Environmental health (EH) is concerned with preventing disease, death and disability by reducing exposure to adverse environmental conditions and promoting behavioral change. It focuses on the direct and indirect causes of diseases and injuries, and taps resources inside and outside the health care system to help improve health outcomes.

**Typical Environmental Health Issues: Determinants and Health Consequences**

<table>
<thead>
<tr>
<th>Underlying Determinants</th>
<th>Possible Adverse Health and Safety Consequences</th>
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</thead>
<tbody>
<tr>
<td>Inadequate water (quantity and quality), sanitation (wastewater and excreta removal) and solid waste disposal, improper hygiene (hand washing)</td>
<td>Diarrheas and vector-related diseases, eg, malaria, schistosomiasis, dengue</td>
</tr>
<tr>
<td>Improper water resource management (urban and rural), including poor drainage</td>
<td>Vector-related diseases, eg, malaria, schistosomiasis</td>
</tr>
<tr>
<td>Crowded housing and poor ventilation of smoke</td>
<td>Acute and chronic respiratory diseases, including lung cancer (from coal and tobacco smoke inhalation)</td>
</tr>
<tr>
<td>Exposures to vehicular and industrial air pollution</td>
<td>Respiratory diseases, some cancers, and loss of IQ in children</td>
</tr>
<tr>
<td>Population movement and encroachment and construction, which affect feeding and breeding grounds of vectors, such as mosquitoes</td>
<td>Vector-related diseases, eg, malaria, schistosomiasis, and dengue fever, may also help spread other infectious diseases eg HIV/AIDS, Ebola fever</td>
</tr>
<tr>
<td>Exposure to naturally occurring toxic substances</td>
<td>Poisoning from, eg, arsenic, manganese, and fluorides</td>
</tr>
<tr>
<td>Natural resource degradation, eg, mudslides, poor drainage, erosion</td>
<td>Injury and death from mudslides and flooding</td>
</tr>
<tr>
<td>Climate change, partly from combustion of greenhouse gases in transportation, industry and poor energy conservation in housing, fuel, commerce, industry</td>
<td>Injury/death from: extreme heat/cold, storms, floods, fires. Indirect effects: spread of vector-borne diseases, aggravation of respiratory diseases, population dislocation, water pollution from sea level rise, etc.</td>
</tr>
<tr>
<td>Ozone depletion from industrial and commercial activity</td>
<td>Skin cancer, cataracts. Indirect effects: compromised food production, etc.</td>
</tr>
</tbody>
</table>

Source: adapted from Listorti and Doumani 2001.

Environmental health and poverty

Environmental health risks can be grouped into two broad categories. Traditional hazards related to poverty and lack of development affect developing countries and poor people most. Their impact exceeds that of modern health hazards by a factor of 10 in Africa, 5 in Asian countries (except for China), and 2.5 in Latin America and Middle East (see figure).

Water-related diseases caused by inadequate water supply and sanitation impose an especially large health burden in Africa, Asia, and the Pacific region. In India alone, over 700,000 children under 5 die annually from diarrhea. In Africa, malaria causes about 800,000 deaths annually. More than half of the world’s households use unprocessed solid fuels, particularly biomass (crop residues, wood, and dung) for cooking and heating in inefficient stoves without
proper ventilation, exposing people—mainly poor women and children—to high levels of indoor air pollution (IAP). IAP causes about 2 million deaths in each year.

Modern hazards, caused by development that lacks environmental safeguards, such as urban (outdoor) air pollution and exposure to agro-industrial chemicals and waste, prevail in industrialized countries, where exposure to traditional hazards is low. But the contribution of modern environmental risks to the disease burden in most developing countries is similar to—and in quite a few countries, greater than—that in rich countries. Urban air pollution, for example, is highest in parts of China, India and some cities in Asia and Latin America. Poor people increasingly experience a “double burden” of traditional and modern environmental health risks. Their total burden of illness and death from all causes per million people is about twice that in rich countries, and the disease burden from environmental risks is 10 times greater.

Best interventions to reduce EH burden

Environmental health risks can be prevented or significantly mitigated, by activities in various sectors in addition to health—especially infrastructure, energy, and agriculture. The infrastructure sector has huge potential to improve health outcomes and save lives: water, sanitation, drainage, transportation, housing, urban development and energy projects could avert a large percentage of the deaths and disability-adjusted life year (DALY) loss from four of the top-ten global burden of disease causes: acute respiratory infections (1st), diarrheal diseases (3rd), malaria (8th), and traffic accidents (9th).

Environmental protection regulations and their enforcement are a major tool. Other policies also have large potential health benefits but are not generally considered in an EH context, e.g., policies on taxation, advertising and use of tobacco products. Similarly, import/export and tariff policies related to pesticides and their use in agriculture, and impregnated bednets to control malaria, or protective gear for handling hazardous waste are often outside the purview of agencies dealing with EH, but could have a large positive health impact.

Cost-effectiveness of interventions to improve environmental health

Many EH interventions are very cost-effective. Although the number of studies is limited, a review of available evidence of the effectiveness of measures outside the health sector in achieving health improvements found the following estimated costs per DALY saved (see Listorti and Doumani 2001 for full references):

Traditional environmental health hazards prevail in developing countries but modern risks are also significant...

