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Health and Environment in Sustainable Development: Five Years after the Earth Summit

EXECUTIVE SUMMARY

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CHAPTER 1

A New Perspective on Health

The basic human need for a safe environment — one which provides clean water, and adequate food and shelter, and in which different people can live together in peace — is the same for all of us.

Five years have passed since the Earth Summit and numerous initiatives have been launched at local, national and global level to highlight the need for health-and-environment action. So it is timely to start the analysis of how we are doing as a community of peoples in terms of meeting this need, how development can provide resources for health protection, but also how such development can threaten health through degradation of natural resources. This analysis should highlight problems, but also give examples of solutions that will bring us closer to sustainable development. The dreams and aspirations of a healthy future for the next generation can be accomplished only if we use our current knowledge wisely and take action in solidarity.

Extract from the foreword of
Dr Hiroshi Nakajima,
Director-General, WHO.

HOW ARE WE DOING?

Human society is more able than ever before to secure good health for each community. But the remarkable sustained improvement in human health observed in some societies has not been realized everywhere, as illustrated in Table 1.1. The contrast between many of the “least developed countries”, where more than 20% of children die before they reach the age of 5, and typical “developed countries”, where less than 1% of children will do so, indicates that we are far from doing as well as we would like or in fact could.

FIVE YEARS SINCE THE EARTH SUMMIT

In response to the concern created by such disparity, the Earth Summit held in Rio de Janeiro, Brazil, in June 1992 heralded a new approach to national and international development and environment planning. In brief, the world’s leaders recognized the importance of investing in improvements to people’s health and their environment as a prerequisite for sustainable development. Continuing commitment to securing human health and a healthy environment is now widespread, as evidenced by a number of declarations and statements that have emanated from recent international conferences (Table 1.2). Indeed, a new perspective on “health” is clearly evolving whereby health is a concern for almost every sector in society and not just the “health sector”.

ENVIRONMENTAL THREATS TO HUMAN HEALTH

Environmental threats to human health are numerous. For ease of discussion and priority-setting, they can be divided into “traditional hazards” associated with lack of development, and “modern hazards” associated with unsustainable development.

Traditional hazards related to poverty and “insufficient” development are wide-ranging and include: lack of access to safe drinking-water; inadequate basic sanitation in the household and the community; indoor air pollution from cooking and heating using coal or biomass fuel and inadequate solid waste disposal.

Modern hazards are related to development that lacks health-and-envi-

Table 1.2

Key elements of declarations and statements of particular relevance to human health

Rio Declaration, Principle 1: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."

UNCED
Rio de Janeiro, Brazil, 1992

"All countries should give priority to measures that improve the quality of life and health by ensuring a safe and sanitary living environment for all population groups through measures aimed at avoiding crowded housing conditions, reducing air pollution, ensuring access to clean water and sanitation, improving waste management, and increasing the safety of the workplace."

International Conference on Population and Development
Cairo, Egypt, 1994

"In addressing inequalities in health status and unequal access to health-care services between women and men, governments and other actors should promote an active and visible policy of mainstreaming a gender perspective in all policies and programmes, so that... an analysis is made of the effects for women and men respectively."

Fourth World Conference on Women
Beijing, People's Republic of China, 1995

"... to sustain our global environment and improve the quality of living in our human settlements, we commit ourselves to sustainable patterns of production, consumption, transportation and settlements development; pollution prevention; respect for the carrying capacity of ecosystems; and the preservation of opportunities for future generations. In this connection, we shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem."

United Nations Conference on Human Settlements,
HABITAT II
Istanbul, Turkey, 1996

"... a peaceful, stable and enabling political, social and economic environment is the essential foundation which will enable States to give adequate priority to food security, poverty eradication and sustainable agriculture, fisheries, forestry and rural development."

World Food Summit
Rome, Italy, 1996

"We decided to include this issue (i.e. health and environment) for the first time in our agenda to emphasize that the protection of public health has been and remains a fundamental objective of environmental policies."

G7 meeting of Ministers of Environment
(Canada, France, Germany, Italy, Japan, UK and USA)
Cabourg, France, 1996

Sources: UN, 1993; UN, 1995b; FAO, 1996a; UN, 1996b; UNCHS, 1996a. Chairman's summary of the Meeting of the Ministers of the Environment in Cabourg, France, 9–10 May, 1996.

environment safeguards, and to unsustainable consumption of natural resources. They include: water pollution from populated areas, industry and intensive agriculture; urban air pollution from motor cars, coal power stations and industry; climate change; stratospheric ozone depletion and transboundary pollution.

The changing pattern of environmental health hazards and associated health risks — moving from "traditional" to "modern" with time and economic development — is known as the "risk transition".

A HEALTH-AND-ENVIRONMENT CAUSE-EFFECT FRAMEWORK

But although we can identify and describe individual environmental health hazards, the relationship between human health and the environment is highly complex. For instance, each of the traditional and modern hazards is associated with a variety of aspects of economic and social development, which complicates analysis of their incidence and impact.

Thus it is useful to adopt a framework within which the different interactions operating between environmental health hazards and the environment can be analysed. A "health-and-environment cause-effect framework" (Fig 1.3) has

been devised to view the development-environment-health relationship, to reveal and highlight important interactions, and to help pinpoint possible entry points for public health interventions.

FINDING SOLUTIONS TO ENVIRONMENTAL HEALTH PROBLEMS

As can be seen, action can be taken at each step in the framework (Fig 1.3). Different levels of intervention are illustrated in Fig 1.4, which is based on acute respiratory infections (ARI) in children. When quantified, the multiple-causation framework can be a powerful guide to designing cost-effective and timely interventions. It also provides a means for examining possible synergies among interventions.

SUPPORTIVE ENVIRONMENTS FOR HEALTH

Too great a focus on environmental health problems, however, can lead us to forget that the environment can also be "supportive" of health, exerting a positive influence in much the same way as a healthy diet. A supportive environment for health is free from major health hazards, satisfies the basic needs of healthy living, and facilitates equitable social interaction.

Table 1.1

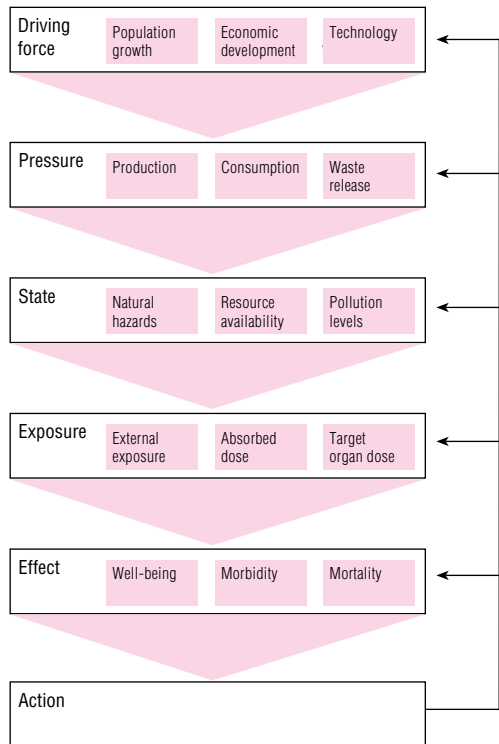
Infant mortality, child mortality, water supply and sanitation coverage, and GNP per capita in six countries

Country	Infant mortality rate* (0-1 years) (per 1000)	Child mortality* (0-5 years, cumulative) (per 1000)	Access to safe water** (% of population)	Access to adequate sanitation** (% of population)	GNP per capita***(US\$)
Sweden	5	6	100	100	24 740
Chile	15	17	96	71	3 170
Philippines	39	48	84	75	850
Ghana	77	113	56	42	430
Guinea-Bissau	135	207	57	20	240
Afghanistan	159	251	10	8	(<200)+

+ estimate, data not available *1995 **1994 ***1993

Source: compiled from data in WHO, 1996a.

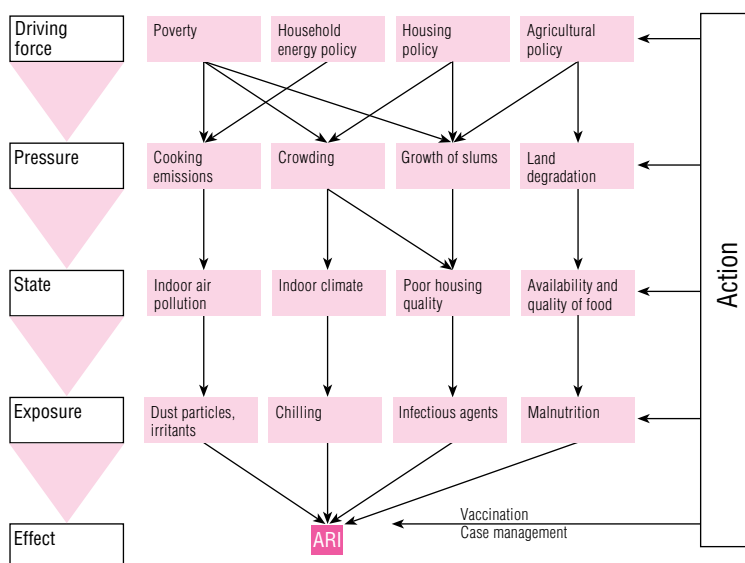
Fig. 1.3
Health and environment cause–effect framework



This diagram is a simplified abstraction of the complex cause–effect relationships operating between driving forces, environmental pressures, environmental states, human exposures, health effects, and actions aimed at minimizing these effects. The various boxes provide examples of factors acting at each level. Arrows mark the potential connections that exist between various causes and effects in environmental health.

Sources: modified after Kjellström & Corvalán, 1995 and Briggs, Corvalán & Nurminen, 1996.

Fig. 1.4
Health and environment cause–effect framework for ARI in children



This framework, based on the model given in Fig. 1.3, provides examples of major cause–effect relationships affecting one specific group of diseases: namely, acute respiratory infections (ARI). Additional linkages could take the form of education policy and the literacy rates of mothers, both of which could increase early detection and treatment of ARI in children.

Creation of supportive environments for health depends upon *full* participation, however: not only in terms of contributory actions from all members of society but also in terms of cooperative action between sectors.

POWER AND PARTICIPATION OF BOTH MEN AND WOMEN

Representation of women is particularly important in improving health status, since women have key roles in all societies with respect to basic living conditions. Yet women remain largely underrepresented at most levels of government, especially in ministerial and other executive bodies. More women in politics and decision-making positions would help to redefine priorities, place new items on the agenda, and provide new perspectives on mainstream political issues.

INTERSECTORAL ACTIONS FOR A HEALTHY ENVIRONMENT

Along the same lines, an intersectoral approach is the most effective means of formulating environmental health policy, since it can help to ensure that priorities are coherent and do not conflict with those of individual sectors. Ministries of health and environment have key roles to play in such activi-

ty. Joint programmes involving these and other ministries would enable much more to be achieved in environment and health. International agencies can also contribute much to environmental health policy development: through collaborative assessments, for example.

HEALTH FOR ALL: THE WAY AHEAD

Action must follow policy. The WHO Health-for-All Policy has provided a framework for translating the preventive health message of *Agenda 21* (the major document to emerge from the Earth Summit) into practical action to be undertaken by the institutions and professionals of the health and other sectors. It is currently being updated and renewed so that it meets the challenges of the 21st Century effectively, and is able to light "the way ahead" for health-and-environment actions towards sustainable development.

"I would like to urge those who have already achieved the best indices to assist and cooperate fully with the endeavours of those who are yet to attain the goal of Health for All"

Mr S.I. Shervani, President of the World Health Assembly, 1997.

CHAPTER 2

Driving Forces Behind Current Health-and-Environment Trends

THE DRIVING FORCES CONCEPT

Driving forces create the conditions in which environmental health threats can develop or be averted, as indicated in the health-and-environment cause-effect framework (Fig. 1.3). These driving forces are often associated simultaneously with a number of health-and-environment issues, as highlighted in Box 2.1. Government policies and programmes — which will vary according to the prevailing value system — change the direction and/or magnitude of driving forces and can therefore alleviate or exacerbate a broad array of environmental health threats.

Driving forces considered in our analysis are: population dynamics; urbanization; poverty and inequity; technical and scientific developments; consumption and production patterns, and economic development. Not considered in our analysis, since it lies beyond the scope of the book, but nevertheless important, is the political system, or democratic governance, or lack thereof. Undemocratic societies are at high risk of not achieving sustainable development, since they do not incorporate all the relevant stakeholders in decision-making.

POPULATION DYNAMICS

Population driving forces have three basic components: the total number and geographical distribution of people, age-distribution, and changes to these distributions caused by population movement. In its simplest form, increased population density leads to intensified human activities that if mis-

managed contribute to environmental damage and resource depletion, both of which can have negative direct or indirect effects on human health.

At the same time, high fertility rates coupled with decreasing mortality have increased the dependency ratio significantly in many developing countries, helping to create ageing populations. While a sign of successful public health policy and action, ageing populations bring with them a different set of disease prevention and health-care needs.

