FEBRUARY 2008 Policy Brief

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Health and the Environment

Introduction

How much does the environment affect human health? Are air pollution and tainted water shortening our lives and those of our children? These questions have aroused increasing interest in recent years, particularly since the adoption of Agenda 21 at the UN Conference on Environment and Development, which drew the attention of policy makers to the links between health and the environment.

Air pollution is one obvious environmental health threat in OECD countries, contributing to a number of illnesses, such as asthma and in some cases leading to premature death. Of particular concern is the fact that children are more vulnerable to air pollution than adults, and increased rates of infant mortality have been recorded in highly polluted areas.

Concerns about the impact of air pollution on health and the economy have resulted in measures to mitigate emissions of the most harmful pollutants, such as particle pollution (acids, organic chemicals, metals, and soil or dust particles) and ozone, which affects the respiratory system. Despite national and international interventions and decreases in major pollutant emissions, the health impacts of air pollution are not likely to decrease in the years ahead, unless appropriate action is taken.

Water is another key environmental health issue – unsafe drinking water and untreated waste water kill thousands of people a year, most of them children.

Other health issues associated with emerging environmental hazards, such as chemical products, will also need to be addressed. Chemical products are used in virtually every man-made product and play an important role in the everyday life of people around the world. However, harmful exposure to chemical products can lead to health problems such as skin diseases, chronic bronchitis, nervous system dysfunctions and cancers as well as damaging the environment.

What should be done to better address environmental health risks? This *Policy Brief* proposes some answers as well as possible policy directions. ■

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How does pollution affect health?

Environmental degradation exerts significant pressure on human health. Exposure to air, water and soil pollution, to chemicals in the environment, or to noise, can cause cancer, respiratory, cardiovascular and communicable diseases, as well as poisoning and neuropsychiatric disorders.

Outdoor air pollution is a major environmental problem in OECD countries. It can have acute health effects resulting from short-term exposure or chronic health impacts resulting from long-term exposure. Health problems linked to air pollution range from minor eye irritation to upper respiratory symptoms, chronic respiratory diseases such as asthma, cardiovascular diseases and lung cancer. Some of these require hospital treatment, and may be fatal.

How badly air pollution affects individuals will depend on the pollutant's chemical composition, its concentration in the air, the length of exposure, the synergy with other air pollutants, as well as individual susceptibility (Box 1). Although environmental risk factors can affect the health of the whole population, some groups are particularly vulnerable to environmental pollution, including children, pregnant women, the elderly and persons with pre-existing diseases.

Although the direct health effects of exposure to chemicals are complex and sometimes open to debate, health problems due to harmful exposure to some chemicals are well documented. For instance, concern has been raised about the link between exposure to chemicals such as alkylphenols (used in detergents and pesticides) and disruption of the hormonal system that regulates many of the body's functions. Effects on sperm motility, foetal growth rate and neurological functions of offspring have been observed from human exposure to PCBs, and epidemiological studies suggest exposure-related increases in cancers of the digestive system. PCBs were used in coolants,

Box 1.

CHILDREN'S HEALTH AND THE ENVIRONMENT

Children are more susceptible to environmental pollution than adults. Metabolic activity is higher in children as their bodies are still developing. Children's bodies respond differently than adults' to the same apparent levels of exposure and are less able to metabolise or remove pollutants. Moreover, adults and children are exposed to different types of risk, mainly because of their different activities. Children tend to spend more time outdoors and are more exposed to soil and outdoor air pollution. They are also less aware of the environmental risks surrounding them. So children can be exposed to higher levels of pollution than adults.

Examples of impacts of environmental pollution on children's health include:

- cancer (*e.g.* skin cancer from exposure to UV radiation or leukaemia resulting from exposure to pesticides while still in the womb)
- asthma (exacerbated by outdoor air pollution)
- birth defects (from drinking-water contaminants ingested by the pregnant mother)
- neurodevelopmental disorders (resulting from lead poisoning)

Despite a large number of measures undertaken in OECD countries to protect children's health from environmental hazards, most existing environmental legislation does not take account of children's specific vulnerability to the various environmental risks.

insulating fluids, PVC and other products until their production was banned in most countries the 1970s; even so they are still found in the environment.

