

CHAPTER 2: DEVELOPING SOLUTIONS THROUGH TARGETED COLLABORATION

Environmental Health: Bridging the Gaps helps multisectoral teams identify opportunities for cost-effective interventions outside the health sector, building its approach on three underlying principles:

- *The whole is greater than the sum of its parts.* Coordinating interventions among environment, health, and other sectors will do more to reduce poverty than a series of single sector interventions.
- *Define half a problem, devise half a solution.* Environmental health problems tend to be multisectoral and require multisectoral solutions. Any benefits from a single sector approach come with a missed opportunity: the inability to prioritize the relative importance of various issues and their solutions within a broad context.
- *Do no harm.* Putting health in its broader environmental setting can help fulfill one of the most important rules of public health: to do no harm. Single sector projects may miss opportunities to address equally important health issues or sometimes inadvertently do harm by promulgating policies and promoting a mix of investments that fail to address health risks or give a false sense of security that the whole problem has been addressed.

Adhering to these cautionary principles should encourage a multidisciplinary approach to analyzing projects, one that ensures that investments in single sectors, especially for pollution control, also produce long-term health benefits. The principles should not be misinterpreted, however, as a recommendation to *avoid* investments in pollution management. The intention is simply to alert staff to low-cost, often neglected measures—sometimes only a small component within or parallel to a project—that could anchor and enhance the health benefits of such investments.

Low-cost, often neglected measures—sometimes only a small component within or parallel to a project—could anchor and enhance the health benefits of investments in other sectors.

Implementation of multisectoral approaches, however, as explained in chapter 1, is fraught with challenges. This chapter presents a new approach that attempts to address these challenges and bridge gaps in current efforts and among various agencies by harmonizing health with other sector priorities and targeting promising areas of collaboration on cost-effective health interventions. Box 2-1 explains some of the ways this new approach can be mainstreamed into the operations of the World Bank and other development agencies.

Box 2-1: Mainstreaming the New Approach into Bank Development Work

Untapped environmental health benefits in development work need to be better quantified, valued and integrated into Bank strategies, policies, and lending procedures at all levels. Bank staff need to be sensitized to practical ways to tap these potential benefits and convey this message to other development agencies, donors and NGOs. Several areas could be explored to help win promulgating these into lending: (a) *options to mainstream environmental health*; and (b) *methodologies and instruments* for Bank staff and borrowing countries among others. Environmental health constitutes one of the building blocks of the forthcoming Bank Environment Strategy, which is a recent positive factor that could catalyze the mainstreaming effort. Environmental health concerns are also being integrated in Poverty Reduction Strategy Papers (e.g., Madagascar), thanks to a mounting interest in improving the wellness of the poor through the poverty reduction.

Several other areas could be explored as non-lending options inside and outside the Bank. For example, the Development Committee of the World Bank and the International Monetary Fund need to be sensitized on environmental health issues during IDA replenishment, mainly through the Bank's Environmentally and Socially Sustainable Development and Human Development networks. Bank, borrower countries, NGOs and CBOs can be sensitized on environmental health concerns which should also be included in Bank research programs and the World Bank Institute's curriculum; dissemination through publication, web sites, and distance learning. Several of *Environmental Health: Bridging the Gaps* chapters deal with developing, enhancing or suggesting a panoply of options and tools to mainstream environmental health concerns at the macro, sector and project levels (as shown below).

Options to Mainstream Environmental Health

Country/Macro Strategies and Programmatic Instruments. Structural adjustment lending, country assistance strategies, comprehensive development frameworks, poverty reduction strategy credits, national environmental action plans (WHO-funded national environmental health action plans), and environmental action plans.

Economic and sector work (ESW). Integration into (a) poverty reduction strategy papers, country economic memoranda, public expenditures reviews, sector reviews, sector strategy papers, poverty assessments, and social assessments, and (b) Bank sector strategies, for example, environment, health, social, poverty, energy, and water and sanitation.

Global/Regional/Local Strategies and Instruments. Including (a) intermediation mechanisms, e.g., community driven development, community action plan, and social funds and (b) other initiatives, programs, funds, and facilities, e.g., Carbon Fund, Cities without Slums, City Development Strategy, Clean Air Initiative, Disaster Management Facility, Global Environment Facility (GEF), Local Environmental Action Plans (LEAP), Multi-Country HIV/AIDS Program, Post-Conflict Reconstruction Program, and Rollback Malaria Initiative.

Multisector/Single Sector Project and Monitoring. Including (a) integration of environmental health into environmental assessment procedures and into project documentation, design summary, management, and monitoring and (b) preparation of environmental health projects (e.g., as the one under preparation in South Asia).

Operational Procedures, Quality at Entry, and Safeguard Policies. Need to be adapted accordingly.

