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FINNISH ENVIRONMENTAL HEALTH ACTION PLAN

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FINNISH ENVIRONMENTAL HEALTH ACTION PLAN

PREFACE

On 23 February 1995, the Council of State appointed a committee to draw up the Finnish National Environmental Health Action Plan. On one hand, the Action Plan was to be based on the decisions and action plans endorsed by the World Health Organization's Conference on Environment and Health in Helsinki in June 1994, and on the other hand, on the state of the Finnish environment and on the state of health of the Finnish population. Areas adjacent to Finland and other relevant international issues were also to be taken into account in compilation of the Action Plan.

The Committee was to chart the central problems pertaining to environmental health, to identify means of ensuring an environment conducive to health, and to draw up a programme of action that would help prevent and rectify environmental health problems.

The Committee was to complete its work by 31 December 1996.

The Committee was chaired by Chief Director Jarkko Eskola, Head of Department, Ministry of Social Affairs and Health; the Deputy Chair was Hannele Nyroos, Special Adviser, Ministry of the Environment; and the members were (deputy members in brackets): Mirja Arajärvi, Senior Adviser, Ministry of Education (Raisa Valli, Senior Inspector, Ministry of Transport and Communications); Pirjo Gyllenberg, Senior Inspector, South-West Finland Regional Environment Centre (Marjo-Riitta Hämäläinen, Chief Hygienist, City of Joensuu); Jussi Huttunen, Director General, National Public Health Institute (Sisko Salomaa, Head of Laboratory, Radiation and Nuclear Safety Authority); Pirkko Lahti, Executive Director, Finnish Association for Mental Health (Liisa Horelli, PhD, Helsinki University of Technology); Riitta Larnimaa, Specialist Adviser, Confederation of Finnish Industry and Employers (Kurt Hemnell, LL.M., Central Union of Agricultural Producers and Forest Owners); Sirkka-Liisa Paikkala, Senior Inspector, Ministry of the Environment (Esa Nikunen, Head of Division, Finnish Environment Institute); Matti Laiho, Special Expert, Association of Finnish Local Authorities (Antti Pönkä, Chairman, Finnish Communal Association for Environmental Protection and Health); Markku Wallin, Environmental Protection Secretary, Central Organisation of Finnish Trade Unions (Jorma Rantanen, Director General, Institute of Occupational Health); Sakari Ervola, Senior Inspector, Ministry of Agriculture and Forestry (Mervi Salminen, Senior Inspector, Ministry of Trade and Industry); Juha Saltevo, Licentiate in Medicine, Finnish Association for Nature Conservation (Tapio S. Linna, MA, Finnish Society for Housing and Planning); and Professor Jouko Tuomisto, Academy of Finland (Liisa Ollila, Special Adviser, Ministry of Social Affairs and Health). Marja Ekroos, Specialist Adviser, Confederation of Finnish Industry and Employers, was appointed to substitute for Riitta Larnimaa as a member of the Committee from 1 January to 31 July 1996. Matti Huttunen, Occupational Safety Secretary, Central Organisation of Finnish Trade Unions, was appointed to substitute for Markku Wallin as a member of the Committee as of 22 June 1995, and Jyrki Helin, Research Secretary, Central

Organisation of Finnish Trade Unions, was appointed to substitute for Matti Huttunen as a member of the Committee as of 22 April 1996.

The deputy members of the Committee participated in the Committee's work on an equal footing with the regular members.

At its meeting on 27 April 1995, the Committee founded a local section. Antti Pönkä, Chief of Environmental Health, City of Helsinki was selected as chairman of the local section, and the members were Pirjo Gyllenberg, Senior Inspector; South-West Finland Regional Environment Centre; Marjo-Riitta Hämäläinen, Chief Hygienist, City of Joensuu; Anne Mannerkorpi, Chief of Environmental Health, City of Kuopio; Stefan Skog, Director of Environmental Affairs, City of Vantaa; and Jouko Kinnunen, Section Manager, Neste Ltd.

The Committee secretaries were Eeva Ikonen, Senior Planner, Finnish Environment Institute, as of 1 July 1995, and Mikko Holopainen, Senior Researcher, National Public Health Institute, for the entire duration of the Committee's work.

The Committee adopted the name Environmental Health Committee.

The Committee held a total of 18 meetings and the local section held 12 meetings.

The Committee has charted the major environment-based health risks in Finland and has sought ways of achieving an environment that promotes and ensures health. The Committee also proposes measures that would help prevent and solve problems pertaining to environmental health. In addition to the Committee members, numerous experts from various sectors of administration and from different institutions, organisations and associations have participated in the drafting of this Action Plan.

The Committee held two seminars, which were also attended by outside experts. The seminars discussed the present status of Finnish environmental health and weighed actions that should be taken to promote environmental health - including the order of priority of these actions. The first draft of the Committee's report was circulated for comments among experts in the organisations represented by the Committee members.

The Environmental Health Action Plan for Europe, endorsed at the European Conference on Environment and Health in Helsinki in 1994, was translated into Finnish at the Committee's request. Two Nordic meetings, centring on environmental health action plans, were arranged during the Committee's term. The second meeting, held in Finland in autumn 1996, also included participants from the Baltic States. During the Committee's term, Finland took part in two WHO conferences that discussed environmental action plans in European countries. In addition, Finland has been represented at the European Environment and Health Committee.

Among the issues discussed by the local section of the Environmental Health Committee have been actions that are of primary importance from the local and regional perspective, preparation of a local environmental health action plan, indicators of environmental health, information systems for environmental health, and education in environ-

mental health. The section conducted a questionnaire survey on the state of environmental health and on development prospects at local and regional levels. A separate report is published on the results of the questionnaire. The section set up a municipal network for local environmental health action plans. The municipalities (11) encompassed by the network worked to draw up a municipality-specific environmental health action plan. The network has held two seminars and has studied the situation within municipalities by means of two questionnaires. The network still continues its work, and in addition to the municipalities that made up the original network, other municipalities are also welcome to join the activities. The local section drafted a questionnaire to survey residents' views on environmental health; the questionnaire was distributed among residents in four municipalities. The results are published separately. The section has assessed environmental health indicators and data collection from the local perspective.

The background section of the National Environmental Health Action Plan drawn up by the Committee discusses the concept of environmental health and describes the history of environmental health in Finland. Some other national programmes are reviewed, and the state of the environment, as well as the effects of environmental factors on health in Finland, are analysed. Against consideration of principles and objectives, the Action Plan addresses the basic factors of environmental health, the role of environmental health within human activities, and means of promoting environmental health. A review of international co-operation in the sector is also included. For each subsection, the Committee sets a number of objectives that should be attained and proposes actions that enable attainment of these objectives. The principal objectives and actions proposed by the Committee are listed in the last chapter of the Action Plan.

Having finished its task, the Committee submits its report to the Council of State.

The report is supplemented by an explanatory statement by a member of the Committee, Riitta Larnimaa.

Helsinki, 20 December 1996

Jarkko Eskola

Hannele Nyroos	Sirkka-Liisa Paikkala
Sakari Ervola	Mirja Arajärvi
Jussi Huttunen	Jouko Tuomisto
Juha Saltevo	Riitta Larnimaa
Jyrki Helin	Matti Laiho
Pirjo Gyllenberg	Pirkko Lahti
Eeva Ikonen	Mikko Holopainen

THE CONCEPT OF ENVIRONMENTAL HEALTH

An environment that promotes and ensures health is one of the central objectives of Finnish societal policy. According to the Constitution of Finland, a citizen's fundamental rights include the right to a healthy environment and the possibility to influence one's environment. In their planning and decision-making, the authorities must take account of the requirements for a healthy environment and the possibility granted to citizens to influence their environment. Implementation of these principles calls both for practical measures from very many different sectors of administration and for co-operation between various bodies. Moreover, citizens must be ensured the opportunity to take an active part in planning, decision-making and implementation of the actions. Citizens must have the prerequisites for obtaining information on environmental planning, and they must have the prerequisites for working towards a healthy environment.

Environmental health encompasses a wide sphere. The components of a healthy environment include a sufficient and safe supply of food and drink, safe and comfortable accommodation, clean air, good transport services, and opportunities for safe work as well as for mental and physical recreation.

At the First European Conference on Health and the Environment, held in Frankfurt in 1989, environmental health was defined as follows:

"Environmental health comprises those aspects of human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health" Environment and Health, The European Charter and Commentary, WHO, 1990.

According to the specifications of the WHO definition, the environmental factors affecting health not only include physical, biological and chemical factors, but also the physical environment and the psychological, social and aesthetic factors of the environment. The Finnish Environmental Health Action Plan has adopted the above WHO definition of environmental health in its broad sense. The Plan draws attention to factors that can affect the lives and health of present and future generations as well as the conditions essential for a healthy life and for a good environment. The considerable risks to nature arising out of human actions often involve a risk to human health, too. Thus, the Action Plan emphasises the prevention of environmental health hazards in advance by introducing efficient measures to protect the environment.

In its concept of environmental health, the Environmental Health Action Plan does not include lifestyles or eating and drinking habits, such as smoking, consumption of alcohol or an unhealthy diet. In con-

trast, environmental exposure caused by lifestyles, such as passive smoking or the air pollution, noise and accident risks resulting from traffic, are considered to be part of environmental exposure. The working environment and occupational health are discussed only briefly in the Action Plan, since there are specific national action plans in the field of occupational health and safety.

The most efficient way of dealing with environmental health hazards is to prevent them in advance at their sources of origin. This means reducing emissions or, for instance, community planning in which environmental health effects are taken into account. For this reason, the measures needed to promote environmental health often coincide with the measures needed to protect people's living environment. However, promotion of environmental health in future will require considerably more extensive and closer co-operation between various bodies. The Finnish National Environmental Health Action Plan reflects the wish to accentuate the necessity of co-operation between various administrative sectors, business and industry, non-governmental organisations and other players. One of the Action Plan's central objectives is to encourage citizens to participate in promotion of environmental health and in improvement of the quality of their own environment.

The objective of the Finnish Environmental Health Action Plan is to assess the current state of environmental health and to evaluate its future trends. The Plan proposes measures that are needed to ensure a healthy environment and to foster a favourable trend in environmental health, and presents means for studying, analysing and remedying environmental health hazards.

1 BACKGROUND

1.1 INTERNATIONAL BACKGROUND

During the past two decades, it has been increasingly recognised that success in protecting and promoting human health is closely linked with the quality of the environment. The principle of sustainable development was introduced at the Conference on the Human Environment, held in Stockholm in 1972. Numerous international initiatives aimed at protecting the environment were made on the basis of the Stockholm Conference.

The General Assembly of the World Health Organization (WHO) laid the foundation for a global health strategy in 1977. According to this strategy, "the main social target of governments and WHO in the coming decades should be the attainment by all citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life".[1]

In 1983, the United Nations set up the World Commission on Environment and Development. In 1987, the Commission published its report, *Our Common Future*, which urged that all human activities should follow a path of sustainable development. Sustainable development was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[2]

In 1984, the European Member States of WHO approved the Health for All strategy, which for the first time defined a common health policy for the region and for the individual Member States and set a number of targets that should be met by the year 2000. The strategy recognised the dependence of human health on environmental factors and formulated eight environmental health targets. These include both the direct effects of biological, physical and chemical environmental factors, and the indirect effects of psychosocial factors, on health and well-being. The strategy targets were updated in 1991.

During the United Nations International Drinking Water Supply and Sanitation Decade (1981–1990), extensive international development cooperation projects were carried out in order to improve the supply of drinking water and sanitation. The objective was to provide all people in the world with clean drinking water and with satisfactory and hygienic sanitation by the year 1990.

The UN Conference on Environment and Development was held in Rio de Janeiro in June 1992. In addition to issuing the Declaration on Environment and Development, the Conference endorsed Agenda 21, a blueprint for how to make development socially, economically and ecologically sustainable for the twenty-first century. The Convention on Bi-

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[1] Resolution WHA 30.43

[2] World Commission on Environment and Development. *Our Common Future*. Oxford, Oxford University Press, 1987.

ological Diversity and the Framework Convention on Climate Change were also signed at the Conference.

In response to the Rio Conference and based on the recommendations of the WHO Environment and Health Commission, WHO formulated a new global strategy for health and environment, which was endorsed by the World Health Assembly in May 1993. This strategy establishes a unifying framework for WHO's work plans and activities.

In 1991, the Ministers of Health of the European Community adopted a resolution on health and the environment, which reflected the basic principles and strategies outlined in the European Charter for Environment and Health. The European Union's Fifth Environmental Action Programme (Towards Sustainability) was adopted in 1992. In 1995, the European Commission drew up a report on integration of requirements concerning the protection of health in the Community policy.

The European Centre for Environment and Health (ECEH) was set up within the structure of the WHO Regional Office for Europe, with a view to strengthening collaboration on the health aspects of environmental protection, with special emphasis on information systems, mechanisms for exchanging experience, and co-ordinated studies.

The World Health Organization's First European Conference on Health and the Environment was held in Frankfurt, Germany, in December 1989. The Conference unanimously approved the European Charter on Environment and Health. The Charter recognises that every individual is entitled to an environment conducive to the highest attainable level of health and well-being. The Charter underlines the shared responsibilities of individuals, public authorities and economic sectors in society for protecting such an environment. The Second European Conference on Environment and Health was held in Helsinki in 1994. This Conference endorsed the Environmental Health Action Plan for Europe (EHAPE), drawn up by WHO and other international organisations. According to EHAPE, the WHO Member States in the European Region are developing their own national environmental health action plans, which draw attention to the central needs of each country. It has been planned that the next European Conference on Environment and Health will be held in London in 1999.

The United Nations Economic Commission for Europe has served as an integrating force in the process initiated by the European Ministers of the Environment. A conference held in Lucerne in 1993 endorsed the Environmental Action Programme for Central and Eastern Europe, which serves as a basis for various environmental projects. This process has also included endorsement of the Environmental Programme for Europe.

1.2 HISTORY OF ENVIRONMENTAL HEALTH IN FINLAND

The history of environmental health in Finland can be examined from several different perspectives. One approach is to study transformation of the environment and the reflection of this transformation on health.

Secondly, studies may focus on how concepts pertaining to environmental effects on health have changed over time. These two approaches are closely linked, because in most cases our awareness is limited to the environmental factors that are assumed to affect our health at any given time. Review of the history of environmental health may also centre on the level of administration: legislation, organisations and actions.

The relations between the environment and health in Finland can roughly be divided into periods; for instance, as shown in Table 1. The various means of livelihood available to people have been the central factor regulating the relationship between people and the environment, and thereby the effects of the environment on health. Under the Finnish circumstances, the first phase – extending over thousands of years – was a period of hunting, fishing and gathering. Towards the end of the period, primitive animal husbandry and agriculture, based mainly on the slash-and-burn method, supplemented the traditional means of subsistence increasingly often. The second phase is characterised by advanced agriculture and the third phase by an industrial culture, which in the table is divided into two parts. The boundaries between all these phases naturally are merely hypothetical; no sudden leaps can be observed. The situation within the phases is not stationary, either; the relationship between the environment and health is under constant change.

The history of the population's health is generally determined by two environmental factors: food and pathogens. Even though various chemical and physical environmental factors are important, their main impact on human health is indirect. In particular, the environment shaped by modern technology affects morbidity and the occurrence of pathogens. In Finland, asbestos was used in pottery as early as the Stone Age. Combustion of wood also gives rise to compounds that pose a risk to health. In the 17th century, for instance, chimneyless huts and smoke saunas were typical in Turku, which was Finland's biggest and wealthiest town at the time. Although some attention was paid to smog in Turku already in the mid-18th century, chemical and physical factors did not gain any widespread importance for the population until the era of industrialisation.

For millennia, 'wilderness' was an accurate term to describe the environment where Finns lived. The relationship between the environment and health was primarily determined by the cold climate, the austere natural environment, and the small number of people. In fact, after the disappearance of the continental glacier, the climate warmed up fairly quickly, and for several thousand years before the Christian era, the climate was warmer than at present. People living in isolated conditions were sometimes likely to suffer from hunger, owing to occasional disappearance of game and food plants. The problem in reviewing this period, which may have lasted up to the 16th century, is the lack of written sources. Only a few written sources are available from the last centuries of the Middle Ages. Archaeological studies, however, help us form an idea of the environment at that time, even though our knowledge about health during that period is scanty. Since transport routes were undeveloped, small, isolated communities were able to avoid many disastrous epidemics of communicable diseases. It is justified to assume, for exam-

ple, that the Black Death (which raged in Europe between 1347 and 1353) and the subsequent epidemics of plague that recurred during the late Middle Ages had little if any effect in Finland. Accidents and intentional violence constituted an obvious health risk under these conditions of hunting, fishing and primitive agriculture.

The second phase, which began in the 16th century, is characterised by the increasingly important role played by agriculture in regulating interaction between people and the environment. A substantial increase also occurred in the number of written sources available from this period. For as long as agriculture formed the economic basis of society, people in Finland were highly dependent on natural circumstances. This dependence was particularly evident during famines. The great famine of 1696-97 killed one-third of the Finnish population. Population losses were particularly great in areas where agriculture was the only means of livelihood. The great extent to which the agricultural society depended on natural circumstances and – owing to the undeveloped transport routes – on locally produced food was still clearly visible in 1866-68, when some 15 per cent of the Finnish population died because of a general famine. Mortality was not distributed evenly throughout the country, but depended, among other things, on local conditions and transport routes. In the case of both of these major famines in Finland, the combined effects of hunger and disease proved to be fatal for people. Mortality caused by recurrent epidemics of communicable diseases (smallpox, typhoid, measles, etc.) were typical of this entire period.

The third phase, which began around 1870, might be termed as the first period of industrialisation. This period is already described in a wealth of written sources, which give a considerably more accurate picture of the effects of the environment on our health. Industrialisation, improved transport routes and budding urbanisation reduced Finns' dependence on locally produced food and released people from the grip of hunger. At the same time, environmental problems of a new type emerged. Pollution entered the air and water, although at first only locally. New energy sources (coal, oil) made air pollution a more widespread phenomenon. Apparently, chemical pollution of air and water had only slight effects on the Finnish population. It was considerably more important to bring pathogens under control – for instance, by means of improved water supply and sanitation, food hygiene, vaccinations, general hygiene, and isolation of patients. All these measures helped reduce the impact of communicable diseases before the Second World War.

The fourth phase, which began during the Second World War, is characterised by rapid urbanisation and industrialisation. Agriculture quickly lost its role as the source of livelihood for the majority of the population. Interaction between the environment and human health became increasingly international. Pollution of air and water was no longer confined within national boundaries; it became a global phenomenon. Radioactive fallout from nuclear test explosions spread over continents. Fewer and fewer Finns died of communicable diseases. Many diseases – such as smallpox, poliomyelitis, measles, rubella, mumps and diphtheria – disappeared or became virtually non-existent. The circumstances created by economic prosperity and advanced urbanisation enabled envi-

ronmental protection measures to prevent, for example air or water pollution, from having more extensive effects on the health of the population and on the quality of the environment. Human health was threatened mostly by factors associated with nutrition (fats, sugar, salt) and lifestyles (smoking and drinking). Chronic diseases caused by lifestyles became more common.

The fifth phase in the history of the environment and health began to take shape in the 1980s. This phase is characterised by the increasingly tighter interlinking of Finland and the global economic system. Environmental risks of biological origin could be reduced further, for instance, by means of new technologies and vaccinations. On the other hand, new communicable diseases (HIV) also reached Finland, and a new epidemic of some old communicable diseases (such as tuberculosis) is being anticipated. Environmental changes have obtained global scales, and at least the warming of the climate is also expected to have health effects. Today, ever developing transport links and increasing international contacts enable communicable diseases to spread much more rapidly than before. As production processes are becoming more international, food hygiene also faces new challenges. Since nearly all Finns live in built-up areas and use the same industrially manufactured products, exposure to various chemical and physical factors has reached wide proportions. Rising traffic volumes and the all-encompassing media and entertainment industry have made noise an increasingly important factor impairing the health and well-being of Finns. Polarisation of Finnish society enhances the risk of violence as well as the risk of mental and social malaise.

The 1990s have been characterised by a growing need for co-operation between various administrative sectors and actors in issues concerning the environment. Many decisions promoting environmental health are made in sectors other than the environment or health sectors. Development of environmental protection in the 1970s, as well as more progressive administration and legislation, have contributed to more healthy living conditions. This decade is also characterised by closer international co-operation and by the need for assistance with the management of environmental health questions in countries where economies are undergoing transition. At present, the high level achieved in environmental health is jeopardised by personnel cuts that reduce the number of people needed to carry out the work.

Administration of environmental health began to develop rapidly in Finland when the country was an autonomous Grand Duchy of Russia (1809-1917). Before the 19th century, only a few individual regulations had been issued to prevent health hazards stemming from the environment. However, as early as the first half of the 19th century, the duties of district health officers included some tasks related to environmental health management, although the resources available for control were still scanty. Factors such as industrialisation and urbanisation, together with the population growth, sped up the development of environmental health management in Europe, as well as in Finland, from the 1850s onwards. On the other hand, rapid advancement of medicine and the natural sciences created prerequisites for the development of environmental health management. In addition, development was accelerated by widespread

epidemics, such as global cholera epidemics, which also spread to Finland in the 19th century.

Articles, academic theses and other material on environmental health management have been published on a larger scale since the 1850s. Preparation of legislation started at the same time. The Health Care Decree was issued in 1879, and was soon followed by a number of other statutes. Issuance of the Health Care Decree can be regarded as the most important single event in the history of Finnish environmental health management. The Decree enabled creation of the first comprehensive body of legislation and establishment of a system of administrative responsibility for controling environmental health.

The central administration of public health care in Finland dates back to the early years of autonomy; environmental health management was included in the sphere of public health care. Within central administration, operations were first governed by the *collegium medicum*, which was then incorporated into the National Board of Health, founded in 1878. After the abolishment of the National Board of Health – later the National Agency for Welfare and Health – in 1991, responsibility for environmental health management was transferred to the Ministry of Social Affairs and Health. Within regional administration, responsibility rested with the Provincial Governments and, in particular, with the district health officers and the district veterinary surgeons. Within municipalities, environmental health management was seen to by municipal health care boards (municipal boards of health) and, subordinate to these boards, by municipal health officers, municipal veterinary surgeons and health care inspectors. Today, municipalities are free to organise environmental health management according to their needs so that responsibility is vested in a board or some other body appointed by the local authorities.

Nature conservation has a long history in Finland. Concern for forest reserves and their depletion has been expressed since the late 17th century, when legislation entailing restrictions on slash-and-burn was enacted for the first time. The period of traditional nature conservation was characterised by measures to preserve landscapes and nature. The idea of nature reserves came to Finland in the late 19th century from countries such as the United States. The Nature Conservation Act was passed in 1923, and the first national parks were established by law in 1928.

Provisions aiming to promote healthy, safe and aesthetic urban areas have been included in legislation and in building regulations for centuries. For instance, as early as the 14th century, the General Towns Act contained regulations on the width, pavement and cleaning of streets. The need for legislation on town planning became increasingly apparent in the 20th century. The Act on Town Plans came into effect in 1932. The Act was mainly applied to towns and to the built-up areas of rural municipalities. The Building Act of 1959, which has undergone several amendments, contains regulations on town planning, zoning and building in both urban and rural areas.

Environmental protection began to develop rapidly during the 1970s, when protection of the human environment, in addition to nature conservation, gained more and more importance. Up to 1970, responsibility

TABLE 1.

Economy, environment and health in Finland from the Middle Ages to the present day.

Period	Economy	Environment	Health factors	Environmental health
up to the 16th century	Hunting, fishing, gathering, agriculture	Wilderness, land clearing, slash and-burn, poor transport	Hunger, violence, accidents, epidemics	Inadequate hygiene
from the 16th century to 1870	Agriculture, handicrafts, development of trade	Land clearing, population growth, slow improvement of transport	Epidemics of communicable diseases, hunger, smallpox vaccinations introduced	Water supply, hygiene, quality of foodstuffs and housing conditions inadequate
from 1870 to 1945	First phase of industrialisation, trade and agriculture, nation-state	Rural landscape, population growth, budding urbanisation, local and national environmental problems, improved opportunities for education	Fewer deaths from communicable diseases, less hunger, development of preventive health care	Water and sewage systems are built, monitoring of foodstuffs and household water is developed, improved waste management and hygiene
from 1945 to 1985	Second phase of industrialisation, increased international co-operation	Rapid urbanisation, population growth, level of education rises, international environmental problems	Vaccinations become widespread and epidemics of infectious diseases recede, chronic diseases become more frequent, development of environmental protection that supports health	Improved cleaning of waste waters, reduction of emissions, better housing, development of waste management, building-specific heating systems become less common
from 1985	Deepening integration, global economy	Global changes in the environment, the importance of the quality of the human environment is accentuated	Resurgence of communicable diseases, chronic diseases, violence, abuse of intoxicants	Global environmental problems, transboundary emissions, increased traffic volumes, co-operation in environmental issues

for the central administration of Finnish environmental protection rested with the Nature Conservation Office, operating in connection with the Finnish Forest Research Institute, and with the Water Protection Office of the National Board of Agriculture. The National Board of Waters and its regional organisation were founded in 1970, and the environmental protection departments of the Provincial Governments were set up in 1973. The Ministry of the Environment was founded in 1983, and a number of tasks that had previously been handled by the Ministry of the Interior, the Ministry of Agriculture and Forestry and the National Board of Waters were transferred to the new Ministry. The National Board of Waters and its regional units were subordinated to the Ministry of the Environment in 1986, when the National Board of Waters was reorganised as the National Board of Waters and the Environment.

The regional administration of environmental affairs was revised in 1995. The regional units of the National Board of Waters and the Environment and the environment units of the Provincial Governments were combined into Regional Environment Centres, which number 13. Simultaneously, the National Board of Waters and the Environment became the Finnish Environment Institute.

Statutory environmental protection administration was established within municipalities in 1986. An environmental protection board had to be set up in all municipalities having more than 3,000 residents. In 1992, municipalities were given the opportunity to organise environmental protection according to their needs, which has led to reorganisation of tasks. Today, most municipalities have incorporated environmental protection into building supervision or environmental health management.

1.3 REVIEW OF OTHER NATIONAL PROGRAMMES

THE FINNISH STRATEGY OF HEALTH FOR ALL BY THE YEAR 2000

Health for All by the Year 2000 is the global strategy approved by the 32nd General Assembly of WHO in 1979. Its objective is to raise the level of human health and, in particular, to improve the relative status of the most disadvantaged population groups. The strategy characterises health as a resource enabling people to lead a socially and economically productive life.

At the core of the strategy is the view that health is largely determined by social conditions. In addition to general improvement of the level of health, the priority targets of the strategy include minimising health differences between various population groups, and well-being and functional capacity as indicators of health: more years to one's life, more health to one's life, more life to one's years. The Finnish strategy centres on promoting healthy lifestyles, reducing any preventable health risks, and developing the health service system.

The Health for All strategy has eight targets that are clearly concerned with environmental health: development of an environmental and health policy and environmental health administration; ensuring the supply of clean drinking water and water reserves; improvement of air quality; ensuring clean food; control of health hazards caused by wastes and prevention of health risks caused by soil pollution; creating human settlements that promote and ensure health; and ensuring occupational health. In addition, the target of reducing injury and disability arising from accidents is closely related to environmental health.

The Finnish Health for All by the Year 2000 (the Finnish HFA 2000 strategy) has defined the contents of the environmental health targets so that they correspond to the Finnish conditions. The targets – and the measures determined for achieving these targets – are concrete and their implementation can be measured. Several projects have been launched at the local level in order to integrate the Finnish HFA 2000 strategy with practical public health work.

The Finnish HFA 2000 strategy provides a good basis for the development of the Environmental Health Action Plan. The Environmental Health Action Plan elaborates on the targets and actions for environmental health set forth in the Finnish HFA 2000 strategy, to make them compatible with today's needs and the anticipated future trends. At the same time, environmental health can be viewed from a wider perspective and joint targets can be shared with other programmes – such as the Environmental Strategy 2005 and the Finnish Agenda for Sustainable Development.

Municipal HFA 2000 strategies have been drawn up at the local level. Preparation of local environmental health action plans can be carried out as part of the municipal programmes for health promotion, the municipal environment programmes or the agendas for sustainable development (local agenda), or as a separate environmental health action plan. The needs of various municipalities and intermunicipal authorities vary in this respect.

ENVIRONMENTAL STRATEGIES AND AGENDAS FOR SUSTAINABLE DEVELOPMENT

In 1995, the Finnish Ministry of the Environment published the Environmental Strategy 2005, which assesses the measures needed for attaining sustainable development. In addition, the Strategy discusses how the various functions of society can be kept within the limits set by nature and how future generations can be ensured the prerequisites for a good life. Mental and physical health are essential components of a good life.

The Environmental Strategy discusses the major environmental problems and sets certain goals based on the state of the environment. The Strategy assesses what actions need to be taken in the various sectors of society for attaining these goals. The Strategy also studies the means of ensuring a healthy, safe and comfortable environment for living and housing.

The environmental changes dealt with in the Strategy also have effects on environmental health. Environmental health risks can be reduced

by means of environmental protection measures, by preventing new risks from arising and by reducing existing risks. The Environmental Strategy 2005 can thus be used as source material when health risks posed by the environment are determined and prioritised.

Measures taken in accordance with the Environmental Strategy also promote the reaching of environmental health targets in many ways, even though no link as such is shown between the measures and environmental health management.

Ecologically sustainable development means that economic growth is adapted to the conditions set by nature. Sustainable development includes ecological, social and cultural dimensions. The principle of sustainable development also includes ensuring a healthy environment for the present and future generations.

Finland is committed to complying with the principles of the Rio Declaration, and participates actively in the implementation and development of Agenda 21 and of the Conventions on Climate Change and on Biological Diversity.

So that the objectives can be attained, advancement of sustainable development must encompass the entire society. Attainment of the objectives calls for actions from various sectors of administration, from business and industry, and from non-governmental organisations.

The Finnish Committee on Sustainable Development (1994) has set out the key actions for advancement during the next few years of sustainable development in Finland and in Finland's international co-operation. Various sectors of administration – such as the Ministry of Transport and Communications, the Ministry of Education and the Ministry of Agriculture and Forestry – have drafted their own strategies to promote sustainable development. Business and industrial organisations, such as the Confederation of Finnish Industry and Employers, have also published environmental outlines based on the concept of sustainable development. Municipal agendas for sustainable development and municipal environmental action plans play a highly important role at the local level.

The Government's Agenda for Sustainable Development is currently being drafted under the Ministry of the Environment. In accordance with its political programme, the Government intends to prepare a national agenda that contains the key environmental targets and concrete actions for the next few years, in order to promote sustainable development. In addition, outlines are studied for long-term planning that would integrate the environmental perspective with various other functions of society. When drawing up the Agenda, it is important to take the viewpoint of environmental health into account.

1.4 THE STATE OF ENVIRONMENT IN FINLAND

By international comparison, the Finnish environment can be regarded as a healthy one. The high standard of environmental health in Finland is the result of work done for the protection of health and for the protec-

tion of the environment. The value put on a healthy environment is reflected by the fact that, according to the Constitution of Finland (§14 a), citizen's basic rights include the right to a healthy environment and the possibility to influence one's environment.

Nature is important as a factor that can promote health in a multitude of ways. Nature provides products that can be utilised directly, and it provides the setting for physical exercise and recreation, which have a positive effect on people's relationship with nature. By protecting other forms of life and by maintaining the diversity of species, we also indirectly protect the human species in the long run. Impoverishment of the biological environment affects the selection of foods, medical preparations and other renewable resources available for utilisation in nature, thereby diminishing the potential provided by nature for people. Preservation of genetic diversity also makes it easier to adapt to changes in the environment.

Finland's geographical location and climate, the quality of the bedrock and soil, hydrological and ecological features all have an effect on the characteristics of the environment and thereby, indirectly, on environmental health.

Finland's cold climate increases some environmental health risks, such as impurities caused by traffic and heating in urban air, especially during unfavourable weather conditions. Houses must be tightly sealed, which accentuates the requirements placed on the quality of indoor air and ventilation. Spreading of sand on icy streets and roads and keeping the engines of motor vehicles running during cold weather increase the volumes of impurities in air. Applying salt on roads affects the groundwater. On the other hand, fewer species of parasites, pests, and pathogenic organisms passing from animals to humans thrive in the cold climate than in warmer countries. As a result, the need for chemical pesticides, among other things, is smaller in Finland than in some other countries.

Man has caused detrimental changes in the environment. The visible signs of these changes include depletion of natural resources, reduction of biological diversity, decline in the aesthetic and cultural values of nature, and functional disturbances in the ecosystem, resulting from emissions. The Agenda for Sustainable Development strives to diminish the risks stemming from human activities and to create a sustainable basis for exploitation of natural resources.

During the past fifty years, Finnish nature has undergone many changes. Half of Finland's bogs have been drained, rivers have been dammed up and the water levels of many lakes are regulated. The principal problem in water protection is eutrophication, which today is chiefly caused by agriculture. A considerable proportion of the changes brought about by human activities has impaired the original state of nature. The detrimental effects of land use on the state of the environment may be even greater than the environmental changes brought about by emissions. This trend will continue both in Finland and elsewhere in Europe.

Intensive land use, water system construction, community building and a dense road network lead to fragmentation of uniform natural environments and to reduction of the areas of different types of natural envi-

ronment. In the long run, such development will increase the number of endangered plant and animal species and will impair the habitats of many species. The Finnish range of species has been reduced, above all, by intensive forest management and logging, by changes in agriculture, and by the increase in the number of both permanent residences and holiday homes. For Finland, forests constitute important natural genetic reserves, since land under forest management accounts for 86 per cent of the Finnish area and forest is the habitat of most species. Nearly half of all endangered species in Finland live in forests. Changes in agricultural production methods and reforestation of fields have also diminished natural diversity.

The most important long-term and extensive environmental changes are the climatic change, depletion of the ozone layer and acidification. These changes affect the entire ecosystem, food production, and interaction between species. The effects on human health and well-being are manifested in time as either direct or indirect risks.

The following problems cause pollution and deterioration of the quality of the environment on a regional and local scale:

- *deterioration of air quality*
- *noise*
- *deterioration of the state of water systems*
- *deterioration of the quality of groundwater*
- *increased waste volumes and pollution of the soil, and*
- *increased volumes of hazardous substances in the environment.*

The general state of Finnish water bodies has been under constant improvement during the past few decades. As recently as the 1960s, many water bodies – for example those next to pulp mills – were badly polluted, and waters surrounding major towns were largely unhygienic and unfit for swimming. Improved purification technology and stricter water protection requirements have diminished the burden on waters caused by industry and residential communities. At the same time, however, scattered pollution – i.e. emissions from fields, forests and non-urban settlements and airborne emissions – has been on the increase. The most common reasons for inferior water quality today are eutrophication and lack of oxygen. The most severe problem in the Gulf of Finland – and in the entire Baltic Sea – is the high content of nutrients; the measures taken so far have not been able to cut the nutrient content to any significant degree. Most nutrients enter the Gulf of Finland via the rivers that empty into the Gulf. Cities on the coast also play a considerable role as sources of pollution in the Gulf of Finland. Likewise, fish farming has added to the burden on the sea. Water protection programmes, international cooperation and administrative and legal measures are among the actions taken to improve the state of our waters and to protect groundwater areas. The European Union's Environmental Action Plan for Agriculture plays an important role for reducing the risks stemming from agriculture.

Individual groundwater reservoirs are fairly small in Finland, although water is available practically everywhere. Health risks are most commonly associated with the use of private wells by households and

with the operations of small waterworks that pump groundwater. A few of the largest cities in Finland obtain their drinking water by purifying surface water and artificial groundwater. For this purpose, they have good water purification technology. Nearly all medium-sized towns and municipalities use groundwater. Although relatively efficient actions have been taken in Finland to protect waters, the water used by people is not absolutely of high quality everywhere. Problems in water supply are caused, in particular, by local soil characteristics, natural acidity of water, insufficient processing of raw water at small waterworks, and the imperfect condition of private wells.

Since Finnish bedrock consists of acidic rock types, Finnish soil and waters are exceptionally sensitive to acidification. Sulphur dioxide is the most important component of emissions giving rise to acidification in Finland. Finland has already reached the target of reducing sulphur emissions by 80 per cent from the 1980 level by the year 2000. However, transboundary emissions account for most of the sulphur load in this country. The total annual emissions of nitrogen oxides kept rising throughout the 1980s, but this trend came to a halt in the 1990s. Road traffic remains one of the main sources of atmospheric pollution in heavily trafficked population centres, and traffic is an obvious environmental health risk in spite of the many measures that have been taken to curb the hazards posed by it.

Preventive measures are taken to stop hazardous substances from entering the environment. Concentrations of hazardous substances have been discovered in wild animals at the higher trophic levels of the food chain. Recommendations that have been issued in Finland to limit the consumption of certain products, such as fish and the liver and kidneys of elk, have pertained only to some local areas. The average intake of hazardous heavy metals and organic compounds in Finland is clearly below international recommendations. Exposure to certain substances may, however, play a significant role in total exposure. Such substances include mercury, PCB, DDT, polychlorinated dibenzodioxines and dibenzofurans and cadmium, but not, for example, lead. Thanks to effective chemical legislation and administrative actions, the detrimental effects of chemicals on the environment and on health have largely been avoided.

Most human activities take place in communities. For this reason, communities produce the bulk of emissions, noise and waste. The common basis shared by the health-related well-being of both the environment and people consists of a social and economic policy that draws attention both to the environment where people live and to environmental health. In many countries – including Finland – community planning and activities within communities do not include a sufficient number of factors that would promote and maintain sustainable use of the environment or human health, safety and social functioning. Community building has splintered natural environments. Access to natural landscapes and recreational areas, and preservation of cultural environments, have not been given enough emphasis in the planning and building of communities.

The levels of impurities in urban air, with the exception of total suspended particles, are somewhat lower in Finland than in Central and

Southern Europe. Short-term air quality problems occur particularly in winter, in the centres of major cities and in industrial localities. Traffic noise and emissions, as well as inadequate integration of traffic arrangements and other community planning, diminish the quality of the environment. Legislative and administrative measures have been taken in order to reduce atmospheric impurities.

The principles of sustainable development are taken into account in the efforts made to halt the growth of waste volumes and to eliminate the health risks associated with wastes; the idea is to affect accumulation of waste already during production and during the life span of products. Health risks within material flows are minimised, and sustainable materials economy is supported. It is suspected that some 25,000 land sites in Finland suffer from contamination. According to plans, approximately 1,200 of these will be restored within the next twenty years, in order of priority. The national waste management plan, and the local plans that support the national plan, have been drawn up to diminish the volume of waste and to reduce environmental and health risks.

1.5 THE STATE OF HEALTH OF THE FINNISH PEOPLE AND THE EFFECTS OF ENVIRONMENTAL FACTORS ON HEALTH

The state of health of Finns has improved constantly during this century. Infectious diseases had lost their importance as causes of premature death by the early 1960s. The key factors supporting this trend were sufficient nutrition, education, improved housing, better water and food hygiene, and vaccinations. After the abatement of infectious diseases, the principal causes of death have been cardiovascular diseases, cancer, accidents and suicides. During the past twenty years, mortality caused by these diseases has also diminished, and life expectancy has risen accordingly. The average life expectancy for men (72.8 years in 1994) is approaching the average in the European Union and the average life expectancy for women (80.3 years in 1994) has already exceeded the average in the EU.

Other disease categories important for the population's health include diseases of the musculoskeletal system, mental health disturbances, infectious diseases, allergies and diabetes. All these cause much morbidity but less premature mortality. Not much information is available on changes in the prevalence of these diseases. Disability pensions granted on the basis of mental health disturbances and musculoskeletal diseases have increased. However, reasons other than medical ones may contribute to this trend. Asthma and allergies seem to have become clearly more common among the population. One reason for this may be that people have been exposed to impurities in indoor air and in urban air. The quality of indoor air has deteriorated in some respects – a fact that is related to changes in building practices. The quality of outdoor air has suffered from emissions caused by increased volumes of traffic.

Wide differences exist between the health status of various population groups in Finland. For both women and men, age-standardised mortality is still higher in eastern and northern Finland than in western and southern Finland. The differences are primarily caused by differences in mortality from cardiovascular diseases, but similar differences also exist for other causes of death. Possible explanations include genetic factors, lifestyles or the environment. Apart from socioeconomic factors, there are few research results on the contribution of the environment to regional differences in mortality. Lifestyles explain some of the differences.

In 1994, the average life expectancy of Finnish men was approximately 7.5 years shorter than that of women. This difference is one of the largest in the world, and it has not diminished much during the past twenty years. The average life expectancy is higher among people who have better education and who belong to higher social classes than among people who have less education and belong to lower social classes. The difference between the highest and the lowest social classes is roughly six years for men and roughly three years for women.

The state of health among Finnish children has improved constantly. Mortality during the first year of life is one of the lowest in the world. Accidents are the most common cause of death among pre-school and school children. Twice as many boys as girls die in accidents. Mortality caused by accidents decreased rapidly in the 1970s and more slowly in the 1980s. The bulk of fatal accidents among children occurs in traffic. Improving the safety of the traffic environment would help prevent some of these accidental deaths.

EVALUATION OF HOW DETRIMENTAL FACTORS IN THE ENVIRONMENT AFFECT PUBLIC HEALTH IN FINLAND

Compared with the European level, exposure to environmental factors detrimental to health is relatively minor in Finland. However, we have some special features important for environmental exposure. These features pertain, for example to the cold climate, the geographical location and the production structure. The most important environmental health hazards are associated with accident risks in traffic and during leisure, the quality of indoor air (microbes, allergens, radon, tobacco smoke), and emissions from traffic in urban centres (particles). Groundwater contamination in some areas, microbes in food and some new problems (new foods) may cause health hazards that are still insufficiently known. Noise has become a more common problem in the environment and can cause, among other things, sleeping disorders and stress. Environmental factors most likely play an important role in mental well-being, but little research has been carried out on this role. Global changes in the environment – above all climatic changes and ozone depletion in the upper atmosphere – will cause such upheavals in our environment that their effect may in future change the state of public health in Finland, too (Table 2).

Table 2 mainly includes biological, physical and chemical factors that cause environmental exposure and have significant health effects among the population. Psychosocial factors of the environment are important for health, but their effects are less known. For instance, employment, the financial situation of families, social networks, and functional aspects of the environment have major effects on health and comfort, but they have been omitted from the table because there is not enough information available for evaluation of their effects. In addition to the factors listed in the table, there are many factors that have only minor health effects or health effects that are so little known that they cannot be evaluated. For instance, the number of people exposed to chemical substances in indoor air, and the extent of their effects, are known insufficiently. Another example is arsenic in drinking water, which is basically only a local problem and has not been included in the table.

Microbes in indoor air: According to recent research conducted by the National Public Health Institute, 55 per cent of single-family houses and 45 per cent of homes in blocks of flats show signs of moisture damage that would need repairing. Insurance companies pay indemnity for water damage in some 20,000 homes per year. The results of questionnaires have revealed that approximately 10-20 per cent of respondents have noticed mould growth or the smell of mould in their homes. In more than half of the cases of moisture damage, the contents of microbes in indoor air are estimated to pose a risk to health. In the event of serious moisture damage, 30-50 per cent of people living or staying in the building (homes, workplaces, schools etc.) develop symptoms of one kind or another. Serious symptoms, such as asthma, are discovered only in a few per cent of the people exposed. Microbes in indoor air can be estimated to cause symptoms for tens of thousands of Finns and serious diseases, such as asthma, for less than a hundred Finns.

Allergens in indoor air: To a certain extent, the entire population is exposed to animal epithelia and dust mites. People have more pets, and the associated exposure to animal epithelia is more common. Cleaning of the home is a simple and effective way of reducing exposure to animal epithelia and dust mites. The materials used for furniture and indoor surfaces also affect the exposure.

Radon: On the basis of radon measurements conducted in residential buildings, it has been estimated that 610,000 Finns live in homes where the average radon concentration exceeds 200 Bq/m^3; 180,000 live in homes where the concentration exceeds 400 Bq/m^3; and 50,000 live in homes where the concentration exceeds 800 Bq/m^3. According to different estimates, the number of deaths from lung cancer caused by exposure to radon in indoor air ranges from a few dozen to several hundreds per year. The highest estimates (700) are based on risk assessment by the International Commission on Radiological Protection (ICRP, 1993). According to a Swedish estimate (Pershagen), some 10 per cent of lung cancers are caused by radon. This would mean less than 200 cases of

lung cancer per year in Finland. The latest epidemiological studies conducted in Finland indicate that the proportion of lung cancers caused by radon is even smaller than this.

