

Economic Impacts of Sanitation in **Vietnam**

Summary

A five-country study conducted in
**Cambodia, Indonesia, Lao PDR,
The Philippines and Vietnam**
under the Economics of Sanitation Initiative (ESI)

Water and Sanitation Program - East Asia and the Pacific (WSP-EAP)
World Bank
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The Sanitation Impact Study was conducted in Cambodia, Indonesia, the Philippines and Vietnam. A study is ongoing in Lao PDR. The study was led by the East Asia and Pacific office of the World Bank's Water and Sanitation Program (WSP), with the contribution of WSP teams in each of the participating countries. The study took one year to complete, and has undergone two major peer review processes.

Guy Hutton (WSP-EAP Regional Senior Water and Sanitation Economist) led the development of the concept and methodology for the Economics of Sanitation Initiative, and the management and coordination of the country team. The study benefited from the continuous support of other WSP-EAP staff. Isabel Blackett was the Task Team Leader; and Jema Sy, Brian Smith, Almud Weitz and Richard Pollard provided input to the concept development and study execution. Bjorn Larsen (WSP Consultant) contributed to the study methodology and provided the figures for malnutrition-related health effects of poor sanitation.

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WSP and the country team appreciate the inputs of local stakeholders met during the course of the study.

Reference for citation:

This Policy Brief is an abbreviated version of the technical report. A more comprehensive discussion is available in the detailed research report: "Economic impacts of sanitation in Vietnam." Thang P, Tuan H, Hutton G. World Bank, Water and Sanitation Program. 2008.

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- Economic impacts of sanitation in Southeast Asia. Hutton G, Rodriguez UE, Napitupulu L, Thang P, Kov P. World Bank, Water and Sanitation Program. 2008.
- Economic impacts of sanitation in Cambodia. Kov P, Sok H, Roth S, Chhoeun K, Hutton G. World Bank, Water and Sanitation Program. 2008.
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Table of Basic Country Data

Variable	Value
Population	
Total population (millions)	84.2
Rural population (millions)	61.4
Urban population (millions)	22.8
Under 5 population (% of total)	8.85%
Under five mortality rate (per 1000)	19
Female population (% of total)	51%
Urban population (% of total)	26%
Annual population growth (2005-15)	1.0%
Population below poverty line	29%
Currency	
Currency name	Dong
Year of cost data presented	2005
Currency exchange with US\$	16,080
Exchange rate year	2007
GDP per capita (US Dollar)	723
GDP per capita (PPP)	3,300
Sanitation	
Improved rural (%)	50%
Improved urban (%)	92%
Urban sewage connection treated (%)	14.0%

Despite the steady rise in improved latrine access in Vietnam over the past 15 years, sanitation is a neglected aspect of development in Vietnam. In 2004, access to improved latrines was 50% in rural areas and 92% in urban areas, leaving over 30 million people without access to basic improved sanitation. Furthermore, these coverage figures do not expose the poor solid waste disposal, hygiene practices, and failure to prevent human excreta and other wastes from polluting water resources. Indeed, improved sanitation is seen more as a result, rather than a cause, of economic growth.

This study examines the major health, water, environmental, tourism and other welfare impacts associated with poor sanitation. By examining the economic impacts of poor sanitation, and the potential gains from improved sanitation, this study provides important evidence to support further investments in sanitation.

This study has found that poor sanitation causes considerable financial and economic losses in Vietnam. Financial losses – reflecting expenditure or income losses resulting from poor sanitation average 0.49% of annual GDP, while overall population welfare losses average 1.3% of GDP.

The majority of economic losses are shared between health (34%), water resources (37%), the environment (15%), tourism (9%) and other welfare (6%). The losses per capita are US\$9.38 or VND 150,770.

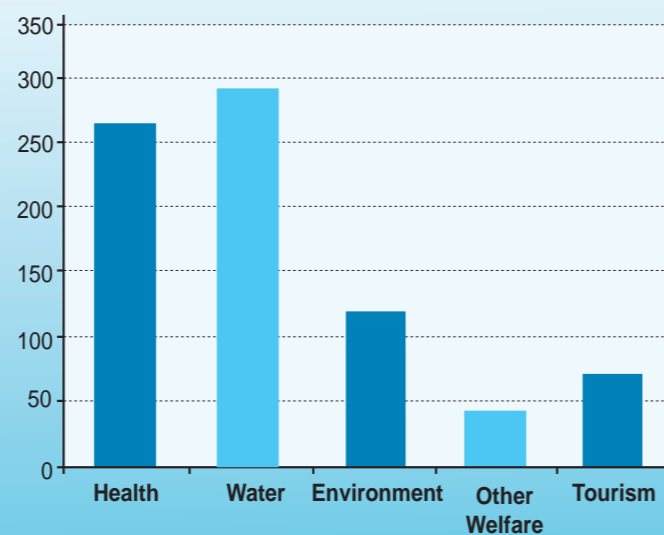
The study estimated the economic losses of health impact to be US\$262 million, accounted for by premature death, health care costs and lost productivity. The study results indicate that sanitation accounts for nearly 7 million diarrhea cases, 2.4 million cases of scabies, helminthes, hepatitis A and trachoma and 0.9 million malnutrition-related cases per year. These diseases also cause about 9,000 deaths per year, mostly among children. The costs of premature death account for 78% of health-related costs of poor sanitation and hygiene.

The second impact measured in this study is impact on water resources. This study estimates the costs of poor sanitation to be more than US\$287 million, accounted for by domestic water uses (US\$197 million), fisheries (US\$27 million) and drinking water (US\$63 million).