![Chart showing the percentage of total health risks due to traditional and modern environmental risks in different regions.](chart)

- water connections in rural areas: US$35 per DALY (World Bank 2000);
- hygiene behavior change: US$20 per DALY (Stephen 1998);
- malaria control: US$35–75 per DALY (Binka 1997);
- improved stoves (indoor air): US$50–100 per DALY (Smith 1998);
- kerosene and LPG stoves in rural areas: US$150–200 per DALY (World Bank 2000);
- tobacco tax increases that raise real prices 10%: US$2-42 (World Bank, 1999);
- improved quality of urban air: large variations, from negative costs (electronic ignition systems in two-stroke vehicles) to US$70,000 per DALY and more for some pollution control measures, with most measures costing over US$1,000 per DALY.

### Monitoring environmental health improvements

Infrastructure, energy and agriculture projects seldom try to monitor EH impact or maximize EH benefits. For this to change, better links between activities in these sectors and EH indicators are needed. This table summarizes environmental risk factors, sectors in which interventions could take place and possible indicators for monitoring health impact.

#### Measuring environmental health outcomes of multi-sectoral interventions

<table>
<thead>
<tr>
<th>Environmental risk factors</th>
<th>Associated sectors/projects</th>
<th>Health outcomes and indicators</th>
<th>Examples of monitorable proxy indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Air Pollution</td>
<td>Energy (cleaner fuels, improved stoves) Health Rural development Macroeconomic (tobacco taxes) Various (smokefree public places)</td>
<td>Child deaths due to respiratory illness Acute respiratory infection (ARI) cases Chronic obstructive pulmonary disease (COPD) incidence Lung cancer</td>
<td>Estimates of exposure levels to indoor air pollution Percent of households using clean fuels or/and improved stoves Type of housing Cooking practices Tobacco use</td>
</tr>
<tr>
<td>Outdoor Air Pollution</td>
<td>Energy Transport</td>
<td>Deaths (adult) COPD incidence ARI cases Respiratory hospital admissions IQ impairment (lead) Cancer incidence</td>
<td>Annual mean levels of PM10 (ug/m$^3$) Annual ambient concentrations of lead in the atmosphere (ug/m$^3$) Lead level in blood, particularly children (ug/dl) Waste management codes Environmental performance</td>
</tr>
<tr>
<td>Vector-Borne Disease</td>
<td>Irrigation Reforestation Infrastructure (drainage) Health (vector control)</td>
<td>Deaths due to malaria Malaria cases</td>
<td>Use of bednets Application of insecticides Indicators related to the development and maintenance of irrigation and drainage infrastructure</td>
</tr>
<tr>
<td>Lack of water supply and sanitation (WSS)</td>
<td>WSS Infrastructure Social funds</td>
<td>Child deaths due to diarrhea Diarrhea cases in children</td>
<td>Access to water and sanitation (e.g., % households with in-house connections, liters per capita per day, % of communities with sanitation facilities) Sustained and effective use of WSS facilities Quality of water at the source Hygiene/behavioral change indicators</td>
</tr>
<tr>
<td>Pesticide Residues</td>
<td>Agriculture</td>
<td>Acute poisoning cases Cancer incidence Fetal defects</td>
<td>Application norms Storage and handling practices</td>
</tr>
</tbody>
</table>

Source: Lvovsky 2001
Do’s and don’ts

Environmental health involves many ministries. So do take a holistic, multi-sectoral approach to mitigating major risks to health, integrating cost-effective efforts in infrastructure and human development, and building effective institutions at all levels, including in communities. A holistic approach is particularly important for improving the health of poor people, who are most vulnerable to environmental hazards and deficiencies in health services delivery.

At the same time, however, do be selective since capacity, knowledge and awareness are always inadequate to tackle everything at once. Focus first on issues where a big impact is possible. For example, a pilot study in Ghana examined how the five largest cities could implement their new responsibilities without jeopardizing human health and focused on three key areas: (i) urban malaria and other vector-borne diseases (ii) AIDS outreach, and (iii) health facility waste management. Respiratory disease, the second biggest health problem after malaria, was not chosen because it was felt to be too difficult to move forward effectively. (Listorti and Doumani 2001.)

DO look for opportunities to act where institutional capability is adequate, stakeholders have a common interest in solving a problem which is clearly understood, and are committed to addressing it.

DO bring together a multi-sectoral team. Each profession brings a different angle, contributing to a whole picture. Only effective cross-sectoral teamwork can ensure that missed opportunities to improve environmental health are seized.

DON’T rely solely on technology changes. When introducing new technologies, consider carefully the feasibility of uptake, behavioral aspects, other inputs needed, maintenance, cost, etc.

Useful resources

Documents

HNP “at a glance” fact sheets on: indoor air pollution, malaria, water & sanitation, road safety, nutrition, tobacco, smoke-free workplaces. www.worldbank.org/phataglance


Poverty, Health and Environment. Our Planet, UNEP, Vol. 12, Number 2, 2001

Environmental Health Project, USAID http://www.ehproject.org Contains basic information, publications, including many lessons learned, upcoming conferences.

World Health Organization www.who.int click on topics, environmental health.


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Expanded versions of the “at a glance” series, with e-linkages to resources and more information, are available on the World Bank Health-Nutrition-Population web site: www.worldbank.org/hnp