Passive smoking: According to a questionnaire survey conducted by the National Public Health Institute, the number of smokers at workplaces has fallen during the last few years. In 1994, approximately 10 per cent of non-smoking people of working age were exposed to tobacco smoke at their workplaces. Today some 25 per cent of adults are exposed to tobacco smoke at home. Figures for children are not known. Based on this information, it can be estimated that roughly 1.25 million people are exposed to tobacco smoke passively; some of them also smoke themselves.

Impurities in urban air: The worst urban air quality problems in Finland are exposure to particles and to nitrogen oxide. It is estimated that the most serious health risks arise from small combustion particles (traffic, industrial emissions), whereas the risks caused by street dust are probably less serious. The estimates drawn up by WHO on the effects of urban air impurities on morbidity and mortality encompass urban areas of over 50,000 inhabitants. The same approach is applied to the Finnish estimate presented here. The risk assessment is based on data obtained on air pollution levels in European and Finnish cities and on American and European epidemiological studies.

Microbes in food: According to European studies, 50-300 persons per one thousand inhabitants get food poisoning every year. According to a recent Swedish study, 750,000 Swedes per year get food poisoning. Half of the cases are caused by home cooking, one-third by food purchased in restaurants, fast-food eateries, or other places and 15 per cent of the cases occur during trips abroad. Based on these studies, it has been estimated that 500,000 people per year get food poisoning in Finland. Most often, the food poisoning is just a passing case of diarrhoea, but in some cases the cause is a microbe that may have long-term detrimental effects, such as reactive arthritis. Long-term effects are to some extent unknown.

Microbes in drinking water: In Finland, 800,000 people draw their drinking water from a well. Some 300,000 wells have been contaminated by faecal microbes. It is estimated that roughly 10 per cent of people who use contaminated water show some symptoms. An average of one epidemic where the cause is drinking water supplied by waterworks and contaminated by bacteria is reported annually in Finland. As a result of the epidemic, an annual average of 1,500 people contract diarrhoea. Since not all epidemics are publicised, the real figure is likely to be considerably higher.

Accidents: In principle, the entire population is at risk of accidents in traffic and during leisure, and the entire gainfully employed population is at risk of occupational accidents. According to mortality statistics, there are approximately 2,500 accidental deaths in Finland annually. Ques-

tionnaire surveys show that some 790,000 people are injured in accidents every year. Most accidents are not caused by environmental factors but by the individual's own actions. However, it is not possible to give a sufficiently accurate estimate of the importance of environmental causes as contributors to accidents.

Noise: Altogether 900,000 to 1,000,000 Finns are exposed to noise levels exceeding 55 dBA and caused by road and street traffic. An estimated 500,000 people experience road traffic noise as a disturbing factor in the environment where they live. In Helsinki, some 300,000 people live in areas where the average daytime noise level exceeds 55 dBA. In Helsinki proper, 77-79 per cent of people living by a busy street, and 25 per cent of people living by a quieter street, found noise disturbing. Some 12 per cent of middle-aged Finns, at one time or another, have lived in a dwelling where noise has interfered with normal conversation. It is estimated that exposure to noise will increase in Finland in the near future.

Climatic change: The Finnish climate is predicted to change so that winters will become relatively warmer and rainfall will increase, especially in winter. In time, the indirect effects of climatic change will probably prove to be more important than the direct effects. The number of environmental refugees will rise rapidly in the world. The range of the intermediary hosts of infectious diseases, such as mosquitoes, will change. For instance, malaria may become endemic in Europe.

UV radiation: Depletion of ozone in the upper atmosphere increases the intensity of UVB radiation reaching the Earth's surface. Exposure to UVB radiation increases the risk of skin cancer. A thinning of one per cent in the ozone layer increases the incidence of skin cancer by approximately two per cent. In Finland, depletion of the ozone layer is estimated to increase the incidence of skin cancer by not more than 30 per cent. Most of these cases will be basal cell and spinous cell carcinomas. Malignant melanomas will also become more common, but this increase in melanomas is not in the same way directly dependent on UVB doses, but possibly on recurrent high skin exposures, such as sunbathing. According to estimates, a reduction of one per cent in the ozone layer increases the incidence of cataracts by 0.5 per cent.

Total: The exposures of environmental origin listed in Table 2 annually cause between 3,500 to 4,500 deaths and a little less than two million different cases of short-term or long-term illness or injury in Finland; most of the cases are accidents. However, the table shows only some of the factors causing environmental exposure. In addition, a number of other exposure factors cause morbidity and mortality. Moreover, a host of other aspects – for example, aspects associated with the amenity of the environment, the social environment and economic factors – also have environmental health effects and apply to a considerable proportion of the population. Quantitative evaluation of their effects on health, however, is impossible on the basis of the information available.

In the near future (5-10 years), no major changes are foreseen in environmental exposure. Indoor air problems are likely to be alleviated when buildings are renovated and built better and smoking becomes less common. Trends in transport and changes in the vehicle stock will affect the scenario of impurities in urban air. Particle emissions from vehicles are likely to be reduced within the next ten years. The number of microbes in drinking water will decrease along with expansion of the water pipe network, provided that the network is repaired and maintained sufficiently. The trend in accidents will be clearly positive if prevention of accidents at home and during leisure is given the same attention as prevention of traffic accidents is given now. Noise in the environment is on the increase, and no changes in this trend are foreseen in the near future.

In the long term (10-50 years), the scenario is different. It will probably prove possible to constrain short-term local problems to a marked extent. In contrast, changes in the climate will begin to be reflected as changes in the spectrum of environmental diseases. The incidence of communicable diseases will undergo changes in Finland. Malaria may become endemic in Europe, too, and it may become more common among groups such as tourists and immigrants entering Finland. Productivity of agriculture may change as may the need for energy generation. A change in the direction of the Gulf Stream would pose the greatest risk for Northern Europe. After such a major change, our climate might resemble the present-day climate of Alaska or Labrador. The probability of such a change cannot yet be predicted. Depletion of the ozone layer will increase the incidence of skin cancer and cataracts during the next 50 years. Thereafter, once the emissions of ozone-depleting substances have been restricted, exposure to UVB radiation will begin to fall.

TABLE 2.

Estimate of the effects of environmental factors on public health in Finland: Number of people exposed, mortality and morbidity related to the exposure, and measures to prevent the adverse effects

Environmental factor	People exposed	Mortality/year	Morbidity/year	Measures needed to prevent adverse effects
microbes in indoor air	1, 500, 000[1)]	*	50,000 (10,000-100,000) infections, respiratory tract or general symptoms	prevention of moisture damage and renovation of buildings
allergens in indoor air	5, 000, 000[8)]	*	allergy and asthma	choice of materials and cleaning of homes air
radon in indoor air	610, 000[2a)] 180, 000[2b)] 50, 000[2c)]	20-700 lung cancers	20-700 lung cancers	zoning, planning and renovation of buildings
passive smoking	1,500,000[3)]	ca. 60 lung cancers; ca. 700 cardiovascular diseases	20,000-30,000 respiratory tract symptoms, cardiovascular diseases	measures to reduce smoking indoors
impurities in urban air	1,900,000[4)]	200-400 chronic cardiopulmonary diseases, cancers	30,000 aggravated cases of asthma symptoms, 30,000-40,000 respiratory tract infections among children	reduction of emissions from traffic, energy generation and industry
microbes in food	5,000,000[8)]	*	500,000 cases of diarrhoea	self controling, efficient control of foodstuffs
microbes in drinking water	300,000[5)]	*	30,000 cases of diarrhoea	repair andmaintenance of systems susceptible to risks
accidents	5,000,000[8)]	2,500	790,000	improving the level of safety in the environment
noise	1,000,000[6)]	-	500,000, noise disturbs and interferes with sleep	restriction of noise, especially from traffic, reduction of exposure
climatic change	5,000,000[8)]	*	conditions of life and spectrum of infectious diseases will change	reduction of greenhouse gas emissions
UV radiation	5,000,000[8)]	100 skin cancers	skin cancer will increase by 30%, cataracts will increase	removal of ozone-depleting chemicals from use, avoidance of sunbathing

* The number of cases cannot be estimated reliably on the basis of present-day information

1) People who live, study, work or are in daycare in buildings that have moisture damage

2a) Radon content of indoor air over 200 Bq/m^3

2b) Radon content of indoor air over 400 Bq/m^3

2c) Radon content of indoor air over 800 Bq/m^3

3) People who are exposed to tobacco smoke at home

4) Population of towns of over 50,000 inhabitants in Finland

5) People whose drinking water has been contaminated by faecal microbes

6) People who are exposed to a noise level of over 55 dBA caused by road traffic

8) The entire Finnish population.

2 PRINCIPLES AND OBJECTIVES

The leading principle of the Environmental Health Action Plan is to promote and ensure health and to maintain a healthy environment for future generations. Preventive health care and environmental protection measures play an important role in advancement of health and in prevention of hazards. This requires that protection of health and protection of the environment constitute an integral element of societal policy and of operations in the various sectors of society. The objective is to put environmental health on a joint desk shared by various authorities, who can then contribute to advancement of environmental health through their own expertise and tools. Other actors in society, such as business and industry and non-governmental organisations, also play an important role as promoters of environmental health.

The Environmental Health Action Plan strives to integrate advancement of environmental health with social and economic development within society. The precautionary approach is applied when planning actions. The life cycle approach is applied to prevention of risks, and the various stages in production and in the use of products are taken into account when assessing the impact on environmental health.

Emergence of environmental health hazards should be prevented in advance, and according to the principle of subsidiarity, hazards should be eliminated at their source of origin. The 'polluter pays' principle will also be applied more widely, in order to reduce environmental health hazards.

The principle of sustainable development constitutes the cornerstone for goal-setting. In accordance with the principle, people strive to ensure the prerequisites for life for present and future generations. Human activities must be adapted to the special conditions set by nature. Interaction between sustainable development, the environment, and health leads to three central objectives that affect human health:

- promotion and protection of human health and the well-being that supports health
- preservation of the life forms and species that have a positive effect on human health
- protection of the living environment.

Future human generations are protected indirectly by protecting other forms of life from harmful effects and by maintaining the diversity of species. Maintaining the diversity of nature provides people with more varied possibilities of utilising the renewable natural resources that are already in use and of developing new applications where these resources are utilised.

According to the Constitution of Finland (§14 a), a citizen's basic rights include the right to a healthy environment and the possibility to influence one's environment. The Government must ensure this right to

every citizen. An environment that is conducive to health, offers possibilities for recreation and takes human needs into account and creates the basis for various activities by citizens and communities. Sustainable development in environmental health requires that citizens assume active responsibility for their environment and health. Increasingly often, administrative and legislative means need to be supplemented with other opportunities for human action as well as with economic and information-related means of steering that have the ability to modify human behaviour.

Efforts are taken to preclude detrimental changes in the environment in advance by reducing the burden on the environment and by affecting the use of natural resources and areas. Another goal pursued at the same time is to create healthy, safe and comfortable environments for living and housing. Measures that promote environmental health help cut costs when less repair and maintenance are needed and irreparable damage is prevented. Maintenance and renovation are needed to repair any damage that has already surfaced.

Social well-being is important for both physical and mental health. For the maintenance of health, it is important that the environment provides all inhabitants with good opportunities for organising their daily lives, for satisfying their basic needs and for engaging in various activities and interaction.

The environment should support the development of children and young people, should provide healthy living conditions, and should be suitable for a varied selection of games, hobbies, recreational activities and social contacts with people of different ages. Practical actions must pay attention to safe transport, to the quality of the environment, to distances between facilities for games, sports and recreational activities, social services, and daycare centres and schools, on one hand, and residential areas, on the other, and to the controlled management of the environment.

The proportion of elderly people among the population is on the rise. One goal of care for elderly people is to ensure that they can live at home for as long as possible. In practice, this calls for services in the neighbourhood, for good parks and recreational areas close to home, and for provision of safe facilities for transport and outings.

People who are physically challenged or have restricted mobility should receive support according to their own life situation and financial status, so that they have an opportunity to be active in their living environment.

Action should be taken to promote the state of health of the more helpless members of society, to encourage their independent coping and to help them maintain their social contacts.

Detailed objectives and grounds for them are presented in Chapters 3 and 4.

In setting the objectives, attention is paid to development trends and to Finland's special features, such as the geographical location, hydrological, ecological and climatic factors, the production structure, the social structure, the state of the environment and the population's state of health.

3 BASIC FACTORS OF ENVIRONMENTAL HEALTH

The basic environmental factors include good-quality drinking water, clean air and clean and wholesome food. If these factors are missing, people cannot survive or at least health will be subject to serious risks. In addition, a number of other factors are important for survival, for basic security and for comfort. It should be possible for people to live, play, go to school and go to work without environmental considerations posing a threat to their health. This Chapter discusses the basic facts of environmental health and some other central areas of environmental health in Finland.

For each of the basic factors, an account is given of the situation and problems encountered in Finland, and some central objectives and actions for solving the problems and for promoting health are presented. Emphasis is placed on environmental health risk factors that are of considerable importance to health. In assessing this importance, particular attention has been paid to the population's exposure and to the extent of this exposure, and to the prevalence and severity of the health hazards caused by the exposure. Special emphasis is put on hazards that can be eliminated or alleviated by taking advance preventive measures. The objectives have been set over a time range of five to ten years.

3.1 WATER RESOURCES

BACKGROUND

Finland has plentiful water resources. The total area of inland water bodies accounts for 10 per cent of the entire area of Finland, or 33,500 square kilometres. The extent of territorial sea areas is 36,000 square kilometres. Owing to the shallowness of lakes, their combined volume is only 235 cubic kilometres. However, each Finn would still have some 60 cubic metres of surface water for use per day. The most plentiful groundwater sources are located in areas where the soil is dominated by gravel and sand. Today, approximately 0.6 million cubic metres of groundwater is used per day. Contrary to some other European countries, sufficient water resources are no problem in Finland. However, some factors in the quality of water may cause a potential health hazard – either as such or indirectly.

Industry and agriculture use considerable volumes of both groundwater and surface water. People drink some 2 litres of water per day and use 150-200 litres for other household purposes. Consumption of water has been falling during the past few decades in households and in industry, thanks to the introduction of water-saving technology, economic steering, education, and renovation of water pipes. It is estimated that the total consumption of water in Finland is one million m^3 per day.

Human health is affected not only by the water used for drinking and for preparing and processing foods, but also by the water needed for personal hygiene and recreation. Moreover, Finns spend much of their freetime enjoying Finnish nature with its thousands of lakes, numerous rivers, extensive sea coasts and archipelagos.

Finland has fairly good legislation on water protection. The prohibition on groundwater pollution applies particularly to important groundwater areas and to other groundwater areas that can be used for water supply. Water system construction, discharge of waste water into water bodies, and other operations that alter a water body require a licence. The authorities supervise compliance with the licence terms. The regulations on water protection and international agreements require that the state of waters and the burden on water bodies are monitored. Treatment of waste waters by industry and by municipalities has improved. Industry has cut its water consumption markedly, and municipalities have also implemented actions aimed at saving water. In order to improve the state of waters, water protection targets have been drawn up and ratified by the Council of State. At present, a new target programme for water protection and an action plan for groundwater protection are under preparation.

Although the standard of water protection measures in Finland has been high and the overall state of waters has been improving constantly since the 1970s, the quality of water used by people is not high everywhere. The reason may be specific soil characteristics, deficiencies in raw water treatment technology, or the condition of wells in sparsely populated areas. Effluents emitted into water bodies by industry and communities have diminished markedly in the last few decades, but effluents from agriculture and other dispersed sources still require effective measures so as to reduce the burden on water systems.

Drinking water in Finland

Besides posing no risk to health, good drinking water tastes good and looks clear and colourless. It should not corrode materials in water distribution equipment. The content of minerals in drinking water affects the attainment of all the above requirements, but from the point of view of nutrition, the content of minerals is insignificant because the amount of minerals obtained from water is minimal when compared to that obtained from food. Fluoride is an exception in this respect.

Out of the raw water treated by the water utilities of communities, 44 per cent is surface water and 56per cent is groundwater or artificial groundwater. The proportion of the population encompassed by the water utilities of communities (86%) is among the lowest within the European Union. This is partly explained by the fact that the population is dispersed over a large area and water is available almost everywhere. Most water utilities are small facilities that treat groundwater. Most health risks are caused by the private wells of individual households and by small water treatment plants. It is fairly common for surface waters to affect the quality of water in wells, but contamination of wells because of waste water spilled into the ground is rare.

Individual reservoirs of groundwater in Finland are relatively small, which is both an advantage and a disadvantage. Extensive pollution that is difficult to rectify and that does not manifest itself until much later does not occur here. In the event of contaminated groundwater, it has been possible to change the pumping site. The high number of water treatment plants – owing to the small size of groundwater reservoirs – makes control and adoption of advanced technology more difficult. Susceptibility to technical faults and the risk of epidemics also increase at the same time. Some of the largest cities use surface water for their water supply, but their water purification technology and quality control are of a high standard.

The quality of drinking water supplied by water utilities is under statutory control. The control obligation also encompasses private wells when there is reason to suspect health hazards.

Epidemics caused by drinking water are subject to systematic reporting in Finland. In the bulk of the epidemics (95%) that are caused by water distributed by waterworks, the reason for symptoms is waste water that has entered the groundwater source. From the perspective of public health, epidemics of intestinal disorders are the main risk factor associated with drinking water. Ageing water treatment plants and distribution networks increase the risk of epidemics. Use of disinfection chemicals is minimised in order to avoid the formation of harmful by-products. However, this increases the risk of epidemics.

Nearly all quality problems affecting drinking water in Finland are associated with our natural conditions: the characteristics of soil and bedrock.

Waters in Finnish rivers and lakes are acidic and low in minerals. In addition, they have a high percentage of natural organic matter, humus. Organic matter is the main reason for quality problems in surface waters. It uses up disinfectants for oxidisation reactions. Disinfectants are needed in fairly large quantities to ensure sufficient disinfection efficacy. This in turn gives rise to a high number of by-products, some of which are carcinogenic. In order to avoid the by-products of chlorination, raw water sources have been changed and water treatment methods have been made more efficient. Finland now has only a few fairly small plants where the concentrations of by-products from disinfection are still too high. These plants are situated, for example, on the coastal areas, where the soil contains bromides. In long distribution networks, aftergrowth of microbes also causes problems.

Acidification of water occurs in shallow wells into which surface water can pass. Applying salt on roads increases the risk of groundwater contamination. Finnish groundwater has few mineral salts. The groundwater is naturally acidic and contains much carbon dioxide, for which reason it is very palatable as drinking water. However, this kind of water tends to corrode the water pipe materials in common use. Thus, the metals contained in tap water have come from the materials used for the piping and equipment. Copper in tap water is above all a technical and aesthetic drawback. Lead, which often occurs in tap water in Central and Southern Europe, is no problem in Finland, because lead pipes are not used here.

The fluoride content of groundwater is high in some areas in south-eastern and south-western Finland. Elsewhere in Finland, too, high contents may be discovered in drilled wells. Too much fluoride has a negative effect on dental enamel and on the strength of bones. On the other hand, in some areas in Finland, the fluoride content of groundwater is very low.

A high nitrate content of water is a common problem in Central and Southern Europe. In waters treated by water utilities, nitrates have not so far been a problem in Finland, although the contents have risen in many areas, particularly because of fertilisers. In individual wells, occurrence of nitrates is fairly common.

Now that individual households get their water increasingly often from wells drilled in bedrock, two serious water quality problems have appeared. The concentrations of radon and arsenic in water from drilled wells in some areas of Finland are very high by international comparison. Both substances have been classified as carcinogenic.

OBJECTIVES

- The population has access to a sufficient supply of healthy and good quality drinking water under all circumstances.

ACTIONS

1 Use of groundwater in water supply is increased; protection plans are drawn up on the basis of charts made of groundwater areas; implementation of the protection measures is supervised and the quality of water is monitored. When using surface water, it is ensured that the water source is as good as possible, and the quality of the source is monitored. (Municipalities, Ministry of Agriculture and Forestry, Ministry of the Environment, Finnish Environment Institute, Regional Environment Centres)

2 Treatment of raw water is improved in accordance with the general quality requirements so that the end result is drinking water of a good quality. Organic matter is removed more efficiently from surface water used as raw water, and the corrosion treatment of groundwater is improved, so as to prevent the quality of water from deteriorating in the distribution network. (Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, water utilities)

3 The risk factors of important groundwater areas are identified as part of the charting and protection plans pertaining to groundwaters, and the necessary actions are taken for elimination of the risks. (Ministry of the Environment, Ministry of Social Affairs and Health, Finnish Environment Institute, Regional Environment Centres, municipalities)

4 The needs associated with the various uses of water resources, groundwater protection and water supply are taken into account in town planning and in the planning of land use. (Ministry of the Environment, Ministry of Agriculture and Forestry, municipalities)

5 The reliability of water supply systems, and their preparedness for crises, are improved. Water treatment is concentrated in larger units, for better treatment results. Water pipe systems and sewer systems are planned and located so that there is no risk of contaminating drinking water. (Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, municipalities, water and sewerage utilities)

6 Design and maintenance of water supply systems are made more effective. Technology is developed to ensure the supply of good-quality drinking water. (Municipalities, water utilities, water users, Technology Development Centre of Finland, Finnish Environment Institute, Academy of Finland)

7 In order to solve water quality problems in sparsely populated areas, wells are modernised and renovated and, as far as possible, common water supply systems are devised, especially in areas rich in radon, arsenic and fluoride. Methods for purifying water and waste water are developed, and drilling of wells in problem areas is avoided. (Ministry of Agriculture and Forestry, Finnish Environment Institute, municipalities, Regional Environment Centres, users of water)

8 When engaged in international co-operation and in drafting of new legislation within the European Union, care is taken not to lower the standard of water resource protection in Finland. (Ministry of the Environment, Ministry of Social Affairs and Health)

NATURAL WATER RESOURCES FROM THE PERSPECTIVE OF ENVIRONMENTAL HEALTH

The quality of water in about 80 per cent of Finnish lakes and in about 40 per cent of the total length of Finnish rivers has been classified as excellent or good. However, the number of completely clean water areas and water areas that are virtually in their natural state has diminished.

Owing to their shallowness, Finnish water bodies are susceptible to eutrophication. Eutrophic waters may contain blue-green algae, which form toxins. Some of these toxins affect the nervous system or the liver. Large colonies of blue-green algae pose a health risk to animals and to humans. Additionally, in swimming waters, the algae cause allergic skin and eye reactions and, if swallowed, reactions in the stomach. Eutrophication also alters aquatic nature and interferes with fishing and recreation.

Agriculture is the major source of nutrients in water bodies. Efficient agriculture and intensive forest management may also cause erosion and passing of nutrients into water bodies. In addition to eutrophication, fertilisers may cause deterioration in the quality of groundwater.

Industrial waste waters increase the content of nutrients in water bodies. Environmental toxins from these effluents, the substances accumulated in contaminated sediments and, for example, airborne impurities may become concentrated in fish and pose a health risk to people who eat plenty of fish. Waste waters from communities increase the contents of nutrients in water bodies and impair the hygienic quality of water. Most of the contamination affects coastal waters.

Acidification of water bodies occurs easily because of the poor buffer capacity of water bodies and the characteristics of the soil. The risk to our water resources caused by airborne impurities and acid rain is one that is the most difficult to ward off. More than one-tenth of the small lakes in southern Finland can be considered acidified, but only a few lakes have lost all their fish because of acidity. Owing to the climate change, flow volumes may rise in Finnish water bodies and leaching may increase. If water temperatures rise and, hence, eutrophication becomes more widespread, the risks of fish diseases increase and the relations between species may change.

The states bordering on the Baltic Sea have signed a Convention on the protection of the marine environment. One of the measures listed in the Convention is a programme for the protection of the Baltic Sea, which will extend up to 2010 and includes actions for cleaning the waste waters discharged into the Baltic Sea and actions for reducing effluents from marine traffic. The Convention on the protection of the marine environment in the Northeast Atlantic aims to prevent pollution in Arctic water areas.

From the perspective of the Finnish natural water resources, it is important to ensure that the legislation adopted by the European Union is not used to lower the current standard of surface water and groundwater protection in Finland. The environmental co-operation projects launched by Finland in developing countries and in areas adjacent to Finland strive to improve the drinking water and waste water systems in the areas concerned, and thereby to reduce health risks and contamination of the environment.

OBJECTIVES

- Clean and biologically diverse aquatic nature, and the possibilities of using water bodies for recreational purposes, are preserved. Use of water bodies conforms to the principles of sustainable development.
- Pollution of water bodies from dispersed sources is diminished.
- The volumes of waste water are diminished and the technology for purifying waste waters is improved.
- The hazards caused by acidification are reduced.

ACTIONS

1. Pollution of waters by agricultural activities, fish farming and scattered settlements is reduced by revising and implementing the environmental programmes already drawn up. (Ministry of Agriculture and Forestry, Ministry of the Environment, municipalities, enterprises)

2. The standard of water protection is ensured by further decreasing effluents originating in communities and in industry and by introducing effective purification, service and control technologies within processes. (Municipalities, enterprises)

3. The state of water bodies is improved by means of maintenance and renovation projects and by regulating emissions into waters, into the air and into the ground in a uniform manner. (Ministry of the Environment, Ministry of Agriculture and Forestry, Regional Environment Centres, municipalities)

4. With the assistance of international co-operation, efforts are made to slow down the climate change and to prevent the acidification of water bodies and the deterioration of water quality in sea areas by airborne pollutants. (Ministry of the Environment, Ministry for Foreign Affairs, Ministry of Transport and Communications, Ministry of Trade and Industry)

3.2 AIR

Air is one of the major transmitters of environment-based exposure. An adult breathes an average of several cubic metres of air per day. The inside surface of the respiratory organs has a total area of 40 to 80 square metres. Gaseous substances can easily pass from the lungs into the circulatory system and thereby into other parts of the body. Small particles are carried by air into the lungs, from which the various defence mechanisms in the respiratory tract try to remove them. Besides being an important target for detrimental effects, the respiratory tract can be the main transport route whereby hazardous environmental factors enter the body.

The first reports dealing with the effects of atmospheric pollution on mortality came from the industrial areas of Europe and the USA during the first half of the 20th century. In 1952 an episode of smog in London led to the death of over 4,000 people. In recent years, traffic has become the principal polluter of urban air. In the light of epidemiological studies, respirable particles are the principal health hazard in urban air.

The quality of indoor air is clearly better today than it was in the small and cramped dwellings of the early 20th century. On the other hand, energy conservation measures and deficiencies in building practices and in ventilation have again made risk factors in indoor air an important health problem.

INDOOR AIR

Finns spend about 90 per cent of their time indoors. In fact, indoor air is today the principal source of exposure to airborne impurities in Finland.The factors impairing the quality of indoor air include animal epithelia and dust mites, smoking, mould growth caused by moisture damage in structures, radon that rises into buildings from the ground, and chemical impurities emitted by building materials. Insufficient ventilation increases concentrations of impurities in indoor air. Since Finnish homes need to be built tightly to ensure efficient heat insulation in the cold climate, good ventilation is particularly important.

Good indoor air is clean, suitably humid and warm. The major health risks associated with indoor air in Finland stem from allergens, moisture damage and mould growth, and from tobacco smoke. Other sources of impurities in indoor air are hearths, gas stoves, use of chemicals, and emissions from materials. Animal epithelia constitute the main allergenic factors. Especially people who have pets at home are exposed to animal epithelia. Dust mites and excretions of the mites are also a major factor contributing to allergies. Exposure to dust mites can be reduced by choosing the right materials and by cleaning often enough. Problems associated with mould in indoor air can be eliminated, or at least they can be alleviated considerably, and the consequent illnesses can in principle be avoided. The same is true for passive exposure to tobacco smoke. Indoor air quality may also be deteriorated by impurities in outdoor air, because these impurities enter indoor air fairly quickly.

In addition to the above risks in indoor air, public premises (day-care centres, premises for sports and other activities) may be affected by other, even very serious problems. A gas stove or a gas oven may give rise to high concentrations of carbon monoxide (town gas) or nitrogen dioxide (natural gas, LPG) in indoor air. During the last few years, operation of ice maintenance machines running on combustion engines has given rise to a few cases of carbon monoxide poisoning among the audience in some inadequately ventilated ice stadiums.

MOULD PROBLEMS IN BUILDINGS AND THE RESULTING HEALTH HAZARDS

A mould problem in a building always originates in moisture damage, which causes continuous or recurrent wetness in the building material. Mould fungi have modest requirements for their growth, and their spores are present everywhere. In practice, the moisture of surfaces and structures is the only factor regulating mould growth.

Any building material becomes mouldy if there is enough moisture. Materials that are particularly susceptible to mould include wallpapers, natural materials used as insulators, textiles, and many glues and putties that contain organic material. Even though mould fungi cannot feed on mineral-based materials, such as brick, concrete or steel, they can also grow on these surfaces because of the moisture collected there. Excessive moisture on building material may come from a leak, or it may be caused by concentration or by capillary action.

Mould fungi growing in structures release spores into indoor air. The spores of mould fungi and actinomycetes are 1-30 micrometers in size; they are easily carried by air currents, and when inhaled, some of them end up deep in the respiratory tract. The spores may be allergenic or they may have toxic effects. Organisms in the active growth phase also emit gaseous metabolic products.

Sources of moisture in buildings include rain, melting and runoff waters, floods, moisture rising through capillary action, humidity in outdoor and indoor air, waters used for washing and household purposes, faults in piping and equipment, and moisture in structures. During building, special attention should be paid to heat insulation, moisture insulation, subsurface drainage, sufficient foundation height, and shaping of the ground surface around the building. Building materials should also be protected against moisture during building.

Health hazards experienced by people living or staying in buildings that suffer from moisture and mould problems have been reported in many epidemiological studies. These hazards include irritation of mucous membranes, more frequent respiratory tract infections or general symptoms. Increased occurrence of asthma has also been reported in several studies. In recent years, cases of illness related to mould damage in buildings have been diagnosed as occupational diseases more often than before. The occupational disease diagnoses have included allergic rhinitis and allergic alveolitis.

The extent of mould problems in Finnish buildings, and the scope of the resulting public health problem, are currently under study. The first phase of the study has focused on the frequency of moisture damage in detached and semi-detached houses and in blocks of flats. According to the results, 82 per cent of the detached and semi-detached houses studied either had or had previously had moisture damage of one kind or another. This result indicates that a house is likely to develop some sort of moisture damage during its life cycle. Altogether 55 per cent of houses and 45 per cent of flats in blocks of flats needed repair because of moisture damage.

The types of moisture damage depended on features characteristic of building in each decade. The results of the study indicate that there is a pressing and serious need both to carry out renovations and to reassess the quality of building.

Moisture damage in daycare centres and in schools has exposed children to moulds in indoor air. The problem in repairing these buildings has been that municipalities have not always had funds to allocate for repairing the damage. Mould problems at workplaces are included in the sphere of labour protection and occupational health care. The problems can be detected, and occupational health risks can be prevented, by carrying out occupational hygienic inspections at workplaces and by monitoring workers' health.

TOBACCO SMOKE IN INDOOR AIR

Depending on the context, exposure to tobacco smoke in the environment is termed passive smoking or involuntary smoking. As used here,

the terms mean that a person is exposed to tobacco smoke whether he/she wants it or not.

According to studies conducted by the National Public Health Institute, 33 per cent of men and 23 per cent of women over 15 years of age smoked regularly in Finland in 1995. Smoking among men and women between 15 and 24 years of age was equally common (28%) in 1995. Exposure to tobacco smoke at workplaces has diminished sharply, but exposure at home has not been reduced at the same rate. In 1995, 10 per cent of adults were involuntarily exposed to tobacco smoke at work and 24 per cent were exposed to tobacco smoke at home. Exposure at home, in particular, is harmful because people breathe the indoor air of their homes for more than half of their lives. At home, children are also exposed to tobacco smoke.

The International Agency for Research on Cancer, established by the World Health Organization, has reached the following conclusion on the risk of cancer associated with smoking: There is sufficient evidence that tobacco smoke is carcinogenic to human beings. In a report, "The Health Consequences of Involuntary Tobacco Smoking", the United States Surgeon General made the following conclusions:

1 Involuntary smoking is a cause of disease, including lung cancer, in healthy non-smokers.

2 The children of parents who smoke compared with the children of non-smoking parents have an increased frequency of respiratory infections, increased respiratory symptoms, and slightly smaller rates of increase in lung function as the lung matures.

3 The simple separation of smokers and non-smokers within the same air space may reduce, but does not eliminate, the exposure of non-smokers to environmental tobacco smoke.

The United States Environmental Protection Agency (EPA) has estimated that involuntary smoking may also increase the risk of cardiovascular diseases by 30 per cent. A similar estimate was made by the American Heart Association in 1992. Several epidemiological studies have shown that long-term exposure to tobacco smoke at home increases the risk of lung cancer and cardiovascular diseases by about 30 per cent.

If it is assumed that exposure to tobacco smoke, and the resulting morbidity, is more or less on the same level in Finland as in the USA, the following estimate on the effects of passive smoking in Finland is obtained on the basis of the estimate made by EPA:

– 700 deaths caused by cardiovascular diseases per year
– 60 deaths caused by lung cancer per year
– 2,000-5,000 respiratory tract infections per year among children under 18 months of age
– 3,000-16,000 cases of more aggravated symptoms per year among asthmatic children
– an increased risk that children showing no symptoms will develop asthma

– increased occurrence of respiratory tract irritation and secretory otitits media among children.

When assessed in the light of these figures, environmental exposure to tobacco smoke is a significant public health problem in Finland.

OBJECTIVES

- Indoor air conducive to health is ensured by building and by planning and controlling building.
- Residents themselves are able to prevent moisture damage and other health hazards in indoor air. They can identify problem situations and know how to act in these situations.
- Exposure of children and young people to tobacco smoke will diminish radically by the year 2000 and will cease by 2005.
- Exposure to tobacco smoke at workplaces and in public premises will cease, and customers at cafés and at restaurants are exposed to much less tobacco smoke.

ACTIONS

1 Moisture damage in buildings is repaired in order of urgency. Damage giving rise to health hazards is given priority. The funds for this are taken, among other sources, from the employment appropriations reserved for repair projects. (Ministry of the Environment, Ministry of Labour, owners of buildings)

2 The guidelines on building practices are supplemented with a section on the prevention of moisture damage, which covers the design, construction and repair of buildings. Any unresolved responsibility issues in regard to building are determined through legislation. (Ministry of the Environment, Ministry of Justice)

3 The existing educational organisations provide further training for professional groups responsible for health issues in accommodation. The main target groups are health protection personnel, building inspectors, doctors, builders, building designers, teachers in the building trade, maintenance and service personnel, housing managers and lawyers. (Ministry of Education, Ministry of the Environment, Ministry of Social Affairs and Health, Provincial Governments)

4 Research is continued in order to determine problems affecting indoor air, to ensure good quality of indoor air, to determine the health effects of materials, and to develop healthy methods of building. In addition to inventories of detached and semi-detached houses and blocks of flats, the situation is charted at least in day care centres, in schools and at workplaces. (Ministry of Education, Ministry of the Environment, Ministry of Social Affairs and Health, National

Public Health Institute, Academy of Finland, Technology Development Centre of Finland)

5 A smoke-free environment for children is promoted in schools and at child welfare clinics by giving practical instructions and by providing support for efforts to quit smoking. The labour protection, environmental and health authorities work together to disseminat- information and arrange campaigns for promoting smokefree workplaces and public premises. (Ministry of Social Affairs and Health Ministry of Education, Ministry of Labour, enterprises, National Research and Development Centre for Welfare and Health, Finnish Environment Institute, municipalities)

6 Information concerning recognition of health hazards in indoor air is enhanced through advice. Examination and treatment of people suffering from these hazards are made more efficient within the health care system. (Ministry of Social Affairs and Health, Ministry of the Environment, health care units)

URBAN AIR

BACKGROUND

Most impurities in urban air originate in traffic and in energy generation. Emissions from traffic are the most hazardous for health, because the emissions are close to people's breathing zone, especially in cities. Carbon monoxide concentrations in the centres of Finnish cities seldom exceed the maximum limits recommended by WHO. Emissions of nitrogen oxides by traffic showed a constantly rising trend during the 1980s, but in the last few years these emissions have fallen slightly, thanks to catalytic converters in cars and to new fuel grades. Sulphur dioxide emissions, which mostly originate in energy generation and industry, have been cut by approximately 80 per cent from the 1980 level.

Ozone in the lower atmosphere is formed through photochemical reactions, from emissions of nitrogen oxides and hydrocarbons. In spring and summer, ozone concentrations in Finland are from time to time high, especially in areas outside city centres. Most of the ozone comes from transboundary emissions, but the role of local emissions is not insignificant either. Ozone clouds carried by air currents from Central Europe have an effect, in particular, on ozone concentrations in southern Finland.

The concentrations of respirable particles in air are the highest in urban centres, where traffic is heavy, and in built-up areas that have large industrial or energy-generation plants emitting particles into the atmosphere. Most of the respirable particles entering the lungs come from exhaust gases and from stationary combustion processes, whereas the larger particles that remain in bronchi consist mainly of street dust.

In rush-hour traffic, the concentrations of exhaust gas compounds (carbon monoxide, nitrogen dioxide, hydrocarbons, particles) inside cars, buses and trams may become much higher than the outdoor air concen-

trations. This is because exhaust gases emitted by vehicles get inside vehicles through air intake blowers and escape back to outdoor air more slowly.

Epidemiological studies carried out in recent years have added considerably to our knowledge of the nature and extent of the effects of atmospheric impurities on health. Exposure to impurities in air may be connected, for example, with mortality, with the hospital treatment of people with respiratory and cardiac problems, with asthmatic attacks and use of medicine among people who have asthma, and with respiratory symptoms and infections among children. Children, elderly people and people who suffer from asthma and from other long-term lung diseases and cardiovascular diseases are more sensitive to the effects of many irritating impurities in air than is the healthy working-age population.

The WHO report "Concern for Europe's Tomorrow" assesses the effects of urban air impurities on health. The assessment concluded that the most serious hazards were associated with suspended dust and probably with its finer particles that originate in various combustion processes (exhaust gases from traffic, energy generation and industry). It is estimated that exposure to particles in European cities is responsible for:

- 1-2% of all deaths
- 7-10% of all cases of respiratory diseases among children
- 3-7% of new cases of chronic obstructive lung diseases
- 3-15% of new cases of asthma.

The WHO Regional Office for Europe has been drafting new air quality guidelines. In connection with that project, the working group studying the principal impurities in urban air published its interim report, according to which no guideline figures were set for total suspended particles, inhaled particles, fine particles and sulphate aerosols. This is because, according to the present research findings, it is not possible to define any specific value under which no health hazards would occur.

The European Union has also set targets for the quality of urban air. The air quality directives in force within the EU set forth the minimum requirements. This means that, if they so wish, Member States may set forth national air quality objectives that are stricter than the Community-wide regulations. With the exception of the ozone directive, the relevant EU directives date back to the 1980s. The Commission has started their revision. In summer 1995, the Council of the European Union adopted a joint stand concerning the framework directive on air quality. According to the joint stand, the new guidelines, recommendations and experts' opinions issued by WHO were approved as the starting point for drafting new derivative directives on air quality.

With the exception of the total suspended particles, the levels of impurity in the air of Finnish cities are probably somewhat lower than the average levels in Central and Southern European cities of the same size. However, some significant shot-term air quality problems occur in Finland, too, especially in the centres of the largest cities and in localities where there are industrial facilities. The cold climate affects the physical and chemical properties of atmospheric impurities, and the long, relatively cold winter is likely to enhance the population's sensitivity to the

effects of irritating impurities in air. For these reasons, it is important that air protection in Finland is based on up-to-date national air quality guidelines, which have been defined taking into account climatic and other special factors that affect health hazards. In 1996, the Council of State ratified the new guidelines, which were based on the proposal made by a working group that published its report in 1993. The guidelines are clearly stricter than the present EU directives and somewhat stricter than WHO's new preliminary recommendations for Europe. In future, too, national guidelines must always be subject to revision when important new research findings – whether national or international – have been obtained on the health hazards of air impurities. Air quality guidelines are an important tool in the planning and monitoring of local and regional air protection measures.

OBJECTIVES

- Air quality will improve in Finland. Cases where the maximum values defined in the air quality guidelines are exceeded will become significantly less common by the year 2000. In 2005, there will be no concentrations of impurities exceeding the guidelines in the atmosphere of built-up areas, except during unusual weather conditions.

- Emissions of exhaust gases and, above all, emissions of particles from vehicles are reduced.

ACTIONS

1 The air quality guidelines are always revised whenever enough new information about the health effects of air impurities is available. (Ministry of the Environment, Ministry of Social Affairs and Health, National Public Health Institute)

2 Emissions from buses and delivery vehicles in city centres are reduced in the long term, for instance, by promoting use of alternative fuels and modernisation of equipment and by substituting electric vehicles for the ones currently in use. For example, economic means of steering are applied here. Heavy road traffic is directed to areas where adverse effects can be minimised. (Municipalities, enterprises, Ministry of Transport and Communications, Ministry of Trade and Industry, Ministry of Finance)

3 Increased attention is paid to the health effects of atmospheric impurities in regional, community and traffic planning, in environmental impact assessment and in the processing of environmental permits, through more efficient education and co-operation between the authorities. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, Regional Environment Centres, Provincial Governments, municipalities)

4 By means of planning and construction, more opportunities are secured for living and moving in built-up areas without cars. As a consequence, public transport is improved and the options available for pedestrians and cyclists are enhanced; examples include routes for pedestrians and cyclists, city centres and streets reserved for pedestrians, or car-free zones. (Ministry of the Environment, Ministry of Transport and Communications, municipalities, regional federations)

3.3 FOOD

BACKGROUND

In Finland, ensuring the safety of food has been a focus of attention for a long time. From the international perspective, diseases that spread through foodstuffs, or the intake of hazardous substance with food, are not a major public health problem on the level of the Finnish population.

Finnish adults consume an average of 820 kilograms of food and drink per capita per year. Thus, food is a very important potential source of exposure in the human environment. Even slight changes in food safety may have a significant effect on human health.

The microbiological quality of food is controlled at various stages of the production chain. Statistical data on cases of food poisoning give a picture of the occurrence of pathogenic microbes. In reported cases of food poisoning, the most common causes have been *Clostridium perfringens*, Salmonellas and *Bacillus cereus*. However, on the basis of studies conducted in various countries, it can be estimated that statistics reveal only 1-3 per cent of illnesses contracted through food. In addition to the actual food poisoning symptoms, some bacteria may cause serious complications.

The safety of Finnish food with respect to chemical contamination is also at least satisfactory on the population level. The average intake of heavy metals is under 20 per cent, that of dioxins about 30 per cent, and that of pesticide residues under 10 per cent of the internationally adopted limit values. As to additives, the highest intake in relation to the acceptable daily intake is recorded for nitrites among children (89% of ADI). From the point of view of public health, salt is the most hazardous additive in Finland. Even though the intake of salt has fallen in the last few years, the figure is still high: for women on average 8 grams and for men 12 grams, while the target is 5 grams per day. The amounts of radionuclides and residues of veterinary medicines in food are monitored regularly, and no alarming concentrations have been discovered in recent years.

Various factors affect the safety of food consumed by Finns. For some hazardous agents, the nature of the risk, or the extent of the exposure, is not known well enough. Such agents and processes include certain microbes (e.g. the enterohaemorrhagic *Escheria coli*), chemicals that have oestrogenic effects, natural toxins (e.g. plant oestrogens), the ef-

fects of antibiotic residues on the development of microbes resistant to medicines, or hazardous substances generated during the processing of foodstuffs (e.g. mutagens appearing during frying). The possibility of antibiotic residues is mainly associated with imported foods, because the use and distribution of veterinary medicines in Finland are strictly controlled. Almost without exception, these medicines are only used to treat veterinary diseases. Use of veterinary medicines as artificial growth stimuli is prohibited.

The state of the environment has a marked effect on the accumulation of certain substances – such as heavy metals, pesticide residues and some other toxins – from the environment into foodstuffs (e.g. accumulation of mercury and toxins in fish). The safety of foodstuffs can be improved and people's exposure to these substances can be cut substantially by reducing contamination of the environment.

