Economic Assessment of Sanitation Interventions in the Philippines

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

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wsp
water and sanitation program

The Water and Sanitation Program is a multi-donor partnership administered by the World Bank to support poor people in obtaining affordable, safe, and sustainable access to water and sanitation services.

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Executive Summary

A. Introduction

The Philippines is well on its way to achieving the sanitation target, which is part of a combined drinking water and sanitation target within the Millennium Development Goal (MDG) 7. As of 2008, about 76% of its population had access to improved sanitation facilities (JMP 2010). This is nearly 18 percentage points higher than the estimates for 1990 and 3 percentage points short of the MDG target for sanitation.

Despite its progress, there are still a number of concerns regarding the overall state of sanitation in the country. First, the Joint Monitoring Programme (JMP) estimates suggest that close to 7 million people in the country still practice open defecation. Another 15 million people do not have access to improved sanitation facilities. Second, while differences have narrowed over time, there continues to be a wide divide in access to improved sanitation across the regions. Households in rural areas continue to have lower access to improved sanitation compared to those living in urban areas. Households in the island of Mindanao also have significantly lower access to sanitation compared to those living in other parts of the country. This is most noticeable in the Autonomous Region of Muslim Mindanao (ARMM), where access to improved sanitation in 2006 was below the national average in 1990. Third, there is an urgent need for improvement in the management of human excreta, even for households that have access to improved sanitation facilities. The Water and Sanitation Program's (WSP) project Sustainable Sanitation for East Asia (SuSEA 2008) reported that the design of most septic tanks does not conform to the standards prescribed by the Department of Health (DOH). Septic tank management, especially desludging, also requires improvement. This study revealed that about half of the respondents with their own septic tanks have not emptied their facilities in the past five years, if ever. Finally, the costs of poor sanitation remain high. The previous study conducted under WSP's Economics of Sanitation Initiative (ESI) showed that the economic costs of poor sanitation in the Philippines amount to PhP77.8 billion or US$1.4 billion at 2005 prices (Rodriguez et al. 2008). About 71% of these costs are accounted for by health-related losses.

B. Study Aims and Methods

This study aims to generate evidence on the costs and benefits of sanitation improvements in different contexts in the Philippines. Conducted with a view towards identifying the most economically efficient options under different conditions, it aims to contribute to the decision making processes of government, donor agencies, non-governmental organizations (NGOs) and other institutions.

The study quantified the costs and benefits associated with various sanitation options in different study sites. The benefits included the impacts on health, water sources and treatment, access time, and the reuse of human excreta. The costs included capital or investment costs and the recurrent costs associated with various sanitation options. The costs and benefits of the sanitation options were synthesized using standard indicators of economic efficiency. These indicators included the benefit-cost ratio, cost-effectiveness ratio, net present value, internal rate of the return, and payback period of sanitation options. Cost-effectiveness ratios — cost per disability life year averted, cost per disease case averted, cost per death averted — were also calculated.

C. Data Sources and Study Sites

The study used primary and secondary sources of data in the analysis. Primary data were obtained from surveys in six sites that have recently been the focus of intensified sanitation improvement efforts — Alabel, Bayawan, Dagupan, San Fernando (coastal and upland regions) and Taguig. The instruments for the primary data collection included focus group discussions (FGD) and surveys on households, markets, physical locations and health institutions. A tour-

ist survey of departing visitors was conducted at the Ninoy Aquino International Airport. A survey of businesses in Metro Manila and Southern Luzon was also implemented. Secondary evidence was sourced from international and local published literature, project and government documents and surveys, and data from various institutions. The opinions of experts in the local sanitation sector were also solicited to validate and fill in knowledge gaps from primary or secondary sources.

Table A shows the sanitation interventions that were examined in each of the study sites. In the analysis, the benefits from the interventions were compared against a baseline of open defecation, as well as comparing different rungs on the sanitation "ladder."

D. Main Economic Analysis Results

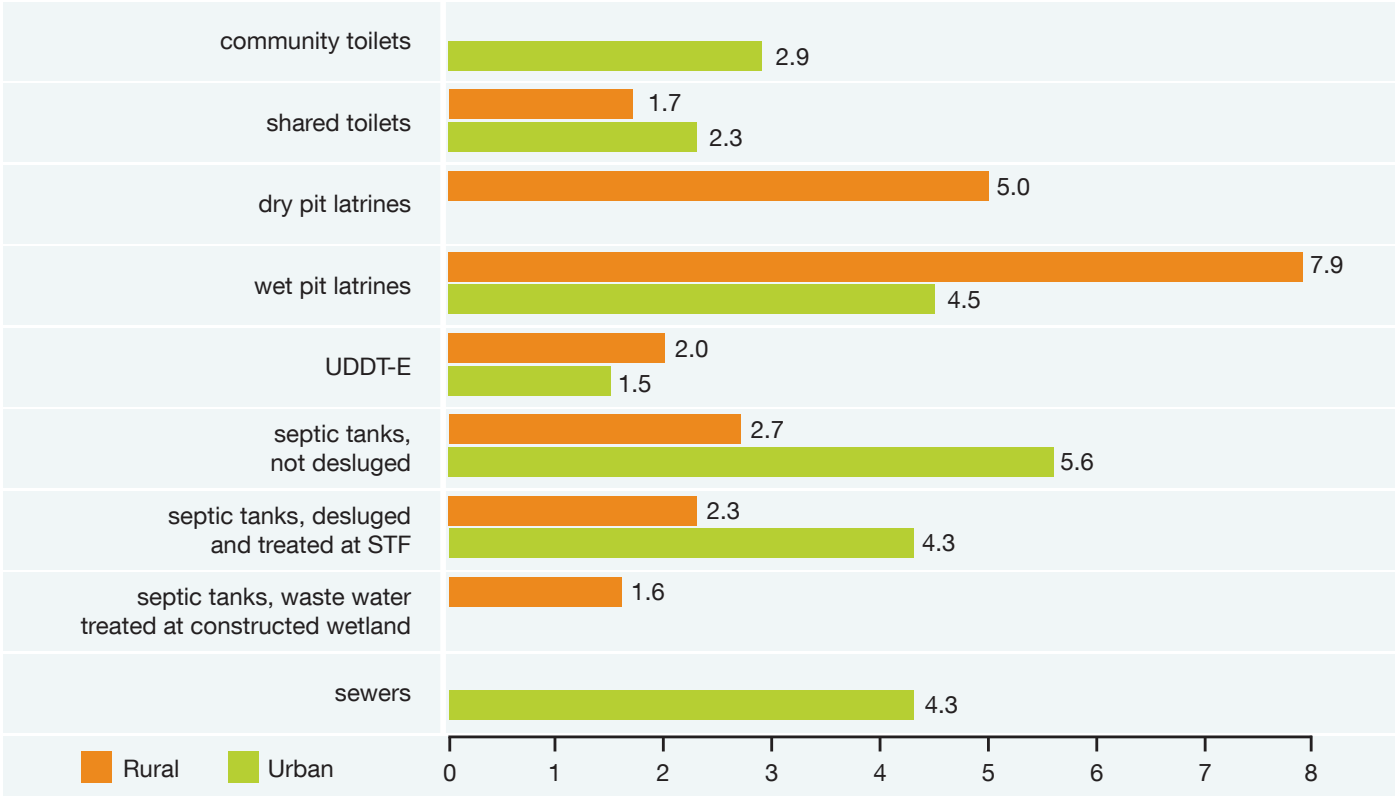
The key finding of the study is that there are net benefits associated with all of the interventions evaluated. The benefit-cost ratios were greater than one for all interventions (Figure A), suggesting that the monetized gains exceed every peso that is spent for the intervention. In rural areas, the most favorable results were found for wet and dry pit latrines. On the other hand, "toilets that flush to septic tanks" had the most favorable indicators for urban areas. Toilets with access to wastewater facilities and shared toilets had the least favorable indicators for rural areas. Urine Diversion-Dehydration Toilet (EcoSan), or UDDT-E, had the lowest benefit-cost ratios in urban areas.

The high benefit-cost ratio for wet and dry pit latrines in rural sites is due to their relatively low investment and recurrent costs. The most favorable benefit-cost ratios in urban areas are for wet pit latrines and toilets with access to septic tanks (not desludged). In the case of wet pit latrines, the reason for the favorable estimate is its low investment costs. On the other hand, the relatively high benefit-cost ratios for toilets that flush to septic tanks are due to the high benefits. In particular, the values are largely affected by the estimates for Taguig, where incomes are higher than the other study sites. Such large incomes tend to raise the gains from averted opportunity costs associated with improved health and reduced travel time. The estimates from the introduction of wastewater and sludge treatment to toilets that flush to septic tanks should be interpreted with care. The main reason is that the benefits associated with treatment, especially its implications for the environment and reuse, were not quantified in the study. The potential links of an improved

TABLE A: SANITATION OPTIONS COMPARED IN THE STUDY SITES

	Alabel	Bayawan	Dagupan	San Fernando Coastal	San Fernando Upland	Taguig
	Rural	Rural	Urban	Urban	Rural	Urban
Open defecation	●	●	●	●	●	●
Community/public toilets			●	●		
Shared toilets			●		●	
Private dry latrines: simple dry pits					●	
Private dry latrines: urine diversion - dehydration toilets (EcoSan) or UDDT-E				●	●	
Private wet latrines (improved)	●		●	●		
Septic tank: Not-watertight and/or dumping of sludge and/or effluent flow directly to waterway/body	●	●				●
Septic tank: Improved, with sludge removal and septage treatment facility	●					●
Septic tank: Improved, with sludge removal and constructed wetland		●				
Sewage/Sewerage: Decentralized conventional treatment						●

FIGURE A: BENEFIT-COST RATIOS IN THE RURAL AND URBAN SITES, IDEAL SETTING[1]



Note: STF = septage treatment facility; UDDT-E = urine-diversion dehydration toilet (EcoSan)
[1] Dry pit latrines and toilets with access to wastewater treatment at a constructed wetland were not examined for urban sites. Community toilets, wet pit latrines and toilets with access to sewers were not examined for rural sites.

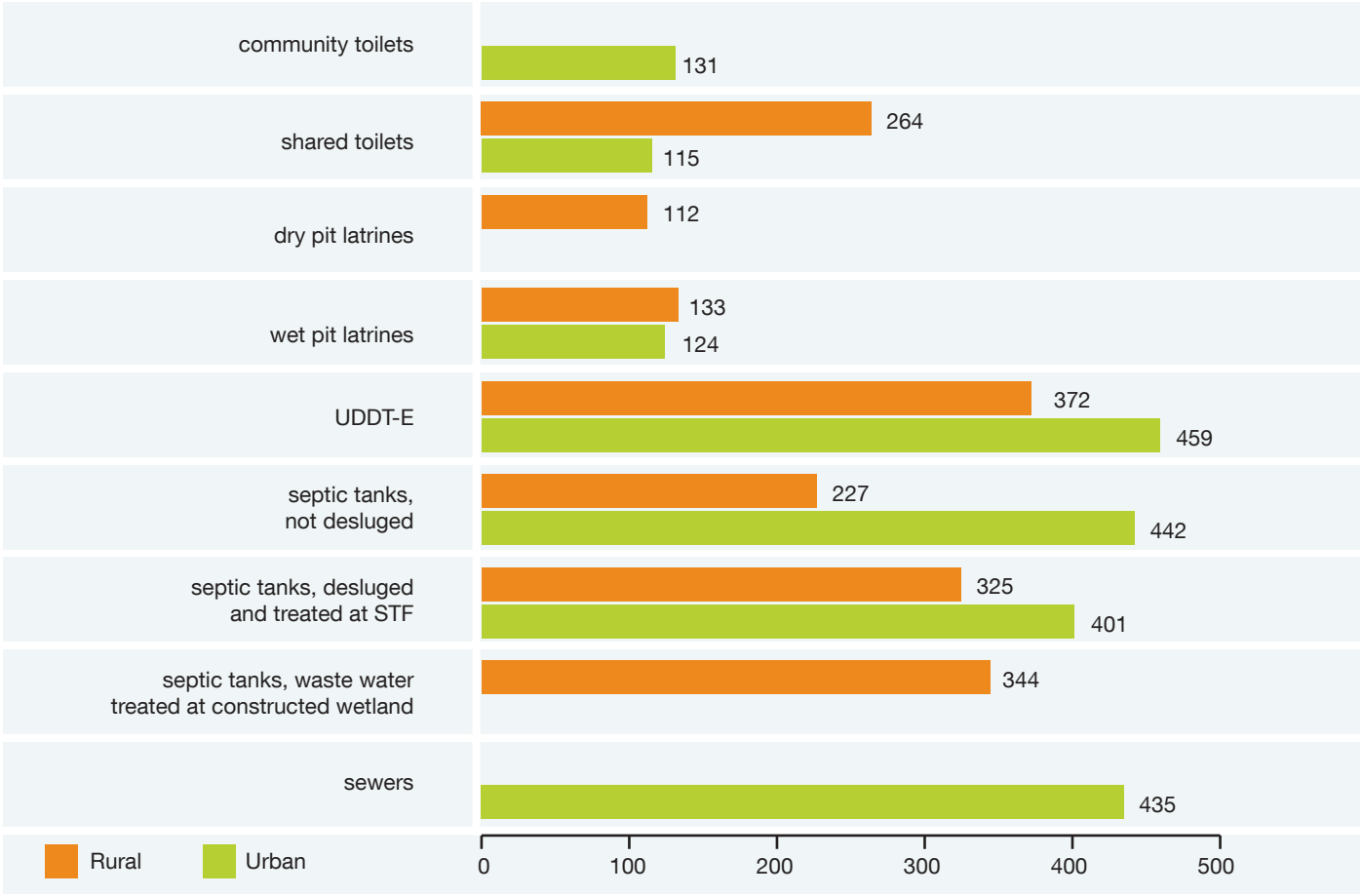
environment to business costs and tourism could also raise the benefit-cost ratios for such facilities.

The study also estimated cost-effectiveness indicators which are mainly focused on the health impacts of the sanitation options. Figure B summarizes the key results using the costs for each disability life year (DALY) averted from each option. It indicates that the lowest costs per health unit gained were found for dry pit latrines and wet pit latrines in rural and urban areas, respectively. It also shows that costs per DALY averted are lower for toilets with access to septic tanks compared to UDDT-E facilities. In the case of urban households, cost per DALY falls further, relative to toilets with access to septic tanks that are not desludged, with the introduction of off-site treatment facilities.

The implications of the results above are as follows: First, it pays to invest in sanitation improvements. All interventions for all the sites had gains that exceed investment and recurrent costs. Second, low-cost sanitation options, i.e., wet and dry pit latrines, deliver relatively high economic benefits for every peso that is invested in such facilities. This result is especially important in situations where funds for sanitation improvements are scarce. Third, the cost effectiveness ratios of toilets in urban areas that are subject to off-site treatment are lower than toilets with access to septic tanks which are not desludged. This finding strengthens the case for off-site treatment in urban areas. Fourth, the results reinforce the widely held belief that the viability of a sanitation option is sensitive to site-specific conditions. This is partially supported by the differences in the efficiency indicators across rural and urban areas. The differences are even more pronounced in the study sites. For example, the benefit-cost ratio for septic tanks in Alabel is 2.8 versus 5.6 in Taguig. The difference can also be partially accounted for by the higher income level of Taguig residents which tends to raise the opportunity costs from poor sanitation.

The results presented above were conducted under ideal settings; i.e., these do not account for actual conditions and practices in the study sites. Accounting for these factors led to efficiency indicators that were slightly less favorable

FIGURE B: COST PER DISABILITY LIFE YEAR AVERTED IN RURAL AND URBAN SITES, IDEAL SETTING, 000 PESOS[1]

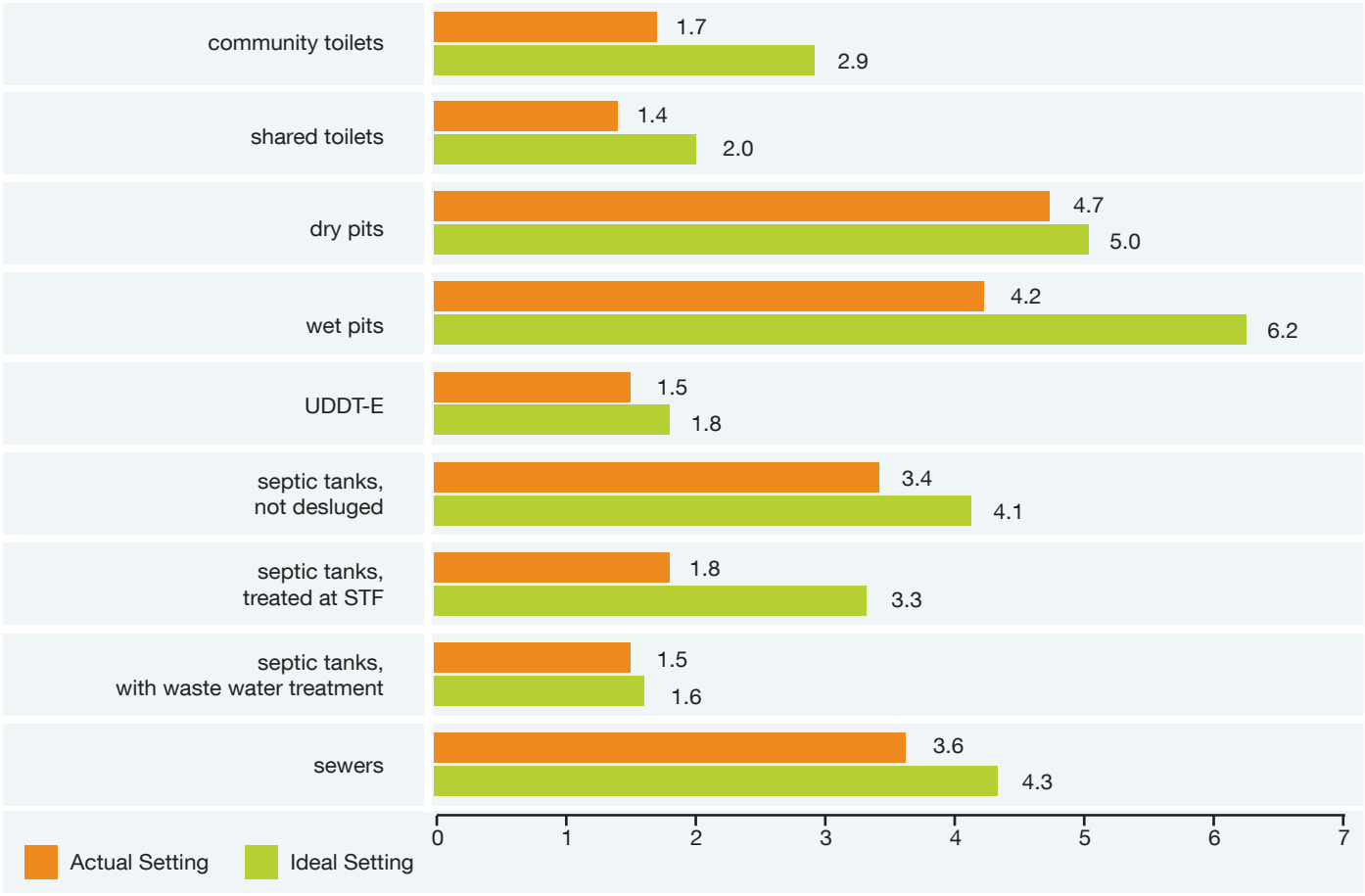


[1] See notes to Figure A.

than those presented earlier (Figure C). The result is based on findings in sites that (a) not all household members use improved toilets regularly, (b) not all toilet facilities fully isolate water from human excreta, (c) not all households recycle human waste, (d) not all households with improved facilities are connected to a treatment facility and (e) households continue to practice boiling water despite having access to improved sanitation (suggests that water in the community is still perceived to be unsafe despite the sanitation intervention). With its benefit-cost ratio under actual settings being less than half of its value under ideal settings, the most noticeable decline was for septic tanks that are desludged at septage treatment facilities (STFs). This is due to the under-utilization of the STF in Alabel, where the benefit-cost ratio under actual conditions was found to be less than one.

It is important to note some limitations of the analysis. First, there is no single site in which both UDDT-E facilities and toilets that flush to septic tanks were evaluated (i.e., in the same location). This compromises the comparability of the results between the two sets of interventions because of inter-site variations. Second, the quantitative analysis did not include a number of benefits associated with improved sanitation. These include the impacts on the environment, tourism, business, and intangible aspects (comfort, prestige, privacy, convenience and safety). While these impacts were analyzed qualitatively, their potential impacts on the quantitative estimates should not be ignored. The reasons are as follows: First, the importance of privacy, convenience and safety are likely to raise the benefits of toilets that are located within or very near the house. Hence, it is likely to raise the benefit-cost ratios of toilets that have access to septic tanks relative to dry pits, wet pits, shared toilets and community toilets. Similarly, the ability to quantify the benefits associated with comfort and prestige are likely to raise the net gains associated with toilets that flush to septic tanks. Third, the benefit-cost ratios associated with toilets that have ac-

FIGURE C: BENEFIT-COST RATIOS UNDER IDEAL AND ACTUAL SETTINGS, BY INTERVENTION[1]



[1] Represents simple averages for the sites.

cess to wastewater and treatment facilities are likely to be higher if their environmental benefits are fully accounted for in the analysis. Such estimates are also likely to become more favorable if the cleaner environments translate to higher tourism revenues and lower business costs.

E. Disaggregated Results

The succeeding paragraphs discuss the other results of the study. Sub-sections E1 to E5 summarize the key inputs to the cost-benefit analysis. Sub-sections E6 to E9 present the results from the qualitative analysis.

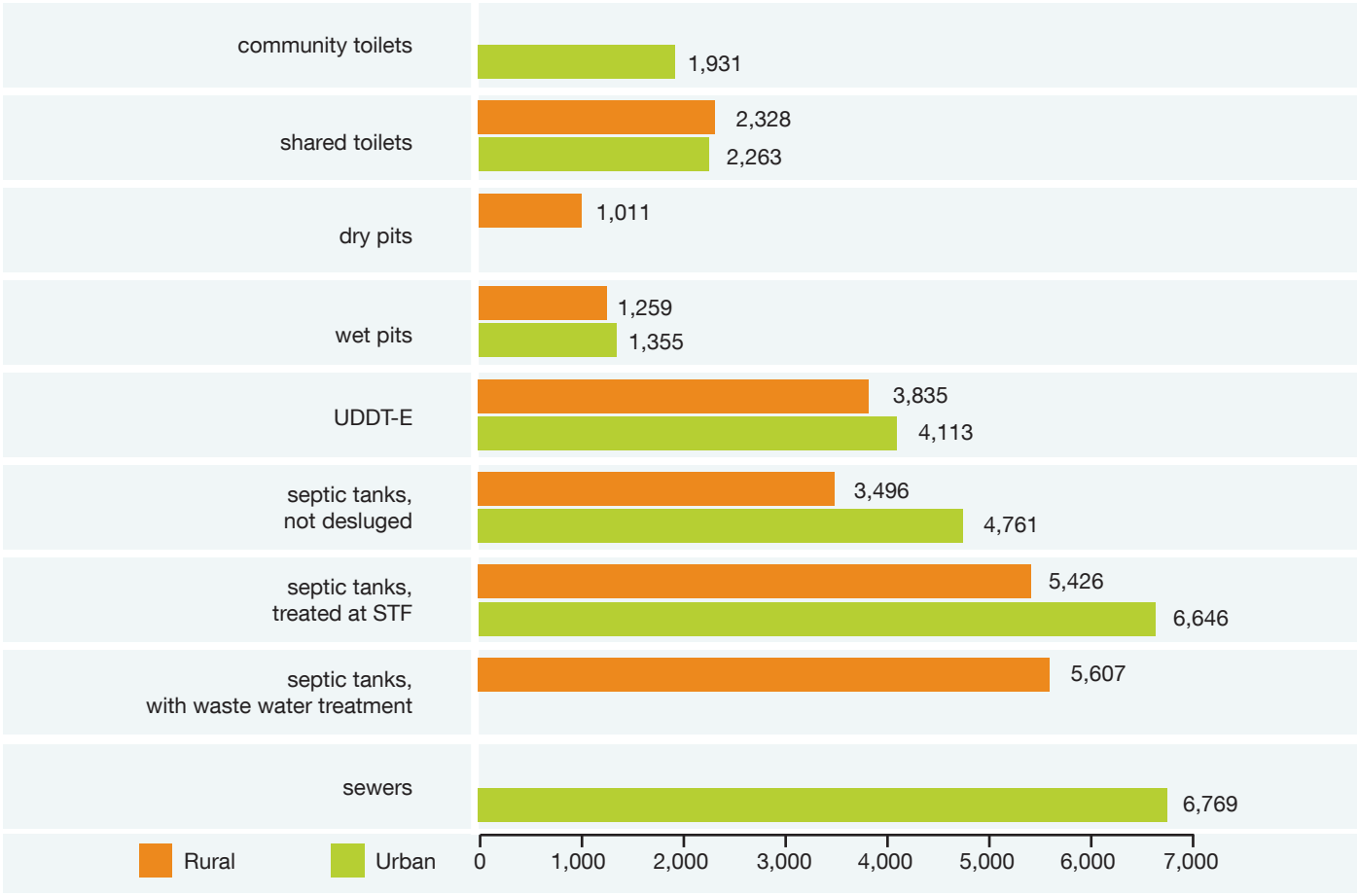
E1. COSTS OF INTERVENTIONS

Data on investment and recurrent costs per household were compiled and estimated for each intervention. Recurrent costs are annual expenditures for the operation and maintenance of the facilities. Investment costs, which were annualized for comparability across interventions and with recurrent cost, represent the expenses for constructing and installing the facilities. For toilets that have access to treatment facilities (wastewater treatment, STF, and sewers), the costs combine the expenses incurred for the toilet and the treatment facilities.