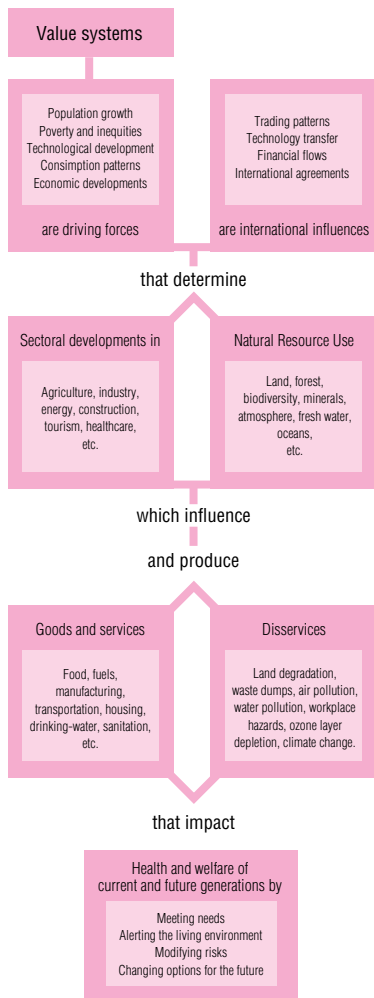
Population mobility is also causing shifts in the distribution, composition and environmental impact of populations. Population movement is seen especially in relation to rural-urban and rural-rural migration. Both are often associated with economic entrapment, unemployment and hunger, all of which may drive populations to seek a better standard of living elsewhere. Population movement also occurs as a result of warfare and environmental degradation. The rapid increase in the flow of refugees over the past decade is illustrated in Figure 2.4.

URBANIZATION

Cities generate a large part of a nation's economic activity, and create potential efficiencies not found elsewhere, as well as advantages in the delivery of education, health and other social services. But given their concentration of people and activities, and their greater levels of consumption and consumerism, and dependence on machines and technologies, cities generate considerable waste and pollution. Urban growth also means greater dependence on

Box 2.1

Elements of sustainable development



Sustainable development can be described in terms of the elements in this figure, interlinking in a logical manner: the driving forces, intermediate elements and the eventual impact or effect on the health and welfare of current and future generations.

Source: Mr Nitin Desai, Under-Secretary-General for Policy Coordination and Sustainable Development, UN.

transport systems, generating yet further pollution, and risk of accidents. The resulting public health challenges are daunting, but with appropriate policies and action programmes, health in cities can be improved.

POVERTY AND INEQUITY

Poverty and inequity are two of the most important contributory factors to poor environmental conditions and poor health.

Poverty as reflected in global income inequity is actually increasing. In 1970, the richest 20% of humanity had roughly 30 times more income than the poorest 20%. Today, the richest fifth receive more than 60 times as much as the poorest fifth. The net worth of the world's 358 richest people is larger

than the combined annual income of the poorest 45% of the world's population (2300 thousand million people).

On a more general level, inequity is seen with respect to geographic area, gender and race/ethnicity (Box 2.5).

Poor local environmental conditions probably affect women more than any other group — primarily by creating additional pressures and increasing women's workload.

SCIENCE AND TECHNOLOGY

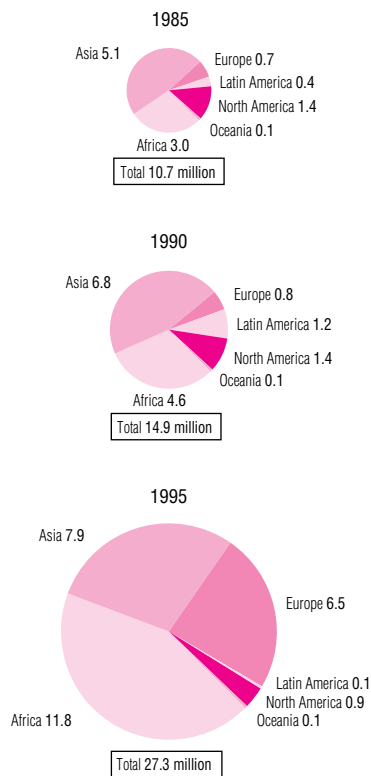
In the past three decades science and technology have been two of the most decisive driving forces for economic development, especially in developed countries. They have played, and will continue to play, a significant role not only in the search for new knowledge and more efficient means of agricultural and industrial production, but also in saving lives, improving health, improving environmental conditions and promoting human development (Table 2.2). Technological developments can be polluting and wasteful, however, and may create serious risks to environment and health. The prevention and reduction of such risks are thus key issues for sustainable development.

CONSUMPTION AND PRODUCTION PATTERNS

Affluence, by most common definitions, means increased per capita consumption of food, goods and services. But increased consumption and production deplete natural resources and produces waste, which can have severe effects on the environment and human health. Three of the most important consumption issues in terms of sustainability are: diet (particularly the consumption of meat), consumption of certain raw materials and persistent chemicals, and the consumption of fossil fuels and associated carbon dioxide (CO₂) emissions.

Dietary composition and food consumption per capita are key driving

Fig. 2.4
Refugees and other persons of concern to UNHCR by region — 1985, 1990, 1995



Source: UNHCR, 1995.

forces because they heavily influence agricultural use of land and water, with impacts on environmental quality and health.

Consumption of raw materials can affect health and environment if those raw materials are associated with greater environmental health risks. Examples here include the toxic metals: lead, cadmium, mercury and chromium. Use of persistent organic pollutants (POPs) is also of great concern (Box 2.8). It is the rich countries who consume the greatest proportions of the world's raw materials and the most dangerous chemicals.

More insidiously, changes in the composition of the atmosphere have resulted from our unsustainable reliance on natural resources in the quest for higher living standards. Although not the only factor at play, fossil fuel combustion for the generation of energy and for transportation is significant. Fossil fuel combustion is leading to higher CO₂ levels. CO₂ is one of the principal greenhouse gases (GHGs).

ECONOMIC DEVELOPMENT

Overall life expectancy and other health indicators have improved for those benefiting from economic development. Economic growth in itself is not sufficient, however, to reduce poverty. Furthermore, if economic development is misguided, poorly planned or inadequately regulated, people's vulnerability to environmental health hazards is increased.

In many countries an "environmental health hazard transition" has occurred in tandem with economic development. That is, a shift from traditional hazards to modern hazards has been observed. In developing countries, though, this transition is ongoing, meaning that the modern hazards of industrial development become established before the traditional hazards of poverty have been significantly reduced. Some communities can therefore be said to live in the "worst of both worlds".

Box 2.5

Examples of inequity in health by socioeconomic group, geographical area, gender and race/ethnicity

By socioeconomic group

The life expectancy at birth of the most disadvantaged population group in Mexico is 20 years less than that of its most affluent group. Adults in São Paulo, Brazil, in the late 1980s had mortality rates that were two to three times higher if they worked in nonprofessional rather than professional jobs. In Bolivia, most public spending on health goes towards care for people belonging to the upper two income quintiles, although these groups already have the best health status. Disparities in health between rich and poor are also apparent within developed countries, although they are usually smaller; wealthy groups have the most concentrated medical attention, eat better, and can afford to live in environmentally clean and disaster-free areas.

By geographical area

In Nigeria, the average life expectancy in one region, Borno, is only 40 years—18 years less than in the Bendel region. Although only 39% of the population of Côte d'Ivoire lives in cities, at least 80% of the country's public health expenditure is directed towards urban areas. In Lima, Peru, the infant mortality rate is 50 per 1000 live births, while in some rural areas it is as high as 150 per 1000.

By gender

A study in India showed that female infants were almost twice as likely to die by the age of two as were males, and concluded that the most likely explanation was the different behaviour of families towards male and female children, not biological differences. Another report concluded that the death of one out of every six female infants in India, Bangladesh and Pakistan was due to neglect and discrimination. Studies in Bangladesh found that boys under 5 years of age were given 16% more food than girls the same age. Additionally, evidence is mounting that adolescent and adult women may not receive an appropriate proportion of available food within the family.

By race/ethnicity

In Guatemala, poverty and malnutrition during the 1980s was much higher among indigenous children than among non-indigenous children. In 1990 in South Africa death rates for non-white men were double those of white men, and more than four times as much money was spent on healthcare for whites than for blacks.

Sources: Batiwala, 1987; Das Gupta, 1987; Vogel, 1988; Chatterjee & Lambert, 1989; UNPF, 1989; Gittelsohn, 1991; UNDP, 1991; Psacharopoulos et al., 1993; UN, 1993; Unidad de Análisis de Políticas Sociales, 1993; World Bank, 1993; Pan American Sanitary Bureau/UN-ELAC, 1994; UNDP, 1994; Yach & Harrison, 1995.

Box 2.8**Persistent organic pollutants**

Considerable political attention has recently focused on persistent organic pollutants (POPs). POPs are organic compounds that have long half-lives in the environment and undergo slow physical, chemical and biological degradation. They are able to pass through ecosystems because of their high vapour pressure and can travel great distances, both locally and globally. These characteristics mean that they may pose a special threat to the environment and human health. POPs include DDT, polychlorinated biphenyls, furans, chlordane, heptachlor, aldrin, dieldrin and endrin.

Many POPs are used in or arise from industry, agriculture and disease vector control. POPs may also be created unintentionally, as by-products. Stockpiles of unwanted POPs are significant cause for concern.

POPs have high lipid solubility and therefore bioaccumulate in the fatty tissues of living organisms. They pose a special risk to human health and the environment since they mimic the function of steroid compounds such as hormones potentially leading to disruption of the endocrine system. Human exposure to POPs occurs via diet, occupation, accidents and the indoor environment, particularly in those developing countries where POPs are used in tropical agriculture.

It is widely accepted that the use of such substances cannot be considered sustainable. Increasing evidence of the long-range transport in the environment of these substances and the consequent threats they pose to the whole globe, has prompted the international community to call for urgent global action to reduce and eliminate releases and emissions of these chemicals.

Among the twelve POPs under initial consideration for international action, DDT is the only insecticide still in use for public health purposes. The use of DDT in public health programmes, notably for malaria control, has been the subject of much controversy for many years. Vector-borne diseases—malaria is one of the most significant—are major threats to human health, and social and economic development. DDT has made a major contribution to the eradication, or virtual eradication of malaria from a number of countries and remains a most valuable tool, particularly since the options for malaria control are limited. Use of DDT has declined, however, following development of vector resistance, reduction in its global production and adverse publicity.

Further options to minimize the use and impacts of POPs include improving the availability of information and expertise on alternatives to POPs (through information exchange and education programmes) and guidance on the selection of replacements for POPs. This guidance should cover non-chemical as well as chemical alternatives, and include advice on the factors to be considered in choosing alternatives.

Sources: IPCS, 1995a; IFCS, 1996.

THE FOUNDATIONS OF SUSTAINABILITY

These driving forces very much determine whether a society is proceeding towards or away from sustainability. Some of the trends that have evolved since the Earth Summit threaten sustainable development, especially those resulting in increased pressure on land and water resources, increased household and hazardous waste, and increased conflict between the economic imperatives of a "globalizing" industry and the health-and-environment protection needs of people.

"The quality of growth is as important as its quantity"

Mr J.G. Speth, Administrator of UNDP, 1996.

Table 2.2**Examples of new technologies which have positive health-and-environment impacts**

Technology	Positive impact on health and environment
Improved biomass stoves/burners	Reduced indoor/outdoor air pollution Greenhouse gas "neutral" ^{**} More efficient fuelwood use
Biogas stoves and lights	Reduced indoor/outdoor air pollution Reduced dependence on power supplies Improved recycling of organics ^{**}
Heat pump technology for space heating	Negligible indoor/outdoor air pollution No greenhouse gas emissions
Photovoltaic energy conversion systems	No indoor/outdoor air pollution No greenhouse gas emissions Reduced dependence on power supplies
Genetically improved crops	Increased yields Reduced dependence on pesticides
Catalytic converters and lead-free petrol	Reduced air pollution from cars
Electric vehicles	Reduced emission of air pollutants along roads
HCFCs and HFCs as CFC alternatives	Reduced stratospheric ozone depletion
Fibreglass cabling for telephone lines	Vastly reduced use of copper
Low water-use irrigations systems	Reduced water use and waterlogging
New alloys and plastics in manufacturing industry	Reduced waste
Biological pest control methods	Reduced use of toxic chemicals

*The growing of biomass fuel (i.e. mostly trees) absorbs exactly the same amount of CO₂ as is released in its combustion (i.e. it is neutral in terms of greenhouse gas emissions).

**Emissions produced during the production and complete burning of biogas are more oxidized and less harmful than those that would have been produced following the decay of e.g. vegetable and plant waste, and organic household waste.

CHAPTER 3

Major Human Activities Affecting Environmental Quality

HOW DRIVING FORCES CREATE ENVIRONMENTAL PRESSURE

The atmosphere, fertile soils, freshwater resources, the oceans, and the ecosystems they support, play a key role in providing humans with shelter, food and safe water, and the capacity to recycle most wastes. However, the pressures exerted by the driving forces are in many instances increasing. They relate to household wastes, fresh water use, land use and agricultural development, industrialization and energy use.