Evaluation. Informal reviews, as well as those of the Operations Evaluation Department (OED), to take into account missed opportunities and make recommendations to be formulated and fed into new Bank sector strategies.

Tools to Mainstream Environmental Health

Analytical Tools to quantify and value environmental health burden of disease (disability-adjusted life years to measure health outcomes besides mortality, and cost-effectiveness) and help mainstream its concerns at the macro, sector and project levels (chapters 3 and 6). Demographic and Health Surveys (DHS), Living Standards Measurement Study (LSMS) household surveys, World Development Indicators (WDI), and so on need to be adapted to provide data on environmental health.

Sectoral Tools to bring about sectoral priorities to help harmonize environmental health with other sectoral priorities, e.g., "shortcut tools," such as "environmental health profiles," which provide a short list of issues through a desk review or "entry points," which focus on issues for which a critical mass of the stakeholders are ready to take action (chapters 3-5 and 15-17).

Institutional Tools to help determine institutional compatibility through institutional needs assessments and foster multisectoral collaboration and forge partnerships through entry points, incentives and mutual benefits (chapters 2, 3, and 15-17).

Monitoring Tools to develop cross-sectoral outcome-based monitoring systems, e.g., application of quality adjusted life years to measure years life gained from an intervention (chapter 3), early warning monitoring indicators, and multilayered geographic information system, which can combine information ecology, topography, socioeconomic groups, and associated environmental health risks (chapters 2, 5, and 17). DHS, LSMS and WDI need to be adapted.

Procedural and Operational Mechanisms to deal systematically with environmental health concerns at all levels and possibly: enhance exiting procedures, e.g., poverty, environmental and social assessments (chapters 4-6); and improve control mechanisms such as quality at entry and safeguard policies (chapters 7-14).

Source: Authors' data.

The overall framework for implementing methodologies to tap missed health benefits through multisectoral collaboration is described below. Chapter 3 describes economic valuation. Chapters 4, 5, and 6 consider the gathering and analyzing of information to aid inclusion of environmental health in decisionmaking and chapters 8 through 15 present environmental health assessment guidelines.

Objectives of Harmonizing Sectoral Priorities

The main objective of the 1996 volumes of *Bridging Environmental Health Gaps* was to *improve the well-being of the population at large*. To this end, the Environmental Health: Bridging the Gaps program has worked to *mainstream environmental health into World Bank operations*. Current Bank attempts to bridge sectoral gaps through its “networks” help link *two* sectors, but difficult problems in Bank projects could benefit from solutions in *several* sectors simultaneously. The approach introduced here facilitates multisectoral efforts to the Bank’s chief goal of poverty reduction and sustainable development and expands health benefits beyond those of single sectors—health care, basic infrastructure services, and pollution management, fulfilling the first of the principles cited above.

Box 2-2: Environmental Health Defined

Environmental health is as much a way of thinking as a set of facts or professional discipline. Preventing disease, death, and disability should ideally form its core and entail looking at a problem in both its broad and narrow contexts. Broadly speaking, environmental health is intended to reduce exposure to adverse environmental conditions as well as promote behavioral change. More narrowly, it addresses the underlying causes of individual groups of diseases and injuries by looking at the direct and indirect causes and effecting relationships in the short and long term. Table 2-1 shows typical examples and their adverse health consequences.

Table 2-1: Sample Environmental Health Determinants and Consequences

Underlying Determinants	Possible Adverse Health and Safety Consequences
Inadequate water (quantity and quality), sanitation,* and solid waste disposal	Diarrheas and vector-related diseases, e.g., malaria, schistosomiasis, and dengue fever
Improper water resource management (urban and rural), including poor drainage	Vector-related diseases, e.g., malaria and schistosomiasis
Crowded housing and poor ventilation of smoke	Acute and chronic respiratory diseases, including lung cancer
Exposures to vehicular and industrial air pollution	Respiratory diseases, some cancers, and loss of IQ in children
Changes in feeding and breeding grounds of vectors, such as mosquitoes, from construction and population movement	Vector-related diseases, e.g., malaria, schistosomiasis, and dengue fever
Exposures to naturally occurring toxic substances	Poisonings from, e.g., arsenic, manganese, and fluorides

* “Sanitation” in this document refers to the various forms of excreta and wastewater removal.