Figure D shows the estimated annual costs per household of various sanitation options, with both investment and recurrent costs included. It indicates a wide divergence in the costs between the various options, ranging from PhP1,011 (US$23) for dry pits in rural areas to PhP6,769 (US$152) for toilets with access to sewers in urban areas.[1] There are also differences in costs in the rural and urban sites for similar types of interventions. For example, the costs of UDDT-E facilities in rural areas were found to be lower than their counterparts in urban areas. Cost differences for a particular

[1] Unless otherwise noted, all peso values are converted to US$ using 2008 average exchange rate of US$1= PhP44.48.

FIGURE D: ANNUAL ECONOMIC COST PER HOUSEHOLD OF SANITATION OPTIONS, PESOS (2008)[1]



[1] See notes in Figure A.

technology are accounted for by variations in the materials used for construction and prices across the sites. Annualized investment costs accounted for a larger proportion of the total costs in all interventions. Its contribution to total costs is as follows: community toilets (59%), shared toilets (73% in urban sites and 68% in rural sites), dry pits (93%), wet pits (67% in urban sites and 75% in rural sites), UDDT-E (80% in urban sites and 78% in rural sites), toilets with access to septic tanks that are not desludged (78% in urban sites and 77% in rural sites), toilets where septic tanks are desludged at STFs (79% in urban sites and 66% in rural sites), toilets with access to a constructed wetland (71%) and toilets with access to sewers (81%).

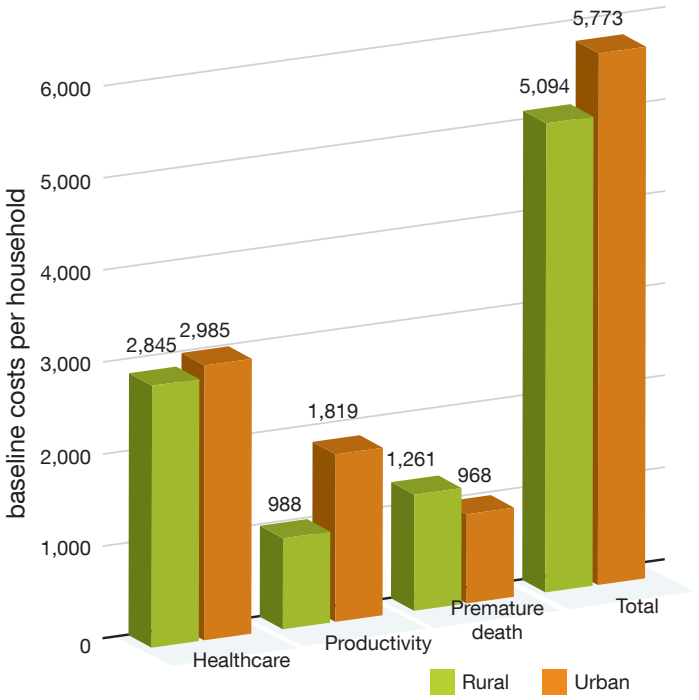
With a few notable exceptions, households generally financed the construction of toilet facilities themselves. Exceptions include the construction of the community toilets in Dagupan, UDDT-E facilities in San Fernando, and private toilets in the Gawad Kalinga Village in Bayawan, where local government units partly or wholly financed the construction of the toilet facilities. For some of the UDDT-E facilities in San Fernando (Fishermen's village) and the Gawad Kalinga village, the toilets were part of a housing project which will eventually be paid by the households through monthly amortizations for the houses. Government and the private sector had a major role in financing the construction of all treatment facilities. Such was the case for the STFs in Alabel (government) and Taguig (Manila Water), the constructed wetland in Bayawan (government), and the sewers in Taguig (Manila Water). However, households are eventually expected to pay for most of these facilities through various user fees.

E2. HEALTH BENEFITS

Health benefits are based on the averted costs of diseases associated with poor sanitation. The diseases included in the study were diarrhea, helminthes, and malnutrition-related diseases like malaria, acute lower respiratory infection

(ALRI), and measles. Using information from the international literature and survey sites, the study estimated the costs in terms of health care (treatment and medication), productivity (lost productive time for sick persons and their carers) and premature death (valued using the human capital approach). As a whole, annual health-related costs were estimated to be in excess of PhP5,000 (US$112) per household in the rural and urban sites (Figure E). Despite higher estimated mortality in the rural sites, total health-related costs per household were higher in the urban sites. This is caused by higher productivity losses which are in turn explained by higher incomes in urban sites. Most of the health-related costs were attributed to diarrheal disease because of its relatively high incidence rate. Children under the age of five years also had the highest costs among the different age groups since they are most vulnerable to diarrheal diseases. In the rural sites, for example, about 73% of the health costs per household were due to diarrhea among children under the age of five years.

FIGURE E: ANNUAL HEALTH COSTS PER HOUSEHOLD IN RURAL AND URBAN SITES, PESOS



Averted health costs in the study depended on the sanitation option that was available to the household before and after the intervention. For rural households that initially practiced open defecation, the projected gain from an intervention that provides access to basic improved sanitation facilities was slightly more than PhP2,000 (US$45) per household, or about 40% of the costs. For urban households that already have access to basic improved sanitation, the provision of access to treatment facilities was estimated to cause benefits that were approximately 20% of the baseline health costs.

E3. WATER BENEFITS

Water benefits were based on the premise that poor sanitation contributes to water pollution. Pollution in turn alters the behavior of households by forcing them to obtain water from expensive sources or distant sources and practice water treatment. The costs of obtaining drinking water go beyond financial costs (e.g., the price paid for bottled water); it also includes hauling costs associated with traveling to farther places for water. The household survey provided some support to the asserted link between pollution and household behavior. The results show that about 38% of the households in urban sites used piped water sources because of its quality. Another 17% of the respondents mentioned safety. On the other hand, about 66% of the households that purchased bottled water cited safety as the reason for their choice of the water source. However, water treatment did not appear to be a common practice in the sites. Only about one in five respondents said that they treated drinking water. Of these, nearly three in four respondents used boiling as a method for treating water.

Water benefits were calculated by assuming that households will seek less expensive water sources (both financial and hauling), practice water treatment less, or use cheaper methods for water treatment. However, given the findings stated in the previous paragraph, the estimated changes were not large. The result was a projected annual savings per household of PhP279 (US$6) for more convenient water sources that can be used for drinking water, and PhP65 (US$1.5) for fewer requirements for water treatment.

E4. ACCESS TIME SAVINGS

Households that practice open defecation or only have access to community and shared toilets incur costs not experienced by those who have access to private toilets. The sources of these costs are time spent traveling to a place for defecation or waiting in a queue before using the toilet in the case of those who use community and shared toilets. Such costs are also incurred by people who accompany chil-

dren to a place of defecation. The survey confirmed that households in the sites recognize the value of the time that is lost from accessing toilets. Almost all the respondents who do not have access to private latrines said that proximity is an important characteristic of toilets (94%). An equally large proportion of households who already have access to private toilets also claimed satisfaction with the proximity of their current facilities.

The amount of time that is lost in accessing toilets was found to be significant. From the household survey, about 20 days per year are lost for the average household. This translated to annual costs of about PhP1,700 (US$38) per household in the rural and urban sites. While the estimated losses from rural and urban sites are very close to each other, the sources of these costs are quite different. Annual time losses in rural areas (32 days/household) were found to be three times as much as in urban areas. However, incomes, and therefore opportunity costs, in urban areas are much higher than in rural areas. It is also important to note that the estimates are conservative as these only cover losses associated with time spent accessing place of defecation, and not urination. The extent to which omission understates the true losses is difficult to determine because there are no existing estimates of the time spent searching for a place to urinate. However, the findings from the FGD, where participants claimed urinating up to seven times a day, suggest that the additional losses could be significant.

E5. EXCRETA REUSE BENEFITS

Benefits from reuse are based on the potential savings or earnings from using human excreta and/or urine as inputs for the production of fertilizer or energy (biogas). With an exclusive focus on fertilizer, the study found that only UDDT-E users in San Fernando reuse human waste. About a third of these respondents reuse waste, with an average household saving on fertilizer that is slightly more than PhP500 (US$11) per year. There are three other points that are worth noting. First, the processed fertilizer was only meant for home use and was not sold in the market. Second, reuse was more prevalent in upland areas. In the upland region of San Fernando, 87% of the respondents said they reuse human waste as fertilizer. This proportion is about four times as much as those who lived in the coastal areas. Third, in the coastal regions, the local government collects the human waste from the UDDT-E facilities. The collected waste is used as fertilizer for a botanical garden or the green zone of a landfill site.

E6. INTANGIBLE BENEFITS OF SANITATION OPTIONS

Intangibles are determinants of personal welfare such as comfort, privacy, convenience, safety, status and prestige. Some of the key findings on the intangible aspects of sanitation are as follows: First, the FGDs found that the respondents have a common desire for cleaner surroundings. The respondents also said that the absence of toilets contributed to the practice of open defecation in their areas. Second, the respondents felt a sense of shame associated with open defecation. Several respondents said they covered their faces, either with their hands or a piece of cloth, to avoid being recognized by their neighbors whenever they defecate in the open. In contrast, households with private toilets reported a feeling of pride associated with owning such a facility. The source of this pride varies from one group to the next. Some said that owning a private toilet no longer required them to ask permission from their neighbors in order to use the toilets. For others, having a private toilet was viewed as an improvement in their social status in the community. Those who previously did not have toilets also expressed greater confidence in inviting guests to their homes now that they owned a private toilet. Third, about three out of four respondents in the household survey said that their greatest concern was the safety of their children. This is consistent with the finding in the FGD that respondents prefer a toilet that is near the house. The study also found that the preference for proximity was also based on its potential to save time and create a feeling of safety for women at night or when it is raining. While valuing the intangibles is difficult, the household survey asked the respondents about their willingness to pay for an improved toilet. The average value provided by the respondents was about PhP2,500 (US$56), an amount capable of purchasing or constructing a dry pit latrine, but much less than the value of their preferred sanitation option. Most of the respondents (78%) expressed preference for a toilet that is connected to a septic tank.

E7. EXTERNAL ENVIRONMENT

The external environment refers to the area outside of the toilet itself and is not related to accessing toilets. It excludes water pollution, which was covered in a separate component of the study. One objective here is to get a sense of

how the respondents perceived the overall state of sanitation in their community. In this regard, the respondents gave the impression that their respective environments were in need of improvement, based on an average rating of less than 3 out of a maximum 5 (very good) for various aspects of sanitation. The lowest ratings were given to smell from sewage/defecation/waste (1.9), the presence of insects (2.1) and rodents around uncollected waste (2.0), and dust and dirt in shops/markets/restaurants (2.1).

The survey found that households which have access to improved sanitation also contributed to the pollution of their local communities. Apart from the poor septic tank management, the survey found that slightly more than a tenth of households with septic tanks still practiced open defecation. About a third of these households also urinate in the open and close to one in five households do not properly dispose of the stools of their children. There were also indications that the design and management of pit latrines require improvement. Twenty four out of 30 respondents admitted that their pit latrines overflowed "sometimes." In addition, 18 out of 30 respondents said that their pits have experienced seepage or flooding. Many toilets also had insect problems.

E8. TOURISM BENEFITS

Decisions of tourists to visit or return to a country might be sensitive to sanitation conditions — e.g., quality of water resources, quality of the environment, food safety, availability of toilets in public places, and health risks, etc. While such impacts were not directly quantified, the study conducted a survey of foreign visitors who were about to leave the country. The focus of the exercise was to get impressions of how sanitation in the Philippines affected the perceptions of tourists and the overall quality of their stay in the country. The results could be significant to the Philippines in light of the importance of tourist revenues to the economy.

The survey found that visitors enjoyed their stay in the Philippines as a whole. This was particularly the case for visits to beaches and forests or natural areas. However, the respondents assessed that general sanitation conditions can still stand some improvement, especially for the capital (Metro Manila). On the question of toilet availability, only one in ten visitors said that they could not find a toilet at a time of need.

A quarter of the survey respondents said they had gastrointestinal problems during their stay. On average, affected visitors were incapacitated for nearly three days but felt the symptoms for slightly more than four days. This is a cost to tourism. The amount that they could have spent during those days of illness less the amount they spent for treatment (about US$18 per tourist) represents foregone earnings for the tourism industry.

Despite incidence of illness, nearly nine in ten visitors expressed an intention to return to the country. Furthermore, a significant proportion (82%) said that they will recommend the country as a tourist destination to friends.

E9. BUSINESS BENEFITS

Sanitation affects the business environment and costs of doing business, especially of those that are very sensitive to water quality. To get an impression of the perceptions of businessmen, a survey was conducted of owners/managers of selected firms that are mostly located around Laguna Lake. Most of the respondents confirmed that the availability of clean water is important to their business. This is especially the case for resort owners, food processing industries, and fish pond/cage owners. On the other hand, owners of travel agencies said that sanitation as whole matters to their business because it affects the desired destinations of their clients.

The respondents considered a pleasant environment, which includes favorable sanitation conditions, as very important to their business. This was supported by their concerns over the poor quality of the rivers that flow into Laguna Lake. About a third of the respondents also said that they would expand their operations if sanitation conditions improved considerably.

It is important to note that the links between sanitation and tourism and sanitation and business are not mutually exclusive. For example, in 2009, a typhoid outbreak in Calamba, Laguna hurt resort owners in the area who were heavily dependent on domestic and foreign tourists.[2]

[2] Laguna Lake is surrounded by Laguna (east, west and south), Rizal (north to northwest) and Metro Manila (northwest). Water in the lake comes from catchment areas and 21 major tributaries. Some of the 21 main tributaries are Pagsanjan river, Sta. Cruz river, Balanak river, Marikina river, and Mangangate river.

F. Recommendations

The major finding of this study is that all interventions evaluated have benefits that exceed costs, when compared with no sanitation facility or open defecation. The high net benefits from low-cost sanitation options, such as wet pit latrines in urban areas and dry pit latrines in rural areas, also suggest that these technologies should not be ignored in any plans for sanitation improvements, especially in situations where funds are scarce. Net benefits from sanitation interventions also vary considerably from one site to the next. This suggests a careful consideration of site conditions before interventions are implemented.

Based on the findings, the study recommends the following:

1. Intensify efforts to increase access to improved sanitation. Because many people who do not have access to improved sanitation are poor, such an initiative will also require the active participation of government, donor agencies, and other institutions. This is also essential for projects that require large initial investments, such as off-site treatment systems and sewers.
2. Resource constraints are likely to require a clear definition of priorities. While important, economic considerations measured in this study such as intervention costs and efficiency are not the only criteria for choosing technologies and program approaches. Intangible impacts, socio-cultural issues, availaibility of suppliers, financing, and household willingness to pay are all important when making the decision on which technology to choose and how to deliver or implement it.
3. In providing access to improved sanitation, decision makers should be cognizant of initial conditions in the project sites. The reason is that there is no single type of intervention that is economically efficient in all settings. Hence, understanding the conditions in project sites is likely to increase the chances of success for the intervention.
4. Intensifying knowledge and information campaigns on personal hygiene, maintenance of sanitation facilities and desludging of septic tanks are needed. This effort should not be limited to households, but must be expanded to capacity building in local government units and sanitation suppliers.

This study is an initial attempt to generate an economic evidence base in the Philippines and examine ways in which evidence can be practically applied in sanitation decision making. A handful of projects and sites were selected for the analysis; hence it does not provide an exhaustive assessment of the economics of sanitation in the Philippines. Several data inputs were based on non-site-specific data, and there was limited quantitiative assessment and monetization of the benefits for some impacts. Therefore, further research is needed on the potential impacts of poor sanitation and on the efficiency of sanitation interventions. Future research needs to include the following:

1. Generating reliable site-specific and age-group-specific incidence and mortality rates for sanitation-related diseases such as diarrhea, helminthes, etc. Value of statistical life estimates associated with poor sanitation will also enhance estimates on the value of averting premature death.
2. Establishing rigorous and site-specific quantitative links between sanitation and (a) disease incidence (attribution factors), (b) tourism, (c) water use and access, (d) water quality and (e) business activity.
3. Generating more reliable estimates of the potential benefits from the reuse of human waste as fertilizer and biogas. This includes households (UDDT-E) and the reuse of wastewater and sludge treated in STFs.
4. Establishing stronger evidence on the performance of projects in actual settings. This also includes recently introduced demand-driven programs in the Philippines such as Community-Led Total Sanitation (CLTS), and the evaluation of various implementation and financial approaches.
5. Further attempts are needed to quantify the intangible benefits (e.g., comfort, prestige, privacy, etc) and environmental benefits of improved sanitation, and the importance of these benefits in household or community willingness to pay for sanitation.

Foreword

In its recognition of sanitation as a key aspect of human development, target 10 of the Millennium Development Goal 7 includes access to safe sanitation: "to reduce by half between 1990 and 2015 the proportion of people without access to improved sanitation." This reflects the fact that access to improved sanitation is a basic need: at home as well as at the workplace or school, people appreciate and value a clean, safe, private and convenient place to urinate and defecate. Good sanitation also contributes importantly to achieving other development goals such as child mortality reduction, school enrollment, nutritional status, gender equality, clean drinking water, environmental sustainability and quality of life of slum dwellers.

Despite its recognized importance, sanitation continues to lose ground to other development targets when it comes to priority setting by governments, households, the private sector and donors. This fact is hardly surprising given that sanitation remains a largely taboo subject, neither is it an "attractive" subject for media or politicians to promote as a worthy cause. Furthermore, limited data exist on the tangible development benefits for decision makers to justify making sanitation a priority in government or private spending plans.

Based on this premise, the World Bank's Water and Sanitation Program (WSP) in East Asia and the Pacific region is leading the "Economics of Sanitation Initiative" (ESI) to compile existing evidence and to generate new evidence on socio-economic aspects of sanitation. The aim of ESI is to assist decision makers at different levels to make informed choices on sanitation policies and resource allocations.

Phase 1 of the Economics of Sanitation Initiative in 2007-08 conducted and published a "sanitation impact" study, which estimated the economic and social impacts of unimproved sanitation on the populations and economies of the Philippines and other countries of Southeast Asia. This study showed that the economic impacts of poor sanitation are US$1.4 billion per year for the Philippines, or US$16.8 per capita. This is equivalent to 1.5% of the annual GDP. These and other results were disseminated widely to national policy makers, sector partners, and decentralized levels of the Philippines.

The current volume reports the second major activity of ESI, which examines in greater depth the costs and benefits of specific sanitation interventions in a range of field settings in the Philippines. The purpose is to provide information to decision makers on the impact of their decisions relating to sanitation — to understand the costs and

benefits of improved sanitation in selected rural and urban locations, as well as to enable a better understanding of the overall national level impacts of improving sanitation coverage in the Philippines. On the cost side, decision makers and stakeholders need to understand more about the timing and size of costs (e.g., investment, operation, maintenance), as well as financial versus non-financial costs, in order to make the appropriate investment decision that increases intervention effectiveness and sustainability. On the benefit side, the monetary as well as non-monetary impacts need to be more fully understood in advocating for improved sanitation as well as making the optimal sanitation choice. For cost-benefit estimations, a sample of sites representing different contexts of the Philippines was selected to assess efficiency of sanitation interventions, and thus illustrate the range and sizes of sanitation costs and benefits.

The research under this program is being conducted in Cambodia, China, Indonesia, Lao PDR, the Philippines, and Vietnam. Similar studies are also ongoing in selected South Asian, African and Latin American countries.

While WSP has supported the development of this study, it is an "initiative" in the broadest sense, which includes the active contribution of many people and institutions (see Acknowledgments).

Abbreviations and Acronyms

ADB	Asian Development Bank
ALRI	Acute Lower Respiratory Infection
ARMM	Autonomous Region of Muslim Mindanao
AusAID	Australian Agency for International Development
BCR	Benefit-cost ratio
CAPS	Center for Advanced Philippine Studies
CBA	Cost-benefit analysis
CER	Cost-effectiveness ratio
CLTS	Community-Led Total Sanitation
DALY	Disability-adjusted life-year
DENR	Department of Environment and Natural Resources
DGIS	Directorate General of International Cooperation
DILG	Department of the Interior and Local Government
DOH	Department of Health
DPWH	Department of Public Works and Highways
EAP	East Asia and the Pacific
EcoGov	Environmental Governance Project
EcoSan	Ecological sanitation
ESI	Economics of Sanitation Initiative
FDI	Foreign direct investment
FGD	Focus group discussion

FSSI	Foundation for a Sustainable Society, Inc.
GDP	Gross domestic product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
HH	Household
IRR	Internal rate of return
ISSUE	Integrated Support for Sustainable Urban Environment
JMP	Joint Monitoring Programme
LGU	Local government unit
LINAW	Local Initiative for Affordable Wastewater
MDG	Millennium Development Goal
MTSP	Manila Third Sewerage Project
NCR	National Capital Region
NGO	Non-governmental organization
NPV	Net present value
NTU	Nephelometic turbidity units
PAA	Program Approach Analysis
PCWS	Philippine Center for Water and Sanitation
PBP	Payback period
PhP	Philippine Peso
PNSDW	Philippine National Standards for Drinking Water

RWSSP	Rural Water Supply and Sanitation Project
SCOTIA	Sustainable Coastal Tourism in Asia
SIDA	Swedish International Development Cooperation Agency
STF	Septage treatment facility
SuSEA	Sustainable Sanitation for East Asia
UDDT	Urine Diversion-Dehydration Toilet
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VIP	Ventilated improved pit
WB	World Bank
WDDP	Water Districts Development Project
WHO	World Health Organization
WSH	Water, Sanitation and Health
WSP	Water and Sanitation Program
WSSPEP	Water Supply and Sanitation Enhancement Program
WWT	Wastewater treatment

Glossary

Benefit-cost ratio (BCR): the ratio of the present value of the stream of benefits to the present value of the stream of costs. The higher the BCR the more efficient the intervention.

Cost per case averted: the discounted value of the costs for each case of a disease that is avoided because of an intervention.

Cost per DALY averted: the discounted value of the costs for each DALY that is avoided because of an intervention.

Cost per death averted: the discounted value of the costs for each death that is avoided because of an intervention.

Cost-effectiveness ratio (CER): the ratio of the present value of the future costs to the present value of the future health benefits in non-monetary units (cases, deaths, disability-adjusted life-years). The lower the CER the more efficient the intervention.

Disability-Adjusted Life-Year (DALY): a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability. One DALY can be thought of as one lost year of "healthy" life (WHO 2010).

Ecological sanitation (EcoSan): a new paradigm in sanitation that recognizes human excreta and water from households not as waste but as resources that can be recovered, treated where necessary and safely used again. It is based on the systematic implementation of reuse and recycling of nutrients and water as a hygienically safe, closed-loop and holistic alternative to conventional sanitation solutions (GTZ 2009).

Improved sanitation: the use of the following facilities in home compounds: flush/pour-flush to piped sewer system/septic tank/pit latrine, ventilated improved pit (VIP) latrine, pit latrine with slab, or composting toilet (JMP 2008).

Shared sanitation facilities: sanitation facilities of an otherwise acceptable type shared between two or more households. Only facilities that are not shared or not public are considered improved (JMP 2008).

Open defecation: the practice of disposing human feces in fields, forests, bushes, open bodies of water, beaches or other open spaces or disposed of with solid waste (JMP 2008).

Intangible benefits: Benefits of improved sanitation which are difficult to quantify. These include impacts on the quality of life, comfort, security, dignity, personal and cultural preferences, among others.

Internal rate of return (IRR): the discount rate for which the present value of the stream of net benefits is zero. In other words, the discount rate for which the BCR equals unity (1).

Net benefit: the difference between the present value of the stream of benefits and the present value of the stream of costs.

Net present value (NPV): the discounted value of the current and future stream of net benefits from a project.

Payback period (PBB): represents the number of periods (e.g., years) that are necessary to recover the costs incurred for a project.

Sewage: water-borne human or animal wastes removed from residences, buildings, institutions, industrial and commercial establishments together with groundwater, surface water and storm water. Liquid and solid waste carried off in sewers or drains.

Septage: The sludge produced on individual onsite wastewater-disposal systems, principally septic tanks and cesspools. The contents of septic tanks.

Sewerage: A network of pipelines, ditches, channels including pumping stations and force mains, service connections including other devices for the collection, transport, and treatment of sewage.

Strategic sanitation: a concept based on the following principles (Rosenweig and Perez 2002):

- Ensuring that any plan to improve sanitation services is financially sustainable
- Consulting households to understand what sanitation solutions are in use and what expectations people have
- Using a public consultation process with stakeholders to discuss the options
- Including a specific health component to maximize health benefits
- Selecting an appropriate model for managing the provision of sanitation services to ensure sustainability

Unimproved sanitation: the use of the following facilities anywhere: flush/pour flush without isolation or treatment, pit latrine without slab/open pit, bucket, hanging toilet/hanging latrine, use of a public facility or sharing any improved facility, no facilities, bush or field (open defecation) (JMP 2008).

