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DELIVERING WATER, SANITATION AND HYGIENE SERVICES
IN AN UNCERTAIN ENVIRONMENT

The economic returns of sanitation interventions in Vietnam

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BRIEFING PAPER 1830

Results of sanitation interventions in 9 rural and 8 urban sites have been evaluated, comparing open defecation with different range of sanitation facilities. Both quantitative and tangible benefits of sanitation and hygiene improvements versus averted costs of interventions were analyzed. Study results show improved sanitation is a socially profitable investment – pit latrines in rural areas have an economic return of at least 6 times the cost, and off-site treatment options in urban areas have an economic return of at least 3 times the cost. Net benefits from low-cost options are especially high, offering an affordable opportunity to poor households. 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. Study results provide valuable information to allocate adequate resources for sanitation and hygiene improvement at central and local levels.

Introduction

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).

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 from Vietnam.

Vietnam has made good progress towards the Millennium Development Goal target. Access to basic household sanitation increased from 35% (in 1990) to 75% of households (in 2008). However, 33% of the rural population – equal to 20 million people – is without access to improved sanitation, of which 5 million people practice open defecation. Regional inequalities exist—with coverage barely exceeding 50% in some regions. Furthermore, coverage figures do not reflect the proper management of human excreta. While access to an improved private toilet is 94% in urban areas, less than 10% are connected to sewerage networks with treatment. The majority (three-quarters) of households have 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 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% of gross domestic product (GDP).

The 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.

Materials and methods

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 thirteen 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.

Types of 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.

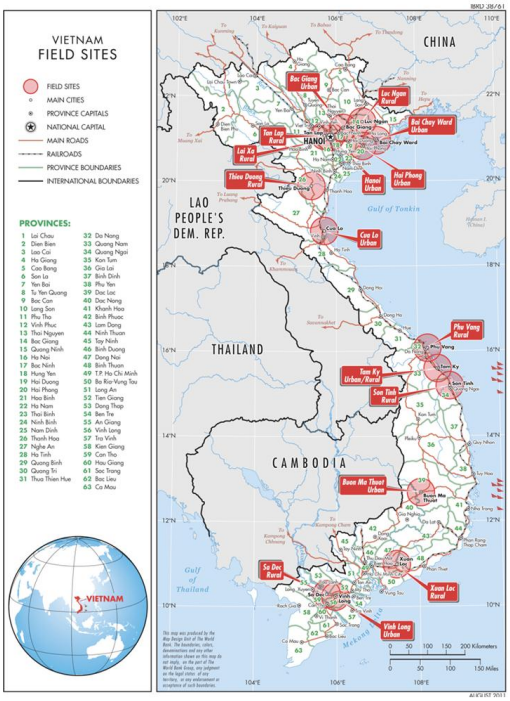

Figure 1. ESI Field Sites in Vietnam

Results and discussions

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. 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, 6, and 4, respectively. The annual economic rate of return was more than 100%, 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. For households with livestock,

latrines with biogas generators are proven to be an economically profitable option, also with a benefit-cost ratio of 3.

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 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) 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, or annualized US$ 1,310.

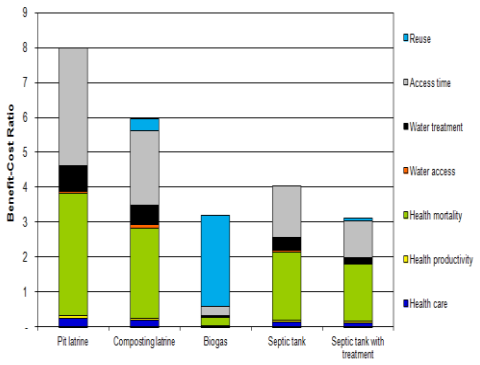

Figure 2. Benefit-Cost Ratio in Rural Sites (economic return per unit of currency spent)