The impacts on the environment were divided into aesthetics and land use, but only the latter was evaluated quantitatively. The study estimated the amount of land that has been rendered temporarily unusable or unproductive for other uses for all unsanitary landfills in Vietnam as a result of the necessary buffer zones. The study estimated that more than US\$118 million in the value of land is lost annually.

User preferences comprise two components. The first is access time or time use. This refers to valuing the time it takes for users who share or do not have toilets to access a facility or suitable location. The second is life choices. The study found that the cost of sub-optimal access to toilet facilities US\$42 million per year, while estimates for life choices total US\$1.3 million per year. About 8.8% of total economic costs are accounted for by the tourism impacts with the absolute value of US\$69 million.

Economic losses - (million US\$)



Having estimated the costs of poor sanitation, the study also evaluated the benefits associated with improved sanitation and hygiene practices. Economic gains were from the following six features of sanitation improvements (a) improved toilet system: US\$84 million, (b) better hygiene practices: US\$118 million, (c) improved latrine physical access: US\$43 million, (d) improved isolation of human waste from water resources: US\$287 million, (e) improved tourist sanitation: US\$69 million, and (f) re-use: US\$202. Sanitation input markets are in excess of US\$127 million per year, which provides income and employment.

This is the first study to compile economic evidence on a range of impacts of poor sanitation. The results are a wake-up call to stakeholders in the sanitation sector. Poor sanitation affects everyone, but especially the poor and vulnerable. The considerable socio-economic importance of sanitation shown in this study, and the key links improved sanitation has with other development goals (poverty and hunger reduction, gender equality, child health, access to safe drinking water, and quality of life of slum-dwellers), demonstrates that sanitation should

receive far greater attention from the government and other development partners whose interest is equitable socioeconomic development. Decision makers from various sectors should act now and in a concerted way to increase access to improved sanitation.



Photo by Nguyen Viet Anh

Vietnam, like other countries of Asia, is on a development path that is lifting large numbers of people out of poverty and improving access to goods and services that improve quality of life. Vietnam has done well so far in achieving significant development gains, especially in terms of poverty reduction. However, some aspects of development are being forgotten in the race to economic progress, affecting especially the vulnerable and low income groups.

Sanitation is one such neglected aspect of development. In places where the public purse is severely limited and population needs seemingly boundless, sanitation is not deemed attractive or important enough to gain the attention of politicians or journalists. It is often seen as a 'private matter' to be handled by the household or local community, and something that results from economic development rather than being seen as a precondition for economic development. Also, institutionally, sanitation is sidelined by lack of clear ministerial responsibilities.

Although sanitation coverage in Vietnam has risen rapidly over the last 15 years, the sanitation sector is weaker than water supply in terms of material facilities, institutions and management capacity. Based on current trends in coverage growth, Vietnam is projected to meet its development goals for sanitation. However, many challenges remain which require greater commitment, strategic thinking as well as spending. Furthermore, 'sanitation' in Vietnam is more broadly defined than the MDG target which focuses on access to improved household latrine. Vietnam's sanitation vision is outlined in the "Unified Sanitation Sector Strategy and Action Plan" under development. While this broader vision is to be welcomed, it will require even greater political commitment and increasing spending to be implemented.

If stakeholders are to be convinced that increased expenditures are worth making on sanitation, evidence is needed to better understand the impacts of poor sanitation now and in the future, and to detail the expected benefits from different sanitation choices.

Based on this premise, the World Bank's Water and Sanitation Program (WSP) in East Asia and the Pacific (WSP-EAP) is supporting the development of a research program "the Economics of Sanitation Initiative" (ESI) to generate evidence on the economic costs and benefits of different sanitation-related options. The current sanitation impact study aims to compile and generate evidence on the following aspects:

- Economic impacts of poor sanitation on health, water and the environment.
- The links between sanitation and broader human activities, such as education, productivity, tourism, and business investment climate.
- Population preferences concerning latrine options and environmental sanitation, and their contribution to quality of life.
- How much improved sanitation can alleviate these burdens and generate economic savings to society and improve quality of life.

The target audience of ESI is primarily national-level policy makers with influence over the allocation of resources to sanitation, including central ministries (e.g. government's office, planning and investment, finance), line ministries (e.g. infrastructure/construction, health, water, environment, rural development, urban planning) and external funding partners (multilateral, bilateral and non-government agencies). The study is also targeted at sub-national decision-making levels where its results and conclusions are also relevant, particularly in a decentralized environment.



Photo by Nguyen Viet Anh

2.1 Study approach

This present study follows a standardized peer reviewed methodology. While the primary aim is to provide national estimates of the economic impact of poor sanitation, results are also presented by regional level, as well as by rural/urban, gender, and age breakdown where feasible.

Table 4 below shows the population size and provincial make-up of each region of Vietnam. It indicates that about 73% of the population in Vietnam is concentrated in rural areas. The urbanization rate of Vietnam is lower than that in other South East Asian countries, but still equates to approximately 1 million people officially recognized as moving to urban areas each year.

The study uses a modeling approach, drawing almost exclusively on existing studies and survey data from official sources. The study presents impacts in primary units of measurement (e.g. disease episodes, water quality), and converts these to monetary equivalents using conventional economic valuation techniques where possible. Lack of existing economic valuation approaches for some impacts required further methodological development (e.g. fisheries, tourism). Economic impact are presented in United States Dollars (US\$) for a single year, 2005. Some impacts are examined and reported descriptively.