Maintenance of food safety will face many challenges in future. Increasing international trade may expose consumers to new microbiological and chemical agents at the same time as risk management is more and more tied in with international trade policy agreements. Since Finland's accession to the European Union at the beginning of 1995, no border control has generally been possible in trade on the internal market within the Union. Since the conclusion of the accession treaty, the main responsibility for the control of foods on the market has rested with the local authorities. The increase in tasks and the changes that have taken place in the nature of control require efficient supplementary training and sufficient resources in municipalities.

Reliance on the good standard of food safety may lead to excessively radical cuts in control when different bodies compete over scarce resources. Changes in consumption patterns may expose various consumer groups to new risks originating in food. Raw materials of new types and new origins are used to make foods, and their introduction calls for risk assessment. Changes in the traditional methods of foodstuff processing or extension of the distribution chains may also pose new risks.

OBJECTIVES

- Food is safe. Attention is also paid to the needs of children, elderly people and people whose resistance has weakened.
- Consumers can themselves assess the safety and healthiness of foodstuffs.
- Sufficient standard of food control can be ensured.

ACTIONS

1 The consumers' possibilities of obtaining sufficient information on the safety and quality of foods are ensured, for instance through a labelling system, taking into account the entire life cycle of the product. (Ministry of Trade and Industry, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Social Affairs and

Health, producers, municipalities, Provincial Governments, advisory organisations, National Consume Administration, National Food Administration)

2 Importation of animal feeds that contain salmonella and the spread of zoonoses are prevented in co-operation with enterprises and voluntary organisations. (Producers, the association for animal disease control, Ministry of Agriculture and Forestry)

3 The health effects of foods made of new kinds of raw materials and using new food production and processing methods (bioconervation and genetic engineering) are studied and monitored. (National Public Health Institute, National Veterinary and Food Research Institute, Technical Research Centre of Finland, universities, Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry of the Environment, municipalities)

4 The opportunities of citizens themselves to assess the safety and healthiness of foods is improved by teaching pupils in comprehensive schools more about the safety of food and by investigating the possibilities of devising an information service for consumers and producers. (Ministry of Social Affairs and Health, Ministry of Education, National Food Administration, National Veterinary and Food Research Institute, municipalities, industry, trade, consumers)

3.4 SOLID WASTES AND SOIL POLLUTION

BACKGROUND

Wastes and their utilisation and handling

It is estimated that some 90 million tonnes of waste is generated annually in Finland. The bulk of this waste, or about 54 million tonnes per year, originates from industrial operations, in which mining accounts for the highest waste volumes (36 million tonnes per year). Industrial waste proper comes to 15 million tonnes per year, most of which is produced in the pulp and paper industry and in the mechanical forest industry. Other major producers of industrial waste are the chemical industry and the metals and food industries. Wastes from agricultural sectors, about 22 million tonnes per year, mostly consist of dung from cattle and fur animals. Wastes from the building sector consist of land masses excavated during building, wastes from the building product industry as well as building and demolition wastes; these amount to roughly 1 million tonnes per year. A total of 3 million tonnes of community wastes, and about 0.5 million tonnes of hazardous wastes, are generated per year. The utilisation rate of wastes is 47 per cent. Wastes from the building sector and hazardous wastes are utilised the least.

Industrial wastes are generated both during production processes themselves and during the cleaning of emissions. Only a small pro-

portion of industrial waste is transported to public landfills; however, at landfills they may account for the bulk of all waste. In 1992, on average 59 per cent of the waste accumulated in industry was utilised either as recycled raw material or as energy. The utilisation rate varies considerably between sectors. Since wood-based waste accounts for a high percentage of industrial waste, utilisation of the waste to produce energy is more common than any other utilisation.

It is estimated that the utilisation rate of **solid community wastes** is on average about 30 per cent. In the main, the community wastes utilised are paper, cardboard, glass, metal and, to a slight extent, plastic. Centralised utilisation of organic waste by means of composting is being launched in most major urban areas. Composting of organic waste by individual house-owners has again become more common in recent years, and the importance of composting is expected to increase in the near future, especially in sparsely populated areas.

Community wastes are incinerated to a significant extent only at the waste incineration plant of the City of Turku. Incineration of sorted community wastes at energy generation plants and in industrial boilers is likely to increase steeply. In contrast, construction of mass incineration facilities for community wastes is fairly unlikely.

Most community wastes are still taken unsorted to landfills. There is wide variation in the structure and maintenance level of landfill sites. However, the level of foundation and maintenance at most landfill sites in use is not up to the standard specified in the relevant directive under preparation within the EU. The number of public landfills in use has decreased sharply in recent years.

The volume of sludge generated annually at **community** wastewater treatment plants is about 1 million cubic metres. Roughly 60 per cent of the sludge is composted and utilised in agriculture or in landscaping. The use of sludge for landscaping has increased in recent years, whereas its use in agriculture has fallen.

The bulk of waste classified as **hazardous waste** is generated in connection with industrial operations. Because of the risks that they pose, hazardous wastes place special requirements on waste collection, transport and treatment. Most hazardous wastes generated in Finland are treated centrally at the treatment plant owned jointly by the State, municipalities and industry. Industry's hazardous waste is also treated in connection with industry's own operations. Operations at the central treatment plant meet very strict requirements by international standards, the purpose being to prevent any environmental and health hazards that the operations might cause. The Finnish system still has certain deficiencies with respect to the recovery, collection and transport of small amounts of hazardous waste for treatment.

Soil pollution

Soil pollution may come about as a result of accidents, disturbances in operations or negligence. In most cases, soil pollution is caused by landfill operations, by negligence or laxity in connection with land extraction, by sawmills or by industrial effluents. The consequences of deteri-

orated soil quality may be manifested as pollution of groundwater and surface waters, or as risks or hazards that emerge via the atmosphere or via vegetation. Hazardous chemicals may remain unchanged in the earth for long periods of time or – under suitable circumstances – they may become even more hazardous. A polluted site cannot be used for its original purpose without restoration measures, and no plans can be made involving use of the site for housing or for some other useful purpose.

In Finland, about 25,000 sites are suspected of being polluted. Data on over 10,000 of these sites have been registered. The sites that have been left outside the register are in most cases small areas that only pose minor risks. Soil pollution has usually arisen through improper handling of chemicals or wastes. Some of the handling methods that were acceptable in the past have later proved to pose a risk to the environment. It is estimated that some 1,200 polluted land areas will be restored during the next 20 years. This figure includes 808 industrial sites, 334 landfills and 35 mining waste sites.

Health risks associated with wastes and waste management

Wastes and waste management involve health risks that are partly related to labour protection and partly general in nature. Health hazards may arise during the collection, transport, storage and treatment of wastes. The hazards are caused by pathogens in the wastes or by the hazardous or toxic properties or components of the wastes. Direct health hazards are most often occupational, whereas health risks caused indirectly through pollution in the air, water or soil encompass larger population groups.

Waste management personnel and workers handling waste within industry are exposed to direct risks stemming from wastes more than the rest of the population, particularly in connection with the collection, transport and treatment of wastes. An advanced collection system, waste containers that can be closed, regulations on how often waste containers must be emptied to eliminate health hazards, and instructions on the sorting of hazardous wastes and on separate collection have helped in advance to prevent health hazards. In most parts of Finland, collection vehicles are modern rubbish collection trucks with packing equipment or interchangeable platforms. The health risks encountered by workers in using these vehicles are mainly associated with occupational accidents and mishaps.

One measure through which communities can reach the principal objective of waste management, that is, reduction of the amount of wastes, is by cutting the volume of packaging used for products. Even though much can still be done to eliminate unnecessary packaging, it should be remembered that packaging is important for keeping products fresh and intact on their way from producers to consumers. When packaging is eliminated, any health risks that might ensue should be assessed.

Separation of organic waste from other wastes and its storage, especially during the warm season, may pose a health risk, particularly in built-up areas where considerable quantities of waste are accumulated.

These problems can be avoided by using tight containers that keep pests out and, in particular, by emptying the containers often enough.

In the main, utilisation and handling of wastes may cause indirect health risks. When untreated, waters that seep or leach from landfills are comparable to community waste waters and can contaminate groundwater and surface waters. Fires at landfill sites may increase exposure to airborne impurities near the sites. At open refuse tips it is also possible that zoonoses, such as *Salmonella*, have the chance to spread, for instance, when carried by birds. In addition, landfills may have other effects: more rubbish in the environment, unpleasant smells and a higher number of pests in the area.

When wastes are composted and digested in special facilities, indirect health hazards are usually easy to control. Treatment of the resulting waste waters and cleaning of the exhaust air are, however, necessary measures in order to avoid adverse effects. In small-scale composting, adverse effects may appear if the structure of the compost bin does not prevent pests from entering the compost, or if the compost is not aired sufficiently and suitable conditions for composting are not ensured. Health risks are always associated with the use of end products obtained from the biological treatment of organic wastes and sludges. Health hazards may arise when an imperfectly composted and unstable end product is used or when the compost product contains impurities, such as heavy metals.

Uncontrolled incineration of wastes may cause risks to health and to the environment. Incomplete combustion of mixed waste gives rise to hazardous organic compounds, such as chlorinated furans and dioxins. The chlorine in these organic chlorine compounds usually comes from NaCl in organic waste and from certain plastic grades. Particle emissions and the contents of some heavy metals in flue gases may also be considerable in incineration of unsorted waste. Emissions of organic chlorine compounds and heavy metals can be reduced markedly by sorting the wastes at their source so that components unsuitable for incineration are removed. Moreover, emissions can be reduced by technological means and by cleaning flue gases.

The Finnish Ministry of the Environment and the Regional Environment Centres have the statutory responsibility to draw up waste management plans. According to the objectives of these national and regional plans, waste volumes should be reduced and utilisation of wastes should be intensified, the detrimental effects of wastes should be alleviated and the health and environmental hazards caused by waste should be prevented.

OBJECTIVES

- The volumes of wastes, and the hazards posed by wastes, are rduced.
- The collection, transport, utilisation, treatment and disposal of wastes do not pose a hazard to the environment or to health.
- Areas of polluted soil do not pose risks with respect to environmental health.

ACTIONS

1 National and regional objectives and regulations are set in order to eliminate and minimise the environmental and health hazards posed by wastes. Less waste is generated; the quality of waste collection, transport and treatment is improved; and utilisation of wastes is increased. (Municipalities, enterprises, Ministry of the Environment, Ministry of Social Affairs and Health)

2 The safe handling of wastes of an infectious nature and other special wastes originating in the health care sector is promoted through measures taken by hospitals and health centres themselves. (Hospital districts, municipalities)

3 Products based on waste material are developed so that they pose the minimum of risks to the environment and health. (Regional Environment Centres, research institutes, universities, Ministry of the Environment)

4 Any health hazards that might be caused by polluted land areas are always assessed before the area is put to residential or some other use through town planning or construction. (Ministry of the Environment, municipalities, regional councils)

5 Methods for cleaning polluted land areas and methods for risk assessment are developed by means of research and development. (Research institutes, universities, Ministry of the Environment)

6 Citizens' awareness and preparedness to sort and to handle wastes in a proper manner is increased. Sorting of wastes is made easy. (Municipalities, Ministry of the Environment, Regional Environment Centres)

7 Use of product labels and specifications is increased to make it easier to recognise materials that are hazardous as wastes and, whenever necessary, restrictions are introduced concerning the manufacture and use of products. (Manufacturers, importers, international agreements, authorities, Ministry of Trade and Industry, Ministry of the Environment, Council of State)

8 Land areas in need of urgent restoration are mapped, and real estate owners are required to restore the land areas that are already known to be polluted. Land areas that have no owners are restored as State waste management projects. (Ministry of the Environment, Regional Environment Centres, municipalities)

3.5 RADIATION

Most radiation exposure in Finland comes from natural sources, especially from radon in indoor air. Finns are under no direct radiation risk caused by human activities. For instance, the radiation dose from the

Chernobyl nuclear power plant accident accounts for only a few per cent of the total radiation dose from natural background radiation and from cosmic radiation received by Finns during their lifetime. The standard of radiation safety is very high in Finland. The history of radiation protection and the dissemination of information and advice to the general public go back a relatively long time.

According to measurements and estimates made by the Finnish Radiation and Nuclear Safety Authority, the average annual dose of ionising radiation comes to approximately 3.7 mSv (= millisieverts) in Finland (1995/1996). This dose is distributed as follows:

–	indoor radon	2.0 mSv
–	outdoor radiation from the ground	0.5 mSv
–	cosmic radiation from space	0.3 mSv
–	natural radioactivity in the body	0.3 mSv
–	x-ray diagnostics	0.5 mSv
–	radionuclides in diagnostics	0.04 mSv
–	Chernobyl fallout	0.04 mSv

This estimate does not include radiotherapy. In 1987, the year after the Chernobyl accident, the dose from the fallout was roughly one order of magnitude higher than in 1995. It has been estimated that the radiation dose received by an average Finn from the Chernobyl fallout will amount to about 2 mSv within 50 years.

The purpose of radiation protection is to prevent and to limit health hazards and other adverse effects caused by radiation. Use of radiation and other operations causing radiation exposure must be planned so that the benefits gained exceed the hazards resulting from the operations (justification principle), that exposure is kept as low as reasonably achievable (ALARA principle), and that an individual's radiation exposure does not exceed the maximum values set (principle of dose limits for individuals).

Because the risk associated with radiation exposure, that is, the probability of adverse health effects, is not a simple or precisely known figure, the ALARA principle plays a central role in radiation protection. In consequence, the application level of the ALARA principle is under constant change as new information is accumulated and the potential of taking practical protection measures is improved; the basic reason is simply that no absolute level of safety (dose limit) can be defined for ionising radiation. Instead, the effects of non-ionising radiation are usually manifested above a certain threshold value.

Specification of the adverse health effects associated with exposure to small radiation doses, preparedness for accidents, dissemination of information on accidents, and planning of the correct radiation protection measures call for combination of resources on the international level.

The following is a list of the types of radiation exposure that are of importance to environmental health. The health hazards are presented on the basis of the currently existing knowledge.

3.5.1 RADON AND OTHER NATURAL RADIOACTIVE SUBSTANCES

The average radon content of Finnish homes, approximately 120 Bq/m^3, is the highest national average in the world. The natural radioactivity of groundwater is also clearly higher in Finland and in Sweden than elsewhere in Europe; in particular, the radioactivity of water drawn from wells drilled in the bedrock in some Finnish localities is among the highest in the world. Exposure to radon causes lung cancer. It is estimated that radon in the home environment causes from a couple of dozen to several hundred cases of lung cancer per year in Finland. In addition, radon in the working environment increases the number of cancer cases by ten per cent.

Exposure to naturally occurring radionuclides also takes place via drinking water. In all, the overall radiation dose recived by Finns from natural radionuclides amounts to some 730 manSv per year. If repairs were conducted in all homes where the maximum value (400 Bq/m^3) is exceeded, the average radon content in Finland would fall by 19 per cent and 66,000 homes would have to undergo repairs. If an annual dose limit of 0.5 mSv were applied to all sources of drinking water, and concentrations giving rise to higher doses were eliminated by means of water purification, the overall dose caused by radioactive substances in drinking and cooking water would be cut by more than half.

It is estimated that, out of the cases where the maximum concentration of radon in indoor air (400 Bq/m^3) is exceeded in old buildings, less than 10 per cent are known (measured); of these, one in ten has been repaired. According to current regulations, new homes must be designed and built so that the annual average radon concentration does not exceed 200 Bq/m^3. The objectives set for safe drinking water by virtue of the Radiation Act apply to the radioactivity of water distributed by water processing plants, intended for sale, or used for making foods. The objectives do not apply to water for personal use. Whenever necessary, exposure to radioactive substances in drinking water can be reduced by means of technical solutions. An effort is made to introduce water sources that would replace drilled wells.

OBJECTIVES

- Exposure to radon and to other naturally occurring radioactive substances is reduced at home and at work so that the limit values set are not exceeded.

ACTIONS

1 Exposure to radon and to other naturally occurring radioactive substances is reduced, the problem areas are mapped, and prevention of the hazard is taken into account in town planning, in the planning of water supply, in renovation and in new building projects. Information and education are used as additional preventive measures. (Ministry of Social Affairs and Health, Ministry of the Environ-

ment, Finnish Radiation and Nuclear Safety Authority, municipalities)

2 The most essential research needs are: specification of risk estimates (especially as concerns the health effects of radioactive substances in drinking water); development of methods for radon repairs and water purification and of methods for eliminating radon in new buildings, and assessment of the efficiency of these methods; assessment of radon contents and exposure at home and at work; and use of hydrogeological data and radiometric mapping in predicting the radioactivity content of water from drilled wells. (Ministry of Social Affairs and Health, Ministry of the Environment, Finnish Radiation and Nuclear Safety Authority, research institutes, municipalities)

3.5.2 NUCLEAR SAFETY AND NUCLEAR WASTE MANAGEMENT

Use of nuclear energy in Finland has not caused radiation exposure that would have affected the environment or health. The risk of a severe nuclear accident is very low in Finland. Similarly, operation of the reactors situated in areas adjacent to Finland will most likely continue without any serious accidents, or without any major radioactive emissions, until the end of their service lives. There are about ten reactors in the vicinity of Finland, and their service life is 30-40 years. The basic structure of these power plants is less safe than that of the Finnish nuclear power plants, for instance, because they do not have a containment structure. This applies to both the 'Chernobyl-type' RBMK graphite reactors (Sosnovyi Bor) and water reactors (VVER in Kola). In the nearby areas, the risk of a severe accident probably ranges from a few per cent to some tens of per cent (as much as 1/1,000 reactor years). Should a severe nuclear accident take place, the ensuing radiation hazard might, in the worst of cases, affect all functions of society. In addition to health hazards, the situation would have serious economic and social consequences. Emissions from a nuclear accident can spread over several states.

In Finland, nuclear waste comes from two nuclear power plants and one research reactor. In previous years, spent fuel from the Loviisa reactors used to be taken abroad for reprocessing and disposal, while the rest of the radioactive waste was placed in interim storage at the plant site. Disposal of high-level nuclear waste in Finland will become topical around the year 2020. Very strict safety regulations are applied to waste that comes from nuclear energy generation and that poses a radiation risk. Although, according to present knowledge, disposal of nuclear waste in bedrock is safe, site investigations must still be continued to attain certainty. One suggested alternative to disposal in bedrock is long-term storage under supervision. However, this kind of storage has the drawback that it will require constant care, even in future societies. The Finnish nuclear energy legislation includes the 'polluter pays' principle, according to which the producer of the waste must answer for nuclear

waste management and for the resulting costs. The money needed for nuclear waste management in future is collected in the State Nuclear Waste Management Fund. Altogether FIM 6.5 billion will be accumulated for this purpose; of this, about FIM 4 billion has been collected through inclusion in the price of electricity generated by nuclear power. In all, the estimated cost of nuclear waste management by the Finnish nuclear facilities will amount to around FIM 9 billion. The regulatory authorities have the duty of ensuring that provision for nuclear waste management is made in time and in an appropriate manner. According to Finnish law, the opinion of the municipality where the disposal site is planned to be located must be considered when the decision on disposal is made. The decision on the project will be made by the Council of the municipality where the disposal facility would be located.

OBJECTIVES

- Use of nuclear energy must be safe and should not pose a risk to people, to the environment or to property.

- Nuclear waste must be isolated from the environment so effectivly that it does not present a threat to human health or to living nature, even over long periods of time.

ACTIONS

1 The primary task is to prevent accidents at nuclear facilities in advance: the high standard of nuclear safety is maintained in Finland, and a contribution is made to promoting safety and to reducing accident risks in facilities situated close to Finland. (Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry for Foreign Affairs, Ministry of the Environment, Finnish Radiation and Nuclear Safety Authority, power companies)

2 Operative preparedness for nuclear accidents is developed and research on the efficiency and applicability of countermeasures is intensified. International co-operation is furthered in the fields of information exchange and preparedness planning. (Ministry of Social Affairs and Health, Ministry of the Interior, Finnish Radiation and Nuclear Safety Authority, municipalities)

3 Finland supports the proposals made in the Helsinki Declaration. Accordingly, the resources available to WHO and ECEH are strengthened when provision is made for collection and dissemination of information on public health in a post-nuclear accident situation and when views are expressed on the health effects of radiation. (Ministry of Social Affairs and Health, Ministry for Foreign Affairs, Finnish Radiation and Nuclear Safety Authority)

4 The target in all stages of nuclear waste management is a code of safety of a high standard and high quality. In addition, citizens'

opinions, technical feasibility and economic factors are taken into account when planning disposal of nuclear wastes in Finland. (Ministry of Trade and Industry, Council of State, Ministry of Social Affairs and Health, Finnish Radiation and Nuclear Safety Authority, power companies)

5 Illegal transports of radioactive materials are prevented by means of international co-operation. (Ministry of Trade and Industry, Ministry for Foreign Affairs, Finnish Radiation and Nuclear Safety Authority, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of the Interior, the customs authorities

3.5.3 NON-IONISING RADIATION

The sun's ultraviolet radiation causes an estimated 100 cases of fatal cancers – mostly melanomas – per year among Finns. However, a considerable proportion of the UV radiation exposure leading to cancer is obtained outside Finland, above all at southern holiday resorts. The number of all cancers caused by the sun's UV radiation is many times higher than the above figure because UV radiation can be considered to be the reason behind most other skin cancers (basal cell and spinous cell carcinomas). These cancers, however, rarely lead to death. UV radiation may also cause cataracts and, in high doses, acute conjunctivitis ("snow blindness"). The effects of depletion of the ozone layer in the upper atmosphere are discussed in section 3.10.

Because technological devices (electrical appliances, data communications equipment, power cables, mobile phones) have become more common, people's exposure to electrical and magnetic fields and to radio-frequency radiation has increased steadily.

The potential health effects of low-frequency electrical and magnetic fields have been studied actively in recent years. Some epidemiological studies have suggested that the magnetic fields of power cables might have a link with leukaemia and brain tumours. However, the effect mechanism, if any, is still open. A typical background magnetic field in Finnish homes is about 0.1 μT. From the viewpoint of the exposure of the entire population, the principal sources of magnetic fields are electrical cables and earth connections in buildings as well as electrical appliances. Relatively strong electrical and magnetic fields occur at certain workplaces (e.g. transformer stations, induction heating). With the exception of working environments, the population's exposure to strong electrical and magnetic fields is rare. Exposure caused by power cables is significantly lower than the fields caused by electrical appliances at home and by transformers in blocks of flats. It is, however, justified to exercise precaution by limiting long-term exposure to electrical and magnetic fields as much as is technically and economically feasible. This fact must be taken into account in planning, zoning and building.

OBJECTIVES

- Exposure to electromagnetic radiation in Finland is not so high as to result in any health hazards.

ACTIONS

1 Awareness of the risks of, and protection against, UV radiation is increased through education, information and instructions. People are instructed to avoid excessive sunbathing (sunburns and permanent tan). Consumers must be informed of magnetic fields caused by electrical appliances at home. (Ministry of Social Affairs and Health, Ministry of Trade and Industry, Finnish Radiation and Nuclear Safety Authority, National Consumer Administration, health authorities in municipalities)

2 Keeping the electrical and magnetic fields on a low level in homes is taken into account in the planning of power lines, location of transformer stations, town planning and building. (Enterprises, municipalities)

3 Research into the health hazards of various electrical and magnetic fields is continued, and the population's exposure is monitored as a possible consumer protection issue. (Ministry of Trade and Industry, Ministry of Social Affairs and Health, Finnish Radiation and Nuclear Safety Authority, National Consumer Administration)

4 Systems for measurement of UV radiation are developed and UV radiation research is continued. An active contribution is made to the development and introduction of international safety standards. (Ministry of Social Affairs and Health, Ministry of Trade and Industry, Finnish Radiation and Nuclear Safety Authority)

3.6 AMBIENT NOISE

BACKGROUND

Noise is a part of our everyday environment. It is one of the most common environmental health hazards in Finland. The most usual sources of ambient noise are traffic, industry, energy generation and building. Some leisure activities, such as shooting and motor sports, and equipment in buildings are also included in this group. Noise means a sound that a person finds unpleasant or disturbing or that poses a risk to health in some other way or poses a hazard to general well-being. Noise may be disturbing, it may interfere with sleep, may make communication more difficult and may cause stress and other health hazards. Noise also has a negative effect on learning, on functional capacity and on behaviour.

So far no comprehensive survey has been conducted on the noise situation in the whole of Finland. Nor are there comprehensive data on

exposure to noise. According to studies made by the National Road Administration and the Advisory Committee on Noise Prevention, noise arising from road and street traffic exposes some 900,000 to 1,000,000 people in Finland to a level in excess of 55 decibels (dBA). An estimated 500,000 people in Finland experience road traffic noise as a disturbing factor in the environment where they live. Some 300,000 people in Helsinki live in an area where the average daytime noise level exceeds 55 dBA. According to an interview, 77-79 per cent of people who lived by a busy street in central Helsinki, and 25 per cent of people who lived by a quieter street, found noise disturbing. A questionnaire on the health effects of ambient noise revealed that, at one time or another, some 12 per cent of middle-aged Finns have lived in a dwelling where noise has interfered with normal conversation.

The hazards caused by air traffic noise have increased owing to the increase in air traffic. Once the noisiest aircraft types are removed from use in 2002, noise hazards will be alleviated. Thereafter, the trend in air traffic noise will greatly depend on the general trend in air traffic.

It is estimated that ambient noise and exposure to noise will become more widespread in Finland in future. The increase in traffic and the use of more equipment and machines will raise the noise level. Quiet areas will become smaller and sparser. Increased exposure to noise will also aggravate health hazards among the population.

The effects of noise on falling asleep and on the quality of sleep appear clearly when the sleeping period includes several occurrences of noise exceeding 45 dBA. It is estimated that about one million Finns are exposed to such noise during their sleep. Noise impairs the duration and quality of sleep for hundreds of thousands of Finns. The effects may be manifested as fatigue, dispiritedness or impaired functional capacity. After-effects from sleep disorders are particularly common among people sensitive to noise, who account for about one-third of the population.

The research findings concerning the effects of ambient noise on hearing are somewhat contradictory. It is possible that particularly sensitive people may develop hearing impairment over a long period of time when the average noise level exceeds 75 dBA. Noise levels of this kind can be measured in the immediate vicinity of busy streets and roads and near airports. According to the latest research findings, the risk of hearing impairment may also be present when listening to music through headphones or when engaged in leisure activities in noisy environments, such as discotheques. The combined effect of noise at the workplace and in the living environment may rise as high as to impair hearing. A recent questionnaire survey showed that half of Finnish school children between 14 and 17 years of age were exposed to noise levels of over 85 dBA during their leisure activities. According to the international noise standards, lifetime exposure to this noise level causes a risk of hearing impairment.

A good aural environment is one that an individual finds pleasant. A good sleeping environment should not have noise exceeding 30 dBA or even any quieter sounds that would wake the sleeper up. In a good working environment, sounds help maintain a state of alertness but if the work requires concentration, sounds may be very disturbing. One of

the goals of noise prevention work is to ensure the possibility of enjoying silence and sounds of nature.

OBJECTIVES

- The areas where the recommended noise level is exceeded do not become larger and quiet areas are preserved.
- The number of people living in areas where the average noise level of 55 dBA is exceeded becomes smaller.
- The noise level of noisy leisure activities, such as discotheques, sports events and restaurants, is reduced.
- Transport vehicles and machines emit less noise.

ACTIONS

1 The national noise situation is charted. (Municipalities, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications)

2 Municipalities compile noise prevention programmes and the necessary noise prevention measures are taken. (Municipalities, originators of noise)

3 Regulations on town planning and building are developed so that they can be used more effectively to prevent noise hazards. The objectives of noise prevention are taken into account in planning the use of areas and in building and traffic planning. (Ministry of the Environment, Ministry of Transport and Communications, regional councils, municipalities, Regional Environment Centres)

4 The exposure of children and young people to noise is studied and the necessary measures are taken to minimise this exposure. (Ministry of Education, Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

3.7 CHEMICALS

BACKGROUND

Finnish industry is primarily an importer and user of chemicals. Out of the chemicals and chemical industry products imported to Finland, the bulk is reused in industrial processes. The major users of chemicals are oil refineries, the petrochemical industry, the plastics industry, manufacturers of basic industrial chemicals and fertilisers, and manufacturers of pulp and paper. The chemical industry is Finland's fourth biggest indus-

trial sector, coming after the metals, forest and food industries. There are some 400 enterprises in the chemical sector in Finland.

The largest categories of imported chemicals are resins and raw materials for plastics, other basic chemicals and pharmaceuticals. More or less the same categories also top the list of exported chemicals.

Transports of hazardous substances in Finland amount to some 10 million tonnes on roads and some 7 million tonnes on railways. More than half of this volume consists of chemicals in transit traffic. Liquid fuels, petrol and fuel oil account for 80 per cent, and corrosive substances for about 14 per cent, of all hazardous substances transported. The rest is divided between other hazardous substances. Tankers carry about 3.5 million tonnes of chemicals and about 15 million tonnes of oil per year by sea. It is estimated that over 260,000 tonnes of packed hazardous chemicals are transported annually through Finnish ports. Most of the substances that come to Finland by sea are transported further by road. Oil products are no longer transported on Finnish lakes and rivers.

EXPOSURE TO CHEMICALS

Risks posed by chemicals are usually assessed, for each substance, by comparing the concentrations or doses that are known to be hazardous against the exposure to these concentrations or doses. It is difficult to study the population's overall exposure to chemicals and the effects of this exposure. Individuals' exposure to certain substances varies over a wide range, and so does individuals' sensitivity to the effects of these substances. The exposure of certain population groups to substances such as pesticides, PCB and dioxin compounds, and additives in food, has been studied in Finland. Most studies have, however, focused on exposure to heavy metals. The average intake of lead is 60 micrograms per day and the average intake of cadmium 10 micrograms per day. These figures are clearly lower than the intake levels that are considered harmful. The above estimate is based on amounts received from smoking, from urban air and from drinking water. Exposure varies greatly between individuals. The concentrations of chlorinated and aromatic compounds in human fatty tissues, revealed by a Finnish study, are also lower than the results reported in most other countries. It is thought that the increased use of chemicals and the higher volumes of chemical substances are linked with the rise in the number of allergies, with cases of poisoning and, in some instances, with the elevated risk of cancer.

The levels of impurities in the working environment are often considerably higher than elsewhere in the environment. The working environment may also contain chemicals and impurities to which exposure elsewhere in the living environment is rare or slight. The population's occupational exposure to chemicals is well reported in Finland. The most common materials to which workers may be exposed during their work are mineral and metal dusts, organic and inorganic gases and vapours, solvents, plastic and rubber chemicals, pesticides, dyes and organic dusts. The most common carcinogenic substances in the working environment are chromium (VI) compounds, nickel compounds and asbestos.

Inappropriate management of chemical wastes has resulted in hundreds of cases of soil or groundwater contamination in Finland. The consequent exposure of the population and the environment has in some cases been locally significant. Similarly, contamination that has taken place a few decades ago – for instance, pollution of the soil by slowly decomposing wood preservation agents – may still pose a health risk.

PREVENTION OF CHEMICAL HAZARDS

Finland has a long history of health care and labour protection legislation. Legislation, and effective enforcement of laws and regulations, have made it considerably easier to introduce efficient precautions for the use of chemicals, especially at workplaces. At present, the Finnish legislation on chemicals is based on harmonised EU laws. Hazardous chemicals have been classified and labelled and provided with instructions for handling and use. In addition to the legislation on environmental protection and the legislation on chemicals, handling of harmful chemicals is regulated by many other statutes as well. The principal statutes are included in the labour protection legislation and in the legislation on the transport of hazardous materials. Hazards caused by chemical wastes are prevented by means of the Waste Act. Control of chemicals has been divided between many authorities in Finland.

The objective of chemicals control is to minimise and to control any environmental and health risks posed by chemicals. Among other things, the Chemicals Act requires that the manufacturer and the importer are aware of the health and environmental effects of a chemical to the extent necessary for fulfilling the obligations set down in law. The regulatory authorities have the right 1) to receive data from the enterprise as required by control, 2) to conduct inspections, 3) to take samples, and 4) to perform studies.

The Chemicals Act also sets the general requirement for the enterprise to exercise diligence and care in the handling of chemicals, in order to prevent health and environmental hazards. The requirement to exercise care has been supplemented with a restoration requirement, which means that the enterprise is obligated to clean the structures and the environment contaminated by a chemical so that they no longer pose a risk to health or to the environment.

Chemicals are classified and labelled for the purpose of warning workers and consumers of the dangers posed by the chemicals. A classification system for chemicals dangerous for health has been in use for a long time. Flammable or explosive chemicals have had their own established classification system. Classification of substances dangerous for the environment began in Finland in 1993. A system for the classification of mixtures dangerous for the environment is currently being prepared within the European Community.

In addition to classifying hazardous chemicals, information must be given as to their safe use. The information sheet is more detailed than the package label and contains data on the properties of the chemical and instructions for safe use and for handling of the chemical as waste.

The Waste Act also includes the responsibility for prevention of environmental hazards for the entire life cycle of products.

The manufacture, importation or use of the most dangerous chemicals can be restricted by virtue of legislation. Advance approval must be acquired for chemicals in certain product categories, such as protective chemicals and pesticides. Before introducing a new substance onto the market, an enterprise must notify the authorities thereof. The manufacturer or the importer must specify the dangerous properties of a chemical before its marketing is started. The authority that handles the permit or notification ensures that the properties of the chemical have been studied thoroughly enough. Whenever called for, the authority may refuse approval of the chemical, or may set conditions or restrictions for its use.

More than 50 Finnish enterprises have committed themselves to the chemical industry's environmental, health and safety programme "Responsible Care". The starting point of the programme is to inspire self-motivated action and constant improvement among enterprises in their environmental, health and safety programmes. The programme consists of various themes, such as process and transport safety, quality of products, waste management, and emissions.

INTERNATIONAL CO-OPERATION

The Finnish authorities participate in international co-operation in various sectors: research into the properties of chemicals; development of research methods; compilation of statistics and registration of data; risk assessment, and planning and decision-making in regard to measures to reduce risks. The bodies involved in this co-operation include the OECD, UNEP, the International Chemical Forum, and Nordic co-operation bodies in the chemicals sector.

As a Member State of the EU, Finland participates in preparation of the Community acts concerning chemicals. Restrictions concerning the use of chemicals, made on the basis of health and environmental hazards, and approval of exceptions – whether permitting or denying an action – always call for a proposal based on evidence. Drawing up these proposals requires that the authorities have access to sufficient evidence supporting the proposals. Prohibitions and restrictions must be based on risk assessment. For Finland, it is particularly important to study how the Northern natural conditions affect the availability, decomposition and toxicity of hazardous substances, and the exposure of the population to these substances. For reaching this objective, Nordic co-operation is of utmost importance

OBJECTIVES

- Use of chemicals does not cause a hazard to the environment and health and does not lead to deterioration of the state of the environment.

- Handling, transport and storage of chemicals and chemical wastes is safe.

- Advance prevention of accidents involving chemicals is efficient; should accidents occur, exposure of the population and the environment to dangerous substances can be minimised.

ACTIONS

1 An active part is taken in the preparation of acts, regulations, agreements and recommendations on chemicals within the European Union and within the major international organisations; the relevant national and Nordic preparatory work for this purpose is made more efficient. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Trade and Industry, Ministry of Transport and Communications, Confederation of Finnish Industry and Employers, National Public Health Institute, Finnish Environment Institute, National Product Control Agency for Welfare and Health)

2 Intensification of studies on how the Northern natural conditions affect the biological availability, decomposition and toxicity of hazardous substances, and the exposure of the population to these substances. A contribution is made to international research focusing on compounds that enter the environment and have an oestrogenic effect and on the importance of these compounds for nature and people. (Ministry of the Environment, Finnish Environment Institute, Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, Academy of Finland)

3 The legislation on chemicals is supplemented with a substitution principle, according to which the manufacturer, importer or user of a chemical should, whenever possible, replace a dangerous chemical with less dangerous chemicals. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Trade and Industry, Ministry of Labour)

4 Transport and concentrations of hazardous substances that occur in the environment are monitored more closely, an inventory is made of operations that are liable to pose a risk, and the resulting risks are assessed. (Ministry of the Environment, Finnish Environment Institute, Ministry of Social Affairs and Health, Ministry of Labour, Ministry of Trade and Industry, Ministry of Agriculture and Forestry, local authorities)

5 Information systems on chemicals and compilation of statistics on the use and emissions of harmful substances are developed. The information is used for the recognition and reduction of risks posed by chemicals. (Ministry of the Environment, Finnish Environment Institute, Ministry of Labour, Ministry of Social Affairs and Health, Ministry of the Interior, Ministry of Transport and Communications)

6 Attention is paid to information and education directed at the public, at industry and at enterprises. Basic, further, and supplementary

training and education in labour protection and in vocational issues is provided. In addition, practical exercises are needed to prepare for accidents and to prevent environmental and health hazards caused by harmful substances during the use, storage and transport of chemicals. (Ministry of Social Affairs and Health, Ministry of Labour, Ministry of the Environment, Ministry of the Interior, Ministry of Transport and Communications, administrative sectors of the Ministry of Education, and Confederation of Finnish Industry and Employers)

3.8 ENVIRONMENTAL ACCIDENTS

BACKGROUNDS

Environmental accidents are exceptional situations that require rapid and expert action and efficient collaboration between the authorities. It is of particular importance to prevent casualties and the risk of such casualties. In Finland, these situations may come about as a result of radiation, chemicals or microbes. Health hazards may arise from environmental pollution, either as a consequence of a sudden accident or through a more prolonged process of continual exposure. Most exceptional situations have come into light so, that it has been suspected that people have been exposed to an environment-based hazardous factor, for instance, via drinking water. In such a case, investigations have focused on determining the health hazard caused by the exposure. In rarer events, the first indications of an exceptional situation have been cases of illness that are suspected to have arisen from environmental exposure. In all, about one hundred exceptional situations of this kind occur in Finland annually. Roughly half of these cases involve health hazards or considerable material costs. A few serious large-scale accidents occur yearly. The probability of natural disasters is slight in Finland.

Accidents and their effects can be diminished principally by means of advance prevention, that is by minimising the probability of a hazard. Effort is made to foresee factors that involve a risk of accident. These factors are taken into account in town planning and in other forms of community planning, such as in the building of protective barriers for groundwater areas and in the design, maintenance and servicing of processes and equipment. International agreements – and procedures and markings specified in these agreements – are complied with when hazardous substances are handled. When hazardous substances are transported, the transport modes, routes and times are chosen so as to minimise the risk of accidents. Despite all these measures, for example, raw water sources are at risk of contamination as a result of accidents. To diminish this risk, a programme on planning protective measures has been drawn up; the first steps in implementing this programme have already been taken. An important aspect of advance prevention is to ensure that people responsible for the handling of substances receive sufficient education.

Despite precautions, accidents may still occur in the handling of hazardous substances. Successful control and mastery of exceptional situations requires that provision has been made for these situations in advance, that the magnitude of the potential health hazards is known, and that preparedness, precautionary and preventive measures needed for eliminating the health hazards have been planned. In addition, sufficient dissemination of information must be ensured. In Finland, responsibility for the advance prevention of environmental accidents and for procedures during accident situations is divided among a large group of actors. It is therefore important that all actors know their own responsibilities and are able to work in co-operation with each other.

Responsibility for the prevention of large-scale accidents and for the maintenance and development of preparedness is vested in the relevant enterprises, the rescue authorities, the health and environment authorities and several other bodies. Responsibility for national preparedness in exceptional situations involving environmental health is vested in the Ministry of Social Affairs and Health, which works in co-operation with other official bodies and with research institutes in the sector. The environmental health care authorities participate in the advance prevention of accidents, in the charting of factors giving rise to exceptional situations, in the drafting and maintenance of preparedness and contingency plans, in exercises preparing for exceptional situations, in the dissemination of information and in the provision of instructions for the public in co-operation with other authorities. The health care authorities are responsible for the examination and treatment of people who have been exposed to harmful substances and who have become ill. Finland has a regional, on-call system of social welfare and health care and rescue operations; this system is also prepared to manage situations jeopardising the environment and health. There are regional and national plans for joint operations in the event of major accidents. Responsibility for managing the situation in a sudden accident rests with the rescue organisation. The Finnish Environment Institute and the Regional Environment Centres have the necessary preparedness to investigate environmental accidents, and the health care organisation is equipped to assess health effects. The principle is that the body normally responsible for operations also handles exceptional situations.

In previous years, investigations in exceptional situations have been slow to start, but recently some improvements have been made in this respect. One reason for the slowness has been uncertainty about the allocation of costs. By law, the party that has caused the accident is responsible for any resulting hazards to health or to the environment. However, it has not always been possible to show who has caused the accident, and investigations have therefore been delayed. Investigations to determine health hazards must be started immediately when an accident has occurred. Taking samples does not usually involve any major costs. The necessary samples of the environment and of people who have been exposed to the accident must be taken immediately even if it is not known who in the end will be responsible for the costs. In their budgets, the authorities should be prepared for launching investigations. Whenever necessary in order to launch urgent investigations, it has been possible

to use the resources and expertise of government agencies and research institutes.

In 1994, the European Commission approved a proposal for a Council Directive on the Control of Major Accident Hazards Involving Dangerous Substances. The directive, commonly known under the abbreviation COMAH, replaces the earlier corresponding directive ('Seveso Directive'). The new directive strives to prevent accidents caused by dangerous substances and to limit their consequences to people and to the environment. According to the COMAH Directive, an enterprise that handles dangerous substances must draw up a plan for the prevention of accidents and must inform the public of operations involving a risk. If an enterprise possesses large quantities of dangerous substances, it must prepare a safety report. The public has the right to participate in the licensing process, to be informed of the safety studies conducted and to be informed of the substances posing a risk to the environment or to health that are used by enterprises. On the basis of the COMAH Directive, the public must also be informed of local rescue plans covering the area of a municipality.

OBJECTIVES

- The objective is to minimise and to control the risks of environmental accidents in advance and to ensure correct and efficient operations in accident situations.

ACTIONS

1 Data on expert institutes for exceptional situations are maintained in a file that is available to the authorities and to enterprises. The file is utilised in exceptional situations by sending a message immediately to the institutes concerned. (Ministry of the Interior, Ministry of Social Affairs and Health, Ministry of the Environment, National Public Health Institute)

2 The operational prerequisites of preparedness units under national and regional authorities to deal with exceptional situations involving environmental health are developed by establishing liaison networks on the regional level for this purpose. (Ministry of the Interior, Ministry of Social Affairs and Health, Ministry of the Environment, Provincial Governments, Regional Environment Centres)

3 Local preparedness plans are developed and compiled, and they are kept up-to-date. The workability of the plans is tested by means of practical exercises. On the basis of these exercises, the public is informed of local hazards, preparedness plans, precautionary measures and correct action in accident situations. (Municipalities, enterprises)

4 Education is arranged to maintain preparedness for exceptional situations involving environmental health and to ensure correct ac-

tion in these situations. Various sectors contribute jointly to this education, which is prepared in co-operation between universities, other institutes of education, the Ministry of the Interior, the Ministry of Social Affairs and Health and the Ministry of the Environment.

3.9 ACCIDENTS

Accidents cause premature death, disability and decreased functional capacity more than any other single factor originating in the environment. About a million accidents occur in Finland every year, taking nearly 3,000 lives. The total cost of accidents to society comes to over FIM 20 billion per year. Two-thirds of accidents take place at home and during leisure. The number of accidents at work and in traffic has been falling, whereas the number of accidents at home and during leisure has been rising. By international comparison, the situation in Finland is unfavourable. Finland has the highest accident figure among the Nordic countries.

Accidents arise through the combined effect of environmental factors and human factors. The Environmental Health Action Plan pays particular attention to the environmental factors that give rise to accidents in Finland.

The advisory committee on traffic safety has drafted a traffic safety plan for the years 1997-2000. For this reason, the Environmental Health Action Plan does not address traffic accidents. Traffic safety has been improving in Finland. The number of fatal accidents in traffic has fallen, but the number of injuries in traffic has been rising in recent years. The objective expressed in the traffic safety plan is continuous improvement of traffic safety so that the number of the most serious casualties will fall as quickly as they have been falling during this century and that the safety level in Finland will approach that in Sweden and in Norway.

ACCIDENTS AT HOME AND DURING LEISURE

Tripping and falling constitute the largest group of accidents at home and during leisure. Nearly 900 Finns per year die in accidents involving tripping; some 700 of them are over 65 years of age. Hip fractures are the most common result of the tripping and falling accidents of old people. The number of hip fractures among the elderly has been increasing constantly. According to statistics on the cause of death, the second largest group of accidents consists of cases of poisoning, particularly alcohol poisoning. The third most common cause of accidental death in Finland is drowning. The figure for deaths in fires is also the highest in Europe.