Underlying Determinants	Possible Adverse Health and Safety Consequences
Natural resource degradation, e.g., mudslides, poor drainage, and erosion, which create health and safety problems	Injury and death from mudslides and flooding
Climate change, partly from combustion of greenhouse gases in transportation and industry and poor energy conservation in housing, fuel, commerce, and industry	Injury and death related to extreme heat and cold, storms, floods, and fires. Also indirect effects, e.g., spread of vector-borne diseases, aggravation of respiratory diseases, population dislocations, water pollution from sea level rise, and so on.
Ozone depletion from industrial and commercial activity	Skin cancer, cataracts, and indirect effects, e.g., compromised food production, and so on

Environmental health is intended to prevent human illness and injury by systematically tapping resources outside the health care system to enhance those of the health sector. In this sense, “environmental health” differs from “medicine,” “public health,” and “occupational health” in emphasis and points of intervention (see box 2-3). The World Bank has no specific definition for environmental health. In practice, however, the use of the term is most frequently used in the context of pollution management projects.*

Source: Authors’ data.

The three underlying principles, stated above, however, call for multisectoral work among government agencies and community groups from health, environment, and other sectors that are not used to working together. A secondary objective, implemented through this discussion paper, has, thus, been to achieve multisectoral collaboration by *harmonizing health and other sectoral priorities*, that is, identifying and prioritizing remedial measures that are *practicable*, as defined by national and local institutional capabilities. To this end, health-related measures that may otherwise seem too far removed from or too expensive given overall project objectives are undertaken for their residual health benefits.

Box 2-3: Key, Confusing, and Misused Terms on “Medicine” and “Health”

Medicine. Emphasizes *curative and preventive* services oriented to *individual diseases and injuries* and operates mainly through the public and private health care system.

Public health. Emphasizes *preventive and curative* services oriented to *promoting health and safety in society* and operates through the public and private health care system *as well as* other institutions in society at large.

Environmental health. Emphasizes *preventive* services oriented to *reducing exposures in society* (current tendency toward pollution control) and operates through various public and private sector institutions.

Occupational health. Emphasizes *curative and preventive health and safety* oriented mainly to *the workplace*. Sometimes referred to as “occupational health and safety” or “occupational and environmental health.”

Source: Authors’ data.

The main objectives of the program are to enhance the Bank’s chief goal of poverty reduction by mainstreaming environmental health into World Bank operations and achieve multisec-

* Chapter 4 and the glossary define terms for environmental health assessments.

toral collaboration by harmonizing health and other sectoral priorities. This discussion paper is a means to achieve these objectives.

Methodologies of Targeted Multisectoral Collaboration

Harmonizing sectoral priorities depends on a process that *targets collaboration* among those sectors and on those measures that, tempered by administrative considerations, have the best chance of generating health and other benefits, generally at a lower cost for all. The process involves four new tactics:

- *Identifying and prioritizing measures outside the health care system* that will enhance efforts of the health care system
- *Quantifying missed or untapped health benefits*
- *Devising entry points* based on institutional capability to collaborate
- *Enhancing mutual benefits* for the sectors that agree to collaborate.

Identifying and Prioritizing Measures Outside the Health Care System

Instead of focusing analysis on the statistical levels of death, disease, and disability, this volume shifts the focus to remedial measures outside the health care system to solve health problems that are based on the *types of interventions* used to help solve problems: leading health problems, diseases for special consideration, and key cross-cutting issues that are pertinent to all sectors. This innovative system of classification, new in this discussion paper, maintains the focus on tapping health benefits outside the health care system, complementing and not replacing traditional health data.

Table 2-2 shows the range of possible remedial measures for the infrastructure sector, based on the top five burdens of disease in SSA (see also table 1-5.) This list would lengthen if other sectors were reviewed as part of a coordinated effort to deal with health systematically outside the health care system.

Table 2-2: Infrastructure Measures for Top Five Burdens of Disease in SSA

Disease/Condition	Type of Infrastructure Remedial Measure
1. AIDS	Outreach to high-risk groups, such as truckers, work crews, and market-related groups
2. Malaria	Vector control, and sanitation and drainage
3. Diarrheal diseases	Improved drinking water supply and waste management
4. Respiratory disease	Improved housing and air pollution abatement
5. Perinatal conditions	(Remedial measures handled primarily through the health ministry. <i>Some</i> hygiene education possible through outreach to infrastructure groups.)

Source: Authors' data.

As one example, table 2-3 shows that seven of the top ten health problems in Ghana are amenable to infrastructure improvements (see also table 17-2). Chapter 3, which discusses socioeconomic aspects of health interventions outside the health sector, estimates that infrastructure projects could conceivably relieve a greater level of the burden of disease than health investments, about 20 percent, for a fraction of the cost. This is because infrastructure projects have already been justified on other grounds. These links to other sectors also open the door to identifying untapped and missed benefits.

Table 2-3: Top Ten Diseases in Ghana by Infrastructure Intervention (1994)

Disease	1994	Major Infrastructure Link
Malaria	1	v
Upper respiratory infection	2	v
Skin diseases	3	v
Diarrheal diseases	4	v
Accidents	5	v
Intestinal worms	6	v
Pregnancy related complications	7	
Acute eye infection	8	v
Gynecological disorders	9	
Hypertension	10	

Source: Country assistance strategy for Ghana.

