

# The Economic Returns of Sanitation Interventions in Vietnam

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## INTRODUCTION

The Economics of Sanitation Initiative (ESI) is a multi-country study launched in 2007 as a response by the World Bank's Water and Sanitation Program to address major gaps in evidence among developing countries on the economic aspects of sanitation. Its objective is to provide economic evidence to increase the volumes and efficiency of public and private spending on sanitation. This research brief summarizes the key findings of Study Phase II—cost-benefit analysis of alternative sanitation options—from Vietnam.<sup>i</sup>

## PROBLEM STATEMENT

Vietnam has made good progress towards the Millennium Development Goal target. Access to basic household sanitation increased from 35 percent (in 1990) to 75 percent of households (in 2008).<sup>ii</sup> However, 33 percent of the rural population—equal to 20 million people—is without access to improved sanitation, of which five million people practice open defecation. Regional inequalities exist—with coverage barely exceeding 50 percent in some regions.



Furthermore, coverage figures do not reflect the proper management of human excreta. While access to an improved private toilet is 94 percent in urban areas, less than 10 percent are connected to sewerage networks with treatment. The majority (three-quarters) of households have a septic tank of which a significant proportion are not properly designed or have regular emptying with safe septage management—thus causing health risks and widespread pollution to water resources.

The Phase I of the ESI study estimated the overall economic costs of poor sanitation in Vietnam to be US\$780 million per year at 2005 prices, equivalent to 1.3 percent of gross domestic product (GDP).<sup>iii</sup>

## Key messages

- **Improved sanitation is a socially profitable investment.** Pit latrines in rural areas have an economic return of at least six times the cost, and off-site treatment options in urban areas have an economic return of at least three times the cost. Net benefits from low-cost sanitation options are especially high, offering an affordable option to poor households.
- While investment costs account for a major share of annualized costs (i.e., costs converted to annual equivalent), **the appropriate estimation of operational and maintenance costs is crucial to the correct functioning of sanitation facilities.** Municipalities and service providers should ensure these expenses are fully accounted for in the budget.
- **Sanitation options that protect the environment are more costly to provide,** but while environmental benefits are difficult to quantify in economic terms, **the benefits are highly valued by households, tourists and businesses.** When environmental benefits to downstream populations of proper wastewater management are valued, it can considerably increase the economic returns.
- **Economic efficiency of the improved sanitation can be optimized by making programs more demand-sensitive,** which leads to sustained behavior change. Users should be involved in all the stages of sanitation projects.