HOUSEHOLD WASTES

Gaseous household wastes arise mainly from heating and cooking. They contribute substantially to both outdoor and indoor air pollution. Liquid wastes are the by-products of domestic activities; their disposal and treatment varies enormously by region. In Fig. 3.1 the variability in rural and urban sanitation, for instance, can be seen for four major regions. Of the unserved in developing countries (2900 million), 80% live in rural areas.

Development efforts have been made to improve provision of sanitation services by central and local governments, and household themselves. But population growth is outstripping these. Fig. 3.3 shows coverage projected to the year 2000 for developing countries, by each major region and in total.

In unserved areas faeces are recycled for use in agriculture or deposited on land without prior destruction of pathogens. Not surprisingly, infectious diseases such as diarrhoeal diseases, schistosomiasis and hepatitis are endemic, and sometimes epidemic, in such areas.

Solid waste can also create environmental health problems. It consists mainly of non-hazardous materials such as paper and plastic packaging material, glass, food scraps and other residues. However, it generally also contains small quantities of hazardous substances such as paints, medicines, solvents, cleaning materials and batteries, leading to potential chemical exposures. Production of household and municipal solid waste continues to increase worldwide, both in absolute and per capita terms. Estimated typical municipal waste production per capita increases with rising average income (Table 3.3). Encouragingly, however, industrial concerns in many developed countries are realizing that minimization of waste production can improve efficiency and reduce costs.

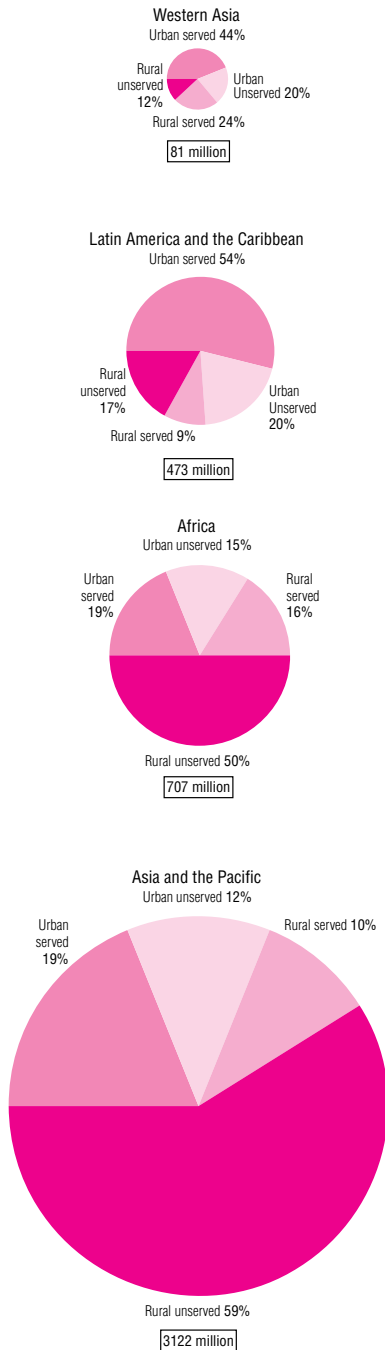
FRESH WATER

For a large percentage of the world's population, water supplies are neither safe nor adequate. Currently, over 1000 million people do not have access to an adequate supply of safe water for household consumption. Moreover, the world's freshwater resources are limited and unevenly distributed over the global land mass.

Demand for water is nevertheless increasing in several sectors — for drinking-water (domestic needs), food production (agriculture) and product manufacturing (industry). Water use figures differ significantly in terms of continent, region, country and area (Fig. 3.5) and type of use, but globally, total demand for water increased by six times between 1900 and 1990, more than double the rate of population growth for the same period. Some

Fig. 3.1

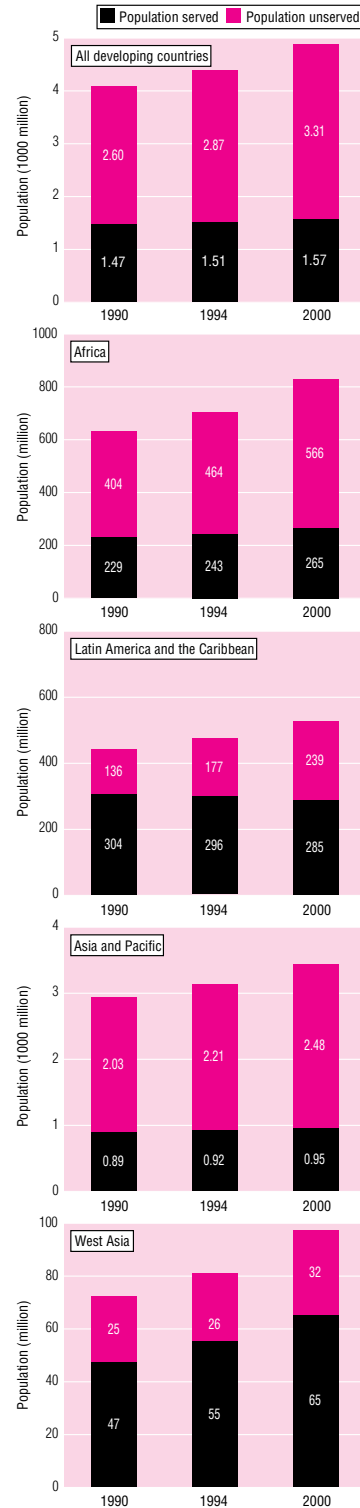
Sanitation coverage by region — 1994



Source: WHO/UNICEF, 1996a.

Fig. 3.3

Sanitation services coverage in developing countries



Source: WHO/UNICEF, 1996a.

water uses — such as irrigation for agriculture — are highly wasteful. Not surprisingly, water scarcity today is increasingly becoming a problem of regional and even sub-continental proportions. Evidently, it is particularly acute in dry zones, where competition between agricultural, industrial, domestic needs is often fierce.

Global freshwater resources are threatened not only by overexploitation, however, but also by poor management and ecological degradation. Untreated sewage is discharged into rivers and lakes, industrial wastes are dumped into water bodies, and run-off from agricultural fields treated with herbicides and pesticides is leading to water contamination. Industrial development, the exponential growth of human settlements and the ever-increasing use of synthetic organic substances, are also having serious adverse impacts on freshwater bodies. Many surface and groundwaters are now contaminated with nutrients, heavy metals and POPs (see Box 2.8).

LAND USE AND AGRICULTURAL DEVELOPMENT

Competition for land appears to be intensifying between sectors and production systems. Agriculture, in particular, can be expected to become an even more dominant form of land use. Population increase and the finite extent to which further land can be converted to agricultural uses, mean that per capita arable land availability is becoming an issue.

Agricultural production carries several risks. Thus extension and intensification of agricultural production systems, together with fluctuation in the supply of and demand for agricultural produce are causing shifts in the environmental determinants of the health status of local communities. Some of these are masked or compounded by simultaneous demographic and socioeconomic shifts. Major environmental health risk factors of agricultural development are presented in Table 3.8.

INDUSTRIALIZATION: IMPROVED PROSPECTS AND ADVERSE CONSEQUENCES

Industrialization is central to economic development and improved prospects for human well-being. But if proper abatement technology is not used, industry becomes a major source of air, water and soil pollution, hazardous wastes and noise. Industrial workers are often at highest risk of health impacts. Furthermore, developed countries have exacerbated the environmental problems now being experienced by developing countries through transfer of hazardous wastes, industries and technologies.

Major industrial impacts also arise from small-scale industry. In developing countries, small-scale industry contributes substantially to economic development, but can create problems for environment and health if environmental safeguards are not used.

If industrial development is to become

more environmentally sound, three transitions must be completed. Firstly, environmental considerations must be incorporated into all aspects of planning for new industry. Secondly, techniques must be developed which more easily and flexibly control pollution within a legal framework which provides strong incentives, particularly economic incentives, to minimize the release of pollutants and the production of waste, and which places greater emphasis on the "polluter pays" principle. Thirdly, producers of hazardous products should be required to be responsible for those products "from cradle to grave", i.e. from production to safe disposal.

ENERGY

Energy plays a critical role in basic human survival. Too little energy — through its effects on nutrition and food safety, and on chilling — has important implications for health. Energy is also crucial to transportation and industrial processes. However, production and use of energy, if not properly controlled,

Table 3.3
Typical quantities of municipal waste production per capita

Type of country	Waste generation (Kg/capita/day)
High-income countries	0.8 to 3.0
Middle-income countries	0.5 to 0.9
Low-income countries	0.3 to 0.6

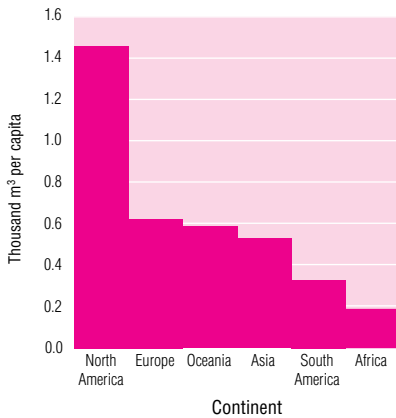
Source: based on data from UNCHS, 1996b.

Table 3.8
Major environmental health risk factors of agricultural development

Agricultural development issue	Direct environmental changes	Secondary environmental changes	Environmental health risk factors
Irrigation development	Hydrological changes Waterlogging Salination Increased water surfaces Increased relative humidity	Increased insect populations Increased densities Greater chemical inputs	Introduction of new vector species Increased vector densities Changed vector population composition Prolonged transmission season Chemical poisoning
Land-use changes	Deforestation Reduced biodiversity/habitat Simplification	Changed composition of the insect fauna	Changed vector population composition Changed vector longevity
Cropping patterns	High-yielding varieties Shift from subsistence to cash crops Accelerated cropping cycle Plantation agriculture	Greater chemical inputs Greater densities of insect populations	Poisoning Reduction of predator insects in favour of pest and vector species
Livestock management	Changed in livestock densities and spatial distribution of livestock New breeds of livestock	Changed densities of blood-sucking insects	Changed disease transmission potential
Mechanization	Changes in livestock densities and Loss of ecological features Associated with draught animals	Changed densities of blood-sucking insects Reduced refuge areas for predator insects Air and water pollution	Changed disease transmission potential
Chemical inputs	Increased levels of pesticides, herbicides and/or fertilizer	Chemical contamination Eutrophication of water bodies Expansion of aquatic weeds	Poisoning Introduction of new vector species Development of insecticide resistance in vector populations

Source: Bradley & Narayan 1987.

Fig. 3.5
Per capita water use by continent for 1995



Source: based on data from WRI, 1996.

may be accompanied by adverse health-and-environment impacts.

In developing countries, biomass accounts for about one-third of all energy use, and in some of the least-developed countries, for as much as two-thirds (Fig. 3.10). Open fires impair indoor air quality (Fig. 3.11), add to the risk of accidents and jeopardize food hygiene.

But the largest source of atmospheric pollution is the combustion of fossil fuels in power plants and by industries, in motor vehicles and by households. Huge quantities of sulphur and nitrogen oxides, heavy metals, HCs, particulates, CO, and other highly toxic pollutants are emitted. Associated major health-and-environment effects include:

- indoor and outdoor air pollution
- emission of GHGs
- contamination of water bodies and land by atmospheric fallout of emissions
- occupational health-and-safety risks.

The rapid growth in the world motor vehicle fleet (Fig. 3.12) is also creating serious air pollution problems in some parts of the world.