Table 1. Population size and provincial make-up of regions in Vietnam (year 2005)

Region	Population size			Provinces contained
	Urban	Rural	Total	
Red River Delta	4,484	13,555	18,039	Hanoi; Vinh Phuc; Bac Ninh; Ha Tay; Hai Duong; Hai Phong; Hung Yen; Thai Binh; Ha Nam; Nam Dinh; Ninh Binh
North East	1,768	7,590	9,358	Ha Giang; Cao Bang; Bac Kan; Tuyen Quang; Lao Cai; Yen Bai; Thai Nguyen; Lang Son; Quang Ninh; Bac Giang; Phu Tho
North West	357	2,208	2,566	Dien Bien; Lai Chau; Son La; Hoa Binh
North Central Coast	1,455	9,165	10,620	Thanh Hoa; Nghe An; Ha Tinh; Quang Binh; Quang Tri; Thua Thien - Hue
South Central Coast	2,123	4,927	7,050	Da Nang; Quang Nam; Quang Ngai; Binh Dinh; Phu Yen; Khanh Hoa
Central Highlands	1,337	3,422	4,759	Kon Tum; Gia Lai; Dak Lak; Dak Nong; Lam Dong
South East	7,328	6,132	13,460	Ninh Thuan; Binh Thuan; Binh Phuoc; Tay Ninh; Binh Duong; Dong Nai; Ba Ria - Vung Tau; Ho Chi Minh city
Mekong River Delta	3,566	13,701	17,268	Long An; Tien Giang; Ben Tre; Tra Vinh; Vinh Long; Dong Thap; An Giang; Kien Giang; Can Tho; Hau Giang; Soc Trang; Bac Lieu; Ca Mau
Total	22,418	60,701	83,120	64 provinces

2.2 Scope of sanitation

In the international arena, the sanitation target adopted as part of the Millennium Development Goals focuses on the disposal of human waste, thus leading to a narrower understanding of the term 'sanitation'. However, this present study recognizes that other aspects of sanitation are relevant to the impacts being measured in the present study, especially in Vietnam, where a broader definition is gaining ground.

While it is understood that sanitation in Vietnam is more broadly defined than excreta, gray water and solid waste management (see Table 2),

it was not possible to apply a comprehensive definition in this present study due to time and resource constraints. Hence, issues such as drainage, flood control measures, hospital waste, large-scale industrial waste, and broader environmental health such as food hygiene, air pollution and vector control, were not included. The excluded aspects also have considerable economic, environmental and population welfare impacts, and merit detailed study.

Table 2. Aspects of sanitation included in the present 'Sanitation Impact' study

Included	Excluded
• Practices related to human excreta:	• General flood control measures
• Quality, safety and proximity of latrine system	• Large-scale industrial effluents, toxic waste and medical waste
• Disposal or treatment of excreta and impact on the (inhabited) outdoor environment	• Air pollution unrelated to human excreta
• Hygiene practices	• Vector control
• Practices related to disposal or treatment of gray water	• Broader food safety
• Practices related to disposal or treatment of household solid waste	
• Practices related to use or disposal of animal excreta	
• Practices related to use or disposal of agricultural waste	

2.3 Impacts evaluated

Poor sanitation has many actual or potentially negative impacts on populations and national economies. The study focuses on five impacts because of their importance and/or amenability to analysis using credible information and data sources:

- Health impacts
- Water resource impacts
- Environmental impacts (focusing on the outdoor environment)
- Welfare impacts (focusing on preferences for latrine type)
- Tourism impacts

The estimated economic losses of these impacts include additional expenditures, income or productivity losses, and the value of premature death associated with poor sanitation. Non-pecuniary welfare impacts were assessed, but not quantified in monetary units. When other factors impacted an evaluated sector, economic losses were estimated based on the narrower definition of poor sanitation (See Table 2).

2.4 Impact mitigation

From a policy viewpoint, it is important to know how much the estimated losses resulting from poor sanitation can be reduced by implementing improved sanitation options. For some impacts such as health, improved sanitation and hygiene do not totally solve the problem, so the overall estimated losses cannot be fully mitigated.

This study estimates the potential benefits of certain features of sanitation improvements. It provides an initial estimate of the likely gains from improving these features (see Table 3). A future study aims to estimate the costs and benefits of specific sanitation technical and management approaches.



Photo by Nguyen Viet Anh

Table 3. Features of sanitation improvement for assessing economic gains

Intervention	Detail	Gains evaluated
Making toilets cleaner and safer	Improved: position or type of toilet seat or pan; structure; collection system; ventilation; waste evacuation	Avert health impacts (32% reduction)
Hygiene	Availability of water for anal cleansing; safe disposal of materials for anal cleansing; hand washing with soap; toilet cleaning	Avert health impacts (45% reduction)
Latrine access	Toilets closer and more accessible (private rather than shared or public)	Save latrine access time
Isolation of human waste from water resources	Improved: septic tank functioning and emptying; flood-proof; treatment; drainage system	Avert costs of accessing clean water for drinking and other household uses; avert losses to fish production
Sanitary conditions for tourists	Culturally appropriate improved tourist toilet facilities (hotel, restaurants, tourist attractions) and general sanitary conditions	Avert tourist losses
Re-use of human waste	Composting of feces for fertilizer; biogas production	Value of replaced fertilizer and fuel

3.1 Health

Table 4 reports the estimated cases and deaths per year which are attributable to poor sanitation. It shows that diarrhea has the most number of cases at 7 million. Diarrhea is also the main cause of death from poor sanitation and hygiene, accounting for 4,600 deaths per year. Malnutrition-related diseases, in particular ALRI, account for an estimated 1,500 deaths per year, followed by malaria with over 600 deaths per year.