Poor water supply, sanitation and hygiene (WSH) is another environmental source of ill-health. Inadequate sewage treatment and poor sanitation result in diarrhoeal diseases caused by bacteria, such as cholera or E. coli, by viruses such as norovirus or rotavirus or protozoan parasites such as cryptosporidiosis or giardiasis. The greatest health risk in this area comes from unsafe drinking water. ■

What does environmental degradation cost our health?

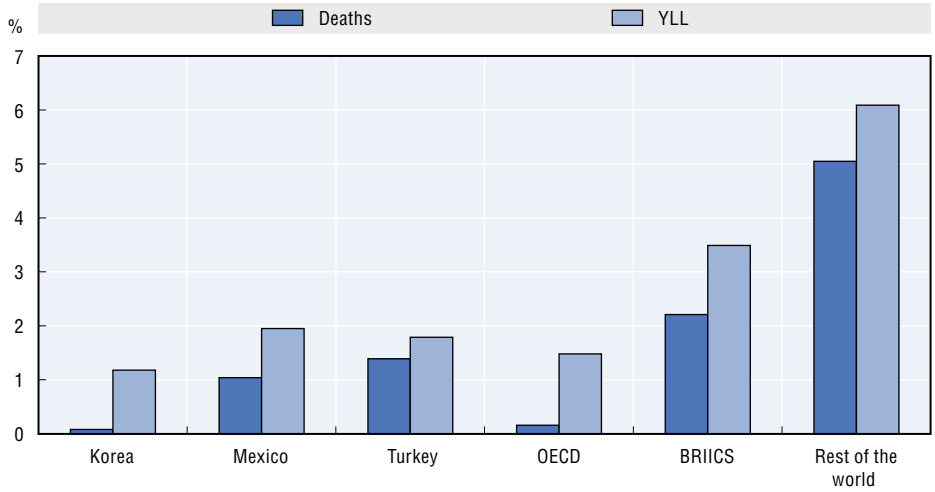
Evidence suggests that environmental problems can have a substantial impact on human health. Unsafe water supply, sanitation and hygiene are responsible for 3% of all deaths and 4.4% of all years of life lost (YLL) worldwide. But the poorest developing countries are the worst affected; 99% of these deaths occur in non-OECD countries and 90% of those dying are children. Although the health impacts of water-related diseases remain very low in OECD countries (around 0.2% of deaths), some OECD countries are affected more than others (Figure 1).

In Brazil, Russia, India, Indonesia, China and South Africa (BRIICS), unsafe WSH was responsible for 2.2% of all deaths and 3.5% of the total burden of disease in 2002 – of which 87% occurred in India and China. When these figures are adjusted for population size, deaths from unsafe WSH in the rest of the world are 40.5 times higher than in OECD countries, and 2.7 times higher than in the BRIICS.

At the global level, air pollution is estimated to be responsible each year for approximately 800 000 premature deaths, or 1.4% of all deaths worldwide and 6.4 million years of life lost, or 0.7% of the world total. This burden of disease is most important in developing countries, causing an estimated 39% of years of life lost in south-east Asia (*e.g.* China, Malaysia, Viet Nam) and 20% in other Asian countries (*e.g.* India, Bangladesh).

Figure 1.

MORTALITY AND BURDEN OF DISEASE DUE TO UNSAFE WATER, SANITATION AND HYGIENE, 2002



Source: Prüss-Üstün *et al.*, 2004.

PM_{10} – tiny particulate matter small enough (PM) to be inhaled into the deepest part of the lung – is especially harmful to human health, as it can substantially reduce life expectancy. For the year 2000, exposure to PM_{10} caused approximately 960 000 premature deaths and 9.6 million YLL worldwide. At least 80% and in some areas more than 90% of these deaths were associated with cardiopulmonary diseases.