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Summary reports are available for each country, in both English and in the local languages. All country reports are accessible from http://www.wsp.org/pubs/index.asp

Content

List of Tables

List of Figures

List of Annex Tables

Selected Development Indicators for the Philippines

Variables	Value
Population	
Total population (millions, 2008)	90.5
Rural population (%)	49.2[1]
Urban population (%)	50.8[1]
Annual population growth (%) (2000-2007)	2.0
Under 5 population (% of total) (2000)	12.6
Under 5 mortality rate (deaths per 1,000) (2004)	5.1
Female population (% of total) (2008, projected)	49.7
Population below poverty line (%) (2006)	32.9
Economic	
Currency name	Philippine Peso (PhP)
Year of cost data presented	2008
Currency exchange with USD (average, 2008)	44.5
GDP per capita (USD) (2008)	1,863.4
GDP per capita in International $, adjusted for purchasing power (2008)	3,773.0
Sanitation	
Improved total (%) (2008)	76.0
Improved rural (%) (2008)	69.0
Improved urban (%) (2008)	80.0
Open defecation (%) (2008)	8

[1] Estimates are based on the 2007 census

I. Introduction

1.1 Sanitation Coverage and Overview of the Sanitation Sector

The Philippines has made substantial progress in increasing the access of its people to improved sanitation. Recent estimates from the Joint Monitoring Programme for Water Supply and Sanitation (JMP) of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) indicate that 76% of the population of the country had access to improved sanitation facilities in 2008 (Table 1).[1] This is a significant improvement from the 58% that was estimated in 1990. Moreover, the proportion of the population who practice open defecation was halved over the same period from 16% in 1990 to 8% in 2008. The Philippines is clearly well on its way to achieving the Millennium Development Goal (MDG) of reducing by half the proportion of its population in 1990 who did not have access to improved sanitation facilities.

Another positive development is the dramatic increase in the access to improved sanitation in rural areas. As of 2008, 69% of rural households had access to improved sanitation. This was 23 percentage points higher than its counterpart for 1990. While access to improved sanitation in urban areas was still higher by 11 percentage points, the gap between rural and urban areas was substantially lower than the 24 percentage point difference in 1990.

Figure 1 provides information on sanitation coverage for the different regions of the Philippines. It indicates that the National Capital Region (NCR), Ilocos, and Central Luzon had the highest proportions of households with access to improved sanitation facilities in 2007. In contrast, the Autonomous Region of Muslim Mindanao (ARMM) lagged behind the other regions, with only about 51% of its households having access to improved sanitation facilities. The estimates also indicate double-digit increases in the proportion of families with access to improved sanitation in all regions between 2000 and 2007. The largest gains ranged from 13 percentage points in the Southern Mindanao to 25 percentage points in the ARMM. As a result, there was a narrower gap between the regions in terms of access to improved sanitation in 2007 compared to 2000.

Two common patterns emerge from the analysis of secondary data. First, there have been noticeable improvements in sanitation coverage over the last decade and a half. Second, the gap in terms of access to improved sanitation facilities across regions has narrowed over the same period.

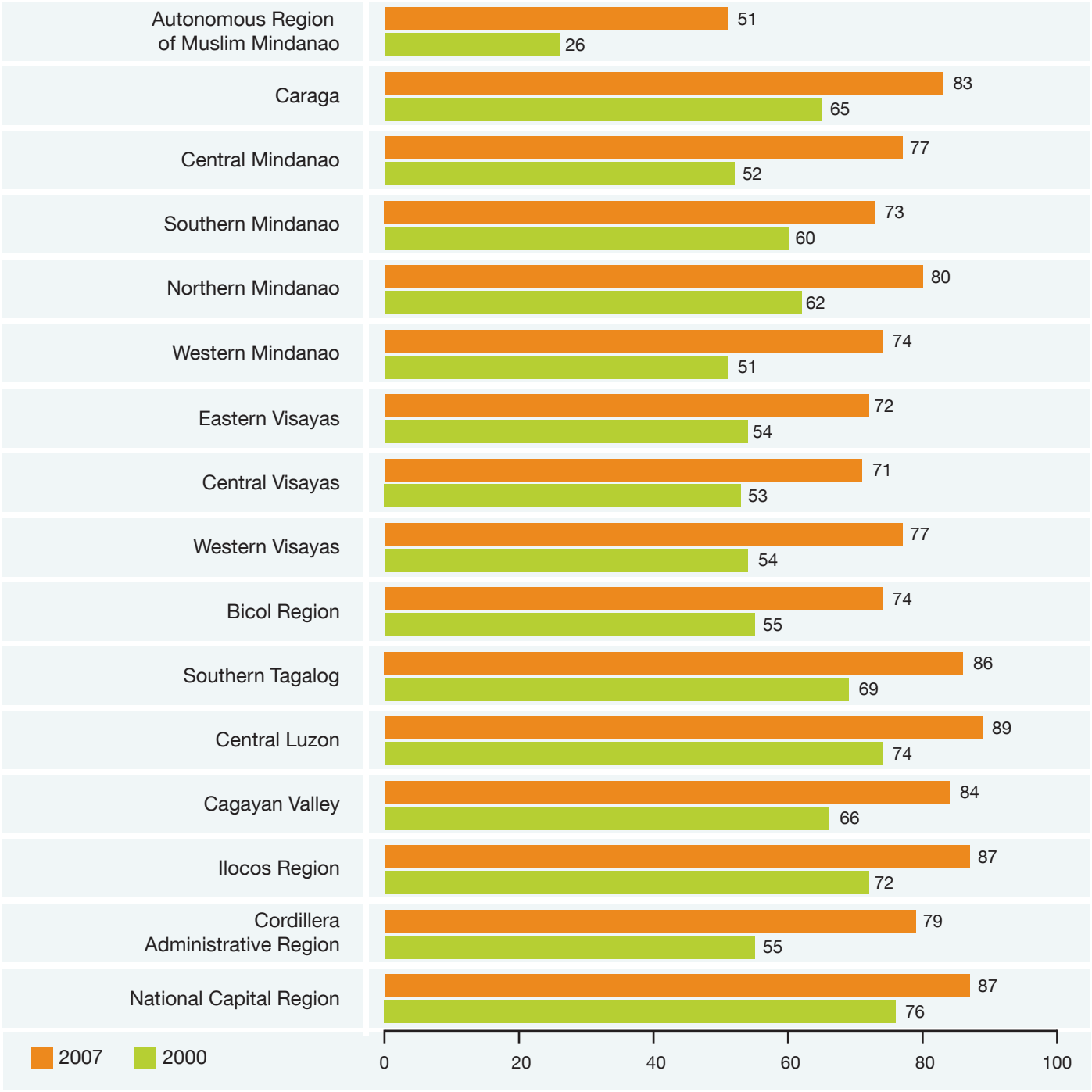
TABLE 1: SANITATION COVERAGE IN THE PHILIPPINES, % OF HOUSEHOLDS

Coverage type	Rural		Urban		Total	
	1990	2008	1990	2008	1990	2008
Improved private facility[1]	46	69	70	80	58	76
Unimproved private facility	22	3	8	0	15	1
Shared facility	9	14	14	16	11	15
Open defecation	23	14	8	4	16	8

Source: JMP (2010)

[1] The JMP (2008) defines an improved sanitation facility "as one that hygienically separates human excreta from human contact" (p.39). This includes flush or pour-flush latrines connected to a piped sewer system, septic tank or pit latrine and ventilated improved pit latrine. On the other hand, unimproved facilities include pit latrines without slab or platform, hanging latrines, and bucket latrines. Pour-flush toilets that discharge into open drains, ditches or other bodies of water and facilities shared by two or more households are also considered unimproved.

FIGURE 1: SANITATION COVERAGE IN DIFFERENT REGIONS OF THE PHILIPPINES, %, 2000 AND 2007



Source: Annex Table A1

Despite the progress made by the Philippines, the JMP (2008) data suggest that 24% percent of the population still do not have access to improved sanitation facilities. With an estimated population of 90.5 million persons in 2008, this implies that about 21.7 million people do not have access to improved sanitation facilities. Of this, approximately 7.2 million people practice open defecation. The gap in sanitation access between rural and urban households still needs to be further narrowed. For instance, access to improved sanitation for the ARMM region in 2007 (51%) was the same proportion as the region with the second lowest access rate (Western Mindanao) in 2000.

Information on sanitation coverage also needs to be viewed with caution. Citing information from the 2003 World Health Survey of the World Health Organization (WHO), the JMP (2008b) indicated that a relatively small proportion of Philippine households had private toilets which flush to septic tanks. Of the 78% of urban households that had access to improved sanitation facilities, only about 21 percentage points had access to toilets that flush to septic tanks. In the case of rural households, only 14% of all households had toilets that flush to septic tanks. There is also some uncertainty over the values being presented here. For example, the National Statistical Coordination Board (2006) reported that 42% of all households in 2000 had private access to water-sealed, sewer/septic tanks. Regardless of the values, it is clear that a larger proportion of the population do not have private access to toilets that flush to septic tanks. More recent data from the WHO (2009) also show that only 6.7% of urban households had toilets that flush to a sewage system. An even lower proportion (2.1%) was reported for rural households.

Another important issue is the design and management of septic tanks. Poor design and mismanagement can contribute to the pollution and increased exposure to health risks. In a survey of six sites in the Philippines, WSP's Sustainable Sanitation for East Asia project (SuSEA 2008) reported that the majority of the septic tanks did not conform to the design recommended by the Department of Health (DOH).[2] The World Bank and PPIAF (2005) also noted that there are septic tanks that drain into uncovered drainage systems. Septic tank management is also an issue. While aggregate data are unavailable, surveys indicate that households do not regularly desludge their septic tanks. In a survey in Marikina City, Metro Manila, the USAID (2007) found that 37% of respondents have never emptied their septic tanks. In a separate survey, the USAID and City of San Fernando (2006) found that 71% of respondents never emptied their septic tanks or did so more than five years prior to the survey. Similar results were found from the surveys conducted for this study. The SuSEA (2008) also reported that desludging trucks without close access to a septage treatment facility generally dispose of the waste in open fields, drainage systems or water bodies.

The costs associated with poor sanitation are large. A previous phase of the Economics of Sanitation Initiative (ESI) estimated the overall economic costs of poor sanitation to be in the order of US$1.4 billion or PhP77.8 billion (at 2005 prices) per year, or PhP923.7 (at 2005 prices) per person per year (Rodriguez et al. 2008)[3]. Equivalent to about 1.5% of gross domestic product (GDP) for 2005, nearly three-quarters of this amount was attributable to health-related costs.

Policy makers in the Philippines recognize the importance of increasing access to improved sanitation. For example, Chapter 3 of the Medium-Term Development Plan 2004-10 stated the following target: "Ensure that all barangays/municipalities will be provided with water supply services that have corresponding sanitation facilities for proper disposal of wastewater and septage …" (NEDA 2004). There is also an array of laws and regulations which date as far back as 1949 with the provision on the drainage of buildings in the Civil Code of the Philippines (RA 386). More recent measures were the formulation of the National Sewerage and Septage Management Program (NSSMP) and establishment of Water Quality Management Areas (WQMA) in the Clean Water Act of 2004 (RA 9275). In 2007, the DOH also developed the Operations Manual on the Rules and Regulations Governing the Collection, Handling, Transport, Treatment and Disposal of Domestic Septage as a supplement to the implementing rules and regulations of Chapter 17 of the Sanitation Code. Citing the economic costs of poor sanitation from the ESI Impact Study, a senate resolution (PSR No. 326) was introduced in 2008. The resolution called for an inquiry, in aid of legislation, into the "deplorable state of hygiene and sanitation in the country."

There continues to be a big divide between recognizing the costs of poor sanitation and appropriate actions aimed at addressing these costs. Public investments in sanitation continue to receive low priority. A study by Manasan (2008) showed two important points to support this assertion. First, general government expenditures on water and sanitation account for a very small proportion of total expenditures on basic social services. In 2006, expenditures on water and sanitation amounted to PhP12 per person (at

[2] The survey sites in the SuSEA study were Bauko, Dagupan City, Guiuan, Polomolok, General Santos City and Alabel.
[3] The study used JMP sanitation coverage statistics for 2004.

2000 prices, or about PhP19.3 at 2008 prices) - approximately 0.9% of per capita expenditures on basic social services. Second, per capita expenditures have declined substantially over time. Per capita spending in 2006 was only about 40% of its value in 1997.

While data is difficult to obtain, interventions specific to sanitation also appear small relative to total expenditures on water and sanitation. The World Bank (2003) reported that sanitation accounted for only about 3% of total investments in water supply and sanitation in 1999, while 97% went to water supply investments.

At present, many government agencies are tasked with addressing sanitation problems in the country. These include the Department of Health (DOH), Department of Environment and Natural Resources (DENR), Department of Public Works and Highways (DPWH), Department of Finance (DOF), Department of the Interior and Local Government (DILG), and local government units (LGU). While this reflects the multi-dimensional nature of sanitation, the existing set-up makes it harder to formulate and implement sanitation programs and strategies. The coordination problems associated with having multiple government agencies in charge of sanitation concerns were emphasized by Dr. Jaime Galvez Tan, former Secretary of Health and Team Leader for the Technical Assistance Management Services (TAMS) for SuSEA Philippines. In a presentation at the Second Sanitation Summit in Manila in 2008, he raised the question of "Who is in charge?"– referring to the absence of a lead agency for initiatives in the improvement of sanitation conditions in the country (Galvez-Tan 2008).

The discussion above asserts two points. First, the costs of poor sanitation are high and should not be ignored. Second, there is a need for more action from government and other stakeholders. Convincing these institutions requires concrete analysis on the costs of poor sanitation. Equally important is the need for rigorous studies on various options that are available as these will provide decision makers with analyses of choices from which they can make informed judgments. Unfortunately, there are very few of such studies, especially at the national level or representing a range of settings which typify the Philippines.

1.2 Studies on the Costs and Benefits of Sanitation in the Philippines

Most of the studies on costs focused on the impacts on water pollution and sanitation and did not explicitly attempt to isolate the costs which are solely attributable to poor sanitation.[4] With the exception of a World Bank (2003) report which also estimated the costs to tourism and water resources, these studies focused exclusively on the health impacts. While this is a difficult task indeed, it is necessary to convince decision makers to provide more attention and investments to the sector. To date, the most comprehensive analysis of costs of poor sanitation in the Philippines is the ESI Impacts Study (Rodriguez et al. 2008). The study evaluated the impacts of poor sanitation not only on health, but also on water use including household uses and value of fish catch, access time, and tourism. However, the study did not provide an analysis of the various sanitation options which are available to decision makers.

There are studies which provide information on various options, with some including estimates of the costs associated with specific technologies.[5] Other studies also compared various technologies with a specific option. For example, Santos et al. (2007) and Partnerships in Environment Management for the Seas of East Asia (PEAMSEA 2006) evaluated various wastewater treatment technologies. On the other hand, the Netherlands Water Partnership (NWP 2006) compared the costs of three types of urine diversion toilets.

There are also a few studies which attempted a cost-benefit analysis of sanitation options. Uhlig (2008), for example, analyzed urine diversion dehydration toilets in the city of Bayawan, Negros Occidental. Another evaluated UDDT-E in San Fernando, La Union (FSSI et al. 2006).While these studies provide valuable information for the decision maker, they tend to be site- and/or technology-specific. There is clearly a need for an analysis of the various options that has a wider scope and geographical coverage.

[4] Examples include the World Bank (2007), World Bank (2003) and Arcenas (2009).
[5] Examples of such studies are Dueñas (2008), World Bank (2007b, 2000, 1996), Carajay and Herrera (2006), Lapid (2005), WPEP (2005) GTZ (2004), Municipal Government of Panglao (undated), APDC-BAI (undated), SCOTIA (undated-a and undated-b).

1.3 The Road Ahead

One method that can be used to evaluate various sanitation options is cost-benefit analysis (CBA). The objective of the technique is to generate a monetary measure of the stream of benefits and costs from an investment project or policy. It can estimate the (a) expected economic return (return per US$ invested), (b) net present value, and (c) the internal rate of return of investments or policy initiatives. It therefore aids decision-makers in identifying whether the net benefits from a project or policy are positive or negative. In the presence of multiple options, a CBA may provide a valuable input for priority setting.

The analysis is important in enhancing the chances that scarce resources are efficiently allocated to projects that provide acceptable levels of net benefits. Moreover, it also helps evaluate the costs, budget impacts and benefits of sanitation alternatives, should additional funds become available to finance further investments. Furthermore, the analysis provides information that can be used for advocacy of development interventions, assuming CBA findings are favorable for the evaluated interventions.

The remainder of this report is organized as follows: Chapter 2 describes the overall objectives and aims of the study. It also explains some of the key research questions that will be addressed in subsequent chapters. Chapter 3 discusses the methodology of the study. It describes the costs and benefits to be evaluated and the key indicators used in the analysis of the various options. The chapter also describes the study sites and data collection methods. Chapter 4 presents the local or site-specific benefits associated with improved sanitation while Chapter 5 describes some of the broader benefits to the economy. Chapter 6 presents the costs associated with various sanitation options. It also describes the costs as a household moves up the sanitation ladder. Chapter 7 combines the information in Chapters 4 to 7 by way of a cost-benefit and cost-effectiveness analysis. It also compares the various efficiency indicators across various sanitation options. Chapter 8 provides a discussion of the results and Chapter 9 concludes with the recommendations of the study.

II. Study Aims

2.1 Overall Purpose

The purpose of the Economics of Sanitation Initiative (ESI) is to promote evidence-based decision making using improved methodologies and data sets, thus increasing the effectiveness and sustainability of public and private sanitation spending.

Better decision making techniques and economic evidence themselves are also expected to stimulate additional spending on sanitation to meet and surpass national coverage targets.

2.2 Study Aims

The aim of this current study is to generate robust evidence on the costs and benefits of sanitation improvements in different programmatic and geographic contexts in the Philippines, leading to the selection of the most efficient and sustainable sanitation interventions and programs. Basic hygiene aspects are also included, insofar as they affect health outcomes.

The evidence is presented in simplified form and distilled into key recommendations to increase uptake by a range of sanitation financiers and implementers, including different levels of government and sanitation sector partners, as well as households and the private sector.

Standard outputs of cost-benefit analysis include benefit-cost ratios, internal rate of return, payback period, and net benefits (see Glossary). Cost-effectiveness measures relevant to health impacts will provide information on the costs of achieving health improvements. In addition, intangible aspects of sanitation not quantified in monetary units are highlighted as being crucial to the optimal choice of sanitation interventions.

This study also contributes to the debate on approaches to sanitation financing and ways of scaling up sanitation improvements to meet national targets.

2.3 Specific Study Uses

By providing hard evidence on the costs and benefits of improved sanitation, the study will:

- Provide advocacy material for increased spending on sanitation, and to prompt greater attention of sector stakeholders to efficient implementation and scaling up of improved sanitation.
- Enable the inclusion of efficiency criteria in the selection of sanitation options in government and donor strategic planning documents, and in specific sanitation projects and programs.
- Bring greater focus on appropriate technology through increased understanding of the marginal costs and benefits of moving up the "sanitation ladder" in different contexts.
- Provide the empirical basis for improved estimates of the total costs and benefits of meeting sanitation targets (e.g., MDG target), and contribute to national strategic plans for meeting and surpassing the MDG targets.
- Contribute to the design of feasible financing options through identification of the beneficiaries as well as cost incidence of sanitation programs.

2.4 Research Questions

In order to fulfill the overall purpose of the study, research questions were defined to have a direct bearing on sanitation policies and decisions, distinguished for overall efficiency questions (i.e., cost versus benefit), and for costs and benefits separately.[6]

[6] "Costs" (and "benefits") refer simultaneously to financial and economic costs (and benefits), unless otherwise specified.

BOX 1. RESEARCH QUESTIONS ON SANITATION EFFICIENCY

i. Are benefits greater than the costs of sanitation interventions? By what proportion do benefits exceed costs (benefit-cost ratio — BCR)?

ii. What is the annual internal rate of return (IRR)?

iii. How long does it take for a household to recover its initial investment costs, at different levels of cost sharing (payback period — PBP)?

iv. What is the net gain of each sanitation intervention (net present value — NPV)? What is the potential interest of sanitation for business opportunities?

v. What is the cost of achieving standard health gains such as averted death, cases and disability-adjusted life-year (DALY)?

vi. How does economic performance vary across sanitation options, program approaches, locations, and countries? What factors explain performance?

The major concern in economic evaluation is to understand economic and/or financial efficiency — in terms of return on investment and recurrent expenditure. Hence the focus of economic evaluation is on what it costs to deliver an intervention and what the returns are. Several different efficiency measures allow examination of the question from different angles, such as number of times by which benefits exceed costs, the annual equivalent returns, and the time to repay costs and start generating net benefits (see Box 1). Also, as sanitation and hygiene improvement also fall within the health domain, economic arguments can be made for investment in sanitation and hygiene interventions with the health budget, if the health return per unit cost invested is competitive compared with other uses of the same health budget.

As well as overall efficiency questions, it is useful from decision making, planning, and advocacy perspectives to better understand the nature and timing of costs and benefits, as well as how non-economic aspects affect the implementation of sanitation interventions, hence affecting their eventual efficiency (see Box 2 and Box 3). Furthermore, given that several impacts of improved sanitation cannot easily be quantified in monetary terms, this study attempts to give greater emphasis to these impacts in the overall cost-benefit assessment.

In addition, other research questions are crucial to an appropriate interpretation and use of information on sanitation costs and benefits. Most importantly, the full benefit of a sanitation intervention may not be received due to factors in the field that affect the uptake and compliance with the intervention. These factors need to be better understood to advise future program design.

BOX 2. RESEARCH QUESTIONS ON SANITATION COSTS

i. What is the range of costs for each technology option in different field settings? What factors determine cost levels (e.g., quality, duration of hardware and software services)?

ii. What proportion of costs are capital, program and recurrent costs, for different interventions? What are necessary maintenance and repair interventions, and costs, to extend the life of hardware and increase sustainability?

iii. What proportion of total (economic) cost is financial in nature? How are financial and economic costs financed in each field location?

iv. How do costs per sanitation option vary by income group? What is the average cost per sanitation option as a percentage of annual household cash income, by income quintile?

v. What are the incremental costs of moving from a sanitation improvement to another — i.e., up the sanitation ladder — for specified populations to meet sanitation targets?

BOX 3. RESEARCH QUESTIONS ON SANITATION BENEFITS

i. What local evidence exists for the links between sanitation and the following impacts on: health, water quality and water users, land use, time use, welfare, tourism, and the business environment?

ii. What is the size of the economic benefit related to health expenditure, health-related productivity and premature mortality; household water uses; time savings; and other welfare impacts?

iii. What proportion of each benefit accrues to households who invest in sanitation and what proportion is external to the investor?

iv. What is the actual or likely willingness to pay of households and other agencies for improved sanitation? What is up-front versus annual recurrent willingness to pay?

v. How do benefits accrue or vary over time?

vi. How is improved sanitation — and the related costs and benefits — tangibly linked with poverty reduction? What is the potential impact on national income and economic growth?

vii. What is the overall household and community demand (expressed and latent demand) for improved sanitation?

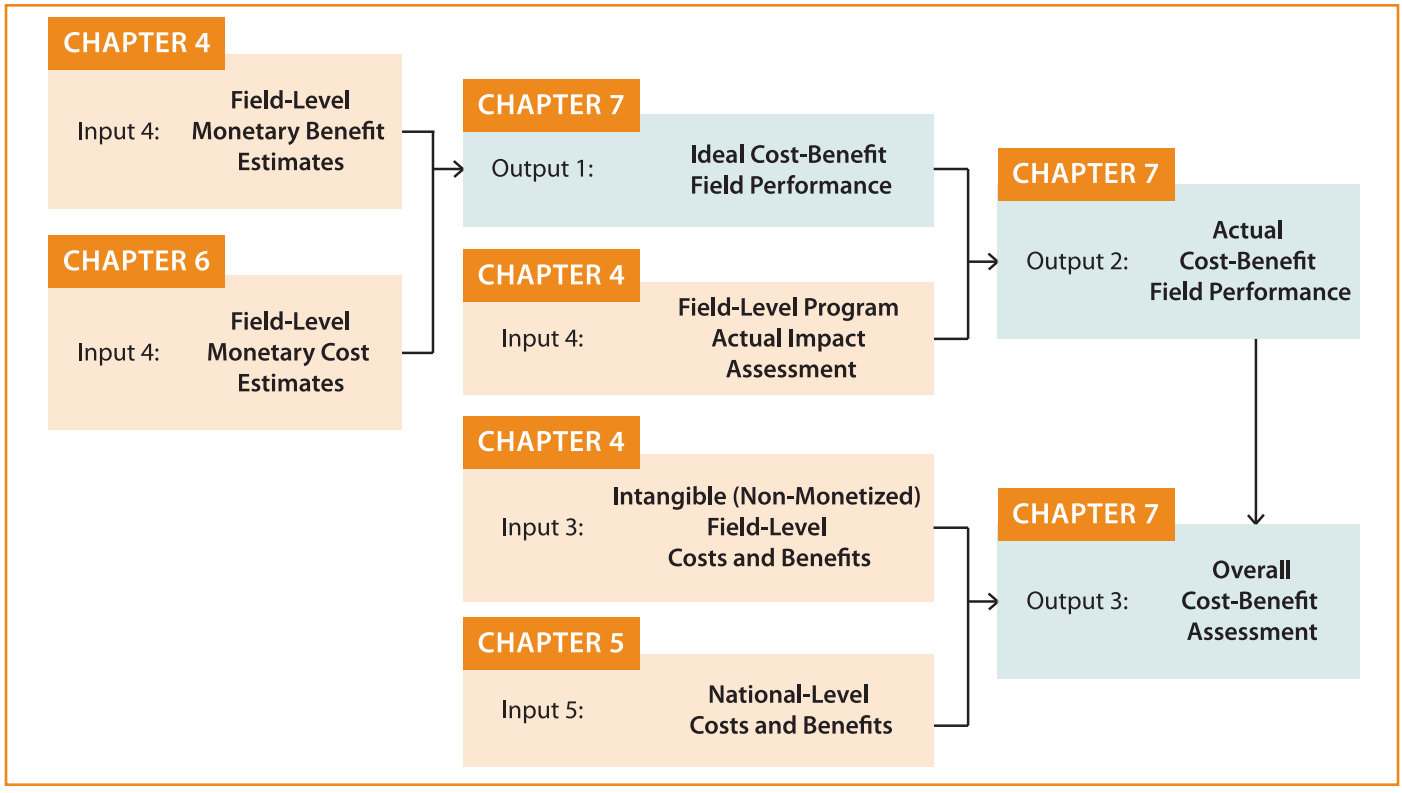
III. Methods

The study methodology in the Philippines follows a standard approach developed at the regional level reflecting established cost-benefit techniques (Boardman et al. 2006, Gramlich, 1998), which have been adapted to sanitation interventions and the Philippines field study based on specific research needs and opportunities. As shown in Figure 2, the study consists of a field component which leads to quantitative cost-benefit estimates as well as an in-depth study of qualitative aspects of sanitation. Two types of field-level cost-benefit performances are presented: Output 1 reflects ideal performance assuming the intervention is delivered, maintained, and used appropriately; Output 2 reflects actual performance based on observed levels of intervention effectiveness in the field sites. Both of these analyses are partial, given that intangible benefits of sanitation improvements, as well as other benefits that may accrue outside the sanitation improvement site, are excluded. Hence, Output 3 synthesizes the quantitative and qualitative findings to generate overall conclusions and recommendations.