Devising “Entry Points”

Entry points are determined by institutional capability and complementarity, that is, the likelihood of successful interagency and stakeholder collaboration due to their common interest in solving common problems. Promising entry points demonstrate the following characteristics:

- Widespread knowledge of the problem
- Clearly identifiable stakeholders and players
- Ability by the majority of actors in the situation to get to work.

These factors could create a framework for working on a range of environmental health problems, as the individuals and groups involved build up experience and practice working together. A trial case in Ghana Sekondi-Takoradi, one of Ghana’s five largest cities, for example, focused on the following entry points:

- Management of health facility waste
- Urban malaria and other vector-related diseases
- Diseases related to water, sanitation, and drainage.

Even though respiratory disease in Ghana ranks second out of the top ten diseases (see table 2-3), it was not selected for the case study, because the range of relevant players and stakeholders was so diverse. This increased the difficulty of those involved starting immediately to work toward a common goal without a delay involved in creating awareness among stakeholders from several sectors—health, energy, housing, transport, industry, environment—that they had a constructive role to play. With time, building on experiences with various successful entry points, other diseases and areas for collaboration may be identified in Ghana. Table 2-4 presents possibilities any country might consider.

Table 2-4: Sample Linkages and Synergies to Harmonize Sectoral Priorities

Sector	Environmental Priority	Health Priority	Health Linkages	Possible Entry Points
Agriculture	Land degradation, pesticide use, and stagnant water (rural and periurban agriculture)	Food security, nutrition, and malaria	Contamination of the food chain, pesticide use, exposure to grain dust, vector-related diseases	Malaria and pesticide management
Energy	Air pollution and greenhouse gases	Acute respiratory diseases and indoor air pollution	Indoor and outdoor air pollution, and cooking fuels	Household ventilation and improved cookstoves
Environment	Natural resource management, climate change, global warming, and pollution control	Pollution control	Reduction of lead from multiple sources	Lead reduction for nontransport sources
Health	Medical waste disposal and greenhouse gas generation	Infant and child health, AIDS, malaria, tobacco smoking, and TB	—	Medical waste disposal
Industry and mining	Air, water, and coastal zone pollution	Occupational health and exposure to heavy metals and malaria	Mosquito breeding, respiratory diseases, and contamination of food chain	Malaria reduction and AIDS education
Infrastructure	Providing access to water, sanitation, and waste management facilities; pollution control; and drainage	Diarrheal diseases, traffic injuries, and malaria	Water, air, and land pollution; traffic safety; and mosquito breeding	Diarrheal diseases, traffic injuries, medical waste disposal, urban malaria, traffic-related air pollution, and AIDS in transport, construction work crews, and markets

Source: Authors' data.

Health agencies may have a number of potential partners at any one entry point. For example, they might join with transport, water and waste management, and community groups, and schools to reduce urban malaria from mosquito breeding sites.

Establishing Mutual Benefits for Sustainability

Collaboration is more likely to be sustainable if it is based on sharing benefits, rather than merely increasing the budget for activities added. Establishing the mutual benefits that involved sectors may gain is, therefore, important to the process of harmonizing sectoral priorities. Methodologies for targeted collaboration try to reduce reliance on additional budget by identifying areas of *mutual compatibility*.

Table 2-5 below shows the stakeholders at risk for each of two entry points in the Ghana trial and possible partnerships.* Table 2-6 lists recommendations for the potential partnerships associated with the stakeholders at risk identified in table 2-5 (see chapters 16 and 17 for more details).

* Details of the pilot study appear in chapters 15 to 17 in this volume.

Table 2-5: Stakeholders at Risk and Potential Partnerships for Entry Points in Ghana

Entry Point	Populations at Risk	Potential Partnerships for Solutions
Urban malaria and other vector-related diseases	<ul style="list-style-type: none"> • Children under 5 years and other vulnerable groups (women, elderly, sick, and so on) • Communities around bushy and marshy areas • Densely populated areas • Low income groups that cannot afford any preventive or curative treatments (bed nets or drugs). 	<ul style="list-style-type: none"> • Hydro Division, Ministry of Works and Housing • Ministry of Roads and Transport • Ministry of Environment • Environmental Protection Agency • Ministry of Health • Ministry of Industry • Media (press and radio) • Ministry of Planning (Census Statistics), Education, Town, and Country Planning • Assemblymen, unit committees • Community, religious groups • Fishing industry • NGOs, community-based organizations, and private sector • Shama Ahanta East Municipal Area's (SAEMA's) Assembly, Environmental Health Unit, Public Relations Unit, Urban Roads Department, and Waste Management Department
Management of health facility waste	<ul style="list-style-type: none"> • Children • Community • Health workers • Patients • Scavengers • Waste management operators 	<ul style="list-style-type: none"> • Environmental Protection Agency • Environmental Health Department • Ghana Medical Association • Medical drug vendors and pharmaceutical manufacturers • Pharmacy board • Waste management department

Source: Authors' data.

