Environment Technical Notes

TN1. Poverty Outcomes, Causes, and Potential Public Policy Actions

	Examples of Causes	Public Action
Economic Opportunities		**Reducing barriers to access**
Private consumption per capita Poverty incidence, depth and severity Inequality including within specific groups—regional, ethnic and gender	(i) Income and investment: Macroeconomic stability; agricultural productivity; quality of governance; sectoral composition and patterns of growth; (ii) Distribution of assets: distribution of income; distribution of e.g. land; human capital (iii) Factors impeding access: infrastructure—e.g. roads; gender-based impediments to access to land, credit.	Macro, financial and trade policies Micro-finance Reform distortionary pricing policies Improve rule of law, governance Clarify land tenure and improve distribution Improve or conserve the productivity of the natural resource base (land, forests, fisheries etc Provide urban and rural Infrastructure Increase spending on and targeting of safety net programs Improve environmental planning systems e.g. EIA, Prevent environmental damage that where cleanup costs are prohibitive (e.g. pollution of the water source for a large population centre)
Capabilities		**Access to essential services**
Literacy	Quality of schooling; private costs of education; early childhood development;	Spending/policies on primary education Action to reduce gender discrimination
Infant Mortality Rate	Mother's education; access to safe water and sanitation; breastfeeding; access to health services including immunization; household poverty rates; HIV infection rates	Immunization AIDS programs Increase access to safe drinking water and 'private' toilets Reduce indoor and urban air pollution Spending and policies on curative health for the poor Improve coverage of ante/post natal care Integrated programs to combat vector borne diseases
Under-five Mortality Rate		
Maternal Mortality Ratio		
Underweight children under-five	Household poverty rates; intra-household resource allocation practices	

Empowerment		**Good governance and participation**
Participation in decision making -	Ability to monitor and influence public resource allocations, Social cohesion; inequality	Transparency, accountability; improve judicial system Effective decentralization Developing local institutions for communities to manage and use natural resources Actions on gender discrimination
Security		**Reducing vulnerability**
Security against physical shocks, economic shocks and personal violence	External economic and climactic shocks; crop failure; macro-instability… Household level shocks, like accidents, disablement and debilitating illnesses.	Access to risk management mechanisms, e.g. micro-credit Measures to mitigate environment disaster risks (e.g. better designed infrastructure, better planning processes) Disaster prediction and prevention mechanisms Ensure availability of natural resources to smooth consumption in times of shock?

TN 2. Poverty Outcomes and Environmental Interventions

Health Outcomes

Source of health damage	***Associated public action***	***Health outcome affected***	***Monitorable health indicators***	***Proxy sector indicators***
Indoor Air Pollution	Energy (cleaner fuels, improved stoves) Rural development	Mortality Chronic lung disease (COPD) *Acute respiratory infections (ARI)*	Deaths (child) Symptom days / COPD Cases of ARI	Number/share of households using clean fuels/improved stoves Type of housing
Outdoor Air Pollution	Energy/heating Transport	Mortality COPD ARI Respiratory Hospital Admissions (RHA) IQ impairment (lead)	Deaths (adult) Symptom days / COPD Cases of ARI RHAs	Annual mean levels of PM10 [ug/m3] Lead level in blood (children) [mg/dl?]
Vector-Borne Disease	Irrigation Reforestation Infrastructure (drainage) Health (vector control)	Malaria mortality Malaria morbidity	Deaths due to malaria Malaria cases	
Lack of Water and Sanitation (WSS)	WSS Infrastructure Social funds	Diarrhea mortality Diarrhea morbidity	*Deaths due to diarrhea (child*) Diarrhea cases (child)	Access to sanitation (% of households, urban/rural); Community coverage (% of HHs in a community); Access to water (% of households, % of households with in-house connections, local, urban/rural)
Pesticide Residues	Agriculture	Acute poisoning Cancers Fetal defects	Cases of acute poisoning Cases of cancers Spontaneous abortions	Application norms Storage and handling practices
Other Toxic Substances	Industrial pollution control	Cancers IQ impairment (lead)	Cases of cancers	Environmental performance Waste management codes Land zoning regulations

