

KEY SIGNALS

- Environmental degradation can have a significant impact on human health. Estimates of the share of environment-related human health loss are as high as 5% for high-income OECD countries, 8% for middle-income OECD countries and 13% for non-OECD countries.
- Air pollution and exposure to hazardous chemicals are important causes of the environment-related burden of disease in OECD countries. The transport and energy sectors are major contributors to air pollution, while important sources of chemical pollution are agriculture, industry, and waste disposal and incineration.
- Opportunities for reducing environment-related health risks are considerable. The benefits of many environmental policies in terms of reduced health care costs and increased productivity significantly exceed the costs of implementing these policies.

21.1. Introduction

Concern for health has traditionally underlain much of the political priority given to environmental issues in OECD countries. The impact of environmental risk factors on health are extremely varied and complex in both severity and clinical significance. For example, the effects of environmental degradation on human health can range from death caused by cancer due to air pollution to psychological problems resulting from noise. This chapter attempts to describe the major impacts on human health of environmental degradation and to estimate the associated amount of health loss. A better understanding of the economic costs of environment-related health loss can help to inform environmental policy design.

21.2. Impacts of environmental degradation on human health

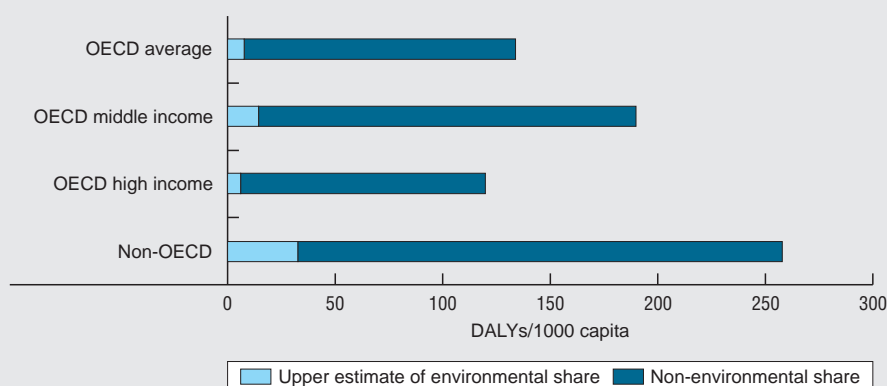
Many factors influence the health of a population, including diet, sanitation, socio-economic status, literacy, and lifestyle. These factors have changed significantly during the economic transitions that have shaped present society and resulted in a considerable increase of life expectancy in OECD regions (Ruwaard and Kramers, 1998). Recent studies show that the major determinants affecting life expectancy in OECD regions from 1970 to 1992 were better working conditions, and increased GDP and health expenditure per capita. However, they also indicate that during the same period the negative impacts of air pollution on human health increased in OECD countries (Or, 2000).

In order to provide a complete picture of a population's health status, the various aspects which affect it can be combined in a measurement of the "burden of disease", as expressed for example in "disability adjusted life years" (DALYs). They give an indication of how the duration of disease combined with the impact of disease can alter the ability of people to live normal lives as compared to those with no disease (Murray and Lopez, 1996). Figure 21.1 shows estimates for the average total burden of disease, using the DALYs approach, for all OECD countries, for OECD countries grouped by income level, and for non-

Environmental damage is responsible for 2-6% of the total burden of disease in OECD countries.



Figure 21.1. Total burden of disease, with estimated environment-related share, mid-1990s



Note: OECD middle income countries: Czech Republic, Hungary, Mexico, Poland and Turkey (World Bank, 1999).
Sources: de Hollander *et al.* (1999), Melse and de Hollander (2001), Smith *et al.* (1999), UNEP/RIVM (1999) and WHO (1999).