Identifying the Stakeholders

Transport agencies, for example, are typically responsible for monitoring and cleaning storm drains to prevent highways and other roads from flooding. Clogged drains provide breeding grounds for malaria. Health agencies could collaborate with transport agencies by monitoring and reporting clogged drains at the neighborhood level. Transport agencies, saving monitoring time and money, could then devote more resources to cleaning. Health agencies could help reduce the spread of urban malaria and could use the monitoring for community outreach on urban malaria. As mentioned before, this collaboration could also address other mosquito-borne diseases, such as dengue (clean water) and filariasis (polluted water), often overlooked in malaria programs and economic analyses. Collaboration must also allow for changes in programs based on technical, social, or economic objectives of nonparticipants. The land reclamation recommended by the community stakeholders, for example, may not be ecologically sound and alternate means would need to be developed.

Table 2-6: Ghanaian Recommendations for Entry Points Based on Multisectoral Collaboration

Entry Point	Recommendation
Urban malaria and other vector-related diseases	<ul style="list-style-type: none"> • <i>Land use management:</i> <ul style="list-style-type: none"> (a) <i>Land reclamation.</i> Reconsider reclamation of marshy areas to destroy major mosquito-breeding grounds. Reclaimed lands could be used for agriculture, resettlement, or compatible uses. (b) <i>Burrow pits in construction and mining sites.</i> Involve construction, mining, and industry in malaria prevention efforts. For example, work out the social, economic, and technical details of introducing tilapia and/or other appropriate fish species into unfilled areas and determine fishing rights. • <i>Proper drainage.</i> Clarify roles and responsibilities for drain management and monitoring: <ul style="list-style-type: none"> (a) Develop clear maps of primary, secondary, and tertiary drains (b) Link maps (geographic information system) to existing roles and responsibilities (c) Assure an earmarked, nonfungible budget for desilting (d) Involve communities in drain clearing, drawing lessons from the Bank’s Urban Environmental Sanitation Project (UESP). • <i>Awareness creation.</i> Build awareness on many alternatives to spraying to prevent mosquito breeding in households—for example, use of tilapia and sealed water tanks, storage, and containers—at all levels of government and society.
Management of health facility waste	<ul style="list-style-type: none"> • <i>Develop medical waste management bylaws.</i> Medical waste management was recently delegated to the local assemblies, which have no bylaws to implement this policy. Such bylaws would need to be based on a multisectoral approach. • <i>Build capacity to monitor.</i> Improve the capacity of assemblies to monitor proper disposal of medical waste. • <i>Add value to waste.</i> Examine the medical waste stream to determine those items with any economic value, removing hazardous materials from inexperienced waste pickers and disposing of them safely. Help scavengers to improve waste recycling in the medical waste. Items that are now being reused or sold with risk should be removed from the “informal market.” • <i>Increase awareness of proper disposal of medical waste</i> at all levels of government and society, especially target communities and medical staff.

Source: Authors’ data.

Establishing Mutual Benefits through Mapping

The aim of the environmental health map is to devise a model that will help identify the geographic incidence of environmental health effects at the national, regional, and communal levels. The map, which could evolve to become a decision support system to prevent environment health risks and formulate policy response, should combine environmental health risk factors and national, regional, or urban social maps (to derive vulnerable groups incurring an environmental risk) with a GIS technology to perform an environmental health survey of patterns that could be integrated in an environmental or environmental health assessment:

- Environmental health risk factors can include comparative risk assessment, risk communication, and risk management (see glossary).
- Data from social maps offer a means of exploring national or intra-urban environmental health differentials. Social maps can help identify data sources and contacts, relevant “hotspots,” both topically and geographically, and the perceived social causes that underlie and perpetuate observed patterns. They are an excellent way to begin any data search and, perhaps, frame the policy implications of later findings.
- Geographic information systems (GISs) mapping can help establish benefits by adapting existing GIS maps for environmental health purposes. GISs permit a view of a true spatial relationship of geology, hydrology, and ecology, in conjunction with land use (urban and rural settlements, industry and mining, agricultural land, and so on), social factors (income group concentration, among others), and environmental health patterns.

An environmental health map can effectively be done on a paper map, and a simple discussion note can describe how issues relate to geographic boundaries, as was demonstrated during the

Ghana pilot (see map 5-1 and chapter 17). A multidisciplinary group representing the public sector and stakeholders drew this “low-tech” map to depict the incidence of vector-related diseases in Sekondi-Takoradi.