Livelihood outcomes

Source of loss of livelihood	**Associated public action**	**Livelihood outcome affected**	**Monitorable livelihood indicators**	**Proxy sector indicators**
Policy distortions/ ineffective	Policy reforms (pricing, subsidies,	*Sustainable livelihoods*	Productivity, nutrition	Natural and social capital (e.g. resource productivity, water scarcity, security of tenure)

institutions/ imperfect property rights	etc)			

This is one of many possible examples for links between economic opportunities and environment interventions. There is no generic relationship between outcomes related to economic opportunities and environmental interventions. Causal effects do not follow any patterns that can be generalized, nor are they unidirectional. They will always depend on specific national or regional circumstances.

Vulnerability outcomes

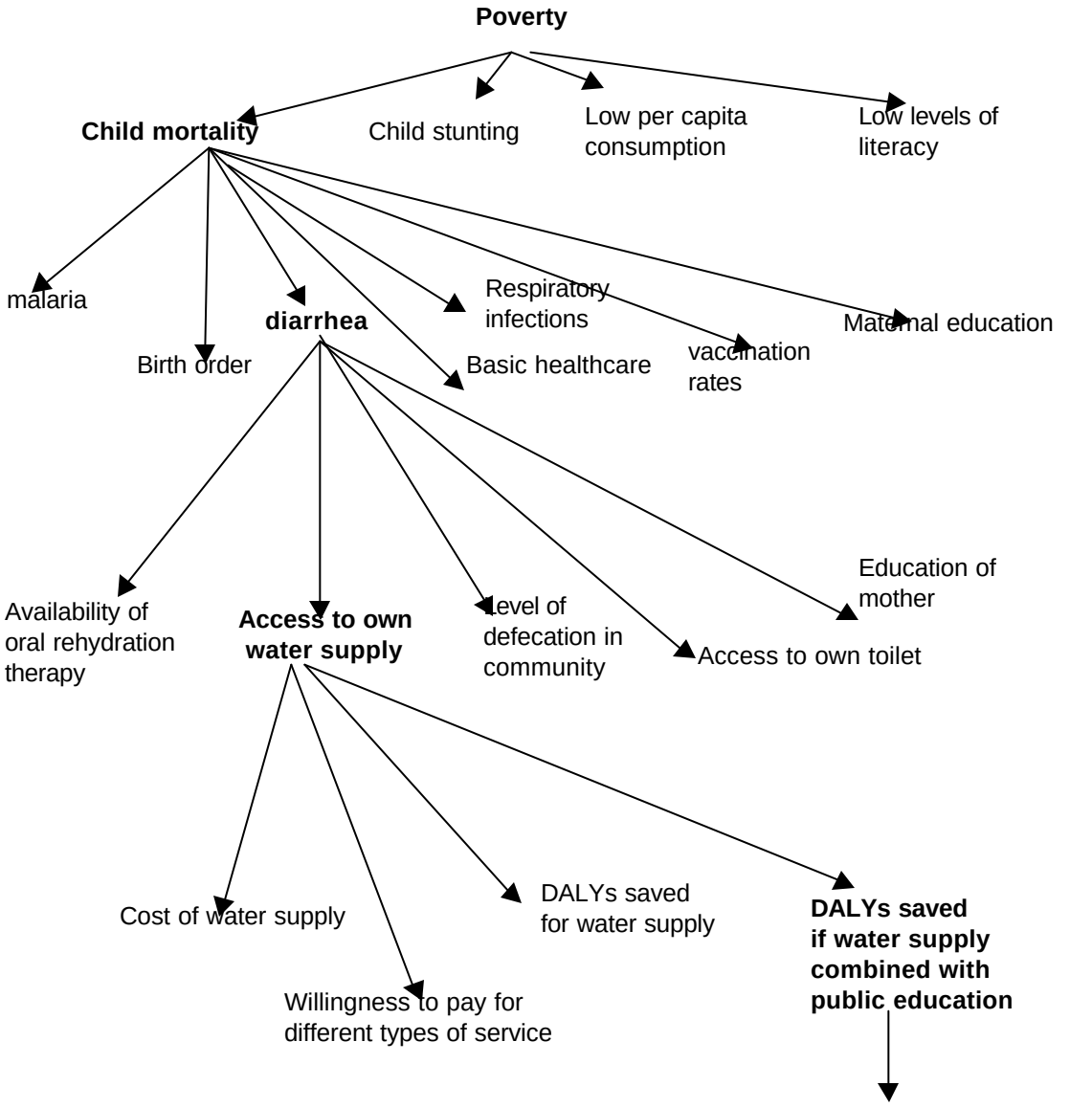
Source of vulnerability	**Associated public action**	**Security outcome affected**	**Monitorable security indicators**	**Proxy sector indicators**
Natural disasters* - immediate threat to life	Improve prediction and emergency preparedness	*Death (human & animal)*	Number of deaths in equivalent disasters	Existence of and capacity to use prediction equipment
Natural disasters—temporary loss of livelihood	Improve access to insurance,	Loss of income	Stunting before and after disasters	malnutrition
Natural disasters—loss of savings	Improve access to insurance, micro-credit	Lack of education	Enrollment before and after disasters	Ability to restore savings
Natural disasters—permanent loss of livelihood	Improve disaster relief,	Displacement	# of environmental refugees in equivalent disasters	Capacity to channel relief aid, and to rebuild affected areas quickly