OECD countries (Melse and de Hollander, 2001). It clearly shows a significant difference between OECD countries and non-OECD countries (and the influence of income levels on the burden of disease within OECD countries) as regards both total burden of disease and the health conditions related to environmental degradation. The environment-related share of the burden of disease is greatly dependent on income, with higher environmental shares generally occurring in lower-income countries. In OECD countries, this share is estimated to be 2-6% of the total burden of disease.¹

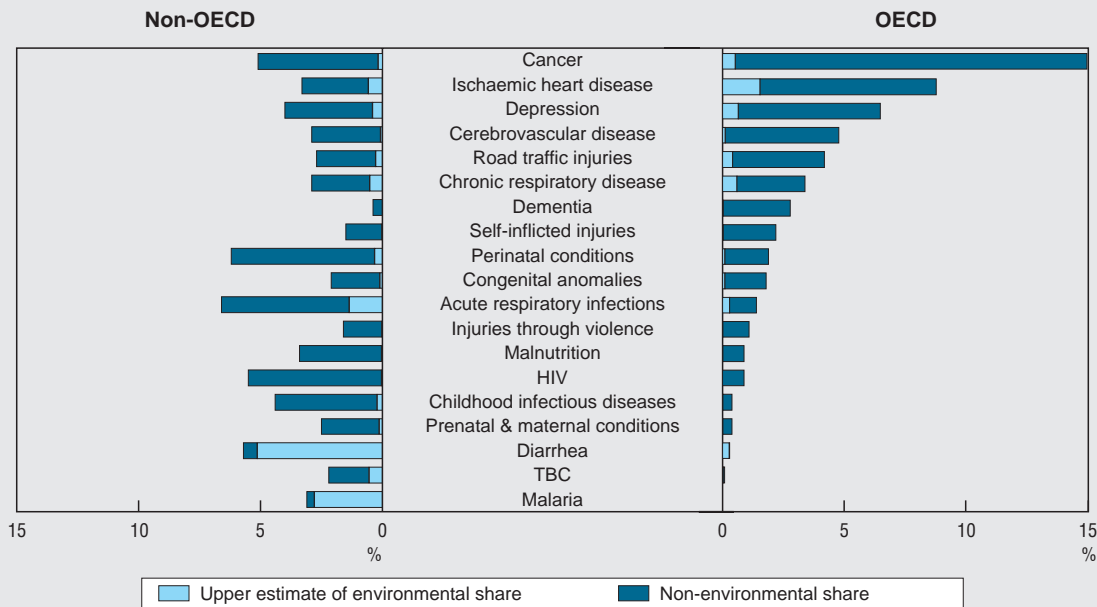
Figure 21.2 indicates the different patterns of disease in OECD and non-OECD countries, as well as the environment-related share of the various health conditions (Melse and de Hollander, 2001). In non-OECD countries, the majority of the burden of disease can be attributed to communicable disorders (e.g. infectious, maternal, pre-natal), while in OECD countries health is lost primarily through the non-communicable (chronic, degenerative) diseases. In OECD countries conditions like heart disease and depression make up a major portion of the burden of disease. In non-OECD countries, diseases in children under four years old account for 50% of the total burden of disease, while in OECD countries the percentage for young children is significantly lower (7% of the total burden of disease).

The large environmental share of health problems in non-OECD countries (diarrhea, TBC, etc.) is primarily due to factors related to poverty, such as limited access to proper food, housing, health care and drinking water. Environmental determinants of human health in OECD countries, on the other hand, are related more to the exposure to air pollutants (particularly in urban areas) and chemicals in the environment than to poor living conditions. Although emissions of many air pollutants have declined in OECD countries in recent years, urban air quality problems related to some pollutants are on the increase, with serious repercussions for human health (see Chapter 15).

Sources of human exposure to chemicals are many and varied. Chemicals can reach the environment, for example, through emissions from industries, anti-fouling paints on marine vessels, pesticides in agriculture, waste incineration and leakage from waste disposal sites. While emissions of chemicals from industries and other point

1. Figure 21.1 only shows the upper estimate of the environment-related share of the burden of disease, with the range (due to uncertainties in risk and the exposure to disease categories used as a basis for the calculations) estimated to be 2-5% for high-income OECD countries, 4-8% for middle-income OECD countries, 2-6% averaged for all OECD countries, and 8-13% for non-OECD countries.