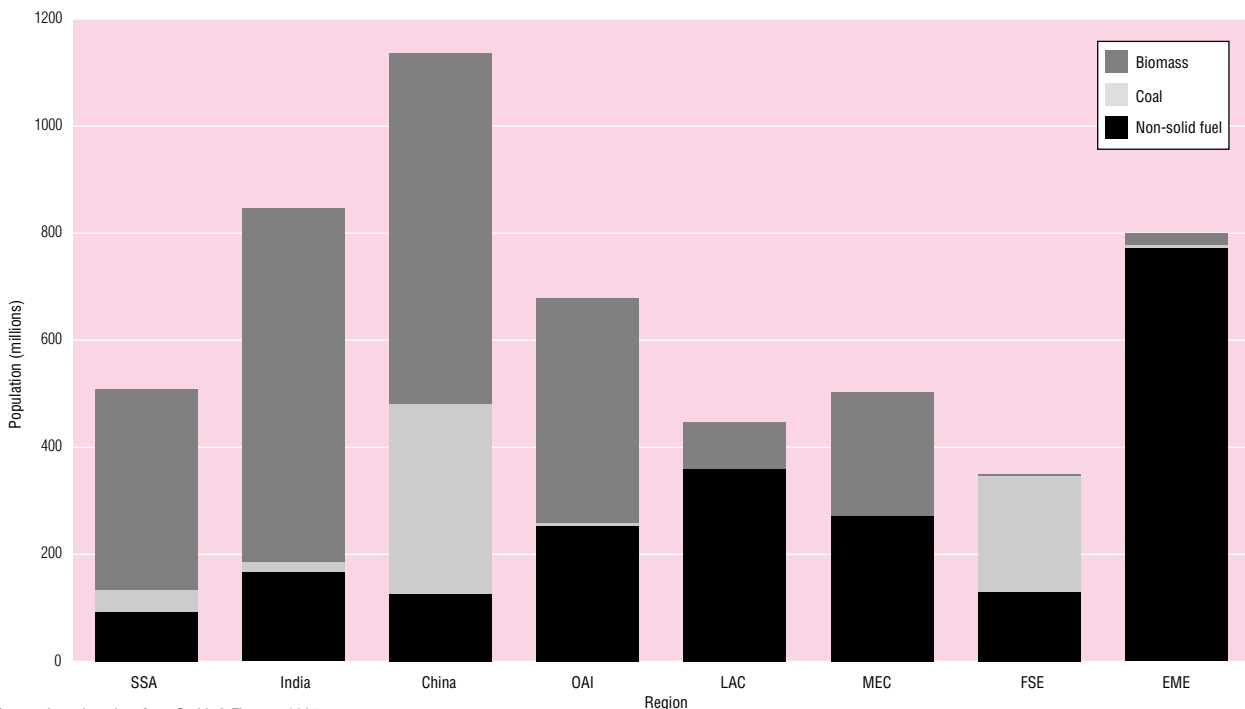
Clearly, the mix of technologies and fuels that are chosen today will have considerable environmental implications for tomorrow.

CONSIDERABLE THREATS TO ENVIRONMENTAL QUALITY AND HEALTH

In summary, the adverse effects on the environment of human activities are many and appear to be growing in intensity, at least in some parts of the world, and affecting larger and larger areas. Current and future potential "pressures" on the environment have major implications for health.

"Despite progress on several fronts, from a global perspective the environment has continued to degrade during the last decade, and significant environmental problems remain deeply embedded in the socio-economic fabric of nations in all regions"
UNEP Global Environment Outlook, 1997a.

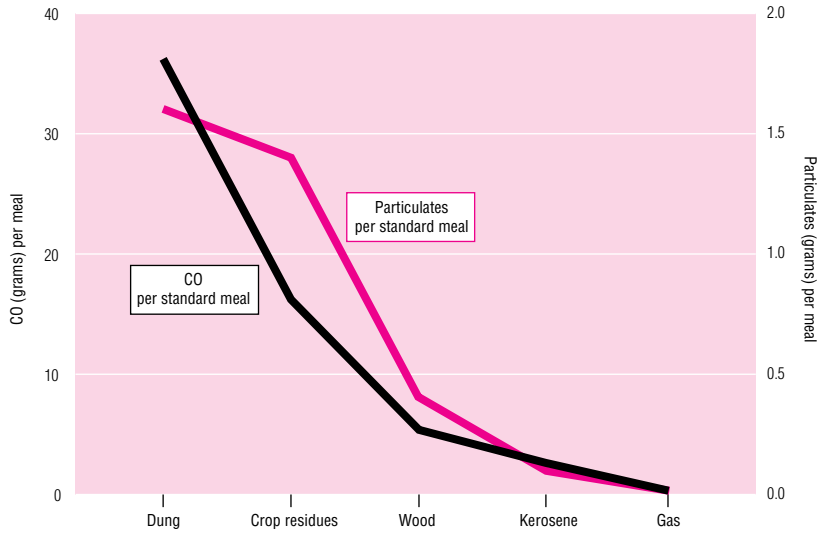
Fig. 3.10
Number of people using different household fuels by region — 1990s



Source: based on data from Smith & Figuero, 1997.

Fig. 3.11

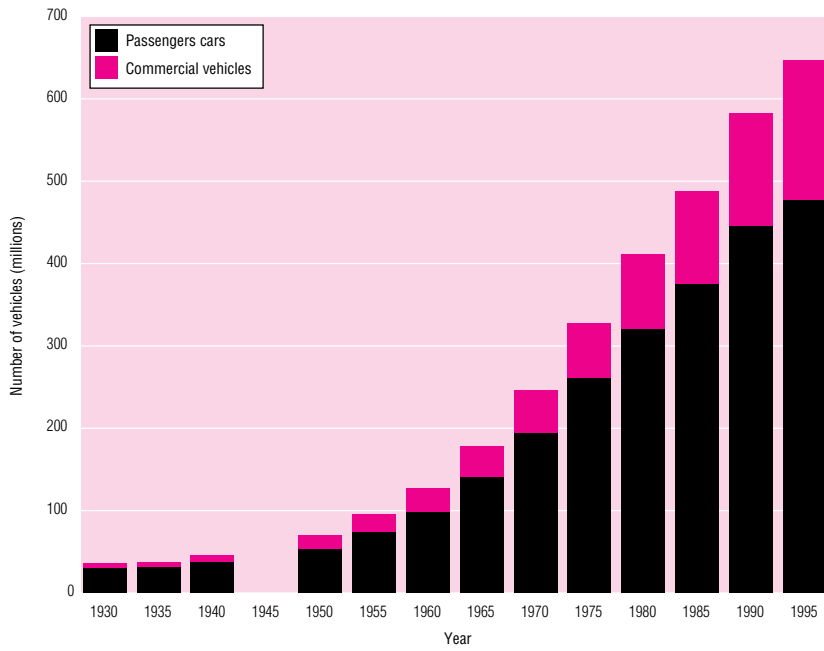
Emissions per meal for household cooking fuels



Source: adapted from Smith, 1991.

Fig. 3.12

Growth of world motor vehicle fleet — 1930–1995



Source: based on data from AAMA, 1996

CHAPTER 4

From Environmental Quality to Exposures and Risks

THE HUMAN DIMENSION TO ENVIRONMENTAL QUALITY

Pressures on the environment in the form of pollution emissions, resource depletion, land-use changes and others affect environmental quality (the "state" of the environment). Degradation of environmental quality can, in turn, lead to adverse human exposures and eventual health effects.

Air, water and food are the principal exposure routes of environmental health hazards. Also heavily implicated are the manner in which household wastes and sewage are handled, and the conditions in which people live and work.

AIR POLLUTION

When inhaled, air pollutants affect the lung and respiratory tract; they are also taken up by the blood and transported throughout the body. And since air pollutants are deposited on soil and plants and in water, they can contribute to further human exposure if contaminated food and water are ingested.

SPM and gaseous pollutants are emitted by a wide range of sources (Table 4.1). In recent years, attention has shifted to that portion of SPM made up of particles that are so small that they can penetrate deeply into the lung. Other health-damaging pollutants include gaseous inorganic pollutants such as SO₂, CO, and nitrogen dioxide (NO₂), as well as HCs, such as benzene and butadiene, other volatile organic compounds (VOCs), and secondary pollutants.

Indoor air pollution can be particularly hazardous to health because it is released

in close proximity to people. The most prominent source of indoor air pollution in developing countries is household use of biomass and coal for heating and cooking, usually involving open fires or stoves without proper chimneys.

A large number of studies in recent years have shown remarkable consistency in the relationship observed between changes in daily ambient suspended particulate levels and changes in daily mortality. Two different methods for estimating the total global mortality from suspended particulate air pollution exposures arrive at very similar total numbers (i.e. 3 million and 2.7 million), with indoor air pollution accounting for the vast majority of total deaths (Fig. 4.4).

Other air pollutants of health concern include ozone (O₃), environmental tobacco smoke (ETS) and ionizing radiation. ETS is on the increase; in adult non-smokers, chronic exposure to ETS increases mortality from lung cancer by between 20% and 30%.

HOUSEHOLD WASTES

Poorly managed wastes — specifically excreta, liquid and solid wastes from households and the community — represent a serious health threat. Waste from industries and agriculture can also cause serious health risks.

Human faeces are dangerous to human health everywhere because of the pathogens they contain. Ingestion of faecal pathogens can cause diarrhoeal disease, cholera, intestinal worm infections and typhoid fever.

Table 4.1
Common atmospheric pollution sources and their pollutants

Source category	Source	Emitted pollutants
Agriculture	Open burning	SPM, CO, VOC
Mining and quarrying	Coalmining	SPM, SO ₂ , NO ₂ , VOC
	Crude petroleum and natural gas production	SO ₂
	Non-ferrous ore mining	SPM, Pb
	Stone quarrying	SPM
Manufacturing	Food, beverages and tobacco	SPM, CO, VOC, H ₂ S
	Textiles, leather industries	SPM, VOC
	Wood products	SPM, VOC
	Paper products, printing	SPM, SO ₂ , CO, VOC, H ₂ S, R-SH
Manufacture of chemicals	Phthalic anhydride	SPM, SO ₂ , CO, VOC
	Chlor-alkali	Cl ₂
	Hydrochloric acid	HCl
	Hydrofluoric acid	HF, SiF ₄
	Sulfuric acid	SO ₂ , SO ₃
	Nitric acid	NO _x
	Phosphoric acid	SPM, F ₂
	Lead oxide and pigments	SPM, Pb
	Ammonia	SPM, SO ₂ , NO _x , CO, VOC, NH ₃
	Sodium carbonate	SPM, NH ₃
	Calcium carbide	SPM
	Adipic acid	SPM, NO _x , CO, VOC
	Lead alkyl	Pb
	Maleic anhydride, terephthalic acid	CO, VOC
	Fertilizer and pesticide production	SPM, NH ₃
	Ammonium nitrate	SPM, NH ₃ , HNO ₃
	Ammonium sulfate	VOC
Manufacture of chemicals	Synthetic resins, plastic materials, fibres	SPM, VOC, H ₂ S, CS ₂
	Paints, varnishes, lacquers	SPM, VOC
	Soap	SPM
Manufacture of chemicals	Carbon black, printing ink	SPM, SO ₂ , NO _x , CO, VOC, H ₂ S,
	Trinitrotoluene	SPM, SO ₂ , NO _x , SO ₃ , HNO ₃
Petroleum refineries	Miscellaneous products of petroleum and coal	SPM, SO ₂ , NO _x , CO, VOC
Non-metallic mineral products manufacture	Glass products	SPM, SO ₂ , NO ₂ , CO, VOC, F
	Structural clay products	SPM, SO ₂ , NO _x , CO, VOC, F ₂
	Cement, lime and plaster	SPM, SO ₂ , NO _x , CO
Basic metal industries	Iron and steel	SPM, SO ₂ , NO _x , CO, VOC, Pb
	Non-ferrous metal industries	SPM, SO ₂ , F, Pb
Power generation	Electricity, gas, steam	SPM, SO ₂ , NO _x , VO, VOC, SO ₃ , Pb
Petrol retail trade	Fuel storage, filling operations	VOC
Transport	Combustion Engines	SPM, SO ₂ , NO _x , CO, VOC, Pb
Community services	Municipal incinerators	SPM, SO ₂ , NO _x , CO, VOC, Pb

Source: adapted from Economopoulos, 1993

Solid wastes can come into direct or indirect contact with human beings at several stages in the waste cycle. The health risks of uncollected solid waste are obviously most severe for those actually living in unserved areas. Notable, pre-school children in developing countries are at risk of injury, intoxication or infection since they are likely to be exposed to uncollected waste in streets or at unofficial dump sites. But even if solid waste is collected, it may create health risks for large numbers of people if disposed of improperly. Groundwater used for drinking purposes, for instance, can become chemically or microbiologically polluted if wastes are disposed of in or near water sources.

Recycling, too, although in principle a good approach to waste management, carries health risks if proper precautions are not taken. Workers dealing with recycling of waste that has a high metal or chemical content may experience toxic exposures, while in developing countries "scavengers" who comb waste sites for articles that can be recycled and reused may sustain injuries and come into direct contact with infectious dusts and disease vectors, such as rats and flies.

WATER

Adequate supply of safe drinking-water is universally recognized as a basic human need. Yet more than 1000 million people do not have ready access to an adequate and safe water supply, and a variety of physical, chemical and biological agents render many water sources less than wholesome and healthy.

Today, more than 800 million of those unserved live in rural areas. Fig. 4.5 shows trends in development of water supply services in developing countries for 1990–2000. Water supply also varies widely in terms of region and country. For instance, urban areas generally have higher coverage than rural areas. Even within areas, inequitable distribution can be very marked. In cities, water is often provided to districts whose populations can pay for services.

Water pollution, whether it involves sewage, nutrients, synthetic organics, acidification or specific chemicals, has a direct bearing on human health. Sewage, in addition to upsetting the ecological balance of rivers and lakes, also carries microbial pathogens. Other nutrients contaminate groundwater sources with nitrates, with the result that nitrate levels in drinking-water often exceed the safe levels recommended by WHO. The most dangerous can bioaccumulate in fish and shellfish which, if consumed, may be hazardous to human health. Acidification contributes to high levels of heavy metals in drinking-water where metals in soil and water distribution pipes are mobilized by acidified groundwater (Fig. 4.7).