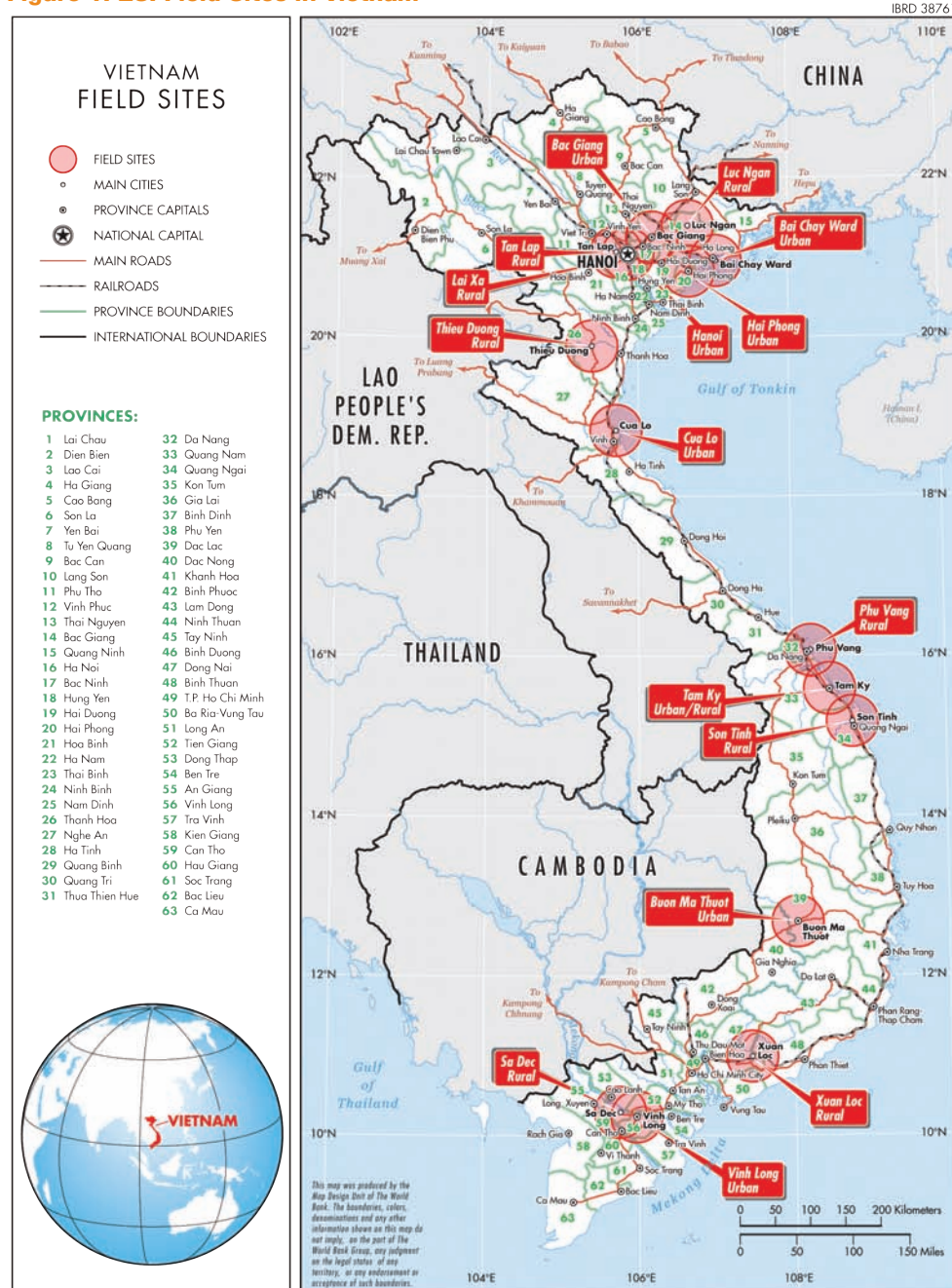
**Economic analysis** measures the broader **welfare** benefits of products and services on populations, such as value of life, time use, environmental and social benefits, as opposed to **financial analysis**, which measures the financial gains only (e.g., changes in income or cash situation).

## STUDY AIMS AND METHODS

The purpose of the Phase II of the ESI study is to provide sanitation decision makers with improved evidence on the costs and benefits of alternative sanitation options in different contexts in Vietnam. The study results presented in this report focus on human excreta management, covering selected field sites as well as national surveys. The main report also presents results on the costs and benefits of solid waste management in four field sites.

Surveys were conducted in nine rural and eight urban sites that have recently been the focus of sanitation programs or projects (see Figure 1), of which 13 were implementing improved toilet and wastewater management options. Overall 2,400 household questionnaires were administered, and focus group discussions, physical investigations, water quality assessments, market surveys and health facility surveys were conducted in each site. Primary data were supplemented with data from other national and local surveys.

Figure 1. ESI Field Sites in Vietnam



Sanitation interventions evaluated varied by rural and urban location, comparing open defecation with the range of sanitation facilities currently used by the Vietnamese population: dry pit latrine, wet pit latrine (pour-flush), double-vault composting latrine, pour-flush toilet with septic tank, pour-flush toilet with biogas digester in stock-breeding, and toilet with sewerage connection and treatment.

Conventional techniques of economic analysis were utilized to generate outputs such as benefit-cost ratio, cost-effectiveness ratio, net present value, internal rate of the return, and payback period of sanitation options.