Among accidents at home, the most common are tripping and falling, hurting oneself with a sharp object and burns. For women, accident situations are often associated with cooking, cleaning and other physical activity, while men have accidents during repair and servicing work. The elderly population is the group most at risk at home.

The risk group for accidents during physical exercise consists of young men. The bulk of accidents during physical exercise are slight and

do not cause long-term incapacity. Tripping and slipping constitute the most common accident type among other accidents during leisure. Young and elderly people constitute the risk groups.

Children are prone to have relatively many accidents. Every year, one in ten children sees a doctor because of an accident. Some 7,000 children need treatment in hospital, and 85-95 accidents per year lead to death. Traffic accidents and drowning are the most common groups of fatal accidents. As a rule, small children have accidents at home while indoors; from the age of four years upwards more and more accidents occur outdoors. The most common accidents at home consist of tripping and falling.

Children have accidents when playing with playground equipment, for example, on jungle gyms, slides and swings at daycare centres. According to a Norwegian estimate, standardisation would eliminate about 10% of children's accidents on such equipment. However, the majority of children's accidents when playing outdoors take place elsewhere than on stationary equipment.

Advance inspection of electrical equipment was for the most part abolished in Finland in connection with the EEA Treaty in 1994. Thereafter, the manufacturer and importer of products have been responsible for the initial control of electrical equipment. Through market supervision, the authorities have ensured compliance with the regulations. After abolishment of advance inspection, appliances that pose a risk have been removed from the market more often than before; at present, on average one appliance per day is removed from the market. However, there have been no fatal accidents because of any new dangerous equipment. It is important that importers comply with regulations and that the authorities continue effectively to supervise electrical equipment introduced onto the market.

In the early 1990s, attention began to be paid to the high number of accidents occurring at home and during leisure. Various projects to prevent accidents were launched. The advisory committee for the prevention of accidents at home and during leisure drew up a development plan for avoiding these accidents. The plan covered the years 1991-1993.

A national campaign against accidents at home and during leisure has been pursued since 1993. The target group for the campaign is the entire population. In particular, the campaign has prodded municipalities to take local action. The campaign has generated education material of various kinds, and training and information has been provided for professionals in the field. Several bodies have participated in organising the campaign.

Co-operation between bodies that deal with accidents in traffic, at home and during leisure was launched in 1995. The objective is to develop a code of safety in Finland and to improve co-operation in the prevention of accidents, both nationally and locally. Information on how to avoid accidents is distributed at daycare centres and at schools, using material prepared especially for children.

As a result of a steep increase in accidental deaths, especially at home and during leisure, the Council of State appointed the first advisory committee for the prevention of accidents at home and during leisure.

The advisory committee set two national goals: to bring about a decrease in the total number of accidents and to halt the increase of fatal accidents. The advisory committee drafted national three-year programmes, which contained detailed proposals for measures to prevent accidents. Many of the proposals were carried out.

The first goal has not been reached yet; surveys indicate that minor accidents at home and during leisure have continued to increase. The second, more important, goal has been reached. The annual number of fatal accidents has started to fall, and the rapid increase in accidental deaths at home and during leisure has come to a halt. It is justified to anticipate that the number of these deaths will fall if the intense efforts to prevent accidents are expanded and deepened and if first-aid care, ambulance services and treatment methods based on new technology are developed further.

The goal proposed by the advisory committee for the prevention of accidents at home and during leisure within the next ten years is to cut the annual number of serious accidents, leading to death and to long-term disability and incapacity, by one-quarter from the present level.

A reduction in the number of accidents by one-quarter would lead to savings of over one billion Finnish marks, at present currency values, in direct accident costs (costs of hospital and outpatient care, sickness benefits, disability pensions, etc). In addition, four billion Finnish marks would be saved in indirect costs (e.g. production losses, value of lives lost). Thus, prevention of accidents brings significant cost benefits. A long-term programme and co-operation are needed for reaching the goal, which also requires that accident trends are monitored closely and that extensive information is available on accidents and on the potential for avoiding accidents.

OBJECTIVES

- Citizens can live, play, go to school and to work, spend their free time and engage in physical activities in an environment safe from the risk of accidents.

- The number of serious accidents at home and during leisure will be reduced by one-quarter during the next ten years.

ACTIONS

1 In order to create safe environments, accident prevention projects are carried out locally. In these projects, risk factors are mapped and ways are sought to develop safer environments for living, playing, school and physical activities. In particular, the safety of elderly people's and children's environments are improved. (Various authorities and voluntary organisations within municipalities)

2 Increased attention to safety is paid in town planning and in community planning. The needs of special groups, such as children,

elderly people and people with disabilities, are taken into account in the planning of urban areas. (Municipalities, Ministry of the Environment, Ministry of Social Affairs and Health, Regional Environment Centres, provinces, municipalities, enterprises)

3 Safety education is given at school in connection with various subjects. Procedures are developed to promote the opportunities available for people to influence the safety of their environment. (Ministries, municipalities, schools, sports organisations)

4 Prevention and investigation of accidents is made more efficient by setting up investigation boards for accidents occurring at home and during leisure, and by improving the assessment of environmental factors when compiling statistics on accidents. (Ministry of Social Affairs and Health, Ministry of the Environment, the insurance sector)

5 More resources are allocated for research into accidents, especially those occurring at home and during leisure. (Ministry of Education, Ministry of Social Affairs and Health, Ministry of the Environment, universities and research institutes)

3.10 CLIMATE CHANGE AND DEPLETION OF THE OZONE LAYER

BACKGROUND

The climate change and depletion of the ozone layer have long-term effects on the health of people on Earth. The effects that depletion of the ozone layer has on health can be predicted much more exactly than the effects of the climate change. Likewise, the duration and preventability of the changes are different. It is now predicted that, owing to emissions caused by human action, the ozone layer will continue to become thinner over the southern hemisphere for some time. However, it is predicted that the limits set on emissions will mean restoration of the ozone layer to the level preceding the change within the next 50-100 years. If the ozone layer over the northern hemisphere shows the same trend, it can be expected that there will be a period of higher incidence of skin cancers and other diseases associated with UVB radiation, lasting for 50 to 100 years. Initially during this period, morbidity will increase until a maximum is reached within a few decades, after which morbidity will gradually start to fall. In other words, it will be possible to overcome the problem. There is, however, more uncertainty in predicting the changes that will take place in the ozone layer over the northern hemisphere, because observations have only been made for a short time.

Estimation of the trend that the greenhouse effect will follow is different. No reduction in the emissions of greenhouse gases is foreseen, and even if it were possible to restrict the emissions, the effects of the present emissions on the climate may continue for as long as centuries. It

is highly difficult to predict the climate change. Similarly, much less is known of how the climate change affects health than is known about the effects of ozone depletion. If the present scenario of the climate change proves to be true, the effects of the climate change on people's health and living conditions on Earth will be much greater than that of ozone depletion.

CLIMATE CHANGE

The greenhouse effect arises when gases known as greenhouse gases, which exist in small concentrations in the atmosphere, prevent the energy emitted by sunlight onto the Earth from radiating back into space. In consequence, the temperature of the Earth rises. Greenhouse gases include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide, or laughing gas (N_2O), and chlorofluorocarbons or CFCs. Above all, the volumes of carbon dioxide are affected by human action, and the emissions of carbon dioxide are also known the best. A long time ago, the greenhouse effect made life on Earth possible, but intensification of the effect may change circumstances so that not all species can adapt to the new situation. As a result, changes will occur in the distribution of species, in ecology and in food production. The higher volume of greenhouse gases is a consequence of increased daily consumption by people in industrialised countries. Emissions can be restricted by reducing consumption and by shifting to low-emission energy sources.

Owing to human activities, the concentrations of greenhouse gases in the atmosphere have risen since pre-industrial times: CO_2 by 30%; CH_4 by 145%; and N_2O by 15%. According to the latest estimates, the consequent warming of the climate can already be reliably observed. During the past 100 years, the average temperature on the Earth's surface has risen by 0.3 to 0.6 degrees. Intensification of the greenhouse effect is estimated to raise the average temperature of the Earth by 1.5 to 4.5 degrees by the year 2100, when compared to the pre-industrial era. Many greenhouse gases stay in the atmosphere for decades or even for centuries; therefore, the change in temperature will persist for a long time even if the emissions of greenhouse gases were reduced.

The changes at high latitudes would be greater than the average changes. The Finnish climate is anticipated to change so that winters become warmer in relation to summers and there is more rainfall, especially in winter. However, it is difficult to make forecasts since simultaneous changes are taking place in glaciers, sea currents and in other natural phenomena that have an impact on temperatures on a regional scale.

The effects of the climate change on health stem from the direct and indirect consequences of a warmer climate. The indirect consequences are likely to have more importance in the long run. The direct consequences will be caused by an increase in hot spells. In contrast, the number of cold spells will fall in cold areas, which may even have favourable effects on health.

Changes in the prerequisites for agriculture and cattle breeding are very likely to lead to major population changes. The number of environmental refugees will rise steeply. According to forecasts, there will be no

increase in the global grain production; it will therefore be difficult to provide food for the refugees. Refugeeism is associated with inadequate hygiene, poor housing conditions and malnutrition, which may lead to epidemics of various diseases. The rise in the sea level will leave large, densely populated coastal areas under water; as a result, there will be more population changes.

Regional changes may take place in the occurrence of natural catastrophes (floods, droughts, storms). Their intensity may also change. The climate change will affect the distribution of the intermediate hosts of infectious diseases, such as mosquitoes. For instance, malaria may become endemic in Europe.

The emissions contributing to the greenhouse effect come from the use of fossil fuels, from the eradication of rainforests and from the chemicals released into the atmosphere. The majority of these emissions originate in industrialised countries, in which economic growth and lifestyles have been based on ample use of energy. If the economies of developing countries follow the same trend as the economies of industrialised countries, their emissions of carbon dioxide will increase sharply. One of the main threats to life on Earth is the accelerating population growth. Climate changes can only be prevented through concerted international efforts. Greenhouse gas emissions from Finland account for a mere 0.3 per cent of the world's total emissions. However, when calculated per capita and compared to the national product, the Finnish emissions are relatively high, partly because of the cold climate, long distances and energy-intensive industry.

In addition to reducing emissions, carbon sinks such as forests and bogs can limit the amount of carbon dioxide in the atmosphere by storing carbon.

According to the UN Framework Convention on Climate Change, the concentrations of greenhouse gases in the atmosphere must be stabilised at such levels that human activities do not disrupt the climate system in a dangerous manner. It is currently considered that reaching this objective would require cutting emissions by more than half within the next 40-50 years. Since the developing countries cannot be expected to reduce their emissions – rather the opposite – industrialised countries must be able to cut their emissions much more than at present. The Framework Convention does not include any specific quantitative emission limits. However, the Convention obligates industrialised countries to take measures for limiting emissions and to strive to ensure that emissions would be stabilised at lower levels by the turn of the millennium.

The objective of the Finnish energy policy has been to halt the increase in emissions by the turn of the millennium and to institute a falling trend thereafter. The objective encompasses all emissions of greenhouse gases and all sinks. Finland must also work to help other countries to reduce their emissions, especially in areas adjacent to Finland.

DEPLETION OF THE OZONE LAYER

The ozone layer in the stratosphere prevents ultraviolet radiation from reaching the surface of the Earth. Formed hundreds of millions of years

ago, the ozone layer has become thinner following emissions of chlorofluorohydrocarbons. In consequence, more and more ultraviolet radiation can reach the surface of the Earth. Increased UVB radiation, in particular, has biological effects. The ozone layer has become thinner above Antarctica, but clear indications of the thinning of the ozone layer have also been detected in the northern hemisphere.

If the depletion of ozone over the northern hemisphere proves to be a regular, annually repeated phenomenon, it will affect the intensity of UVB radiation in Finland. Finland is located in an area where thinning of the ozone layer clearly increases the UVB radiation reaching the surface of the Earth. The effect is particularly strong in late winter and early spring, when a thinner ozone layer and reflection of radiation off the surface of snow enhance exposure to UVB. On the other hand, the intensity of UVB radiation in northern areas is clearly lower than, for instance, at the equator.

More intense UVB radiation reduces the amount of plankton in the oceans and thwarts the growth of sensitive cultivated plants and forests. Through this process, the radiation may affect the conditions of life on Earth in the long term.

More exposure to UVB radiation increases the incidence of eye diseases and skin cancer, and may weaken the immune response. Long-term exposure to UVB radiation is a risk factor for cataracts. It has been estimated that a reduction of one per cent in the ozone layer increases the occurrence of cataracts by 0.5 per cent.

Some studies indicate that UVB radiation may weaken the immune response of the skin. The significance of this effect to health is not known, but it may have an impact on the incidence of skin infections and some other dermatological ailments.

Exposure to UVB radiation adds to the risk of skin cancer. Thinning of the ozone layer by one per cent means a higher incidence of skin cancer by about two per cent. It is estimated that thinning of the ozone layer in the upper atmosphere over Finland will reach its maximum in the early years of the next century, when the intensity of UV radiation in Finland will be 12 per cent higher than before the year 1978. This is estimated to lead to a higher incidence of skin cancer by 20-30 per cent in Finland, unless people reduce their exposure to UV radiation by covering themselves better. The bulk of the additional cancers will be basal cell and spinous cell carcinomas. The incidence of malignant melanomas will also rise. The higher incidence of melanomas is not in the same way linearly dependent on the UVB dose; rather, it depends on how frequently the skin is subjected to major exposure, such as sunbathing.

The Vienna Convention has the goal of protecting the ozone layer. The Montreal Protocol, which supplements this Convention, initially restricts, and will later prohibit, the use of substances that destroy the ozone layer.

OBJECTIVES

- Emissions of greenhouse gases do not endanger the health of the Earth's population.

- Finland does her share in the reduction of greenhouse gas emissions.

- The concentrations of substances destroying the ozone layer are reduced to the level that prevailed before the industrial introduction of chlorofluorocarbon compounds (CFC). Finland continues to limit the use of these substances at least as much as required by international obligations and targets.

ACTIONS

1 International conventions are concluded to help ensure that countries commit themselves to reducing greenhouse gas emissions. In addition, production and use of substances that deplete the ozone layer are given up as soon as possible, and emissions of substances detrimental to the ozone layer are reduced by creating more efficient procedures for the recovery and handling of products and equipment that contain these substances when they are removed from service. (Ministry of the Environment, Ministry of Trade and Industry)

2 Emissions of greenhouse gases are limited and storage of carbon is promoted. (Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry, industry, organisations and citizens)

3 The effects of the climate change on the environment and on health are monitored and studied in Finland. Awareness of the negative effects of ozone depletion and UV radiation is increased. (Ministry of Social Affairs and Health, Ministry of Education, Academy of Finland, universities)

4 Long-term economic means of steering are introduced to make the release of greenhouse gases into the atmosphere economically unprofitable. The means are introduced in steps so that their economic consequences can be predicted. (Ministry of Finance, Ministry of the Environment, Ministry of Trade and Industry, industry, Ministry of Social Affairs and Health)

4 ENVIRONMENTAL HEALTH IN THE HUMAN SPHERE OF ACTIVITY

The influence of the environment on human health has traditionally been assessed on the basis of deaths, accidents and verified cases of illness, or by identifying environmental factors that probably lead to an increased incidence of illness. A broader view is taken in the case of a health-promoting environment, since the social environment and people's sense of security must also be considered, as must the magnitude and effect on health of a perceived health risk. In order to recognise environmental factors which promote or threaten health, we need new, generally accepted indicators and tools.

For human environmental health, the most important spheres of activity are the residential, work and leisure environments and those involving the production of essential foodstuffs, consumer goods and sufficient energy. Almost all of the activities mentioned cause changes in the environment, and some of them have an adverse effect on it. Furthermore, some of these negative influences affect human health – either directly or indirectly. The protection and enhancement of health, and positive development of the quality of life, can be influenced by reducing negative influences on the environment and health. Thus it is important how we shape our living environment, and how we utilise it.

In this Chapter an attempt is made to enumerate the connections between spheres of human activity and the basic factors affecting environmental health, and to place on the public agenda the measures necessary for the promotion of environmental health within these spheres.

4.1 NATURAL RESOURCES AND THE PRIMARY PRODUCTION OF FOODSTUFFS

4.1.1 NATURAL RESOURCES

FORESTS, BOGS AND RURAL AREAS

Finland is one of the world's most heavily wooded countries. A good 86 per cent – or 26 million hectares – of Finland's land area consists of forestry land. Fairly unproductive areas of stunted growth and wasteland account for some 6 million hectares of this figure. Forests are important for combatting air pollutants and for storing carbon dioxide. They also prevent the spread of insect pests and plant diseases. In addition, they have a favourable effect on the microclimate and are of great importance for a pleasant living environment. The natural products obtained from

woods and bogs enrich and diversify our diet. Finns are also able to spend their leisure time enjoying exercise and recreation in the forests.

Human beings have both a positive and a negative influence on natural wooded areas. The widespread intensification of wood production has occurred at the expense of natural diversity, and intensive forestry has sometimes resulted in nutrient run-off into water systems, thus reducing the value of the forest as a place for recreation and other leisure activities. There has been large-scale draining of bogs for agricultural and forestry purposes and for peat extraction. During the draining of bogs, organic matter is released into water systems. Drainage and peat extraction have reduced the value of bogs as natural areas and landscapes, and their use for purposes of exploitation and recreation.

Since these areas are useful for a wide variety of reasons, and since they promote health, it is essential to preserve original bogs and forests. The economic exploitation of forests must take into consideration the principle of sustainable development and must ensure the prerequisites for a range of uses.

Traditional rural landscapes and the living countryside with its wealth of plant and animals species are part of our national cultural and natural heritage and provide many opportunities to foster recreation and health.

GATHERED PRODUCTS, FISH AND GAME

Products obtained from the natural environment are a valuable part of our diet. One should, however, ensure that they are safe and that they remain in adequate supply. The use of such products should conform with the principle of sustainable development, a principle which has been written into legislation on forests and waters and legislation concerning fishing and hunting.

Gathered products

About 70 per cent of households in Finland gather natural products either for their own use or for sale. Despite this, only a few per cent of the annual growth of berries and mushrooms are gathered. Other products gathered include lichens and herbs. In recent years, the import of natural berries and wild mushrooms has become common.

Cases of poisoning caused by wild plants, berries and mushrooms are fairly rare in Finland. There are only a few dozen such cases a year. Small children constitute the most important risk group. The most frequent cause of poisoning has traditionally been species used as food which are not suitable for eating.

In Finland, contaminants have not been encountered in wild berries and mushrooms to an extent that would cause the weekly intake limit recommended by the WHO-FAO independent Joint Expert Committee on Food Additives and Contaminants (JECFA) to be exceeded. The authorities ensure that wild berries and mushrooms intended for sale comply with regulations. They also provide advice on the treatment of products intended for food, and on safe gathering areas. After the

accident at the Chernobyl nuclear energy plant, radiation levels rose in some areas of Finland. Even in these areas it has not been necessary to restrict the consumption of gathered products, game, fish or reindeer meat, although the public did receive instructions concerning fish and gathered products. In order to ensure the sustainable exploitation of our natural resources, it has proved necessary to limit the picking of the sea buckthorn berry and the ways in which it is gathered. In reindeer herding areas, the collecting of lichens is restricted.

Fish and fishing

In Finland some twenty indigenous species of fish are caught. There have been considerable changes in the distribution of some fish species and the relative abundance of stocks, especially in the case of migratory fish. Minor reproductive problems have been reported for some species. Only salmon – and to some degree lavaret – are threatened by over-fishing. The annual catch of non-farm fish in Finland amounts to some 150 thousand tonnes, plus about 5 million crayfish. We have about twenty farmed species, and 99 per cent of the 18 thousand tonnes farmed for food consist of rainbow trout. Fish and crayfish are also raised for release in order to consolidate natural stocks. During all seasons, fish and fish-based products are imported.

Guidance and official regulations are aimed at preventing fish diseases at breeding stations and during the release of stock into natural waterways. The main environmental drawback of fish breeding is the eutrophication of water systems. The antibiotics used during breeding can also cause environmental problems. The strain on water systems can be diminished by optimising feeding and by using types of feed that impose as small a burden as possible on the surroundings. The environmental effects of veterinary methods should be examined, and measures changed where necessary. The damage caused by fish farms in the country can also be reduced by treating waste water. The environmental burden caused by fish farming is being reduced as a preventive measure. Research and development work is required in order to reduce the use of antibiotics in fish production, to prevent fish diseases and to improve methods of farming and feeding.

Most of the mercury in our food originates from fish products. At the end of the food chain, mercury compounds become enriched in the form of methyl mercury in predatory fish. It is only in the case of heavy consumption that the recommended weekly maximum (FAO and WHO) of 200 micrograms may be exceeded. In Finland mercury is now mainly a local problem affecting pike, pike perch and burbot, and it is on the decline. In many industrialised countries, exposure to heavy metals is between two and five times what it is in Finland.

The dioxin levels of marine fish are higher than those of other foodstuffs, and thus the amount of fish eaten affects the intake of dioxin from food. Baltic-region herring (mature) and salmon in particular are responsible for a notable amount of PCB compounds in the Finnish diet. The production and use of such substances is now banned in Finland as in

many other countries. The intake of PCB compounds in Finland amounts to only three per cent of the American recommended maximums. At this time there is no reason, except in special instances, to limit the consumption of domestic fish.

GAME

Finland's range of game comprises 26 species of birds and 27 of mammals. The most popular species for hunting are elk, hares, duck and woodland fowl. The amount of game taken and the sufficiency of animal species are continually monitored in Finland, as are the health of the animals and the quality of meat products. Natural habitats are the most important factor in maintaining the numbers of most game species.

OBJECTIVES

- The quantity and quality of products obtained from the natural environment and used as food are maintained, at the same time ensuring that such products do not constitute health risks for humans.

ACTIONS

1 The quality of natural products and heavy metal and pesticide residues are monitored, and a labelling system is developed for natural products intended for sale. (Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, Ministry of the Environment, municipalities, advisory bodies)

2 The state of health and adequacy of fish and game species, and their safety as food sources, are monitored. If necessary, utilisation of fish and game species is restricted and other measures are initiated to conserve them. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, Ministry of the Environment, Finnish Game and Fisheries Research Institute, rural economic development districts, Hunters' Central Organization, game preservation districts, municipalities)

4.1.2 PRIMARY PRODUCTION OF FOODSTUFFS

Finland produces meat, cereals, milk, eggs, sugar, root vegetables and some other vegetables and berries in sufficient quantities to satisfy the domestic market. During the winter period in particular, our country imports fresh fruit and vegetables. Throughout the year we import cultivated plants that require special growing conditions. Finland's accession to the European Union has meant a great upheaval in our agricultural sector.

The foodstuff raw materials produced in Finland are pure by international standards. The foods made in our country do not contain contaminants in quantities which would cause the permissible total weekly intake (PTWI) to be exceeded. This is due firstly to a favourable environment – pure water, soil and air, and a relative lack of pests – and secondly to the expertise of farmers, effective quality control and good health care for livestock. In Finland, as in other Nordic countries, ethical principles and a concern for animal protection have traditionally been particularly strong in the area of livestock production and have been partly responsible for the fact that methods used to increase production have mainly involved the enhancement of production conditions rather than the use of artificial growth-promoting substances and excessive reliance on preventive medication.

Hygienic aspects of the packaging, distribution, sale and storage of foodstuffs are very well controlled in Finland. Guaranteeing quality and safety to consumers requires close co-operation both on the internal EU market and in trade with third countries. In order to make decisions, the authorities, producers and consumers need information on products and production methods. Labelling systems for products must be developed in such a way as to give a clearer indication than at present of a product's origin, method of manufacture and other characteristics.

Now that international agreements are being used to remove barriers to the free movement of goods, there is also an increasing risk of the spread of pests, weeds, animal diseases that can infect humans, and plant and animal diseases. Dealing with such dangers requires close international co-operation aimed at ensuring the quality of foods and of the raw materials used in their production and at preventing the spread of plant and animal diseases.

Plant production

In Finland the production of cereals is concentrated in the south and south-west of the country. Because of our climate, the yield per hectare is lower than in Continental Europe, even on the most productive farms. The south and south-west are the main areas for the cultivation of horticultural products and field vegetables. Eastern and central Finland are berry-growing regions. Apple orchards are concentrated in Ahvenanmaa and south-west Finland. In addition, three kinds of mushrooms are cultivated in Finland, the most important (over 90 per cent of production) being champignons.

In contrast to many countries in Continental Europe, Finland has at its disposal adequate arable land and pure water for plant cultivation. Thus agricultural products do not contain significant amounts of impurities. The excessive or incorrect use of pesticides and other agricultural chemicals can result in direct or indirect environmental and health hazards and can put a strain on water systems. Excessive fertilising or the incorrectly timed application of manure or community waste-water sludge can also cause nutrient release and can contaminate surface and groundwater or wells. In Finland, the climate and geography make the use of

chemicals against pests, weeds and plant diseases less necessary than in other European countries. Intensive mechanisation of agriculture increases the compacting of the soil, reduces the productivity of fields and makes the risk of erosion greater. Intensive agriculture makes the landscape less diverse and reduces the range of plant and animal species. Many of these problems can be avoided through good farming methods and the controlled use of preventive chemicals. Among other things, the Agri-Environmental Subsidy Programme is regulating (1995-1999) the use of fertilisers and pesticides.

Animals and animal products

Especially in central and northern Finland, our agriculture is dominated by stock raising. Milk production accounts for about a third of total agricultural production, and if beef is taken into consideration the share of cattle in agricultural production rises to about half of the total. Beef, pork and chicken account for most of the meat produced in Finland. Lamb and mutton production is less important.

The health of Finnish livestock is good; salmonella, for example, has been kept exceptionally well under control. In Finland, attention has long been paid to the hygiene standards in the production of livestock, a fact which contributes to the safety of animal products.

Animal manure can constitute a problem on farms where more accumulates than can be used. Improvements in the storing and treatment of manure can reduce, for instance, the release of ammonia and methane into the environment by 25 to 80 per cent. Technologically controlled methods can be used if the treatment of manure is centralised in larger facilities. Correct treatment of manure improves protection against eutrophication, acidification and climatic changes caused by agriculture, and it fosters a good nutrient balance. Most of the problems are caused by the excrement of pigs and fur animals.

Reindeer grazing is eroding the natural environment in northern Finland and is also detracting from the conditions necessary for successful forestry. The size of the reindeer population is increasing the risk of disease and malnutrition. Additional feeding of the reindeer and preventive medicine have reduced the incidence of disease. In Finland, reindeer do not show contaminant concentrations which would cause the weekly intake limit recommended by the WHO-FAO independent Joint Expert Committee on Food Additives and Contaminants (JECFA) to be exceeded.

Beekeeping in Finland is mainly a side occupation in rural areas. The environmental effects of beekeeping are mostly positive, and the quality of Finnish honey is good. Bee diseases are fairly rare in this country.

The detrimental effects of fur farming on the environment and the problems associated with infectious animal diseases arise mainly from inadequate waste management and from the treatment of excrement and other animal wastes.

Combating of animal diseases and control of animal-derived foodstuffs

The aim of combating animal diseases is to ensure the health and well-being of animals and to prevent and monitor diseases. It is also important to prevent the spread of zoonoses – infections transmitted from animals to humans. The fight against animal diseases is founded on both strict official control when live animals and animal products are imported and effective eradication when an infection has been observed. With EU membership, the combating of animal diseases is based on an effective division of labour and on co-operation between the authorities, industry and animal owners. Producer organisations and the industry have created their own voluntary quality systems in order to prevent the spread of infectious animal diseases to our country.

The goal of the foodstuff supervision associated with the treatment of animal diseases is to ensure the hygienic quality of animal-derived foodstuffs and to prevent the transmission of infections from animals to humans via such foodstuffs. The chain of supervision extends from primary production to retailing. Control covers foods derived from both livestock and wild animals, as well as processing facilities. From the viewpoint of its legislative background, food supervision in Finland conforms with the law of the European Union.

In many cases, the supervision of animal-derived foods effectively blocks the transmission of certain parasites and microbes from animals to humans.

OBJECTIVES

- The quality and safety of animal products are maintained.
- The health risks to humans posed by agriculture, and the problems caused to the environment, are minimised.
- Plant and animal production adhere to the principle of sustainable development, follow production methods which are acceptable from the viewpoint of ethics and animal protection, and enable the preservation of natural diversity.

ACTIONS

1 The production facilities of livestock, the quality of drinking water, occupational safety, waste treatment and the safe use of wastes are improved by incorporating environmental health aspects in farm-specific production plans, by promoting the general implementation of such plans by economic means and with the help of education and counselling. (Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Social Affairs and Health, National Board of Education, municipalities, advisory bodies)

2 Use of chemical pesticides is reduced by improving need assessments, dosing, targeting and timing. Chemicals are replaced with biological or mechanical methods which have been proved safe. Use of antibiotics and other pharmaceutical preparations for animals is reduced. (Ministry of Agriculture and Forestry, Ministry of the Environment, Agricultural Research Centre, National Board of Education, municipalities, advisory bodies)

3 Financial guidance, education and counselling are intensified in support of the introduction of new production methods. (Ministry of Agriculture and Forestry, Ministry of the Environment, Agricultural Research Centre, National Board of Education, municipalities, advisory bodies)

4 Inspection and control methods for agricultural products are developed and improved. Collaboration between authorities and actors is initiated to develop labelling systems providing consumers with reliable information on the safety and quality of foods. (Ministry of Agriculture and Forestry, National Veterinary and Food Research Institute, National Food Administration, Ministry of the Environment, advisory bodies)

5 Activities aimed at preserving the vitality of traditional rural landscapes and the diversity of flora and fauna for recreational and other purposes are intensified. (Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Education, municipalities, advisory bodies)

6 It is ensured that plant and animal materials used in production do not cause health problems for humans or the environment, and that the health and genetic diversity of flora and fauna are maintained in order to meet the current and new needs of food production. (Ministry of Agriculture and Forestry, Ministry of the Environment, municipalities, organisations)

7 Implementation of health supervision programmes and special programmes in raising livestock are promoted. Where required, appropriate programmes are introduced to combat zoonoses. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, municipalities, organisations)

4.1.3 INTERNATIONAL CO-OPERATION

The quality and purity of animal-derived products in Finland have traditionally been extremely good by international standards. Many infectious animal diseases and zoonoses present even elsewhere in Europe are not found here or are significantly less problematic than in many other EU Member States. Before EU membership, prevention of animal

diseases was founded both on strict official control when live animals and animal products were imported and on effective countermeasures in cases of infection. Measures being adopted in order to maintain this favourable state of affairs within the new internal market include the implementation of EU-approved salmonella control for livestock. In addition, producer organisations and the industry have created their own voluntary quality-control systems in order to prevent the spread of infectious animal diseases to our country. As with the maintenance of quality and safety, prevention of animal diseases requires close co-operation between the authorities, the industry and producers. In order to improve consumer information, labelling systems making it possible to ascertain a product's origin, method of manufacture and other characteristics are needed.

The importance of international co-operation is especially evident in the environmental health work associated with primary production and the supply of foodstuffs. Now that international agreements are being used to remove barriers to foreign trade and the import of goods, there is an increasing risk of the spread of pests, weeds, problem animals, animal diseases that can infect humans, and other plant and animal diseases. The free import of foodstuffs requires that co-operation should be intensified within the EU in order both to lessen the risks mentioned above and to control the quality of the foods on sale. Control and monitoring should cover animal health, the use of preservatives and other additives, irradiation as a means of increasing durability, and drug and chemical residues. Co-operation between the authorities and in education is being increased in order to prevent the spread of plant and animal diseases in areas adjacent to Finland.

It is forbidden in Finland to use artificial means to accelerate the growth of animals. Veterinary measures and the inspection of slaughter animals can eliminate the possibility of drug residues in meat products. International co-operation aims at ensuring that meat products do not contain drug residues and that meat produced with the aid of growth hormones does not get onto the market.

By means of genetic engineering, we can shape the genetic make-up of plants, animals and micro-organisms in a way not possible in nature. Genetic engineering is applied, for example, as a method of plant breeding. Assessment of the effects and predictability of gene-modified organisms (GMOs) and the control of environmental risks present problems. One example of the problems associated with genetic engineering is the cultivated plants that have been manipulated in such a way that they are resistant to a particular herbicide. In certain cases, this can lead to increased total use of the chemical in question. An objective of laws and regulations on genetic engineering is to ensure human health and protect the environment from possible negative effects. Both the EU and the OECD have established teams of experts, which are working on joint procedures for the assessment of environmental and health risks and for the harmonisation of control. Finland is participating in this area of international collaboration.

OBJECTIVES

- The quality of measures to prevent plant and animal diseases in Finland remains high, and pests, weeds, problem animals, plant and animal diseases and infectious animal diseases are not introduced from abroad along with imported foodstuffs, plants, fruits, fodder or other agricultural or forestry products.
- The quality of food for sale in Finland remains high.
- It is ensured that gene-modified organisms (GMOs) do not endanger health.

ACTIONS

1 Co-operation is carried out with neighbouring countries and on the broader international level to prevent the spread of plant and animal diseases, infectious animal diseases, pests, weeds and problem animals. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health)

2 The quality of foodstuffs and plants in international trade is monitored through international collaboration. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, Ministry of Trade and Industry)

3 In the area of primary food production, measures are taken to ensure that sufficient genetic diversity for plant and animal breeding is maintained, both in Finland and internationally. (Ministry of Agriculture and Forestry, research institutes, advisory bodies)

4 Work is done with other Nordic countries and on the broader international level to devise a method of assessing and controlling the environmental risks associated with gene-modified organisms. Finland is active in the preparation of regulations governing the use of gene-modified organisms. (Ministry of Social Affairs and Health, Ministry of the Environment, Finnish Environment Institute, Board for Gene Technology)

4.2 THE PROMOTION OF ENVIRONMENTAL HEALTH IN COMMUNITIES

BACKGROUND

Communities – ranging from villages to cities – constitute the everyday living environment for the majority of Finns. The structure and vitality of a community affect the quality of human life, mental well-being and the

vigour of the social network. The causal relationships between the living environment and health are complex, and the long causal chain means that the effects of measures may not become apparent until a long time after their implementation. The most easily observable are direct environmental effects on health; these manifest themselves when people are exposed to air, water or noise pollution, for example. Indirect effects become apparent when the environment facilitates or impedes essential human activities, such as the formation of social networks. Such factors, as well as the occurrence of accidents, can be influenced by the way in which communities are planned.

Besides reducing negative effects on health, an essential aspect of promoting environmental health is creating an environment favourable to people's physical and mental health. An environment which fosters health is one which provides people with good opportunities to organise their everyday lives and to satisfy their basic needs. Further important factors in daily life are opportunities for independent activity, social relationships, recreation and hobbies, exercising an influence on one's surroundings, and enjoying a private life and relaxation.

The place where we live, with its immediate surroundings, and our work and play environments are important factors for the health and well-being of every one of us. These factors affect how comfortable we feel and our sense of identification and security. Important factors which can be influenced by community planning include a residential area's outward appearance, aesthetic aspects and scale. A good residential area has an adequate network of services, provides wide scope for outdoor activities and hobbies, and has good transport links. Moving around in the area is safe, the noise level is low, and the air is of good quality. Residents feel that they are part of a social body in a community that fosters health, and they can influence the development of their own surroundings.

The residential environment is particularly important for people who spend most of their time in their area of residence: children, the elderly, people with disabilities, parents looking after small children at home, people who work at home, and the unemployed. When community development is being planned, their special needs must be included. A good environment can, for example, foster children's development and can make it easier for elderly people to cope independently. The content of children's everyday lives depends to a large extent on what opportunities they have for playing and for moving around safely in the immediate environment of their homes.

Besides helping residents to manage their daily lives, appropriate services create preconditions for social relationships. Everyday services located within walking distance reduce traffic and, for example, make it more possible for elderly people to live in their own homes longer. Services important for the living environment include day care centres, schools, food shops, facilities for group activities, exercise and hobbies, libraries and health services. The importance of services for the social vigour of a residential area has received very little attention; though a school, for example, affects the parents' social network and the residents' feeling of togetherness. In recent years, the development of communities has not

moved in a desirable direction. Services have moved to more distant locations and have become difficult to reach. Neighbourhood services are on the decline. Many changes in society are increasing the need to develop the living environment in ways which foster health. The percentage of elderly people in the population is growing. The size of households is decreasing, and the unemployment rate remains very high. All these phenomena highlight the need for new types of services.

COMMUNITY STRUCTURE AND HEALTH

The way in which a community is developed can either encourage health-enhancing choices on the part of the individual or make them difficult and expensive. The siting of dwellings, services, workplaces, recreational areas and traffic routes in relation to one another affects such things as the distance travelled to the workplace and for various errands, the accessibility of services and recreational areas, the amount of traffic and the kind of transport chosen, and noise and pollution levels. The geographical splintering of communities increases traffic and reduces the role of public transport. The outskirts of cities and low-density areas with single-family houses are particularly problematic as far as public transport is concerned. The building of shopping malls outside population centres also increases traffic and makes it harder to reach services without a car. The length of road and local utility networks affects the consumption of energy and other natural resources and thus the prevalence of health-impairing emissions as well. In addition, longer networks are more expensive to build and maintain than short networks.

When one is planning the structure of a community, one can promote health aspects by taking advantage of the existing built environment and internal structure, by making the structure integrated, by locating activities and services appropriately and by improving the conditions for pedestrian and bicycle traffic and public transport. In contrast to the effects of many other changes in community structure, health impacts only become apparent gradually. In addition to individual measures, it is thus essential to examine policies which have a gradual effect on observable changes in the health and well-being of a community's residents.

THE LIVING ENVIRONMENT AS A HEALTH FACTOR IN COMMUNITIES

Noise and air pollution can constitute a health problem for people living near busy traffic arteries or industrial plants. The negative impact of such pollution can be reduced not only by means of technology but also by the appropriate siting of activities, by vegetation and wooded areas, and by landscaping and the design of buildings. Children are more sensitive to air pollution than are adults. Playgrounds, day care centres, schools and recreation areas should thus not be located near busy traffic routes. Air pollution and noise are dealt with in more detail in Chapters 3.2 and 3.6.

Negligence in waste disposal and sanitation can result in the pollution of groundwater, shores and banks, water systems and the air, and can thus have a direct or indirect influence on health. Aesthetic aspects of the environment also have a significant effect on people's feeling of well-being. Visual aspects, odours, dustiness and other aesthetic factors make an area feel pleasant or alienating. An area can inspire a feeling of security or insecurity.

The concentration of unemployment and social problems in certain residential areas can lead to their decline and stigmatisation and to a deterioration in the living environment. As problems pile up, areas can be created in which people also feel more insecure than previously. The improvement of an area's physical and social environment is one way to decrease exclusion and to prevent deterioration.

The ability to influence one's own living environment is an important ingredient of social well-being. When residents have real opportunities to influence their environment, they become more committed to this environment and to looking after it, which is important for the formation of well-functioning neighbourhood communities.

Many natural factors are important for health. Natural environments and landscapes contribute greatly to the quality of communities. Vegetation purifies the air and binds dust, has a favourable effect on the microclimate, increases humidity, protects against wind, and muffles noise. Green belts can be used, for example, to reduce the noise and pollution problems caused by traffic arteries and industrial facilities. Green areas and spaces left in their natural state constitute important outdoor areas for people of different ages, and they also provide children with play and adventure environments.

Finnish people have traditionally had close relationship with nature; it can help us to enhance our personal growth, to relax and to experience the continuity of life. Seasonal variation and the richness of ecosystems enhance health and the quality of life in communities. In particular, woods and forests, open spaces, rocky outcrops, water systems, and banks and shorelines lend great variety to communities and the living environment.

Outdoor activities and exercise are crucial to the maintenance of health. Parks, trails and other outdoor areas are also important as places where people meet.

TRANSPORT AND TRAFFIC IN COMMUNITIES

Traffic and transport networks are a key element in people's ability to cope with daily life. In general, this aspect of coping is bound up with car traffic and with ensuring that it continues to function. The current trend is for car traffic to keep increasing and for cars to be used even for short trips. Public transport, which used to play a relatively large role in Finland, has declined in importance. If this trend continues, various groups within the population will find access to services very problematic because of constraints on their ability to move about. The division of society into increasingly differentiated groups will become sharper.

Most traffic is encountered in densely populated areas, and it is here that most of the associated problems arise. Thus land use and transport systems in these areas have a great impact on people's daily lives. Technology has been able to reduce emissions and noise. In densely populated areas, the recommended maximum noise levels will, however, continue to be exceeded, and high air-pollution levels will arise from time to time when mixing of the air is slow. Dust concentrations in the air are particularly high in spring. Air quality and noise are dealt with in more detail in Chapters 3.2 and 3.6. The geographical splintering of the structure of communities is increasing car traffic in particular. The amount of land required for traffic is growing, and traffic systems are limiting the opportunities for walking and bicycling in particular. Intact unbuilt areas are being fragmented, and this is reducing opportunities to experience nature.

When traffic and transport systems are being developed, attention must be paid to measures which promote human health and safety. Planners should aim for policies which take account of all the following aspects: the smooth functioning both of businesses serving communities and of the daily life of the rest of the population; the quality of living environments; and the rational overall functioning of society. Questions of environmental health should be accorded more emphasis than is currently the case. For environmental and health reasons, attempts should be made to further develop road safety, public transport and the role of walking and bicycling in everyday activities. Pedestrian and bicycle traffic and public transport are especially important for people who do not have a car at their disposal. Greater road safety makes it easier for children and physically handicapped people to cope with everyday life; the scope of their living environment depends largely on how safe it is to move around in their residential area. The safety of traffic and transport systems should be designed to meet the needs of the more dependent members of a community. Children should have safe routes to day care centres, schools, playgrounds and recreation areas. In courtyards of residential buildings and in play and recreation areas, traffic should be prohibited.

Technological advances in vehicle design affect the extent of environmental damage, as does the quality of fuels. There is thus constant scrutiny aimed at ensuring that regulations accord with the principle of sustainable development. The objective of reducing the emissions and other environmental problems caused by traffic is being achieved largely by technological means. In this area, regulation can best be influenced through the European Union and international organisations. In the field of maintenance and repairs, there is a need for research and product development aimed at replacing substances and materials detrimental to health and the environment with less harmful products. It is when communities and their traffic and transport systems are being developed that additional measures are especially necessary.

PROMOTION OF ENVIRONMENTAL HEALTH IN COMMUNITIES

Health aspects should be included in all decision-making and planning affecting communities. As far as the promotion of health in communities is concerned, the starting point should be a reduction in direct environmental health hazards coupled with the consideration of factors which indirectly affect health. The planning and development of communities can influence the healthiness of the environment in many different ways and at a reasonable cost. In order to co-ordinate the work of actors contributing to health promotion and the positive development of communities, we need new ways of working and new ways of ascertaining what the health effects of different measures are and how these effects should be evaluated. For example, good joint planning of a community's structure and transport system creates a basis for reducing the need for traffic and transport and for improving air quality.

Town planning can to a large extent co-ordinate the measures needed in a community, since it examines an area as a whole and reconciles the needs of different activities and population groups. Comprehensive town planning steers the shaping of the community's structure and the siting of activities – for example, the location relative to one another of residential areas, services, workplaces and recreation areas, and the transport links between them. Detailed planning regulates the formation of neighbourhoods. Town planning also has an impact on the achievement of objectives related to environmental protection and environmental health.

Only scant information is available on the connections between the built environment and health. If one is to pay more attention to health aspects in the development of communities, in community planning and in decision-making, one must acquire adequate information on the state of the environment, its ability to function and on how these factors affect health. By monitoring the environment and developing the indicators necessary for such work, and by increasing the amount of research, it will be possible to obtain a better picture of the effects on health of environmental changes within communities.

Constructing buildings in existing areas and increasing their density enables one to take advantage of old structures, and this also makes it easier to organise public transport and services. When a structure is being integrated, special attention must be paid to the adequacy of green areas and to the continuity of green-area networks. It should be ensured that community structure includes functioning local units, in such a way that neighbourhood services are within walking distance. Areas should also be closed to outside traffic so as to provide undisturbed courtyard and leisure areas. Communities should also include areas where there is little traffic and public open spaces such as marketplaces and squares.

Special attention should be paid to the safety of children in traffic. And in order for the elderly and disabled to be able to live in their own homes as long as possible, the residential environment must provide them with adequate services. These people must also have good, safe means of getting around.