Untreated sewage, industrial effluents and agricultural waste are frequently discharged into inland waterways, lakes and coastal zones, endangering the health of those who use these water bodies for recreational purposes such as swimming, canoeing and windsurfing. Recreational exposure to polluted waters can cause diarrhoea, respiratory infections, skin irritation and other diseases, depending on the specific pollutants involved.

Finally, the aquatic environment provides an essential habitat for the mosquito vectors and intermediate snail hosts of parasites that cause human

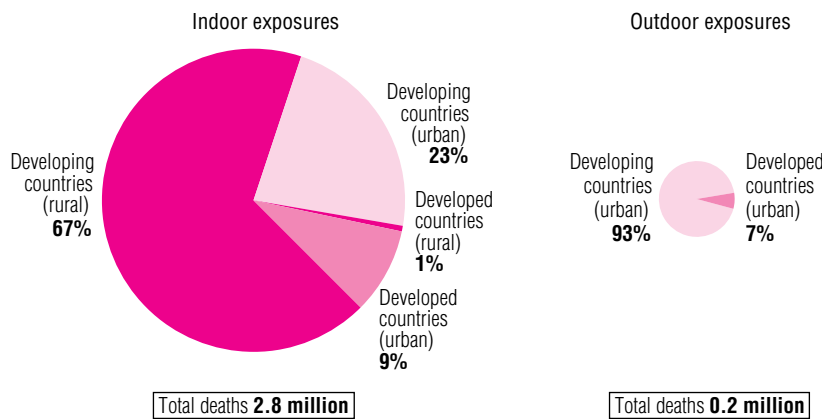
diseases. Accelerated development of water resources has led to habitat modifications and ecological conditions that favour certain disease vectors. Health issues linked to irrigation development have become a particular focus of attention, but increased transmission is also linked to the construction of dams and reservoirs, to changes in land-use patterns and to poor water management in urban areas. The most important water-related vector-borne diseases affected by development projects in recent decades include malaria, schistosomiasis, dengue fever, filariasis and Japanese encephalitis.

FOOD

Food is essential to a healthy life, but it can also be a major route of exposure for many pathogens and toxic chemicals. These contaminants may be introduced into food during cultivation, harvesting, processing, storage, transportation and final preparation. Inspection and monitoring of food quality are therefore necessary to ensure food safety.

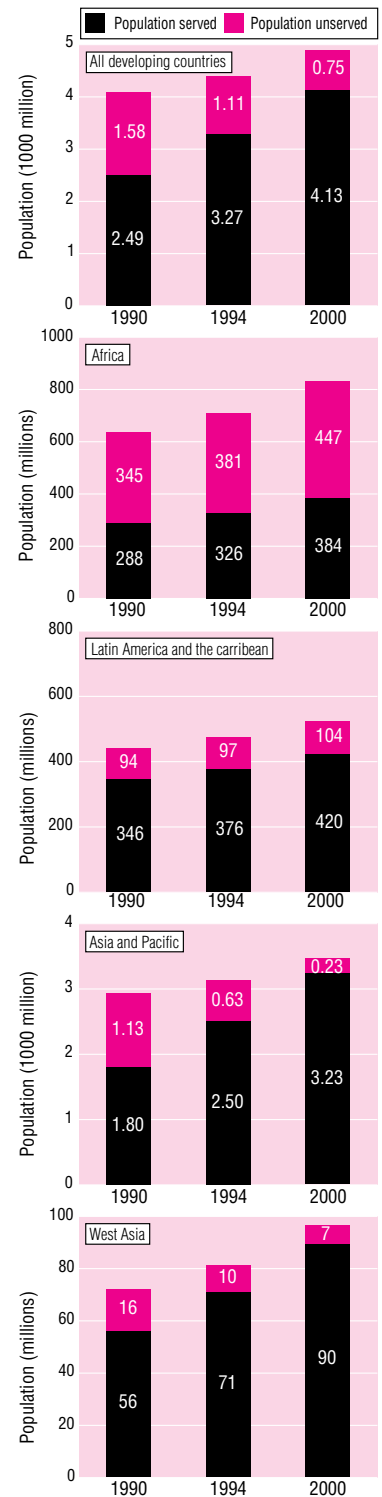
The increasing interdependency and complexity of our food supply mean that even the best control systems are becoming strained, however. Foodborne disease is now a widespread and growing threat to human health, and a major cause of reduced economic produc-

Fig. 4.4
Estimated global annual deaths due to indoor and outdoor pollution exposure



Source: Smith, 1996.

Fig. 4.5
Development of water supply services in developing countries 1990–2000



Source: WHO/UNICEF, 1996a.

tivity. Health impacts range from mild indisposition to life-threatening illness. The people most affected are the poor, who are also vulnerable to lack of food and undernutrition.

Biological and chemical agents in food represent the two major types of foodborne hazard. Biological agents tend to pose acute hazards with incubation periods of a few hours to several weeks before the onset of disease, whereas chemical hazards usually involve long-term, low-level exposures.

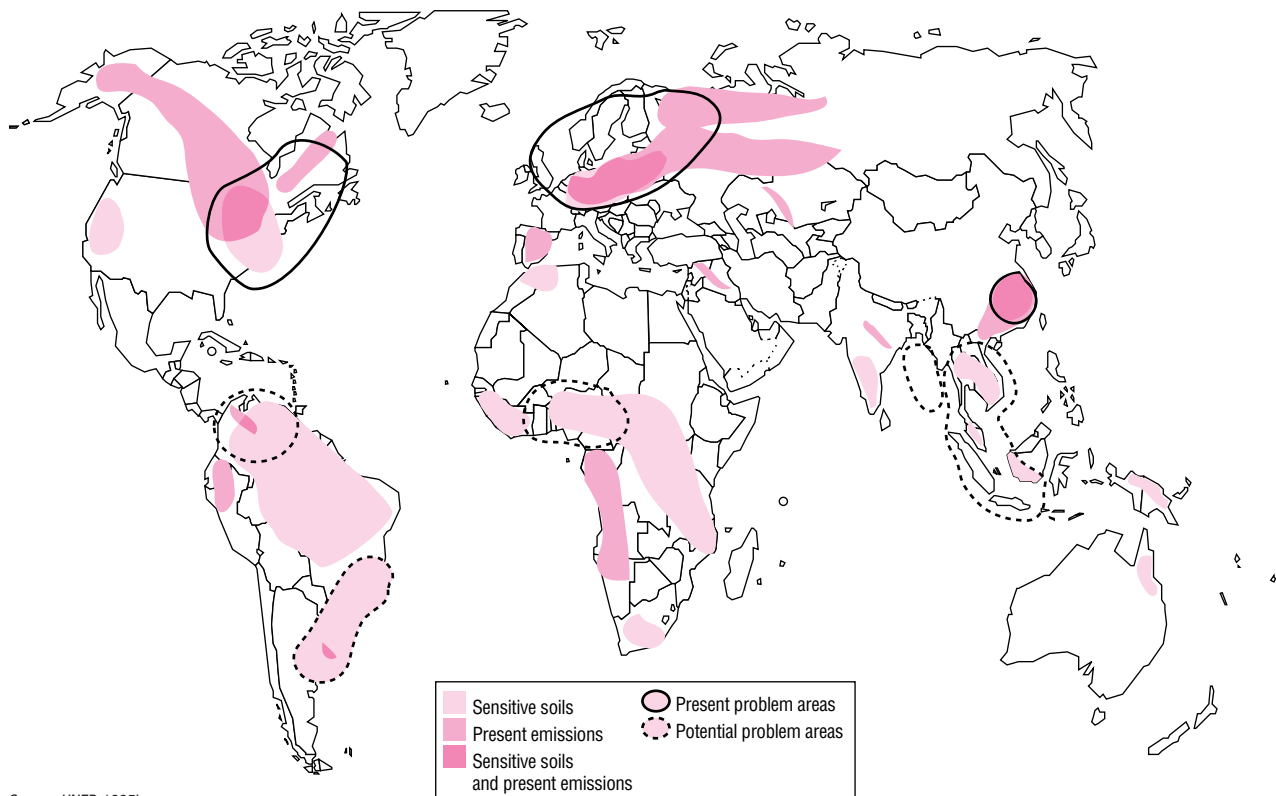
Many chemical hazards in food are produced naturally by organisms in the environment. Others are inherent components of food itself. Yet other potentially hazardous chemicals are produced during processing. Pollutants such as lead, cadmium and polychlorinated biphenyls (PCBs) in air, water and soil can also lead to high levels of toxic chemicals in food.

SOIL

Exposure to hazards in soil can occur, for instance, when farmers till agricultural soil, when children play in schoolyards, or when dust from dry fields is blown into populated areas. Additionally, deposition of biological, chemical or radioactive hazards on or in soil can lead to indirect exposures following use of contaminated groundwater for drinking-water, or consumption of food grown on contaminated soil.

Direct contact with soil or soil dust that has been contaminated with helminth eggs is a major source of exposure to intestinal worm infection. Soil can also harbour many other parasites and microbes, which can survive for long periods in spite of large variations in soil temperature and humidity. Neonatal tetanus (NT) is a common example of an associated disease. Tetanus spores infect

Fig. 4.7
Global risk of surface water acidification



Source: UNEP, 1995b.

humans through direct contact with soil or dirt; in developing countries, childbirth in impoverished conditions often leads to NT.

HOUSING

Housing is of central importance to quality of life. Ideally, it minimizes disease and injury, and contributes much to physical, mental and social well-being. The home environment should also afford protection against the hazards to health arising from the physical and social environment (Table 4.17).

Numerous factors in the home environment may influence health negatively, though. Lack of access to piped water or a nearby stand-pipe, and lack of sanitary facilities, are often considered key indicators of "unhealthy" housing, leading to high disease burdens, in both urban and rural areas. Factors such as high levels of noise, poor indoor air quality, inadequate refuse storage and collection facilities, poor food storage and preparation facilities, temperature extremes and high humidity, overcrowding, poor lighting, inadequate or inappropriate construction material, building defects and pests may also influence health significantly.

Crowded, cramped conditions, for instance, facilitate transmission of diseases including tuberculosis, influenza, meningitis, ARI, diarrhoeal diseases and measles. Some evidence suggests that women's health is more likely to be adversely affected by crowding than that of men. If crowding combines with poor-quality housing materials, incidence of injuries and accidents rises significantly.

THE WORKPLACE

In favourable circumstances, work contributes to good health and economic achievement. However, the work environment exposes many workers to health hazards that contribute to injuries, respiratory diseases, cancer, musculoskeletal disorders, reproductive disorders, allergies, cancer, CVD, mental and neurological illnesses, psychological stress, eye damage and hearing

loss, as well as to communicable diseases.

Mechanical hazards, unshielded machinery, unsafe structures in the workplace and dangerous tools are some of the most prevalent workplace hazards in developed and developing countries alike. Approximately 30% of the workforce in developed countries and between 50% and 70% in developing countries, may be exposed to a heavy physical workload or ergonomically poor working conditions.

Exposure to some 200 biological agents, viruses, bacteria, parasites, fungi, moulds and organic dusts occurs in selected occupational environments. Physical factors in the workplace such as noise, vibration, ionizing and non-ionizing radiation and microclimatic conditions can also affect health adversely if not controlled. Occupational chemical exposures are another area of increasing concern. About 100 000 different chemical products are in use in modern work environments and the number is growing.

With economic development many countries have experienced a shift from the hazards that characterized work in agriculture, mining and other primary industries, to those that characterize manufacturing industries or service industries. New occupational disease problems have emerged and incidence of reported occupational disease has accordingly increased in certain developed countries.

THE GLOBAL ENVIRONMENT

As a result of the combined action of driving forces at local and regional levels, environmental change is gradually becoming "globalized". Major examples of global environmental change include: climate change, stratospheric ozone depletion, transboundary air and water pollution, acid precipitation, loss of biodiversity, desertification and deforestation.

Human-induced climate change is due primarily to accumulation of GHGs in

Table 4.17

Principles of healthy housing

Protection against communicable diseases through:

- safe water supply
- sanitary excreta disposal
- disposal of solid wastes
- drainage of surface water
- personal and domestic hygiene
- safe food preparation
- structural safeguards

Protection against injuries, poisonings and chronic diseases through attention to:

- structural features and furnishings
- indoor air pollution
- chemical safety
- use of the home as a workplace

Reduction of psychological and social stress through:

- adequate living space, privacy and comfort
- personal and family security
- access to recreation and community amenities
- protection against noise

Access to a supportive living environment through provision of:

- security and emergency services
- health and social services
- access to cultural and other amenities

Protection of populations at special risk:

- women and children
- displaced and mobile populations
- the aged, ill and the disabled

Source: adapted from WHO 1989e.

the atmosphere, resulting from activities such as combustion of fossil fuels, large-scale deforestation and the rapid expansion of irrigated agriculture. Both direct and indirect health impacts can be expected to occur as a result of climate change (Fig. 4.9).