3.1 Technical sanitation interventions evaluated

The type of sanitation evaluated in this study is household human excreta management. Interventions to improve human excreta management at the household level focus on both onsite and off-site sanitation options. One of the key aims of this study, where possible, is to compare the relative efficiency of different sanitation technologies. Basic hygiene aspects of sanitation are also included, insofar as they affect health outcomes and intangible aspects.

FIGURE 2: FLOW OF DATA COLLECTED (INPUTS) AND EVENTUAL COST-BENEFIT ASSESSMENTS (OUTPUTS)



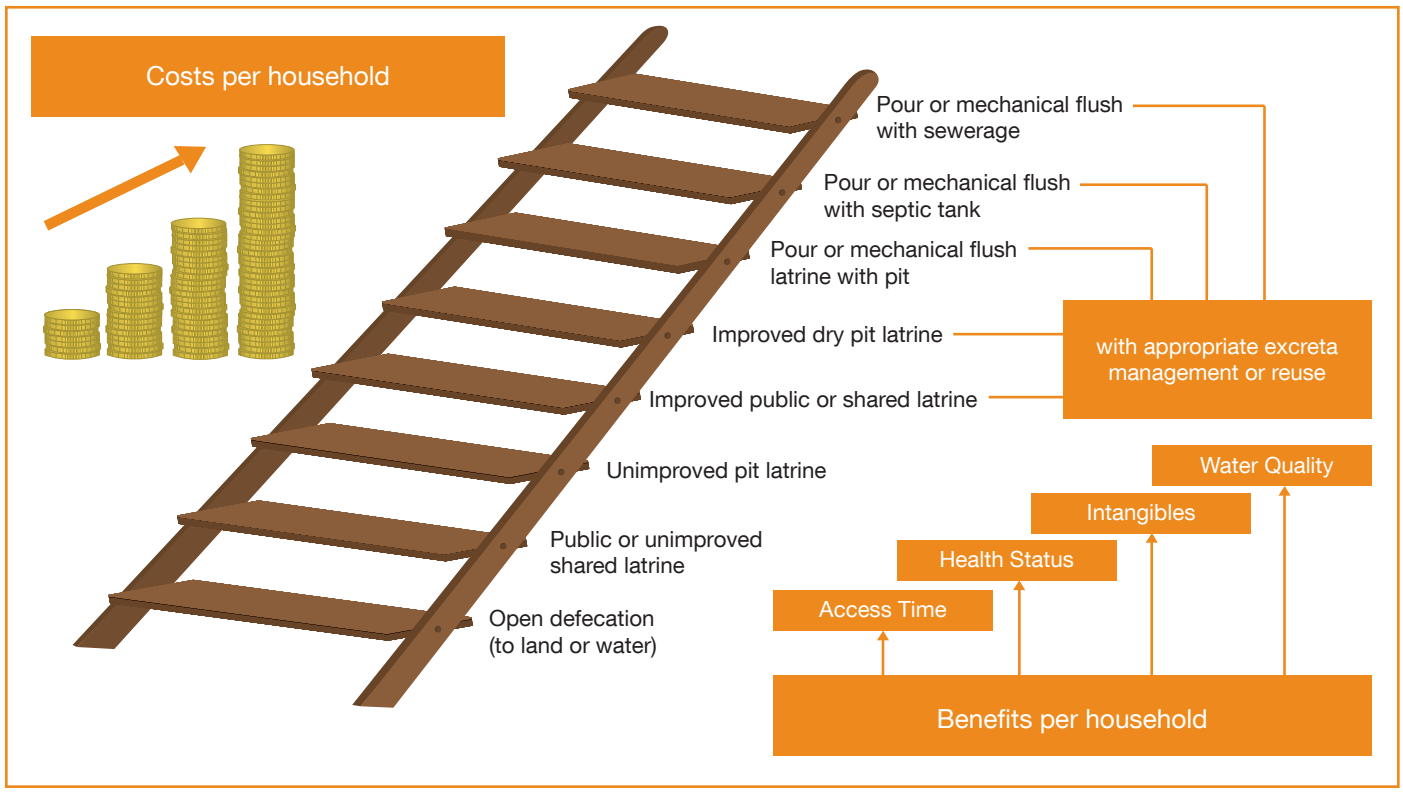
Interventions that jointly address human waste with domestic wastewater management (especially in urban areas) and with animal waste management (in the case of biogas generation) are also considered. In Vietnam, the study includes other sanitation improvements, covering solid, agricultural, and trade village wastes.

To qualify as an economic evaluation study, a cost-benefit analysis compares at least two alternative intervention options. It usually includes comparison with the baseline of "do nothing." However, comparing two sanitation options will rarely be enough since, ideally, the analysis should compare all sanitation options that are feasible for each setting — in terms of affordable, technically feasible, and culturally acceptable options — so that a clear policy recommendation can be made based on efficiency of a range of sanitation options, among other factors.

Technical sanitation options include all those interventions that move households up the sanitation technology ladder and, thus, bring benefits. Figure 3 presents a generalized sanitation technology ladder. The upward slope of the ladder reflects the assumption of greater benefits as the household climbs the ladder, but (generally) with higher costs. The progression shown in Figure 3 is not necessarily true in all settings and hence needs to be altered based on setting-specific features (e.g., rural or urban, different physical/climatic environments such as soil type or water scarcity). Furthermore, a higher technology will only provide an improved level of service if it is maintained and operated properly.

While previous studies have estimated the costs and benefits of achieving the MDG target and universal sanitation coverage, sanitation options considered should not be restricted by "unimproved" and "improved" sanitation as defined by the WHO/UNICEF JMP. For example, some households will be interested to upgrade from one type of improved sanitation to another type, such as from VIP to septic tank, or from septic tank to sewerage. Other households are faced with a decision whether to replace a facility that has reached the end of its useful life. Under some program approaches, e.g., Community-Led Total Sanitation (CLTS), households are also encouraged to move up the ladder, even if it does not imply a full move to JMP-defined "improved" sanitation, such as the use of shared or unimproved private latrines.

FIGURE 3: REPRESENTATION OF THE SANITATION TECHNOLOGY "LADDER"



3.2 Costs and benefits evaluated

Sanitation costs are the denominator in the calculation benefit-cost and cost-effectiveness ratios, and are thus crucial to the evaluation of sanitation option efficiency. Summary cost measures include the total annual and lifetime costs, cost per household and cost per capita. For financing and planning purposes, this study disaggregates costs for each sanitation option by capital and recurrent costs, and by financier. The incremental costs of moving up the sanitation ladder are also assessed.

To maximize the usefulness of an economic analysis for diverse audiences, the benefits of improved sanitation and hygiene are divided into three categories:

1. **Household direct benefits:** These are incurred by the households who are making the sanitation improvement. The actual or perceived benefits will drive the decision by the household to invest in sanitation, and will also guide the type of sanitation improvement chosen. These benefits may include: health impacts related to household sanitation and hygiene, local water resource impacts, access time, intangible impacts, house prices, and the value of human excreta reuse.
2. **Local level external benefits:** These are potentially incurred by all households living in the environment where households improve their sanitation. However, some of the benefits may not be substantial until a critical mass of households has improved their sanitation. These benefits may include: health impacts related to environmental exposure to pathogens (e.g., water sources, open defecation practices), aesthetics of environmental quality, and usability of local water sources for productive activities. Given the challenges in designing studies to distinguish these benefits from household direct benefits, this study classified local level external benefits with household direct benefits.
3. **Wider scale external benefits:** These result from improved sanitation at the macro level. Benefits may include: water quality for productive uses, tourism, local business impact, and foreign direct investment. They can either be linked to coverage in specific areas or zones (e.g., tourist area or industrial zone), or the country generally (e.g., investment climate). As well as improved management of human excreta, other contributors to environmental improvement such as solid waste management and wastewater treatment need to be considered.

In brief, this study distinguishes between the economic analysis results and local community impacts, where the sanitation and hygiene improvements take place, and national level impacts. Table 2 shows the impacts included in the current study, distinguishing between those impacts that are expressed in monetary units and those that are expressed in non-monetary units.

TABLE 2: BENEFITS OF IMPROVED SANITATION INCLUDED IN THIS STUDY

Level	Impact	Socio-economic impacts evaluated in	
		Monetary terms ($ values)	Non-monetary terms (non-$)
Local benefits	Health	• Health care costs • Health-related productivity • Premature death	• Disease and mortality rates • Quality of life impacts • Gender impacts
	Domestic Water	• Water sourcing • Household treatment	Linking poor sanitation, water quality and practices
	Other welfare	Time use	Convenience, comfort, privacy, status, security, gender
	Environmental quality		Aesthetics of household and community environment
	Output reuse	Fertilizer generated	
Tourism and business	Tourism		• Sanitation-tourism link: potential impact of poor sanitation on tourist numbers • Income losses associated with loss of tourists • Tourist health costs
	Business		• Sanitation-business link: potential impact of poor sanitation on local business and FDI • Costs of averting negative impacts of poor sanitation

While the focus of this study is on household sanitation, the importance of institutional sanitation also needs to be highlighted. For example, improved school sanitation may affect decisions for children (especially girls) to start or stay in school until the end of the secondary level, and workplace sanitation affects decisions of the workforce (especially women) to take or continue work with a particular employer. These impacts are incremental and beyond the scope of this study.

The next sections describe the study methods for the three major study components: the field level cost-benefit assessment (3.3), the assessment of program effectiveness (3.4) and national level impacts (3.5).

3.3 Field studies

3.3.1 FIELD SITE SELECTION AND DESCRIPTION

According to good economic evaluation practice, interventions evaluated should reflect the options faced by households, communities and policy makers. Therefore, locations should be selected which contain a range of sanitation options which are typically available in the Philippines, covering both urban and rural sites. By sampling a range of representative locations, the study results can be generalized outside the study settings, and hence be more useful for national and local level planning purposes.

The principal criterion for site selection applied in this study is that there has been a sanitation project or program implemented in the past five years, and at some level of scale that allows minimum sample sizes of 30 households to be collected per sanitation option per site. Once the list of projects and programs has been established, a further set of criteria was applied in order to reduce the short-list to six locations or projects (based on the available budget). These criteria include (i) logistical feasibility for research to be conducted; (ii) potential for collaboration with project/program; (iii) being representative of the Philippines in terms of geophysical, climatic, demographic and socio-economic characteristics. Annex Table A2 shows the list of projects considered for the study.

The six sites selected for the study were Alabel, Bayawan, Dagupan, San Fernando (upland and coastal regions), and Taguig (Figure 4). San Fernando was originally envisioned as one site, but was eventually divided into the upland and coastal regions to capture the potential differences in the benefits and costs associated with the two environments. Figure 4 shows the location of these sites in the Philippines. It indicates that four sites (Dagupan, San Fernando and Taguig) are located in Luzon, while Bayawan and Alabel are located in the Visayas and Mindanao, respectively.

SITE 1: ALABEL

Alabel is a first class municipality and is the capital of Sarangani province in Region XII (Soccsksargen). Composed of one urban and 11 rural barangays, it is bounded by South Cotabato (northwest), Malugon (northeast), Malapatan (southeast) and Sarangani Bay (southwest). It has four rivers (Maribulan, Domolok, Molo and Lun Padidu) and two lakes (Bito and Mofong). Based on the 2007 national census (NSO 2008a), Alabel had a population of 71,872 persons. Its population density of about 133 persons per square kilometer (persons/km^2) is nearly half of the Philippine average of 295 persons/km^2. Alabel is located in a relatively poor region that had an average annual family income of PhP113,919 (US$2,220)[7] in 2006 and a per capita gross regional domestic product (GRDP) of PhP57,708 (US$1,250)[8] in 2007 (NSCB 2008). Both values were lower than the average for the country as a whole.[9] Municipal records from Alabel indicated that 81% of families in the municipality had access to toilets which flush into a septic tank as of 2008. For the same year, 6% still used pit latrines while 13% practiced open defecation.

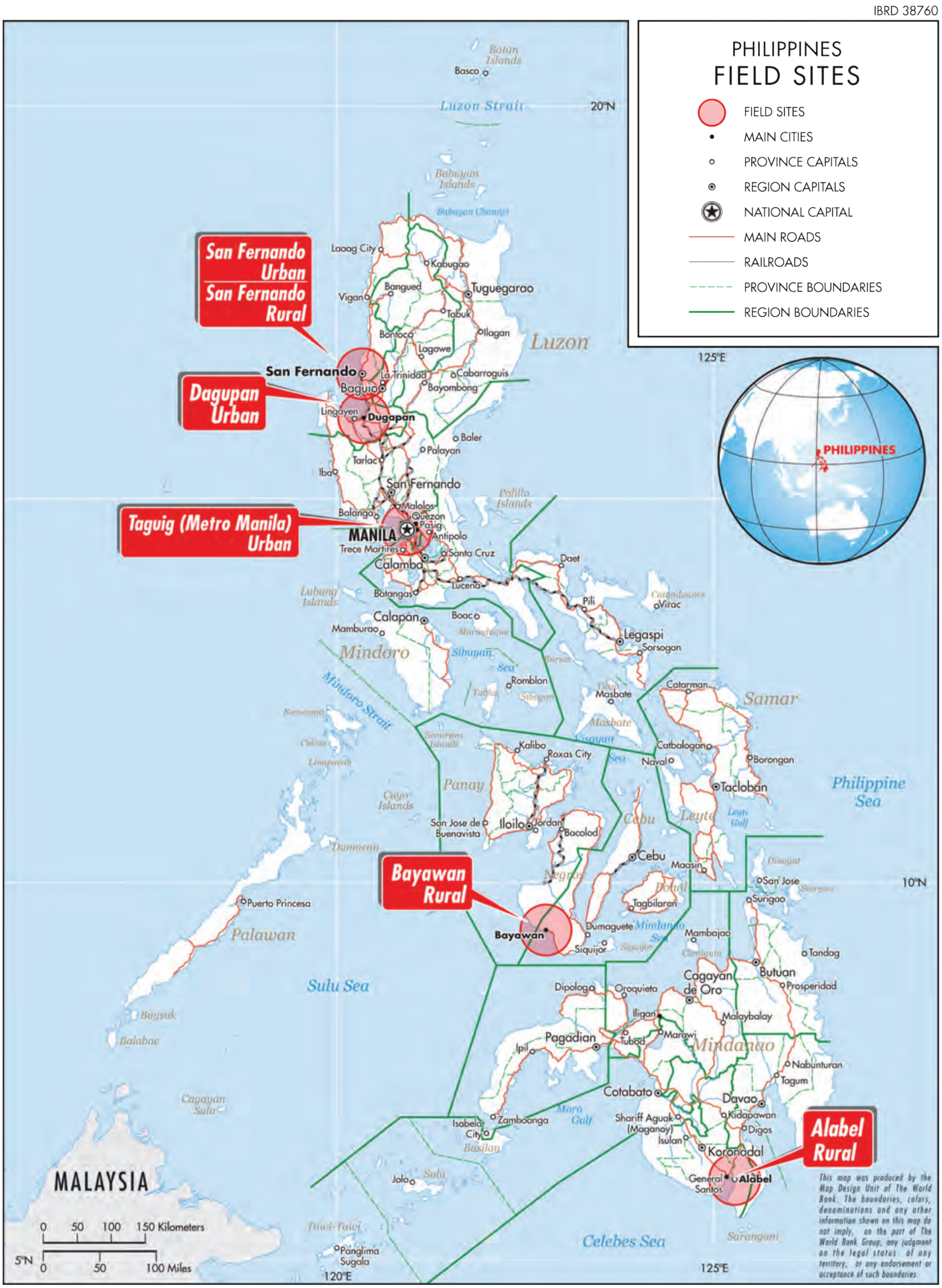
The ESI field survey in Alabel was conducted in barangays Poblacion, Kawas, Maribulan, and Baluntay. With the exception of Poblacion, the barangays covered in the survey are classified as rural areas.

SITE 2: BAYAWAN

Bayawan is a third class city located in the province of Negros Oriental in Region VII (Central Visayas). Composed

[7] US$1= PhP51.3, 2006 exchange rate
[8] US$1= PhP46.2, 2007 exchange rate
[9] The NSCB (2008) reported that the average annual family income in 2006 and per capita GDP of the Philippines for 2007 were PhP172,730 and PhP74,947, respectively.

FIGURE 4: LOCATION OF THE SELECTED FIELD SITES IN THE PHILIPPINES



of five urban and 23 rural barangays, it is bounded by Mabinao (north), Sta. Catalina (east), Tanjay City (southeast), Basay (west), and Kabangkalan City (northwest). It has a 15 kilometer coastline from east to west and a 60 kilometer coastline from the south to the northern portion of the city. The city has four major rivers; namely, Sicopong, Ilog, Pagatban, and Bayawan. Based on the 2007 national census (NSO 2008a), the city had a population of 110,250 persons and a population density of about 158 persons/km^2. Bayawan is also located in a relatively poor region in the country. The average annual family income of Region VII was PhP144,288 (US$2,812) in 2006 while its per capita GRDP in 2007 was PhP69,797 (US$1,512) (NSCB 2008). As with Region XII, both values were lower than the average for the country as a whole. The most recent sanitation data from the Bayawan City Health Office is for the year 2000. It indicates that about 65% of families in the city had access to toilets which flush into a septic tank. Other families had access to flush toilets connected to a sewer network (1%), bucket/hole in ground (3%), ventilated improved pit latrines (3%), flush toilets to pit (2%), and composting toilets/UDDT-E (less than 1%). About 26% of its population practiced open defecation during that period. It is also worth noting that the canals in the city streets are categorized as sewer lines. The main sewer line represents canals with a width of 1 meter while the secondary sewer line represents canals with a width of 0.7 meter.

The ESI field survey in Bayawan was conducted in barangays Banga, Tinago, and Villareal. Tinago is classified as an urban barangay while the other two are rural barangays. In the survey, special attention was paid to a Gawad Kalinga village in barangay Villareal.

SITE 3: DAGUPAN CITY

Dagupan is a second class city in the province of Pangasinan in Region I (Ilocos). Composed of 31 urban barangays, it is bounded by Binmaley (west), Calasiao (south), Mangaldan (east), San Fabian (northeast), and the Lingayen Gulf (north). Apart from a coastline that spans a total land area of nearly 12 kilometers, Dagupan also has seven major rivers — Magueragday-Anolid, Bayaoas, Calmay, Patogcawen, Dawel, Tanap, Pantal rivers. Dagupan is a low-lying area that experiences flooding especially during the rainy season. Based on the 2007 national census (NSO 2008a), the city had a population of 159,554 persons. Its population density of about 4,020 persons/km^2 is more than ten times the national average. Dagupan city is located in a relatively poor region in the country. The average annual family income of Region I was PhP142,358 (US$2,773) in 2006 while its per capita gross regional product was PhP38,053 (US$825) in 2007 (NSCB 2008). Despite this, Dagupan appears to be a relatively prosperous city. Poverty incidence in the city was nearly 11% in 2003 (NSCB 2005), which was less than half the national average and Region I incidence rate of about 24% (NSCB undated). Sanitation coverage data is available for the years 2004 to 2006. It indicates that nearly 61% of households in the city had access to toilets which flush to water-sealed pits in 2006. This was followed by toilets which flush to septic tanks (25%), improved pits with slab (4%) and unimproved open pits (2%). Close to 9% of families were estimated to practice open defecation.

The ESI field survey in Dagupan was conducted exclusively in barangay Pugaro. This is a coastal barangay that is also adjacent to Pugaro River.[10] The houses in the barangay are also located approximately 500 meters from the sea.

SITES 4 AND 5: SAN FERNANDO-COASTAL AND SAN FERNANDO-UPLAND

San Fernando is a third class city and is the capital of the province of La Union in Region I. It is bounded by the municipalities of San Juan (north), Bauang (south), Bagulin (east), Naguilian (east), and the South China Sea in the west. Composed of eight urban and 51 rural barangays, it had a population of approximately 114,813 persons in 2007. Its population density of about 1,073 persons/km^2 is more than three times the national average. Like Dagupan, it is located in a relatively poor region. However, San Fernando appears to be prosperous relative to other cities and municipalities in the region. As of 2003, its poverty incidence rate of slightly over 14% is about 10 percentage points lower than the national and provincial averages.

Sanitation coverage statistics for the years 2006 to 2008 are available from the City Health Report. The report indicates that slightly more than 65% of households in the city had access to water-sealed toilets in 2008. For the same period,

[10] Pugaro river is part of the Pantal River stretch.

another 25% of the population had access to flush type toilets.[11] The remainder of the households had access to shared toilets (3%), public toilets (less than 1%), composting toilets/UDDT-E (less than 1%), unimproved open pits (less than 0.1%) and unclassified (5%). While official statistics do not report values for open defecation, interviews in barangay Nagyubyuban revealed that households still defecate in the bushes and near creeks. In addition, men from barangays San Agustin and Ilocanos Sur admitted to defecating along the shoreline.

The ESI field survey for the upland site was conducted in Nagyubyuban. The survey for the coastal sites was implemented in barangays San Agustin, Poro, and Ilocanos Sur. Special attention was also given to a village of relocated fishermen in barangay Poro. These fishermen, who were originally from Ilocanos Sur and Ilocanos Norte, were relocated to an area with 97 housing units that have an UDDT-E facility. San Agustin and Nagyubyuban are considered rural barangays, while the other sites are urban barangays.

SITE 6: TAGUIG

Taguig is a first class city located in the National Capital Region (NCR). It is bounded to the south by Laguna Lake and Muntinlupa, and by various cities in other areas. The major bodies in Taguig are Laguna Lake, Napindan channel (upper mouth of Pasig river), and Taguig river. Other rivers/creeks that flow across the city are Bagumbayan, Mauling/Tabacuhan, Hagunoy, Tipas/Labasan, and Sta. Ana. The city is in a relatively high income region. The average annual family income of the NCR of PhP310,860 (US$6,058) in 2006 (NSCB 2008) was nearly two times/twice the national average. On the other hand, the per capita GRDP of the NCR was PhP223,332 (US$4,839) in 2007 (NSCB 2008), or close to three times the national average. The City Sanitation Office reported sanitation coverage statistics from 2003 to 2008.[12] It indicated that about 87% of the residents of the city had access to sanitary toilets[13] — about 7 percentage points higher than the value reported for 2003. The ESI field survey was conducted in barangay West Bicutan.

TABLE 3: SANITATION AND HYGIENE INTERVENTIONS EVALUATED PER SITE

	Alabel	Bayawan	Dagupan	San Fernando Coastal	San Fernando Upland	Taguig
	Rural	Rural	Urban	Urban	Rural	Urban
Open defecation	●	●	●	●	●	●
Community/public toilets			●	●		
Shared toilets			●		●	
Private dry latrines: simple dry pits					●	
Private dry latrines: urine diversion - dehydration toilets (EcoSan) or UDDT-E				●	●	
Private wet latrines (improved)	●		●	●		
Septic tank: Not-watertight and/or dumping of sludge and/or effluent flow directly to waterway/body	●	●				●
Septic tank: Improved, with sludge removal and septage treatment facility	●					●
Septic tank: Improved, with sludge removal and constructed wetland		●				
Sewage/Sewerage: Decentralized conventional treatment						●

STF = septage treatment facility; UDDT-E = urine-diversion dehydration toilet (EcoSan)

[11] No other information is available regarding these flush-type toilets.
[12] Disaggregated data are not available.
[13] Sanitary toilets refer to water-sealed, sewer/septic tank and closed pit.