Less serious diseases (scabies, helminthes, hepatitis A) appear to be a small proportion of the total. There are no reported cases from official statistics of mortality from these diseases. Collectively these account for only about 5.4 percent of the number of cases. However, their collective influence on the quality of life cannot be ignored. Trachoma, chronic contagious bacterial conjunctivitis that can lead to blindness, is particularly important in Vietnam where 865,000 cases were reported.

Table 4. Summary health impacts by disease

Disease	Total cases		Total deaths
	Seeking formal treatment ¹	All cases	
Diarrheal diseases	933,559	7,050,762	4,576
Helminthes	27,000	203,918	-
Trachoma	864,747	864,747	-
Scabies	234,388	1,370,042	-
Hepatitis A	5,170	39,050	-
Malnutrition	960,400	960,400	-
ALRI (Pneumonia)	43,095	325,474	1,475
Measles	-	-	335
Malaria	2,382	17,990	631
Total	3,075,048	10,864,924	7,016

¹ Includes the estimated cases reporting to government facility or formal private provider

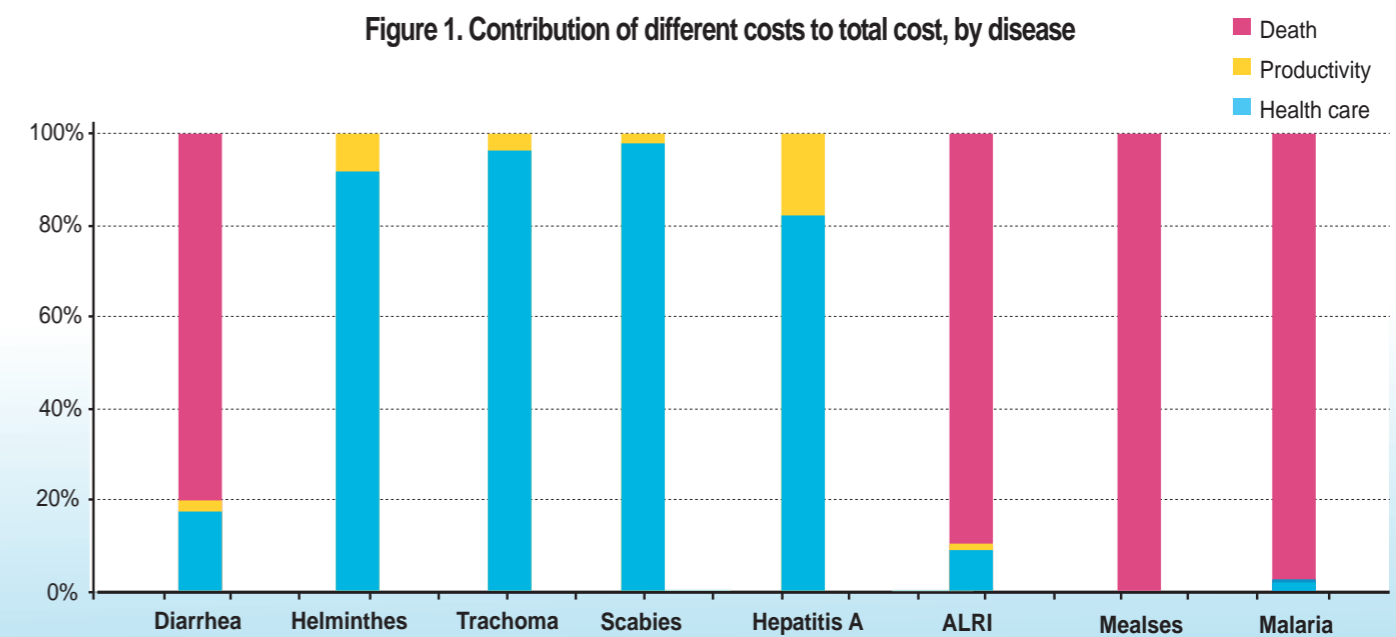
Table 5 presents the estimated economic costs of negative health impacts of poor sanitation and hygiene in Vietnam. It shows that total economic costs to health is US\$262 million per year, in which health care costs account for 16%, productivity losses account for 4% and the remaining 80% are due to premature death.

Table 5. Total health-related costs (US\$ Thousand)

Disease	Total financial costs				Total economic costs			
	Health care	Productivity	Death	Total	Health care	Productivity	Death	Total
Diseases directly related to poor sanitation and hygiene								
Diarrhea diseases	25,955	959	7,023	33,937	27,768	3,837	131,334	162,939
Helminths	272	6		278	320	24		344
Trachoma	16,919	61		16,980	17,052	429		17,481
Scabies	3,934	2		3,936	4,255	58		4,313
Hepatitis A	432	24		456	442	95		537
Diseases indirectly related to poor sanitation and hygiene								
ALRI(Pneumonia)	2,905	45		2,950	2,992	181	44,326	47,499
Measles							10,065	10,065
Malaria	281	8		289	286	25	18,952	19,262
Total	50,697	1,106	7,023	58,826	53,114	4,648	204,677	262,439

Figure 1 shows the contribution of different costs to overall cost, by disease. The main contributor to health-related economic costs of diarrhea, ALRI, measles, and malaria is premature death, which has a higher unit value than health care costs and morbidity-related productivity loss, but less cases. For other diseases (helminthes, trachoma, scabies and hepatitis A), health care costs are major contributor followed by productivity costs.