Although stratospheric ozone depletion and climate change are separate phenomena, they are linked by a number of processes. For instance, several GHGs, especially CFCs, also destroy stratospheric ozone. The principal result of stratospheric ozone

depletion is that an increasing proportion of solar ultraviolet radiation (UVR) is reaching Earth's surface. Higher UV exposure is expected to result in a number of direct impacts on human health, including an increase in the incidence of skin cancer (especially non-melanoma skin cancers) in light-skinned populations. It could also increase the incidence of eye lesions, such as cataracts, and lead to suppression of the immune system.

Stratospheric ozone depletion was first measured in the 1980s at Antarctica. It is now becoming significant in the Arctic area too. An increasing extent of the northern hemisphere is becoming exposed (Fig. 4.12).

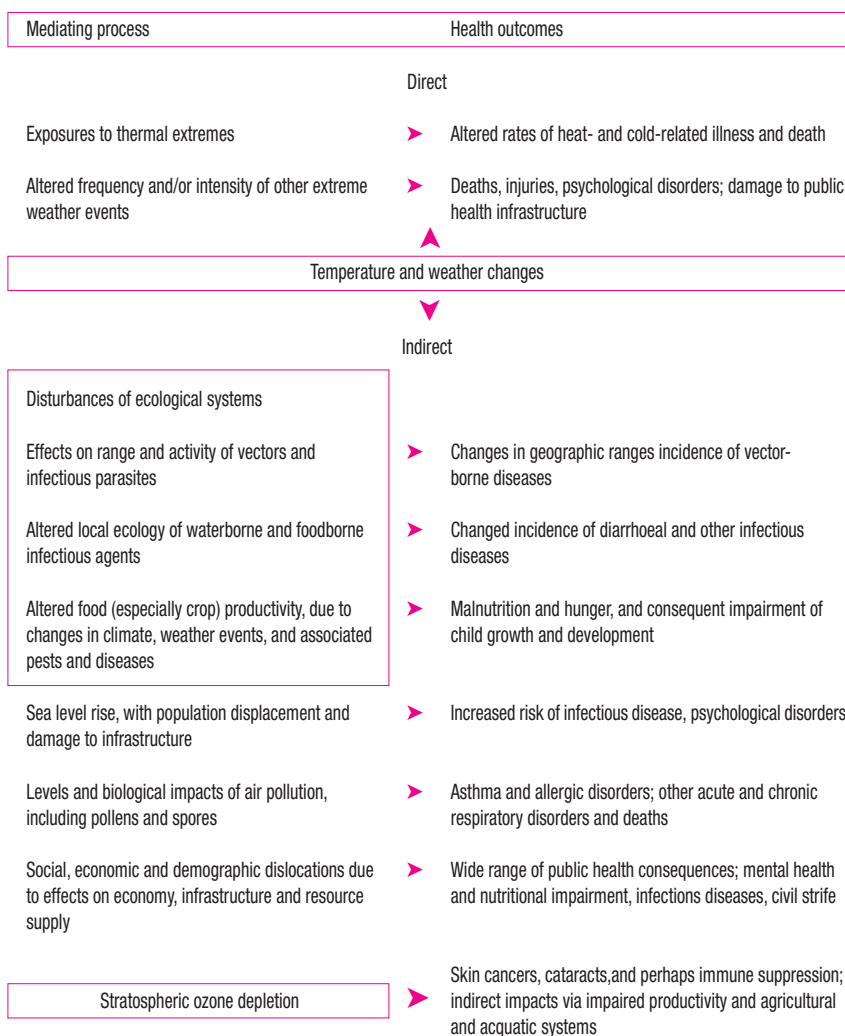
The transboundary movement of hazardous wastes and long-range transport of air pollution are two environmental problems of great international concern. There have been many instances of hazardous waste being shipped to developing countries in order to take advantage of inadequate environmental regulations and cheaper prices.

The main concern relating to long-range transport of air pollution is deposition of harmful substances and reduced air quality in locations far removed from the original sources of pollution. Acid deposition is a regional air pollution problem. While acidification of water bodies and soils is largely an environmental threat, human health may also be affected owing to the mobilization of heavy metals.

COMBINED EXPOSURES FROM A VARIETY OF SOURCES

Many environmental hazards — be they chemical, biological or physical — occur in more than one environmental media or setting (e.g. air, water, housing, workplace). Their control, therefore, requires an understanding of the relative contribution made by each medium or setting. This has led to development of the total human exposure concept.

Fig. 4.9
Possible major types of impact of climate change and stratospheric ozone depletion on human health



Source: McMichael et al., 1996.

Of all the pollutants to which exposure occurs via multiple pathways, lead is probably the best known and most studied. Although decreasing in many developed countries, lead exposure remains a major public health issue, especially in cities and industrialized areas in developing countries.

Fig. 4.12

Ozone layer depletion around the North Pole; mean reduction of ozone levels (%) during the months of February and March during 1992–1997

HUMAN EXPOSURES AND HEALTH RISK: MULTIPLE CHALLENGES FOR HEALTH PROTECTION

Table 4.24 summarizes the multiple linkages between the exposure situations described in this chapter and the major ill health conditions that they can cause. Most of these health conditions are potentially related to several environmental exposure situations.

Source: Bojkov et al. 1997.

Table 4.24

Potential relationships between exposure situations and health conditions

Health conditions of concern	Exposure situations					
	Polluted air	Excreta and household wastes	Polluted water or deficiencies in water management	Polluted food	Unhealthy housing	Global environmental change
Acute respiratory infections	●				●	
Diarrhoeal diseases		●	●	●		●
Other infections		●	●	●	●	
Malaria and other vector-borne diseases		●	●		●	●
Injuries and poisonings	●		●	●	●	●
Mental health conditions					●	
Cardiovascular diseases	●					●
Cancer	●			●		●
Chronic respiratory diseases	●					●

CHAPTER 5

Health Conditions in an Environmental Context

ESTIMATING THE BURDEN OF DISEASE

One can also look at environmental health problems from the viewpoint of the burden of death, disease and disability, and analyse the relative importance of the different environmental factors discussed earlier. Table 5.1 shows two different estimates for the total number of deaths for the major causes of death for 1990–1993. Each of the two estimates involves judgements about the best sources of mortality data, which explains the differences between the two columns for certain disease categories.

To clarify the relative importance of different causative factors, such analysis must take into account the age at which death occurs, or even better, the number of “years of life lost” (YLL). Furthermore, not all negative health outcomes are expressed only in terms of mortality. Morbidity and disability are important outcomes that ideally should also be considered when calculating disease burden.

The disability-adjusted life years (DALYs) concept is one approach which has generated a comprehensive picture of the “burden of disease”, covering all major disease and injury categories. Estimates of disease burden based on this approach are used in this book since these estimates include all diseases of interest to this analysis and all regions of the world. Furthermore, the estimates relate to what is considered “preventable”.

Each DALY indicates the loss of a year of healthy life — that is, time lived with a disability or time lost through pre-

mature death. The number of DALYs in different regions provides a guide to the relative distribution of disease burden: the higher the DALYs, the greater the burden. To calculate disease burden in DALYs, data on premature mortality and disability are combined. The number of YLL are assessed as the difference between the actual age at death and the age at which the person could have been expected to die, given the average age of mortality of an advanced developed country (82.5 years for women and 80 years for men). Next, the incidence of disability due to disease or injury is estimated on the basis of available information pertaining to each community. Different weights are assigned to different disability conditions, according to severity. Finally, discounting and age-weighting are incorporated because this methodology assumes that future years of life lost contribute less to the burden of disease than do current ones.

While most of the DALY burden is due to premature death, the disability component is important for chronic illnesses which are present over many years. This is seen in Table 5.2 where the early death component of DALYs (i.e. years of life lost — YLL) is presented along with the DALYs for selected causes.

Some diseases, such as ARI and diarrhoeal diseases, are of particular importance to children’s health. Thirty percent of the estimated number of deaths for all diseases occur before 15 years of age (Table 5.3), but for ARI and diarrhoeal diseases, the percentages are 67% and 88% respectively. The child proportions of DALYs are even greater:

Table 5.1
Estimated global number of deaths — 1990–1993

Disease	A. Deaths (thousands)	(%)	B. Deaths (thousands)	(%)
Cardiovascular diseases	14 327	28	9676	19
Cancer	6024	12	6013	12
Acute respiratory infections	4380	8.7	4110	8.1
Unintentional injuries	3233	6.4	2915	5.7
Diarrhoeal diseases	2946	5.8	3010	5.9
Chronic respiratory diseases	2935	5.8	2888	5.7
Perinatal conditions	2443	4.8	3180	6.2
Vaccine-preventable infections	1985	3.9	1677	3.3
Tuberculosis	1960	3.9	2709	5.3
Intentional injuries	1851	3.7	1082	2.1
Malaria	856	1.7	2000	3.9
Mental health conditions	700	1.4	–	–
Other identified diseases	6827	13.5	3616	7.1
Unknown causes	–	–	8124	16
Total	50 467	100	51 000	100

Sources: A. deaths in 1990 according to Murray and Lopez, 1996b; B. deaths in 1993 according to WHO, 1995 a.

Table 5.2
Global YLL and DALYs for major health conditions — 1990

Disease	YLL (thousands)	(%)	DALY (thousands)	(%)
Infectious and vector-borne diseases				
Acute respiratory infections	110 992	12	116 696	8.5
Diarrhoeal diseases	94 434	10	99 633	7.2
Vaccine-preventable infectious diseases	67 104	7.4	71 173	5.2
Tuberculosis	34 308	3.8	38 426	2.8
Malaria	28 038	3.1	31 706	2.3
Chronic diseases and injuries				
Injuries and poisoning	132 519	15	208 647	15
Unintentional injury	84 536	9.3	152 188	11
Intentional injury	47 983	5.3	56 459	4.1
Mental health conditions	10 424	1.1	144 950	11
Cardiovascular diseases	116 325	13	133 236	9.7
Cancer	64 837	7.2	70 513	5.1
Chronic respiratory diseases	24 755	2.7	60 370	4.3
Total: all diseases and injuries	906 501	100	1 379 238	100

Sources: based on data in Murray & Lopez, 1996b.

48% for all diseases and more than 90% for ARI and diarrhoeal diseases.

ACUTE RESPIRATORY INFECTIONS

ARI includes viral and bacterial infections of the lungs and respiratory tract, the most severe and fatal being bacterial pneumonia. Certain of the vaccine-preventable infectious diseases (such as measles and whooping cough) can include severe symptoms affecting the respiratory tract and contribute to the global burden of these diseases. Pneumonia incidence is sufficiently high to make it the biggest cause of childhood mortality. It is also the cause of death in many elderly people. Approximately 2.7 million of the estimated 11 million deaths that occur every year in children under the age of five years are due to pneumonia. The burden of disease due to ARI on a per capita basis is about 100 times higher in the least developed countries than in the developed countries (Fig. 5.1). Severe indoor air pollution from biomass burning for cooking and heating is an important contributory environmental factor, as is poor housing.

In most developing countries, control of pneumonia mortality relies on early, effective case-management. The effectiveness of this approach is limited, however, if the availability of antibiotics, training of primary health workers and access to health facilities are poor. Efforts to reduce ARI incidence in children also depend upon the reduction of indoor air pollution exposures to biomass and coal smoke.

DIARRHOEAL DISEASES

The diarrhoeal diseases of main concern are cholera, typhoid fever, paratyphoid fever, salmonella, shigella, giardiasis, non-human *Escherichia coli* infection, and a variety of other diseases caused by bacteria, parasites and viruses. Most of the global burden of diarrhoeal diseases occurs in children in developing countries; it is estimated that approximately 90% of the diar-

rhoeal disease burden is related to the environmental factors of poor sanitation and lack of access to clean water and safe food (see Section 5.13).

VACCINE-PREVENTABLE INFECTIOUS DISEASES

The major vaccine-preventable diseases (measles, NT, poliomyelitis, diphtheria and pertussis) account for nearly 15% of the total disease burden of the 0–4 age group. Progress in immunizing the world's children has been rapid since the inception of the WHO Expanded Programme on Immunization in 1974. However, the transmission of these diseases — especially measles, tetanus and poliomyelitis — is associated with poor living conditions, crowding and other environmental factors. Effective and sustainable elimination of these diseases will therefore require environmental improvements and immunization.

MALARIA, OTHER TROPICAL VECTOR-BORNE DISEASES, AND NEWLY EMERGING INFECTIOUS DISEASES

The environment plays a particularly important role in determining the distribution of vector-borne diseases. In addition to water and temperature, other factors such as humidity, vegetation density, patterns of crop cultivation and housing may be critical to the survival of the different species of disease-carrying vector. All of these diseases are most serious in the poorest countries, and among those living in the most difficult and impoverished conditions. They contribute to a vicious circle of disease–poverty–disease and to the continued marginalization of people living in disease-ridden areas.

Malaria is the only tropical vector-borne disease significant enough at the global level to feature in the DALY-estimated burden of diseases (Table 5.2). That said, other vector-borne diseases are important in specific situations and share similar environmental predispositions with malaria (Table 5.4).