Table 3 shows the interventions that were evaluated for each study site. It indicates that about two to three interventions were analyzed for each site, and these were at varying points of the sanitation ladder. The analysis in Dagupan and San Fernando focused more at the lower end of the sanitation ladder, with interventions ranging from community and shared toilets to private wet latrines. In contrast, the options considered for Alabel, Bayawan, and Taguig were at the higher end of the sanitation ladder — i.e., including sludge and wastewater treatment.

Despite having a mix of rural and urban barangays in the survey, Alabel is treated in the cost-benefit analysis as a rural area. One reason is that more than 60% of the respondents with access to a septic tank (with and without desludging) were from rural barangays. Another reason is that Alabel has a population density that is slightly more than a tenth of the least dense urban site in the study (San Fernando). Its population density is also lower than Bayawan, a rural site in the study. Given the points raised above, it was decided by the study team that the outcomes for Alabel are more likely to reflect conditions in rural areas rather than urban areas.

3.3.3 COST ESTIMATION METHODOLOGY

This study estimated the comprehensive costs of different sanitation options. Cost estimation was based on information from three data sources (sanitation program or project documents, the provider or supplier of sanitation services, and the ESI household questionnaire, described in 3.3.4). Data from these three sources were compiled, compared, and adjusted, and entered into standardized cost tabulation sheets. Annual equivalent costs of different sanitation options were calculated based on annualized investment cost (taking into account the estimated length of life of hardware and software components) and adding annual maintenance and operational costs. For data analysis and interpretation, costs were also broken down by financiers. Information from documents of sanitation projects and providers as well as market prices was supplemented with interviews with key resource persons to ensure correctness of interpretation, and to enable adjustment where necessary.

Cost estimates from the Philippines combine information from the ESI survey, and documents from government agencies and operators. In situations where the information was not available or incomplete for a specific technology, the study consulted experts in order to make a reasonable estimate. Some of the key points about the estimated costs are the following:

- **Components of investment costs.** Investment costs represent the expenditures on labor and materials for the construction and installation of facilities. In the case of toilets, these include the expenditures for constructing the substructure and superstructure, and the installation of toilet bowls. Where applicable, the costs of septic tank and treatment facilities were also included in the computations.
- **Recurrent costs.** These refer to expenditures for the maintenance and operations of the facilities. For some of the facilities (UDDT-E, STF and other treatment facilities), the information was obtained from the operators and the survey. However, no such estimates were available for toilets that flush to pits and septic tanks. For these facilities, recurrent costs included in the analysis were water used for flushing and cleaning toilets, desludging and repairs over the course of its productive life. The values were calculated using assumptions that were based on the available literature on water use, prices and maintenance costs of facilities.
- **Adjustments to the cost of UDDT-E facilities.** Based on the data collected from the Center for Advanced Philippine Studies (CAPS), the cost of constructing and installing an UDDT-E facility was PhP14,214 (US$320) (adjusted to 2008 prices). This is for a facility that has a substructure made from concrete and walls made of flatsheets. However, estimated costs from a separate study (FSSI et al. 2006) were higher — PhP21,030 (US$473) for a facility made of light materials and PhP43,894 (US$987) for a facility with more durable materials --- than the CAPS estimate. There were two cost estimates used in this study. The first was to assume costs of PhP14,214 (US$320) for the UDDT-E facilities in the upland region of San Fernando (barangay Nagyubyuban). This was done because the facilities in that region appear to be made of light materials. The second was to make an upward adjustment to the costs of the UDDT-E facilities in the coastal region of San Fernando. This was done to account for the more durable (concrete) facilities found at the fisher-

men's village in barangay Poro. The adjustment factor (PhP43,894/PhP21,030) was based on the ratio of the costs in the FSSI study.

- **Standardizing costs for toilets that flush to a septic tank.** To increase the comparability of the estimates, and partially to address the fact that the design of toilets vary within the study sites, the study adopted a standard design for costing the cubicles, toilets and septic tanks across the study sites. Hence, differences in cost estimates are attributable solely to variations in prices and labor costs. The only exception was for the toilets in Bayawan which had a combined estimate of the costs.

It is important to note that there are a number of limitations to the cost data that will be used in the study. The most significant of these limitations is the absence of information on program or software costs. This suggests that costs as a whole are likely to be underestimated in the study. Another difficulty is that costs can exhibit wide variations for each toilet facility. Where available, these costs were obtained from sources specific to each site. However, there are other instances in which the cost of a facility in one site is adopted for another site with a minor adjustment for price differences across sites.

3.3.4 BENEFIT ESTIMATION METHODOLOGY

Economic evaluation of sanitation interventions should be based on sufficient evidence of impact, thus giving unbiased estimates of economic efficiency. Hence the appropriate attribution of causality of impact is crucial, requiring a robust study design. Annex Table A3 presents alternative study designs for conducting economic evaluation studies, starting at the top with the most valid scientific approaches, down to the least valid at the bottom. Given that the most valid scientific approach (a randomized time-series intervention study) was not possible within the timeframe and resources of this study, the most valid remaining option was to construct an economic model for assessment of the cost-benefit of providing sanitation interventions and of moving from one sanitation coverage category to the next. A range of data were used in this model, reflecting households with and without improved sanitation, to ensure that before and after intervention scenarios were most appropriately captured. This included capturing the current situation in each type of household (e.g., health status and health seeking, water practices, time use), as well as understanding attitudes towards poor and improved sanitation, and the factors driving household and institutional decisions to invest in sanitation. These data were supplemented with evidence from other local, national and international surveys and data sets on variables that could not be scientifically captured in the field surveys. These included disease incidence and mortality rates, changes in disease rates associated with improvements in sanitation access and economic variables (incomes and discount rates), etc.

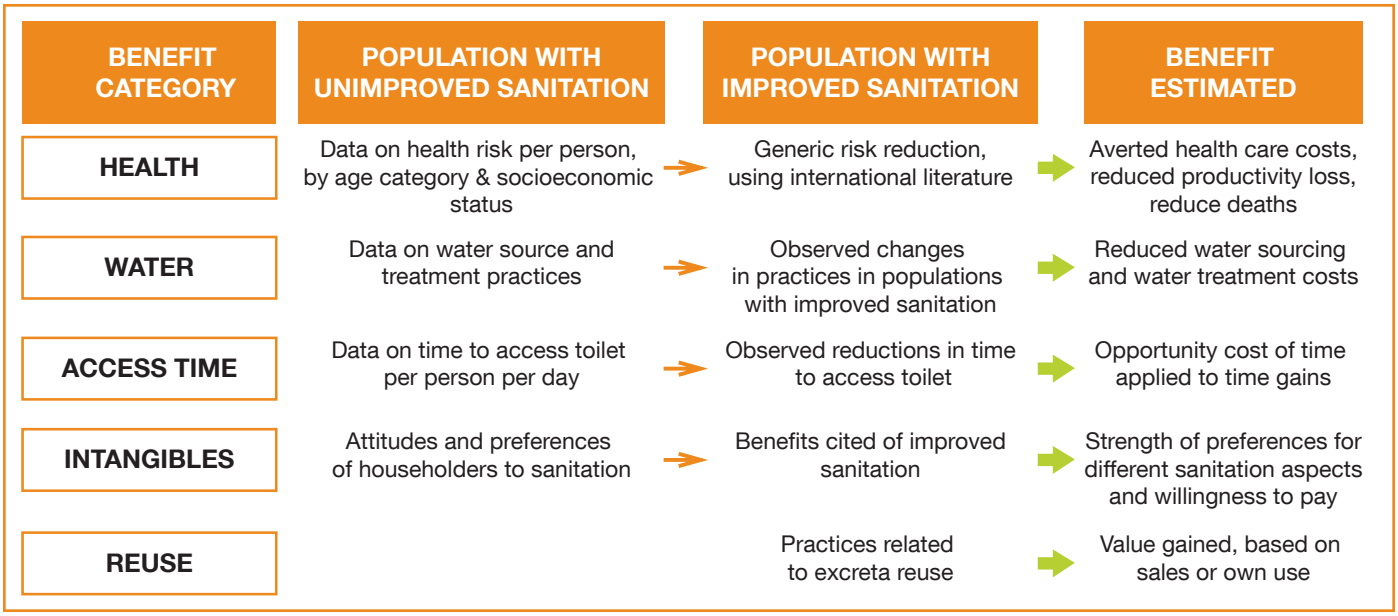
Figure 5 presents an overview of the methods for estimating the benefits of moving up the sanitation ladder. The actual size of the benefit will depend on the specific sub-type of sanitation intervention implemented.

The specific methods for calculating the sanitation benefits are described below.

Health: For the purposes of cost-benefit and cost-effectiveness analysis, three types of disease burden are evaluated: numbers of cases (incidence or prevalence), numbers of deaths, and disability-adjusted life-years (DALYs). Diseases included are all types of diarrheal disease, helminthes and diseases related to malnutrition. Malnutrition is partially caused by environmental factors including poor water, sanitation and hygiene, and the presence of malnutrition increases the risk of, and fatality from, other diseases (e.g., malaria, acute lower respiratory infection, measles, etc.) (see Annex Table A4). Health costs averted through improved sanitation are calculated by multiplying overall health costs per household by the relative health risk reduction from improved sanitation and/or hygiene measures. Health costs are made up of disease treatment costs, productivity losses and premature mortality losses. For cost-effectiveness analysis, DALYs are calculated by combining the morbidity element (made up of disease rate, disability weight and illness duration) and the mortality element (mortality rate and life expectancy). Standard weights and disease duration are sourced from the Global Burden of Disease study (WHO 2008), and average life expectancy for the Philippines of 70.8 years is used.[14]

[14] This is the weighted average of the estimated life expectancy of males (67.83 years) and females (73.8 years) for 2005. The raw data was taken from the Philippine Statistical Yearbook (NSCB 2008).

FIGURE 5: OVERVIEW OF METHODS FOR ESTIMATING FIELD-LEVEL BENEFITS OF IMPROVED SANITATION



- Rates of morbidity and mortality are sourced from various data sets for three age groups (0-4 years, 5-14 years, 15+ years), and compared and adjusted to reflect local variations in those rates. National disease and mortality rates were adjusted to rates used for the field sites based on socio-economic characteristics of sampled populations. As not all diarrheal diseases are from fecal-oral transmission, an attribution fraction of 0.88 is applied for these diseases. For helminthes, an attribution factor of unity was used in the study — i.e., cases are fully attributed to poor sanitation. Methods for the estimation disease and mortality rates from indirect diseases via malnutrition are provided in the ESI Impact Study report (Rodriguez et al. 2008).
- Health care costs are calculated by applying treatment seeking rates for different health care providers to the disease rates, per population age group. The calculations also take into account hospital admission rates for severe cases. Unit costs of services and patient travel and sundry costs are applied based on treatment seeking.
- Health-related productivity costs are calculated by applying time off work or school to the disease rates, per population age group. The economic cost of time lost due to illness reflects an opportunity cost of time or an actual financial loss for adults with paid work. The unit cost values are based on the average income rates per location. For adults a rate of 30% of the average income is applied, reflecting a conservative estimate of the value of time lost. For children 5-14 years, sick time reflects lost time at school which has an opportunity cost, valued at 15% of the average income. For children under five, the time of the child carer or caregiver is applied at 15% of the average income. Values are provided in Table 4.
- Premature death costs are calculated by multiplying the mortality rate by the unit value of a death. Although premature death imposes many costs on societies, it is difficult to value precisely. The method employed by this study — the human capital approach (HCA) — approximates economic loss by estimating the future discounted income stream from a productive person, from the time of death until the end of (what would have been) their productive life. While this value may undervalue premature loss of life, as there is a value to human life beyond the productive worth of the workforce, the study faced limited alternative sources of value due to a lack of studies (e.g., value-of-a-statistical-life[15]). Values are provided in Table 4, including VOSL adjusted to the Philippines from developed country studies.

[15] VOSL studies attempt to value what individuals are willing to pay to reduce the risk of death (e.g., safety measures) willing to accept for an increase in the risk of death.These values are extracted either from observations of actual market and individual behavior ("hedonic pricing") or from what individuals stated in relation to their preferences from interviews or written tests ("contingent valuation"). Both these approaches estimate directly the willingness to pay of individuals, or society, for a reduction in the risk of death, and hence are more closely associated with actual welfare loss compared with the HCA.

TABLE 4: UNIT VALUES FOR ECONOMIC COST OF TIME PER DAY AND OF LOSS OF LIFE, PESOS, 2008

Technique	Daily value of time			Value of life		
	0-4 years	5-14 years	15+ years	0-4 years	5-14 years	15+ years
Rural						
Human capital approach[1]	53	53	106	653,325	1,022,456	1,071,496
VOSL[2]				3,490,237	3,490,237	3,490,237
Urban						
Human capital approach[1]	53	53	106	653,325	1,022,456	1,071,496
VOSL[2]				3,490,237	3,490,237	3,490,237

[1] 2% real GDP or wage growth per year, discount rate = 8%
[2] The VOSL of US$2 million is transferred to the study countries by adjusting downwards by the ratio of GDP per capita in each country to GDP per capita in the USA. The calculation is made using official exchange rates, assuming an income elasticity of 1.0. Direct exchange from higher to lower income countries implies an income elasticity assumption of 1.0, which may not be true in practice.

- Risk reductions of illness and death associated with improved sanitation and hygiene interventions are assessed from previous reviews of the international literature (Esrey et al. 1985; Esrey and Habicht 1986; Esrey et al. 1991; Prüss and Mariotti 2000; Fewtrell et al. 2005, Waddington et al. 2009), and are applied and adjusted to reflect risk reduction in local settings based on baseline health risks and interventions applied.

Water: While water has many uses at the community level as well as for larger-scale productive purposes (e.g., industry), the focus of the field study is use for domestic purposes, in particular drinking water. The most specific link between poor management of human excreta and water quality is the safety aspect, which causes communities to take mitigating actions to avoid consuming unsafe water. These include reducing reliance on surface water and more use of wells or treated piped water supply or bottled water. It even involves the need to rely less on shallow dug wells which are more easily contaminated with pathogens, and to drill deeper wells.

Water quality measurement was conducted by the Intertek Testing Services Philippines Inc. as part of this study in representative field sites, to enable a detailed analysis of the impacts of improved sanitation on local water quality (see Annex Table A5). This study measures the actual or potential economic impacts of improving sanitation on two sets of mitigation measures:

- Accessing water from the source. Because households pay more or walk further to access water from cleaner sources such as drilled wells, or they pay more for piped water, it would in theory reduce these costs if sanitation was improved. For example, traditionally, people prefer the taste of water from shallow wells to deeper wells, and hence would likely return to use of shallow wells or wells closer to their home if they could guarantee cleaner and safer water. Also, in some instances, water access and treatment costs of water utilities may be lower if they use local and less contaminated water sources. Hence, expected percentage cost reductions are applied to current costs of clean water access to estimate cost savings from improved sanitation.
- Household treatment of water. Traditionally, many households treat their water due to concerns about safety and appearance. This is commonly true even for piped treated water supplies. Boiling is the most popular method because it is perceived to guarantee that water will be safe for drinking. However, boiling water can require considerable cash outlays or it consumes their time for collecting fuel. Furthermore, boiling water for drinking purposes is more costly to the environment due to the use of wood, charcoal or electricity, with correspondingly higher CO2 emissions than other treatment methods. If sanitation is improved and the pathogens in the environment reduced to low levels, then households may feel more ready to use a simple and less costly household treat-

ment method such as filtration or chlorination. Or if piped sources could be trusted, as in most industrialized countries, households may no longer need to treat their water. Hence, based on observations and expected future household treatment practices under a situation of improved sanitation, the cost savings associated with changes in water treatment practices are calculated.

Access time: When households have their own private latrine, many of them will save time every day, compared to the alternative of going to the bush or using a shared facility for their toilet needs. The time used for each sanitation option will vary from household to household, and from person to person, as children, men, women, and the elderly all have different sanitation preferences and practices. Therefore, this study calculates the time savings for different population groups of improved sanitation, based on observations of households both with and without improved sanitation. The value of time is based on the same values as health-related time savings (see above).

Excreta reuse: Human excreta, if handled properly, can be a safe source of fertilizer, wastewater for irrigation or aquaculture, or biogas. However, improved human excreta reuse is not commonly practiced in the Philippines. Only the UDDT-E users in the two San Fernando sites were found to re-use human excreta for fertilizer. The value of excreta reuse is measured through assessment of both the nonmarket value (when used by the household, which either saves costs or generates additional benefit) and the market value (when sold at a price). This enables calculation of an average value per household practicing safe human excreta reuse. In the case of combined human and animal excreta reuse (as in the case of biogas), both the full cost and the full benefit of the biogas digester are included.

Intangibles: Intangibles are major determinants of personal and community welfare such as comfort, privacy, convenience, safety, status and prestige. Due to their often very private nature, intangibles are difficult to elicit reliable responses from individuals, and some may vary considerably from one individual and social group to another. Intangibles are therefore difficult to quantify and summarize from a population perspective, and are even more difficult to value in monetary terms for a cost-benefit analysis. Economic tools do exist for quantitative assessment of intangible benefits such as contingent valuation method, and willingness to pay surveys are commonly used to value environmental goods. However, there are many challenges to the application of these methods in field settings which affect their reliability and validity, and ultimately appropriate interpretation of quantitative results. Furthermore, willingness to pay often captures more than just the intangible variables being examined, but will also capture preferences that have been valued elsewhere (e.g., health and water benefits). This current study therefore attempts only to understand and measure sanitation knowledge, practices and preferences in terms of ranking scales and descriptive presentation. This enables a separate set of results to be provided alongside the monetary-based efficiency measures.

External environment: Likewise, the impacts of poor sanitation practices on the external environment are also difficult to quantify in monetary terms. Hence, this study attempts only to understand and measure practices and preferences in relation to the broader environment, in terms of ranking scales and descriptive presentation. Given human-related sanitation is only one of several factors in environmental quality, other aspects — sources of water pollution, solid waste management, and animal waste — are also addressed to understand human excreta management within the overall picture of environmental quality.

A summary of the key formulas, variables and data sources used for calculating the monetized benefits is provided in Annex Table A6.

3.3.4 DATA SOURCES

Given the range of costs and benefits estimated in this study, a range of data sources were defined including both up-to-date evidence from the field sites as well as evidence from other data bases or studies. Given the limitations of the field study, some elements of some benefits needed to be gathered from other more reliable sources. Routine data systems such as the health information system are often of poor quality and incomplete, while larger more reliable nationwide or local surveys may be out of date, or were not conducted in the ESI field locations.

Under the supervision of the ESI region and country leads, the survey was led by Ms. Dieldre Harder of the Resources,

Environment, and Economics Center for Studies, Inc. (RECS). Four teams were deployed for the surveys. Each team had one area supervisor, one research associate/assistant, and four to five enumerators.

A month prior to the survey, area supervisors engaged in pre-data collection in their respective sites. The objective was to obtain an estimate of the population of households from which the sample of respondents can be drawn. Information was obtained from municipal records. If unavailable, especially for households practicing open defecation, the area supervisors consulted Barangay Health Workers. The ESI team also conducted site visits and focus group discussions to familiarize themselves with conditions in the sites as well as potential issues and concerns.

In the course of the survey, the teams stayed in the sites for an average of two to three weeks. However, in situations with high refusal rates and bad weather, the survey teams extended their stay in the sites by a few days.

The contents of the field tools applied are introduced briefly below (the tools applied in the Philippines are available from WSP).

Field tool 1: Household questionnaire. Household questionnaires consisted of two main parts: the first was for household representatives (the senior male and/or female household member, based on availability at time of interview), while the second was a shorter observational component covering mainly physical water, sanitation and hygiene features of the household. The interview part consisted of sections on:

- Socio-economic and demographic information, and household features
- Current and past household sanitation options and practices, and mode of receipt
- Perceived benefits of sanitation, and preferences related to external environment
- Household water supply sources, treatment and storage practices
- Health events and health treatment seeking
- Hygiene practices
- Household solid waste practices

The household questionnaire was applied to a total of 1,270 households over the six sites, or roughly 212 households per site divided over households with improved and unimproved sanitation. In most sites, control sites were also established for comparison with intervention sites. Annex Table A7 presents the sample sizes per sanitation option and per field site. Representing approximately 6% of the total possible respondents, the number of respondents was initially selected with a view towards having the same margin of error for each site and intervention. However, exceptions were made in interventions/options that had a relatively limited number of potential respondents. An example here was the number of households in Alabel whose septic tanks have been emptied. Only 44 potential respondents were identified and a complete enumeration of these respondents was implemented. Another example was the number of UDDT-E users in the upland region of San Fernando. Prior to the survey, 49 potential respondents were identified but only 17 were found to be actually using their facilities. Given the situation, all 17 target respondents were interviewed in the survey. For interventions with a sufficiently large population, the respondents were randomly selected. Replacements were included in cases where the original respondents refused to be interviewed.

On average, the interviews lasted about one hour and 15 minutes per household. Across all sites, about one in ten households refused to be interviewed. The rate of refusal was higher for households practicing open defecation in barangay San Agustin, San Fernando City. Two other problems were encountered in the conduct of the surveys. First, the initial information provided on the types of latrines of the respondents was incorrect in several instances. This led to deviations between the planned and actual interviews conducted for the different sites/interventions (see Annex Table A7). Second, respondents also complained about the length of the interview, especially when it interfered with their household activities.

It is also important to note that there were no significant differences in the manner in which rural and urban households reacted to the interviews. However, the enumerators noted that households in urban areas were more apprehensive in providing information on their income and assets and in allowing the enumerators to enter their houses.

Field tool 2: Focus group discussion. The purpose of the focus group discussion (FGD) was to elicit behavior and preferences in relation to water, sanitation, and hygiene from different population groups, classified (if possible) by sanitation coverage (with versus without) and by gender. The topics covered in the FGDs followed a generic template of discussion topics, but the depth of discussion was dictated by the readiness of the participants to discuss the topics. The added advantage of the FGD approach is to discuss aspects of sanitation and hygiene that may not otherwise be revealed by face-to-face household interviews, and to either arrive at a consensus or otherwise to reflect the diversity of opinions and preferences for sanitation and hygiene among the population.

A total of 18 FGDs were conducted in all the sites. Led by Dr. Carmela Taguiam (sociologist), three to four FGDs, each lasting about one and half hours, were conducted for each site. More than 180 people participated in the FGDs (see Annex Table A8).

Field tool 3: Physical location survey. A survey of the physical environment was conducted in all field locations. The main purpose was to identify important variables in relation to water, sanitation and hygiene in the general environment, covering land use, water sources, and environmental quality. This information was triangulated with the household surveys and FGDs as well as the water quality measurement survey, to enable appropriate conclusions about the extent of poor sanitation and links to other impact variables. This survey was conducted by Ms. Louisa Bite (Taguig), Ms. Lisa Laus (Bayawan), Ms. Clarissa Andrade (Alabel), and Ms. Marilou Eugenio (Dagupan and San Fernando).

Field tool 4: Water quality measurement. Because poor sanitation has detrimental impacts on water quality, special attention was paid in this study to identify the relationship between the type and coverage of toilets in the selected field sites and the quality of local water bodies. Given the time scale of this present study, it was not possible to measure water quality variables before the project or program was implemented; neither was it possible to compare wet season and dry season measurements. The water quality measurement survey was contracted to Intertek Testing Services Phils. and carried out in the months of August and September 2009. The study enabled assessment of the impact of specific local sanitation features on water quality. It also enabled a broader comparison of water quality between study sites with different sanitation coverage levels. Water sources tested in each site included ground water (dug shallow wells, deeper drilled wells), standing water (ponds, lakes, canals), and flowing water (rivers, wastewater channels). Annex Table A5 and A8 shows the type of test and location per parameter, and the number and type of water sources tested. Parameters measured varied per water source, but generally included E. coli, Biological Oxygen Demand for 5 days (BOD5), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), Nitrates, Ammonical Nitrogen, conductivity, turbidity, pH, and residual chlorine.

Field tool 5: Market survey. For economic evaluation, local prices are required to value the impacts of improved sanitation and hygiene. Selected resource prices, and in some cases, resource quantities, were recorded from the most appropriate local source. These include (where available): labor prices (average wage, minimum wage) and employment rate, water prices by different sources, water treatment filters, fuel prices, sanitation improvement costs, soap costs, fertilizer costs (when excreta is used for fertilizer), and pharmacy drug costs. The market surveys were implemented in all the sites.

Field tool 6: Health facility survey. Given the importance of health impacts, a separate survey was conducted in one to three health facilities serving each field site (Annex Table A8). Variables collected include numbers of patients with different types of WSH-related disease, and the types and cost of treatment provided by the facility. Data were supplemented by information collected from municipal/city health offices.

Other data sources: In addition to the data collected from the field sites, information was gathered from other sources to support the field-level cost-benefit study, such as reports, interviews, and data sets. These include:

- Demographic and health survey: regional incidence rates, under-five mortality rates
- Local government publications: site-specific information on demographic and economic data, sanitation coverage, drinking water sources, health statis-

tics, prices of goods and services and water bodies
- National statistics: regional demographic and economic data, price deflators
- Local literature: costs and lifespan of toilet facilities, water consumption and related information, water treatment costs
- International health literature: rates of disease, and effectiveness of WSH interventions to avert disease

3.3.5 DATA ANALYSIS

The types of costs and benefits included in the study are listed in Section 3.2. This section describes how costs, benefits and other relevant data are analyzed to arrive at overall cost-benefit estimates.