Figure 21.2. Patterns of disease burden with estimated environment-related shares, mid-1990s



Source: based on Smith *et al.* (1999), UNEP/RIVM (1999), and WHO (1999).

sources of pollution have declined considerably in the past decade in OECD countries, their release to the environment is still significant (see Chapter 19). Uptake through food consumption is another important source of chemical exposure. Intensive agricultural production uses chemicals in pesticides and fertilisers, and in feed additives and medication for livestock (see Chapter 7). Residues remain in fruit, grains, vegetables, meat and dairy products, all of which can reach the consumer. Other sources of chemicals in food include bio-accumulative chemicals in the environment, such as heavy metals and persistent organic pollutants (POPs), which can be found in fish, meat and dairy products.

Other human health risks that have recently received considerable attention include unsafe livestock feeding practices through which toxins reach the food chain unintentionally. Dioxins that have accidentally contaminated poultry feed can move up the food chain to humans, and using feeds that contain diseased animal remains can cause the so-called “mad cow disease” (BSE) in livestock which has been linked to a new form of Creutzfeldt-Jacobs disease in consumers.

The effects on health from exposure to chemicals and air pollutants vary from allergies to cancer. Although the link between exposure and disease is often not clear, a direct causal relationship has been found for some cases. Even at low exposure levels, urban air pollutants can cause asthma, allergies, respiratory diseases and cardiovascular diseases if the exposure is continuous or long term. Heavy metals have been shown to cause neurological disorders and various cancers. POPs can also cause various cancers and are suspected of causing birth defects and reproductive disorders (Colborn *et al.*, 1996).

Environment-related threats to human health that do not result from direct exposure to chemicals or air pollutants are less common in OECD countries, but may still have significant impacts. A well-known example is the effect on the ozone layer of ozone-depleting substances (ODS) used in cooling systems and spray cans. The depletion of the ozone layer has led to increased exposure to UV-radiation and a greater risk of skin cancer. Although the production of ODS in OECD countries has substantially decreased in recent years (see Chapter 19), exposure levels to UV-radiation are still above acceptable levels in many regions of the world.

In addition to physical diseases, environmental contamination can also cause psychological problems. Noise, one of the determinants of the quality of urban life, can have an impact on human health, decreasing the quality of life and potentially contributing to depression. As Figure 21.2 shows, depression is one of the major diseases in OECD countries.

The environment-related health issues that are likely to be prominent in OECD countries in the future include both the expansion of existing threats and the possibility of new ones. The threat of continuing widespread release of chemicals to the environment gives the greatest cause for concern. This is not only a question of the amount of chemicals that end up in the environment, but more a question of their characteristics and effects. Unfortunately, the latter are often unknown, as the recent discovery of the endocrine disrupting effects of certain pesticide ingredients has shown.

The effects on human health of the widespread release of chemicals to the environment may worsen in OECD countries in the future.



The possible effects of climate change are a widely recognised future threat to human health, although their exact impact is not yet well understood (see Chapter 13). Climate change might result in new infectious diseases, as well as changing patterns of known diseases, and loss of life due to extreme weather conditions (McMichael, 1999; Newman *et al.*, 2001).

21.3. The health-related costs of environmental degradation

The impacts on human health from degradation of the environment affect society not only in terms of loss of quality of life, but also in terms of expenditure on health care, loss of productivity and loss of income. Since these impacts are very different, different approaches are required for estimating their magnitude.

Direct expenditure on health care for environment-related diseases can be estimated using the environment-related shares of the burden of disease discussed in Section 21.2 and data on health care expenditures in OECD countries (OECD, 1999). These estimates are fairly rough, but are useful as proxy indicators for current environment-related expenditure on health care and the possible savings that may result from environmental policy interventions. These indicators can therefore be helpful in estimating the economic benefits of environmental policy options.

Table 21.1 shows that direct health care expenditures due to environmental degradation are substantial. These costs may add up to as much as US\$130 billion per year for OECD countries, equalling 0.5% of GDP. Both the share of GDP that is spent on health care and the environment-related share of the burden of disease differ from country to country within OECD regions, with the largest differences being found between high-income and middle-income OECD countries. Although the economic benefits resulting from environmental measures seem to be lower in middle-income OECD countries, they can still be significant. For example, the potential economic benefits in terms of health cost saving estimated for measures proposed in Turkey's national environmental action plan to reduce SO_x and particulate emissions are US\$125 million annually (OECD, 1999b).