Figure 1. Contribution of different costs to total cost, by disease



Improved sanitation will help mitigate a proportion of these estimated economic costs. The size of losses averted depends on the type and efficiency of the interventions. To reduce the economic impacts of disease, improved sanitation should be combined with other policies such as improved early treatment and child feeding programs. Sanitation programs implemented alone have been

found to reduce disease rates by an average 32%, while hygiene programs have been found to reduce disease incidence by 45%. Hence, sanitation and hygiene improvements could reduce health-related costs by US\$228 million. This figure is conservative given that several other known health impacts of poor sanitation were excluded in this study (see Table 6).

Table 6. Health impacts of poor sanitation included and excluded

Health impacts included	Health impacts excluded
Health care, health-related productivity and premature mortality costs associated with diarrheal disease, scabies, helminthes, trachoma and hepatitis A; and diseases indirectly related to sanitation through malnutrition for children under five.	Health-related quality of life, direct costs of treating malnourished children, reproductive tract infections for women bathing in dirty water, health problems suffered by those working closely with waste products, education impacts of childhood malnutrition, food poisoning due to contaminated fish, animal and insect vectors of disease, animal health related to human sanitation, and avian influenza

¹Fewtrell L, Kaufmann R, Kay D, Enanoria W, Haller L and Colford JJ. Water, sanitation, and hygiene interventions to reduce diarrhea in less developed countries: a systematic review and meta-analysis. *Lancet Infectious Diseases* 2005; 5(1): 42-52.

3.2 Water

Statistics show that Vietnam has abundant internal freshwater resources per capita. Despite this fact, the country suffers from significant freshwater pollution resulting from human activities. Table 7 shows the total release of human excreta to water bodies per year, totaling over 2 million tons of feces,

over 45 million cubic meters of urine, and over 600 million cubic meters of gray water per year. Many households dispose of wastewater and solid waste in water resources; for example, about 13% of households dispose of solid waste to water courses.

Table 7. Total annual release of human excreta and household waste water to inland water bodies

Region	Total release (volume) 2005		
	Feces	Urine	Gray water
	(tons/year)	(m ³ /year)	(m ³)
Red River Delta	493,831	9,876,613	
North East	256,185	5,123,690	
North West	70,235	1,404,695	
North Central Coast	290,722	5,814,442	
South Central Coast	192,988	3,859,766	
Central Highlands	130,276	2,605,518	
South East	368,472	7,369,437	
Mekong River Delta	472,700	9,453,993	
Total	2,275,408	45,508,154	609,876,054

Water quality in Vietnam is monitored, but not comprehensively. The study on water quality focuses almost exclusively on surface waters, particularly the main rivers and lakes. The data on water quality for this study found considerable regional variation in water pollution, with downstream and densely populated areas having the worst pollution. Table 8 presents

biological oxygen demand (BOD), total suspended solids (TSS) and dissolved oxygen (DO) statistics on some of the most polluted water resources in Vietnam. In some cases, the same location showed considerable variability at different times. The contribution of domestic sources (gray water, sewage) to overall water pollution varies considerably within the country.²

Table 8. Selected water quality measurements in Vietnam (in 2005)

Location	Water body location	Selected water quality indicators				
		pH	DO	BOD	TSS	Coliform
Vietnam's Standard		5.5 - 9.0		<25mg/l	<80mg/l	<10,000 MPN/100ml
Red River Delta						
Hong River	Lien Mac Culvert	8.42	4.78	8.85	85	500
	Lien Mac Culvert	7.39	4.57	6.08	152	900
	Van Phuc village (morning)	8.21	4.68	9.34	635	700
	Moi brigde	7.7	0.1	96	58	480,000
	Thanh Liet dam	7.55	0.3	91.2	97	410,000
	West Lake (middle)	8.3	4.02	17.2	16	1,300

² Other sources include offices, medical establishments, small industries (e.g. garments, washing, brewery), manufacturing industries (production or processing), chemical fertilizers and pesticides, animal excreta, soil flushed into water courses, silt release following build-up behind dams, and salinity intrusion from coastal areas.

Location	Water body location	Selected water quality indicators				
		pH	DO	BOD	TSS	Coliform
Vietnam's Standard		5.5 - 9.0		<25mg/l	<80mg/l	<10,000 MPN/100ml
Cau River	Nhu Nguyet brigde	6.89	4.25	6.13	61	1,200
Thai Binh River	Pha Lai	6.73	4.06	3.94	216	600
Nhue River	Border of Tu Liem district and Ha Dong	7.58	3.26	26.1	47	11,000
	Downstream Ha Dong bridge	7.58	3.16	37.5	41	11,000
	Mai Linh bridge	6.72	1.09	36.8	29	22,000
Day River	National Road No. 5, km 9	7.82	4.95	10.4	94	1,100
Cam River	Chua Ve port	7.71	4.17	16.9	98	2,700
North Central Coast						
Huong River	Tuan confluence	7.48	5.49	4	31.2	400,000
	Tuan confluence	7.83	5.48	4.6	32	220,000
	Sinh confluence	7.67	4.96	4	25.4	1,100,000
	Sinh confluence	7.8	5.56	1	21	250
South Central Coast						
Vu Gia - Thu	Giao Thuy	8.14	5.1	2.9	16.7	25
Bon River	Giao Thuy	7.69	5.25	0.5	16.5	21
	Cua Dai	8.11	5.73	2.4	16.7	200
	Cua Dai	7.38	5.09	1.3	12.5	500
Han River	Thuan Phuoc bridge	7.93	4.17	5.8	32	5,000
	Thuan Phuoc bridge	7.74	4.32	3.8	14	3,100
South East						
Thi Vai River	From Long Tho commune, Nhon Trach	9 - 10.5	< 0.5	880	-	30,000 – 690,000
	District, Dong Nai province to My Xuan					
	commune, Tan Thanh district, Ba Ria					
	Vung Tau					

Source: VEPA (2005).