A more advanced environmental health map could, however, be done by using a GIS or digitizing an approved map that could be used by all the sectors and tiers of the government. After producing the map, participatory discussions involving a multidisciplinary group will help (a) identify the patterns, (b) question the patterns evidenced by the data, (c) recommend further types of prioritized data and queries, believed to be necessary to ascertain the environmental health concerns, (d) formulate a plan of action in conjunction with other sectors’ goals and strategies, and (e) monitor the outcomes on a regular basis, allowing re-evaluation of policy response implementation.

Environmental health applications targeting specific health risks have been performed in several countries, but no comprehensive environmental health map has, as yet, been developed. The degree of sophistication of this decision support system will depend on time and resource constraints, availability, reliability of collected data, and sustainability of the process (designation of a lead agency, update, maintenance, and information sharing), which will help formulate environmental health policy responses at the national, regional, and communal levels.

Quantifying Untapped or Missed Health Benefits

Potential health benefits outside the health care system remain untapped or underestimated and, therefore, unrecognized. Four crucial reasons for this, compounded by problems in data availability and reliability, concern economic and health valuation techniques.

- First, health benefits, especially when calculated *within* the health sector, tend to focus on measures implemented through the health care system, on a single disease or condition or on a single causal factor. Only occasionally are measures multisectoral. Such analyses of malaria control, for example, tend not to look at other mosquito-borne diseases and concentrate on measures promoted by the health care system, such as bed nets, medications, and other medical treatment. In comparison, positive infrastructure interventions such as proper drainage tend to be excluded. Because drainage networks can support a variety of mosquitoes, drain cleaning and maintenance that reduces breeding sites for mosquitoes that spread malaria can also reduce breeding sites for mosquitoes spreading dengue and filariasis.
- Second, health benefits, especially when calculated *outside* the health sector, tend to be aggregated under “health,” without recognizing individual contributions of multisectoral causes or remedial actions. Reducing air pollution, for example, has impacts beyond respiratory diseases, addressing impacts on the circulatory system, skin, and eyes.
- Third, the tendency to focus on single diseases may also miss diseases that may be medically different, but would respond to the same type of remedial measures. Under the broad category of respiratory diseases, for example, focusing on acute respiratory infections—the number one cause of DALYs in developing countries (see table 1-1)—would miss diseases such as tuberculosis, asthma, and lung cancer.
- Fourth, it is also possible to miss diseases and conditions that are indirectly related to the single disease being evaluated. For example, in an energy project evaluating the benefits of improved household fuel. Concentrating on indoor air pollution and respiratory disease could miss a range of factors that may be equally important. The consequences of fetching firewood entail injuries (head, neck, and back) to women from carrying heavy loads, and perinatal problems if they are pregnant (low birth weight and miscarriages). Other

missed benefits could include better child nutrition, if mothers are able to improve cooking (boiling water to prevent diarrheas and more hot meals).

These four factors will depend on local conditions, but, collectively, their effects can be considerable.

Analysis of the possible impacts of multisectoral approaches to environmental health, however, can be revealing. The *World Development Report: Investing in Health 1993*¹² estimated that the public sector health care system could relieve about 33 percent of the burden of disease. In comparison, the 1996 *Bridging Environmental Health Gaps* volumes estimated that the infrastructure sector could target up to 44 percent of the burden of disease in SSA (see table 2-7). This points to the great potential of interventions outside the health care system.

The infrastructure sector could target up to 44 percent of the burden of disease in SSA, indicating the great potential of interventions outside the health care system.

Table 2-7: Burden of Disease in SSA by Main Remedial Measures (1990)

Remedial Measures	Disease or Condition	Years with Disability	Annual Deaths	DALY
Improved housing and air pollution abatement	Respiratory disease	3,017,000	1,565,000	45,312,000
Vector control, sanitation, and drainage	Tropical cluster or vector related	8,064,104	1,123,300	35,922,104
Improved water and waste management	Water and sanitation related	1,468,000	888,539	31,208,000
Household and traffic injury reduction	Unintentional injuries	5,322,009	335,300	15,067,000
<i>Subtotal infrastructure related</i>		17,871,113	3,912,139	127,509,104
<i>Subtotal childhood cluster^a</i>		1,501,000	788,000	28,093,000
<i>Subtotal remaining burden of disease</i>		48,158,000	3,326,861	137,236,104
Grand total burden of disease		67,530,113	8,027,999	292,838,208
<i>Percent potential for infrastructure interventions</i>		26.5	48.7	43.5

a. Childhood cluster includes pertussis (whooping cough), poliomyelitis, diphtheria, measles, and tetanus.

Source: Adapted from World Bank (1994) and WHO (<<http://www.who.int/peh-super/lectures5.12/15.htm>>).