The field level cost-benefit analysis generates a set of efficiency measures from site-specific field studies, focusing on actual implemented sanitation improvements, including household and community costs and benefits. The costs and benefits are estimated in economic terms for a 20 year period for each field site, using average values based on the field surveys and supplemented with other data or assumptions. Five major efficiency measures are presented:

1. The benefit-cost ratio (BCR) is the present value of the future benefits divided by the present value of the future costs, for the 20 year period. Future costs and benefits (i.e., beyond the first year) are discounted to present value using a discount rate of 8% (sensitivity analysis: low 5%, high 10%). The 8% discount rate was used in a recent study conducted by Montenegro et al. (2005). The "high" discount rate that will be used in the sensitivity analysis follows the rate used by Predo (2003), Catelo et al. (2001), and Ebarvia (1997). The "low" discount rate of 5% was chosen arbitrarily.
2. The cost-effectiveness ratio (CER) is the present value of the future health benefits in non-monetary units (cases, deaths, disability-adjusted life-years) divided by the present value of the future costs, for the 20 year period. Future costs and health benefits (i.e., beyond the first year) are discounted to present value using a discount rate (see above).
3. The internal rate of return (IRR) is the discount rate at which the present value equals zero — that is, the costs equal the benefits — for the 20 year period. It shows the annual equivalent rate of return of spending on sanitation, and can be compared with other development projects or alternative uses of funds (e.g., earning interest in a bank account).
4. The payback period (PBP) is the time after which benefits have been paid back, assuming initial costs exceed benefits (due to capital cost) and over time benefits exceed costs, thus leading to a break-even point.
5. The net present value (NPV) is the net discounted benefits minus the net discounted costs.

Results are presented by field site and for each sanitation improvement option compared with no sanitation option (i.e., open defecation). Also, selected steps up the sanitation ladder are presented, such as from shared latrine to private latrine, from dry pit latrine to wet pit latrine, or from wet pit latrine to sewerage. The efficiency ratios are presented both under conditions of well-delivered sanitation programs which lead to well-functioning sustainable sanitation systems, as well as sanitation systems and practices under actual conditions, observed from the program approach analysis (Section 3.4). Given that not all sanitation benefits have been valued in monetary units, these benefits are described and presented in non-monetary units alongside the efficiency measures. Gender issues are particularly central in the presentation of intangible benefits.

The results described above reflect data on the input variables of the "average" population. Therefore, to assess whether intervention efficiency is higher or lower in different income categories and socio-demographic groups, input values for poor and vulnerable groups without sanitation are entered into the economic model, and compared with the average and with high income groups. The main variables varying are household size, value of time, disease and mortality rates, water supply and treatment practices, and the investment (cost) most likely to be made in the sanitation option.

Further assessments are conducted to enable national interpretation of efficiency results. This involves entering input values in the economic model corresponding to national averages for rural and urban areas, which is likely to give different results from the specific field sites.

TABLE 5: SAMPLE SIZES FOR TOURIST SURVEY, BY MAIN ORIGIN OF TOURIST

Tourist nationality	Holiday tourists			Business visitors			Total
	First time visitors	Repeat visitors	Total	First time visitors	Repeat visitors	Total	
Europe	26	33	59	9	10	19	78
North America	17	33	50	5	8	13	63
Asia	10	5	15	5	1	6	21
Australia/New Zealand	7	10	17	0	7	7	24
Rest of the world	0	0	0	3	0	3	3
Total	**60**	**81**	**141**	**22**	**26**	**48**	**189**

3.4 National studies

National level studies served two main purposes: (a) to assess the impacts of improved sanitation outside field sites to enable a more comprehensive cost-benefit analysis (tourism, business and sanitation reuse value); and (b) to complement or supplement data collected at field level to enable better assessment of local level impacts.

3.4.1 TOURIST AND VISITOR SURVEY

There exists an arguable link between sanitation and tourism, but for which, to date, very little hard evidence exists. Poor sanitation and hygiene affect tourists in two ways:

1. **Short term welfare loss and expenses.** Tourists get sick from diarrhea, intestinal worms, hepatitis, etc, which have direct health care costs, and tourists are exposed to environments with poor sanitation, thus resulting in a reduction in holiday enjoyment.
2. **Reduced tourist numbers.** In the longer term, tourists stay away from tourist locations which are deemed to be unsafe (from a health perspective) or unpleasant, such as unclean water, smelly environment or without proper toilets. Tourists may stay away either because they already had an unpleasant experience themselves in a tourist site and choose not to come back; or they have been recommended not to visit a location due, among other things, to poor sanitation.

This present study attempts to explore these two impacts via a survey of non-resident foreign visitors. Aside from holiday tourists, business visitors were also included to get personal views of business visitors and hence make an important link with the business survey (Section 3.4.2). A total of 141 holiday tourists and 48 business visitors were interviewed at the departure lobby of the Ninoy Aquino International Airport (NAIA) Terminal 1. Table 5 shows the sample size by type of visitor, major categories of nationality, and whether they are return visitors or not.

The survey was applied in English and Korean, the latter to enable more Asian tourists to be included. Conducted during the period of 4-8 May 2009, the survey method was a mix of drop-off and face-to-face interviews, depending on the preference of the respondent. The rejection rate was quite high, more than 40%. Eleven of the 200 responses were discarded because the questionnaires were not completed. On average, a questionnaire was completed in 20 minutes. The survey form included questions on the following topics:

- Length of trip, places stayed and price category of hotel
- Level of enjoyment of different locations visited, and reasons
- Sanitary condition of places visited, and availability of toilets
- Water and sanitation-related sicknesses suffered, perceived sources, days of sickness, and type and cost of treatment sought
- Major sources of concern for a holiday stay in the Philippines
- Intention to return to the Philippines, recommendation to friends, and reasons

3.4.2 BUSINESS SURVEY

Poor sanitation also has the potential to affect businesses. Two types of impacts are assessed, the local-level "micro" impact and the higher-level "macro" impact:

1. Businesses located in areas with poor sanitation may pay higher costs (e.g., having to pay more to access clean water) or lose income (due to customers being unwilling to visit the location). It should be noted, though, that the customer losses assessed here are not necessarily absolute losses to the country, as customers may have the choice to go elsewhere — i.e., to other businesses located in other areas.
2. Foreign businesses who decide not to locate in the Philippines. Among the many reasons for deciding whether to locate a business in the Philippines, sanitation may be one of them. There are several pathways through which poor sanitation may affect a business' decision to locate in the Philippines: (a) health of the workforce, due to actual statistics or business leader perceptions of poor health of a nation's workers; (b) poor (perceived) quality of water for use by the business, and the related costs; (c) general poor environment (solid waste, unsightliness) which affects the ability to do business; and (d) undesirability for foreign staff to be located in the Philippines due to the poor sanitary conditions, among other things.

TABLE 6: SAMPLE SIZE FOR BUSINESS SURVEY, BY MAIN SECTORS OF FIRMS

Main business or sector of firm	No. of firms	Number of employees		
		0-9	10-50	51-200
Aquaculture	2	1	1	0
Retail: Wet markets[1]	3	3	0	0
Resort/restaurants	4	2	0	2
Slaughterhouse	2	1	1	0
Travel	2	0	1	1
Water/ice	2	2	0	0
Food processing	2	0	1	1
Total	**17**	**9**	**4**	**4**

[1] Wet markets are places where live or slaughtered animals, fruits and vegetables, and other produce are sold. Hygiene standards in such places are usually inferior to supermarkets.

In order to assess both these hypothesized effects, a total of 17 firms were surveyed through face-to-face interviews and in some cases, in-depth discussions. Table 6 shows the number of firms, by sector, and by number of employees. These firms were selected based on the hypothesized link between sanitation and their business, and the importance of the sector and specific firm to the economy of the Philippines. Naturally, the survey of foreign firms was of those firms that have already located in the Philippines, and hence a key category of firm — those that had decided against locating in the Philippines — did not form part of the sample. However, foreign firms were asked about the factors affecting their decision to locate in the Philippines, and their experiences of the country.

The survey form included questions on the following topics:

- Ownership, sector, activities, employees and location of firm (production, sales, etc)
- Perceptions of sanitation at company location
- Factors affecting decision to locate in country or area, and intention to relocate
- The production and sales costs related to different aspects of poor sanitation (health, water, environment)
- Potential costs and benefits of improved sanitation related to the business

3.4.3 NATIONAL SANITATION MARKETS

Sanitation markets include institutions that facilitate the sale of goods arising from the reuse of human excreta as fertilizer, soil conditioners and biogas. While the reuse of sanitation "outputs" is limited to date in the Philippines, it is useful to estimate the potential economic benefits of these activities. Such an analysis will help support policy makers and the private sector to assess whether reuse options could be economically and financially viable to stimulate investment in this area. Hence this study calculates the potential economic value based on assumptions of different adoption levels and output values, ranging from realistic to higher (potential) adoption and price levels.

3.4.4 NATIONAL HEALTH STATISTICS

The field surveys provided data from the sampled households and health facilities on disease incidence for selected diseases related to poor sanitation. For some sites, other studies conducted in the same locality provided alternative sources of disease incidence data. However, constraints in data robustness at the field level requires supplementation of these data with estimates on disease incidence and mortality rates from other sources, and adjustment to the health conditions of the specific field sites. Data were therefore sourced from national surveys (e.g., Demographic and Health Survey) and research studies as well as internationally compiled statistics for the Philippines or the Southeast Asia region (World Health Organization; Disease Control Priorities Project 2). The data from these different sources were compared in terms of quality and applicability to the field sites, to finally select the most appropriate values for use in the cost-benefit analysis and the national health overview.

IV. Local Benefits of Improved Sanitation and Hygiene

This chapter presents the local impacts of improved sanitation and hygiene. In particular, it covers the following topics:

- Health (Section 4.1)
- Water (Section 4.2)
- Access time (Section 4.3)
- Reuse of human excreta (Section 4.4)
- Intangibles (Section 4.5)
- External environment (Section 4.6)
- Projects and actual benefits (Section 4.7)
- Summary of results (Section 4.8)

4.1 Health

The following sub-sections discuss the key values and assumptions used in the calculation of the health benefits. It also summarizes the estimated benefits for the different study sites.

4.1.1 DISEASE BURDEN OF POOR SANITATION AND HYGIENE

Table 7 shows the disease burden associated with poor sanitation and hygiene among children under the age of five years. It indicates an estimated 4,558 disease cases, two deaths and 18 DALYs lost per 1,000 children each year in rural areas. While estimated disease incidence and DALYs are not too different from those in urban areas, mortality rates for children living in rural areas are about 50% (2.2 per 1,000 against 1.5 per 1000) higher than in urban areas. Diarrheal diseases account for the largest proportion of cases, deaths and DALYs lost.

Site-specific rates used in the study are presented in Annex Table B1. While the estimates do not differ too much across the sites, Dagupan had the highest incidence rates among children under the age of five years. On the other hand, the highest mortality rates were estimated for the upland region

TABLE 7: DISEASE RATES ATTRIBUTABLE TO POOR SANITATION AND HYGIENE FOR CHILDREN UNDER 5 YEARS, ANNUAL RATES PER 1000 PERSONS, 2008

Disease	Rural sites			Urban sites		
	Cases	Deaths	DALYs	Cases	Deaths	DALYs
Direct diseases						
Diarrhea	4,120.6	1.32	6.0	4,159.5	0.87	6.0
Helminthes	369.7	0.01	2.3	369.7	0.01	2.3
Indirect diseases						
Malnutrition	nc	0.05	0.8	nc	0.05	0.8
Malaria	0.4	0.02	0.2	0.4	0.01	0.2
ALRI	67.6	0.60	5.7	46.0	0.35	5.2
Measles	nc	0.11	1.0	nc	0.06	0.9
Other diseases	nc	0.12	1.5	nc	0.12	1.5
Total	**4,558.3**	**2.22**	**17.5**	**4,575.5**	**1.47**	**16.9**

Note: nc = not calculated
Source: Annex Table B1

of San Fernando. Such differences are explained by adjustments in national disease incidence and mortality rates that were implemented in order to more closely reflect conditions in the study sites. For example, diarrheal disease rates were adjusted using DHS data on diarrheal incidence of children under the age of five years in the rural and urban regions. The revised incidence rates were then applied to the rural and urban households of each of the sites in order to arrive at an estimate of the appropriate site-specific incidence rate. A similar adjustment was made for the incidence rates of ALRI, and the mortality rates of diarrheal diseases and ALRI. No adjustments were made for the other diseases.

To some extent, quality of life impacts associated with morbidity are reflected in the DALY calculations above, and in the estimates of health care and productivity costs (see later sections). However, it fails to fully capture the pain, suffering, and discomfort that come with disease. For example, the FGDs found that adults continue to report for work even though they are sick. Hence, while there might not be a financial loss of income for these sick adults, the additional discomfort associated with working at a time of illness is not captured in the analysis.

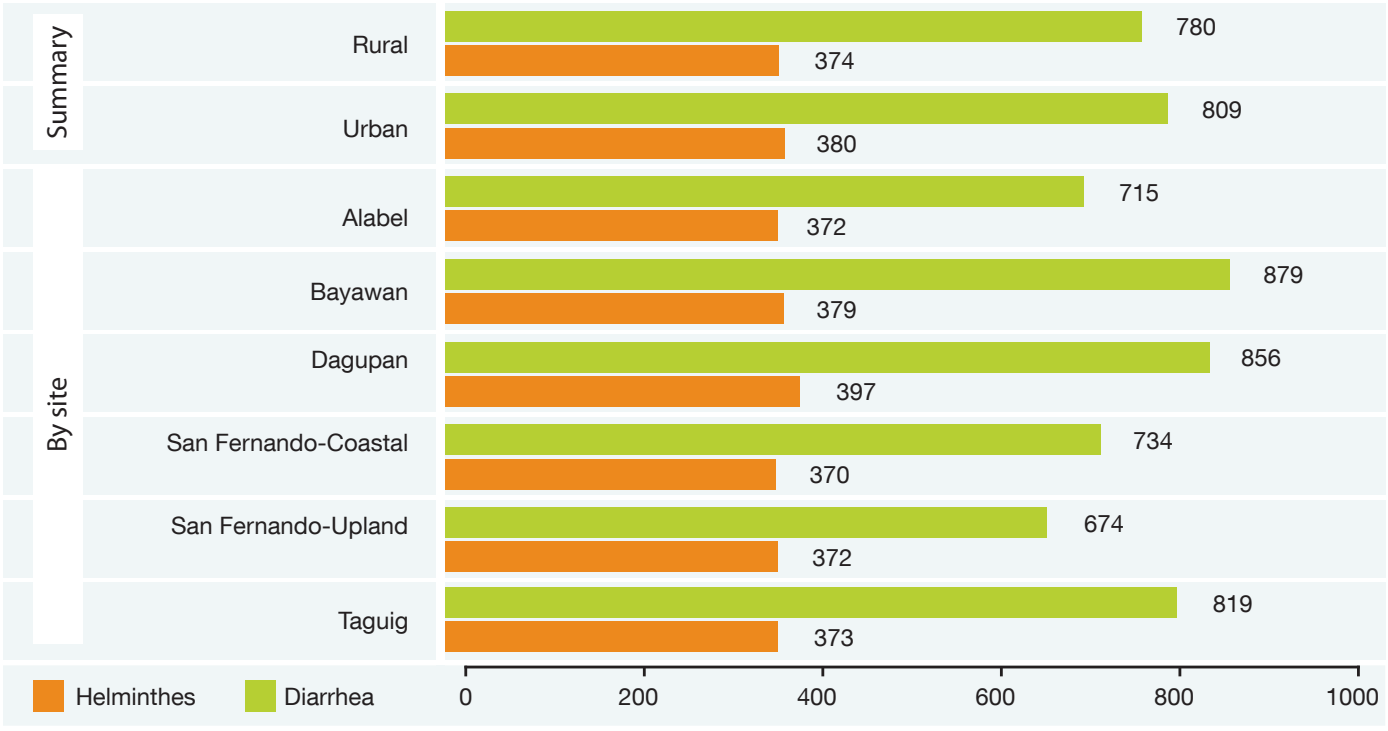
Figure 6 shows the incidence rates for direct diseases for all age groups and sites. The values reported here are lower than those in Table 7 because incidence rates for diarrheal diseases are lower for older age groups.

4.1.2 Health care costs

Health care costs are estimated based on the number of cases, proportion of illnesses treated by each provider, and unit costs associated with each provider.

Table 8 presents a summary of treatment seeking rates for diarrhea among children below five years. It is based on the ESI household survey and indicates that the majority of the respondents practiced self-treatment. In addition, this practice appears to be more prevalent in urban areas. While more than 40% of the respondents in rural and urban areas sought treatment at public health providers, a larger proportion of respondents in urban areas sought advice or bought medicines from pharmacies. The survey results suggest that respondents adopt multiple practices for treating diarrheal disease. Based on the FGDs, this behavior was explained by households initially attempting to deal with the disease through self-treatment. Patients are then brought to formal care facilities when the disease gets worse. It is important to

FIGURE 6: COMPARISON OF DIRECT DISEASE RATES FOR ALL AGE GROUPS, PER 1000 PERSONS



Source: Annex Table B1

note that, in the case of diarrheal diseases, this pattern was more or less observed for all age groups. The only major difference is that adults (i.e., people over the age of 15 years) were less likely to visit public health providers (Annex Table B3). Treatment seeking behavior for people experiencing ALRI-like symptoms also had a similar pattern as diarrheal diseases but a larger proportion of the respondents went to public health providers.

Among those who went to hospitals, in-patient admission rates vary by disease, age group and location. In the case of diarrheal diseases, the rates were based on the survey results. Given the relatively small number of responses for each of the sites however, the approach was to calculate the in-patient admission rates for the different age groups in the rural and urban sites as a whole. The rates for each age group in the sites were then calculated by taking the weighted average of the in-patient admission rates for rural and urban areas. The weights used were based on the site-specific population of persons (by age group) living in the urban and rural areas. The result was an in-patient admission rate with the following ranges:

- 0-4 years old: 12.3% (Dagupan and Taguig) to 16.6% (Bayawan);
- 5-14 years old: 23.1% (Dagupan) to 31.2% (Bayawan); and
- Over 15 years old: 11.1% (Dagupan and Taguig) to 21.5% (Bayawan).

For ALRI, in-patient admission rates were based on respondents who displayed ALRI-like symptoms two weeks prior to the survey. Since there were very few responses for in-patient admission in the survey, two assumptions had to be adopted. The first is that in-patient admission rates do not vary by site. The other is that the in-patient admission rates between the age groups 0-4 years and 5-14 years are the same. In the end, the in-patient admission rates used for all the sites were 3.6% (under the age of 15 years) and 7.7% (15 years and over).

There was no available information on in-patient admission rates for helminthes and malaria. In the case of malaria, the study adopted the rates for ALRI. On the other hand, an in-patient admission rate of zero was used for helminthes. This was based on interviews with doctors who said that people who suffer from helminthes are basically out-patient cases and that those who are admitted are really as a result of complications arising from other diseases.

TABLE 8: TREATMENT SEEKING BEHAVIOR FOR DIARRHEA, UNDER 5S ONLY

Data Source	Observations[1]	% seeking treatment from[2]					No treatment (%)
		Public provider[3]	Private formal clinic	Informal care	Pharmacy[4]	Self-treatment[5]	
Urban							
ESI sites	65	42.0	9.5	3.8	68.9	62.5	4.6
DHS (2003)[6]	na	36.2		na	na	15.1	23.4
Rural							
ESI sites (under 5s)	24	45.8	12.5	0.0	37.5	54.2	12.5
DHS (2003)[6]	na	28.6	na	na	na	20.5	21.3

Notes: na = not applicable

[1] Number of people who reported illness and — responded to question on treatment facility, or responded to question on pharmacy, or responded to question on self treatment. Some households had 4 respondents per question.

[2] This represents a percentage of relevant responses (not necessarily the total number of observations). Response rates are different for each of the columns, e.g., some responded to the question on public providers while others did not. The sums from the ESI survey may exceed 100% because multiple responses were allowed.

[3] Includes Barangay Health Centers

[4] The questionnaire asked if the respondent purchased medicine from a pharmacy. Hence, this does not necessarily refer to people seeking treatment from a pharmacy.

[5] Represents people who used medicine already available at home prior to disease and those who received some form of treatment at home

[6] Information from the DHS presented add up to a number that is less than 100%. The reason is that there are categories in the survey (e.g., oral rehydration therapy and other treatments) which do not fit the categories in the table.

Source: Annex Table B3

Unit costs for treating diarrheal disease are provided in Table 9. It indicates that the out-patient costs of formal care (public and private hospitals and clinics) were about PhP645 (US$15) and PhP693 (US$16) per case in rural and urban areas, respectively. These costs are composed of doctors' fees and payments for medicine in private hospitals. Information from public hospitals, which indicated lower costs, was ignored on the assertion that the presence of subsidies in these facilities imply that the payments made by the patients were less likely to reflect the full economic costs of treatment. Doctors' fees were obtained from the hospital survey and were generally assumed to be the same for all sites and age groups for reasons of consistency across sites. However, higher costs were used for Taguig because of the high cost of medical services in the National Capital Region. Information on the required medication was obtained from informal interviews with doctors. Costs of in-patient treatment are composed of doctors' fees, laboratory tests, room rates and medication. The values in Table 9 indicate that in-patient costs for treating diarrhea in the rural sites were about PhP2,910 (US$65) per patient while costs in the urban sites were about 20% higher. The differences between the costs were mostly accounted for by doctors' fees and room rates, which were higher in urban areas. Incidental expenses capture transport costs associated with traveling to the facility. Along with the costs of informal care, the values used for these items were drawn from the ESI household survey.

Annex Table B4 presents other unit costs associated with diarrhea, such as the costs of medicines bought at pharmacies and self-treatment. It also presents the unit costs associated with helminthes, ALRI and malaria.

Table 10 shows the annual health care costs per person (by age group) and disease attributed to poor sanitation and hygiene in the Philippines. The values account for the unit costs of the diseases and their respective incidence rates. The table indicates three clear patterns. First, health care costs per person in urban areas were slightly higher than in rural areas. Second, diarrheal diseases accounted for the largest proportion of health care costs per person. This is

TABLE 9: UNIT COSTS ASSOCIATED WITH TREATMENT OF DIARRHEA, PESOS, 2008

Health provider	Outpatient cost		Inpatient cost (PhP)		
	Health care (PhP)	Incidentals[1] (PhP)	Average length of stay (days)	Health care[2] (PhP)	Incidentals[1] (PhP)
Formal Care					
Rural	645	64	4	2,910	71
Urban	693	64	4	3,464	71
Informal					
Rural	55	nc	na	na	na
Urban	55	nc	na	na	na

Notes: nc = cot computed, na = not applicable
[1] Incidentals: transport costs per out-patient visit and per in-patient stay.
[2] In-patient health care costs are presented per stay
Source: Annex Table B4

TABLE 10: AVERAGE HEALTH CARE COST PER PERSON PER YEAR IN FIELD SITES, BY DISEASE, AGE GROUP AND RURAL/ URBAN LOCATION, PESOS

Disease	Rural			Urban		
	0-4 yrs	5-14 yrs	15+ yrs	0-4 yrs	5-14 yrs	15+ yrs
Diarrheal disease (mild)	2,652.5	359.6	151.6	2,666.5	379.8	133.5
Helminthes	31.9	86.3	42.5	36.3	103.3	44.7
Malaria	0.1	-	-	0.2	-	-
ALRI	16.4	-	-	20.8	-	-
Total	**2,700.9**	**445.9**	**194.2**	**2,723.8**	**483.1**	**178.2**

especially the case among children under the age of five, where about 98% of the costs were attributed to diarrheal diseases. Given the high unit costs associated with malaria and ALRI for in-patient care, this may be explained by the high incidence of diarrhea relative to other diseases. Third, health care costs of children under the age of five years were substantially higher than any other age group. In rural areas for example, health care costs for this age group amounted to about PhP2,701 (US$61) per person. This is approximately 6 times larger than the costs for children between the ages of 5 and 14 years, and more than 10 times larger than the costs for adults (over 15 years). While this may be explained mostly by the higher incidence of diarrhea in this age group, it is important to note that the relative differences across age groups are overstated because malaria and ALRI were not accounted for in the health costs for people over the age of five years.

4.1.3 PRODUCTIVITY COSTS

There are two sources of productivity costs that are associated with disease. The first is the cost to a patient who is unable to perform his/her regular activities. A second cost, which is often ignored, is that of the carer who takes time away from his/her regular activities in order to look after the patient. The study attempts to estimate the productivity losses associated with these two costs.

In valuing productivity losses, the respondents were asked about the number of days in which household members were sick. Respondents were also asked about the amount of time spent by the carer in looking after the patient. The survey found that, on average, lost productivity from diarrheal diseases was 1.1 (under 5 age group), 3.4 (5-14 age group), and 4.1 (over 15 years) days. The number of lost productive days for children under five years was lower than the other age groups in part because the values only accounted for the time of the carer. In the case of children between the ages of 5 and 14, the time of the patient was also counted to include the lost school days or, for some, working days. On the other hand, lost productivity among children under the age of five years from ARLI was estimated to be 3.7 days. Due to the absence of data, it was assumed that the productivity losses for helminthes and malaria are the same as diarrhea and ALRI, respectively.