* We include without further distinction droughts, floods, hurricanes, earthquakes, landslides, cyclones.

TN 3. Examples of Decision Trees

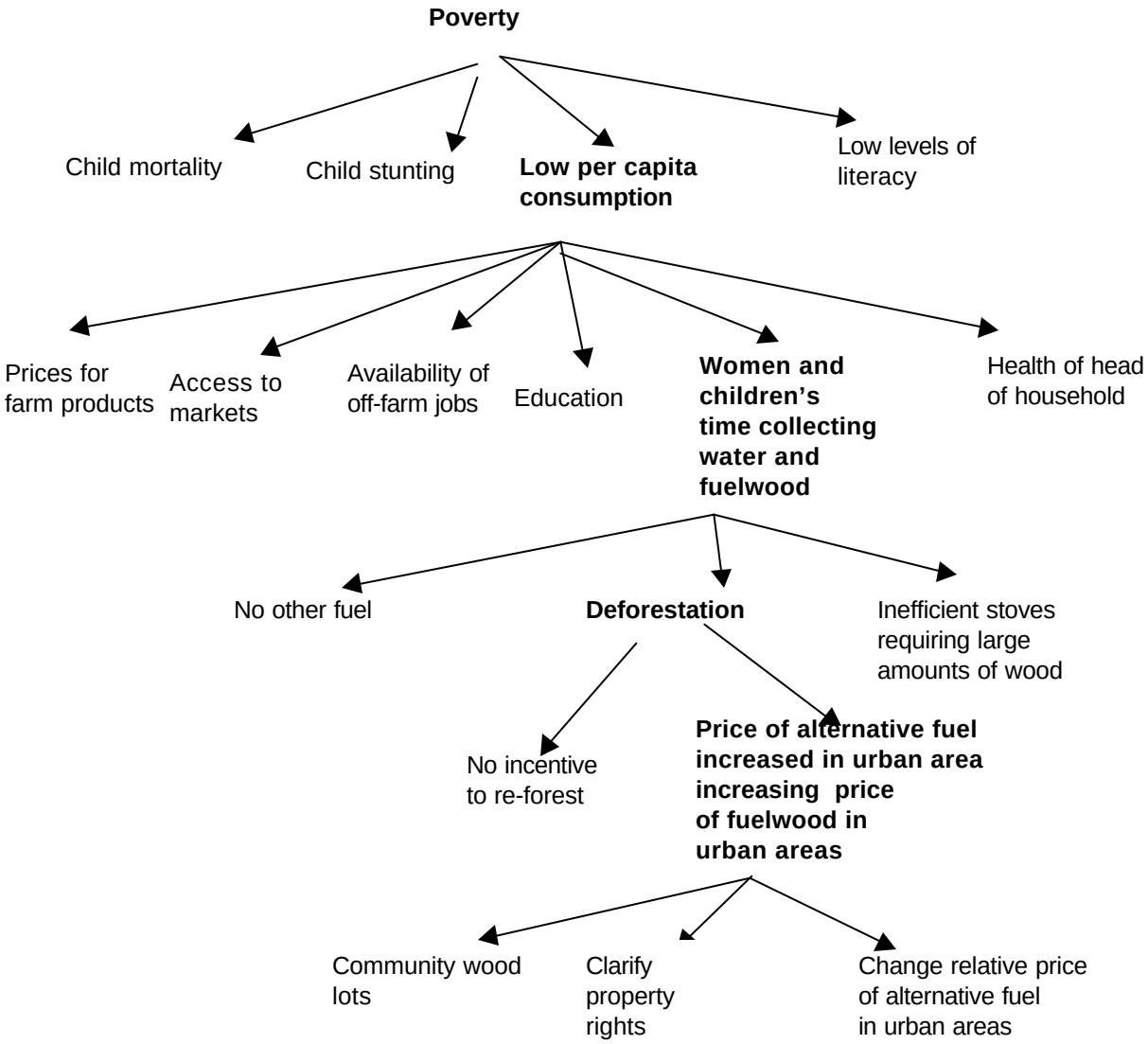
The two decision trees in this note show examples of the ideal process for arriving at priorities for public action. The objective should generally be to put numbers against each of the arrows. With the exception of some health interventions, however, this is unlikely to be possible. It may, however, be possible to rate them high, medium, or low.