Table 2-8 takes the potential target of 44 percent a step further by estimating the *possible range* of health benefits available outside the health sector in SSA. Measures inside and outside the health care system could achieve the same order of magnitude, each averaging about 20 percent. In theory, therefore, it is possible to produce the same order of magnitude of health benefits at only a fraction of the cost, because investments have already been justified for reasons other than health (see chapter 3). Although the figures are still estimates and require rigorous statistical analyses, in the absence of statistically significant data, common sense and professional judgment argue for systematic examination of these possibilities.

Table 2-8: Burden of Disease Relieved by Remedial Measures (1998)

Remedial Measures	Percent of the Range of DALYs Potentially Reduced	
	Low	High
Environmental health remedial measures for infrastructure and other sectors:		
Improved housing and air pollution abatement	6	8
Improved water and waste management	8	9
Vector control, sanitation, and drainage	3	4
Road, workplace, and housing design	1	1
<i>Subtotal of environmental health types</i>	17	22
Health care/education remedial measures:		
<i>Subtotal of health care types</i>	15	20
Other remedial measures:		
<i>Subtotal other</i>	68	58
Total	100	100

Source: Authors' calculations.

Table 2-9 estimates that, for respiratory disease alone, 47 percent of the DALYs are often not analyzed for potential benefits available outside the health sector. For instance, the same factors responsible for acute respiratory infections, such as indoor air pollution from poor quality cooking, lighting, and heating fuels, can also cause or aggravate the remainder of respiratory diseases, which are analyzed separately in statistics.

Table 2-9: Possible Health Benefits Missed by Focusing on a Single Disease

Respiratory Disease/Condition	World DALYs (1,000s)	Developed DALYs (1,000s)	Developing DALYs (1,000s)
Counted in top ten or alone			
Acute respiratory infections (lower)	82,344	1,355	80,990
<i>Subtotal "counted in top ten"</i>	82,344	1,355	80,990
Diseases counted separately			
Acute respiratory infections (upper)	975	50	924
Tuberculosis	28,189	142	28,047
Chronic obstructive	28,654	2,449	26,205
Asthma	10,986	1,208	9,706
Other	18,932	1,303	17,089
Cancer (lung, trachea, bronchus)	11,176	3,122	8,054
<i>Subtotal "counted separately"</i>	87,736	5,152	81,971
Combined total	181,256	9,629	171,015
<i>Possibly omitted in calculation of benefits</i>	45%	14%	47%

Source: For DALYs, WHO (1999b), pp. 85–115.

Improved Service Delivery

The single sector approach may underestimate the environmental health benefits possible through a broader approach to improving overall service delivery. In the case of transport and health agency collaboration on reducing mosquito-borne diseases, transport agencies could improve drainage and, to a lesser extent, traffic flow in the rainy season by transferring some of the drain monitoring to health or neighborhood groups. This concept is further explored in chapter 3's section on environmental health attributes, which dis-aggregates benefits that are typically listed under the "health" rubric. Table 2-6 above listed expanded health benefits that imply better service delivery, because they add to the types of beneficiaries otherwise excluded from a project.

Estimating Beneficiaries

Single sector approaches traditionally calculate economic rates of returns on a development project by closely examining those directly affected by a project. An environmental health approach needs to examine if benefits can be appropriately applied to a wider audience. Better estimates of beneficiaries can help justify projects or components that are considered too costly.

In the Long-Term Water Sector Project in Senegal, for example, initial economic calculations focused on water as the way to reduce diarrheal disease and on those who would benefit economically by having water conveniently and consistently accessible. An environmental health analysis, however, increased the number of beneficiaries by including (a) 70,000 people who live near a dam in the project zone that are exposed to schistosomiasis and (b) Dakar residents who might benefit from better management of market gardening to help curtail the current spread of urban malaria (see table 2-10).

Table 2-10: Sample of Increased Health Benefits in Long-Term Water Sector Project in Senegal