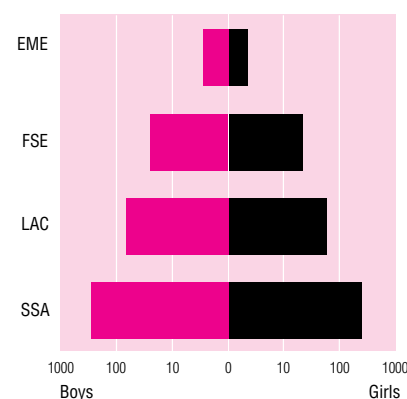
Globally, the malaria situation is seri-

ous and worsening. Around 90% of the malaria burden is estimated to occur in Africa, south of the Sahara, almost all due to *Plasmodium falciparum*, the parasite species associated with the most severe and fatal malaria. In fact, malaria is one of the most serious health problems facing African countries and a major obstacle to their social and economic development. Children under the age of five years and women in their first pregnancy are the most vulnerable. Approximately one million deaths among children under 5 years of age can be attributed to malaria alone, or in combination with other diseases.

Of all the insects that transmit disease, the mosquito represents by far the greatest human health threat. It transmits not only malaria, but also dengue, dengue haemorrhagic fever and lymphatic filariasis (Table 5.4). Diseases transmitted by other insects include leishmaniasis (sandfly), African trypanosomiasis (tsetse fly), onchocerciasis (blackfly), and Chagas disease (triatomine bug). Schistosomiasis is caused by infection with blood flukes,

Fig. 5.1

Acute respiratory infections among children aged 0–4 years, by region — DALYs per 1000 children (log scale)



Source: Murray & Lopez, 1996 b.

Table 5.3

Proportion of global burden deaths and diseases occurring in children under age 15 — 1990

Disease	Deaths, age 0–14		DALYs, age 0–14	
	(thousands)	(%)*	(thousands)	(%)**
Acute respiratory infections	2918	67	105 077	90
Diarrhoeal diseases	2585	88	93 408	94
Perinatal conditions	2443	100	92 311	100
Vaccine-preventable infections	1897	96	69 147	97
Tuberculosis	139	7	5314	14
Malaria	699	82	27 151	86
Unintentional injuries	1065	33	74 620	49
Intentional injuries	258	14	10 415	18
Mental health conditions	96	14	11 000	8
Cardiovascular diseases	441	3	16 259	12
Cancer	163	3	6052	9
Chronic respiratory diseases	185	6	15 440	26
Total	15 073	30	655 112	48

* % of all deaths in this disease category

** % of all DALYs in this disease category

Source: Murray & Lopez 1996b.

whose larval stage develops in aquatic snails; the parasite penetrates the skin of anyone who comes into contact with infested water. Among the driving forces and pressures considered in earlier chapters, those of greatest relevance to these diseases are rapid and uncontrolled urbanization, poor housing and hygiene, water development schemes (including irrigation for agriculture), and road construction and mining activities.

During the past 20 years, at least 30 new diseases have emerged to threaten the health of hundreds of millions of people. Environmental changes have contributed in one way or another to the appearance of most if not all of these. Human activity, such as the cutting down of forests or conversion of grasslands to agricultural lands, has contributed to such change. In other instances, simple behavioural changes have favoured the emergence of a disease pathogen, for example, new and widespread vector-breeding sites in urban environments have been created through careless disposal of food and beverage containers, and motor vehicle tyres.

INJURIES AND POISONINGS

Injuries are one of the largest contributors to YLL and disability at the global level (Table 5.2). They are of great importance in developed and developing countries alike, but the categories of injury shift with development. Agricultural injuries, fires, drownings and war-related violence dominate at early stages of economic development, while road-traffic accidents and industrial injuries appear to increase with economic development. Among *unintentional* injuries, road-traffic accidents are the sole category projected to have increased by the year 2020. By contrast, *intentional* injuries are markedly on the rise.

From both an individual and a public health perspective, the burden of intentional injury has increased dramatically in the 20th Century, affecting not only the well-being of those involved, but also the health services called on to provide care and treatment. The growing problem of violence now also threatens family welfare, community cohesion and the capacity of societies to move towards better health and sustainable social development.

Table 5.4
The burden of some tropical and vector-borne diseases

Disease	People at risk (millions)	People infected (millions)	Mortality	Morbidity/disability	Number of countries affected
Malaria	2020	> 500	1.5–2.7 million	300–500 million clinical cases	> 90
Dracunculiasis	100	> 0.15	Exceptional	High disability	18
Chagas disease	100	18	> 45 000	3 million	21
Schistosomiasis	600	200	< 20 000	20 million	74
Foodborne trematode infections	730	40	> 10 000	Liver disease or diarrhoea	> 100
Intestinal parasites	4000	3500	Helminths: 135 000 Protozoa: 90 000	Helminths: 450 million Protozoa: 48 million	> 100 All
Lymphatic filariasis	1100	120	Excess mortality among those with elephantiasis	44 million with chronic disability	73
Onchocerciasis	120	18	Excess mortality among the blind	270 000 blind	34
Leishmaniasis	350	12	Visceral: 75–80 000 Cutaneous: very low	Visceral: very high Cutaneous: multiple lesions	88
Dengue and dengue Haemorrhagic fever	2500–3000	> 10	20–30 000	Millions of cases	> 100
Sleeping sickness	55	> 0.3	20 000	> 300 000 cases: high disability	36

Note: Figures are provisional, subject to change as and when more current data become available. Some people may be infected with more than one disease. Figures have been rounded up.

Source: WHO, 1997h.

War-related injuries and injuries from land mines are also of major concern. They represent not only a direct and avoidable injury burden, but also divert valuable resources from other health-care needs and from investment in health services. The indirect effects of war on civilian populations are also serious and include disruption of water supply systems and other environmental services.

MENTAL HEALTH CONDITIONS

Mental disorders comprise many conditions, ranging from mild anxiety and depressive states to severe schizophrenia and dementia. The estimated global prevalence of the main categories of mental disorder is several hundred million cases. Mental disorders and other psychological problems account for around 10% of the total burden of disease (Table 5.1). Those affected are usually more disabled in everyday life than persons with other common chronic conditions such as arthritis, back pain and diabetes. Of this burden, more than one-third is accounted for by unipolar major depression. Globally, unipolar major depression is expected to have become the number two contributor to DALYs after ischaemic heart disease by 2020.

In considering the effects of environment on mental health, chemical and physical factors, that influence the body's nervous system, and psychosocial factors that influence mental well-being, must be taken into account.

CARDIOVASCULAR DISEASES

As shown in Table 5.1, CVD tops the list of global deaths. CVD encompasses coronary heart disease (CHD), other diseases of the heart and heart valves, stroke, and diseases affecting the blood vessels. Its risk factors may be divided into four categories: non-modifiable risk factors (age, sex, race and family history); modifiable physiological risk factors (blood cholesterol, high blood pressure, diabetes and obesity); behavioural risk factors (smoking, diet, alco-

hol, sedentary lifestyle); and environmental risk factors (air pollution, temperature, heavy metal exposures, infectious agents). Risk factors in the first three categories, especially diet and smoking, contribute most to the total CVD burden.

The very high indoor air pollution levels caused by the use of biomass and coal for cooking and heating in hundreds of millions of households in developing countries have been linked to increased heart and lung disease mortality in exposed people. In particular, CO can increase CVD through its reduction of blood oxygen transport. Other components of indoor smoke influence CVD indirectly via their effects on the lungs.

Increasing evidence, much of it from North America and Europe, suggests that CVD morbidity and mortality are associated with outdoor air pollution at relatively low levels (less than 100 g/m³), especially airborne particles (PM₁₀). A 10 g/m³ increase in PM₁₀ levels has been estimated to be associated with a 1% increase in cardiovascular mortality.

CANCER

Among the different cancer sites, cancer of the trachea, bronchia or lungs is the leading cause of cancer death, accounting for more than 17.2 % of deaths in 1993, followed by stomach cancer, colon and rectum cancer, lip, oral cavity and pharynx cancer, liver cancer, and female breast cancer. Collectively, cancer in these sites accounted for 57% of all cancers in 1993.

About 5% of cancers could be due to occupational exposures, 5% to viruses and other infectious agents (many of which are due to environmental exposures) and 2% to air pollution. Many of the associated exposures are preventable. WHO, for instance, estimates that over 1.5 million (15%) of the new cancer cases occurring each year could be avoided by preventing infectious diseases associated with them.

Helicobacter pylori is one example of an infectious agent which can act as an environmental link with cancer.

Other environmental factors contributing to cancer risk include chemical exposures, food additives, radon gas, other types of radiation and solar UVR. Additionally, tobacco smoking, diet and alcohol consumption interact with each other and with environmental exposure, producing a higher total combined risk than that produced by simply adding together the risks of each single factor.

CHRONIC RESPIRATORY DISEASES

Chronic respiratory diseases encompass a broad variety of human illness such as: chronic obstructive lung disease due to particulate air pollution; interstitial fibrotic lung disease due to silica, beryllium, and asbestos exposure; upper airway irritation due to exposure to formaldehyde and other gases; asthma in workers exposed to

organic substances, and chronic respiratory infections in people exposed to indoor smoke caused by combustion of biomass fuels (Table 5.12).

Infants in urban areas appear to be at increased risk of mortality due to ambient (outdoor) air pollution and both rural and urban children develop asthma and ARI at excess rates as a result of exposure to indoor and outdoor air pollution. Additionally, hundreds of millions of adult women in developing countries are exposed to extremely high levels of airborne particulates when cooking on stoves using biomass fuels.

In the workplace — especially in manufacturing, construction, and farming — adult men, and to a lesser extent, women, are occupationally exposed to fibrogenic dusts, irritant gases, and carcinogenic agents.

Occupational chronic respiratory diseases are generally believed to constitute one-third of all occupational illnesses. As many as 50 million cases may occur each year among the global labour force. These diseases are of great concern because they are widespread, debilitating, and affect people in the social and economic prime of their lives. They are also highly preventable.

OTHER DISEASES

A number of other diseases and health problems are associated with exposures to environmental factors. Two specific examples have been of concern in recent years: allergies and reproductive health problems. Allergic diseases mainly affect the respiratory system (asthma, hay fever, allergic rhinitis), the skin (eczema) and the digestive system, and other parts of the body in the form of the autoimmune diseases. Growing motor vehicle air pollution makes it likely that asthma incidence will rise. Other environmental exposures contributing to increased asthma incidence include chemicals in the workplace, indoor air pollutants and certain food additives. Hand

Table 5.12
Spectrum of environmental and occupational lung diseases

Exposure category	Settings	Populations at risk	Outcomes
Ambient air pollution	Urban areas	Infants, elderly	Respiratory mortality
	Industrial settings	People with pre-existing respiratory diseases	Cardiovascular mortality Chronic obstructive lung disease Asthma Infant respiratory mortality
Indoor air pollution	<i>Developed countries</i>	General population	Lung cancer
	Radon-exposed areas		Sick building syndrome
	Office and commercial buildings	Asthma	
	Private residences	Solvent-related symptoms Legionnaire's disease, other infectious diseases	
<i>Developing countries</i>	Home biomass fuel use for cooking and heating	Women, children	Acute respiratory infection
	Rural > urban		Chronic obstructive lung diseases
			Lung cancer
Occupational exposures	Workplaces	Men > women Young and middle-aged	Lung cancer Mesothelioma Asthma Chronic obstructive lung disease Pneumoconioses

eczemas are common in the general population, one estimate showing a prevalence of 10%.

Other health conditions that have been linked to environmental hazard exposures relate to reproduction, childbirth and the first days after a child is born. Living conditions and exposures to environmental hazards play important roles with respect to the health of the mother and the newborn child, and other aspects of reproductive health.

Genetic damage has possibly the most adverse basic effect on reproduction since it may interfere with cell division and early development of the embryo and fetus. Experimental studies have shown that ionizing radiation and certain chemical compounds can cause such damage. Other effects of environmental hazards on the fetus include slow growth and low birth weight.

Infertility in both women and men has been associated with exposure to environmental hazards. POPs and subsequent disruption of endocrine functions have received much attention in this respect (see Box 2.8) and in relation to breast cancer. As these chemicals accumulate in the environment, more and more people may be increasingly exposed.

ENVIRONMENTAL FACTORS AND THE GLOBAL BURDEN OF DISEASE

In different ways and to different degrees each of the disease and disability categories discussed above owe their presence to one environmental factor or another. A summary portrayal of the environmental portion of the global burden of disease is given in Table 5.14. Applying these percentages across the diseases and conditions indicated leads to an estimate of the total DALY burden that is associated with environmental factors. This is 320 million or 23% of the world's total DALY burden.

In our analysis of the approximate environmental contribution of the health

conditions described in this chapter, we emphasize long-term sustainable prevention rather than curative measures. We also assume that environmental preventive actions are taken first. The environmental fraction is considered as the fraction of disease occurrence that could be averted through feasible environmental interventions before other interventions are applied.