Residents should have the opportunity to influence the health of their own environment. Co-operation and interaction should be increased between organisations active in the area, business and industry, the authorities and the residents. Working together, the public and the authorities can implement plans and projects concerning the development of the environment.

A neighbourhood improvement programme is being employed in an attempt to rectify existing problems and avoid future ones. The national REMONTTI co-operative programme and other special and pilot schemes in the field of residential environments are aimed at improving the quality and comfort of such environments.

Preference should be given to pedestrian and bicycle traffic and public transport. The environmental damage caused by public transport and the amount of land required by it are smaller per passenger than in the case of car traffic. The standard of service of public transport must be good, and all residents must find it pleasant and easy to use.

OBJECTIVES

- All population groups are guaranteed a healthy residential, work and leisure environment.

- The environment promotes people's non-material well-being, furthers the formation of local communities and contributes to a sense of community.

ACTIONS

1 Town planning is developed in such a way that it takes more account of environmental and health aspects by integrating community structure and by promoting the identification of health effects as part of the assessment of environmental influences. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, municipalities)

2 Key points within communities, where there are problems and hazards, are identified, and effort is made to improve the situation, in co-ordination with programmes in the areas of sustainable development, the environment and health. (Ministry of the Environment, Ministry of Transport and Communications, Ministry of Social Affairs and Health, municipalities)

3 Monitoring of health-related aspects of the built environment is improved through co-operation between the various authorities. (Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

4 Different branches of administration collaborate during the reform of building legislation in order to specify more precisely regulations on environmental, health and social impacts. (Ministry of the Environment, Ministry of Social Affairs and Health)

5 The research and pilot programmes of different branches of administration are combined in order to intensify research on the relationships between health, community structure and the living and social environments. (Academy of Finland, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, STAKES, municipalities)

6 Assessment of the social and psychological effects of the environment is included in regional strategies and in environmental impact assessments (EIA). The opportunities for the public to participate in the development of communities are expanded. An increased knowledge of health is necessary for community development. (Ministry of the Environment, Ministry of Social Affairs and Health)

7 Different branches of administration work together right at the start of traffic and transport planning, in order to develop policies that provide for the everyday needs of different population groups, ensure good living environments, and promote safety and the functioning of society as a whole. (Ministry of Transport and Communications, Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

8 Land use and transport systems, on the one hand, and environmental health, on the other hand, are integrated through the planning and implementation of pilot projects, paying special attention to improving conditions for public transport and for walking and bicycling. (Ministry of the Environment, municipalities, Ministry of Transport and Communications)

4.3 PRODUCTION, PRODUCTS, COMMERCE AND CONSUMPTION

PRODUCTION

In Finland, many environmental and health problems caused by industrial production have been brought under control, and there has been efficient reduction of emissions. Thus the main problem areas are currently consumer behaviour, product safety and the handling of products during disposal. If one takes account of the life cycle approach, the utilisation and conservation of raw materials is also important. Hazards to the environment have decreased thanks to limits on emissions resulting from production, the introduction of production techniques which conserve the environment, and improved management of hazardous and other wastes. However, damage already done to the environment by production still needs to be rectified. The current environmental health problems caused by industry and industrial accidents in Finland are mainly local, but hazardous emissions which spread over wide areas can occa-

sionally have an indirect impact on health. Finland receives emissions originating in other countries. Reducing the negative impact which these have on environmental health requires bilateral and multilateral international co-operation.

Emissions into water systems as a result of industrial production do not cause notable health problems in Finland. Environmental issues associated with water reserves have been dealt with in Chapter 3.1. In industrial localities, emissions into the atmosphere still influence health and the comfort and condition of the environment in many ways. Besides pollution caused by actual production, emissions from vehicles involved in the transport of raw materials, the distribution of products and other activities associated with production have a particularly great influence on air quality. Environmental issues associated with air quality have been dealt with in Chapter 3.2. Production-related noise is not a great problem in Finland. Most of the hazardous and other wastes produced in this country are of industrial origin. Wastes and soil pollution are dealt with in Chapter 3.4. There are still local noise problems. Noise-related issues have been dealt with in Chapter 3.6, and health questions associated with the work environment are addressed in Chapter 4.5.

Finland has comprehensive legislation and licensing and assessment procedures, which has made it possible to reduce the negative impacts of production on the environment and human beings. The courts and competent authorities determine emission limitations when granting licences, and these also cover other environmental risks resulting from operations. In determining the conditions of licensing, national and international targets for the prevention of a deterioration in the quality of the environment are used as a basis. International agreements on the reduction of emissions have been used in order to diminish industrial emissions and ensure a fair basis for competition.

It has been more difficult for small and medium-sized industrial enterprises to take environmental aspects into consideration, which is why Finland, as many other countries, has begun to develop approaches suited to such enterprises in the area of environmental care. In the case of small and medium-sized firms, questions of environmental health and occupational safety and health are closely connected. Thus at the enterprise level, the same administrative system has often been employed in the environmental, health and safety areas.

The EU Directive on Integrated Pollution Prevention and Control (IPPC) provides that emissions shall be inspected in an integrated fashion. Such inspection will cover the protection of air, water and soil, waste management technology and the efficient use of energy, and reduced production of unusable wastes. Finland has prepared a legislative proposal on the integration of environmental licensing in which questions concerning water are integrated into the same licensing procedure.

Enterprises can also take voluntary action to reduce environmental health risks by adopting the non-compulsory Environmental Management and Audit Scheme (EMAS), which is based on the relevant EU Regulation. EMAS is concerned with environmental protection, and it complements the licensing systems. It is currently used in industrial, energy production and waste treatment plants. Applications of EMAS are being

planned for other branches as well. Comparable systems have been developed by the International Organization for Standardization (ISO) and national standards bodies.

Measures taken by industry to promote environmental health are steered not only by norms and official regulations but also by the market. A new dimension has joined those of price and quality competitiveness: that of eco-competitiveness. By this is meant the ability to respond to the environmental demands of interest groups and to utilise ecological aspects better than business competitors. This requires that products should be environmentally sound.

Products

The environmental impact of products depends on the volume of production and the quality of the products. There is close official control in the case of medicines and some foodstuffs, for example; but the supervision of many other products is less thorough, or is indirect. The use of labelling to describe the properties of a product is an important aspect of the work done to improve the quality and safety of products affecting people's environment and health and the choices made by consumers. There is also a need for new methods of influencing the market in such a way that the best products – as far as the life cycle approach and safety are concerned – become more widespread while the most harmful disappear.

For the consumer the broadening and diversification of the market is further decreasing its transparency. It is becoming harder to keep track of the market and products, and it is ever more difficult for the consumer to know where the numerous components of various goods come from and what they contain. The chains linking production and consumption have also become longer, which has weakened the ability of retailers – and ultimately consumers – to influence production methods, the range of products and issues of responsibility during a product's life cycle. The consumer can be provided with a message about the negative effects that a product may have on the environment and environmental health if guidance based on environmental economy and on information is employed.

Products are required not to cause health risks. In assessing the effects of materials and products on environmental health, attention must be paid to direct health impacts, to questions connected with safe recyclability, and to the environmental effects of wastes. The risks associated with the recycling of materials and goods mainly involve hygiene. As far as their properties are concerned, materials for recycling are also varied, less well known and harder to manage. There are also problems of responsibility connected with the recycling of goods. By international standards, the foodstuffs, electrical appliances and other products available to the consumer in Finland can be regarded as safe and of good quality. The high level achieved must be maintained in the future as well. Issues involving environmental health and food are discussed in Chapters 3.3 and 4.1.

Many actors in the chain of production and consumption affect the ways in which a product can cause environmental problems during its life cycle. In this chain, every actor – including, ultimately, the consumer – bears partial responsibility for any negative environmental effects. The manufacturer's responsibility comes primarily at the beginning of the product's life cycle and involves its direct effects on the environment and health. Thus research and development work on a product must take account of health, safety and environmental health aspects. The product's competitiveness can be enhanced by means of labelling systems and by insisting in international trade that equivalent products carry documentation of their safety and their effects on environmental health.

For economic and ecological reasons, attempts are being made to reduce the use of raw materials and energy per unit produced or in relation to a product's value. But a negative aspect of this has in some cases been a decrease in durability and recyclability, and a trend towards disposable products.

Environmental labelling, product descriptions and user instructions can be used to prevent negative environmental and health effects. A product fulfilling the criteria for environmental friendliness can, for example, be given an energy or environment label informing the consumer of this fact. Environmental health awareness can also be increased by providing information. Collaboration on national and international levels is a means of ensuring objectivity in determining the criteria for granting environmental labels. If environmentally friendly products are to become prevalent in domestic and international trade, co-operation and partnership are necessary between various branches of administration, business and industry and citizens' organisations. In the Nordic countries, the right to use an environmental label called the 'Swan Label' has been granted since 1991 to products which fulfil environmental requirements specific to their product groups. The right to use the Swan Label is granted by The Finnish Standards Association (SFS). Some 300 permits to use the Swan Label are in force, and about 800 products bear the mark. In 1992 an EU Regulation on an environmental label was issued, to which Finland is committed. The EU environmental label – the ecoproduct label – covers all EU countries and member states of the European Economic Area (EEA). Thus far, criteria have been approved for eleven product groups, and the right to use the label has been granted in four of these. The labelling is voluntary and is awarded by the EU Commission on the recommendation of the competent national authority. In the case of Finland, this is The Finnish Standards Association.

By siting industrial plants appropriately and by planning the ways in which the necessary raw materials are to be transported and distributed, emissions hazardous to the environment and to health can be reduced. In cases where the transport of goods involves long distances, attention should be paid to ensuring that rail and road traffic are linked with ports. It would be possible to reduce overland transport by distributing transport volumes over different parts of the country. The development of ports should be a component of the development of regional, industrial and commercial structures. Planned and controlled distribution transport can lead both to a reduction in the costs arising from trans-

port and to indirect savings in the form of decreased negative impacts on environmental health. This requires increased research on logistics systems.

Commerce

Better information is now available on the contents and quality of products for sale, and often also on how to use them. Labels indicating the freshness, contents and ways of using foodstuffs are quite comprehensive. The buyer is, however, assumed to have prior knowledge concerning the content and interpretation of different labels; and this can lead to inequality among consumers.

The product safety legislation in force in Finland provides that, at different stages of trade, attention must be paid to ensuring that no products which might put at risk a consumer's health or property are offered for sale. A merchant may not simply shift the blame onto the manufacturer or importer: All persons engaged in business must personally take care that products and services are safe and must report any misgivings to the authorities.

Households are dependent on services and the accessibility of services if they are to obtain everyday, essential items. The structure of commerce has become increasingly dominated by the car and the supermarket, even though shops selling everyday goods still account for half of the small shops in Finland. Changes in the structure of commerce affect such things as the accessibility of services and the way in which purchases are transported, and thus – indirectly – also how handicapped and elderly people, for example, cope at home. The way in which communities – in both low-density and high-density areas – are planned and built influences the accessibility of services. The building of communities and the accessibility of services are also discussed in Chapter 4.2.

Retail chains have launched their own environmental projects, and an agreement has been reached with the packaging industry concerning the recovery of waste packaging. These initiatives are aimed at solving, among other things, product-related packaging and waste problems. An EU Directive on packaging is intended to ensure the recovery and reuse of packaging waste.

Consumption

It is estimated that the average household in a Western country consumes more than 10 tonnes of various materials per person in a year. Of this amount, three-quarters consists of non-renewable natural resources such as stone, metals and fossil fuels, and a quarter of renewable resources.

Besides involving the purchase of essential daily goods and services, consumption is a social and communicative activity. The types of households and consumers' needs, habits and attitudes towards the promotion of their own health and the environment have changed. Positive attitudes towards the environment and health do not, however, readily lead to practical actions, because the influence of choices on nature and

human beings is not always clear, nor do people have sufficient knowledge to make such choices.

A pricing system can be used to encourage the saving and appropriate use of energy and materials, but the ultimate ecological effects of consumption are not easy to demonstrate. The changing of consumption habits and ways of living requires an integrated combination of norms, economic steering, product politics and information work aimed at promoting environmental health. Consumers must be made to feel partly responsible for fostering a healthy environment.

OBJECTIVES

- The environmental and health risks caused by production, products and transport of products are minimised.
- Consumption is environmentally sustainable and causes as little damage as possible to environmental health.

ACTIONS

1 Industrial risks to the environment are pinpointed as part of a procedure for assessing environmental and health risks, taking into account the whole chain of production and the product's removal from use as waste. (Ministry of the Environment, Finnish Environment Institute, National Public Health Institute, industry, occupational health service, municipalities)

2 Industrial processes which are safe and ecologically less burdening and wasteful are developed further, and environmental health risks throughout the life cycle of products are addressed by increasing research and development. (Ministry of Trade and Industry, Ministry of the Environment, The Technology Development Centre of Finland, Academy of Finland, industry)

3 The introduction of environmental management systems in enterprises and major retailing chains is encouraged, placing the main emphasis in such systems on the assessment of environmental health impacts and on measures aimed at reducing negative effects. Environmental aspects are included in the production control and R&D work of enterprises. (Ministry of the Environment, Ministry of Trade and Industry, The Technology Development Centre of Finland, industry)

4 The expertise of companies' occupational health and safety personnel is employed in the limitation and reduction of environmental health hazards, in the prevention of accidents, and in the guidance of employees on questions of safety. In addition, the environmental health expertise of occupational health and safety staff is

maintained. (Ministry of the Environment, Ministry of Labour, Ministry of Social Affairs and Health, enterprises)

5 Environmentally friendly logistics planning systems and community planning are developed in order to reduce the harmful emissions and other burdens on the environment caused by transport during industrial production and the distribution of products. (Ministry of Transport and Communications, Ministry of Trade and Industry, Ministry of the Environment, municipalities)

6 Economic steering methods and consumer awareness campaigns are utilised to support the enhancement of environmental health. (Ministry of Trade and Industry, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Finance, National Public Health Institute, municipalities)

7 Advisory work in the areas of health and the environment is strengthened by maintaining and increasing the expertise of environmental and health authorities concerning product safety and environmental problems, in conjunction with the provision of information and supplementary training. (Ministry of the Environment, Ministry of Social Affairs and Health, National Board of Education, communities, citizens' organisations)

4.4 ENERGY

BACKGROUND

The negative effects of generating energy involve air, water resources, soil and land use. Most of the environmental and health impacts and industrial accidents and occupational diseases caused by the production, transmission and consumption of energy are associated with the use of fossil fuels. When nuclear fuels are handled properly, the radiation risk is small; but the generation of nuclear energy does yield highly active waste, some of which must be isolated from the biosphere for an extremely long time. In theory, there are risks involved in the long-term isolation and storage of this waste.

In Finland, the generation of energy is based on a number of sources – though mostly on fossil fuels. Total energy consumption is currently about 31.5 million oil equivalent tonnes (Mtoe). Industry accounts for some 45 per cent of total energy consumption and about 52 per cent of electric power use. Since the early 1970s, total energy consumption has risen more than one-and-a-half times in Finland. It is estimated that total energy consumption will be about 41 Mtoe in 2010, with electricity consumption running at 100 TWh. Consumption of bioenergy and peat amounts to about 5 Mtoe. Some 69 per cent of total energy consumption in Finland is covered by imports, with domestic sources accounting for about 31 per cent. The approximate shares of energy sources in total consumption are: oil 27%; coal 10%; natural gas 9%; nuclear power 14%;

imported electricity 7%; hydroelectric power 10%; peat 6%; plus 17% for other domestic energy sources, mainly otherwise unusable bark waste produced by the mechanical wood processing industry and residual liquor from the cellulose industry.

The amount of energy consumed is affected by the growth and structure of the national economy, by the structure of industry, and by consumers and their behaviour. As far as the efficiency of energy use is concerned, Finland is in the vanguard and is one of the leading countries in the development and construction of district heating systems simultaneously generating heat and electricity (over 30 per cent of the electricity produced). Technological developments have enabled ever greater conversion efficiency in the energy chain. The structures of industry and communities, as well as ways of working and living, have become more dependent on electricity, and thus a continuous and problem-free supply has become more important than ever.

The increasing contribution of electricity to the total energy system constitutes a clear and long-term trend throughout the world. The reasons are obvious. Electricity can be generated in centralised facilities and can be used effectively and in varied ways by both industry and households. For most energy consumption purposes in modern society, it is the only real alternative. Developed societies are entirely dependent on the electricity supply.

ENVIRONMENTAL IMPACT OF ENERGY GENERATION

The most significant worldwide and local problems which energy generation causes to the environment and health are due to emissions of carbon dioxide and certain greenhouse gases, to the formation of secondary sulphate aerosols and lower-atmosphere ozone and to general acidification. These problems are dealt with in Chapter 3.11. Accidents are discussed in Chapters 3.8 and 3.9, and the work environment and health in Chapter 3.10. Particulate emissions from fossil fuels cause health problems, which are dealt with in Chapter 3.2. Polluted air in communities is mainly the result of energy generation and traffic. Although most of Finland's total sulphur precipitation is due to long-distance pollution from abroad, the sulphur compounds in the air of communities mostly come from domestic pollution sources. The foreign proportion of nitrogen oxides and ozone is more significant.

In Finland the impact of energy generation on the nation's health is not of the same order as the effects of smoking, eating habits or lifestyles. The combustion products of fossil fuels can, however, cause cancer and severe health disorders, and the prevention of these requires both domestic action and international co-operation. Epidemiological studies conducted in North America and Europe over the past ten years have significantly changed our views on the danger to health of small particles. The best current estimates are that in these two regions, exposure to such particles causes a total of about 100,000 premature deaths and significantly shortens lives in the most heavily polluted areas. Pollutant concentrations in the air of Finnish communities are at their highest

during winter air inversions, when air near the ground stays put for long periods, and local pollution – especially traffic exhaust gases – circulates there without mixing with the bulk of the air. In the air of communities, the largest source of mutagenic compounds is the exhaust gases of diesel vehicles. The second most important source is domestic wood stoves, and the third is the exhaust gases of petrol-driven vehicles. The exhaust gases include polyaromatic hydrocarbon (PAH) compounds and their derivatives, which have been classified as carcinogens, fine-particle and volatile organic compounds (VOCs) which have been shown to constitute an acute health risk, and nitrogen oxides which, under the influence of sunlight, give rise to ozone. In confined street areas and parking and service areas, carbon monoxide concentrations can also rise to dangerous levels.

Emissions from energy generation and traffic also play a key role in worldwide climate changes. The phenomenon has been known in theory since fully a century ago, and it has been observable in meteorological statistics since the 1980s. More than half of the electric power consumed in Finland is generated by nuclear and hydroelectric power plants, which do not produce direct greenhouse-gas emissions. Finland's current production machinery for electricity and district heating, on the one hand, and for electricity and industrial process heat, on the other – machinery which mainly uses coal, peat and residual liquor as fuels – is responsible for about 40 per cent of the total emissions resulting from the generation and consumption of energy. Finland is notable for its high degree of cogeneration of electricity and heat. It is not very easy to raise this percentage except by concentrating settlement even more strongly in the largest towns. As electricity consumption grows, it is necessary to resort to less efficient forms of generation.

The trend in total emissions in Finland depends mostly on the methods of generating electricity. Carbon dioxide emissions caused by traffic account for a little under 30 per cent of total emissions, while those resulting from building heating systems (other than district heating and electricity) amount to something over 10 per cent. In 1994 carbon dioxide emissions from fossil fuels and peat totalled 57 million tonnes in Finland, and on the basis of energy consumption forecasts, they will amount to some 70-75 million tonnes in 2010. Finland is working hard to reduce carbon dioxide emissions. The objective of the Council of State's energy saving programme is to reduce total energy consumption by 10-15 per cent – compared to what it would be without energy saving measures – by 2010.

Metallic emissions resulting from the generation of energy are either direct – dispersed along with combustion gases and wastes – or indirect. Indirect emissions can occur in connection with acidification, the building of reservoirs and earth removal, and in drainage. However, most of the metals are bound in solid material. The release of metals into the groundwater as a result of acidification is a factor which lowers the quality of drinking water.

Not one of the accidents classifiable as 'major accidents' that have occurred in Finland has been connected with the generation or use of energy. Most accidents have been associated with fuel transport, or they

have been transport or industrial accidents involving no exposure of the public. Accidents have, for example, led to the release of oil, combustion gases and chemicals. In order to prevent accidents, particular attention must thus be paid to transport equipment, haulage, storage and general fire safety. Procedures must also be put in place to reduce the damage caused by accidents.

The environmental and health risks of **oil use** are associated with transport, storage, refining and combustion. The damage caused by accidents occurring during the sea transport of oil mainly involves coastal waters and shores, sea birds, seals and fish stocks. In cold-water areas, the damage is longer-lasting, and oil spills are more difficult to manage. There is direct damage to flora and fauna and human beings, and indirect effects include harm to fisheries and to the recreational use of water areas. The combustion of oil has traditionally produced the largest amounts of sulphur dioxide pollution; but reductions in the sulphur content of the various grades of oil have – at least in the Nordic countries – diminished such pollution. Oil combustion – especially in small boilers and in vehicles – is generally the most significant source of fine particles in the air of communities. Nitrogen oxides are characteristic pollutants resulting from the high-temperature combustion of all fuels – not just of oil. Combustion technology has a much larger effect on such pollution than does the particular fuel. New combustion processes are lowering emissions by a third, or even two-thirds, in comparison with the technology of the 1960s; but a reduction beyond these levels generally requires the introduction of separate purification facilities.

The environmental health risks associated with **natural gas** arise during its production, transport, distribution and careless use. When natural gas is being transported by sea or stored, for example, for periods of peak consumption, it is liquefied in order to reduce its volume. The storage of liquid natural gas involves a great risk of accident, because damage to the storage container almost always leads to the release of all the gas into the environment, where – at least in a built-up environment – it will most likely ignite explosively. Thus far there has been no major disaster anywhere in the world as a result of natural gas storage; but several explosions (Ohio, Spain, Mexico City) have each claimed hundreds of lives. Emissions of nitrogen oxides caused by the use of natural gas vary, but they can also be high, depending on the technology. Carbon dioxide emissions are about 60 per cent of those for coal.

In Finland, the agents deleterious to environmental health resulting from the use of **coal** consist of dust produced by storage and particulate, metallic and sulphur and nitrogen oxide pollution resulting from the end-products of combustion. Workers at power plants can also be exposed to coal dust. Despite the Rio Declaration, the anticipated rapid increase in the use of coal for the generation of electricity – both in Finland and in most of the rest of the world – after a plateau period lasting a couple of decades is leading to a swift upward adjustment of prognoses for carbon dioxide emissions. At least in Western Europe and North America, most coal-fired power plants are being fitted with efficient systems for sulphur dioxide separation and low-NOx combustion. Despite such progress, sulphur dioxide and nitrogen oxide emissions are too high. From the

viewpoint of climate changes, emissions from coal-fired power plants are raising night-time temperatures in particular worldwide (through the greenhouse effect), while the secondary sulphate aerosols resulting from these emissions are causing local drops in daytime surface temperatures. Sulphate aerosols also influence respiratory symptoms and mortality rates among the population.

The draining of bogs in connection with the use of **peat** is putting a strain on water systems. The transport of peat by road is increasing traffic pollution and the risk of road accidents. In addition to natural radioisotopes, peat ash contains radioisotopes released into the environment by nuclear tests and the Chernobyl disaster. In other respects, the environmental and health risks caused by the burning of peat are fundamentally similar to those involved in coal combustion.

The potential health problems arising from the **normal use of nuclear energy** are mainly in the areas of occupational health and mining. The warm condensation water from power plants increases flow rates and the eutrophication of ambient water systems. A by-product of the mining, concentration and enrichment of uranium is waste containing natural radionuclides; it is many times less radioactive than the actual fuel and is dealt with in the producer countries. Nuclear energy generation produces 30 tonnes/gigawatt year (t/GWa) of highly radioactive spent fuel, which must be disposed of. If one assumes that the current power plants in Finland will operate for 40 years, some 2,400 tonnes of spent fuel will have to be disposed of domestically in this period. Most of the radioactivity of spent fuel comes from short-lived uranium fission products and from transuranic elements, such as plutonium, which arise through neutron activation. Highly active wastes, which remain active a long time and are dangerous to humans, must be isolated from the natural environment and human beings for hundreds of thousands of years. From the standpoint of human history, such a period is unimaginably long, though in geological terms it is extremely short. After several thousand years, however, spent nuclear fuel will no longer be an important source of direct radiation. The problem will then be similar to that of toxic substances causing health damage if they get into the organism. The storage of spent fuel will begin in Finland in 2020. Wastes of low and medium activity accumulating from the operation of nuclear power plants must be isolated from the biological environment for periods ranging from decades to centuries. In Finland, such wastes are stored at facilities located at a shallow depth in bedrock near the power plants. The storage of wastes of low and medium radioactivity began in Finland in 1992. It is estimated that disposal of wastes resulting from the operation of power plants and from their demolition will be completed by 2050. In the disposal of nuclear wastes, Finland adheres to general, internationally approved safety principles.

Obsolete nuclear power plants still in use are a danger to health and the environment. The world has experienced several nuclear power plant accidents, the most serious of which was that at Chernobyl. The radioactive materials that have escaped into the environment during these accidents, and the effects of these materials, will be felt for a long time in the natural environment and human populations.

The occupational health risks in the areas of **hydropower and solar and wind energy** are primarily associated with the construction and dismantling of production plants and equipment. Some of the materials used for these also put a strain on the environment.

In Finland there are about 220 regulated lakes with an area of more than one square kilometre. Water-level variations of as much as several metres during the year may cause shores to freeze and ice to press against the bottom, which is a problem for fish reproduction and the nourishment of fry. The release of oxygen-rich surface water during winter may reduce the oxygen supplies of lakes, and the damming of rapids may hinder the migration of fish. The regulation of water systems negatively affects fish stocks and increases nutrient leaching. By international standards, dam safety is extremely high in Finland; though on a worldwide scale, ruptures in power-plant dams have caused the most casualties per accident of all energy generation related accidents.

Solar energy does not involve emissions into the environment; but the industrial pollution resulting from the manufacture of batteries and solar cells can be hazardous or toxic. Similarly, at least some solar cells contain toxins that have been classified as problem wastes. The importance of solar energy will probably not increase very much, because of the great seasonal variations in solar radiation. For the time being, its usefulness is limited mainly to the production of energy for leisure dwellings and for certain installations which are remote from the grid and which consume low amounts of current. The use of solar energy has increased and will continue to do so. It reduces the need for heating and the associated harmful emissions. Potential applications of solar energy include the preheating of domestic hot water and air, and heat storage systems. The use of solar energy should be considered in the planning of buildings and the built environment.

A large-scale increase in the use of **wind energy** would create landscape problems in Finland. The randomness and swift fluctuations associated with wind-derived energy diminish the practicability of using it. Wind energy can be used to meet local demand in places such as the fells of Lapland and the Finnish archipelago.

Current **geothermal heat pump systems** are based on the use of CFC gases, which destroy stratospheric ozone. In the most recent installations, these gases are being replaced by HCFC gases, which cause less damage to the ozone in the stratosphere; but alternatives which endanger neither human beings nor stratospheric ozone are currently unavailable. The electrical efficiency rate for geothermal heating is better than in the case of direct electric heating.

In the case of **bioenergy sources**, the occupational health hazards of firewood and wood chips consist of accidents occurring during forestry work. In Finland, pollution and greenhouse gas effects associated with the use of firewood and wood chips depend on what wood is used and how it is burned, and also on what alternatives there are to burning wood. If, for example, energy is generated from fast-growing trees planted on former farm fields or on bogs that have been drained for peat production and fully exploited, one can say that the "same" carbon dioxide is recirculated and that the net effect after, say, ten years is negligible. Efficient

monoculture does, however, reduce the amount of substances being circulated and increases the risk of plant diseases. If, on the other hand, the wood used to generate energy would otherwise have continued to grow in the forest or would have been processed to make, for example, paper, furniture or timber, the net carbon dioxide emissions of combustion are greater than in the case of coal. The alternatives – or combinations of them – lie among those mentioned above and depend on the time span and area (Finland – world) under study. At present, nearly 13 per cent of industrial and community energy is generated by the burning of wood or of wood-derived wastes. The energy content of the total annual growth of Finnish forests – some 80 million m^3 of bark-bearing trunk wood – amounts to only just over a third of Finland's current energy consumption. If all energy other than that derived from hydropower and peat were produced from wood, Finland's forests, allowing for growth, would suffice for a bare 14 years – or just under 30 years if branches, tops, needles and roots were used as well.

Pollution arising from the generation of energy from biogas is minor. For the time being, both the overall potential for biogas and the facilities for its production are small in Finland. If gases from rubbish dumps are saved and used for energy production, greenhouse gases can actually be turned to advantage.

Most of the bioenergy produced on a large-scale in Finland is generated by burning forestry wastes, especially bark chips and residual liquor from cellulose production. Wood fuel is also used as a supplement to oil and electricity, mainly in the heating of individual houses.

Energy generation wastes consist mainly of the ash, clinker and dust resulting from the combustion of coal, peat and wood chips. Sludges, rinsing and washing water, residues from the purification of flue gases, and used lubricants are wastes produced by energy generation. Some of the energy generation wastes contain toxic or hazardous substances, which must be treated as problem wastes.

INTERNATIONAL CO-OPERATION

Efforts to reduce pollution resulting from energy generation are being made through agreements at both the European and global levels. Agreements on the reduction of sulphur dioxide have been drawn up, but they have not yet come fully into force. Progress is being made, on the basis of norms and new technology, in the reduction of nitrogen oxides, though the reduction of pollution in accordance with targets has proved to be more difficult than was anticipated. What happens in the case of nitrogen oxides is highly dependent on what is done in the area of traffic. In recent decades, Finland has implemented measures which have enabled a reduction of carbon dioxide emissions in the energy generation chain. There has been an increase in the use of sources – such as nuclear energy, hydropower and low-pollutant natural gas – which result in little or no emission of carbon dioxide.

The fact that Finland has signed and ratified the UN Climate Convention means that the country must act to reduce emissions and report

on the measures undertaken. Achieving the objectives set by the treaty requires a significant and long-term reduction in emissions. The document concerning the objectives and measures binding on industrialised countries which is currently being negotiated will require Finland, as well as other countries, to undertake new measures.

OBJECTIVES

- The health hazards associated with the generation and consumption of energy are minimised.
- Modes of generation and consumption are developed in such a way that less energy is required.

ACTIONS

1 Energy efficiency is improved and the share of renewable sources in energy generation is increased in order to reduce the negative environmental health effects associated with production. (Ministry of Trade and Industry)

2 Economic, taxation and legislative steering is utilised to support the development and introduction of technology that leads to energy conservation and to reduction of environmental health hazards and that improves the fire safety, occupational safety and environmental safety of energy generation and distribution. In addition, effort is made to reduce energy consumption through environmental projects undertaken by the commercial and other entrepreneurial sectors, through environmental management systems and through product labelling systems. (Ministry of Trade and Industry, Ministry of the Interior, The Technology Development Centre of Finland, Academy of Finland, Ministry of Finance, actors)

3 Emissions arising from energy generation in Finland are reduced through voluntary environment-related management systems. The efficiency of energy consumption is improved in accordance with the Resolution of the Council of State on the implementation of energy conservation. Energy conservation is included in the environmental impact assessment procedure and the environmental permit system. (Ministry of Trade and Industry, Ministry of the Environment, municipalities)

4 In order to reduce environmental health hazards, measures that promote slowing down the growth of energy consumption are included in community and traffic planning and in new construction and renovation projects. (Ministry of the Environment, Ministry of Transport and Communications, municipalities)

5 An energy audit is included in studies on the condition of buildings. Energy efficiency is improved and environmental health aspects are

considered in projects involving the repair and renovation of buildings. (Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Internal Affairs, municipalities)

6 An active role is taken in the drawing up of international agreements aiming to reduce pollution, and measures to reduce pollution in areas adjacent to Finland are supported. (Ministry of the Environment, Ministry of Trade and Industry)

7 As an environmental health issue, attempts to create a harmonised and environmentally-based energy taxation system in Europe are supported. (Ministry of Trade and Industry, Ministry of the Environment)

4.5 THE WORK ENVIRONMENT AND HEALTH

Finland is a developed country as far as occupational health, occupational safety and working conditions are concerned. The most important basic structures affecting working conditions are highly developed: labour legislation; labour protection administration; occupational health and occupational safety services; co-operation between the labour-market parties; workplace-level occupational safety; and the occupational health organisation. With some exceptions (small workplaces, the construction and transport sectors and the self-employed), the structures and support activities serving occupational health and safety cover the needs of workplaces both quantitatively and qualitatively. Finland's occupational health system is a comprehensive and innovative service system which by international standards is versatile and of high quality as far as both costs and effectiveness are concerned.

The health hazards and load factors associated with the work environment can be classified as follows: physical factors; chemical factors; biological factors; excessive physical strain and non-ergonomic work load factors such as stationary muscular work and repetitive work; psychological factors and social relationships within the work environment; and accident risks.

PHYSICAL FACTORS

At least fifty different kinds of physical risk factors are known to exist. The most important in Finland are noise, vibration, thermal conditions and various types of ionising and non-ionising radiation. The number of workers exposed to noise is about 300,000 (14% of the work force); for vibration the figure is 50,000 (2.4%); and for radiation – not counting UV radiation during outdoor work – about 50,000 (2.4%).

In all, 1,098 cases of occupational disease resulting from physical factors were recorded in 1994. Noise accounted for 973 of these, UV light

for 57, and vibration for 22. The numbers of occupational disease cases have been declining, and the severity of injuries has decreased significantly.

CHEMICAL FACTORS

About one million workers (45%) may at least occasionally be exposed to chemicals at the workplace, but levels of exposure have fallen markedly in recent years. Finland has been very successful in guarding against the most hazardous types of exposure – exposure to heavy metals, solvents and, for example, inorganic dusts.

In the place of the traditional cases of acute poisoning, cases of exposure leading to cancer, allergies, reproductive problems and mild disorders of the nervous system have now emerged. Some 15,000 workers (0.7% of the work force) are exposed to cancer-causing agents on the job. The most important carcinogens involved are chromium, nickel and its compounds, and asbestos.

BIOLOGICAL AND ALLERGENIC FACTORS

In the work environment, there are some 200 known biological agents that can cause occupational diseases in such sectors as agriculture, the food industry and health care services. In Finland, about 15 per cent of workers are exposed to such agents.

In this country, some 10 per cent of the work force is exposed on the job to allergens, which cause hypersensitivity reactions either in the respiratory organs or on the skin. Among the most important allergens are flour dusts, animal epithelia, mould fungi and many chemicals. The number of cases of allergic occupational diseases has increased in recent years. This is partly due to improved diagnosis; but it also results from changes in exposure.

The percentage of inflammatory diseases caused by biological agents such as animal parasites, viruses and bacteria out of all occupational diseases in Finland is extremely small (5.5%). Such types of exposure always bring with them the danger of a work-related epidemic. Among the most important preventive measures are occupational hygiene, personal protective devices and, in some cases, vaccinations.

PHYSICAL STRAIN AND ERGONOMICS

The types of physical strain that are of importance for health in working life are heavy dynamic muscular work, heavy moving and lifting work, stressful stationary muscular work and repetitive tasks. The harm caused by physical strain affects, among other things, the cardiovascular system. The musculoskeletal system is put under particular strain by heavy moving and lifting work and by stationary muscular work and repetitive work. Workers performing repetitive tasks (repeated, monotonous movements) are thus especially susceptible to work-related disorders. Particularly the incidence of stress-related disorders of the arms have increased in the long term.

The most important ways of preventing injuries to the musculoskeletal system are: reducing physical strain by increasing mechanisation and making work lighter; using lifting equipment to make heavy moving and lifting work easier; improving ergonomic aspects of work by eliminating repetitive tasks and stationary muscular strain as far as possible; regulating the amount of work to within reasonable limits; and prevention of accidents.

PSYCHOLOGICAL STRESS

In recent years, increasing attention has been paid to improving the psychological work environment, particularly in service professions. Among the most common factors causing psychological stress are haste and time pressure, heavy responsibility for human or material matters, monotony-related psychological strain, information overload and the threat of violence or accident. During the 1990s, the threat of unemployment has been a particularly important and widespread factor increasing psychological stress. Stress is on the increase in working life. According to the Ministry of Labour's "work barometer", 45 per cent of the work force felt that work pressure had increased significantly between 1992 and 1994. Questionnaire-based research reveals that, in Finland, the threat of unemployment and violence in particular are emerging as new problems. The increased amount of overtime is also adding to psychological stress. Similar studies conducted in other European countries also indicate increases in work and time pressure and excessively long working weeks. Some 45-55 per cent of workers in European countries reported that work pressure was an increasingly problematic aspect of their jobs.

The consequences of psychological stress can be observed in the quality of work performed and sometimes also in mental health problems. Stress diminishes a worker's feeling of comfort on the job, increases the number of errors, lessens motivation and innovativeness and in some areas adds to general emotional stress. Long-term excessive stress can lead to burnout, and recovery has proved to be extremely slow in some cases.

The psychosocial environment at the workplace – the atmosphere, human relationships and the style of management – can alleviate psychological stress and support the worker; or it can, in negative cases, increase stress. Studies indicate that work organisations with participatory management are more capable than others of coping with the psychological and psychosocial stress situations arising from rapid changes.

OCCUPATIONAL DISEASE AND WORK-RELATED ILLNESS

In Finland, the occurrence of occupational disease has in the past amounted to some 330 new cases per 100,000 employed persons; this corresponds to the figures for widespread diseases in this country. A small proportion (c. 1-1.5 per cent) of occupational diseases are serious – even fatal – and about 20 per cent cause permanent injury or lead to disability or a change of occupation. The rest generally allow the sufferer to con-

tinue in the same occupation, provided that there is intervention in the work-related exposure or a change in the work performed.

The risk of occupational disease is very unevenly distributed across the work force (there is a forty-fold difference between the highest and lowest risks). It is difficult to make international comparisons of the incidence of occupational diseases because of variations in the notion of what constitutes an occupational disease and differences in statistical procedures. The incidences of occupational diseases recorded in Finland are lower than those for Sweden, Denmark and Germany.

An illness may be influenced by job-related exposure acting in conjunction with a factor not related to work. The seriousness of an illness may be exacerbated by a work-related factor; or working conditions may lead to the sort of living conditions or behaviour that negatively affect health. The incidence of work-related illness can be significantly greater than that of actual occupational diseases.

The objective of occupational disease prevention is to eliminate, as far as possible, contributory factors from the work environment, to detect health impairment at an early stage and, where necessary, to direct patients towards a relevant form of care. In the case of preventive measures, prime importance is accorded to the following aspects: the recognition and assessment of risks; the elimination of exposure situations; information, training and health education; the continuous monitoring of working conditions and employees; diagnosis and care; and the early diagnosis of chronic illnesses.

OCCUPATIONAL ACCIDENTS

In 1993, a total of some 107,000 cases of occupational accidents, stress injuries or occupational diseases were recorded in Finland among employees or entrepreneurs covered by accident insurance legislation. About 2 per cent of this total consists of serious cases resulting in death or in permanent or partial disability. There has been a downward trend in fatal and other serious accidents. Since 1985, the rate of occupational accidents has been decreasing (by about 30%); in 1993, it amounted to 35 accidents per million working hours and about 35 accidents per thousand employees. The rate of occupational accidents at the workplace and the risk of accidents resulting in death recorded in Finland correspond to the average European levels but are considerably higher than in Sweden, for example.

The most notable causes of serious accidents are falling trees in forestry, falling objects in industry and construction, falls by workers during construction work, moving machine parts in industry, and forklift trucks and other vehicles in the service industries.

Differences in the risk of accidents by occupation and sector are still considerable. Whereas 212 out of 1,000 workers in the housing construction industry suffer an accident each year, the figure is less than ten in low-risk occupations. In construction, Finnish workers run almost twice the risk of their colleagues in Sweden and Denmark.

About 60 per cent of occupational accidents and 70 per cent of the resulting costs arise from the following:

- traffic accidents at work
- falling objects
- falls by workers
- moving machine parts
- slipping, tripping
- acute stress injuries sustained during lifting and moving work.

Occupational accidents constitute a significant health risk in the working-age population: More than 100,000 workers are affected by an accident every year; more than 50 die; 1,000 are permanently injured; and over 10,000 are incapacitated for periods ranging from a month to a year. The problem is even more obvious in high-risk occupations; one in every five workers annually suffers an accident leading to at least three days of incapacity.

The total costs resulting from occupational accidents are rising significantly. Depending on the method of calculation, they amount to between 5 and 15 billion Finnish marks.

The size of an enterprise has a clear effect on the risk of accidents. Large firms deal well with the accident risks inherent in their working environments, while the very smallest enterprises use machines, equipment and energy sources that are not very dangerous. But in small and medium-sized firms employing between ten and fifty workers, the risk levels exceed those for the extremes of the sector by a factor of 2-6. Preventive measures should be targeted at such firms.

In addition to their negative effects in the form of lost working time, production losses and accident compensation, occupational accidents also put a strain on health care services and result in health care costs which are borne in part by the service system. The prevention of accidents is very worthwhile also from an economic point of view.

The most important objectives of accident prevention involve the creation of a safe working environment, the use of safe technology and the improvement of ergonomic aspects of work. Special attention should be paid, on the one hand, to eliminating the dangers of factory traffic, catwalks, heavy moving and lifting work and transport and, on the other hand, to improving safety behaviour and safe work practices on the part of individuals.

OBJECTIVES

- To create a working environment which protects and promotes health.

- To eliminate aspects of work and the working environment which constitute risks to health and safety at the earliest possible stage.

- To ensure the best possible level of functional capacity among the working-aged population.

ACTIONS

1 The expertise of the occupational health personnel is increased in the area of environmental health. (Ministry of Social Affairs and Health, Centre for Occupational Safety, Finnish Institute of Occupational Health, Ministry of the Environment)

2 Working capacity is maintained through joint training and development projects involving occupational health personnel and workplaces. (Finnish Institute of Occupational Health, employment pension institutes, Social Insurance Institution, occupational health services)

3 Structural occupational safety measures are applied in attempts to plan and construct the working environment, working methods and work arrangements in such a way as to minimise the risk of accidents and of negative effects on the environment and health. (Firms, agricultural entrepreneurs, public-sector employers, Finnish Institute of Occupational Health, Ministry of Labour, labour protection, agricultural and forestry advisory bodies, Finnish Environment Institute)

4 Information, counselling, training and guidance are used to improve the safety behaviour of management, supervisors and workers. (Firms, public-sector employers, Finnish Institute of Occupational Health, labour protection, Ministry of Labour, National Board of Education, universities)

5 Sector-specific safety programmes are drawn up for branches subject to the risk of accidents; such programmes should include occupational and environmental safety as an integral part of production and work processes. Training is provided in order to put these programmes into practice. (Firms, public-sector employers, Finnish Institute of Occupational Health, Ministry of Labour, labour protection, advisory bodies, Finnish Environment Institute)

6 Joint action is taken by the labour market parties and the occupational health services to implement actions aiming to protect and promote environmental health and health at workplaces. (Workplaces, Finnish Institute of Occupational Health, Ministry of Labour, Ministry of Social Affairs and Health, occupational health services)

7 Accident research is intensified, especially by taking into consideration factors which influence safety behaviour and methods which enhance safety. (Finnish Institute of Occupational Health, Academy of Finland, The Technology Development Centre of Finland)

5 MEANS OF PROMOTING ENVIRONMENTAL HEALTH

This Chapter discusses the general means applied in order to achieve the goals of the Environmental Health Action Plan: promoting environmental health; securing a healthy environment for present and future generations; and improving citizens' possibilities to exert influence. This calls for joint commitment and working towards a healthy environment on the part of the various actors. The pivotal actors often come from outside the domains of health care and environmental protection. For instance, primary production, industry, trade, traffic, the power industry, community planning, education and the mass media all have a wide range of impacts on the state of environmental health and on future development, both nationally and internationally. Therefore, various means of promoting environmental health are needed, the basic objective being co-operation between various parties.

5.1 ENVIRONMENTAL HEALTH AWARENESS AND POSSIBILITIES TO EXERT INFLUENCE

BACKGROUND

Awareness of the health impacts of environmental factors has increased, for example, through education and the mass media. The mass media mainly convey fragmentary information; however, formation of a comprehensive impression calls for basic information and a broader perspective on the priority of various environmental factors in causing health impacts. The prerequisites for participation and exerting influence result from information and opportunities for action.