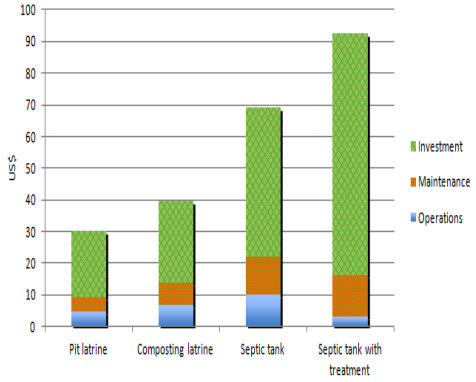

Figure 3. Annualized Costs per Household in Rural Sites

Note:

– Calculations were made with 2009 prices, using average exchange rate with US$.
– The annualized costs for biogas were too high to show in this graphic – annualized investment US$ 1,062; annual operations US$ 195 and annual maintenance US$ 57.

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.

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. 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%, 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.

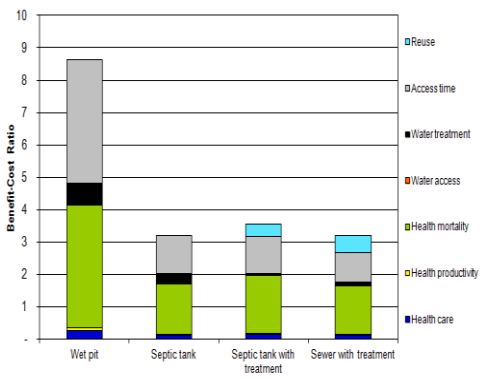

Figure 4. Benefit-Cost Ratio in Urban Sites (economic return per unit of currency spent)

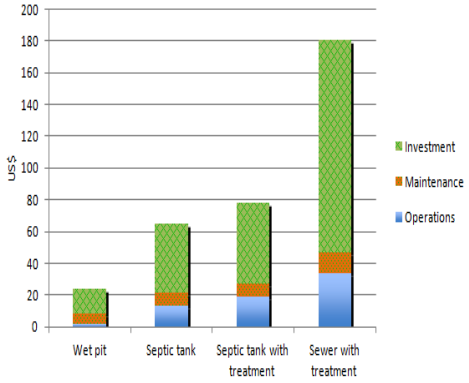

Figure 5. Annualized Costs per Household in Urban Sites

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%). 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) (Figure 5).

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

Conclusions and recommendations

Key findings

This study finds that all sanitation interventions have benefits that exceed costs, when compared with "no sanitation facility." In rural areas in Vietnam, the most benefit-cost ratios (economic return per Dollar invested) and annualized costs per household were found for improved pit latrines, followed by double vault composting latrines and septic tanks. These interventions have the highest benefit-cost ratio of 8, 6, and 4, respectively. Highest benefit-cost ratio in urban areas was found for improved wet pit latrines, with a benefit-cost ratio of 8.6, while this ratio was 3.6 for septic tanks with no post-treatment and 2.7 for off-site sewerage collection and treatment, respectively). 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 uncertain environments and where funds are scarce. In densely populated areas, pit latrines have limited feasibility. 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. Indeed, appropriate treatment and/or isolation of waste are key to the future sustainable development of developing countries like Vietnam.

Recommendations

In a developing world, sanitation investments are not a sunk cost: major economic benefits can be enjoyed at an affordable cost. However, sustainable sanitation requires appropriate sensitization and involvement of customers, who effectively demand (and choose) the solutions provided.

Go beyond basic sanitation provision. 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 different countries.

Stimulate and allow the private sector to be part of the solution. There are significant opportunities for sanitation markets, in which the private sector is well placed to play a major role. Besides economic benefits from reduced environmental pollution and improved public health, businesses and the government can both contribute to a thriving sanitation market that creates jobs, leads to modern solutions, and contributes to poverty alleviation. Financial instruments such as revolving funds and micro-finance can help households pay the up-front costs of investments and reap the benefits of improved sanitation over its entire lifespan.

Promote evidence-based sanitation decision making: variation in economic performance of options between sites 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.

Poor sanitation is directly link to foreign investment. In many developing countries the local authority usually gives much attention to economic development. This will give them other incentive for more priority in sanitation from their limited budget.

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