The diseases or other types of poor health with the largest environmental contribution to disease burden (ARI, diarrhoeal diseases, malaria and unintentional injury) are also those which particularly affect children. Using the percentage of all DALYs contributed by children under age 15 (Table 5.3), estimates of the "child component" of environmental DALYs can be made (Table 5.14). As seen in Table 5.14, this child component adds up to 15% of all DALYs or about two-thirds of environmental DALYs. Taking action to reduce environmental DALYs could thus make a major contribution to child health.

The impact of population growth and the growth in the proportion of elder-

Table 5.14
Proportions of global DALYs associated with environmental exposures — 1990

	Global DALYs (thousands)	Environmental fraction (%)	Environmental DALYs (thousands)	% of all DALYs	
				(all age groups)	(age 0–14 years)
Acute respiratory infections	116 696	60	70 017	5	4.5
Diarrhoeal diseases	99 633	90	89 670	6.5	6.1
Vaccine-preventable infections	71 173	10	7 117	0.5	0.49
Tuberculosis	38 426	10	3 843	0.3	0.04
Malaria	31 706	90	28 535	2.1	1.8
injuries					
unintentional	152 188	30	45 656	3.3	1.6
intentional	56 459	N.E.	N.E.		
Mental health	144 950	10	14 495	1.1	0.08
Cardiovascular diseases	133 236	10	13 324	1	0.12
Cancer	70 513	25	17 628	1.3	0.11
Chronic respiratory diseases	60 370	50	30 185	2.2	0.57
Total these diseases	975 350	33	320 470	23	15.4
Other diseases	403 888	N.E.	N.E.		
Total all diseases	1 379 238	(23)	(320 470)		

N.E.: not estimated

Source: DALY data from Murray & Lopez, 1996b.

ly age group on the relative importance of different diseases and disabilities in relation to the total disease burden, is expected to be profound. New disease patterns are anticipated whereby non-communicable diseases come to the forefront in developing countries. The assumed decline in infectious diseases is based on the assumption that socio-economic development will decrease disease incidence and severity, and that research and development will make available antibiotics that are effective against resistant strains of major pathogens. But this assumption may be considered very optimistic in light of the severe constraints outlined in earlier chapters, such as increased waste production and pollution, water scarcity, land limitation and global envi-

ronmental change. The potential detrimental consequences of global environmental change on human health worldwide makes it even more imperative that future scenarios be realistic and take potential lack of action to improve environmental health and other conditions explicitly into account.

"We increasingly understand that the health and well-being of our families depends upon a clean and healthy environment. Nowhere is this more true than in the case of children, who are particularly vulnerable to pollution"

Declaration of the Environment Leaders of the Eight Industrial Nations, 1997.

CHAPTER 6

Integrated Policies, Strategies and Actions: Progress Since the Earth Summit

THE NEED FOR AN INTEGRATED FRAMEWORK

The problems facing the health sector today are increasingly complex, multidisciplinary in nature, often ill-defined, and solutions to them uncertain. The health sector cannot address these problems on its own. New and innovative approaches are needed to integrate and operationalize concepts of environmental sustainability, economic development and community development if human development is to be achieved. Wide-ranging reforms are also needed to more adequately deal with assessment and management of environmental health risks within a framework of sustainable development.

INTERNATIONAL INITIATIVES

UNCED asked the UN organizations to play an active role in supporting countries in sustainable development planning and implementation of *Agenda 21* (UN, 1993). Many agencies are now active in health and environment and a number of collaborative activities have been strengthened or initiated since 1992, including those of the Water Supply and Sanitation Collaborative Council; the International Programme on Chemical Safety, and the WHO, FAO and UNEP collaborative Panel of Experts on Environmental Management for Vector Control (PEEM), which addresses vector-borne disease problems that can result from water resources development projects. Yet other activities, relating to occupational health, have been developed by WHO and ILO, for example.

New initiatives include the creation of the Intergovernmental Forum on

Chemical Safety (IFCS) in 1994. The Forum is a non-institutional arrangement which provides an opportunity for national governments, intergovernmental organizations and NGOs to meet and consider issues associated with the assessment and management of chemical risks.

The development of international conventions on key issues has proved to be an important tool for securing international cooperation on health-and-environment issues. At the Earth Summit such conventions on biodiversity, deforestation and climate change were discussed. Subsequently, these and other international conventions on ozone-depleting chemicals, transboundary pollution and other key issues were ratified by a number of countries. Agreements at the bilateral or multilateral level have also been instrumental in reducing transboundary pollution.

A STRONGER HEALTH FOCUS IN NATIONAL PLANNING FOR SUSTAINABLE DEVELOPMENT

Agenda 21 presented a golden opportunity for health authorities to increase their influence on national planning and to reverse the trend of environmentally damaging and health-threatening development. Many countries have instituted new policy and planning tools since the Earth Summit to make environmental concerns a part of the planning process.

Measures to incorporate health-and-environment initiatives into national programmes have varied from country to country, depending on planning mechanisms, the current status of sustainable development in the specific

country, and the way in which planning responsibilities are divided. Thus different approaches are being used for promoting health sector involvement in addressing health-and-environment issues. In some countries, health-and-environment plans have been prepared for inclusion in national plans for sustainable development. In others, sectoral plans have been reviewed and modified to include health-and-environment concerns. Many countries have established intersectoral committees for *Agenda 21* follow-up. The health sector has been able to exert significant influence, through these fora — which often include task forces and working groups

set up to address specific issues. Examples of country initiatives are given in Box 6.2.

A STRONGER HEALTH FOCUS IN LOCAL PLANNING FOR SUSTAINABLE DEVELOPMENT

There is consensus that sustainable development can only occur at global level if it first occurs at local level. One of UNCED's most notable results has been the creation of a large number of *Local Agenda 21* initiatives, especially in cities, but also in villages and even on islands. Many of these feature health and health-related objectives and activities.

Local Agenda 21 and related activities include, the WHO Healthy Cities Movement, the Sustainable Cities Movement (of UNCHS) and the Model Communities Programme of the International Council for Local Environmental Initiatives. They all recognize the fundamental importance and central role that communities can play in bringing about change. This implies decentralization. Indeed, a global trend towards decentralized government services and greater emphasis on health-and-environment actions on the part of NGOs and the community itself can now be discerned. All these initiatives focus on the development of participatory planning models.

RENEWING "HEALTH FOR ALL"

In 1977 the World Health Assembly decided that the main social target of governments and of WHO should be the "attainment by all the people of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life" — popularly known as "Health for All by the Year 2000". But beneath encouraging facts about decreasing mortality and increasing life expectancy, and many other unquestionable advances, lie unacceptable disparities in health between rich and poor, between one population group and another, between age groups, and between the sexes.

Box 6.2

Country initiatives

In Jordan, an intersectoral working group was set up by the Ministry of Health and a national health-and-environment action plan prepared.

In Guatemala, a working team was established with representation from the Health Ministry, planning and environment sectors, and a national plan for environmental health and sustainable development produced, accompanied by an institutional analysis of national sectors associated with health and the environment.

In Guinea-Bissau, a national inter-ministerial committee on health and the environment was constituted to foster a national process of coordination among agencies, government, and civil society, conducive to the integration of health-and-environment concerns into overall national sustainable development planning. A national plan of action on health and environment for sustainable development was produced.

In Iran, a draft strategy document on health and environment was developed, to be incorporated ultimately into a national strategy on sustainable development. The draft strategy included a situation analysis, and proposals for structural and institutional reform.

In Nepal, a health perspective was added to the draft Nepal Environmental Policy and Action Plan. Initially, it did not incorporate a public health component. Through the Nepal Environmental Health Initiative, a comprehensive health-and-environment strategy was developed, and most of the resultant recommendations incorporated into the final Environmental Policy and Action Plan.

In the Philippines, collaboration was strengthened between health agencies and the Philippine Council for Sustainable Development. The latter oversees implementation of activities in support of commitments to sustainable development principles made at the Earth Summit. An Interagency Committee on Environmental Health organized by the Ministry of Health and the Council jointly sponsored a detailed analysis with case studies of the best way of integrating health-and-environment issues into the development and implementation of national plans for sustainable development.

Source: WHO, 1995I.

In 1995, therefore, the World Health Assembly called for a reassessment of the Health-for-All Strategy, to culminate in a Renewal Strategy. Various trends have made renewal necessary, including globalization of trade, travel and technology, urbanization and the growth of megacities, widening gaps between the rich and poor, changing concepts of health, the rise of non-communicable diseases, environmental threats, and expanded scientific and technical knowledge.

The new strategy will work on incorporating forecasts of future trends in disease burden in policy-making and forward planning. More accurate estimation of future disease burdens will therefore be needed. This in turn will demand a more comprehensive understanding of health determinants, including the complex interactions between socioeconomic, environmental, demographic and macropolitical and health sector determinants.

CHAPTER 7

Conclusions

At the time of the Earth Summit in 1992 the WHO Commission on Health and Environment presented an assessment of the relationship between health and environment, in the context of development. The report of the Commission was a major contribution to UNCED and brought health towards the top of the environment and development agenda.

The Rio Declaration's first principle affirms that human beings are entitled to a healthy life. Five years is a short time in which to report on progress in such a complex field as health and environment, but the Special Session of the UN General Assembly review presented an opportunity for reassessing the available information on health-and-environment linkages, and analysing this information in the context of sustainable development.

The major health problems due to environmental hazards remain, but progress can be seen in awareness raising, policy and planning at various levels and concrete action, particularly action at the local level. Health indicators in some countries have improved mainly due to economic development. However, the benefits of development are not distributed equitably and absolute poverty is still on the increase globally.

It is the poor who are most vulnerable to health-and-environment hazards. Furthermore, it is becoming increasingly clear that the environmental factors that most affect health are in turn linked to underlying pressures on the environment. These pressures are determined by driving forces such as population growth, inequitable resource

distribution, consumption patterns, technological development and economic development. Since these pressures and subsequent health hazards are associated with the activities of several sectors, effective action to protect health will require coordination and collaboration between them.

Indeed, the 21st Century calls for a new health system which is partnership-oriented, population health-based, and proactive rather than reactive. The health sector must serve as a guide to and be a partner in these actions so that health concerns are represented appropriately at all stages of implementation.

A number of major conclusions emerge from the assessments made in this book. They are not listed here in order of priority because each of them is of major importance at global level and the specific concerns at the local and national levels vary.

- **Environmental quality is an important direct and indirect determinant of human health.** Deteriorating environmental conditions are a major contributory factor to poor health and poor quality of life and hinder sustainable development.
- **Major challenges to sustainable development are posed by mismanagement of natural resources,** excessive waste production and associated environmental conditions that affect health.
- **Impoverished populations living in rural and peri-urban areas are at greatest risk from degraded**

environmental conditions. The cumulative effects of inadequate and hazardous shelter, overcrowding, lack of water supply and sanitation, unsafe food, air and water pollution, and high accident rates, impact heavily on the health of these vulnerable groups.

- **Poor environmental quality is directly responsible for around 25% of all preventable ill-health in the world today,** with diarrhoeal diseases and ARI heading the list. Other diseases such as malaria, schistosomiasis, other vector-borne diseases, chronic respiratory diseases and childhood infections are also strongly influenced by adverse environmental conditions, as are injuries.
- **In today's world, it is children's health that is most damaged by poor environmental quality.** As much as two-thirds of all preventable ill health due to environmental conditions occurs among children.
- **Lack of basic sanitation, poor water supply and poor food safety contribute greatly to diarrhoeal disease mortality and morbidity.** Curative measures have brought the number of deaths from diarrhoeal diseases down, but action that deals with the root causes of these diseases continues to be lacking.
- **Air pollution figures prominently as a contributor to a number of diseases** (ARI, chronic respiratory diseases, CVD and cancer) and to a lowering of the quality of life in general.
- **The occurrence of the major vector-borne diseases is closely related to naturally existing environmental conditions.** In addition, the

incidence, severity and distribution of vector-borne diseases are affected substantially by human activities such as water and agricultural developments and by urbanization.

- **Hazardous chemicals and various forms of hazardous waste, including healthcare wastes, are increasing health-and-environment concerns.** The lack of detailed quantitative information on the production and disposal of such waste, and the lack of information on the resulting health risks, severely hamper efforts to control this problem.
- **Global environmental change has great implications for health, particularly that of the poor.** Marginalized population groups are again at greatest risk, as their ability to adapt is limited due to lack of resources.
- **There are some promising signs** – not yet in terms of environmental improvement, but rather in the national development of policies and infrastructure to address the problems described here. However, the lack of financial and human resources is a major deterrent to progress.
- **The health sector has an essential advocacy role to play in highlighting the links between health, environment, and sustainable development** when future policies are developed and actions planned. A much stronger partnership between the health sector and other sectors is required for successful reduction of health threats arising from poor environmental conditions. Renewal of the WHO Health-for-All Policy for the 21st Century, which is currently in progress, provides guidance for the way ahead.

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