

The Economic Returns of Sanitation Interventions in Cambodia

August 2011

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 Cambodia.ⁱ

PROBLEM STATEMENT

Sanitation improvement has been included among **Cambodia's own Millennium Development Goals (CMDG)**, with the aim of reaching 30 percent rural coverage and 74 percent urban coverage by 2015. In rural areas, progress has been slow, with around a one percentage point increase annually between 1997 and 2007, reaching little over 20 percent in 2008. Open defecation is still practiced by about 75

percent of the rural population. Urban coverage stands at 81.5 percent, as of 2008.ⁱⁱ However, this figure reflects toilet access and not improved management of sewage—in urban areas appropriate wastewater management is still extremely limited—thus causing health risks and widespread pollution to water resources.

Phase I of the ESI study estimated the overall economic costs of poor sanitation in Cambodia to be US\$448 million per year at 2005 prices, equivalent to 7.2 percent of gross domestic product (GDP).ⁱⁱⁱ

STUDY AIMS AND METHODS

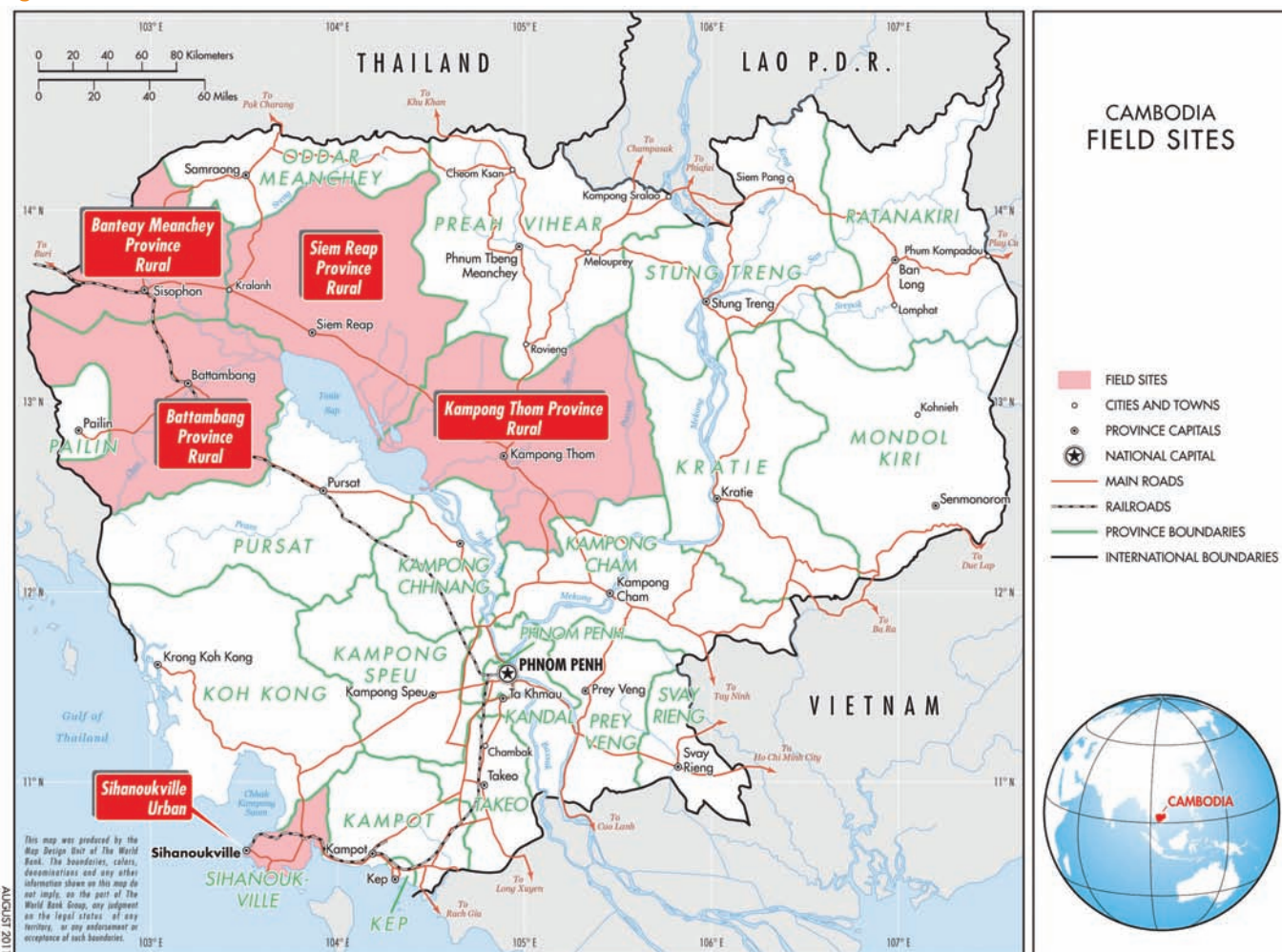
The purpose of **Phase II of the ESI study** is to provide sanitation decision makers with improved evidence on the costs and benefits of alternative sanitation options in different contexts in Cambodia. The study focuses on human excreta management, including data from five selected field sites in addition to national surveys.