Table 21.1. Total health expenditure in OECD countries and the environment-related share

Burden of disease	134 DALYs / 1 000 capita
Environment-related fraction (lower and upper estimate)	2.3%-5.8%
GDP	US\$22 467 billion (PPP)
Total expenditure on health	9.9% of GDP
Environment-related health costs	US\$50-130 billion
<i>Sources:</i> OECD (1999a), and Melse and de Hollander (2001).	

In order to estimate the indirect costs of environmental degradation in terms of loss of quality of life, a different approach is needed. The monetary values of these indirect costs can be derived through measuring people's willingness-to-pay (WTP) for good health. WTP approaches (Melse and de Hollander, 2001) reflect the value peo-

ple attach to health and can provide estimates for the fuller economic benefits that could result from implementing certain environmental policies. Willingness-to-pay values are available for a number of high-income OECD countries where environment-related health costs in terms of WTP can be estimated to be approximately 3.2% of GDP and US\$750 per capita annually (calculated from Aunan *et al.*, 1998; Melse and de Hollander, 2001).

An example of the magnitude of economic benefits which can be obtained through environmental interventions is presented in a recent study of environment-related health costs resulting from road transport particulate air pollution in three high-income OECD countries (de Hollander *et al.*, 1999). The monetary WTP-valued annual health costs in these three countries for diseases resulting from total particulate matter emissions were estimated to be US\$765 per capita or 3.5% of GDP, while costs of diseases from road transport particulate air pollution accounted for US\$411 per capita or 1.9% of GDP.² The study found that a 5% reduction in road transport particulate emissions could result in a benefit of US\$1.5 billion (or US\$21 per capita) by averting 1 000 premature deaths and 1 250 cases of bronchitis.

Although data on environment-related health costs and cost-benefit ratios of environment policy interventions will never be as precise as market values for other goods, the available evidence strongly suggests that measures to improve the quality of the environment can prove to be very worthwhile investments. This is true not only because of the intrinsic value of the environment and human health, but also when only the monetary costs and benefits are compared.

21.4. Policy issues

Clearly, the loss of health due to environmental degradation is substantial and calls for interventions. These environmental policy interventions can in turn save money in health care costs. The upper estimate of the current environment-related share of the burden of disease is 6% for OECD countries combined and 13% for non-OECD countries. The cost-benefit ratio for any given policy intervention will depend on the state of the environment and the pattern of disease of the affected population. Since these factors can differ between OECD countries and even within countries, there are only few recommendations that can be generally applied. However, certain priority issues for intervention common to almost all OECD countries can be identified (summarised in Table 21.2).

Table 21.2. Priority environment-related diseases, issues and sectors in OECD countries

	High-income OECD countries	Middle-income OECD countries
Diseases	Cardiopulmonary diseases Cancer Depression	Communicable diseases Cardiopulmonary diseases Cancer
Issues	Air pollution Chemicals Noise/liveability	Sanitation/food/housing Air pollution Chemicals
Sectors	Transport Industry/agriculture Housing	Public hygiene Transport/energy Industry/agriculture
<i>Source:</i> Melse and de Hollander (2001).		

The most urgent issues to be addressed in OECD countries in relation to limiting health loss from environmental degradation are air pollution and exposure to chemicals. The issue of air quality, and especially urban air quality, emphasises the need for policies resulting in less volume, and cleaner means, of transport (see Chapter 14). The problems related to exposure to chemicals call for policy interventions to limit industry, energy and transport emissions, agricultural chemical use, and to promote food safety (see Chapter 19).

2. Relatively low WTP values and environment-related burdens of disease were used in this study.

A number of the environmental policy instruments discussed in the sectoral and environmental issues chapters of this report – especially those related to decreasing air pollutants and chemicals in the environment – can contribute to reducing loss of health as well as avoiding other effects of environmental degradation (see Chapters 15 and 19). As policies are formulated to address these environmental issues, the health benefits associated with policy interventions should be considered together with the environmental benefits.

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