Children and young people are an important group in absorbing information and adopting ways of influencing their surroundings. Their participation in the planning and improvement of their environment is an integral part of environmental education, creating opportunities for co-operation with adults and reinforcing children's self-reliance and sense of responsibility. Experimental projects have been launched to develop children's and young people's participation in the planning of their living environment. Environmental planning and improvement should also be promoted in school, for example by including planning and improvement tasks concerning the pupils' and students' environment, to be utilised in community planning (see Chapter 5.2).

Sources of information about environmental health

According to many surveys, citizens receive the bulk of their health and environment information from the mass media and data labels on prod-

ucts; informative newspapers and specialised magazines only come after these. Environmental and health organisations are significant background sources of information for the mass media and citizens alike. Finland has some ten major organisations in the health field providing data on the health aspects of the environment. Many organisations have helplines, publish periodicals and newsletters and provide training. In some areas, for example in questions pertaining to indoor air, commercial consulting and measurement services have also been set up.

Information about environmental health risks should be publicised actively. It is particularly important to disseminate information about factors directly affecting health, such as the quality of air and the contamination of food or drinking water. In addition to the authorities and the general public, the needs of special groups should also be taken into account. Many different channels can be employed in spreading information, from the bulletin boards at urban centres to the mass media. This calls for co-operation beyond municipal and national boundaries.

The media

Most Finnish people follow the mass media. An average Finn spends 2-3 hours a day listening to the radio, and an equal amount of time watching TV. Almost 70 per cent of Finns read two or more newspapers regularly. A world of useful information on environmental health is available through the media.

Environmental and health issues compete for coverage with an ever-increasing supply of topics. While the rapid flow of information has its benefits, it also entails the risk of false or unnecessarily alarming information about environmental health hazards, a fact that may result in erroneous attitudes and behaviour. To give an example, exaggerated news on residues in food or on their harmful effects may alter eating habits in a way detrimental from the health viewpoint, if the overall disadvantages and benefits are disregarded in the news. The news given through mass communication is often fragmentary, and, consequently, the view of environmental factors affecting health may remain incoherent and incomplete.

Having an impact

The preconditions for exerting influence and the will to act in practice arise through information, but having an impact is made possible through resources and influence. Access to the source of information should be made so easy as to be available in principle to anyone. Various means of disseminating information, such as libraries and the mass media, may be used to achieve this. Each person's environment is affected by the family, the home, the housing company management, the village or city district, the municipality, the school, the workplace, associations, organisations and political parties.

It is important that residents can influence the development of their immediate surroundings by co-operating among themselves and with authorities. Service-centredness and participation are now relevant is-

sues in environmental health as well, meaning that inhabitants have an opportunity to take part in improving services and that their viewpoints are taken into account. Municipalities have an important responsibility in seeing to it that adequate resources are invested in environmental health. Acting in environmentally sound and healthy ways should be made as easy as possible for municipal residents. Mere information is not enough; the possibilities of participating and exerting influence must constantly be enhanced.

In villages and city districts, it is possible to improve the channels through which people can exert influence. Traditionally, local influence has meant reacting to plans already made. However, important projects with environmental repercussions should be brought to public debate already during the early planning stages, when the objectives are being set. Residents' opinions concerning the goals and objectives should be asked before the project plan is drawn up. Residents will thus feel that they are party to the activities, and they will want to co-operate in developing these activities further.

The goal of legislation on environmental impact assessment is to enhance the information received by citizens about environmental impacts and to improve citizens' possibilities to participate. Survey and interview data collected among the population are often needed in examining the health and social impacts. In this connection, special attention should be paid to groups particularly sensitive to social and health impacts in the environment. The working groups conducting investigations should also invite representation from local residents and interest groups. The projects should be publicised in the mass media and at meetings held among the public, and the plans should be accessible to all.

OBJECTIVES

- The aim is that citizens receive information, which is adequate, comprehensive, correct and well-organised, regarding the factors in the environment that affect their health.

ACTIONS

1 Inclusion in product data of all information relevant to health: the safety, origin and ingredients of the product. (Ministry of Trade and Industry, Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, National Product Control Agency for Welfare and Health)

2 Improved education in the field of journalism and communications, offering better possibilities to specialise in environmental health information and communications. (Ministry of Education, universities and polytechnics)

3 Further development of environmental health information and communications within citizens' organisations, in collaboration with research institutes in the field. Improved readiness in research insti-

tutes to make the results available to the public and the mass media. (Ministry of Social Affairs and Health, Ministry of the Environment, organisations in environmental and health fields, research institutes)

4 Intensified dissemination of information to municipal residents about environmental factors having health impacts. Compliance with the needs of persons with special information requirements (e.g. persons with allergies or respiratory diseases). (Municipalities, federations of municipalities)

5 Development of municipal services in environmental health, in co-operation with residents, by investigating the need for services and the residents' capabilities of improving their environment by themselves. (Ministry of Social Affairs and Health, municipalities)

6 Submission of projects and plans affecting environmental health to residents and citizens at the planning stage in order to give people a chance to influence the goals, objectives and solutions. (Municipalities, Ministry of the Environment, environment centres)

5.2 RESEARCH, DEVELOPMENT AND EDUCATION

RESEARCH AND DEVELOPMENT

Intensification of environmental research and of researcher education has been discussed widely, but specific environmental health questions have not been addressed in these connections. During the preparation done for the Environmental Health Action Plan, it has become clear that research data and economic estimates are needed to support decision-making if many environmental health problems are to be solved. As yet, only superficial knowledge of the direct and indirect costs and benefits of environmental health promotion is available. Sufficient knowledge of the environmental impacts that various activities have, and of their health consequences, is another prerequisite for economic analyses. Economic estimates usually require adequate quantitative information (or data that can be rendered such) on direct and indirect impacts. Some environmental health factors are hard to measure. Further development of the economic assessment methods applied to environmental health requires broad co-operative efforts in the field of economic R&D.

The essential institutes providing evidence-based information supporting political decision-making include the National Public Health Institute, the Finnish Institute of Occupational Health, the Radiation and Nuclear Safety Authority, the Finnish Environment Institute, the National Research and Development Centre for Welfare and Health, the Technical Research Centre of Finland, the Finnish Meteorological Institute, the Institute of Maritime Research, the National Veterinary and Food Research

Institute and the Agricultural Research Centre of Finland. In addition, universities and other institutions of higher education carry out basic and applied research promoting environmental health.

Environmental health research differs somewhat from other research done in a narrow sector. The studies are inevitably interdisciplinary and multidisciplinary because the aims are targeted at improving or ensuring health. However, the topic of a study may involve construction technology, toxicology, community planning or the microbiology of drinking water. In terms of time span, research may either try to solve one isolated and immediate problem (e.g. contamination of drinking water), or it may be projected decades ahead (e.g. assessing the health impacts of climate change). To be successful, research often requires international contacts and interaction. Environmental health research frequently encompasses areas that include a highly advanced specialised field, such as immunology, clinical microbiology or gene technology. The application of this knowledge, however, is only just beginning. Research must also face the pressures resulting from considerable societal expectations and from the safety requirements made by the public, which are often unrealistic and conflicting.

Thus, even if society were well motivated to support environmental health research, there are no established channels for funding. Environmental health research does not fit naturally into any traditional research field; instead, it falls in between medicine and the natural sciences, or, in some cases, in between the former two, on the one hand, and technology or the social sciences, on the other.

Since environmental health research is multidisciplinary, it does not make sense to incorporate all the professional skill and research equipment needed into specific institutes that have been or will be established within public administration. Both economically and often also scientifically, a more worthwhile solution is networking, whereby the institute directing and co-ordinating research has expertise and technical capacity only in the core research areas. Specialised know-how, in turn, is acquired from other institutes, both domestic and international. Furthermore, it is important to determine how information and new technologies produced abroad can be utilised here.

In Finland, current issues clearly in need of financial support include indoor air – especially the topical problem of mould in houses – investigation and risk analysis of contaminated soil, the health impacts of small particles in urban air – especially in the harsh Finnish winter conditions – as well as assessment of the health impacts of energy and traffic policies. High-quality R&D is needed to support the decisions and measures affecting environmental health. Also of great importance is reinforcement of basic research on environmental health.

Environmental health work requires identification of the central hazards in the environment, basic research on and a deeper understanding of the mechanisms involved, risk evaluation and epidemiological studies. The Committee stated that basic research information, applied studies and R&D are lacking in many specialised fields. In addition to basic research, studies may focus on solving the problems identified and on methods to rectify the ensuing harmful effects.

With the exception of some narrow sectors, environmental health research is new in Finland. Therefore, support given to researcher education, at both the PhD and postdoctoral level, is a pivotal aspect of improving professional skill in the field.

Many health hazards caused by the environment call for research and development to solve the problems. Problems can be addressed and prevented, for example, by developing technologies that reduce emissions or that are otherwise environmentally sound and by developing power regulation technology and transport technology.

A specific shortcoming in the promotion of environmental health is the small number of investigations into the associations between built-up surroundings and human health. Furthermore, only scant information is available about the links between the various factors affecting the sensory environment and health.

The key authorities in charge of environmental health R&D include the Ministry of Social Affairs and Health, the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Ministry of Transport and Communications, the Academy of Finland and the Technology Development Centre of Finland.

OBJECTIVES

- Environmental health research and development, and utilisation of research data, are intensified in the operations of various administrations in Finland.

In the field of environmental health, there are **three main lines of approach to research needs**:

- Basic research on environmental health hazards, definition of environmental and health hazards, impact and risk assessment as well as development of assessment methods.

- Research and development for the prevention of environmental exposure, in order to combat and rectify detrimental factors.

- Research in the social sciences and development of economic assessment methods.

ACTIONS

1 Under the supervision of the Academy of Finland and in collaboration with various administrations and other interest groups, launching of a multidisciplinary *environmental health research programme.* (Academy of Finland, Technology Development Centre of Finland, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry, universities and research institutes)

2 Utilisation of national centres for researcher education and Nordic or other international co-operation in order to provide education for environmental health researchers. (Universities, other institutions of higher education and research institutes)

3 Reinforcement of environmental health research conducted in research institutes concentrating on a specific sector, in order to meet the current challenges and at the same time to build up a foundation for knowledge and know-how serving professional skill and scientific competence consistent with international criteria. This is important so that a greater number of competent people can enter the field. Moreover, sustained effort and the ability to face future challenges are essential. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, research institutes, universities)

4 Intensification of researcher education in environmental health and of researcher networking, in order to educate competent scientists who are well familiar with international progress and who can be employed both in research and administration. This is accomplished chiefly by allotting postgraduate and postdoctoral study opportunities in the field. Also, encouragement of postdoctoral researchers from abroad to work in Finland. (Ministry of Education, Academy of Finland, research and development centres, universities)

5 Further development of methods for economic assessment of environmental health and further development of international co-operation (Ministry of Social Affairs and Health, Ministry of the Environment, National Research and Development Centre for Welfare and Health, Academy of Finland, universities and research institutes)

HIGHER EDUCATION

Because environmental problems concern several scientific fields, environmental health work requires broad multidisciplinary know-how. In practical terms, this means that environmental health specialists need to master not only their own field but also the basics of many others.

At the heart of environmental health issues are veterinary surgeons, physicians specialising in environmental health care, environmental hygienists, health inspectors, other health protection personnel as well as administrative and other experts specialising in environmental protection, who have received their education in the natural sciences, technology, environmental science or social sciences.

From the viewpoint of environmental health promotion, there are also key fields outside the professional core area of environmental health. Consequently, in the planning, provision and organisation of this education, it is essential to take into account the educational fields where basic

knowledge of environmental health and possibilities for specialisation are needed.

Education in the science of medicine and in veterinary science allows for specialising in environmental health. Veterinary education also offers specialisation in food product supervision, by means of a specific programme lasting for several years. The education of physicians specialising in environmental health has commenced at the universities of Kuopio, Tampere and Turku.

Instruction in environmental health is also provided in conjunction with education in nursing. Occupational health nurses, in particular, need knowledge of environmental health in their work.

The Faculty of Agriculture and Forestry at the University of Helsinki, the Faculty of Forestry at the University of Joensuu and the faculties of science at many universities provide an educational base for people who will hold expert positions in environmental biology, environmental protection as well as environmental chemistry and toxicology.

In the environmental science programme of the University of Kuopio and the chemistry programme of the University of Turku, students can specialise in environmental health already when taking their Master's degree. Specialised education leading to qualification as a health inspector in chemistry has been launched at the University of Turku.

The competence requirements of health inspectors are specified in the Health Protection Decree. Health inspectors are to hold a relevant degree – granted by a university, by some other institute of higher education, or by a polytechnic or vocational institute – in technology; natural sciences, medicine or veterinary science; or they are to hold a degree granted by a faculty of agriculture and forestry or by a technological institute.

Consideration of environmental health viewpoints in community planning, construction and renovation requires reform of vocational and university education and provision of further education for persons already in working life.

Curricula in science and technology include the basics of environmental protection technology both as a part of basic education and as a component integrated into professional education. Moreover, students may specialise in environmental protection or occupational safety technology.

Comprehensive provision of specialisation programmes and supplementary education requires collaboration between institutes of higher education, usually on the basis of reciprocity. Professional interest groups also provide their membership with further education in the field.

Universities have started to offer long-term studies for persons in working life in order to enhance professional expertise in the form of professional development programmes (PD). In PD training, a personal education plan supporting the student's work tasks is drawn up, usually in collaboration with the employer. Specialised studies are meant for persons who have an academic degree and at least three years of working experience. This education may consist of further education, basic or supplementary training, open university studies, studies abroad or, for example, independent studies. PD programmes offer the possibility to

receive further and supplementary education in the environmental health domain. PD programmes in environmental health run jointly by several universities will be initiated soon.

Researcher education and research collaboration projects along with projects between the authorities undertaken with the Nordic and EU Member States in this field will also advance environmental health and its education in Finland. In addition, international organisations and research institutes offer prospects for research and education.

OBJECTIVES

- Provision of basic and specialised education in environmental health at universities and polytechnics.

- Persons holding environmental health positions are given the chance to maintain and enhance their professional skills through further education.

ACTIONS

1 At institutes of higher education, incorporation of aspects of environmental health into the basic education given in the fields of construction and transport technology, community planning, health care, the behavioural sciences, studies in agriculture and forestry and environmental biology. (Universities and polytechnics)

2 Provision of specialised and further education in environmental health at institutes of higher education. It is especially urgent to organise further education for professionals working in community planning and construction. (Universities and polytechnics)

VOCATIONAL AND SCHOOL EDUCATION FOR YOUNG PEOPLE

The curriculum includes environmental education integrated into many subjects. In lower levels of comprehensive school, environmental knowledge is incorporated in subjects dealing with environmental and natural sciences, in particular. Health and hygiene, taught in comprehensive and senior secondary school and vocational training, discuss environmental health. Along with informative issues, "learn as you do" type of activities should be developed in the context of various subjects on environmental health, including manual skills and physical education.

At best, the school environment may support school education in environmental health questions. For instance, school buildings and their environs offer good possibilities for this. With regard to functional factors, the occupational health solutions adopted by schools are noteworthy: a safe way to school, recreation, pupil health care and counselling as well as parent-teacher activities. Currently, however, the cuts imposed on schools hamper the development of user-friendly and safe school

surroundings. Moreover, the cuts have had negative effects on the condition of school buildings and on the work atmosphere, and have led to a decline in club activities and to shortcomings in teaching materials.

OBJECTIVES

- Children and young people receive information about environmental health issues; they learn to rethink the significance of their environment in terms of health and well-being, protection of the environment and awareness of the inherent health hazards.
- School surroundings promote health, an agreeable working atmosphere and a positive attitude towards the environment on the part of those active in school.

ACTIONS

1 Supplement health education given in comprehensive and senior secondary school and in vocational training with environmental health information and "learn as you do" type of activities. (National Board of Education, municipalities, teachers' unions, schools).

2 Provision of suitable teaching and other materials for schools, and further development of approaches to environmental health and environmental protection that encourage schoolchildren's independent activities. (National Board of Education, suppliers of study materials, municipalities, further education for teachers)

3 Consideration of healthy school environment when constructing or renovating schools and when planning their surroundings. The pupils, teachers and other staff must have a say in the planning of their working environment. Parents, too, must have a chance to participate. (Ministry of Education / National Board of Education, Ministry of the Environment, Ministry of Social Affairs and Health, municipalities).

4 Inclusion in civics education of topics relating to citizens' opportunities to influence their living environment. (Ministry of Education/ National Board of Education, municipalities, youth work).

EARLY CHILDHOOD EDUCATION

Early childhood education and pre-school education will encourage children to take care of the environment and of themselves. The main emphasis in early childhood education lies in learning as you do, participation and experiencing. Environmental education given in children's immediate surroundings will enhance their readiness to perceive the environment as an entity. Health education starts at home and is supported by day care centres, municipal health services, maternity clinic activities

as well as citizens' organisations in the fields of health care, social welfare and education. Environmental health viewpoints and adhering to them in the environment where the child is growing up are best conveyed to families through day care centres and maternity clinics. Early childhood education always involves co-operation with the family. It is also about influencing the attitudes, actions and choices of the family.

OBJECTIVES

- Children learn how to take care of themselves and the environment and become aware of the positive significance of environmental health.

ACTIONS

1 Provision of an adequate number of safe and pleasant playgrounds and surroundings for adventure, where children may play and be active; places which are close to home and can be reached safely. In the planning of new day care centres and children's areas as well as in renovation of existing areas, environmental education and health viewpoints are taken into account. (Ministry of Social Affairs and Health, Ministry of the Environment, municipalities)

2 Use of environmental and health information to support education in families. (Municipalities)

3 Incorporation of environmental health issues into education for public health nurses, educators and teachers. (Institutes of higher education)

5.3 ENVIRONMENTAL HEALTH MONITORING AND DATA SYSTEMS

BACKGROUND

For monitoring environmental health, one needs information about the factors causing exposure, about the incidence and spreading of these factors, about the degree to which the population is exposed to them and about the resulting effects. Monitoring aims to evaluate the degree of environmental exposure, to investigate how common the exposure is, to determine the effects and course of development with regard to environmental exposure, and to verify that the goals set for minimising the effects are met. In addition, effort is made to identify the population groups at the highest risk. Monitoring may involve continuous and systematic data compilation, analysis and interpretation (e.g. data on the quality of community air), but it can also involve activities linked to a limited time and place, arising from a topical need (e.g. environmental and health monitoring as a result of a chemical emission contaminating groundwater).

The data needed in monitoring environmental health are divided into health information, which are compiled mainly in registers and organisations within the health care sector, and into data on environmental and exposure factors, which for the most part are collected in the databases kept within the environmental sector. The crucial questions for environmental health monitoring are the skill to use the data accumulated in both these sectors and the ability to combine this information in a meaningful way into variables reflecting the state of environmental health.

Only in a few exceptional cases is it reasonable to compile environmental health information separately, in the same way as one collects data on, say, occupational diseases, because it is usually impossible to identify environmentally-induced diseases at the level of the individual. Exceptions to this include, for example, diarrhoea caused by contaminated water, a disease the origin of which can be shown with relative certainty if an epidemic breaks out. However, the incidence of diseases due to, for example, air pollution or environmentally-induced cancer can be proved only at the level of the general population.

In order to improve environmental health monitoring, one must assess the central information needs and create a system whereby data can be collected and made available to various parties. It would therefore be appropriate to support system management, which would show where the necessary data are and which would involve the professional skill and technical facilities for using the data to meet the needs of monitoring.

Disease registers

From the environmental health standpoint, the central variables regarding the public's state of health and disease prevalence are, for example, mortality, the incidence of certain communicable diseases and cancer, malformations, allergies, diseases of the circulatory and respiratory systems as well as some diseases of the nervous system. Some of the variables are accessible through comprehensive and up-to-date registers, such as data on the incidence of cancer. The cause of death statistics also give relevant information about the prevalence of serious diseases among the public. As to some other diseases, such as allergies or most respiratory illnesses, no comprehensive information exists at the national level. In certain cases (e.g. respiratory diseases caused by mould inside buildings), targeted registers would help control the problem. Therefore, it is necessary to pinpoint the diseases which require more precise monitoring data, either because they are apparently environmental in origin or because this connection must be investigated.

Registers of factors causing exposure

Both municipalities and enterprises locally collect environmental information relevant to health. The bulk of this information is not utilised nationally, nor is all the information accessible. These data deal with, for example, the chemical and microbiological quality of drinking water, the quality of swimming water, air quality in communities, contaminants in

food and food hygiene, the physical, chemical and microbiological aspects of indoor air, noise in built-up areas, waste management and soil contamination. A register on chemicals is kept, through licensing and notification procedures. (Appendix: Environmental health monitoring and data systems).

It would be advisable to determine what elements of the information collected in this way could be used nationally for the needs of monitoring, planning and research. At the same time it would be useful to investigate whether all the data that are collected are still relevant, keeping local and national priorities in mind. In addition, the nature and quality of the data should enable the best possible cost-effectiveness.

OBJECTIVES

- Essential environmental health information is to be collected nationally, and these data are to be easily accessible.

ACTIONS

1 Determination of the kinds of environmental health information to be compiled nationally, and development of the data management required therein, so that exposure and effects can be described better and further actions can be planned. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Trade and Industry, Association of Finnish Local Authorities, research institutes)

2 In health care, intensification of the diagnosis, treatment and prevention of diseases associated with the environment. (Ministry of Social Affairs and Health, municipalities, federations of municipalities, hospital districts, National Public Health Institute, Finnish Institute of Occupational Health)

5.4 ASSESSMENT OF ENVIRONMENTAL HEALTH RISKS AND HAZARDS

BACKGROUND

In assessing health risks of environmental origin, the aim is to define the probability that exposure to an environmental factor will be detrimental to health. The risk among the population is affected by the nature of the factor, the degree of exposure and the number of persons exposed. The risk to the individual also depends on personal characteristics.

Assessment of an environmental health risk is more complicated than, say, evaluating the risk arising from occupational exposure because

the scope of the environmental exposure is harder to evaluate, because the exposure is varied in terms of time, and because it depends markedly on individual behaviour. Many factors simultaneously cause exposure, but the concentrations tend to be low, and confounding factors hamper assessment more than is the case with occupational exposure. Therefore, a considerable part of risk assessment is based on toxicological information derived from experiments on animals. Nonetheless, information about environmental risks with significant health impacts, obtained through epidemiological research or clinical experience, is available for risk assessment. Examples include the most common air pollutants and heavy metals, such as lead and mercury. Moreover, information derived from accidents is available with regard to certain risks (mercury, dioxins, PCB compounds).

Typically, toxicological risk assessment starts with studies on the toxicity of a chemical, followed by extrapolation pertaining to dose and species. Analysis of the most obvious toxicity (e.g. potential to cause cancer) is often called the **identification of danger**. This is followed by **determining the dose-impact correlation**: experiments on animals reveal the dose range within which the harmful effect is present. Because measurable hazard is undesirable, an effort is made to establish a dose or level of exposure which has no negative effects or where the probability of an impact would be insignificant (e.g. dose extrapolation, risk reduced to one in a million). The next step is to evaluate **exposure** among humans, extrapolating from animal data (species extrapolation) in order to determine a level of exposure safe for humans.

Epidemiological risk assessment is based on the associations between exposures and diseases that can be established statistically among the population. Preliminary results may be achieved in so-called ecological studies, for example, the prevalence of disease in different cities or countries compared by exposure. This research design is prone to bias since not only the factor causing exposure but also populations, too, may differ in some respects (e.g. smoking, diet). A more reliable method is the cohort study, which follows a population whose exposure is known. One of the best-known cohorts is the cohort consisting of British physicians, distributed according to their smoking habits; this group has been monitored for 40 years. It has indisputably shown that smoking causes many types of cancer. Based on the cohort, it is possible to calculate the degree of risk as the function of exposure. The third research design is the case-control study, an approach based on disease: exposure is studied among persons having contracted a disease and among controls. If the persons who have developed the disease have been more widely exposed to a given factor, other factors being the same, the risk resulting from the exposure can be calculated.

According to general experience, epidemiological risk assessment is a less sensitive method than toxicological evaluation. The risk must range at least between one in a hundred to one in a thousand before it can be detected by epidemiological means. In toxicological risk assessment, on the other hand, the aim is usually to reduce the risk to a negligible level, (typically, to one in a million). Therefore, the risks established with certainty through epidemiological means should generally

be considered very relevant (e.g. increased mortality or incidence of lung cancer due to air pollution; increased incidence of melanoma due to sunburn).

Risk assessment always involves evaluating exposure, because not even the most harmful substance will cause health hazards unless a population is exposed to it. Information on exposure may roughly be categorised as shown in Table 1. Since it is not possible to monitor the exposure of the population at an individual level, **risk management** usually means relying on concentrations in the environment or even on the level of emissions as the basis of hazard prevention (e.g. the limit value for arsenic in drinking water, guidelines for air pollutants or emission norms for a factory). These evaluations often use the modelling of exposure as an aid. Risk management is a political or administrative activity, which generally also takes into account political and economic realities as well as various ethical considerations.

At the individual level, the risk may depend on personal qualities (age, sex, hereditary factors, illnesses such as asthma). Many studies have also established that the exposure may greatly depend on, for example, the lifestyle and daily behaviour (time spent indoors, commuting in rush-hour traffic, choice of transport). A person's risk of contracting a disease or of dying as a result of environmental exposure is generally very small, but it is never non-existent, either. Thus, prevention of environmental health risks focuses on the population level: even a small risk is important, because the number of persons exposed is very high.

TABLE 1

Indicators at various levels of environmental exposure

1. Emission into the environment – for example, chemical discharged into water.
2. Concentration of a factor causing exposure in the environment (soil, air, water, food).
3. Individual exposure through respiratory organs, skin contact or digestion.
4. Individual intake of a factor causing exposure (what enters the body as a result of exposure).
5. Amount of factor causing exposure, which reaches susceptible organs and is thus able to trigger a biological response.

ASSESSING HEALTH HAZARDS AND RISKS IN PRACTICE

The assessment of risks usually addresses the question whether a certain chemical or other environmental factor is safe. However, it is impossible to give a yes-no answer to this question. All chemicals may be detrimental to health, and even the most harmful substances can be handled safely. The answer always depends on a variety of assumptions and circumstantial data.

Since the factors affecting environmental health are often indirect, it is hard to evaluate the associated risks. Therefore, decision-making often calls for caution, that is in uncertain cases, the resulting risk should be minimised.

Assessment of environmental health risks and impacts constitutes a central aspect of the daily work of environmental health personnel. In practice, typical risk evaluation situations are the following:

- Evaluation of the health consequences of the results obtained from environmental hygienic measurements.
- Assessment of whether verified cases of disease have an environmental origin.
- Environmental health impact assessment of a project.
- Strategic assessment of the environmental health impacts associated with planning.
- Environmental health reports given in conjunction with city planning.
- Evaluation of risks caused by accidents.

Nationally, administrative decisions on acceptable risk levels are made by introducing recommended values and maximum concentrations. In Finland, they are often based on EU Directives or recommended values given by WHO. Locally and regionally, national recommended values are applied to local circumstances. By means of maximum values, risk can be evaluated at least roughly, without thorough studies.

The risk or impact can be assessed without more thorough investigations if there is ample information for the evaluation and if clear-cut values exist, upon which the decision is based. The situation is more complicated if the data are inadequate, if the values of a health hazard remain undefined or if there is conflicting information about the health effects of the exposure. In such cases, risk evaluation may be demanding and time-consuming.

Many quarters in Finland are party to the assessment of health risks originating in the environment. Evaluation is grounded on basic research in medicine, veterinary science and the natural sciences as well as on risk assessments carried out by international research institutes. Among the most significant of these are the WHO set of recommendations with the appended risk evaluations, the assessment of the carcinogenic potential of substances conducted by the International Agency for Research on Cancer (IARC) and risk assessments done by the United States Environmental Protection Agency (USEPA).

In Finland, the impact or risk assessment duties specified in the legislation on chemicals, herbicides and pesticides are divided between several administrative branches. Evaluation of the health effects of chemicals, herbicides and pesticides is assigned to the National Product Control Agency for Welfare and Health. Assessment of occupational health impacts falls under the scope of the Ministry of Labour, which discharges its duties through the Finnish Institute of Occupational Health, an expert agency. Evaluation of environmental impacts, in turn, is the responsibility of the Finnish Environment Institute.

By law, businesses must provide the authorities with information needed to assess the health and environmental impacts concerning new substances, protective chemicals, herbicides and pesticides. This includes extensive toxicological tests and information for the evaluation of exposure. The authorities generally have much more limited data on other substances, which are often in widespread industrial use. To eliminate this drawback, in 1987 the OECD launched an extensive project on the existing substances, the goal being to compile and augment information about industrial chemicals in the most widespread use in its member countries. The EU has commenced an equivalent project, which is more clearly aimed at reducing the risks than the OECD project. The purpose of the EU Regulation (793/93) concerning existing substances is to collect data systematically on the substances used widely in the Community and to evaluate the resulting risks for the environment and health. Finland, too, takes an active part in these projects. On the basis of the research data, the party engaging in an activity is obliged to classify and label dangerous chemicals. Through classifications and data labels, the user receives the necessary information about the specifications and protective measures regarding chemicals.

There are several chemicals in use for which the related risk has not been evaluated, but thanks to international co-operation, the situation will probably improve in the near future. Much new information about exposure to impurities in community air and about the impacts of such exposure has emerged during the past few years, a fact making risk analysis easier. Research in this field is being done actively in Finland, as elsewhere. However, the evaluation of many other environmental health risks has so far been less active. For example, investigation of the risks and sources of exposure related to the microbiological hazards of indoor air is only beginning. The information available about the health effects is very deficient, and, consequently, it is impossible to evaluate the risks adequately. Another example is the potential risk posed by chemicals with oestrogen effects, a hazard that must be studied before the risk can be analysed. More research into psychosocial health risks is also needed.

COMPARISON OF RISKS

The purpose of risk analysis is to make administrative decision-making easier. However, the importance of a risk may be hard to determine. For instance, we are not accustomed to thinking what it means in practical terms that exposure to a given substance causes a risk of a disease or death during the lifetime of one person in a million. The risk becomes more concrete when compared with some known hazard, such as the risk of contracting lung cancer due to smoking or the risk of dying in a car accident. Comparison of risks is inevitable in administration so that the countermeasures to prevent the hazards can be ranked by priority. At the same time, it should be determined how easy or difficult it is to reduce the risk in relation to the ensuing benefits. Comparison of risks is easier if suitable yardsticks are available. The risk of death or illness brought about by exposure has been applied in environmental health

risk analysis. However, there are no similar yardsticks for discomfort stemming from environmental factors, a fact that makes comparison harder in this respect.

An essential element of risk management is assessing the effectiveness of the measures taken. In the Environmental Health Action Plan for Europe, the problems and measures have been divided into three priority groups according to the severity and scope of the health impacts. Moreover, the trend of an environmental health problem is taken into account; the possibilities of a technical solution to the problems and the probable health benefits in relation to the measures needed. On the basis of this division, the first category could include measures used directly to reduce mortality and morbidity stemming from environmental factors. The second category would incorporate measures whose impact on mortality and morbidity of environmental origin cannot be as distinctly shown, but may be inferred with certain probability. The third category would include measures enhancing contentment and psychological well-being.

Climate change, depletion of the ozone layer, hazards associated with nuclear energy and nuclear arms, use of gene technology and partly also chemical exposure all entail risks, the impacts and probability calculations of which involve complex global factors. These risks can be far greater in scope because the impacts may concern the whole world population and nature. Consequently, the societal and political dimensions of risk analysis are also on a totally different level. The duration of exposure and its effects might span hundreds or thousands of years, and it is hard to evaluate risks reliably over such a long period of time. Nevertheless, these factors and their prevention must be evaluated and studied more closely than is the case today. In addition, through societal and political decisions, resources should be targeted at controlling and preventing the risks brought about by these factors.

OBJECTIVES

- Adequate resources and know-how are to be available for the evaluation of environmental health risks at the national and local levels.
- An active role is taken in international preparation for risk reduction measures and in the development of risk analysis and reduction methods.
- In the assessment of environmental health risks, the principle of caution is adhered to.

ACTIONS

1 Intensified evaluation of environmental health risks in connection with environmental impact assessment, by developing guidelines for health risk analysis. (Ministry of Social Affairs and Health, Ministry of the Environment, research institutes)

2 Development of methods of analysing environmental health hazards and risks affecting special groups, such as children, persons with illnesses and the elderly. (Ministry of Social Affairs and Health, Ministry of the Environment, regional government, universities, research institutes, Academy of Finland)

3 Active participation in international collaboration with regard to the following measures: a) assessment of chemical risks and of measures to minimise them b) participation in establishing guidelines for, e.g. the development of health risk assessment on the basis of the assessments. (Ministry of the Environment, Ministry of Social Affairs and Health, National Product Control Agency for Welfare and Health, Finnish Environment Institute, research institutes)

4 Further development of research into the costs and effectiveness of measures employed in controlling environmental health risks. (Ministry of the Environment, Ministry of Social Affairs and Health, Academy of Finland, National Research and Development Centre for Welfare and Health, research institutes)

5 Development of methods for measuring satisfaction, psychosocial factors and well-being as part of environmental health risk analysis. (Ministry of the Environment, Ministry of Social Affairs and Health, National Research and Development Centre for Welfare and Health)

5.5 ENVIRONMENTAL HEALTH POLICY

Planning and supervision of environmental health in Finland

The planning and supervision of environmental health requires a great deal of versatile skills and knowledge. Therefore, these tasks involve many different operative and administrative fields.

A prerequisite for efficient environmental health planning and supervision is smooth collaboration between various authorities and branches. Major decisions affecting environmental health are typically made outside the health or environment sector. The various administrative fields see to it that health and the environment are taken into account in all decision-making.

At present, national direction, planning and supervision of environmental health come under the jurisdiction of several ministries. In Finland, health protection and public health direction, planning and steering at the national level are the province of the Ministry of Social Affairs and Health, but municipalities are responsible for the planning and provision of services and for the supervision of environmental health in their area. In addition to legislative preparation, the Ministry supervises the health aspects of housing, environmental hygiene, food hygiene and the quality of water. Government agencies working under the auspices of

the Ministry of Social Affairs and Health participate in environmental health supervision in their respective fields. The Radiation and Nuclear Safety Authority is in charge of the supervision of radiation levels and protection against radiation. The National Product Control Agency for Welfare and Health takes care of chemical supervision. The National Public Health Institute engages in research related to environmental health supervision. In addition, the Finnish Institute of Occupational Health conducts studies benefiting environmental health control.

Working under the Ministry of Trade and Industry, the National Food Administration is responsible for the supervision of food products, and the National Consumer Administration controls product safety. The National Veterinary and Food Research Institute, which operates under the Ministry of Agriculture and Forestry, supervises the primary production and processing of food originating from animals in accordance with the laws on hygiene. However, a ministerial department is responsible for the supervision of communicable veterinary diseases (including zoonoses).

The administrative field of the Ministry of the Environment encompasses, among other things, protection of air and water, combating oil pollution, soil protection, waste management, noise abatement, nature conservation, land use planning and issues concerning built-up areas and housing, environmental impact assessment and the environmental impacts of chemicals. The Ministry of the Environment is in charge of supervision, legislative preparation and international affairs in its domain. The Finnish Environment Institute is the research and development centre for the environment, and also has administrative duties, for example, in the supervision of chemicals, combating environmental hazards and in waste management. The Regional Environment Centres (13 in all) deal with the environment regionally by promoting and supervising the protection of air, water and soil, waste management and protection against noise. They issue environmental permits and monitor that the terms are adhered to. They also supervise land use, produce information about the state and uses of the environment, and promote environmental awareness.

At the regional level, environmental health is directed and supervised by the social and health departments of provincial governments. The provincial governments act as expert bodies in, for example, granting environmental permits, in environmental health impact assessment, in county administrative court rulings, in municipalities' environmental health problems and in waterworks questions.

According to the Health Protection Act, the municipality has the responsibility for taking care of health protection. The law specifies that a board or other body designated by the municipality is in charge of these duties. This body may also serve several municipalities jointly. The municipality may decide which tasks it will delegate to its own civil servants.

The content of health protection is defined in the Health Protection Act, stipulating that the municipality must observe health protection requirements in its community and traffic planning, in planning sites for hospitals, care and service institutions, schools, factories and housing

developments, and in making decisions affecting the community structure. The municipality must actively see to it that health viewpoints are adequately taken into account in all decision-making on the environment.

Through the instructions and regulations given in the environmental permit and notification procedure, environmental health hazards can be prevented, reduced and eliminated. In addition, the municipality may impose the necessary regulations on the party causing a health hazard in order to eliminate or prevent such disadvantage, and sanctions may be introduced to enforce these directions. The supervision of the environmental health situation, carried out by the health protection authorities, plays an important role in maintaining and promoting a healthy environment. When necessary, the enterprise can be given orders to prevent health hazards.

The municipality must actively monitor the physical, chemical and biological state of the environment. Close collaboration with the health and environment protection officials is needed in this monitoring. Data on environmental changes with health impacts may also be obtained through the obligation imposed on the enterprise to monitor the quality of environmental health.

In addition to regulations and restraints, health protection is advanced by organising guidance and information services on these issues. Through information services in health protection, ordinary people's readiness to make choices beneficial to their health can be enhanced. The municipality should disseminate information about the health aspects of the environment, so that not only municipal residents but also the municipal authorities and regional and local health protection officials all receive adequate data on the state of the environment and on the changes taking place.

With regulation by the state diminishing, municipalities have started to rearrange the administration and organisation of environmental health issues. The new municipal law has also opened up opportunities for rearrangements. In many municipalities, environmental health services have been transferred from their traditional frame of reference, that is, public health work, to the same unit as environmental protection. The new municipal law enables intermunicipal co-operation on a wider scale also with regard to organising services stipulated by special legislation. Thus, it becomes possible to develop and utilise specialised environmental health know-how transcending municipal boundaries. In connection with such reforms, it should be ensured that no agency or body is in a position to grant itself environmental health permits. It should also be ensured that the parties undertaking these tasks have at their disposal both the necessary resources and expertise in environmental health.

Environmental health legislation

The environmental health legislation can be divided into general health supervision, food product supervision and veterinary services. Health protection is an important objective in many essential laws on environmental protection.

The most central law governing environmental health services is the Health Protection Act. Replacing the Health Care Act, it took effect on 1 January 1995. The Health Protection Act lays down general principles and stipulations to ensure environmental health standards. According to the law, activities having environmental impacts must be planned to maintain and enhance the health aspects of the environment in which the public or an individual citizen lives, insofar as this is possible. Activities causing environmental hazards are subject to permits granted by the environmental authorities. In addition, notice must be given concerning certain activities with environmental health impacts, so that proper supervision can be performed by the authorities.

Passed in 1990, the Chemicals Act has the purpose of preventing and combating health and environmental hazards resulting from chemicals. With regard to health hazards, the highest supervision and steering of the law lies with the Ministry of Social Affairs and Health. Responsibility for environmental hazards falls under the Ministry of the Environment, while the Ministry of Trade and Industry is in charge of the industrial use and storage of chemicals. The central and regional administrations in various fields act as supervisory authorities. In municipalities, the officials responsible for chemicals take care of supervision. Occupational health and safety administration also participates in enforcing the law.

The objective of the Finnish Radiation Act (passed in 1991) is to prevent and minimise health and other hazards due to radiation. The aim of the Nuclear Energy Act (1987) is to harmonise nuclear energy with societal interests and to ensure that the use of nuclear energy is safe for both humans and the environment, and is not conducive to the proliferation of nuclear arms. The Nuclear Energy Act stipulates the general principles of nuclear energy use, nuclear waste management, licensing of nuclear energy, supervision and the competent authorities. Radiation and nuclear safety is supervised by the Radiation and Nuclear Safety Authority.

The Gene Technology Act was passed in 1995, with the purposes of promoting the safe use of gene technology and its development in an ethically acceptable way, and of preventing and combating potential hazards to human health, animals, property or the environment, resulting from the use of genetically manipulated organisms. The supreme supervision and steering of health hazards lies with the Ministry of Social Affairs and Health, while the Ministry of the Environment is responsible for environmental hazards.

The legislation on food products underwent a thorough reform in 1994-1995. The processing, safety and other characteristics of food products are regulated by the Food Act and Health Protection Act as well as by the law concerning the hygiene of food products derived from animals. Food product supervision is chiefly the responsibility of municipalities. The new legislation obliges all enterprises dealing with food products to chart the inherent risks and to carry out active supervision in order to prevent them.

To protect the population from infectious diseases, the Communicable Diseases Act was passed in 1986. The national planning and super-

vision of combating infectious diseases are handled by the Ministry of Social Affairs and Health and the provincial governments. The expert agency on communicable diseases is the National Public Health Institute, which keeps a register of infectious diseases for this purpose. Municipalities are responsible for organising the prevention of communicable diseases within their areas, as a part of their public health work.

The Product Safety Act, enacted in 1986, deals with consumer goods and consumer services. According to the law, the trader or entrepreneur must see to it that consumer goods or services will not cause harm to the consumer's health or property. The law is enforced by the National Consumer Administration. The Ministry of Social Affairs and Health acts as an expert agency in assessing health hazards related to consumer goods. At the regional level, supervision is carried out by provincial governments; local supervision is handled by municipal authorities.

Passed in 1976 and amended in 1992 and 1994, the Act on Measures Designed to Reduce Smoking aims at preventing diseases resulting from smoking, by reducing smoking among the population and by protecting people from airborne tobacco smoke. By law, the National Product Control Agency for Welfare and Health is responsible for the supervision of tobacco products. Municipalities see to it that restrictions imposed on the sale of tobacco are complied with and that the smoking regulations pertaining to day care centres, schools, official buildings and public transport are observed. The regulations on smoking at workplaces are enforced by the occupational health and safety officials. The police supervise that the smoking regulations are observed at public meetings and events.

The Air Pollution Control Act, enacted in 1982, authorises the Ministry of the Environment to implement air pollution control. Practical implementation of the law is seen to by the regional environment centres and municipalities. The Ministry of Social Affairs and Health acts as the expert authority specified in the Air Pollution Control Act, and the National Public Health Institute as the expert agency. Based on the Air Pollution Control Act, the Council of State has issued decisions concerning the quality of air, reduction of emissions, composition of products and restrictions on the use, import and export of products.

The Water Act, which took effect in 1962, stipulates water protection in Finland. The law requires that a permit be obtained in order to undertake activities polluting waterways. The authorities granting permits specified by law are mainly the Water Rights Courts (3) and, in some cases municipal boards for environmental protection. The stipulations governing the quality and control of drinking and swimming water are specified in the Health Protection Act. The decision of the Ministry of Social Affairs and Health regarding drinking water quality requirements came into effect on 1 February 1994, incorporating the quality criteria for drinking water, compatible with the Directive of the European Community, and regulations on the control of drinking water. The decision also contains certain essential quality parameters from the criteria for drinking water imposed by the WHO in 1993. The limits on some parameters are stricter than in the EC Directive, which was prepared as far back as in

the 1970s. The Ministry of Social Affairs and Health decision regarding swimming water took effect on 1 May 1996.

The general regulations on the prevention of noise are specified in the Noise Abatement Act, passed in 1988. The law stipulates the general principles of combating noise, the planning of noise prevention in municipalities and the obligation to report on temporary work sites involving disturbingly high noise levels. The permits for plants and installations emitting noise, however, are prescribed in the Health Protection Act. On the basis of the Noise Abatement Act, the Council of State issued a decision on normative limits for the noise level in 1993. Practical implementation of the legislation on noise abatement is the responsibility of the regional environment centres and municipalities.

The new Waste Act came into force on 1 January 1994. The purpose of the law is to enhance sustainable development by reducing the amount of waste, by promoting recycling, and by preventing and combatting environmental and health hazards resulting from refuse. The regional environment centres and municipalities are in charge of implementing this law.

The Building Act and Decree lay down provisions concerning community planning and construction, with both direct and indirect health impacts. The city plan must meet the requirements associated with health, pleasant surroundings, fire safety, traffic and aesthetic criteria. There are stipulations, for example, regarding a sufficient number of parks, other recreation grounds and playing grounds in built-up areas, traffic safety in streets and roads as well as stipulations on specifying potential sites for water supply and waste water management facilities in the city plan. Buildings must comply with, for example, health and safety standards and must be constructed of non-hazardous materials, avoiding all possible adverse health effects. In addition, there are stipulations on the processing of city planning and construction permits, including hearings and right of appeal.