Key messages

- Sanitation interventions have very favorable socio-economic returns to households and society, contributing improved health, clean environment, dignity and quality of life, among many other benefits. Economic returns are potentially high—in excess of US\$2 return per dollar invested—especially in rural areas where low-cost on-site solutions are feasible.
- Economic efficiency of improved sanitation can be optimized by improving program performance, which leads to sustained behavior change. Future projects should carefully plan and implement activities cost-effectively, and closely monitor project costs and impacts, to ensure that the project resources are being appropriately utilized.
- High-cost sanitation solutions in urban areas are difficult to justify economically from the perspective of health and time benefits of the community they are serving. While difficult to quantify in economic terms, the associated environmental benefits are highly valued by households, tourists and businesses.
- Improved hygiene and sanitation conditions in institutions, public places and tourist sites are important to attract more businesses and tourists to Cambodia.

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).

Figure 1. ESI Field Sites in Cambodia



Surveys were conducted in four rural project sites and one urban site that have recently been the focus of sanitation programs or projects (see Figure 1). Overall 1,180 household questionnaires were undertaken in addition to focus group discussions, physical investigations, water quality assessments, market surveys, and health facility surveys conducted at each site. Primary data were supplemented with data from other national and local surveys.

Sanitation interventions evaluated varied by rural and urban location, comparing open defecation with the two main sanitation options currently available to the rural population: dry pit latrines and wet pit latrines (pour-flush). In urban sites wet pit latrines were compared with a new wastewater management scheme with household sewerage connections.

Conventional techniques of economic analysis were utilized to generate outputs such as benefit-cost ratio, cost-eff-

fectiveness ratio, net present value, internal rate of the return, and payback period of sanitation options.

Economic benefits quantified include impacts on health, drinking water and sanitation access time. 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: Highly Favorable Economic Returns on Pit Latrines—When Used

Benefit-cost ratios (economic return per currency unit invested) and annualized costs per household were compiled for

the four projects in rural sites, as shown in Figure 2 and Figure 3. Among the sanitation options evaluated, the most favorable economic performance was found for wet pits. In the two projects delivering wet pits, the benefit-cost ratio varied from 2.3 to 2.9, with an annual economic rate of return of at least 70 percent, thus requiring less than two years to recover the economic value of the initial investment costs. The benefit-cost ratio of dry pits also indicates a positive economic return, varying from 1.4 to 2.0, with an annual rate of return greater than 8 percent. These results—wet versus dry pit latrines—need to be put into context, however. Under the projects evaluated, wet pit latrines were heavily subsidized and only reached selected households, thus leaving most households in villages without improved sanitation. In contrast, the villages where dry pits were evaluated generally reached a higher proportion of the community. One of these projects was a Community-Led Total Sanitation (CLTS) project with zero hardware subsidy, while the other was a project delivering longer lasting dry pit latrines with a high proportion of the hardware cost subsidized by the project.

The findings suggest that sanitation technologies appropriate for rural areas are worth pursuing, in that their economic return is positive, and for some interventions it is highly favorable. Although wet pit latrines have a high initial investment cost of at least US\$170 per household (including both hardware costs and agency costs to deliver the intervention), a longer expected life of eight years leads to lower annualized costs than for dry pit latrines (maximum three years).

While the unlined simple pit latrines have a lower benefit-cost ratio because they were found to last no more than an average of one year, they have a lower upfront cost and thus are more affordable to poor households. Also, latrine costs include the program costs of the implementing agent: these program costs, at US\$54 per household adopting a simple pit latrine, were higher than is usually the case in other projects in Cambodia and in other countries. If program costs per household of returning communities to open defecation-free (ODF) status (or maintaining ODF status) actually decline over time, then the benefit-cost ratio would be more favorable than presented in this analysis.