Figure 1.1. Decision Tree for Environmental Health



Note: DALY=Disability-Adjusted Life Year.

Figure 1.2. Decision Tree for Opportunity and Environment: Focus on Reducing Time Women Spend Gathering Fuelwood



TN 4. Sources of Data

Table 4.1. Surveys and Databases

Source of information	*Available indicators*	*Link with environmental issues*
Household surveys		
Existing Demographic and Health Surveys (DHS) and some other specific health surveys These have no income data, but we can calculate "wealth" or asset quintiles for this data for all countries with DHSs. These are given in the expanded HNP Poverty Information Sheets.	Child mortality	Captures respiratory infections and water-borne diseases. Under-five mortality is a better measure of outcomes relating to environment than is infant mortality as it is more influenced by nutrition, diarrhea, etc. Infant mortality is more influenced by problems relating to birth and congenital problems.
	Child malnutrition	This captures the effects of diarrhea, problems with some natural resource management and the effects of natural phenomena such as drought. Stunting (height for age) captures the effects of chronic malnutrition and is a good indicator of persistent diarrhea, lack of economic opportunity relating to natural resources, etc. Wasting (weight for height) is relevant where people are vulnerable to climatic shocks and natural disasters.
	Incidence of diarrhea	Clearly captures the effects of inadequate water and sanitation access and hygiene practices. It does not capture whether or not the problem had long-term effects (whether, for example the problem was cured quickly).
	Incidence of respiratory infection / coughing	Captures indoor air pollution as well as urban air pollution in some places.
	Incidence of fever	Captures malaria and some other vector-borne diseases.
	Type of fuel used for cooking.	High prevalence of wood or dung can indicate likelihood of indoor air pollution.
	Type of water supply (river, stream, public well, private well, shared standpost, private outside tap, tap inside house, tanker, bottled water.	Prevalence of safe water, to test for mortality/morbidity related to diarrhea
	Type of sanitation (no facility, shared latrine, private latrine, flush toilet).	as above
	Lead levels in blood.	Indicates problems of urban air pollution
	Prevalence of vector-borne diseases.	

