseases should be developed, with coverage of all workers and the self-employed. The international harmonization of such data systems should be encouraged to facilitate analysis on a Regional basis of the most important causes, thus enabling priorities for preventive measures to be established.

[a] Indoor air quality is addressed under Air quality, p. 78–79, and home accidents under Accidents and man-made disasters, p. 83.

40. The coverage, activities and competence of comprehensive occupational health services should be improved throughout the Region according to the guidance given by the International Labour Organisation and WHO. Adequate numbers of occupational health physicians, nurses, hygienists and other personnel should be trained for such services.

41. Special action should be taken to improve occupational health in CCEE and NIS. Workers in agriculture, small industries and the so-called informal sector as well as the self-employed should be given special consideration in the development of national occupational health programmes.

Accidents and man-made disasters[a]

42. Further action is required to reduce the contributions of both the environment and personal behaviour to road traffic accidents including:

    – the development of better traffic infrastructures, regular checks on the roadworthiness of vehicles, greater compliance with regulations (including those related to alcohol consumption by drivers) and the provision of adequate, alternative transport systems; and

    – education and training of all road users.

43. The recording of domestic accidents and poisonings needs improving. It should include their causation, together with factors determining their outcome, and thus help define more clearly effective measures for prevention.

44. Countries should take all the steps in siting, design, construction and operation that are necessary to prevent accidents in industrial and nuclear power plants and during transport of hazardous materials, and draw up appropriate contingency plans to deal with any accidents that may still occur.

[a] Accidents at work are covered under Occupational health, pp. 82–83. Natural disasters have not been covered in a comprehensive way, and no recommendations are therefore made.

Transboundary issues

45. To safeguard people's health, greater international cooperation is needed on such issues as global climate change, depletion of the ozone layer, conservation of shared water resources, control of food quality, and trade in hazardous substances, products and wastes.

46. Changes in energy consumption patterns in both western and eastern European countries are necessary if sustainable rates of energy production are to be achieved. A 25% increase in electricity generation is predicted for the Region in the next 25 years. Further use of alternative energy sources should be explored, taking into account their possible environmental impacts, if growth in energy consumption is not to be accompanied by an increase in global or transboundary pollution.

47. Implementation of the Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer should be a Regional objective.

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People are increasingly concerned about the state of the environment and its effect on their health and wellbeing. They know of examples, throughout the WHO European Region, of unacceptable levels of pollution, inadequate drinking-water and sewage facilities, uncontrolled dumping of waste and occasionally major man-made disasters.
But what *is* the situation?

Concern for Europe's Tomorrow is a major Region-wide project, launched in 1991 to find out. The report that resulted is the most comprehensive survey of environmental health ever carried out in Europe. For the first time, information has been assembled from almost all the 50 Member States of the Region. This summary sketches the picture that has begun to emerge.

The main areas of concern are microbiological contamination of food and drinking-water and urban air pollution. Over 100 million people, largely in central and eastern parts of the Region, lack safe drinking-water, while people everywhere suffer increasingly from illness caused by contaminated food. Hot spots of urban air pollution persist in some industrial areas. The inexorable increase in road traffic not only contributes to air pollution, but is a major cause of death and injury among young people and, through noise and congestion, detracts considerably from the quality of city life. Rapid urbanization in the south and inner city decay in the west exacerbate these urban problems.

The implications of some transboundary issues, such as acid deposition and the pollution of river basins, are of obvious concern. But if the people of the Region share a common concern for Europe's tomorrow, they must also tackle the global problems of possible climate change, resulting from the generation of greenhouse gases, and ozone depletion by chlorofluorocarbons, now.

The countries of the Region, from Greenland to the Pacific coast of the Russian Federation, can and must work together to tackle all these issues before it is too late. This summary makes recommendations about how they can do so.

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