Major categories of water use include household activities (e.g., drinking water, washing, personal hygiene, cleaning); crop, livestock and fish production; energy production; industry; transport and recreation. This study focuses on household

use and fish production, for which good quality water is important. Table 9 shows which costs were included and excluded in this study

Table 9. Water impacts of poor sanitation included and excluded in the study

Water impacts included	Water impacts excluded
Household uses (drinking water, other uses), and freshwater fish production	Household time spent treating drinking water; economic losses of flooding from lack of drainage; polluted surface water may lead to unsustainable extraction of groundwater; intangible benefits of water resources; wildlife use of water resources; unrecorded marketed freshwater fish; marine fish; subsistence fishing losses; nutrient losses from less fish capture and effect on spending

Households are known to use one or more of several mitigation strategies when local water sources are polluted. For many households, especially in urban areas, piped water supply is available, which is usually purchased on a meter basis. For those to whom metered water is available, this is usually the preferred option as water from this source is lower cost than other mitigation options such as water purchase from vendors or bottled supply. In Vietnam, rainwater harvesting is common during the rainy season hence reducing the need for purchasing water. Importantly, a significant proportion of households are reported to treat their water before drinking, thus adding considerably to the cost of water for drinking purposes. Many households who purchase water still treat it themselves for drinking. Figure 2 presents the economic costs of polluted water attributed to poor sanitation.

Whether these costs can be fully mitigated with improved sanitation depends on several factors, including the extent of water pollution from other sources, and the behavior of households in relation to perceived changes in water quality. If concern about existing water sources containing bacteria is the major driver of household water treatment, then a reduction in water pollution from human excreta could lead to significant financial and economic savings, if it means a reduction in the unit price of treatment.

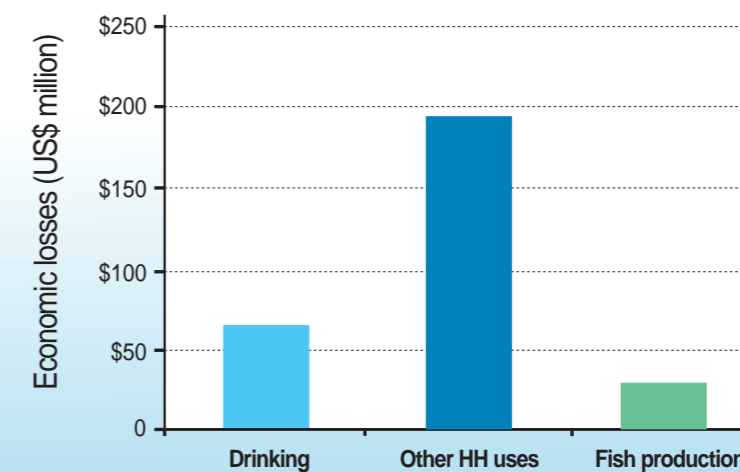
Because in Vietnam fish production is important in local economies, exports, employment and diets, the impact of declining water quality on freshwater fish production was assessed. Declining water quality clearly affects fish production, and fish production and preparation standards affect the ability to export fish

and fish products. There are many reports of killed fish and declining fish stocks due – among other factors – to heavy water pollution and poor environmental conditions; and farmed fish often require antibiotics to help them fight infections from water-borne bacteria.

One key indicator of water quality for fish production is the level of dissolved oxygen (DO), which is determined by BOD from pollutants, presence of algae, temperature, and the diurnal pattern (night/day), among others.

Declining DO levels affect fish reproduction, migration and spawning patterns, and ultimately fish survival. Fish losses were estimated by comparing actual DO levels against optimal levels in the major rivers and lakes. Based on an estimated fish catch value of US\$393 million from inland water bodies, the study estimates that reduced dissolved oxygen levels in rivers and lakes lead to losses of at least US\$68 million. Of this, US\$27 million is attributed to release of human excreta to surface or groundwater.

Figure 2. Water-related economic costs of poor sanitation (in US\$ million)



3.3 Environmental impact

Poor sanitation practices affect the broader environment in many ways in addition to its impact on water resources. Open defecation and poorly managed latrines spoil the environment and people's enjoyment of it. Poorly managed solid waste leads to streets lined with rubbish. Decomposition of organic waste attracts flies and animals. This causes smells and poor sightlines for residents, visitors and businesses, affecting the livability and usability of land. These impacts are hard to quantify in economic terms, and few previous studies have rigorously examined the population effects of poor environmental sanitation.

In terms of the sanitation-related environmental impacts, this study focuses on solid waste management. Good solid waste practices generally consist of sanitary landfill or incineration. These have only reached a small proportion of the population, mainly in urban areas in Vietnam.

In urban and rural areas, the lack of coverage of waste management services means littering is the norm and household garbage is left lying in streets. In Vietnam, only 12 out of 64 cities have sanitary landfills. Poorly managed

dumpsites affects the population. For example, the Dong Thanh dumpsite outside Ho Chi Minh city affects economic activities as well as water sources of the local residents. Only 22% of households in Vietnam have garbage collected, mostly in urban areas. 53% of households nationally burn their garbage, creating local air pollution. In rural areas, 23% of households bury garbage in the ground. 13% of households nationwide throw their rubbish to rivers.

Land that is used inefficiently for improper, unofficial disposal of solid waste or for open defecation will be unusable for other more productive uses. It is assumed that a buffer zone exists around unsanitary landfill sites. This study used a buffer zone of one thousand meters. This study estimated the value of land lost, using conservative land prices, giving an annual economic loss of US\$119 million.