The OECD projects an increase in premature deaths for most world regions between now and 2030 (see Figure 2), even for areas where PM_{10} levels are estimated to decrease (for example, Asia and Brazil). This is because of other factors, such as increasing urbanisation and ageing of the population (the elderly being more vulnerable to air pollution). In 2030, premature deaths from lung cancer are projected to be multiplied by four, but premature deaths from acute respiratory infection in children would decrease both in absolute and relative numbers. The total number of premature deaths caused by PM_{10} in 2030 is projected to be 3.1 million

The OECD *Environmental Outlook to 2030* also projects a sixfold increase in deaths attributable to ozone by 2030. OECD countries are anticipated to be differently affected, with Japan and Korea presenting a larger number of premature deaths associated with exposure to ground-level ozone than European and North American OECD countries. ■

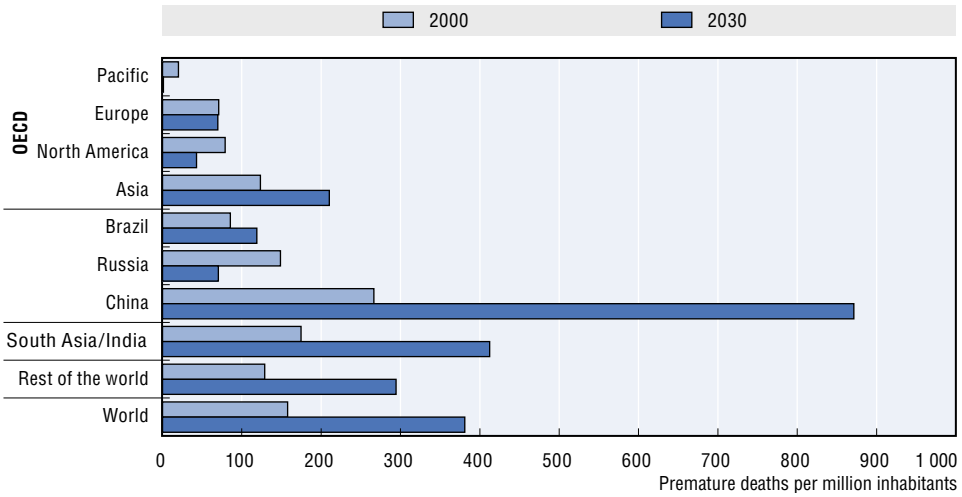
What environmental policies are needed?

Governments have various policy options for improving air quality, such as regulating fuel quality or imposing stringent standards on pollutant emissions. Many of them have been reviewed to see how effective they are in reducing air pollution.

France and Mexico, for example, tested out the effectiveness of putting particle filters on private and public vehicles. In both countries, these interventions were found to induce significant health benefits, which were largely greater than their costs. The Mexico study found that the benefits

Figure 2.

PREMATURE DEATHS FROM PM_{10} AIR POLLUTION FOR 2000 AND 2030



Source: OECD (2008).

were between 1.1 and seven times higher than the costs, depending on the type of filters applied.

Different air pollution abatement policies have been evaluated elsewhere. For example, the US *Clean Air* Act for reducing air pollution is considered as an efficient policy intervention with four dollars of benefits for every dollar of cost. The US Environmental Protection Agency has also assessed the benefit of additional control requirements, and found projected benefits of USD 100 billion while the costs would amount to USD 27 billion, generating net benefits of USD 73 billion.

In Canada, a cost-benefit analysis was conducted to determine the most efficient air-quality options. The study estimated that introducing Canada-wide standards for PM_{10}, $PM_{2.5}$ and ozone in Canada would result in net benefits of USD 3.6 billion per year.

In Europe, different scenarios of air pollution abatement under the EC *Clean Air for Europe* programme were evaluated. The estimations suggested that reducing air pollution in Europe slightly more than is currently done would generate net benefits of between USD 42 billion and USD 168 billion over 20 years.

A cost-benefit analysis was also undertaken in Mexico City to determine the efficiency of an ultra-low sulphur fuels policy. It projected that substantial health benefits were associated with a reduction in sulphur content of fuels. Moreover, this policy intervention would be efficient with annual benefits significantly larger than corresponding annual costs (respectively USD 9 700 million and USD 648 million).

Although there is a wide variation between these policy interventions in terms of their cost-benefit ratio, some lessons can be learned from these experiences:

- Less stringent policies can be very effective: the current *EU Thematic Strategy on Air Pollution* has a benefit to cost ratio (BCR) of 6 to 20 – in other words, its benefits outweigh its costs by more than three to one.
- "Simple" policies can sometimes be the most efficient: Mexico's fuel policies that require ultra-low sulphur content have a BCR of 10 to 19.
- There is evidence of a "first mover and laggard" effect: policies introduced recently benefit from the experience of countries which implemented similar policies a few years earlier.
- Policies targeting several pollutants at the same time are more efficient than single-pollutant policies.
- Total benefits vary across countries, mainly because of GDP differences.
- A comparison of *ex ante* and *ex post* evaluations of environmental policies suggests that *ex ante* costs are often overestimated, while *ex ante* benefits are underestimated partly due to strategic behaviour by involved industries.