The lessons from this and other CLTS projects means that future unit costs of changing behavior and achieving basic sanitation options should be significantly lower, and hence the

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

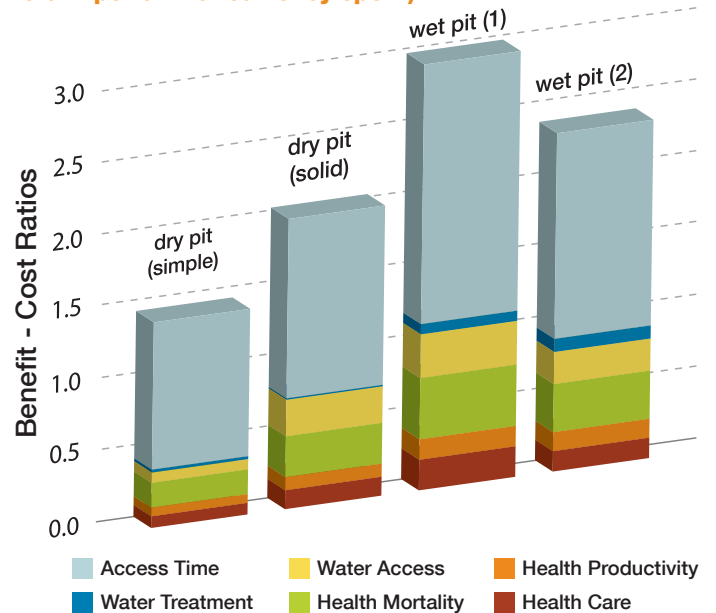
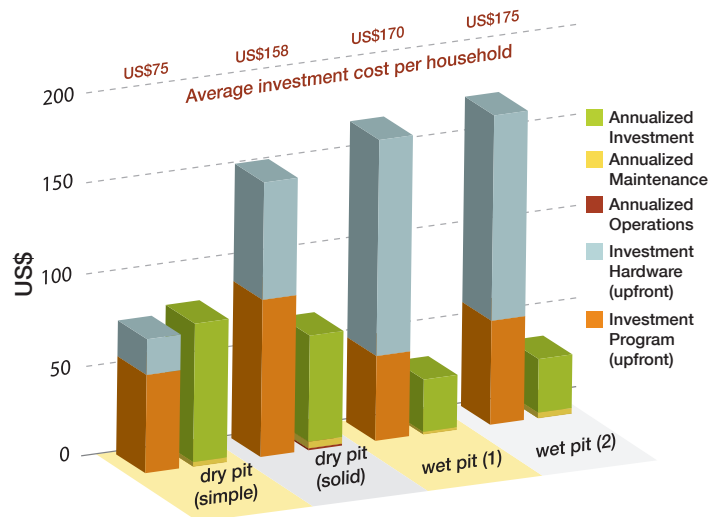


Figure 3. Annual Costs per Household in Rural Sites (2009 prices, using average exchange rate with US\$)



economic performance of CLTS will improve. Effective CLTS also leads to all households in a community moving quickly onto the sanitation ladder, with social pressures for sustainability, and those who start on the lowest rung with dry pits progressing up the ladder when they can afford it.

The most important benefits for all options are time savings followed by health improvements. The health values estimated are based on an assumed 36 percent reduction in mortality and disease cases related to poor sanitation. Health care

costs are based on actual treatment seeking rates of around 50 percent: if treatment seeking were higher, the associated health care savings would also be higher.

The results presented above are under “ideal” conditions, where latrine adopters continue to use their latrine for the full-assumed life of the latrine. However, in the projects some “dropout” was observed in all project sites, with some or all household members going back to open defecation. This is due partly to force of habit, lack of social pressures and norms to stop open defecation, and partly due to the latrine ceasing to function properly. When dropout was taken into account, the economic performance declined significantly. For simple dry pit latrines benefit-cost ratio dropped from 1.4 to 0.8, improved dry pit latrine dropped from 2.0 to 1.3, while wet pit latrine dropped from an average 2.6 to 1.8.

Urban Areas: Poor Economic Performance of High-Cost Sanitation Option

Benefit-cost ratios and annualized costs per household are presented for the urban site, Sihanoukville, in Figure 4 and Figure 5. Given the lack of range of alternative sanitation options practiced by households, only wet pit latrines and sewerage with treatment were compared. A sewerage system without treatment is also still provided in the urban site, with outflow to the sea. However, given this is a tourist resort, such a practice is not favorable for attracting tourists and therefore the economic performance of this option is not considered. As in rural areas, the most favorable economic performance was found for wet pit latrines—in this case, with sedimentation tank made from bricks—with a benefit-cost ratio of 1.8 and an annual return of 27 percent, requiring under three years to recover the economic value of the initial investment. Taking into account non-use of latrines by households, or individual household members, the benefit-cost ratio drops to 1.4.