Economic benefits quantified include impacts on health, drinking water, sanitation access time, and the reuse of human excreta. Environmental and social impacts of poor sanitation were not fully captured in the monetary estimates of benefit. Qualitative analyses were conducted on selected social and broader economic benefits. Full investment and recurrent costs were measured for each sanitation option.

## STUDY RESULTS

### Rural Areas:

#### Substantial Economic Returns on Pit Latrines

Benefit-cost ratios (economic return per dollar invested) and annualized costs per household are compiled for the eight rural sites in Figure 2 and Figure 3. Among the various sanitation options, the most favorable economic performance was found for improved pit latrines, followed by double vault composting latrines and septic tanks. These interventions have the highest benefit-cost ratio of 8.0, 6.0, and 4.0, respectively. The annual economic rate of return was more than 100 percent, requiring less than one year to recover the economic value of the initial investment costs. The sanitation option evaluated with improved off-site excreta management—septic tank with safe septage management—has a benefit-cost ratio of 3.0. For households with livestock, latrines with biogas generators are proven to be an economically profitable option, also with a benefit-cost ratio of 3.0.

The two major contributors to the economic benefits were reduced mortality and access time savings associated with improved, private latrines. The reuse value for composting latrines is relatively small compared to health and time benefits, while for biogas digesters the reuse value (electricity and sludge value) makes up more than three-quarters of the economic benefit; for biogas digesters a major part of the excreta comes from animals, not humans. The annualized cost of a double-vault composting latrine of US\$40 is marginally higher than that of a pit latrine of US\$30, but the difference in up-front investment cost is more marked (US\$110 versus US\$190). Options with septic tank are considerably more expensive. The investment cost of a septic tank averages US\$322 (annualized US\$70) and is exceeded by septic tank with safe septage management of US\$531 (annualized US\$93). A biogas digester (not shown in Figure 3) has an investment cost of US\$9,339 (annualized US\$1,310).

Under actual program conditions, there is a small decline in performance for all sanitation options. This is due to projects not reaching full coverage in the area, or non-use by some household members of the facilities. For example, the benefit-cost ratio of improved pit latrines declines from an economic return per dollar spent of 8.0 to 6.4 and for composting latrines from 6.0 to 4.5, and for septic tanks with septage management from 3.1 to 2.6.

Figure 2. Benefit-Cost Ratios in Rural Sites (economic return per unit of currency spent)