Photo by Nguyen Viet Anh

3.4 User preferences

The type of sanitation facility used by a household has a range of impacts on population welfare. An important but difficult to quantify aspect is the impact on individuals and families with no latrine or using a sub-standard, uncomfortable latrine. These less tangible aspects of human welfare have limited direct financial implications, and cannot be easily captured by market values. For women and girls, a private sanitary latrine with running water is particularly important, and

has considerable impact on quality of life. There can be physical dangers of using distant toilets or open spaces, especially at night. Being seen defecating openly can damage a person's status. Vulnerable groups tend to be more affected by poor sanitation, due to frailty (senior or disabled people) or dangers (e.g. children) of poorly functioning latrines and open defecation.

Table 10. Indicators of latrine conditions and access

Population (millions)		Average access time (minutes/day)		Economic loss (US\$ million)
No latrine (open defecation)	Shared toilet facilities	No latrine (open defecation)	Shared toilet facilities	
2.2	3.1	10	15	41.6

⁴Selling Sanitation in Vietnam - What works? 2002. Water and Sanitation Program, World Bank.

A survey conducted in Vietnam in 2002 showed that 7 of 12 focus groups considered reputation with neighbors and guests as a motivating factor to build a latrine. Households are motivated by the desire to be considered modern, save face with guests, and get respect from neighbors, thus indicating a range of arguments for improving sanitation.

More tangible impacts of a sub-standard latrine or no latrine is the time spent journeying to open defecation sites or public latrines, or waiting due to insufficient shared or public latrines per capita. Time savings can be used for other productive or leisure activities, and thus have an economic value. Based on the time saving assumptions used in Table 10, the total time spent in accessing unimproved latrines was estimated. Adult time value is assumed at 30% of the average wage, while for children a time value of 15% of the average wage is used. The total annual economic value of time lost spent accessing open defecation sites is US\$42 million. The time loss only includes daily time for one visit to the site of defecation and does not include urination, which would add further time losses, especially for women who usually seek more private places than men.

A third potential impact is on life decisions such as schooling or choice of employment, and absences from school and the workplace, which are linked to the presence of sub-standard or no latrines in institutions. Almost half of the schools in Vietnam do not have latrines. Even if toilets exist in schools, reports indicate their insufficient number, poor technical standards, lack of maintenance and poor sanitary condition. Many workplaces also lack adequate water supply and sanitation, thus affecting time use, productivity, and employment decisions, especially of women.

Children are clearly affected by the poor sanitary conditions in schools. Among many other reasons, poor sanitation in schools contributes to the decision not to enroll or to drop out of school, especially for girls once menstruation begins. The heightened transmission of disease due to poor school sanitation leads to absences. For all pupils as well as teachers, inadequate latrines cause significant discomfort and inconvenience.

3.5 Tourism

Tourism is an important and still expanding industry in Vietnam. In 2006 3.6 million foreign visitors visited Vietnam, generating about US\$3.2 billion in tourism-related revenues (5.2% GDP). The industry boasted very rapid growth over the last 15 years, and it aims to maintain the trend.

No previous studies have examined the link between tourism and sanitation conditions, although in many developed countries medical and tourist organizations monitor the diseases contracted by travelers returning home. Thus 'high risk destinations' are known for specific diseases, including dengue fever, parasites, severe acute respiratory syndrome (SARS), respiratory and diarrhea-related diseases.

Unarguably, the popularity of tourist destinations is partially related to the sanitary conditions in Vietnam. Whether tourists can expect private, hygienic, and culturally appropriate toilet conditions, as well as running water, soap and hand towels, will play a role in determining whether they select Vietnam as their holiday destination. Furthermore, tourists' perceptions and experiences of broader sanitation aspects will contribute importantly to their choice, and whether first-time visitors decide to return to Vietnam. These experiences include food safety, health events, sights and smells of the immediate environment, and – at beaches – the cleanliness of the water for swimming. Also, with an ageing population, the needs and preferences of senior people – who are more sensitive to their environment – will play an increasing role in tourist standards.

Vietnam could further exploit existing tourist capacity to generate significantly greater revenues from tourism and at relatively little extra cost. Improved sanitation would help attract more tourists. This study estimates current economic losses, based on the premise that occupancy rates are below an assumed optimal rate of 90% due, in part, to poor sanitation. It is recognized that poor sanitation is one of many reasons depressing the number of foreign tourist arrivals, and hence is assumed to account for a small share (5%) of the attributed losses. Based on these assumptions, the annual economic losses are estimated at US\$69 million. Therefore, with the improvement of sanitation in Vietnam, especially in and around tourist destinations, it is expected that tourist growth will continue and significant economic returns will be generated.



Photo by Nguyen Viet Anh

3.6 Overall economic impacts

This study has found that poor sanitation causes considerable financial and economic losses in Vietnam. Table 11 summarizes the financial and economic impacts of poor sanitation. It shows that the estimated overall annual financial and economic losses from poor sanitation are US\$290 million and US\$780 million, respectively. This translates to annual losses per capita of US\$3.5 (financial) and US\$9.3 (economic), or VND 56,750 (financial) and VND 150,770 (economic).

Financial losses – reflecting expenditure or income losses resulting from poor sanitation average 0.5% of annual GDP, while overall population welfare losses average 1.3% of GDP. The majority of economic losses are shared between health (34%) and water resources (37%), and the environment (15%).

For policy decisions, it is not adequate to know only the losses associated with poor sanitation, but also which of these losses can be mitigated with the implementation of different sanitation options. Hence, based on this methodology, the reduction in pathogens, pollution and so on through

improved sanitation, should lead to partial or full mitigation of the estimated losses.