The permits specified by the legislation on health protection, waste management, air pollution control and issues concerning neighbour relations are processed in accordance with the Environmental Permit Procedures Act, passed in 1992. The regional environment centres and the municipal environment permit authorities grant such permits. In its 1996 memorandum, the environment permit committee, set up by the Ministry of the Environment, suggested amendments to the environmental legislation so that a new law on environmental protection would be passed, replacing the laws on air pollution control and noise abatement. Some changes are also to be introduced to the Waste Act, Health Protection Act and the Water Act. The permit system would be amended, combining the present environmental permit issues and water pollution permits into a new administrative permit system. The reform will take effect in 1999.

The Act on Environmental Impact Assessment Procedure (EIA) was enacted in 1994. The objective of this law is to promote the assessment and consideration of environmental impacts in planning and decision-making. The availability of information to citizens, and citizens' possibilities to exert influence, must be enhanced. The law requires that the evaluation of the environmental impacts of a project, plan or programme

includes an investigation into human health, living conditions and residents' satisfaction with the surroundings. The general steering and monitoring of the implementation of the law, as well as assessment development, are assigned to the Ministry of the Environment. Each ministry will take care of supervising implementation of the legislation within its domain. The regional environment centres direct and supervise the implementation of the EIA law in their respective regions. The Ministry of the Environment and the Ministry of Social Affairs and Health have given the regional environment centres and provincial governments joint guidelines in a letter on collaboration in the environmental permit and EIA procedures.

The new Nature Conservation Act was enacted in late 1996 to replace and update legislation on nature conservation passed in 1923. The new law implements the two nature conservation Directives of the European Union. Among other things, the law addresses the planning of conservation and the obligation to draw up land-use plans for inland and coastal shorelines.

Environmental health in the European Community

The 1957 Treaty on the European Economic Community makes no reference to environmental or health protection. However, the requirements on products, specified in the Treaty (Article 100), were aimed at safeguarding human health and safety.

A new foundation for environmental and health protection was laid in the Community legislation through the Single European Act in 1987. Article 100 was amended, and a section dealing with the environment was added to the Treaty.

In accordance with the Single European Act (Article 100a), the Commission must base its recommendations, aimed at legislative harmonisation and concerning health, safety, environmental protection or consumer protection, on high-quality protection. In addition, the article incorporates what is known as the environment guarantee. If a Member State, for example, for environmental or health reasons, considers it necessary to adopt a national regulation or instruction, irrespective of harmonisation implemented by the Council through statutory majority, the Member State should notify the Commission accordingly. The Commission must endorse the regulations and instructions in question, having made sure that they are neither discriminatory nor a means of covert impediment to trade between Member States. On the basis of Article 100a, a large body of legislation aiming at health or environmental protection has been passed.

In the new Article 130r of the Single European Act, addressing environmental protection, the related goals of the Community were laid down as follows:

1) To preserve, protect and improve the quality of the environment.
2) To contribute to the protection of human health.
3) To secure proper and sustainable utilisation of natural resources.

Thus, the protection of health is an integral part of environmental protection in the Community legislation. The legislation on environmental protection is based on Article 130s in the Treaty. According to the Article and its supplement, Article 130t, the Community legislation on environmental protection (circumstances) does not prevent Member States from retaining or implementing stricter conservation regulations than is the case in the legislation of the Community.

In the Treaty on the EU, the content of the Articles on the environment was altered so that environmental protection would have a more prominent role in the Community legislation. Article 130r further expanded the substance of environmental protection.

The Treaty on the EU added a new section on public health to the treaty on the Community. According to Article 129 on public health, the protection of health must be taken into account in all Community policies. Rather than issuing directives or other legislation, the Article will serve to integrate health protection, making it a part of decision-making in various sectors. The national systems of health services do not fall within the domain of the EU. Moreover, on the basis of Article 129, there are programmes which Member States may join if they wish to do so. Through these programmes, funding is provided for projects carried out in Member States.

The Commission has made a proposal for a Community action programme on monitoring the health situation. The purpose of the action programme is to develop the monitoring of the state of health and disease-related risk factors in the Community. The programme also includes monitoring indicators of health hazards in the living and working environment, such as pollution of air and water and pollution in the environment at large.

The Directorate General V has prepared the proposal for a Community action programme regarding pollution-related diseases. The programme, to be implemented during the five-year period of 1998-2002, has as its goal the surveying of pollution-induced morbidity in the Community and the increasing of awareness about environment-related causes of disease and their prevention.

The EU legislation on environmental health is a broad entity. In most EU domains, there are acts with direct or indirect health objectives. In the environmental domain alone, there are some 250 Community acts. Reducing environmental health risks is also the direct or indirect purpose of many provisions on food products, transport and consumer issues.

Important EU Directorate Generals for environmental health and the related R&D are: III (industry), V (public health), VI (agriculture), VII (transport), XI (environment, civil defence and nuclear energy) and XII (science, R&D).

National latitude in the legislative domain

Despite membership of the EU, important aspects of environmental and health legislation remain national. The Maastricht Treaty expanded the

principle of subsidiarity also to encompass other areas instead of just environmental protection. Hence, decisions must be made as close to citizens as possible. This especially applies to public health, because the Treaty of Rome explicitly states that Community measures in public health should not involve any harmonisation of the Member States' legislation or other regulations

Environmental protection acts have been handed down on the Community level, for example, on air and water pollution control, waste management, noise abatement, environmentally harmful chemicals, environmental permits for industrial establishments and environmental impact assessment. Many directives concerning the environment contain minimum requirements, allowing for the Member States to retain stricter national legislation.

Member States can also apply for exceptions in totally harmonised fields. The environment guarantee gives Member States an opportunity to appeal to the stricter national legislation whenever a State considers this necessary for reasons of health or the environment. Nevertheless, it is hard to say how much latitude the environment guarantee will give to legislation differing from the EU laws, because the European Court of Justice has not yet given precise information as to how it interprets the environment guarantee. To date, Germany, the Netherlands, Denmark and Sweden have appealed to the environment guarantee in order to retain stricter regulations. As regards Germany, this led to the first court case concerning the environment guarantee.

OBJECTIVES

- Safeguarding a healthy environment is taken into account in all EU legislation and decision-making and in the Finnish administration and legislation.

ACTIONS

1 Finland contributes to the development in EU legislation and other provisions so that they comply with the health and environmental protection objectives (State administration, Finnish EU officials and Members of the European Parliament)

2 Reinforcement of collaboration between various administrations, and at different administrative levels, in preparing environmental health issues. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Trade and Industry, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Education, other Ministries, provinces, regional environment centres, municipalities)

3 Intensification of co-operation between provincial governments and regional environment centres, for example, in environmental permit issues and in environmental impact assessment. (Provinces, re-

gional environment centres, Ministry of the Environment, Ministry of Social Affairs and Health)

4 Compilation of local and regional Environmental health action plans as part of the local agenda, as part of public health and environmental protection programmes or, when necessary, as separate environmental health action plans. (Municipalities, provincial governments, regional environment centres)

5 Assurances that development of municipal autonomy does not lead to any agency or body being able to grant itself permits for its own activities in decisions affecting environmental health. (Municipalities)

6 INTERNATIONAL CO-OPERATION

The majority of the world's population lives in conditions lacking clean drinking water, wholesome nourishment or clean air. Unhealthy or detrimental conditions cause morbidity and mortality. Each year four million children die of diarrhoea caused primarily by contaminated water or food. Hundreds of millions of people suffer from malaria, intestinal parasites and malnutrition. Airborne impurities lead to respiratory symptoms and diseases among hundreds of millions of people. More than one billion people live in conditions where they are unable themselves to obtain their daily nutrition, water, or adequate housing or shelter.

Over one billion people live in poverty – more than 600 million of them in extreme poverty. The number of people whose living conditions are inadequate is much higher still. If poverty is defined on the basis of living conditions, taking into account wholesome nutrition, an adequate supply of clean water, decent housing and shelter, and the availability of education and health care, the number of people living in poverty rises above two billion, which is some 40 per cent of the world's population. Environmental health problems are linked with poverty. Eradication of these problems depends on improvement of the living conditions in developing countries. Moreover, a direct comparison cannot be drawn between prosperity measured as the gross domestic product and the inhabitants' state of health because a good state of health has been achieved in some countries despite a modest gross domestic product. The issue is also a question of how evenly the wealth is distributed and how willing the society is to invest in improving and maintaining the prerequisites for good health.

Countries with a developed economy face different environmental health problems. The basic needs of the majority of the population are met, but growing consumption and increasing use of energy and natural resources threaten to spoil the environment and change the world's climate. The consequences of this trend are in part difficult to predict. International co-operation strives to limit harmful emissions.

The world's population is expected to reach 8 billion people in the year 2020. In developing countries, where the population growth is still rapid, lack of resources has made it difficult to achieve improvements in living conditions. In developed countries, where the population growth has come to a halt, it has been possible to increase consumption – to an extent that, seen from a global perspective, has outstripped necessity and that exceeds both the Earth's endurance and the sufficiency of natural resources. If the growing population of the world were to reach the same level of consumption, the state of the environment would undergo radical change. Constant growth of the world's population increases environmental health risks, and international co-operation is needed in order to bring the population growth under control.

Improving the health-related quality of living conditions has reduced, in particular, child mortality in developing countries. This trend, however, has not led to an increase in population. In general, birth rates have also fallen in places where child mortality has decreased. These trends can be reinforced by increasing economic security, by improving education and health care, and by intensifying advice on birth control.

6.1 INTERNATIONAL ORGANISATIONS

Within the field of environmental health, the importance of international co-operation is increasing constantly. Global problems such as climate change and ozone depletion from the stratosphere affect the world's population and all of nature. Measures effective in alleviating these changes and even in partly preventing them can be found only if as many nations as possible commit themselves to common goals by reducing greenhouse gas emissions and by doing away with the use of ozone-depleting substances.

As a Member State, Finland has actively participated in formulation of WHO's environmental health and health promotion objectives and in implementation of these objectives on the basis of the Health for All in 2000 strategy. Examples include the WHO Conference on Environment and Health, which was held in Helsinki in 1994, and Finland's participation in the work of the European Environment and Health Committee. WHO will continue to play a central role in implementation of international co-operation on environmental health in Europe and throughout the world. Reports published in WHO's *Environmental Health Criteria* series have served as a base for national regulations and recommended values in many countries.

On a global scale, environmental health is also promoted by the UN Committee on Sustainable Development (CSD), by the UN Environment Programme (UNEP), by implementation of international conventions on the environment and by the Commission on Human Settlements (Habitat). The World Trade Organisation (WTO) is conducting a working programme on the integration of environmental health policies with trade policies. Environmental objectives are also advanced by the UN Conference on Trade and Development (UNCTAD) in its working group on the environment and development efforts. Particular attention is paid to the market entry of products that conserve the environment and to development of standards and labelling systems. The Conference of European Ministers of Transport (CEMT) has furthered environmental health within its field. The Organisation for Economic Co-operation and Development (OECD) has supported environmental protection and environmental health, such as the work of the WTO and UNEP. The OECD plays a significant role, for example, in the Intergovernmental Forum on Chemical Safety and in the International Labour Organisation (ILO). Finland has been an active participant in the environmental health promotion programmes of the UN and its specialised agencies.

6.2 EUROPEAN CO-OPERATION

Two important conferences for ministers of environmental and health affairs have been held under the auspices of WHO; these conferences have reflected the growing concern over the effects of environmental changes on health. The European Charter on Environment and Health was adopted at the first conference, held in Frankfurt in 1989; it outlines European nations' common principles and objectives for improving the state of environmental health in Europe.

The second ministerial conference, held in Helsinki in 1994, adopted the Environmental Action Plan for Europe, which is based on an extensive and many-sided analysis of the current state of environmental health in Europe and on a report, Concern for Europe's Tomorrow, drawn up on the basis of the analysis. The Helsinki Conference decided that the European members of WHO would compile national environmental health action plans by the end of 1997. More than half of the countries in Europe have begun preparatory work, by the time being. The European Environment and Health Committee was established to monitor and support formulation of these national plans. The next ministerial conference is due to be held in London in 1999.

The major challenges facing environmental health in Europe are to be found in Eastern Europe, where environmentally induced morbidity and mortality are at a level differing from that in, for example, the Nordic countries. Western European countries, however, must deal with their own problems, too. Only in this way can they offer models that have been tested in practice for solving the large-scale problems of Eastern Europe. The problems are common problems in that environmental pollution is not contained within national borders or, in the case of global problems, even within individual continents.

In addition to compilation and implementation of the Environmental Action Plan for Europe and the national environmental health action plans, environmental health planning in the member countries must be promoted at the regional and local levels. A network for exchanging experiences on compilation of local environmental health actions plans should be established between different countries. Increasing citizens' participation in environmental health issues is another central area of co-operation in Europe. International co-operation is also needed in developing environmental health service systems. The countries of Europe differ widely as to their service systems, but in many countries there is a need to develop services meeting citizens' needs better.

The United Nations Economic Commission for Europe (ECE) plays an important role in achieving regional environmental agreements and other agreements, and in developing technical regulations. For years, the most important environmental agreement has been the Convention on Long-Range Transboundary Air Pollution, which has great significance in the constant monitoring of air pollution. The Convention on the Transboundary Effects of Industrial Accidents, the Convention on Environmental Impact Assessment in a Transboundary Context and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes are some of the more recent agreements associated

with environmental health. Not all of them are in force yet.

The ECE Committee on Environmental Policy has started a research programme on the Eastern European countries, by means of which environmental health can be promoted in these countries. The ECE has acted as a background organisation for the co-operation process of European Ministers for environmental affairs (Environment for Europe). The process began at the ministerial conference held in Dobris in 1991 and has continued at the respective conferences in Lucerne (1993) and Sofia (1995). The following ministerial conference will be held in Denmark in 1998. The conference at Lucerne approved the Environmental Action Programme for Central and Eastern Europe, in which effects on human health are among the most important criteria for action. Efforts are made to carry out the programme by means of national environmental action programmes. One task of the ECE Committee on Environmental Policy is to co-ordinate environmental action programmes and environmental health action plans.

The Nordic countries have traditionally had a great deal of co-operation concerning environmental health issues, for example, through the Nordic Council. Moreover, Nordic meetings on environmental health have been arranged for researchers and administrative officials alternately in the different Nordic countries. In recent years, representatives from the Baltic States have also participated in these meetings. Nordic co-operation has become an important aspect of Finland's international collaboration in environmental health.

The environmental health policy of the European Union has been dealt with in Chapter 5.5.

6.3 FINLAND'S ENVIRONMENTAL HEALTH CO-OPERATION WITH NEIGHBOURING AREAS

Among the most important tasks in Finland's adjacent areas are reduction of emissions burdening the Baltic Sea region, reduction of air pollution causing acidification, improvement of nuclear power plant safety and nuclear waste treatment, and promotion of nature conservation and protection of the diversity of nature. In addition to the Baltic Sea region, focal areas important for Finland include Arctic co-operation to promote environmental protection and environmental health within the sphere of UN action programmes, as well as joint European and Nordic co-operation projects financed by the World Bank and other financial institutions.

Finland has supported projects promoting the state of the environment – which consequently enhance human health – on the basis of action programmes agreed on with the officials for environmental affairs in the neighbouring countries. Finland's co-operation partners have included Estonia, Latvia, Lithuania, and Poland as well as the greater St Petersburg, Murmansk, Novgorod and Pskov regions and the Karelian Republic in Russia. Environmental co-operation programmes and top-priority projects have been drawn up together with these countries. The majority of the top-priority projects promote environmental health.

During the past five years, the Ministry of the Environment has assisted in a total of 135 investment projects and 450 technical support projects. The main objective has been to reduce emissions harmful to the environment in the neighbouring countries, thus at the same time lessening hazards to the Finnish environment, to the Baltic Sea and to the Baltic Sea region. The projects have focused on air and water protection and on management of hazardous waste. Investment projects have included modernisation of water distribution and sewage systems, waste water treatment plants, improvement of readiness for oil spill prevention, and development of an environmental information network. Co-operation targets have involved, for example, development of community planning and of structures and legislative instruments for town planning, preservation of the indigenous ecology and promotion of the sustainable use of natural resources.

Various branches of administration working in co-operation have organised education and training on control and monitoring of chemicals for the officials in neighbouring countries responsible for chemical affairs.

Co-operation within the adjacent areas can hasten reduction of the environmental burden caused by acidic deposition, toxic substances and nutrients in the Baltic Sea and in the vicinity of joint borders. At the moment, the best results in reducing the sulphur and nitrogen burden are achieved by cutting sulphur and nitrogen emissions in countries with economies undergoing transition. International co-operation for the protection of the Baltic Sea marine environment is co-ordinated by the Helsinki Commission (HELCOM). Other programmes for the development of environmental administration in adjacent areas are also carried out, financed by the World Bank and the European Bank for Reconstruction and Development.

Special attention has been paid to increasing the readiness of the authorities, industrial enterprises, research institutes and universities in neighbouring areas to deal with environmental problems. Administrative, legislative and environmental protection education and training as well as trainee exchange programmes have been supported. Administration of environmental affairs and of monitoring of the state of the environment as well as environmental impact assessment have been strengthened. Activities also include exportation of Finnish environmental technology, on the receiver's terms. To an increasing extent, investments are directed at projects aiming to enhance the efficiency of production methods and to projects aiming to conserve energy and raw materials. Use of the EU PHARE and TACIS programmes to advantage, and utilisation of Nordic and EU education and training programmes, are considered particularly important with regard to rectifying environmental hazards in adjacent areas.

In spite of the widespread co-operation in environmental affairs, little work has been done to determine the effects of the environment on people's health. Launching of environmental health co-operation in adjacent areas would be important for furthering protection of people's health. In areas near Finland, environmental health co-operation is essential not only for obtaining basic knowledge about the effects of the

environment on health but also for drawing attention to transboundary emissions.

The objective of co-operation in environmental health issues is to provide the health authorities and environment officials with research findings that can serve as the base for recommendations promoting environmental health. The greatest environmental health risks and the most serious environmental hygienic inadequacies in adjacent areas could be mapped in co-operation with researchers and officials from the countries in question. The key priorities can be determined by evaluating the state of environmental health, the public's exposure to environmental hazards, and the consequent health risks on the basis of existing data. The reliability of the environmental health indicators applied can be assessed jointly, and a system for the monitoring of environmental health can be proposed.

There are various environmental accident risk factors in adjacent areas, involving, for example, industrial enterprises and power plants. Should accidents in these occur, they could affect the people on both sides of the border. The transport of hazardous substances on both sides of the border and across the border involves risks. Together with officials in adjacent areas, accident risks having environmental health impacts should be charted and preparedness for such accidents should be created in order to prevent the associated environmental health impacts.

Recent research on urban air pollution has shown that fine particles, ozone and possibly also nitrogen dioxide have highly significant effects on health. Among other things, they cause increases in direct mortality and long-term mortality, in hospital admissions and in the occurrence of respiratory infections. It is unclear whether urban air pollution is linked with increases in allergy and asthma, and if so, in what way. During the period of social and economic transition in Central and Eastern Europe, the state of air pollution in these countries will change substantially. There will be a decline in acidifying emissions rich in sulphur dioxide released by industry and by energy generation, but these will be replaced by emissions having high levels of particles, carbon monoxide and nitrogen oxides and affecting the formation of ozone, all of these being given off in traffic, which is increasing rapidly. The pace of this trend in Central and Eastern Europe will be extremely fast. It is especially important to take account of this development, both for reasons of health in cities and to prevent transboundary emissions. Research on the health effects of the principal air pollutants should be conducted in adjacent areas.

OBJECTIVES

- Finland encourages international organisations to work vigorously to ensurethe basic preconditions for a healthy environment, to prevent the hazards caused by pollution and to achieve an environment conducive to health, particularly in the poorest countries.

- Environmental health co-operation between Finland and countries in neighbouring areas and Central and Eastern Europe is strengthened.

ACTIONS

1 The principal environmental health hazards and accident risks in neighbouring countries are determined, the prerequisites for their correction are created and environmental health research is conducted together with researchers and the authorities in these countries.(Ministry for Foreign Affairs, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, National Public Health Institute, Finnish Radiation and Nuclear Safety Authority)

2 Finland takes part in international co-operation to promote regional and local environmental health action plans, Agenda 21 programmes and citizens' participation in Europe (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry for Foreign Affairs)

3 Finland supports the work of the WHO Regional Office for Europe for promotion of environmental health, and participates actively both in the work of the European Environment and Health Committee (EEHC) and in preparations for the European Conference on Environment and Health to be held in London in 1999. (Ministry of Social Affairs and Health, Ministry of the Environment)

4 Support for the ECE action programmes is continued, the aims being to reduce emissions into the air in Eastern and Central Europe, to promote the planning of urban structures that diminish traffic and energy consumption and to develop health assessment as part of the EIA procedure. (Ministry for Foreign Affairs, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications)

5 The special position of developing countries is taken into account by the working group on trade, environment and development within the UN Conference on Trade and Development (UNCTAD), the goal being to obtain most-favoured status for products that conserve the environment. Efforts here include work to develop an eco-labelling system. (Ministry for Foreign Affairs, Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry of the Environment)

6 Finland plays an active role in the EU PHARE and TACIS programmes, and in he INCO programme and other research programmes, working to further environmental health and to rectify factors detrimental to environmental health in Central and Eastern European countries. (Ministry for Foreign Affairs, Ministry of Education, Academy of Finland, the Technology Development Centre of Finland, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Trade and Industry, Ministry of Agriculture and Forestry)

7 PRIMARY OBJECTIVES AND ACTIONS

In international comparison, the Finnish living environment can be regarded as a healthy one. The high standard of environmental health in Finland is the result of the work carried out to advance health protection and environmental protection. An indication of the value put on a healthy environment is that, according to the Constitution of Finland (§14 a), a citizen's fundamental rights include the right to a healthy environment and the possibility to influence one's environment. Exposure to health hazards originating in the environment is low compared to the general European level. Finnish nature still provides many opportunities for recreation, physical activity, gathering of natural products – such as berries and mushrooms – and for fishing and hunting. It is important to ensure the standard of environmental health that has been achieved and the diversity of Finnish nature in future, too. Similarly, the environmental health hazards caused by human activities in the past must be rectified.

The trend in the state of health of Finns over the long term can be considered highly positive. The factors that have attributed to this positive trend include a higher standard of living and a higher standard of education, and the development of legislation conducive to health and social well-being. More specifically, the key factors have been sufficient and healthy nutrition, good housing and working conditions, a high standard of health care and social welfare, good water and food hygiene, immunisations, and enhanced awareness of factors affecting health.

Several indicators show a marked improvement in the state of the environment. Emissions caused by single load factors have been reduced by introducing effective environmental protection measures. The number of severely contaminated water bodies has diminished, emissions of heavy metals into the environment have been cut, and the quality of urban air has improved in many respects. In spite of the improved state of the environment, further actions are needed in some sectors of environmental health in order to rectify environmental health hazards.

Promotion of health and advancement of environmental protection have developed side by side, and so have the actions taken by various administrative sectors towards improvement of the safety and comfort of the environment and towards development of services. In recent years, increasing emphasis has been placed on the interdepartmental and interdisciplinary character of environmental health promotion.

Environmental health covers a wide range of issues. The prerequisites for a healthy environment include a sufficient and safe supply of food and drink, safe and comfortable accommodation, clean air, good transport services, and opportunities for safe work as well as for mental and physical recreation. Through information, education and improved preconditions for participation, citizens must be ensured the opportunity to exercise influence.

The Committee has assessed the state of environmental health by utilising the surveys and studies conducted on the state of the environ-

ment and the health of Finns, the national programmes concerning the environment and health, and their background material. Based on this assessment, the Committee has proposed actions both for preserving the high standard of environmental health and for addressing the problems encountered and the factors that affect environmental health in the long run.

As defined in this Action Plan, the concept of environmental health does not include lifestyles or nutritional habits. In contrast, environmental exposure caused by lifestyles, such as passive smoking or atmospheric pollution, noise and accident risks resulting from traffic, are considered to be part of environmental exposure. The work environment and occupational health are discussed only briefly in the Action Plan, since there are specific national action plans in the field of occupational health and safety.

In the main, many of the factors constituting the basic prerequisites for a healthy environment are in order in Finland today, but maintenance of this good level requires further actions. In order to preserve the quality of drinking water, action needs to be taken, in particular, to protect groundwater sources, to maintain the high standard of water treatment, and to develop and maintain water supply systems. Continuance of the high standard of foodstuffs control must be ensured. Use of nuclear energy and disposal of waste must be safe and must not pose a risk to people's health.

Finland, too, has environmental health problems that may require further actions – even of major scope – in order to create a healthier environment and to rectify hazards. As elsewhere, impurities in urban air – especially exposure to particles emitted mainly by traffic in towns and cities – give rise to considerable health hazards here as well. Cold weather increases both the amount of air impurities and the health effects of these impurities. Indoor air impurities, especially microbiological hazards associated with moisture damage, constitute an extensive problem area, which cannot be managed properly without co-operation and resources from many actors. Exposure to ambient noise is common and is anticipated to become more widespread as a hazardous factor. Advance elimination of accidents and disasters, and prevention of hazards, require co-operation between various administrative sectors, actors and non-governmental organisations.

So little is known about some processes of interaction between the environment and health that research and surveys call for additional resources. Such little known areas include exposure to fine particles, links between the built environment and health, the effects of the environment on mental health, and the indirect effects of the climate change on health.

National measures to rectify environmental health hazards need to be supported by international action. Finland's participation in international work to prevent hazards is important for national interests, too, since many emissions hazardous to the environment and health, the consequences of accidents, traces in foods, and so on cross national borders. Finland must take an active part in the work to improve the safety of nuclear power plants in areas adjacent to Finland and in efforts to

reduce the volumes of airborne emissions that burden the Baltic Sea region. Global environmental health issues, above all the climate change and the depletion of ozone in the upper atmosphere, may have direct or indirect effects on human health in Finland in the future. Thus it has been considered necessary that the Environmental Health Action Plan also draws attention to actions that have long-term effects on people's health.

Co-operation between actors in the fields of environmental protection and health protection should be increased in order to promote environmental health and the environmental protection measures that support environmental health. The Finnish National Environmental Health Action Plan emphasises the necessity of co-operation between various administrative sectors, business, non-governmental organisations and other actors. Citizens' participation in promoting environmental health and in improving the quality of their own environment is vital for implementation of the National Environmental Health Action Plan.

7.1 CENTRAL PRINCIPLES AND OBJECTIVES

An environment fostering and supporting health

The objective is that the environment promotes citizens' health and that citizens have equal opportunities for a healthy environment. Attainment of an environment promoting health must be given priority in the various sectors of societal policy, particularly in social and health policy and in environmental policy. Health promotion and environmental protection must be considered in all national and European Union legislation.

The environment must reinforce the possibilities of individuals and groups to further their own health. Above all, this means creation of working, school, study and leisure environments that support health. Citizens must be able to live, eat, play, go to school, go to work and spend their leisure so that their health is not jeopardised by the environment. A good and healthy environment is particularly important for children, for elderly people and for people with illnesses. Their opportunities of coping in, and influencing, their environment are few compared with healthy adults. The manner in which a society ensures that its most dependent members can lead a healthy and safe life is a good indicator of the ethical standard of that society.

High standard of health protection and environmental protection

The life expectancy of Finns has become much longer during the 20th century. In 1994, the average male life expectancy was 72.8 years, a figure approaching the EU average for men, and that of women was 80.3 years, which is higher than the EU average for women. The longer life expectancy can partly be attributed to the advances made in medicine and health care; however, improved nutrition and hygiene are even more

important contributing factors. Our living environment is now healthier than it was 100 years ago. The high standard of health care and environmental protection, and the high standard of environmental and health control, have played a major role in securing this trend. The Finnish figure for infant mortality, a good indicator of the level of environmental hygiene, is one of the lowest in the world.

A healthy environment can only be preserved by maintaining a high standard of health protection and environmental protection. This can be achieved, for instance, by looking after water supply, water protection, waste management, waste water purification, air protection, food control, healthy housing and planning of healthy communities. These aspects have been well taken care of in Finland. Our objective must be to ensure that Finland continues to be among the foremost countries in environmental health care.

Responsibility for development, monitoring and control of health and environmental conditions is primarily vested in the public administration, but business, industry and producers, for their part, also bear responsibility for the tasks assigned to them. Health and environmental control includes, among other things, self-controlling by enterprises and producers, preventive control, control of conditions. Among the aspects under control in Finland are the safety of imported and domestic foodstuffs, the quality of drinking water, and the safety and healthiness of buildings. Preservation of a healthy and high-quality residential and living environment calls for sufficient resources at national, regional and local levels.

The importance of the local authorities in the steering and control of environmental health has increased, while the role of the State administration has diminished. The development of legislation in Finland has contributed to this trend. On the basis of the European Union's legislation, controls at borders have been reduced considerably. In consequence, municipalities face additional requirements as regards, for instance, control of foods. It is important to ensure sufficient resources for health and environmental control within municipalities. In the 1990s, municipalities have reduced the number of their health control personnel by some 100 posts per year, which in some municipalities has weakened the level of control. At the same time, municipalities have also cut their environmental protection staff. Development of activities, and health and environmental protection associated with long-term planning, are the first to suffer from cuts in resources. Thus it is possible that there will be an upswing in the number of environment-induced illnesses unless sufficient resources are ensured for health and environmental control.

Local actions

Alongside the National Environmental Health Action Plan, local and municipal environmental health action plans should also be drawn up. Preparation of environmental health action plans may be another way whereby co-operation between municipalities is intensified and joint projects are launched. The aim is that municipalities compile an action plan on the basis of their own points of departure; the plan would define

the priorities of environmental health and the actions needed. Local environmental health action plans can be drawn up as part of the municipal health promotion programme, as part of the municipal environment programme or the local agenda for sustainable development, or as a separate environmental health action plan. In this respect, various municipalities and joint municipal boards have different needs and resources. Small municipalities, in particular, can benefit from co-operation that helps strengthen resources. Compiling an environmental health action plan as a joint project between municipalities may also be the best alternative if environmental health issues are dealt with by joint municipal boards or if municipalities clearly have common needs for the development of environmental health.

Planning healthy communities

Health aspects of communities and factors affecting comfort – and thereby health – within communities must already be taken into account in the planning phase. This applies to both regional and local planning. Planning of land use and development of existing communities must further the healthiness of the environment. Mistakes made at the planning stage are much more difficult to correct later.

The quality of the built environment can be improved, for instance, by means of town plans that unify and correct the townscape and by means of supplementary building.

Promotion of a comfortable and healthy environment in the neighbourhood calls for co-operation between residents and various bodies. Much can be achieved in housing companies and in suburbs if enough attention is paid to the health aspects of the environment. Improving the environment does not always require great financial resources, provided that these aspects are already addressed at an already stage of planning. On the other hand, there are areas where more resources must be allocated to environmental health. These are discussed, for instance, in Chapter 7.2 of the Environmental Health Action Plan.

Citizens' participation in the creation of a healthy environment

According to §14 a of the Finnish Constitution, citizens shall be able to influence their own environment. Citizens' active participation can help to achieve an environment that is seen to promote and to support health. The prerequisites for participation are created in practice through information. Information concerning environmental health should be available to all.

Information alone, however, is not enough. Mechanisms and opportunities for exercising influence, for assuming responsibility and for making a contribution also need to be developed. Joint projects between residents, and co-operation between residents, enterprises and the authorities, are important when developing the surrounding environment. It must be made as easy as possible for residents and enterprises to act in

an environmentally sound and healthy manner. Everyone is responsible for the environment, since care for our common environment – from waste management to emissions of greenhouse gases – is highly dependent on individuals' attitudes and decisions.

Actions by business, industry and producers

The objective should be that both production and products are healthy and conform to the principles of sustainable development. The need to prevent environmental health hazards covers the entire life cycle of products, from production to consumption and further to disposal. The most effective way of preventing hazards is to address them at the initial stage of the production chain. Moreover, the party responsible for hazards must meet the costs for the actions that are needed to rectify, compensate for and study the environmental health hazards caused.

Healthy and environmentally sustainable production methods and products add considerably to competitiveness. In consequence, their importance is on the rise. The quality of products with respect to environmental health is an important sector of research and development, which may also have a positive effect on employment. When choosing products, consumers pay increasingly more attention to environmental and health aspects. When buying products, consumers should in principle be able to know what environmental or health effects a product will have during its lifecycle. This requirement can be met in different ways, such as by developing the quality and labelling systems of products.

Co-operation between actors in environmental health issues

Ensuring a healthy environment for housing and living requires participation by various sectors of society and administration, from organisations and from citizens. The central players often come from outside the sectors of health care or environmental protection. For instance, primary production, industry, commerce, transport, energy generation and community planning, teaching and the mass media play important roles in the advancement of environmental health, both nationally and internationally. Efficient planning and control require well-functioning co-operation between the various authorities and sectors.

Co-operation between the various administrative sectors should be developed within both the European Union and the national central administration. It is particularly important to encourage co-operation between the Ministry of Social Affairs and Health and the Ministry of the Environment and the bodies and institutions subordinate to these two Ministries. Within regional administration, co-operation between the Provincial Governments and the Regional Environment Centres in environmental health issues needs to be improved. Likewise, municipalities must increase co-operation across sectors. In many municipalities, environmental protection and environmental health care are organised under the same municipal board, which makes co-operation smoother. How-

ever, environmental health care is also an aspect of public health work. Closer co-operation should be created between environmental medicine, preventive health care and environmental health care. When decisions are prepared, it should be ensured that the decisions are based on sufficient expertise in environmental health. It must also be guaranteed that the roles of executive and supervisory bodies are kept separate and that executive bodies do not issue decisions or permits in matters where they themselves have a vested interest.

High standard of knowledge and know-how in environmental health

Promotion of environmental health needs support from various sectors: from qualified experts in practical environmental health work and administration, from high-standard research, R&D, economic assessment, risk assessment, and from monitoring of the state of the environment and health. Finland will maintain the high professional and scientific standards of education in the field of environmental health and will allocate resources for education and research in environmental health. Finnish research teams also provide foreign researchers with a good and internationally advanced environment for researcher training and research work.

International co-operation in environmental health

The importance of international co-operation in environmental health is increasing constantly. Global environmental problems affect the health of the entire world population. Global co-operation is the only way of finding effective measures to alleviate and – even partially – to prevent these problems. An active member state, Finland contributes to the creation of the WHO environmental health objectives. Finland has also participated in implementation of these objectives. Examples of this include arrangement of the WHO Conference on Environment and Health held in Helsinki in 1994, and participation in the activities of the European Environment and Health Committee. WHO plays a central role in implementation of international co-operation in environmental health, both in Europe and globally. In addition to WHO, environmental health is promoted globally, for example, in the UN Committee on Sustainable Development (CSD), in the UN Environment Programme (UNEP), in the execution of international conventions on the environment, in the Commission on Human Settlements (Habitat), and in the UN specialised agencies. The UN Economic Commission for Europe (ECE) plays an important role as a promoter of regional environmental co-operation in Europe. ECE serves as the forum for conventions on the environment. It has compiled the Environmental Programme for Europe and works to promote implementation of the programme. ECE has also drawn up the Environmental Action Programme for Central and Eastern Europe, which serves as the basis for execution of separate projects.

Co-operation with areas adjacent to Finland

Finland should develop long-term co-operation in order to reduce environmental health problems in the Baltic region and in other nearby areas. Co-operation is of particular importance in order to prevent accidents, to reduce atmospheric emissions of pollutants and to protect the Baltic Sea against pollution.

Some major environmental health risks in Finland originate in countries of Central and Eastern Europe (CEE). Many of the nuclear facilities close to the Finnish border are not up to today's standards. Pollution of the Baltic Sea, and the effects of the emissions that impair air quality, extend over large areas.

By means of co-operation with the neighbouring areas, Finland's objective is to reduce environmental health risks affecting Finland and to support improvement of environmental health conditions and sustainable development. Development is supported by means of bilateral programmes and multilateral projects. An important objective is to map the principal environmental health and accident risks in the nearby areas and to plan actions for eliminating the risks. Moreover, Finland participates in international co-operation to draw up regional and local environmental health programmes. Finland supports work carried out within Agenda 21 of the Baltic region and within HELCOM by having the perspective of environmental health included in the work.

7.2 PRIORITY ACTIONS

This summary presents the priority actions that should be taken in order to reduce environmental health risks and to maintain the high standard of environmental health. These central actions have been discussed in more detail in chapters 3, 4 and 5. The central actions have been divided into three categories. The first category includes segments of environmental health in which a high standard has been achieved. This standard must be ensured in future, too, through both national and – in many cases – international means and through co-operation with nearby areas. The second category consists of segments of environmental health in which considerable further actions are needed in order to check or to reduce hazards. The third category consists of problems or issues that require long-term actions. In addition, the category includes segments that call for extensive co-operation and development.

Based on the principles outlined above, the central actions have been divided into three categories as follows:

SEGMENTS OF ENVIRONMENTAL HEALTH IN WHICH THE HIGH STANDARD THAT HAS BEEN ACHIEVED SHOULD BE MAINTAINED

- *quality of drinking water*
- *safety and healthiness of food*
- *radiation safety*

ENVIRONMENTAL HEALTH HAZARDS THAT REQUIRE CONSIDERABLE FURTHER ACTIONS FOR THEIR CONTROL/REDUCTION

- *indoor air quality*
- *urban air quality*
- *noise hazards*
- *accidents and disasters*
- *mental and social health risks of the environment*

OTHER PROMOTION OF ENVIRONMENTAL HEALTH

- *prevention of the climate change and ozone depletion*
- *integration of health-promoting factors into community planning and building*
- *participation by citizens in promotion of healthy living environments*
- *research and product development to promote environmental health*

7.2.1 QUALITY OF DRINKING WATER

Finland has plentiful water resources and water shortages rarely occur to the same extent as in several other European countries. Fairly good legislation on and administration of water protection have created a sound basis for the prevention of environmental health hazards. The prohibition on groundwater pollution is absolute, that is, no exception from it can be granted by judgement of a Water Rights Court, and the prohibition applies particularly to important groundwater areas and to other groundwater areas that can be used for water supply. Water system construction, discharging waste water into water bodies, and other operations that alter a water body require a licence. The regulations on water protection and international agreements require that the state of waters and the burden on water bodies are monitored.

The quality of Finnish drinking water is relatively good and, in comparison to the situation in many other countries, cases of illness caused by poor water quality are rare. The quality problems of drinking water are associated with the properties of the soil and bedrock, with the high content of humus in surface waters, with the inferior quality and location of wells in sparsely populated areas, with ageing distribution networks, with the treatment of raw water at small water utilities, and occasionally with the contamination of groundwater. Most health risks in Finland occur in the private wells of individual households and at small water supply plants. Finland has many groundwater reservoirs, but they are fairly small and do not always coincide with housing. This has both advantages and disadvantages. So far, Finland has been able to avoid extensive contamination of groundwater sources in the manner that has taken place in Central and Eastern Europe. In places, the quality of groundwater has deteriorated in Finland, too, as a consequence of human activities. Small water supply plants are susceptible to technical failures, distances to consumers may be long, and the expenses arising from the ageing network may be quite high.

The objective is to ensure the good quality of groundwater and to maintain groundwater in a natural state corresponding to the local hydrogeological conditions in important groundwater areas and in areas suitable for water supply, to prevent acidification or decline in quality as a result of human activities, and to rectify any repairable damage in important groundwater areas and areas suitable for water supply so that these areas can again be used for water supply. Protection of groundwater reservoirs is necessary for ensuring the supply of healthy drinking water. Use of surface water as raw water for household purposes should be reduced because treatment of raw water containing humus gives rise to substances hazardous to health. Removal of these substances increases the price of water considerably. High concentrations of radon and arsenic in water drawn from wells drilled in the bedrock, and problems associated with the amount of fluoride, are important health factors which should be addressed.

Use of private wells as a source of drinking water is more common in Finland than in the other EU Member States. It is fairly common for surface water to affect the quality of the water in wells, but contamination of wells as a consequence of waste waters discharged into the ground is rare. In international co-operation and in revision of the European Union's legislation, provision should be made for preservation of the high standard of water protection in Finland.

OBJECTIVES

- The Finnish people have access to sufficient, healthy and high-quality drinking water sources in all circumstances.

ACTIONS

1 Use of groundwater in water supply is increased, groundwater protection plans are drawn up on the basis of mapping of groundwater areas, the implementation of protection plans is supervised and the quality of water is monitored. When using surface water, the best possible raw water sources are chosen and their quality is monitored. (Municipalities, Ministry of Agriculture and Forestry, Ministry of the Environment, Finnish Environment Institute, Regional Environment Centres)

2 The risk factors of important groundwater areas are determined in conjunction with the mapping of groundwaters and the compilation of protection plans. The necessary actions are taken to eliminate risks. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, Finnish Environment Institute, Regional Environment Centres, municipalities)

3 The treatment of raw water is improved in accordance with the general quality criteria to be set so that the end product is drinking water of a good quality. Improvements are made both in removal of organic matter from surface water that is used as raw water and in

corrosion treatment of groundwater so as to prevent the quality of water from worsening in the distribution network. (Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, water utilities)

4 The needs of the different uses of water resources, as well as the needs of groundwater protection and water supply, are taken into account in town planning and land use planning. (Ministry of the Environment, Ministry of Agriculture and Forestry, municipalities)

5 The reliability of water supply systems, and their preparedness for crises, are improved. Water treatment is centralised into bigger units in order to raise the quality of treatment. Water pipe and sewer systems are planned and located so that there is no risk of drinking water contamination. (Ministry of Social Affairs and Health, Ministry of Agriculture and Forestry, municipalities, water and sewerage utilities)

6 Planning and maintenance of water supply systems are made more efficient. Technology is developed to ensure drinking water of a good quality and to save water. (Technology Development Centre of Finland, Finnish Environment Institute, Ministry of Social Affairs and Health, Academy of Finland)

7 In order to solve water quality problems in sparsely populated areas, wells are rebuilt and improved and, whenever possible, joint water supply systems are established, especially in areas where the radon, arsenic or fluoride content of water is high. Purification methods for water and waste water are developed and drilling of wells is avoided in problem areas. (Ministry of Agriculture and Forestry, Finnish Environment Institute, municipalities, Regional Environment Centres, consumers of water)

7.2.2 SAFETY AND HEALTHINESS OF FOOD

The quality of food is a major factor affecting health. Even minor changes in the safety of food may have a detrimental effect on people's health. Today, food safety with respect to chemical agents is at least satisfactory in Finland, and the intake of additives on the population level does not exceed the limits approved for daily intake. The microbiological quality of foods has also been good in Finland. The occurrence of many pathogenic bacteria, such as salmonella, in Finnish foodstuffs is considerably less common than in many other countries. However, maintaining the microbiological safety of foods requires constant good hygiene and control. The nature of the hazard or the intensity of exposure is not known for all hazardous substances. Increased international trade in foods may expose consumers to new food-induced health risks. Finland's objective is to continue to maintain the high standard of food control.

As a rule, food safety is monitored in municipalities. Producers bear the primary responsibility for the quality and safety of food. The increase in tasks vested in the municipal authorities, and changes in the nature of control, call for efficient further training of the regulatory authorities and for sufficient resources within municipalities.

New types of raw materials for food, new foods, new production methods, long transport distances and long-term storage, and changes in consumer habits require research and risk assessment in order to guarantee food safety.

OBJECTIVES

- Natural products used for food and man-made foods maintain their high quality and continue to be pure and safe.
- Plant and animal diseases, or communicable diseases passed to people via food, cannot spread to Finland from other countries.
- Gene-modified organisms do not cause health risks.