Reviews of measures to reduce the health impact of unsafe water and sanitation found similar results. In OECD countries, improving drinking water quality was often found to be cost-efficient. For example in the US, the *Long Term 2 Enhanced Surface Water Treatment Rule* to reduce illness linked with cryptosporidium and other disease-causing micro-organisms in drinking water generated net benefits of between USD 64 million and 2.7 billion. The health benefits of improving sewage treatment also outweigh the costs. In non-OECD countries, hygiene interventions and minimal water disinfection at the point of use were found to be significantly cost-efficient in health and economic terms.

These examples suggest that policies which improve air and water quality are often cost-efficient: the benefits outweigh the costs. Reductions in levels of PM are highly beneficial in health terms, probably due to the relatively strong link that exists between PM exposure and premature mortality. Economic studies of water supply and sanitation interventions in both OECD and non-OECD countries demonstrated that benefit-cost ratios vary from 1 to 3.1, suggesting significant cost savings for healthcare. The fact that most of these cost-benefit analyses only consider the health impacts of specific interventions suggests that total benefits (including benefits to the economy and the environment as well) may be underestimated. ■

Where do we go from here?

The economic evidence shows that there are opportunities for significant net benefits in limiting air pollution (and more generally environmental degradation), not only for human health, but also for the economy. This finding is particularly true for those OECD and non-OECD countries which have significant levels of air and water pollution.

Examples of selected cost-benefit analyses suggest that treating environmental health issues upstream (*improving* the environmental conditions to prevent environment-related health problems) rather than downstream (*treating* the health problem) can be cost-efficient. The cost of these interventions is covered (sometimes several times over) by the health benefits they generate.

OECD countries should therefore:

- Continue to support environmental policies as a key vector for reducing health damage and healthcare costs caused by environmental degradation.
- Strengthen their efforts to further reduce outdoor air pollution emissions to levels in accordance with World Health Organisation (WHO) guidelines. Such efforts could include more stringent legislation and implementation of appropriate pollution control policies, cleaner and more efficient energy policies and environmentally sustainable transport policies.
- Commit significant financial resources in the next decades to upgrading water supply and sanitation infrastructure.
- Increase international development aid and encourage internal investment towards helping developing countries achieve Millennium Development Goals

Target 10 (that is, halve by 2015 the proportion of people without sustainable access to safe drinking-water and sanitation).

- Low-income OECD countries should make additional efforts to reach the levels of drinking water quality and sewage treatment currently observed in OECD countries as a whole.

Despite the considerable progress in managing chemical safety, it is generally recognised that the lack of data on the uses and health effects of chemical substances and the products developed from these substances is a major handicap. Only when such information is available will it be possible to properly evaluate the consequences of the use of chemicals and to ensure that the most effective chemical safety policies are in place.

Further, as more chemicals are now being produced in non-OECD countries, concerns have also been raised about the lack of information on the release of toxic substances from chemical factories in these countries. Pollutants generated by these chemicals can travel great distances; the problem is compounded by the greater reliance by the chemicals industry in non-OECD countries on burning coal – a major source of greenhouse gases.

Although the shift of production toward non-OECD countries will pose challenges to managing chemical safety, it will also provide opportunities. OECD governments and international organisations are already giving (and plan to give even greater) attention to co-operation with non-OECD countries on this issue by sharing information and helping to build capacity in these countries for managing chemical risks.

Given the rapid rise in transport and energy use in non-OECD countries, air pollution levels are anticipated to continue to increase, resulting in a growing number of health problems in these countries. Current trends in the coverage of water supply and sanitation, sewage as well as challenges posed by demographic growth suggest unsafe WSH is expected to continue to have substantial health impacts in developing countries. Finally, emerging environmental challenges, such as climate change, may result in new, significant damages on human health in the near future.

Without sufficient efforts, the costs of healthcare from environmental pollution are likely to become greater in the years to come. Appropriate environmental policies should therefore be implemented in order to address those environmental issues that cause the strongest effects on human health. ■

For further information

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For further reading

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