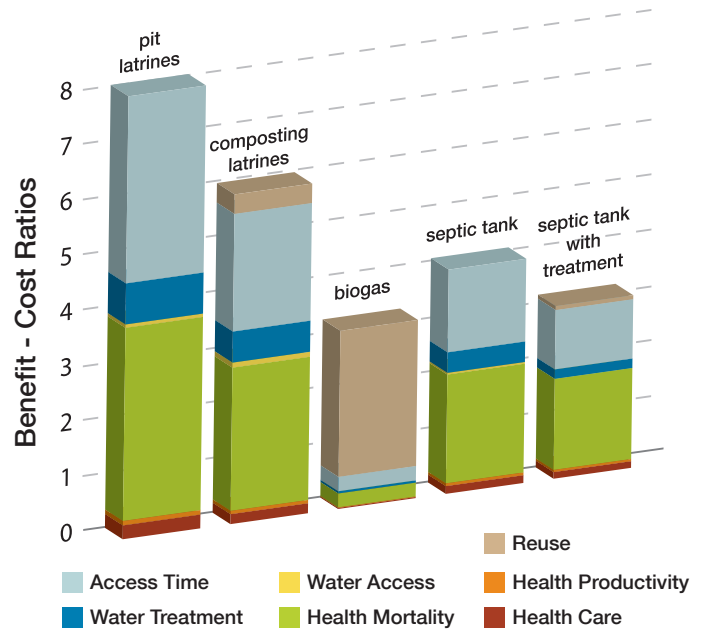
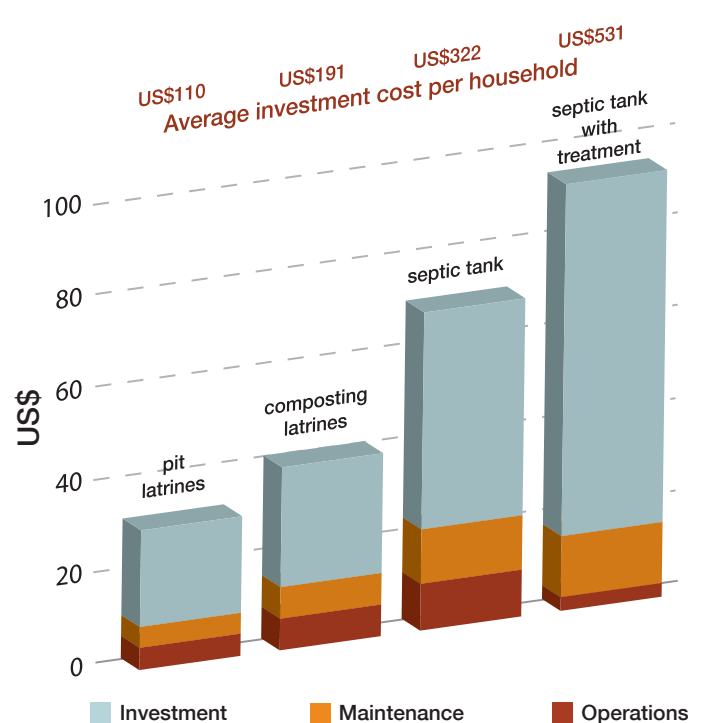


Figure 3. Annual Costs per Household in Rural Sites (2009 prices, using average exchange rate with US\$)



Note to lower graphic: The annualized costs for biogas were too high to show in this graphic—annualized investment US\$1,062; annual operations US\$195; and annual maintenance US\$57.

### Urban Areas: Off-Site Treatment Options Deliver High Economic Returns

Benefit-cost ratios (economic return per dollar invested) and annualized costs per household are compiled for the five urban sites with human excreta management projects in Figure 4 and Figure 5. Among the various sanitation options, the most favorable economic performance was found for improved wet pit latrines, with a benefit-cost ratio of 8.6. The annual economic rate of return was more than 100 percent, requiring less than one year to recover the economic value of the initial investment costs. Septic tanks with no post-treatment were evaluated in four of the five urban sites, and have a benefit-cost ratio of 3.6. The sanitation options evaluated with improved off-site excreta management had a benefit-cost ratio of 2.7 (sewerage with treatment). These latter two ratios declined to 2.9 and 2.4, respectively, due to non-connection of septic tanks by households in the catchment area, and below optimal performance of the wastewater collection and treatment system.

The two major contributors to the economic benefits were reduced mortality and access time savings associated with improved, private latrines. The reuse value of sludge from safe off-site septage management contributed a small proportion of economic benefits (less than 20 percent). The annualized wet pit latrines of US\$20, with an investment cost averaging US\$88 across the sites, is by far the cheapest option. However, due to space limitations and risk of polluting groundwater and neighborhoods, pit latrines without treatment are not a feasible option in most urban areas of Vietnam. Septic tanks with partial but inadequate treatment (as most are not properly designed) cost US\$416 (annualized US\$65). Septic tanks with improved septage management cost US\$530 investment (annualized US\$78), while sewerage costs more than twice as much at US\$1,361 (annualized US\$134).