ACTIONS

1 The authorities and various other actors co-operate to develop a labelling system for foods that enables consumers to ascertain the safety and quality of foods. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, Ministry of Trade and Industry, Ministry of the Environment, producers, advisory organisations, National Consumer Administration)

2 People's knowledge of the safety and healthiness of food is enhanced through education, advice, and teaching at school. (Ministry of Social Affairs and Health, National Board of Education, National Food Administration, National Veterinary and Food Research Institute, municipalities, actors, trade and consumer organisations)

3 Hazardous pesticides are replaced by less hazardous substances, and the use of chemical pesticides is reduced by better evaluation of the need for control, by developing dosing, targeting and timing, and by replacing chemical control with biological or mechanical methods that have proved to be safe. Use of antibiotics and other medical preparations for animals is reduced. (Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Social Affairs and Health, Agricultural Research Centre, municipalities, advisory organisations, Regional Environment Centres, food industry, Committee on Control Agents)

4 In order to ensure the quality of raw materials for food and to enhance responsibility for environmental health, quality systems are developed for farms and for food producers. These quality systems

cover the entire food production chain. (Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Social Affairs and Health, Association of Rural Centres, food industry, advisory organisations, Regional Environment Centres, producers)

5 Within the European Union and in other international contexts, Finland promotes the control of food safety, recommends the inclusion of purity requirements for production inputs and environmental health aspects in quality standards, and stresses the elimination of plant and animal diseases and food poisonings in the import and export of animal feed and foods for human consumption. (Ministry of Agriculture and Forestry, Ministry of Social Affairs and Health, Ministry of the Environment, customs)

6 Methods for assessing the environmental health risks involved in genetically modified organisms, and methods for controlling these risks, are developed in Nordic and international co-operation. (Ministry of Social Affairs and Health, Ministry of the Environment, Finnish Environment Institute, the Board for Gene Technology)

7.2.3 RADIATION SAFETY

Most of the radiation exposure in Finland comes from nature, especially from radon in indoor air. Finns are under no direct radiation risk from man-made sources. For instance, the radiation dose that resulted from the Chernobyl nuclear power plant accident constitutes only a few per cent of the radiation dose received during the lifetime of the average Finn from nature and from cosmic radiation. The standard of radiation safety is very high in Finland. For a relatively long time, attention has been paid to the radiation protection of the public and to information and advisory services.

The average radon content of Finnish homes is about 120 Bq/m^3, which is the highest national average in the world. The natural radioactivity of groundwater is also considerably higher in Finland than elsewhere in Europe; in particular, the radioactivity of water drawn from wells drilled in the bedrock is in places among the highest in the world. It is estimated that radon in the home environment causes between some tens and several hundreds of lung cancers per year in Finland. In addition, radon in the work environment causes some tens of cases of lung cancer. Exposure to naturally occurring radionuclides also takes place via drinking water. The total radiation dose received by Finns from natural radionuclides amounts to 730 manSv per year.

If all homes where the maximum value for radon (400 Bq/m^3) is exceeded were repaired, the mean radon content of Finnish homes would fall by 19 per cent. Repairs would have to be made in 66,000 residences. If all sources of drinking water were under the annual dose limit of 0.5 mSv, and any concentrations resulting in higher doses were eliminated through purification, the total dose from radioactive substances in drinking water would be cut by more than half. It is estimated that of the cases

where the maximum radon content in the indoor air of old buildings (400 Bq/m^3) is exceeded, less than 10 per cent are known, and one in ten of these buildings has been repaired. New homes must be designed and built so that the annual average radon content does not exceed 200 Bq/m^3. The safety limits set for drinking water under the Finnish Radiation Act apply to the radioactivity of water supplied by water utilities, water intended for sale and water used for making foods, but they do not apply to water for personal use.

Use of nuclear energy in Finland has not caused any radiation exposure that would have affected the environment or health. Nuclear waste comes from two nuclear power plants and one research reactor. Previously, the spent fuel of the Loviisa plant units used to be transported abroad for reprocessing and disposal. All other radioactive waste has been placed in interim storage at the plant sites. Disposal of high-level nuclear waste in Finland will become topical around the year 2020. The Finnish authorities have set very strict safety regulations on wastes from nuclear energy generation that involve a radiation risk.

The sun's ultraviolet radiation causes an estimated 100 cases of fatal cancers – mostly melanomas – per year among Finns. However, a considerable proportion of the UV radiation exposure leading to cancer is obtained outside Finland, above all at southern holiday resorts.

With the exception of some work environments, exposure to strong electrical and magnetic fields is rare in Finland. Exposure caused by power cables is significantly lower than the fields caused by electrical appliances at home and by transformers in blocks of flats.

Alongside the introduction of new high-technology devices (electrical appliances, data communications equipment, power cables, mobile phones), people's exposure to electrical and magnetic fields, and to radio-frequency radiation, in their environment is constantly on the rise. It is justified to exercise precaution by limiting long-term exposure to electrical and magnetic fields as much as is technically and economically feasible. This fact must be taken into account in planning, zoning and building.

OBJECTIVES

- Exposure to radon and to other naturally occurring radioactive materials at home and in the work environment is reduced so that the limit values that have been set are not exceeded.

- Use of nuclear energy continues to be safe and does not pose a risk to human health. Nuclear waste must be isolated from the environment so effectively that it does not endanger human health or nature, even over long periods of time.

- Exposure to electromagnetic radiation is limited to the extent that it does not cause any health hazards in Finland.

ACTIONS

1 Exposure to radon and to other naturally occurring radioactive materials is reduced, problem areas are mapped, and elimination of the hazard is taken into account in town planning, in the planning of water supply, in drafting more detailed building regulations, and in renovation and new building. Information and education are used as additional preventive measures. (Ministry of Social Affairs and Health, Ministry of the Environment, Radiation and Nuclear Safety Authority, Regional Environment Centres, municipalities, builders)

2 The high standard of nuclear safety is maintained in Finland, and a contribution is made to the promotion of safety and to the reduction of accident risks at facilities located in areas adjacent to Finland. (Ministry of Social Affairs and Health, Ministry of Trade and Industry, Ministry for Foreign Affairs, Ministry of the Environment, Radiation and Nuclear Safety Authority, power companies)

3 Operative preparedness for nuclear accidents is developed, research on the effectiveness and availability of countermeasures is intensified, and international co-operation is promoted for information exchange and preparedness planning. (Ministry of Social Affairs and Health, Ministry of the Interior, Radiation and Nuclear Safety Authority, municipalities)

4 The objective at all stages of nuclear waste management is to achieve an advanced and high-quality code of safety. Public opinion, technical feasibility and economic aspects are taken into account in the disposal of nuclear waste in Finland. (Ministry of Social Affairs and Health, Council of State, Ministry of Trade and Industry, Radiation and Nuclear Safety Authority, power companies)

5 Awareness of the risks of UV radiation, and of protection against these risks, is enhanced through education, information and guidelines. Advice is given on avoidance of excessive sunbathing (burning and permanent tan). Consumers must be informed of the magnetic fields caused by electrical appliances at home. (Ministry of Social Affairs and Health, Ministry of Trade and Industry, Radiation and Nuclear Safety Authority, National Consumer Administration, municipalities)

6 When power lines are planned, transformers located, town plans made and buildings constructed, consideration is paid to keeping electrical and magnetic fields on a low level in residences. (Ministry of Trade and Industry, energy companies, actors, municipalities)

7 Research work and studies are continued in order to determine the health hazards caused by radiation and to eliminate these hazards (Radiation and Nuclear Safety Authority, universities, Academy of Finland)

7.2.4 INDOOR AIR QUALITY

Finnish people spend about 90 per cent of their time indoors. In fact, indoor air is the principal source of exposure to airborne impurities in Finland. Today, the main reasons for quality problems in indoor air and for consequent health hazards are mould growth caused by moisture damage in structures, tobacco smoke, and radon that rises into buildings from the ground. Other important factors impairing the quality of indoor air include chemical impurities emitted by building materials, animal epithelia and dust mites, impurities in outdoor air that can enter indoor air, fireplaces and gas stoves.

Owing to the cold climate, Finnish homes need to be built tightly to ensure efficient heat insulation. However, this accentuates the importance of sufficient ventilation in buildings. Inadequate ventilation increases the concentrations of hazardous factors in indoor air. The health hazards caused by indoor air quality can be eliminated, or at least they can be alleviated substantially. This also applies to exposure to tobacco smoke. Quality problems in indoor air that stem from impurities in outdoor air can only be rectified or alleviated by means of measures aimed at improving the quality of urban air.

OBJECTIVES

- The health-related quality of indoor air is ensured by means of planning and supervision of construction and maintenance of buildings.
- Exposure to tobacco smoke at workplaces and in public premises ceases; exposure to tobacco smoke at home, in cafés and in restaurants is essentially reduced.
- General awareness of the health hazards posed by indoor air is enhanced, and problems are recognised better than before. Problems in indoor air are eliminated, and people suffering from the hazards are examined and treated.

ACTIONS

1 Indoor air problems in buildings are charted by means of audits, and the necessary repairs are carried out in order of urgency. For this purpose, it should be possible to use renovation funds intended for job creation. (Ministry of the Environment, Ministry of Labour, Ministry of Social Affairs and Health, municipalities, owners of buildings)

2 Responsibility issues with reference to building are specified in legislation. (Ministry of the Environment, Ministry of Justice)

3 Guidelines on building are supplemented with a section on how to prevent and repair moisture damage. (Ministry of the Environment)

4 Professional groups dealing with moisture damage and mould problems are provided with supplementary training, and teaching on environmental health is intensified in key sectors. Institutes of vocational education and universities are responsible for the supplementary training. (Ministry of Education, Ministry of the Environment, Ministry of Social Affairs and Health, enterprises)

5 Research work and studies are continued in order to determine the health hazards resulting from indoor air, to prevent these hazards and to develop repair methods. (Academy of Finland, Technology Development Centre of Finland, Ministry of the Environment, Ministry of Social Affairs and Health, enterprises)

6 Smoke-free indoor air at schools, at workplaces and in public and private premises is promoted by means of guidelines and advice. The labour protection, environmental and health authorities work in co-operation to provide information and to initiate campaigns for the promotion of smoke-free workplaces, public premises and homes. (Ministry of Social Affairs and Health, Ministry of Education, Ministry of Labour, enterprises, STAKES, National Public Health Institute, Finnish Institute of Occupational Health, municipalities)

7 Residents' knowledge of the quality of indoor air and health effects is enhanced; recognition of problems is improved and guidelines for rectifying the problems are provided through advice, instructions and voluntary audits. (Ministry of Social Affairs and Health, Ministry of the Environment, municipalities)

7.2.5 QUALITY OF URBAN AIR

The quality of Finnish air is good by international comparison. The quality of air in Finland has improved considerably, thanks to air protection measures taken during the past twenty or so years. With the exception of total suspended particles, the levels of impurity in the air of Finnish cities are on average lower than the levels in Central and Southern European cities of the same size. However, some significant short-term air quality problems occur in Finland, too, during certain weather conditions, especially in the busy centres of the largest cities and in localities where there are industrial facilities.

The northern location and the climate of Finland affect the physical and chemical properties of atmospheric impurities. The long, relatively cold winter is likely to enhance people's sensitivity to the effects of air impurities. For these reasons, it is important that the planning of air protection measures in Finland continues to be based on up-to-date national air quality guidelines, which have been defined taking into account climatic and other special factors that affect health. In 1996, the Council of State ratified the new guidelines, which are stricter than the present EU directives and WHO's new preliminary recommendations for Europe.

Most impurities in urban air originate in traffic and in energy generation. Emissions from traffic are the most hazardous for health, especially in cities, because these emissions are at street level and people are more exposed to them. The worst air quality problems in Finnish cities consist of exposure to particles and to nitrogen oxides. Carbon monoxide concentrations seldom exceed the maximum limits recommended by WHO. Emissions of nitrogen oxides by traffic have fallen slightly in the last few years, thanks to catalytic converters in cars and to new fuel grades. Sulphur dioxide emissions, which mostly originate in energy generation and in local industrial facilities, have been cut by approximately 80 per cent from the 1980 level. In spring and summer, ozone concentrations in Finland are from time to time high. Most of the ozone comes from transboundary emissions, but the role of local emissions is not insignificant either.

OBJECTIVES

- The maximum values recommended in air quality guidelines are not exceeded in Finland.

ACTIONS

1 The air quality guidelines are always revised whenever enough new information about the health effects of air impurities is available. (Ministry of the Environment, Finnish Environment Institute, Ministry of Social Affairs and Health, Regional Environment Centres, municipalities, enterprises)

2 The number of cars in city centres and emissions from buses and delivery vehicles are reduced in the long term, for instance, by promoting the use of alternative fuels and modernisation of equipment, by substituting electric vehicles for the ones currently in use, and by utilising economic means of steering. Heavy road traffic is directed to areas where adverse effects can be minimised. (Municipalities, Ministry of Transport and Communications, Ministry of Trade and Industry, Ministry of Finance, enterprises)

3 When issuing stricter requirements on exhaust gas emissions from vehicles, special attention is paid to Finland's cold climate and to the emissions of particles that are the most hazardous to health. (Ministry of Transport and Communications, Ministry of the Environment, Ministry of Social Affairs and Health)

4 Opportunities for living and getting around without cars are increased by improving public transport services and by enhancing the options available for pedestrians and cyclists in connection with community planning and during supplementary building and renovation projects. (Ministry of the Environment, municipalities, regional federations)

5 Increased attention is paid to the health effects of atmospheric impurities in regional, community and traffic planning, in environmental impact assessment and in the processing of environmental permits, through more efficient education and co-operation between the authorities. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, Finnish Environment Institute, Regional Environment Centres, Provincial Governments, municipalities)

7.2.6 AMBIENT NOISE

Noise is one of the most common factors impairing the quality of the environment. The major sources of ambient noise are traffic, industry, energy generation, building and maintenance, equipment in buildings, and some leisure activities. It is thought that ambient noise and exposure to noise will increase in Finland in the coming years. In urban areas, the higher traffic volumes and more widespread use of machines raise the level of noise. Quiet areas are getting smaller and less common.

So far there is no comprehensive study of the noise situation that would cover the whole of Finland; nor are there comprehensive data on exposure to noise. An estimated one million Finns are exposed to noise levels exceeding 45 dBA while they sleep. Some 900,000 to 1,000,000 people are estimated to be exposed to noise from road and street traffic (over 55 dBA). Approximately 500,000 people feel that noise from road traffic is disturbing in their living environment. A downward trend is expected in the noise levels of public roads around the year 2000. Noise levels during leisure activities, especially among young people, may be very high (over 85 dBA). Exposure to such high noise levels over long periods of time may involve the risk of hearing impairment.

The general aim of noise prevention is to achieve a healthy and comfortable environment that involves no noise hazards. One objective of noise prevention work is to ensure that people also have the opportunity to enjoy silence and natural sounds.

OBJECTIVES

- The areas where the recommended noise level is exceeded do not become larger and quiet areas are preserved.
- The number of people living in areas where the average noise level of 55 dBA is exceeded becomes smaller.
- Transport vehicles and machines emit less noise and the noise levels of noisy leisure activities are reduced.

ACTIONS

1. The national noise situation is charted. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, municipalities)

2. Actors whose operations give rise to noise chart their situations and see to it that measures are taken to prevent noise. (Actors, municipalities)

3. Use of areas, traffic systems and buildings are designed so that the target levels of noise prevention are not exceeded. Noise emitted by vehicles and machines is cut using technical means, noise standards are made stricter, and the scope of the emission regulations of new machine categories is expanded. (Ministry of the Environment, Ministry of Transport and Communications, regional councils, municipalities, Regional Environment Centres)

4. The exposure of children and young people, and of staff members, to noise is investigated and the necessary measures are taken to minimise this exposure at playgrounds, in schools and in environments for leisure activities. (National Board of Education, Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

7.2.7 ACCIDENTS AND DISASTERS

Accidents cause premature death, disability and decreased functional capacity more than any other single factor originating in the environment. About a million accidents occur in Finland every year, taking nearly 3,000 lives. The total cost of accidents to society comes to over FIM 20 billion per year. Two-thirds of all accidents take place at home and during leisure. The number of accidents at work and in traffic has been falling, whereas the number of accidents at home and during leisure has been rising. Finland has the highest accident figure among the Nordic countries.

Accidents arise through the combined effect of environmental factors and human factors. Tripping and falling constitute the largest group of accidents at home and during leisure. According to the cause of death statistics, the second largest group of accidents consists of cases of poisoning. The third most common cause of accidental death in Finland is drowning. The figure for deaths in fires is also the highest in Europe. In proportion to the population, the number of people killed or injured in traffic has been higher in Finland than in Sweden or in Norway. However, the number of traffic accidents is falling, and the reasons leading to accidents are under constant monitoring to enable elimination of problems. Special measures and special programmes for traffic safety have been introduced in order to reduce the number of traffic accidents.

Much attention has been paid to factors improving the safety of the traffic environment in Finland. The measures taken have focused on various aspects, for example, of vehicles, roads, driving speeds, materials, lighting and traffic planning. Efforts have been made to reduce driver-related factors, for instance through education, information, control and guidance.

Environmental accidents are exceptional situations that require rapid and expert action and efficient collaboration between the authorities. It is of particular importance to prevent casualties and the risk of casualties. In Finland, these situations may come about as a result of radiation, chemicals or microbes. In most exceptional situations, people have been exposed to chemicals or microbes, for instance, via drinking water. The probability of natural disasters is small in Finland.

In all, about one hundred exceptional situations involving environmental health occur in Finland annually. Roughly half of these cases involve health hazards or considerable material costs, but environment-based disease epidemics are rare in Finland. A few serious major environmental accidents occur yearly.

Finland has an advance system for the prevention of major accidents and for the maintenance of preparedness. Responsibility for these operations is vested in the relevant enterprises, the rescue authorities, the health and environment authorities and several other bodies. Responsibility for national preparedness in exceptional situations involving environmental health is vested in the Ministry of Social Affairs and Health, which works in co-operation with other official bodies and with research institutes in the sector. The environmental health care authorities participate in the advance prevention of accidents. The health care authorities are responsible for the examination and treatment of people who have been exposed to harmful substances and who have become ill. At the local level, Finland has a system of social welfare and health care and rescue operations on call. The administrative sector of the Ministry of the Environment has also made on-call arrangements. There are regional and national plans for joint operations in the event of major accidents.

Preparedness, information services, research and training must be kept up constantly in order to prevent accidents and to alleviate their effects. Factors that pose the risk of accidents, and sites that are exposed to danger, must be recognised and taken into account in community and traffic planning, in town planning and in building. Maintenance of international co-operation for the prevention of accidents, for limiting the consequences of accidents and for dissemination of information is also of crucial importance.

OBJECTIVES

- Citizens can live, play, go to school and to work, engage in physical activities and spend their free time in a safe environment.
- The number of serious accidents at work, at home and during leisure will be reduced markedly during the next ten years.

- As part of the traffic safety plan, traffic environments are developed in order to decrease the number of deaths in traffic and to reduce the risks of injury and accidents.
- There are fewer accidents, and the resulting environmental health hazards are minimised.

ACTIONS

1 In order to create safe environments, accident prevention projects are carried out locally and at workplaces. In these projects, risk factors are mapped and ways are sought to develop safer environments for work, living, playing, school and physical activities. Particular attention is paid to ensuring safe environments for children, elderly people and people with disabilities. (Actors, municipalities, research institutes, sports clubs, youth work organisations and volunteer organisations)

2 Procedures are developed for promoting residents' possibilities for improving traffic safety in their daily environments and during trips to and from school and work. Safety awareness is enhanced through advice and through safety education. (Ministry of the Environment, Ministry of Social Affairs and Health, National Board of Education, municipalities, schools, organisations for physical activities, volunteer organisations)

3 Prevention of accidents and disasters, assessment of environmental and health risks, research, and analysis of environmental reasons for accidents are made more efficient. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Trade and Industry, Academy of Finland, research institutes, insurance companies, National Consumer Administration)

4 The safety of pedestrians, cyclists and users of public transport is improved by means of community engineering and town planning. Special attention is paid to traffic safety issues concerning children, elderly people and people with disabilities. (Ministry of Transport and Communications, Ministry of the Environment, Ministry of Social Affairs and Health, Regional Environment Centres, provinces, municipalities, enterprises)

5 The general public and employees at workplaces receive sufficient and comprehensible information from enterprises and from the authorities on how to be prepared for special situations and what to do during accidents. (Ministry of Social Affairs and Health, Ministry of the Interior, municipalities, enterprises)

6 Dissemination of information is rapid and suited to the circumstances in special situations, both in Finland and between Finland and other countries. (Ministry of Social Affairs and Health, Ministry of the Interior, municipalities, enterprises)

7 National and regional preparedness is improved by means of liaison networks, education and training, advice, up-to-date preparedness plans and drills. (Ministry of the Interior, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Transport and Communications, Ministry of Labour, provinces, Regional Environment Centres, research institutes, municipalities, enterprises)

8 Special situations involving environmental health risks are prevented in advance by controlling chemicals, drinking water and food and by means of international co-operation. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, municipalities, enterprises)

7.2.8 MENTAL AND SOCIAL HEALTH RISKS OF THE ENVIRONMENT

The living environment is important for everyday activities and the well-being of people. Deterioration of the quality of the environment may increase the risk of social exclusion and the risk of accidents or diseases, and it may impair the quality and functioning of life. The more prerequisites the environment creates for people to solve their problems without the authorities, the smaller the need for rectifying measures that involve costs for society.

Aspects supporting mental well-being in the environment and the functioning of the social network should also be included in the environmental health issues that serve as starting points for the planning and implementation of living environments and for improving their quality. They should also serve as prerequisites for the financial support granted by society for these purposes.

OBJECTIVES

- A good living environment creates the external prerequisites for the management of one's life, for functional and working capacity and for physical and mental health, and increases the feeling of security. Various population groups must be given the opportunity to develop, and to commit themselves to, their living environments.

ACTIONS

1 The accessibility of housing and service systems and the functioning of services are mapped, and these services are developed so that people can manage themselves. Any shortcomings detected are rectified as part of community planning and as part of repair and integration projects. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Transport and Communications, municipalities)

2 People's mental and social needs are taken into account in community planning by enhancing citizens' opportunities to participate in society. Prerequisites for leisure activities, social interaction, volunteer work including neighbour help are improved in people's immediate vicinity. (Ministry of the Environment, Ministry of Social Affairs and Health, municipalities, organisations for physical activity and citizens' organisations)

3 Assessment of social impact is included in community planning, and people's opportunities to influence their environment are improved in community planning and in projects undertaken to renovate and repair built environments. (Ministry of Social Affairs and Health, Ministry of the Environment, municipalities)

4 Research and pilot projects are launched in order to assess the psychological and social effects of the environment. (Ministry of Social Affairs and Health, STAKES, Ministry of the Environment, Academy of Finland, municipalities)

5 The vitality of city centres, suburbs, and built-up areas and villages in rural areas is maintained, and the variety of their service structures is ensured by means of service networking, town plans that help integrate communities, and economic steering. (Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, municipalities)

7.2.9 CLIMATE CHANGE AND DEPLETION OF THE OZONE LAYER

Changes in the Finnish climate, too, are anticipated as a result of the global increase in the concentration of greenhouse gases in the atmosphere. Winters will become warmer and there will be more rainfall, especially during winter. However, changes in the direction and behaviour of sea currents may cause the opposite effect, that is marked cooling of the climate in Northern Europe. It is therefore difficult to give any specific estimate of the effects of the global climate change on nature in Finland, on the primary production of foodstuffs and, indirectly, on human health. For instance, the following factors may affect health indirectly: unfavourable changes in the preconditions for plant and animal production, increases in the number of refugees, spreading of communicable diseases.

Depletion of the ozone layer in the stratosphere over polar regions intensifies UVB radiation and has biological effects on plant and animal production. Increased exposure to UVB radiation leads to higher occurrence of eye diseases and skin cancer and affects the immune response. It is estimated that depletion of the ozone layer will increase the occurrence of skin cancer in Finland at most by 30 per cent.

Protection of the ozone layer and prevention of the climate change require national and international co-operation and concrete measures

to ward off the global problem. The international Vienna Convention (1985) was introduced to protect the ozone layer. The Convention is supplemented by the Montreal Protocol (1987). Finland has cut the consumption of ozone-depleting substances more rapidly than required in the Montreal Protocol. Finland's goal is to ensure that the restrictions set by the Montreal Protocol for substances detrimental to the ozone layer can be implemented effectively, and that as many states as possible are committed to the objectives expressed in the Protocol.

OBJECTIVES

- Through international and national measures, emissions of greenhouse gases are brought to a level where they do not cause environmental health hazards.
- The ozone layer is restored to its previous state through national and international measures.

ACTIONS

1 Restoration of the ozone layer is promoted by giving up the production and consumption of substances that deplete the ozone layer and by cutting emissions from products and equipment. This is achieved by making the recovery and treatment of ozone-depleting substances, as well as the recovery and treatment of discarded products and equipment, more efficient. (Ministry of the Environment, industry, consumer organisations, municipalities)

2 Legislation on substances detrimental to the ozone layer is developed within the EU, and implementation of the restrictions set in the Montreal Protocol is promoted. (Ministry of the Environment, Ministry of Justice, Ministry for Foreign Affairs, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry, industry and actors)

3 Efficient national measures are prepared in order to limit the emissions of greenhouse gases and to promote storage of carbon. (Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry, industry)

4 Economic means of steering are developed and introduced internationally and nationally in order to reduce greenhouse gases. (Ministry of the Environment, Ministry of Trade and Industry, Ministry of Social Affairs and Health, Ministry of Finance)

5 The environmental and health effects of the climate change are monitored and studied in Finland, and people's awareness of the hazards posed by depletion of the ozone layer and UV radiation is enhanced. (Ministry of Social Affairs and Health, Academy of Finland, municipalities)

7.2.10 LINKING OF FACTORS PROMOTING HEALTH WITH COMMUNITY PLANNING

Community structure and the quality of the neighbourhood affect people's quality of life, mental well-being and the functioning of social networks. The connections and interaction between various factors are not sufficiently known yet. Town planning and various building guidelines are the primary means of steering applied by society in community building. Economic means of steering may also be utilised. Municipalities and the State administration influence the operations of communities in a variety of ways. For instance, the social welfare sector, the education sector, services of various kinds, the sports and cultural sector, and transport connections affect the operations of communities. In all these activities, the direct and indirect effects of various measures on human health and well-being should be taken into account.

Factors associated with human health should be considered in town planning and in community planning from more angles than is done at present. Aspects that require special attention include prevention of accidents and mishaps, safety, noise and the quality of indoor and outdoor air. Stimuli of various kinds and a smaller-scaled environment also have a positive effect on well-being and thereby on mental and physical health. Traffic, its character and volume constitute one of the most important factors determining the character of an area. Special groups, such as children, young people, senior citizens and people with disabilities, should be given particular attention in planning and building of environment that promote human health and well-being. It is often these groups who spend most of their time in the immediate vicinity of their homes and thus end up suffering from unsuccessful construction solutions.

The planning and building of communities in Finland have a long history. They take into account the relevant health and safety factors and implementation of special programmes aimed at improving the comfort and quality of the environment. However, health aspects should be integrated with all decision-making and planning concerning communities. Integrated planning of the environment is needed in order to co-ordinate the work carried out in various administrative sectors; the planning must also be supplemented with tools that enable recognition of environmental hazards and assessment of the health effects of measures. Community planning can affect the health aspects of the built environment in many ways, such as promoting the creation of a good, comfortable, well-functioning and safe living environment. Good joint planning of community structure and traffic arrangements creates the basis for improvements, such as reduced need for traffic and transport.

Town planning plays an important role in integrating the plans made in different administrative sectors. Town planning considers a certain area as an entity and reconciles the needs of various functions and population groups. General town planning steers the formation of community structure and the location of human activities, such as the sites for industry, residential areas, services, jobs and recreational areas with respect to each other and the transport routes between them.

Measures can already be taken during the planning of communities to promote reduction of accidents, prevention of injuries and better safety, by mapping potentially dangerous traffic arrangements, playgrounds, traffic routes, leisure facilities, and deficiencies in lightning.

Parks, areas for play and adventures, recreational areas, sports fields and stadiums, leisure facilities, multipurpose facilities and varied services add to the stimuli offered by the environment. Satisfaction with the environment is also enhanced if the interesting details and stimulating features are placed so that they are within sight.

Very little information is available on the connections between the built environment and health. Better consideration for environmental and health aspects in community planning and in decision-making requires information, based on research and studies, on the state of the built environment, on the changes that have taken place in it, and on the effects of these changes on health.

OBJECTIVES

- The objective is to secure a healthy, comfortable, high-quality environment for living, working and leisure activities for all population groups.
- The environment promotes people's mental well-being and the creation of local co-operation and community spirit.

ACTIONS

1 Town planning is developed in such a way that it takes more account of environmental and health aspects by integrating community structure and by promoting the identification of health effects as part of the assessment of environmental effects. Consideration for environmental health aspects is specified in more detail during reform of building legislation. (Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

2 Various branches of administration conduct joint research and pilot programmes in order to intensify research on the relationships between health, community structure and the living and social environments. (Academy of Finland, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry of Transport and Communications, STAKES, municipalities)

3 Monitoring of the health-related aspects of the built environment is improved. (Ministry of the Environment, municipalities)

4 Municipalities map the key problem areas with respect to environmental health and put forward measures for improving the situation. The State participates in the above development and experi-

mental projects. (Ministry of the Environment, Ministry of Transport and Communications, Ministry of Social Affairs and Health, municipalities)

5 Assessment of the social and psychological effects of the environment is included in regional strategies and EIA practice. (Ministry of the Environment, Ministry of Social Affairs and Health, municipalities)

7.2.11 CITIZENS' PARTICIPATION IN THE PROMOTION OF A HEALTHY ENVIRONMENT

Citizens' participation is important when striving to ensure a living environment that promotes and supports health. According to the Constitution of Finland (§14 a), a citizen's fundamental rights include the right to a healthy environment and the possibility to influence one's environment. In practice, the prerequisites for participation are secured through education, through availability of information, and through opportunities for action. The public administration should provide opportunities to exercise influence and should support residents' independent activities. Legislation, too, can be used to further residents' participation; examples include the EIA legislation and residents' participation in the administration of rental housing.

Municipalities carry out their own schemes in order to help citizens to participate in, and to influence, environmental health issues. By means of local programmes on environmental health, sustainable development, and the environment, residents of a municipality can be engaged in the promotion of environmental health and comfort in their own neighbourhood and elsewhere in their municipality.

Industry has the objective of making environmental and health issues a part of workers' professional skills. In well-functioning enterprises, workers participate in planning their own work. This requires commitment by the management, open interaction at workplaces, and shared responsibility for environmental and health issues.

OBJECTIVES

- Citizens acquire sufficient information on factors that affect the healthiness of their living and working environments.
- Citizens can influence decisions concerning environmental health and can participate in the promotion of healthiness in their living environment.

ACTIONS

1 Support is given to local pilot projects that encourage citizens to participate in improvement of environmental health in their neighbourhood. (Municipalities)

2 Information, advice and education material on environmental health are produced in co-operation with various authorities and experts. The material is intended for use by daycare centres, by schools and by the adult population. Dissemination of information regarding environmental health is improved by means of basic, further and supplementary education. (Ministry of Social Affairs and Health, STAKES, Ministry of the Environment, Finnish Environment Institute, National Board of Education, National Product Control Agency for Welfare and Health, universities, other institutions of higher education and vocational institutes)

3 Municipalities and workplaces intensify dissemination of information on environmental factors affecting health, on health protection and on the state of the environment, while also taking into account the needs of special groups. (Municipalities, joint municipal authorities, enterprises)

4 Up-to-date information on the environment and on environmental health is produced so that it can be accessed and used by citizens. Co-operation between various bodies is improved in the production of material concerning the environment and environmental health. (Municipalities, universities, organisations, research institutes, libraries)

5 Citizens' possibilities to influence projects and plans that affect environmental health are improved even before the actual project plans are made, so that residents can have a say about the goals and targets of projects. (Municipalities, Ministry of the Environment, Ministry of Social Affairs and Health, Regional Environment Centres)

7.2.12 RESEARCH AND PRODUCT DEVELOPMENT TO PROMOTE ENVIRONMENTAL HEALTH

To support decision-making and actions within its sphere, environmental health work calls for high-quality research and product development and economic assessment. Some of the actions needed to advance environmental health do not require launching of new research or new product development work; they require application of the existing knowledge or introduction of innovative technology. Citizens benefit from applications of research and development, which help improve the quality of the living environment, enhance safety and comfort, reduce accidents and injuries, and maintain the high level of environmental health. In the best of cases, savings can be achieved in social welfare and health costs.

In some of its features, research on environmental health differs from other sectoral research. Environmental health research is multidisciplinary and interdisciplinary. It may focus on solving an individual and immediate problem, or it may consist of assessments that are projected decades ahead (assessment of the health effects of the climate change). To be successful, research often requires close international co-operation. Research frequently encompasses areas that include highly advanced

specialised fields, but the application of this knowledge to environmental health is only just beginning. Similarly, research must frequently face the pressures resulting from considerable societal expectations and from the safety requirements made by the public, which are often unrealistic and conflicting.

In Finland, current topics of research include indoor air – especially the surprisingly widespread problem of mould in houses – investigation and risk analysis of contaminated land masses, the health impacts of small particles in urban air, especially in winter, assessment of the health impacts of energy and traffic policies, and – more generally – research on decision-making, for instance in the development of community planning so that health and well-being aspects are given proper consideration. Environmental health work requires identification of the central hazards in the environment, research on and a deeper understanding of the mechanisms involved, risk evaluation and epidemiological studies. The Committee stated that basic research information, applied studies and R&D are lacking in many specialised fields.

With the exception of some narrow sectors, environmental health research is new in Finland. Therefore, support given to researcher education, at both the PhD and postdoctoral level, is a pivotal aspect of improving professional skill in the field.

OBJECTIVES

- Environmental health research and development, and utilisation of research data, are intensified in Finland.

  In the field of environmental health, there are **three main lines of approach to research needs**:

- Basic research on environmental health hazards, definition of environmental and health hazards, impact and risk assessment as well as development of assessment methods.

- Research and development for the prevention of environmental exposure, in order to combat and rectify detrimental factors.

- Research in the social sciences and development of economic assessment methods.

ACTIONS

1 A multidisciplinary environmental health research programme is launched under the supervision of the Academy of Finland and in collaboration with various administrations and other interest groups. (Academy of Finland, Technology Development Centre of Finland, Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry, universities and research institutes)

2 The national centres for researcher education, and Nordic and other international co-operation, are utilised in order to provide education for environmental health researchers. (Universities, other institutions of higher education and research institutes)

3 Environmental health research conducted in research institutes concentrating on a specific sector is reinforced. (Ministry of Social Affairs and Health, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Transport and Communications, Ministry of Trade and Industry)

Appendix to Chapter **5.3**

ENVIRONMENTAL HEALTH MONITORING AND DATA SYSTEMS

What is monitored

Information pertaining to environmental health is collected locally at the request of the local authorities, enterprises or government agencies. Much of the information collected locally is not utilised on a national scale. This Appendix gives a summary of the information that is needed for monitoring environmental health. A description of national data collection is also given. In the main, the list includes data that are necessary for environmental health care within municipalities. The list is not comprehensive and focuses on the most important environmental and health issues that require monitoring.

Water

The control programme drawn up by the municipal waterworks defines the data that are collected on drinking water. The scope of the monitoring depends on local needs. The Ministry of Social Affairs and Health has issued regulations to municipalities on the microbiological and chemical analyses of drinking water. In accordance with the Ministry's decision, swimming water is analysed for *Eschericia coli* and faecal streptococci. A good indicator of the water supply system is the proportion of households connected to the municipal water supply and sewerage systems.

The Ministry of Social Affairs and Health has ordered that the control data gathered by waterworks are collected in the Finnish Environment Institute. Data on swimming water are collected in the Ministry. Other data on water quality are recorded in the environment information system maintained by the Finnish Environment Institute. The information system has the following registers: hydrology; loads imposed on water bodies and their quality; and the water quality register based on control carried out by waterworks, as referred to above. The Finnish Environment Institute also maintains a register on groundwater areas.

Outdoor air

Impurities in outdoor air are measured in the localities that themselves have major emission sources or that are subject to emissions carried from afar. Particles, sulphur dioxide and nitrogen dioxide are the most common impurities measured. Carbon monoxide may be measured as an indicator of impurities emitted by traffic. A few localities in Southern Finland determine the ozone content of air. Odorous sulphur compounds, organic compounds and metals are determined locally if there is a specific reason to do so. Responsibility for local monitoring rests with municipalities and with enterprises, in accordance with their licence terms, within their sphere of influence.

The Finnish Meteorological Institute maintains an air quality register, a climate register and a register containing air quality results from

background stations. The air quality register contains results of gas and particle concentration measurements and results of impurity concentrations and deposits, determined from precipitation. The data have been obtained from background stations indicating the basic level. In all, 22 stations monitor the air quality in accordance with programmes defined by four international networks and two national networks. Sulphur dioxide, nitrogen dioxide, ozone, nitric acid and ammonia are the most common gases measured.

The climate register contains registration results for many weather factors and consists of several subregisters. The weather is observed at 150 stations from 1 to 8 times per day; in addition, there are roughly 400 stations for monitoring rain. Measurement results for the register, containing air quality results from background stations, are collected from the stations used for determining the basic level.

The Finnish Environment Institute maintains a data register on air protection. The register consists of a section on emissions and a section on air quality. The section on emissions contains data on facilities required to provide information on their emissions, as well as the data on the emissions. The environmental administration is preparing a data system (VAHTI), which will in future produce emission data and data on the state of the environment.

Indoor air

The municipal authorities responsible for health control carry out indoor air measurements, mainly on the basis of complaints. In accordance with the Health Protection Act, the Ministry of Social Affairs and Health drew up guidelines for indoor air investigations in 1996, "Microbiological, chemical and physical conditions in residences and in other premises". Among other things, the guidelines include instructions for determination of temperature, humidity, ventilation, radon, and chemical impurities and microbes in indoor air.

The results of radon measurements are kept by the Radiation and Nuclear Safety Authority. No other research results on indoor air are collected nationally.

Food

Investigations associated with food safety, commissioned by the authorities, are carried out in both state-owned laboratories and municipal laboratories. In addition, enterprises within industry and trade investigate their own products using their own control systems. Before Finland's accession to the EU, the Customs Laboratory used to play an important role in the control of imported fruit, vegetables and fish products. The National Veterinary and Food Research Institute analyses foods of animal origin for, among other things, alien substances and residues of medicines and conducts microbiological investigations. The data are kept by the Ministry of Agriculture and Forestry, and they are also reported to the EU. Similarly, information on animal diseases and infectious animal diseases is kept by the Ministry of Agriculture and Forestry. Another public food research institute of great importance is the laboratory of VTT Biotechnology and Food Research. Monitoring of food poisonings has been

divided between the National Public Health Institute, the National Food Administration, and the National Veterinary and Food Research Institute. The National Public Health Institute compiles a follow-up report on nutrition, which was drawn up for the first time in 1995. Laboratories under the auspices of the environmental administration investigate, among other things, fishes as environmental indicators. Municipal food laboratories carry out the greatest number of food analyses. In 1994, altogether 57,300 samples were analysed. With the exception of certain projects, no national summaries are compiled of the analyses conducted in municipal laboratories.

Noise

Municipalities monitor the noise situation in their areas on the basis of the Noise Abatement Act. The goal of the monitoring is to acquire basic data on the major noise sources, noise levels, and noise hazards within the municipality, or within a certain area of the municipality. Roughly 25 per cent of all municipalities have conducted a study on their noise situation. In addition, the National Road Administration has charted the noisy areas around public roads and the numbers of people living in these areas. However, there are not yet sufficient data for compiling a summary report encompassing the whole country. On the basis of the data collected by municipalities, the Ministry of the Environment studied the noise situation in the whole country for the first time in 1997. Municipalities also carry out noise measurements on the basis of complaints. These measurement results are not compiled in any national register.

Radiation

The municipal enviromntal health authorities monitor the radon contents of indoor air in homes in collaboration with the Radiation and Nuclear Safety Authority. More than half of all municipalities have initiated measurements based on a measurement plan drawn up by the Radiation and Nuclear Safety Authority. The radon situation has been mapped in more detail in areas where the radon content of the soil is high. The data are collected by the Radiation and Nuclear Safety Authority, which also draws up radon forecast maps for municipalities. Moreover, the Radiation and Nuclear Safety Authority monitors the radioactivity of drinking water.

The radiation situation in Finland is under constant control. External radiation is measured at stations maintained by the Radiation and Nuclear Safety Authority and the Finnish Defence Forces. Continuous measurement takes place at about 300 automatic stations, and the results are available simultaneously in several places. The radioactivity of airborne particles is monitored at 20 locations. The Radiation and Nuclear Safety Authority also monitors ionising radiation in the soil and in water bodies. Similarly, radioactivity of food is subject to regular monitoring. The intensity of UV radiation is also under constant monitoring, and the general public is informed of the results.

Wastes and contamination of the soil

The amounts of community waste and the proportion of biological waste therein, the quality and quantity of hazardous wastes, heavy metals in

waste water sludge, the seepage, run-off and groundwater of refuse tips, and contaminated land areas are monitored in accordance with regional plans. The data are kept by the Finnish Environment Institute. The physical and chemical properties of the soil are also monitored by the Geological Survey of Finland, the Finnish Forest Research Institute, and the Agricultural Research Centre.

In the context of the project for studying and restoring contaminated land areas (SAMASE), launched by the Ministry of the Environment, land areas were investigated to determine their extent of contamination, and proposals were made for organising the cleaning and restoration of contaminated land areas. The register of refuse tips, maintained by the Finnish Environment Institute, contains information on private and public refuse tips that are in use now or were used in the past. The information on each refuse tip (location, equipment, maintenance, waste treatment, environmental impact, prevention of hazards, design, research, supervision and economy) is collected from the party operating the refuse tip (e.g. the municipality). The information is checked in the Regional Environment Centres, where it is also recorded.

Chemicals

The Chemical Register contains data submitted to the authorities in connection with certain licensing and notification procedures. The Register consists of four subregisters, each of which is maintained by the official body responsible for the administrative procedure in question. The subregisters are: the product register (Ministry of Labour); the permit register (Technical Inspection Centre); the protective chemical register (Finnish Environment Institute); and the register of new substances (National Product Control Agency for Welfare and Health).

Finland has several registers that contain data on the environmental and health effects of chemicals or on their concentrations in the environment. Examples include the register of environmental toxins kept by the Finnish Environment Institute, and the registers maintained by the National Public Health Institute and the Finnish Institute of Occupational Health. The product register of the Ministry of Labour contains information on chemical products. Data on the storage, transport and industrial processes of dangerous substances have been compiled in several publications and registers by the Ministry of the Interior, the Ministry of Labour, the Technical Research Centre of Finland (VTT), the Finnish State Railways and the Ministry of Transport and Communications. The customs authorities compile data on chemicals imported to Finland. The Customs Laboratory compiles data on determinations conducted on imported chemicals. The VARO register maintained by the Safety Technology Authority and the accident database of the Ministry of the Interior contain data on accidents that have taken place. Plans have been made to supervise the manufacture and storage of dangerous substances on the basis of the COMAH Directive (Proposal for a Council Directive on the Control of Major Accident Hazards Involving Dangerous Substances). Accordingly, data on the manufacture and storage will be collected nationally, and they will also be registered by the European Union. Information on accidents involving chemicals will also be reported. Fur-

thermore, the Helsinki University Central Hospital collects data on cases of poisoning.

The results of determinations of hazardous chemicals made on aquatic organisms, sediments and the terrestrial environment are recorded in the accumulation register of the environmental data system. The EnviChem register maintained by the Finnish Environment Institute contains research findings on the principal properties of chemicals with respect to environmental effects, such as accumulation in organisms, and transport and decomposition in the environment. The register also contains basic physical and chemical information on chemicals; this helps estimate the state and behaviour of chemicals in the environment.

Registers on diseases

The major registers containing morbidity data associated with environmental health are the following: the population statistics, the statistics on causes of death, the cancer statistics kepts by STAKES, congenital malformations, the register on communicable diseases, the Social Insurance Institution's data systems, notification of treatment by the social welfare and health care systems (HILMO), the register on occupational diseases, and the register on workers exposed to carcinogenic substances in their work (ASA).

Preparation for problem situations

Sudden environmental health problems have arisen in Finland especially because of microbiological and chemical hazards associated with drinking water. Microbe-related problems brought about by indoor air impurities and, particularly, moisture damage have increased in recent years. Situations that are manifested as cases of illnesses are less common, but sometimes they are the most difficult cases to solve. In contrast, situations in which a potential health hazard must be assessed on the basis of environmental hygienic measurements are more common.

Advance prevention and early detection of an environmental health hazard, an epidemic or increased morbidity constitute a central objective in environmental health care. This objective can only be met through careful investigation and reliable reporting of the cases detected. Investigation of problem situations is included in the tasks assigned to the municipal authorities, but municipalities are under no general reporting obligation, with the exception of food poisonings. Finland has no national follow-up system for environmental exposures or problem situations, which could be used as help in control. Based on voluntary notifications, however, some follow-up data exist on water epidemics.

SOME CENTRAL OBJECTIVES FOR IMPROVING ENVIRONMENTAL HEALTH AND SOME RISK AND BACKGROUND FACTORS INFLUENCING THESE OBJECTIVES