- Improved toilet system leads to US\$17 million financial gain and US\$84 million economic gain through reducing the measured health impacts by 32%.
- Hygiene practices bring US\$23 million financial gain and US\$118 million economic gain through reducing the measured health impacts by 45%.
- Better physical access of latrines and more private as opposed to shared latrines bring US\$43 million economic gain, through saving time for those whose time access is not already minimized.
- Isolation of human waste from water resources could potentially lead to gains attributed to sanitation of US\$240 million financial and US\$287 million economic gains.
- Improved tourist facilities and environment could lead to gains attributed to sanitation of US\$69 million.
- The value of sanitation markets are US\$329 million, including sanitation input and output markets.

Table 11. Financial and economic losses due to poor sanitation, by impact type

Impact	Financial losses			Economics Loss		
	Value	Per capita ¹	Percentage	Value	Per capita ¹	Percentage
<i>Unit</i>	<i>US\$ million</i>	<i>US\$</i>	<i>%</i>	<i>US\$ million</i>	<i>US\$</i>	<i>%</i>
Health costs	52.1	0.62	17.9%	262.4	3.12	33.6%
Health care costs	50.7	0.60	17.4%	53.1	0.63	6.8%
Productivity costs	1.1	0.01	0.4%	4.6	0.06	0.6%
Premature death costs	0.3	0.00	0.1%	204.7	2.43	26.2%
Water costs	239.6	2.85	82.1%	287.3	3.41	36.8%
Drinking water	49.1	0.58	16.8%	62.5	0.74	8.0%
Fish production	27.4	0.32	9.4%	27.4	0.32	3.5%
Domestic water uses	163.2	1.94	55.9%	197.4	2.34	25.3%
Environment	-	-	0.0%	118.9	1.41	15.2%
Other welfare	-	-	0.0%	42.9	0.51	5.5%
Time use	-	-	0.0%	41.6	0.49	5.3%
Life choices	-	-	0.0%	1.3	0.02	0.2%
Tourism	-	-	0.0%	68.6	0.81	8.8%
TOTAL	291.7	3.46	100.0%	780.1	9.26	100.0%

¹ Per capita refers to the total value divided by the total population

The aim of this present study was to generate an evidence base for policies to improve sanitation. This study has identified a broad range of impacts of poor sanitation, and estimated the financial and economic losses associated with those most amenable to valuation. The following four policy recommendations are based on the major findings of the study:

Major finding 1. Poor sanitation causes significant losses to the national economy. This study has found that poor sanitation causes significant economic losses in Vietnam, equivalent to roughly 1.3% of annual GDP. In addition to these quantified impacts, a range of other negative economic and social effects of poor sanitation result. By improving sanitation, a significant proportion of these socio-economic impacts can be mitigated.

Recommendation 1. Decision makers from various sectors are advised to act now. Sanitation 'players' are advised to act now, otherwise the negative impacts of poor sanitation will increase over time. The government and other stakeholders should jointly reassess the current and planned spending on the sanitation and related sectors, covering health, water resources, environment, rural and urban planning and development, fisheries, and tourism. Sanitation should be given increased political importance and budget allocations. The government should give priority to the populations with no latrines.

Major finding 2. Health- and water-related impacts of poor sanitation have the greatest economic toll on society. This study confirms that the most tangible impact of poor sanitation is an increased risk of infectious disease and premature death, which result in high economic costs. A high proportion of human excreta and wastewater eventually finds its way to water bodies and causes significant pollution and related economic costs.

Recommendation 2. The government should focus on easily achieved health benefits of improved sanitation - by educating mothers and children and promoting safe but simple low cost latrine designs, improved excreta isolation measures and improved hygiene practices such as hand washing with soap. The government should urgently implement sanitation standards that reduce the

release of waste matter into water resources. Focus should not be just on human excreta, but also solid waste, household, agricultural and industrial waste, which affect health and pollute water resources.

Major finding 3. Sanitation has a major role in sustainable development, due to its multiple impacts and links with other development goals (MDGs). Sanitation plays a key but largely unrecognized role in population welfare and poverty reduction. Impacts not fully explored in this study – in particular tourism and the investment climate – are potentially major arguments for improving sanitation.

Recommendation 3. Sanitation cannot be the task of a single sector or ministry, nor of a single level of government. The development of a policy and regulatory framework for environmental and health protection should be prioritized. Advocacy is needed at the highest levels to ensure political support and resource allocations for sanitation, but also at implementation levels where population demand for sanitation is crucial for its success. Clear roles and responsibilities need to be defined.

Major finding 4. Socio-economic impact of poor sanitation varies between regions in Vietnam. This study presents crude but realistic estimates of economic impacts at the national level. Given the lack of sanitation-related information in official reporting systems and surveys, several impacts of poor sanitation could not be evaluated, or assessed at the regional or provincial level.

Recommendation 4. Further research is needed to understand the role of sanitation in development. To convince local decision-makers – from provincial people's committee down to households – local studies would be more credible in showing the real population impacts of poor sanitation, and the potential gains in population welfare from improved sanitation. The methodology used in this study can be applied at any level. Further research studies could fill important knowledge gaps about the economic and welfare effects of improving or not improving sanitation.

BOD	Biochemical Oxygen Demand
DO	Dissolved Oxygen
EAP	East Asia and the Pacific
ESI	Economics of Sanitation Initiative
GDP	Gross Domestic Product
HCA	Human Capital Approach
HH	Household
JMP	Joint Monitoring Programme (WHO, UNICEF)
Kg	Kilograms
MDG	Millennium Development Goal
NGO	Non-Governmental Organization
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WSP	Water and Sanitation Program