For the urban centers, where off-site sanitation seems the most feasible option, high connection rate of household to the sewerage and drainage system is a very important factor to ensure a favorable economic return. Higher rates of wastewater collection and treatment from urban centers leads to economic gains in down-

Figure 4. Benefit-Cost Ratios in Urban Sites (economic return per unit of currency spent)

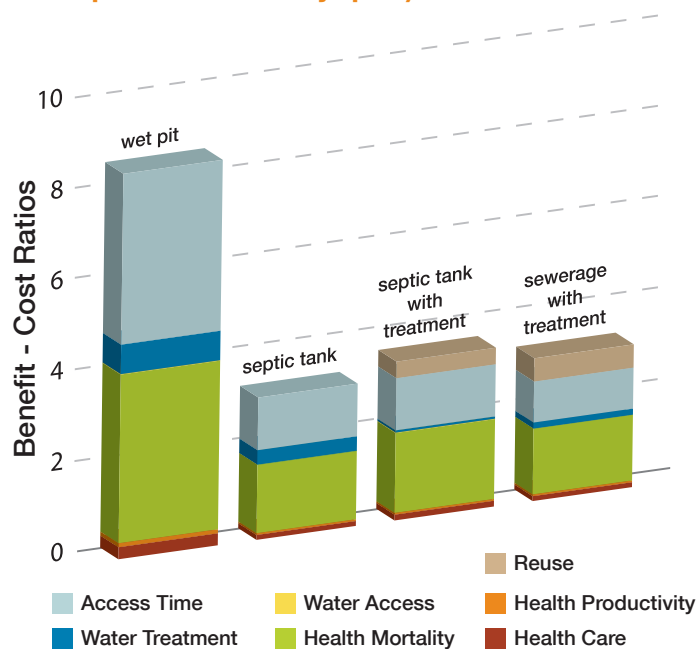
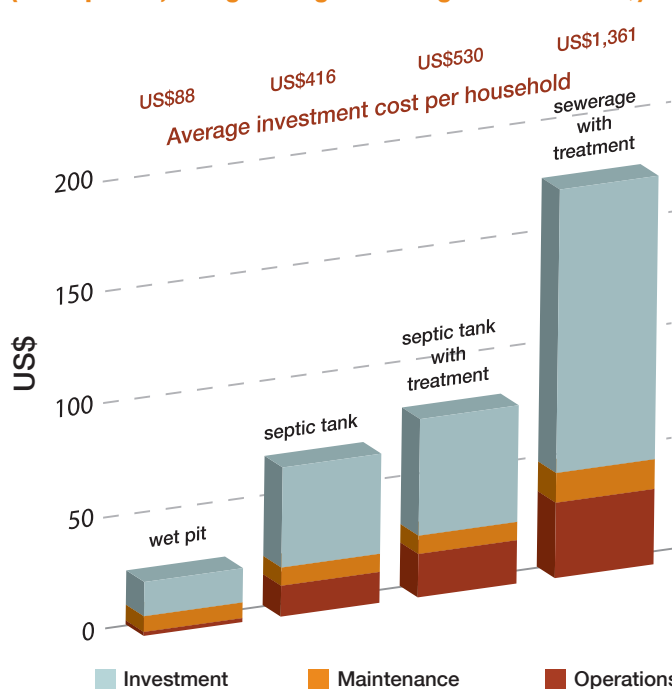


Figure 5. Annual Costs per Household in Urban Sites (2009 prices, using average exchange rate with US\$)



stream populations from less polluted water, such as the reduced cost of vegetable and fish production, as well as water treatment.

## Sanitation Links to Tourism and Economic Development

The key results of a tourism survey of 300 holiday and business visitors are reported in Box 1.

The business survey approached 22 firms, of which seven firms responded. These firms covered hotels, food and drinks producers, and engineering and consultancy firms. The responses confirmed the availability of clean water and a healthy workforce was important to business. This is especially the case for hotels and drink and food processing industries. Engineering firms and consultancies emphasized the importance of a location where their staff could experience a pleasant environment which should increase competitiveness. Some firms indeed get their business from selling bottled water to customers who do not trust other, potentially contaminated sources of water supply. Despite their statements about the importance of environmental conditions to their business, they are reluctant to invest in wastewater treatment facilities to reduce their own impact on the environment. Sanitation improvement means more business opportunities for almost all of the firms.