Household budget survey or equivalent	Expenditure on water, sanitation, energy. Expenditure on, or consumption of, home-grown products.	
Living Standard Measurement Survey (LSMS), household survey Includes income and consumption with health and household facilities information in the same questionnaire therefore relatively easy to break down information by income group.	Health data (as above)	
	Household facilities (water, fuel, sanitation), including behavioral information such as how the household treats its water before drinking.	
	Extent of dependency on agriculture either directly as farmer or as farm laborer. Land area worked. Property rights over land. Number of animals, use of chemical fertilizer and pesticides.	
	Gathering fuelwood or wild products or animals for sale or own use/consumption	
	Extent of community involvement in decisions or collective works	Can indicate likelihood of community based contracting or resource management.
	Whether household has been affected by a natural shock and if so what coping method they used	

LSMS community questionnaire if available	Opinions about local infrastructure, condition of land, tree cover, etc.	
Sector reports and statistics at national level		
National Environmental Action Plans, State of the Environment report	Data on forest cover, water quantity and quality, land quality, erosion, and rainfall. Occurrence of natural disasters and extreme events and impacts. Coverage of water supply, sanitation and solid waste.	
Energy statistics	Use of coal, oil, gas, diesel, petroleum within a jurisdiction.	Can be fed into a rapid assessment model to estimate priorities for reducing air pollution.

TN 5. Project-Specific Indicators: Well-Being Variables

Table 5.1, from an IBRD water resources project in India, shows how the success of environmental interventions can be measured by nonenvironmental indicators (agricultural yields rather than river water quality). A project aiming for poverty outcomes would want to use indicators like these along with additional indicators specifically linked to poverty. We do not suggest that these indicators are perfect but that they show indicators can be combined.

Tables 5.2 and 5.3 provides detailed examples of indicators that can be used to evaluate the impacts of interventions in water & sanitation, and generally in environmental health.

Table 5.1. Indicators for IBRD Water Resources Project, India

Narrative summary	**Key performance indicators**	**Sources of information for monitoring and evaluation**	**Critical assumptions**
Sector-related goal: Foster faster and more sustainable agricultural growth and rural development through improvements in water resources management.	1.1 Broad increases in the value and contribution of agriculture to economic growth. 1.2 Effective management of withdrawal to safe yield levels in surface and groundwater.	1.1 Government statistics; periodic World Bank studies. 1.2 Periodic reports of the State Water Department	Goal to Bank mission: • Improvements in agricultural growth and rural development in targeted interventions assist in poverty alleviation.
Project development objective: Sustainable improvement of agricultural productivity among low-income farmers in selected irrigation and drainage schemes.	1.1 Verifiable evidence of progressive and sustainable improvements in crop yields in project areas above baseline levels through remote sensing (e.g., year 1 -__ % increase, ...); 1.2 Verifiable evidence of widespread and progressive substitution of higher value crops by farmers (e.g., year 1 - __ % increase, ...); 1.3 Progressive improvements in farm income levels above baseline (e.g., year 1 - __ % increase, ...); 1.4 Progressive improvement in production per unit of water used (e.g., year 1 - __ % increase, ...).	1.1 Periodic reports; Agriculture Dept. statistics; supervision mission reports; evaluation mission report (mid-term & final) 1.2 Agriculture Dept. statistics; supervision mission reports; evaluation mission report (mid-term & final) 1.3 Annual project monitoring and evaluation reports from project unit; World Bank supervision reports. 1.4 Annual project monitoring and evaluation reports from project unit; World Bank supervision reports.	• Effective management of salinization and water logging through additional investments; • Higher farm incomes in targeted areas will lead to general improvements in rural development; • Other supporting infrastructure does not become limiting (e.g., rural electricity, transport facilities)

Source : Extracted from project documentation.

Table 5.2. **DANIDA: Volta Region Community Water and Sanitation Program**

Indicator / Indicator Definition	**Unit of Measurements**
Sanitation and hygiene	• Absence of feces and urine of latrine floors and compound • Absence of cleansing materials on latrine floors • Absence of odor and flies in the latrine • Evidence of handwashing after using latrine
Water and hygiene	• Water fetching points are free from dirt • Water transported in clean collecting vessels • Water storage containers free from dirt, placed in clean environment and covered • Use of cup with long handle for collecting water
Health, KAD	• Percentage of population that can demonstrate new knowledge as regards hazards associated with water, sanitation and health of each target community • An existing agenda on hygiene education with data on activities such as the number of hygiene education meetings held and number of women attending the meetings and follow-up activities • Target schools will have in existence: a hygiene education plan, data on number of meetings held by the school health committee, x number of trained school health coordinators, a hygienically kept latrine with hand washing facilities, and clean school environment. • Existence of hygiene education program involving the whole community emphasizing the following: • Proper disposal of refuse • Proper disposal of wastewater • Penning of animals • x number of meetings held on hygiene activities • Environmental cleanliness and human excreta disposal. • At least 4 out of 10 households have some mechanisms of handwashing
"Evaluation of Hygiene Education Component of the Volta Region Community Water and Sanitation Program." Ho, Ghana: Community Water and Sanitation Division, VRCWSP.	