HEALTH BENEFIT	STAGE OF DELIVERY	HEALTH COST/RISK
1. Production of Water at Ultimate Source: Senegal River		
<ul style="list-style-type: none"> Added income to promote better nutrition, especially protein. 	<ul style="list-style-type: none"> Local populations are moving around the Lac de Guiers because of economic activity spurred by a link to the Senegal River. 	<ul style="list-style-type: none"> Spread of malaria and bilharzia. Pesticide and fertilizer contamination.
2. Production at the Immediate Source		
A. Lac de Guiers (population estimate, 70,000)		
<ul style="list-style-type: none"> Fishing and livestock: added income to promote better nutrition, especially protein. Agriculture: nutritional benefit from added crops (flood recession cropping). Reduction of aquatic weeds by shores will help break the cycle of malaria and bilharzia. 	<ul style="list-style-type: none"> Traditional agricultural activity will expand on the lake's western shore and part of the eastern shore. Proposed management plan will vary the water level in the lake so that shores dry up annually for 2–3 months (to be determined). 	<ul style="list-style-type: none"> Fishing: creation of temporary fishing villages with low levels of hygiene and sanitation; sexually transmitted diseases, especially AIDS, from transient population. Livestock: animal-borne diseases (and, for animals, Rift Valley Fever). Agriculture: pesticide and fertilizer contamination of the lake, and spread of malaria and bilharzia from improper agricultural practices.
B. Water Production Plant		
<ul style="list-style-type: none"> Added income to promote better nutrition, especially protein. 	<ul style="list-style-type: none"> Construction of plant will require sand, soil, and vehicles. 	<ul style="list-style-type: none"> Areas used for sand and soil can become vector breeding grounds, if not filled in. Construction vehicles can cause noise; dust, increasing the risk of respiratory disease in local populations; and traffic-related injuries. Poor sanitation and drainage during construction by work crews can spread diarrheal vector-related disease. Sexually transmitted diseases, especially AIDS, from transient population.
<ul style="list-style-type: none"> Health services available at the water production plant. 	<ul style="list-style-type: none"> Operation of plant. 	<ul style="list-style-type: none"> Poor sanitation and drainage by workers can spread diarrheal vector-related disease.
(None readily apparent)	<ul style="list-style-type: none"> Blockage of current watering site for local farmers. 	<ul style="list-style-type: none"> Increased risk of bilharzia for locals who need to find a new watering site because the area now has no vegetation (breeding sites) at its shore, although other nearby suitable sites do.

HEALTH BENEFIT	STAGE OF DELIVERY	HEALTH COST/RISK
C. Housing for Water Treatment Workers		
<ul style="list-style-type: none"> Improved housing, in addition to water sanitation for about 75 families. 	<ul style="list-style-type: none"> Vehicle traffic during operations. 	<ul style="list-style-type: none"> Risk of noise pollution, traffic injuries, and respiratory disease from frequent vehicle traffic passing near homes. Risk of spreading vector-related diseases due to poor sanitation and drainage.
3. Water transportation: Keur Momar Sarr-Thies main		
<ul style="list-style-type: none"> Clean water. Market gardening. Additional sources of nutrition, especially protein from additional crops possible. 	<ul style="list-style-type: none"> Villages along water main. 	<ul style="list-style-type: none"> Spread of malaria through improper agricultural practices. Small dams can lead to water contamination and breeding sites for disease vectors, if not correctly maintained.
<ul style="list-style-type: none"> Possible added income from lower water costs. 	<ul style="list-style-type: none"> Legal connections for drinking water. 	<ul style="list-style-type: none"> Spread of malaria through improper drainage of water.
(None readily apparent)	<ul style="list-style-type: none"> Construction work crews and worker camps during pipe laying. 	<ul style="list-style-type: none"> Spread of AIDS
(None readily apparent)	<ul style="list-style-type: none"> Illegal connections. 	<ul style="list-style-type: none"> Spread malaria through improper drainage of water.
4. Use: Greater Dakar (Agglomeration de Dakar)		
<ul style="list-style-type: none"> Possible reduction in malaria by changing from sprinkle-saturation watering to drip. 	<ul style="list-style-type: none"> Market gardening in periurban Dakar and five secondary cities. 	<ul style="list-style-type: none"> Increase in urban malaria from added water without proper drainage.
<ul style="list-style-type: none"> Reduction in diarrheas and intestinal parasites through improved water, sanitation, and drainage. 	<ul style="list-style-type: none"> Improved sanitation and drainage. 	<ul style="list-style-type: none"> Spread of urban malaria from improper disposal and drainage.
5. Use: Dakar City (Ville de Dakar)		
<ul style="list-style-type: none"> Reduction in diarrheas and intestinal parasites through improved water, sanitation, and drainage. 	<ul style="list-style-type: none"> Improved sanitation and drainage. 	<ul style="list-style-type: none"> Spread of urban malaria from improper disposal and drainage.
<ul style="list-style-type: none"> Reduction in diarrheal diseases and intestinal parasites through improved hygiene. 	<ul style="list-style-type: none"> House connections. 	<ul style="list-style-type: none"> Spread urban malaria through improper drainage of water.
<ul style="list-style-type: none"> Reduction in diarrheal diseases and intestinal parasites through improved hygiene. 	<ul style="list-style-type: none"> Standpipes. 	<ul style="list-style-type: none"> Spread malaria through improper drainage of water. Increase diarrhea from improper water management.
(None readily apparent)	<ul style="list-style-type: none"> Illegal connections. 	<ul style="list-style-type: none"> Spread malaria through improper drainage of water. Increase diarrhea from improper water management.

Source: Senegal Long Term Water Sector Project, 2000, The World Bank.