Despite their favorable economic returns, pit latrines are not an appropriate sanitation option in most parts of Cambodia’s fast-growing cities. While access to toilets in urban areas is high—at over 80 percent according to official statistics—the majority of sewage and wastewater is emptied into water bodies untreated. Previous wastewater treatment plants constructed in other cities (such as Battambang) are not currently functional, and the natural wetland system serving the country’s capital, Phnom Penh, is seriously overloaded and

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

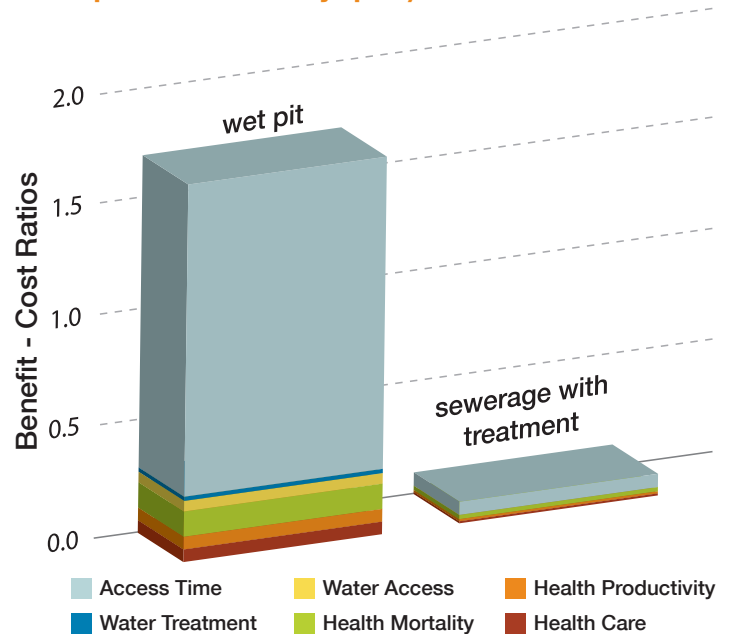
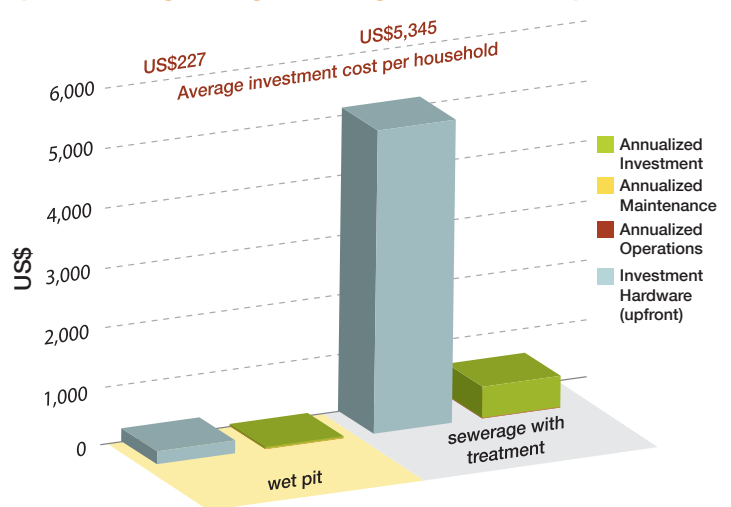


Figure 5. Annual Costs per Household in Urban Site (2009 prices, using average exchange rate with US\$)



hence largely ineffective. Hence, the Sihanoukville wastewater treatment plant is considered the first of a new series of wastewater treatment plants to deal with Cambodia’s urban waste problem, with more recent investments made in a similar plant in Siem Reap.

The Sihanoukville plant with improved sewerage network has been an expensive undertaking, costing almost US\$5,500 per connected household to construct based on its expected

operating capacity (or US\$544 per year, based on a 20-year lifespan and discount rate of 8 percent). Given that in the years after its construction, only around 20 percent of the households have connected (which requires a one-off connection fee and a monthly wastewater fee), the actual construction cost per household of US\$27,500 is five times the planned cost per household. This translates to a benefit-cost ratio of 0.14 under full capacity use, and 0.03 under actual capacity use. However, the value of the improved environment and seawater quality to residents and tourists, and the associated revenues from tourism—which are potentially substantial—have not been included in the calculation (see Box 1).