### BOX 1. KEY RESULTS OF TOURISM SURVEY

General sanitation conditions in Vietnam are perceived to be poor, scoring 2.9 out of maximum of 5.0. The lowest scores were for the quality of urban environments.

The quality of toilets available in public places scored low for bus stations and public toilets, at below 2.0 out of a maximum score of 5.0.

The main concerns of tourists relating to hygiene in Vietnam were tap water and food hygiene, which they perceived as the highest risks for catching diarrhea.

Despite some negative comments about environmental sanitation in Vietnam, 74 percent said they intend to return to Vietnam. Of those tourists who responded “may be” or “hesitant to return,” 13 percent stated poor sanitation as a major or contributory reason.

## KEY FINDINGS AND RECOMMENDATIONS

This study finds that all sanitation interventions have benefits that exceed costs, when compared with “no sanitation facility.” The high net benefits from low-cost sanitation options, such as wet pit latrines in urban areas and all types of private pit latrine in rural areas, suggests these technologies should be considered first for sanitation improvement plans, especially in situations where funds are scarce. However, in densely populated areas, pit latrines have limited feasibility. Also, to improve quality of life in increasingly populous cities, decision makers should be aware of the economic benefits from improved conveyance and treatment options. If they can afford them, populations prefer options that transport waste off-site. Appropriate treatment and/or isolation of waste is key to the future sustainable development of Vietnam. Based on these findings, four key recommendations for decision makers are proposed here:

1. Intensify efforts to cover the entire Vietnamese population with basic improved sanitation access, especially in rural areas where more than 30 percent of the population still lacks basic sanitation. Sanitation investments should not be seen just as an expense, but instead leading to economic benefits that pay back the investments several times during the lifetime of the sanitation facility. However, sus-



tainable sanitation requires appropriate sensitization and involvement of customers, who effectively demand (and choose) the solutions provided.

2. Go beyond basic sanitation provision. In many municipalities and districts of Vietnam, funds could be raised to provide more sustained and quality services, which better capture the full environmental and health benefits and respond to the population's wish for a clean, livable environment. Successful case studies of projects with high implementation efficiency—their technology and program delivery options—need to be identified and adopted (with necessary adjustments) to other settings in Vietnam.
3. Stimulate and allow the private sector to be part of the solution. There
4. Promote evidence-based sanitation decision making. Variation in economic performance of options suggests a careful consideration of site conditions is needed to select the most appropriate sanitation option and delivery approach. Decisions should take into account not only the measurable economic costs and benefits, but also other key factors for a decision, including intangible impacts and socio-cultural issues that influence demand and behavior change, availability of suppliers and private financing, and actual household willingness and ability to pay for services.

<sup>1</sup>Economic assessment of sanitation interventions in Vietnam. Nguyen Viet Anh, Hoang Thuy Lan, Phan Huyen Dan, Le Thu Hoa, Bui Thi Nhung, and Guy Hutton.. World Bank, Water and Sanitation Program. 2011.

<sup>2</sup>The sanitation part of the combined water and sanitation MDG target was to halve by 2015 the proportion of the global population without access to basic sanitation in 1990. The figures cited are those reported by the WHO/UNICEF Joint Monitoring Programme for 2008.

<sup>3</sup>Economic impacts of sanitation in Vietnam. Pham Ngoc Thang, Hoang Anh Tuan, and Guy Hutton. World Bank, Water and Sanitation Program. 2008. Available for download at [www.wsp.org](http://www.wsp.org).

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## About us

The Water and Sanitation Program (WSP) is a multi-donor partnership created in 1978 and administered by the World Bank to support poor people in obtaining affordable, safe, and sustainable access to water and sanitation services. WSP provides technical assistance, facilitates knowledge exchange, and promotes evidence-based advancements in sector dialogue. WSP has offices in 24 countries across Africa, East Asia and the Pacific, Latin America and the Caribbean, South Asia, and in Washington, DC. WSP's donors include Australia, Austria, Canada, Denmark, Finland, France, the Bill and Melinda Gates Foundation, Ireland, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States, and the World Bank.

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