Table 5.3. **ENVIRONMENTAL HEALTH PROJECT (EHP)**

Indicator / Indicator Definition	Unit of Measurements
Priority Behavioral Indicators for Diarrhea Disease Prevention	***Cleansing of Hands-*** Indicator Definition and Unit of Measurement: • Proportion of households..... • Where the mother (or caretaker) reports washing her hands at least once within the previous 24 hours on each critical occasion • Where the mother (or caretaker) demonstrates all elements of adequate handwashing technique ***Sanitary Disposal of Feces-***Indicator Definitions and Unit of Measurements: • Proportion of households. • Where all family members three years or older usually use a sanitary facility for defecation (report) • Where the feces of children under three are disposed of in a sanitary fashion (report) • Where the house area and yard are free of human fecal contamination (observation) • Proportion of sanitary facilities. • That appear to be in use (observation) • That are free of soiling with human feces (observation) ***Drinking Water Free of Fecal Contamination-*** Indicator Definition and Unit of Measurement: • Proportion of households. • That use water from an acceptable source for cooking and drinking • That either have in-house piped water or have a system of water collection, transport, storage, and access that maintains water free of contamination ***Food Free of Fecal Contamination-*** Indicator Definition and Unit of Measurement: • % of infants 6 months and under • That are exclusively breastfed • Proportion of households..... • Where the mother reports washing her hands before preparing or serving food or feeding children • Where food is eaten within 3 hours of cooking • Where cups and spoons rather than bottles are used to feed infants and small children (report, observation)
Other W&S Related Indicators- Access	• Continuous access to safe water at household level • Access to devices for water collection, transport, storage • Access to sanitary excreta disposal; Access to soap or ash for handwashing • Access to sufficient water quantity (20 liters per capita per day)

ENVIRONMENTAL HEALTH PROJECT (EHP)	
Indicator / Indicator Definition	**Unit of Measurements**
Other W&S Related Indicators- Quality	• Water supply: collection time, continuos availability, level of portability • Sanitary excreta disposal: odors/aesthetics, durability of solution, ease of maintaining cleanliness, cultural appropriateness of design • Behavior change: locally appropriate design, use of participatory processes
Other W&S Related Indicators- Demand	• An understanding that diarrhea is preventable • Knowledge of the causes of diarrhea and the means to prevent it • Willingness to pay for adequate water supply, sanitation, soap or ash and to participate (money or in-kind contribution) • Functioning community environmental health committee • Community norms supportive of appropriate behavior
Other W&S Related Indicators- Sustainability	Effective policies and institutions that support access and quality • % of costs recovered from users • Evidence that operation and maintenance are taking place • Availability of capacity financing; Adequately trained personnel • Functioning community environmental health committees
Other W&S Related Indicators- Hygiene Education (this indicators were found in an EHP project in Thailand)	• % of the village population with access to a latrine for everyday use • % of households with latrines kept clean on a regular basis • % of school latrines kept clean and without smell everyday • % of school and household latrines with water and a dipper inside for flushing • % of households and schools with soap or detergent available for washing hands • % of households and school latrines with new picture stickers inside • % of children aged 4-6 who are trained to use a latrine at all times. • % of households and village schools with access to clean drinking water • % of rainwater jars that have covers • % of rainwater jars that are always covered
Bendahmane, D.B. "Indicators for Programs to Prevent Diarrhea Disease, Malaria, and Acute Respiratory Infections - Activity Report No. 46." EHP, 1997.	