The value of the lost time can be estimated by the value of the income that patients and carers could have earned during the period of the illness. Recognizing the alternative approaches to the valuation of opportunity costs (e.g., lost income), the study used regional GDP per capita as the basis for approximating foregone income. However, the values were scaled down to 15% and 30% of GDP per capita per day for under fives and the other age groups, respectively. The adjustment follows the approach in the ESI Impact Study (Rodriguez et al. 2008) to account for the possibility that not all of the time lost was spent on productive activities. It was also an attempt to arrive at more conservative estimates of the impacts.

Table 11 shows the productivity losses per person arising from the assumptions discussed above. It indicates losses of slightly above PhP200 (US$4.5) per person for children under the age of five years and adults in rural areas. In the case of children under the age of five years, the explanation rests heavily on the relatively high incidence of disease, particularly diarrhea. On the other hand, the costs for adults are explained mostly by the relatively high valuation of their time losses, which is two times higher than children under five on a daily basis, and the relatively high number of productive days that are lost per person. As a result of its relatively high incidence rate, the productivity losses per person can be explained mostly by diarrheal diseases. Productivity

TABLE 11: AVERAGE PRODUCTIVITY COST PER PERSON PER YEAR IN FIELD SITES, BY DISEASE, AGE GROUP AND RURAL/ URBAN LOCATION, PESOS

Disease	Rural			Urban		
	0-4 yrs	5- 14 yrs	15+ yrs	0-4 yrs	5- 14 yrs	15+ yrs
Diarrheal disease (mild)	197.0	76.8	89.9	339.9	128.9	160.5
Helminthes	17.6	68.1	118.8	30.2	114.4	212.1
Malaria	0.1	-	-	0.1	-	-
ALRI	10.4	-	-	13.0	-	-
Total	**225.2**	**145.0**	**208.6**	**383.2**	**243.3**	**372.6**

costs in urban areas are at least 60% higher than the losses in rural areas mostly because of the relatively high regional GDP for Taguig.[16]

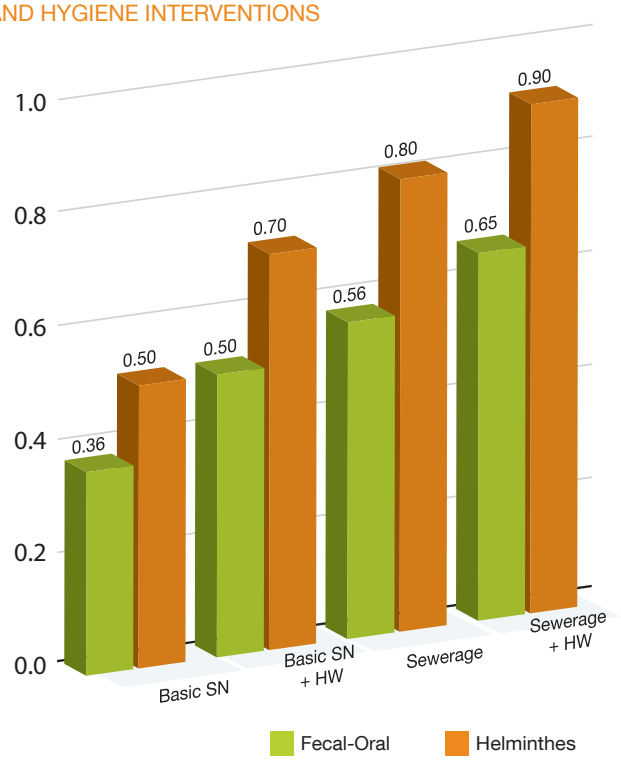
4.1.4 MORTALITY COSTS

Table 12 shows the costs associated with premature death (mortality). The values were computed by multiplying the probability of death (accounting for disease incidence) and the value of life using the human capital approach (Table 4). There are three clear findings indicated by Table 12. First, mortality costs are higher in rural sites. For children under the age of five years in the rural sites, the per capita cost of mortality was about PhP1,305 (US$29). Roughly 32% higher than its counterpart for urban areas, this was explained mostly by the higher mortality rates used in the rural sites (see Table 7). Second, in the case of children under the age of five years, a large proportion of the costs are due to diarrheal diseases. Third, the highest costs are reported for children under the age of five years. In rural sites for example, costs for this age group are more than ten times higher than the costs for the other age groups. This is due to the high diarrheal incidence rate assumed for this age group and the fact that mortality costs associated with malaria and ALRI were not calculated for the other age groups.

4.1.5 AVOIDED HEALTH COSTS

Health effects are central to the arguments of improving sanitation and hygiene. Since limited evidence exists on the actual impact of sanitation or hygiene programs on health outcomes in the Philippines, this study draws on international evidence. Figure 7 shows the different risk exposure scenarios being compared in this study, and the relative risk of fecal-oral disease and helminthes infection associated with each scenario. The left-hand scenarios (basic improved sanitation) are relevant mainly for rural areas, while the right-hand scenarios (moving to treatment of sewage and wastewater) are relevant mainly for urban areas. Each sanitation scenario is combined with handwashing, which is recognized to provide a further health impact.

FIGURE 7: RELATIVE RISK REDUCTION OF FECAL-ORAL DISEASES AND HELMINTHES FROM DIFFERENT SANITATION AND HYGIENE INTERVENTIONS



Note: See methods' section for the references and Hutton et al. (2011) for a more detailed discussion of the selected values.
SN = sanitation; HW = handwashing

TABLE 12: AVERAGE MORTALITY COST PER PERSON PER YEAR IN FIELD SITES, BY DISEASE, AGE GROUP AND RURAL/URBAN LOCATION, PESOS

Disease	Rural			Urban		
	0-4 yrs	5- 14 yrs	15+ yrs	0-4 yrs	5- 14 yrs	15+ yrs
Diarrheal disease (mild)	859.9	102.0	104.8	568.4	66.7	71.0
Helminthes	3.7	-	-	3.4	-	-
Malnutrition	29.8	-	-	29.8	-	-
Malaria	10.0	-	-	9.2	-	-
ALRI	292.5	-	-	268.7	-	-
Other diseases	109.4	-	-	109.4	-	-
Total	**1,305.3**	**102.0**	**104.8**	**988.8**	**66.7**	**71.0**

[16] The regional GDP for Taguig was based on estimates for the NCR.

The ESI household survey provides some support to the earlier assertion that lower disease incidence is associated with moving up the sanitation ladder. Annex Table B3 shows this for the case of diarrhea. However, the implied risk reductions appear to be smaller than those shown in Figure 7. The survey also asked the respondents whether they have observed changes in diarrheal disease incidence in any of the household members since receiving their new latrine. Their responses suggest that lower incidence was noticed for those receiving access to basic sanitation facilities (Table 13). For example, more than 90% of those who recently had access to shared/public toilets and wet latrines said that the incidence of diarrheal disease among household members was "probably less" or "a lot less." About 70% of those who received dry pits also had the same observation. Households who recently had access to septic tanks and/or sludge removal had a different observation. More than 75% of the respondents in this category said that they did not notice any changes in diarrheal disease incidence. Notwithstanding the other factors that might affect diarrheal disease incidence as well as the sampling strategy adopted in the survey, the results might be capturing diminishing returns to movements up the sanitation ladder, which is reflected in Figure 8. Households with access to shared/public toilets or dry and wet latrines are likely to have had no access (i.e., practicing open defecation) prior to receiving their toilets. On the other hand, households who have septic tanks are more likely to have had access to shared/public toilets or pit latrines prior to receiving the technology.

Table 14 summarizes the total costs per household of poor sanitation and hygiene for the field sites. It shows that the health cost for the average rural household in the sites was about PhP5,094 (US$115) per year. About 57% of these costs were accounted for by health care. The remainder was divided between productivity and mortality costs. The estimated health cost for the average urban household was PhP5,773 (US$130) per year. While the costs are still dominated by health care, the contribution of productivity losses was significantly higher than in urban areas. This was driven mostly by the relatively high regional GDP of Taguig. Table 14 also summarizes the estimated costs averted from sanitation improvements. It shows that health costs fall by PhP1,914 (US$43) as a household moves from open defe-

TABLE 13: PERCEIVED DIFFERENCE IN DIARRHEAL INCIDENCE SINCE IMPROVED SANITATION, IN ALL FIELD SITES

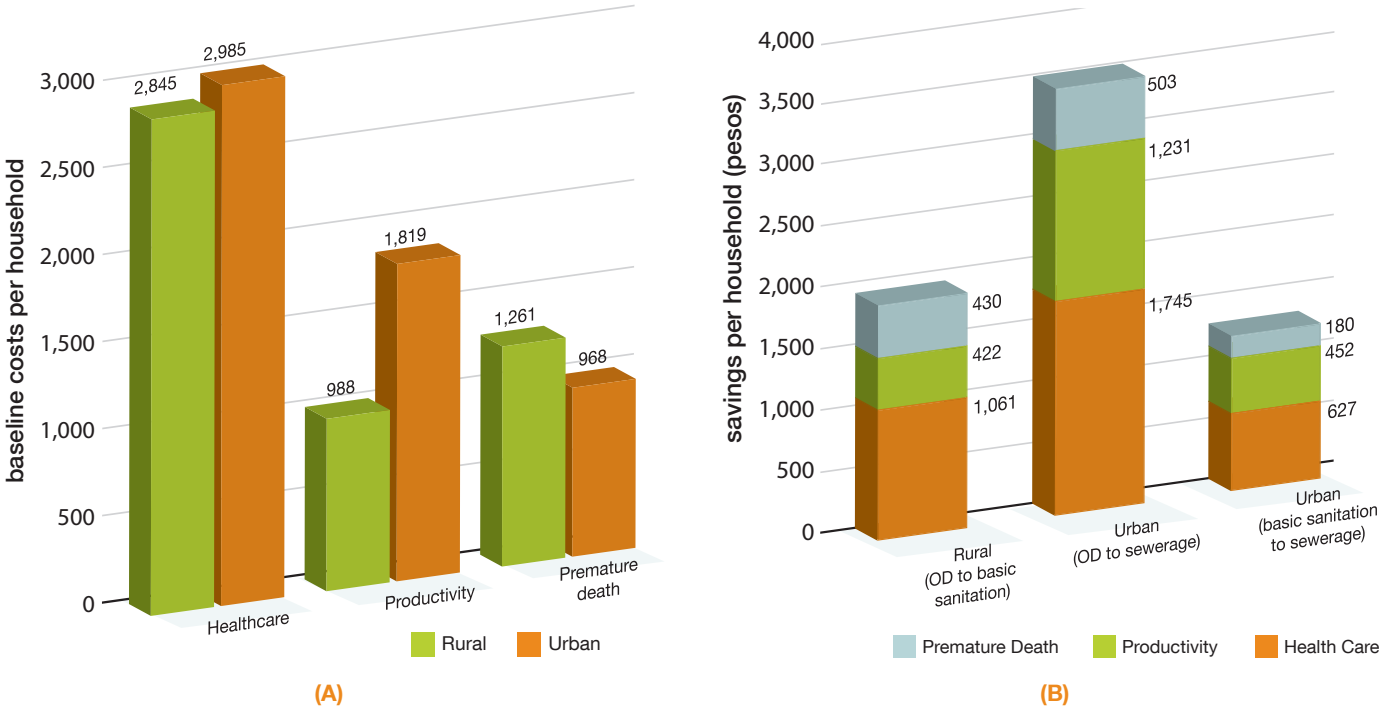
Disease	Households in sample	Total responses	Answer to question "Have you noticed an observable change in diarrheal disease rates in any household members since you received the new latrine?" (% of total responses)				
			A lot less	Probably less	No	Probably more	A lot more
Shared/public	217	58	43	50	5	2	0
Dry pit	88	43	42	28	30	0	0
Wet pit	156	23	52	39	9	0	0
Septic tank (sludge not removed)	178	12	0	8	83	0	8
Septic tank (sludge removed and treated)	315	49	8	12	76	4	0

Note: None of those households which have access to sewerage answered this question.

TABLE 14: ANNUAL COSTS PER HOUSEHOLD OF POOR SANITATION AND HYGIENE, AND ANNUAL COSTS AVERTED OF IMPROVED SANITATION, PESOS, 2008

Costs	Cost (baseline risk)		Cost averted		
	Rural	Urban	Rural (OD to basic sanitation)	Urban (OD to sewerage)	Urban (basic sanitation to sewerage)
Health care	2,845	2,985	1,061	1,745	627
Productivity	988	1,819	422	1,231	452
Premature death	1,261	968	430	503	180
Total	5,094	5,773	1,914	3,478	1,259

FIGURE 8: HEALTH COSTS OF UNIMPROVED SANITATION (A) AND HEALTH COSTS AVERTED OF IMPROVED SANITATION OPTIONS (B)



cation to access to basic sanitation in rural areas. In the case of urban households, a shift from open defecation to having sewerage access causes a 60% cost reduction or PhP3,478 (US$78). As expected, a movement from basic sanitation to sewerage access causes a smaller reduction in health costs. For the typical urban household in the sites, this reduction was estimated to be about PhP1,259 (US$28).

4.2 Water

The Philippines is well-endowed with water resources. It has about 200,000 hectares of lakes, 31,000 hectares of rivers, 19,000 hectares of reservoirs, and 246,063 hectares of swamplands (BFAR, 2004). Moreover, the country has a coastline that stretches over a distance of 32,289 kilometers. Biochemical oxygen demand (BOD) on many of these inland water resources is high, with pollutants coming from agriculture, industry, and domestic sources. The ESI Impact study showed that domestic sources contributed 763 thousand metric tons of BOD to inland water sources in 2005. This came from an estimated 4 million metric tons of feces, 34 million m^3 of urine, and at least 1,962 million m^3 of gray water. Aside from BOD, there is also bacteriological and pharmaceutical contamination of water resources.

Pollutants would be diluted naturally and natural bacteriological processes would toreduce pollution load in areas with small populations and abundant water resources. However, given the high population density in many parts of the Philippines — the city of Manila alone had a population density of 66,482 persons per square kilometer in 2007 (NSCB 2008) — sufficient dilution and natural treatment processes are not guaranteed, and water quality indicators presented below suggest that significant pollution is taking place.

4.2.1 WATER RESOURCES

Table 15 summarizes the water resources that are found in the sites. It indicates that most of the sites are near the sea and have access to rivers. The features of the water bodies vary significantly. For example, as many as seven rivers can be found in Taguig and the rivers in Alabel have an average width that range from two (Molo river) to 22 (Maribulan river) meters. Creeks and canals are also common in the sites. The presence of these water bodies means that the sites are exposed to the risks associated with water pollution. It also raises the potential of poor sanitation practices contributing to water pollution.

TABLE 15: WATER RESOURCES IN FIELD SITES

Resource	Field Site	Name of water body (if applicable)	Remarks
Lake	Alabel	Mofong Lake (small)	surface area (hectares): 3.18
		Mofong Lake (big)	surface area (hectares): 7.5
		Bito Lake	surface area (hectares): 126; depth (meters): 15
River	Alabel	Maribulan	width (meters): 21.93; depth (meters): 0.351; flow rate (meters/second): 0.69; length (meters): 27,737
		Domolok	width (meters): 14.53; depth (meters): 0.26; flow rate (meters/second): 0.645; length (meters): 16,450
		Molo	width (meters): 2.3; depth (meters): 0.058 ; flow rate (meters/second):0.57; length (meters): 6,200
		Lun Padidu	width (meters): 11.12; depth (meters): 0.211; flow rate (meters/second): 0.8
	Bayawan	Pangatban River	
		Sicopong	
		Ilog	
		Bayawan	
	Dagupan (Pugaro only)	Pugaro River	
	Taguig	Taguig	width (meters): 15 (ave); depth (meters): 1.8; flow rate (meters/second): 2.7; length (km; site): 10.3
		Napindan Channel	
		Bugumbayan/ Tabacuha	
		Mauling Creek	
		Hagonoy	
		Tipas/Labasan	
		Sta. Ana	
Coastline	Alabel	Saranggani Bay	230 kilometers coastline[1]
	Bayawan	Sulu Sea	Length (km): 15
	Dagupan	Lingayen Gulf	Length (km): 11.97
	San Fernando	South China Sea	
		San Fernando Bay	
Creek	Alabel	n.a.	Creek (discharge area for WWTP)
	Dagupan (Pugaro only)	Manamikdak Creek	
	San Fernando	Carlatan Creek	
		Catbangen Creek	
		Pagdaraoan	
		Ilocanos Creek	
		n.a.	located at lower Nagyubyuban
	Taguig	n.a.	located near the PNR site, Western Bicutan
Canals	Alabel	BATODO CIP	width (meters): 1.62; depth (meters): 0.23; flow rate (meters/second): 0.53
		Kawas CIP	width (meters): 1.3; depth (meters): 0.58; flow rate (meters/second): 0.69
		SACI Pumping	width (meters): 0.88; depth (meters): 0.073; flow rate (meters/second): 0.34
	Bayawan	n.a.	many of the streets in the site have canals that are categorized as sewer lines
	Dagupan	n.a.	
	Taguig	n.a.	

[1] This is the entire coastline of Saranggani Bay

4.2.2 WATER QUALITY AND ITS DETERMINANTS

A water quality survey was implemented in the sites in order to triangulate water quality readings with household practices and perceptions. This section discusses selected findings while Annex Table C1 provides the full results of the survey.

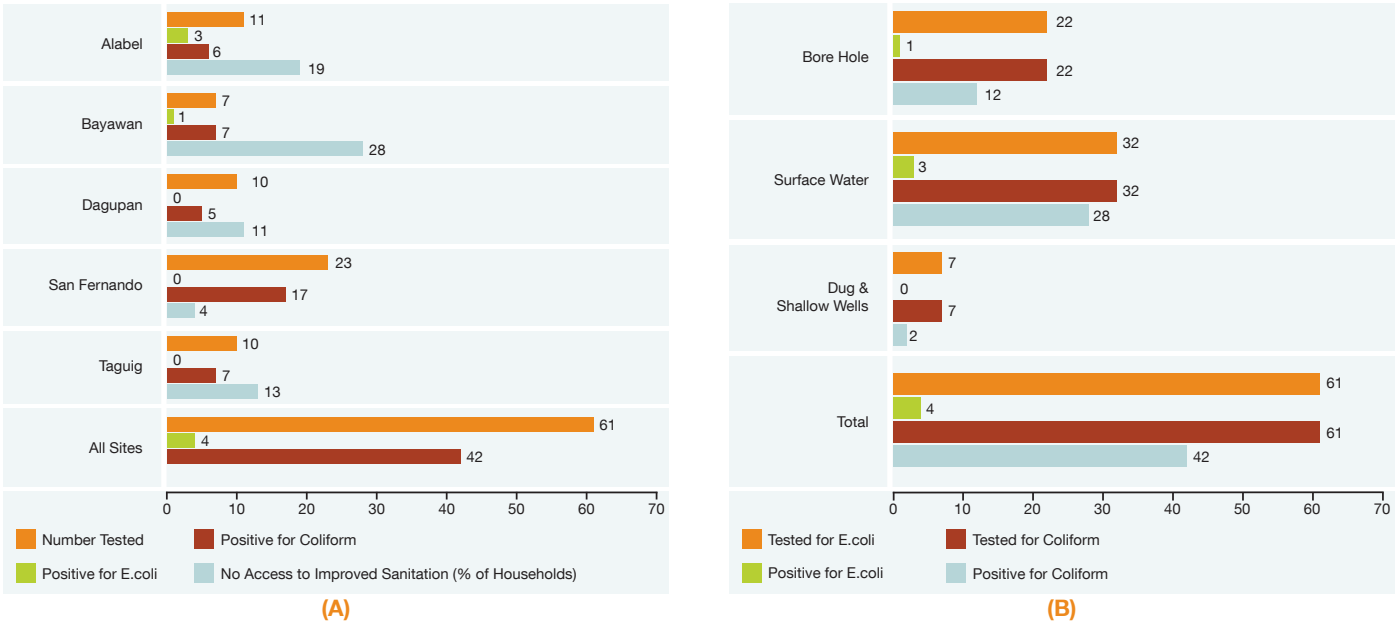
Figure 9 (Panel A) summarizes the results of tests for E. coli and Coliform on 61 wells, surface waters and boreholes in the study sites.[17] It indicates that 57 out of the 61 water sources tested negative for the presence of E. coli. However, more than two-thirds (42 out of 61) of the water sources had Coliform readings in excess of 8 MPN/100 ml. Given the use of these sources for drinking water. A more serious concern is that 15 out of the 30 known drinking water sources tested had readings that were higher than the standard set in the 2007 Philippine National Standards for Drinking Water (PNSDW).[18] The findings were particularly alarming in Bayawan as all seven water sources tested had failing marks for Coliform (based on PNSDW). However, only two of the seven water sources were used for drinking water. A greater cause for concern could be the results for San Fernando, where eight of the water sources that failed the test were used for drinking.

The association between Coliform readings and access to sanitation appears to be weak as Bayawan and San Fernando are at two extremes in terms of sanitation coverage (Figure 9). However, this result must be interpreted with care as the sanitation statistics presented are for the entire province or city. It therefore includes sanitation coverage in barangays which were not part of the survey.

Figure 9 (Panel B) also shows that the highest number and proportion of water sources that failed the test—28 out of the 32 sources tested—were surface waters. This was followed by bore holes where nearly half of the samples failed the test for Coliform.

The water quality survey also tested for turbidity, or the cloudiness of the water caused by small suspended particles. Measured in terms of Nephelometic Turbidity Units (NTU), high turbidity levels suggest a heavy concentration of small suspended particles. Figure 10 reports the findings from tests of turbidity on 35 water bodies in the sites. A big concern was the result that six out of the ten known drinking water sources which were tested for turbidity had readings that were higher than the PNSDW of five NTU.

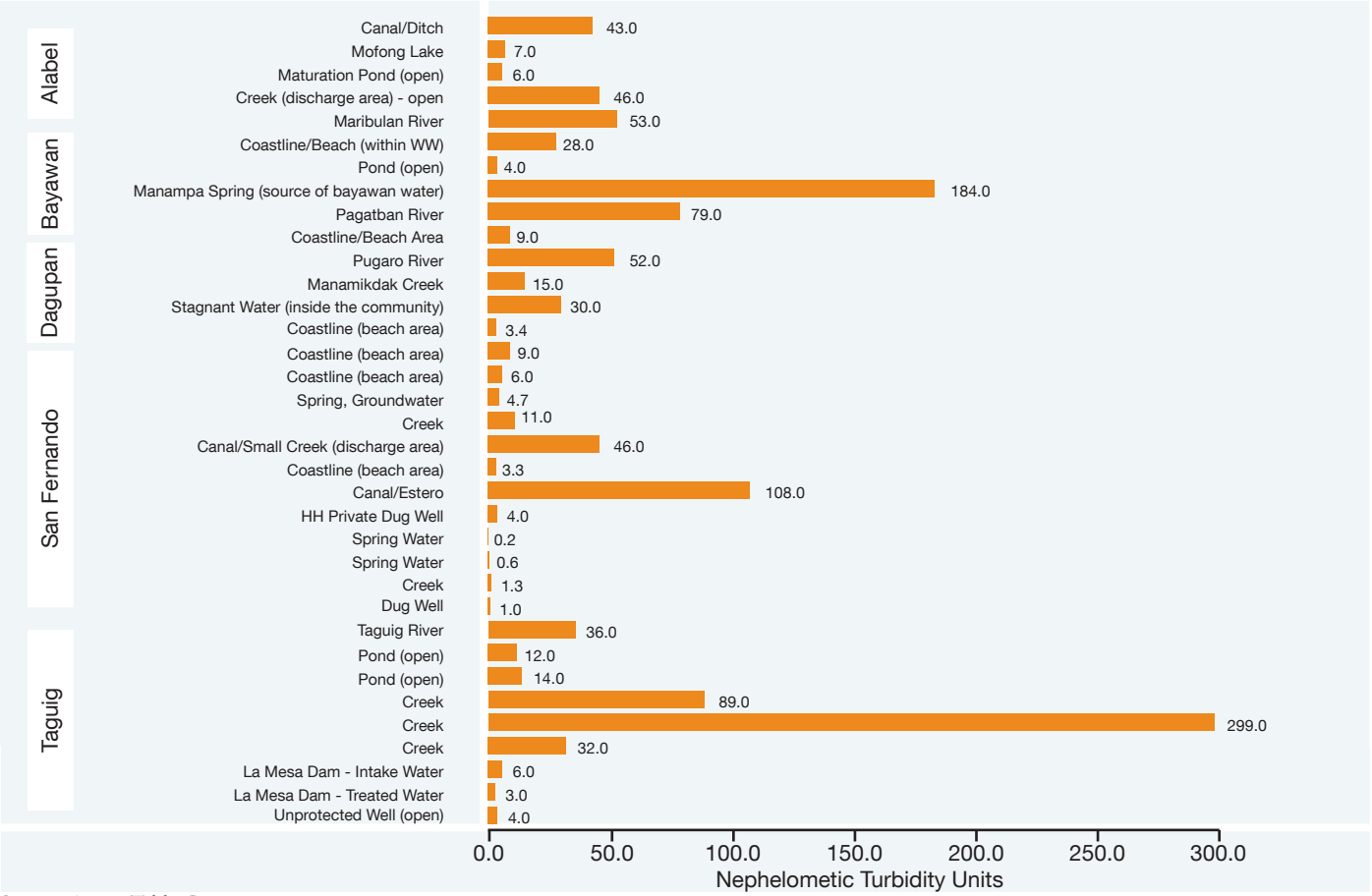
FIGURE 9: TEST RESULTS FOR E.COLI AND COLIFORM BY SITE (A) AND WATER SOURCE (B)



[17] Coliform is a group of bacteria that may be vegetative or fecal in origin. E. coli is a species of coliform whose presence may be indicative of pollution from human or animal waste.