KEY FINDINGS AND RECOMMENDATIONS

This study finds that all rural sanitation interventions have benefits that exceed costs, when compared with “no sanitation facility.” In urban areas, costs of off-site options are not affordable for the majority of the population, and have a very low (unfavorable) benefit-cost ratio. Based on these findings, three major recommendations for decision makers and their partner agencies are proposed here:

1. Intensify efforts to provide broad-based, basic sanitation

access for all Cambodians. When implementing programs, special attention should be paid to ensuring the health benefits are captured as well as sustaining coverage (i.e., avoiding return to open defecation) by focusing on collective behavior change. A key to scaling up rural coverage is for communities to achieve total sanitation followed by moving up the sanitation ladder with better latrine structure and design, particularly the slab and underground components, at affordable cost. Triggering community social norms and pressures against open defecation, technical guidance to households, and availability of expertise in latrine construction in the community, are also elements of sustaining coverage.

2. Go beyond basic sanitation provision in urban areas. Decision makers should be aware of the full range of sewage conveyance and treatment options, and their related costs and benefits, in order to avoid investing in expensive technologies that are difficult and costly to sustain. To achieve maximum benefits and efficiencies from the investments, it will be necessary to ensure incentives and sanction so that all households connect and use the systems. In many municipalities, funds could be raised that permit more sus-

BOX 1. SANITATION LINKS TO TOURISM AND ECONOMIC DEVELOPMENT

A separate tourism survey of 334 holiday and business visitors was conducted as part of the study and found that the general sanitation conditions in Cambodia are unfavorable, receiving an average 2.5 rating out of a maximum of 5.0. The worst score was for open water sources (e.g., rivers, beach). On the question of toilet availability in public areas, bus stations and city centers received the worst rating, receiving little more than 2.0 out of a maximum score of 5.0; availability of hand washing facilities received an even lower score. When asked what the major hygiene concerns were, the top answers were unsanitary toilets, tap water, and food safety. One in five (20 percent) of the survey respondents said they had gastro-intestinal problems during their stay, incapacitating the tourist for several days. The amount that they could have spent during those days of illness represents foregone earnings for the tourism industry. Despite the negative assessment of environmental sanitation in Cambodia, more than seven in ten visitors expressed an intention to return to the country. Of 103 tourists who said they had some doubts about returning, 9 percent of respondents blamed poor sanitation as the main reason for not returning, while 25 percent cited poor

sanitation as a contributory reason for their decision not to return.

The study also conducted a business survey included 19 firms around Phnom Penh (six foreign firms, 13 local firms) comprising five travel agencies, two hotels, three restaurants, four drinking water factories, three food producers, and two trading firms. Although sanitation does not have much influence on investment decisions, business people admit that they do take into account the sanitation conditions in the locations of their investment, as this would have some impacts on business, especially for food producers and restaurants. Water quality in rivers and toilets in public places received poor ratings. Workforce health and a pleasant environment for staff are considered very important for business, especially travel agencies. Businesses pay to treat their water on-site, and also to clean up the environment around the business site. All firms said polluted environment around sales offices would have a bad influence on their business operation, both for customers and employees. When asked whether they plan to move to another location, around half of the firms wish to move to new and cleaner locations.

tained and quality services, which better capture the full environmental and health benefits and respond to the population's wish for a clean, livable environment (see Box 1).

- Promote evidence-based sanitation decision making. Variations in economic performance of options and delivery approaches suggests a careful consideration of site conditions is needed to select the most appropriate sanitation option and delivery approach. Approaches that involve the entire community, such as CLTS, have low hardware costs and although these are not subsidized from the outside, this approach potentially achieves higher coverage rates at low cost. In contrast, more expensive but long-lasting latrine options with high hardware subsidy will not achieve high nationwide sanitation coverage and do not

fundamentally target community-wide behavior change. Therefore, relevant evidence to collect includes assessment of approach, quality of process, and the inclusiveness, scale, and speed of getting onto the sanitation ladder and then moving up with appropriate sanitation options. Further evidence is needed on the approaches—and their implied costs—that help sustain open defecation-free status after initial triggering, and integrate these findings into future cost-benefit studies. 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.



Economic assessment of sanitation interventions in Cambodia. Heng, S., Poch, K., Hutton, G., Kov, P. World Bank, Water and Sanitation Program. 2011.

⁵The 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 those reported by the WHO/UNICEF Joint Monitoring Programme.

⁶Economic impacts of sanitation in Cambodia. Kov, P., Sok, H., Roth, S., Chhoeun, K., Hutton, G. World Bank, Water and Sanitation Program. 2008. Available for download at 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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