[18] The Philippine National Standard for Drinking Water requires a total Coliform reading that is less than 1.1 MPN/100 ml.

FIGURE 10: TURBIDITY READINGS IN FIELD SITES, IN NEPHELOMETIC TURBIDITY UNITS (NTUs)



Source: Annex Table C1

The study also obtained BOD and COD readings for 32 inland and coastal water resources in the study sites. Comparing against the effluent guidelines for class C type waters in Administrative Order 35 of the DENR, nine and 15 out of the 32 water samples collected in the study had higher concentrations of BOD and COD, respectively.[19] Among the different study sites, the highest proportion of BOD readings that exceeded the DENR guidelines were for San Fernando (four out of ten water bodies). Bayawan and Dagupan each had three out of four water bodies with COD readings exceeding the DENR guidelines.

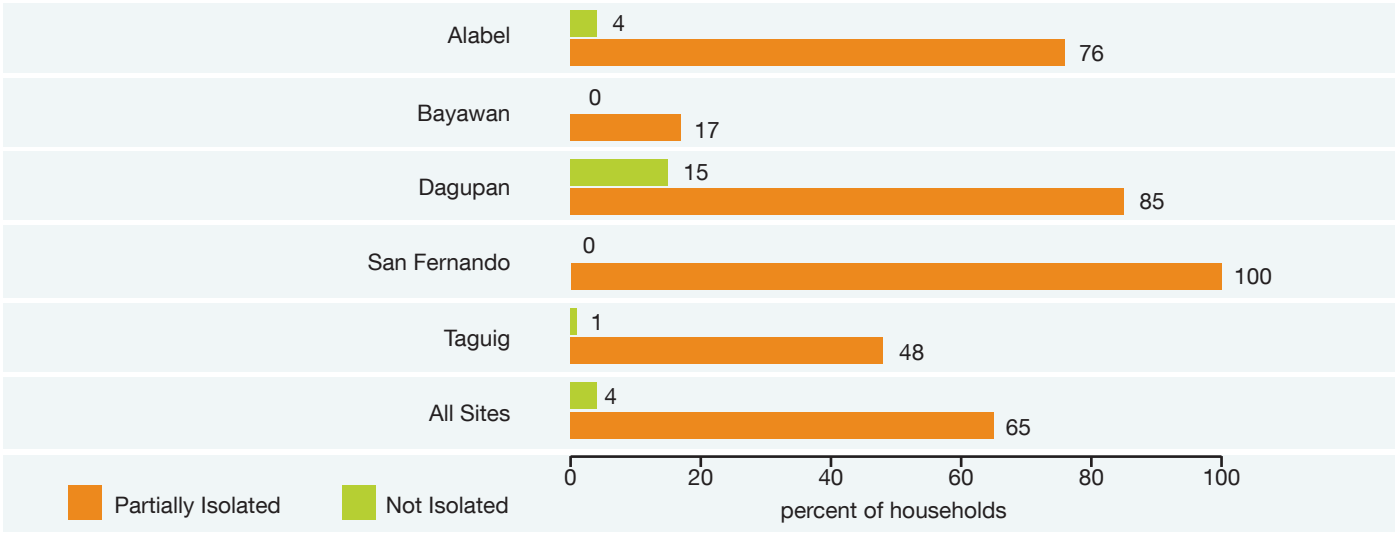
As a whole, the test results presented above suggest that there is a lot of room for improvement in the quality of water in the study sites. This is especially the case since a large proportion of the water sources, including those used for drinking water, had relatively high Coliform levels. This is further supported by the high turbidity readings where about half of the known drinking water sources do not conform to the standards set by the PNSDW.

Figure 11 shows the proportion of households in the survey with sanitation facilities that are likely to contribute to water pollution. It indicates that about 69% of the households in the sites have facilities that do not isolate or only partially isolate contaminants that contribute to water pollution. Households that have toilets which flush to sewers or septic tanks that are desludged and treated at an STF are assumed to have full isolation in the ideal analysis.[20] Open defecation to water bodies represents no isolation. All other practices or facilities are assumed to only partially isolate contaminants that contribute to water pollution.

[19] These findings account for differences in the standard set for various water bodies. Class C refers to water bodies that may be used for fishing, recreational water use (boating, etc.) and as industrial water supply. The requirements for class C are less stringent compared to class B type waters which are used for recreational activities such as bathing and swimming. For more details about the water quality readings in the cities and the DENR standards, please see Annex Table C.1.

[20] The analysis assumes an ideal situation in which there is no leakage in the sewers and septic tanks. The extent to which these sanitation facilities can isolate contaminants will of course be comprised if leakages exit.

FIGURE 11: EXTENT OF ISOLATION OF HUMAN EXCRETA IN FIELD SITES, % OF RESPONDENTS



Source: Annex Table C2

TABLE 16: WATER ACCESS AND COSTS IN THE SURVEY SITES

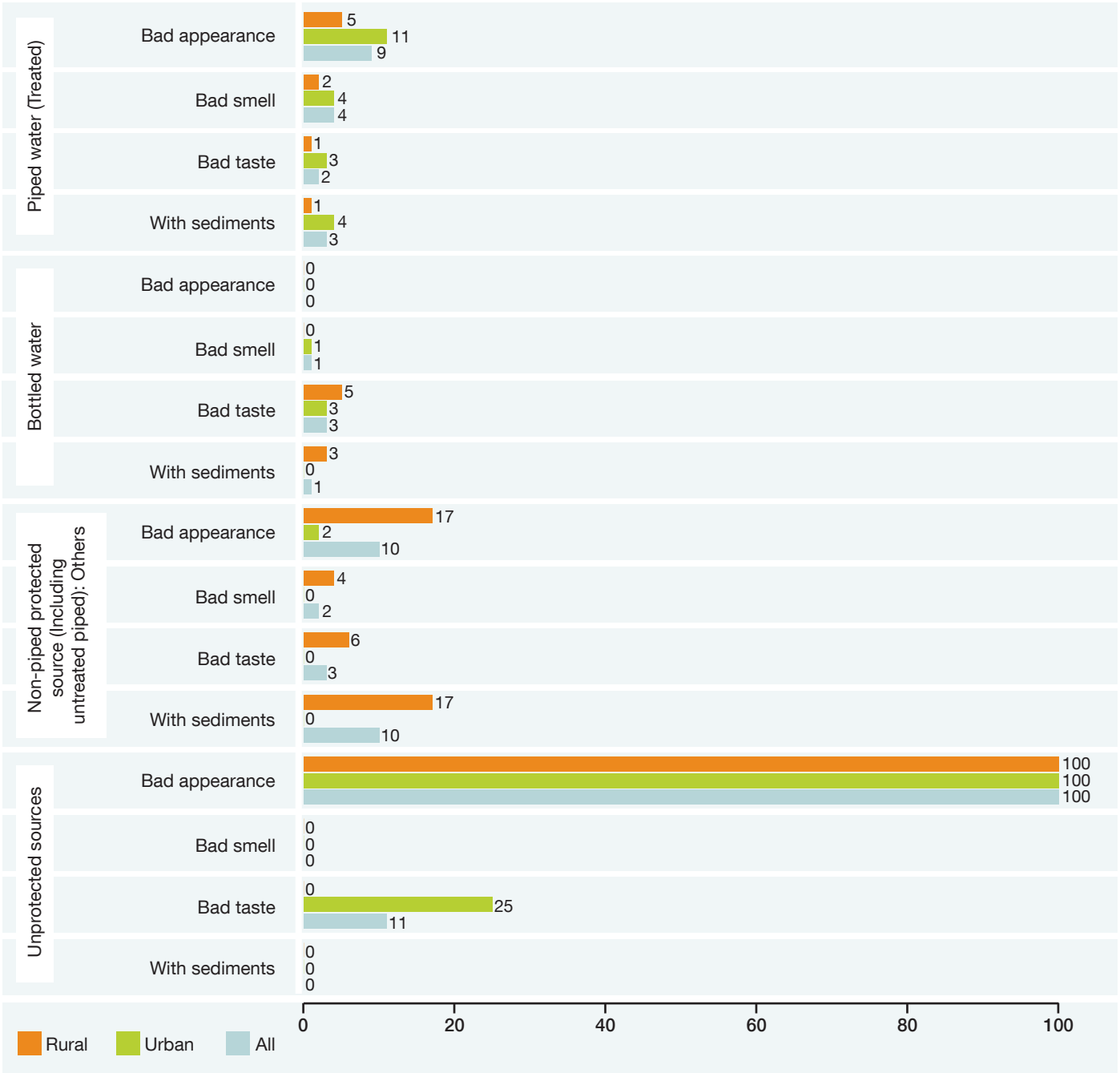
Water Source	Item	Rural	Urban	All sites
Piped water	% access	37.6	33.5	35.0
	Average monthly cost (PhP)	143.5	422.3	316.1
Non-piped protected				
Bottled water	% access	15.3	26.3	22.4
	Average monthly cost (PhP)	184.0	351.5	310.8
Tanker truck	% access	-	0.2	0.2
	Average monthly cost (PhP)	-	884.0	884.0
Others	% access	46.0	40.0	42.1
	Average monthly cost (PhP)	1.8	4.4	3.4
Unprotected	% access	1.1	-	0.4
	Average monthly cost (PhP)	0.2	-	0.2

Source: Annex Table C3

4.2.3 HOUSEHOLD WATER ACCESS AND TREATMENT COSTS

One of the major consequences of polluted water in wells, springs, rivers, and lakes is that populations and water supply agencies will have to treat water, or treat water more intensively, for safe human use. Alternatively, populations and water supply agencies can access cleaner water from different and more distant sources, thus increasing access costs. Those who do not take precautionary measures are exposed to a higher risk of infectious disease, or poisoning due to chemical content. Table 16 shows the household sources of drinking water and the average monthly water source costs. It indicates that the largest source of water for all the sites was other non-piped protected sources (42% of respondents). This is followed by piped water (35%) and bottled water (22%). The relatively high proportion of households using other non-piped protected sources can be explained by the price. On average, financial costs for this source amounted to only PhP3 per month per household, or nearly a hundredth of the monthly costs for the piped water. While the pattern is more or less the same for the rural and urban sites, two differences are worth noting. The first is that a larger proportion of households in the urban sites relied on bottled water. The second is the higher spending of urban households for each source. In the case of piped water, monthly expenditure was almost three times larger in the urban sites compared with the rural sites. Site-specific data on water access is presented in Annex Table C3.

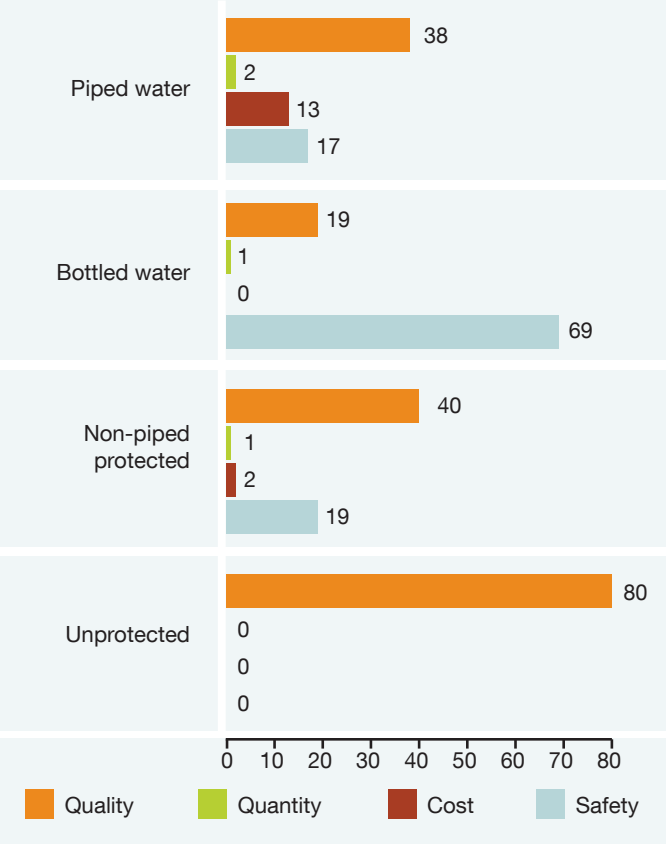
FIGURE 12: HOUSEHOLDS CITING POOR WATER QUALITY FROM THEIR PRINCIPAL DRINKING WATER SOURCE, % OF RESPONDENTS



Source: Annex Table C4

Figure 12 summarizes the data for the householders' responses to the question on characteristics of poor quality water. It provides a comparison between rural and urban areas, and between four major water sources. The highest number of complaints was found to be for the bad appearance of water. This is especially the case for households who use unprotected sources as their primary drinking water source. The result is not surprising given the high turbidity readings reported earlier. In the case of households who use non-piped protected sources, the highest number of complaints was on the presence of sediments and bad appearance. Households who use bottled water as their primary drinking water source were the only exception. For these users, the most number of complaints had to do with bad taste.

FIGURE 13: CITED REASONS FOR USING WATER SOURCES, % OF RESPONSES



Source: Annex Table C5

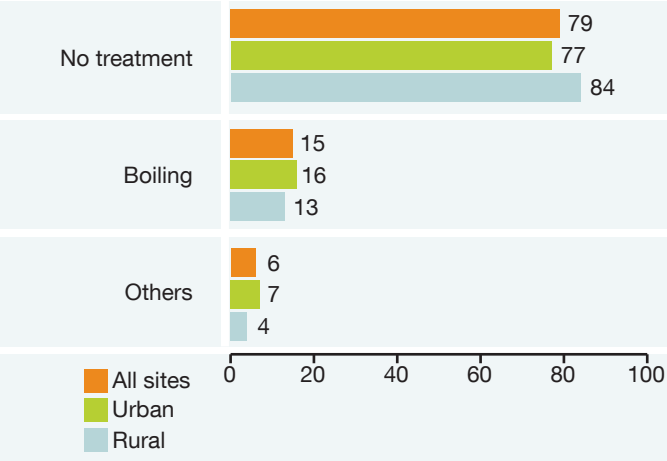
[1] Reasons under quality include good taste, good color and clarity, and less or no solids, sediments or particles. Safety was included because it is usually the primary reason behind the choice of households for drinking water.

[2] Tanker trucks were not included because there were no responses.

[3] "Bottled water" costs were not included because there were no responses.

[4] No responses for quantity, cost and safety for "Unprotected" sources.

FIGURE 14: HOUSEHOLD WATER TREATMENT PRACTICES, % OF RESPONSES



Source: Annex Table C6

4.2.4 HOUSEHOLD RESPONSE TO CONTAMINATED WATER AND RELATED COSTS

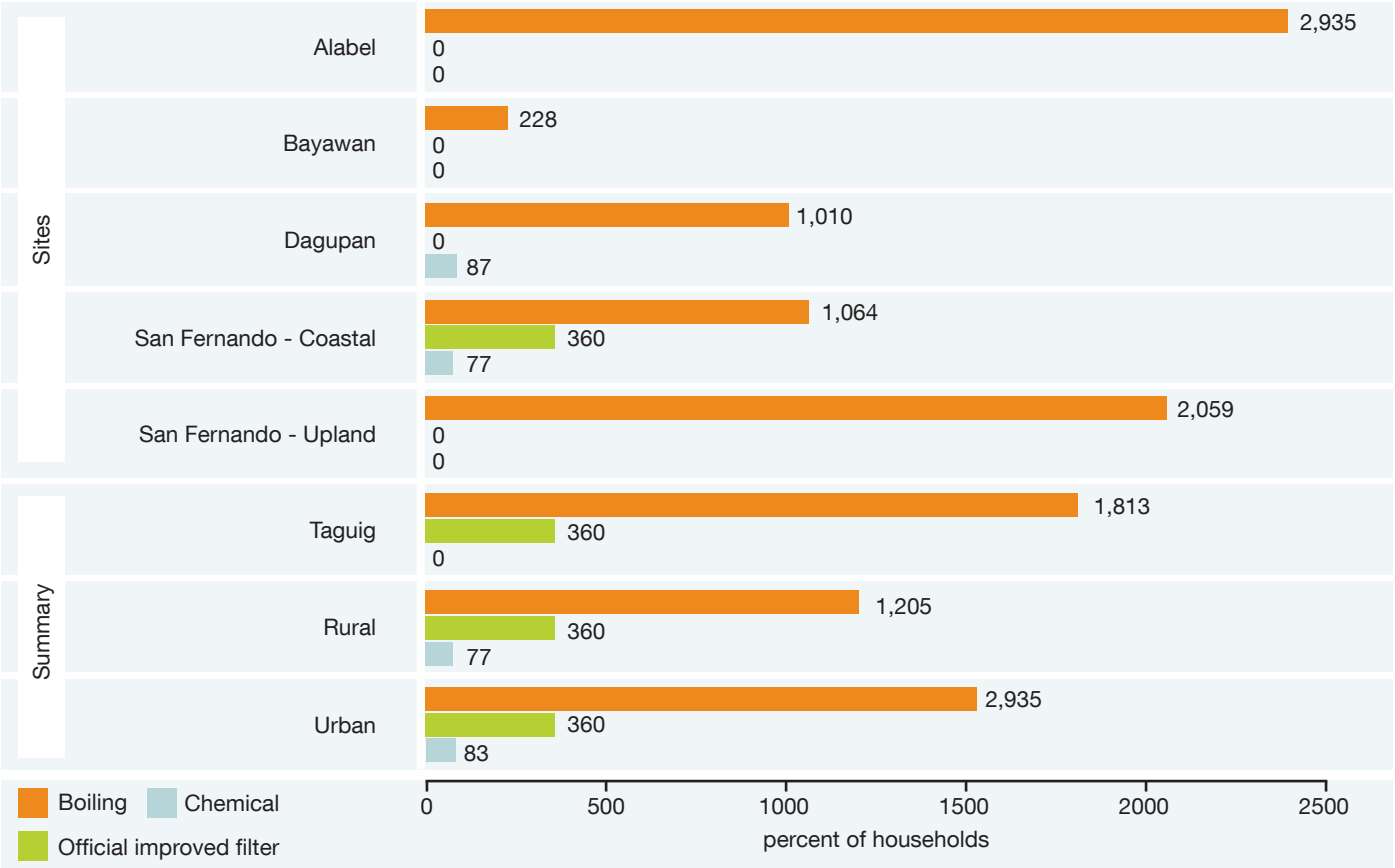
Households may respond to traditional water sources they know to be polluted in one or more of several ways: changing purchased source, walking farther to haul free water, or water treatment. They may connect to a piped water source (if available and affordable), harvest rainwater, purchase bottled water or bring in a tanker (more in urban areas). Figure 13 shows the reasons that were cited by all the respondents for their choice of water source. For most users, the quality of the water was the main reason for their choice. A distant second for piped water and non-piped protected water users was safety. The only exception was for bottled water users where safety was the primary reason for their choice of the water source. Annex Table C5 presents information from the different sites in the study. It indicates that the patterns observed for all households are more or less the same for the rural and urban regions.

Households may also treat drinking water at home in response to water pollution. The survey found that only about 21% of the households treat water (Figure 14). Moreover water treatment was more commonly practiced among urban households. About 15% of all households boil water to ensure safety, while 6% of the households use other treatment methods (see Annex Table C5 for the details).

Figure 15 shows the annual water treatment costs per household in the rural and urban sites. It indicates that annual costs for boiling water were about PhP1,205 (US$27) for the average rural household in the survey. This is about PhP327 (US$7) less than the costs for the average urban household. Costs associated with the other treatment methods were substantially lower than costs for boiling water for rural and urban households.

Changes in access to sanitation facilities and water supplies could affect the water treatment practices of households. In the household survey, the respondents were asked whether their treatment practices changed two years after they received their new latrine or had access to improved water sources. Figure 16 reports the results from the survey. The major finding is that only a small proportion of the households changed their treatment practice. In the case of households that received new latrines, about 18% of the respondents said that their treatment practices changed. On

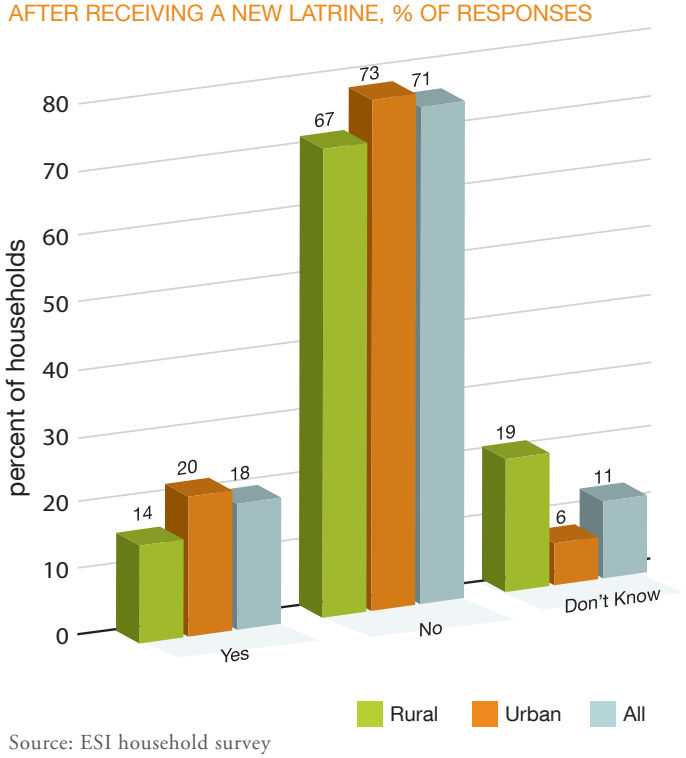
FIGURE 15: HOUSEHOLD WATER TREATMENT COSTS, BY METHOD, PESOS



Source: ESI survey

the other hand, slightly more than a fifth of households said that their treatment practices changed after having access to improved water supplies. It is interesting to note that urban households appear to be more responsive to changes in sanitation access and improvements in water supply. For example, 20% of the urban respondents said that their treatment practice changed after receiving a new latrine. This is six percentage points higher than rural households. However, these values need to be treated with caution as about a tenth of the respondents do not know or recall if their water treatment practices changed. In all, the implication of this finding is that improvements in sanitation will have limited impacts on water treatment practices. At the very least, one cannot expect all households to change their water treatment practices following an improvement in sanitation and/or water supply access. This is likely to be due to a mixture of entrenched habits on the one hand, and the fact that household wastewater is only one of several sources of contamination of water bodies.

FIGURE 16: CHANGE IN WATER TREATMENT PRACTICES AFTER RECEIVING A NEW LATRINE, % OF RESPONSES



Source: ESI household survey

4.2.5 HOUSEHOLD WATER COSTS AVERTED FROM IMPROVED SANITATION

Table 17 summarizes the averted annual costs of an average household in terms of accessing water and water treatment. The averted costs assume that the reduction in water pollution arising from improved sanitation will alter the behavior of households with respect to where they access water supplies and water treatment. In the case of water access costs, it was assumed that there will be a 10% reduction in the costs of drinking water sourced from expensive sources — bottled water or tanker trucks. The water reduction from these water sources was then offset by water sourced from piped sources, if available. Water from piped sources which are used for non-drinking purposes was then assumed to be replaced by cheaper sources, e.g., deep wells, which are available in the sites. In the end, the general assumption was that there is no change in piped water consumption so that all that is reflected is the shift from expensive sources (bottled water and tanker trucks) to inexpensive water sources (e.g., deep wells). In the case of water treatment, the cost savings were based on a comparison of the water treatment practices of households which have access to improved and unimproved sanitation in the study sites.

TABLE 17: WATER ACCESS AND HOUSEHOLD TREATMENT COSTS AVERTED AS A RESULT OF IMPROVED SANITATION, PESOS

Site	Annual average costs saved per household following 100% sanitation coverage		
	Water source access	Water treatment	Total
Average rural	55	28	83
Average urban	403	85	488
Average all sites	279	65	344

Source: Annex Table C7

The values in Table 17 indicate that the savings from improvements in sanitation are also quite small. The estimated annual savings from water access and treatment costs were PhP279 (US$6) and PhP65 (US$1.5), respectively. These values capture the point that it is impossible for all the costs to be averted following an improvement in sanitation. For one, sanitation is not the only source of water pollution. In relation to this, water treatment practices are also likely to be a function of perceptions regarding water quality. This is in part supported by the earlier finding that water treatment practices do not really change much following an improvement in sanitation and water supply (Figure 16). Another reason is that a shift towards other lower cost treatment practices and water sources still entails a cost, be it a financial or opportunity cost of collecting water. This partially offsets the reduction in costs brought about by the shift away from the higher financial cost alternative. Finally, there are instances in which the opportunity for reducing costs is very low. In Alabel, for example, only 2% of the respondents practiced water treatment. Hence, even if all of these households stop treatment after the improvement in sanitation, it is unlikely that the impacts on the province as a whole are going to be large.

4.3 Access time

4.3.1 ACCESS TIME AND TIME SAVED

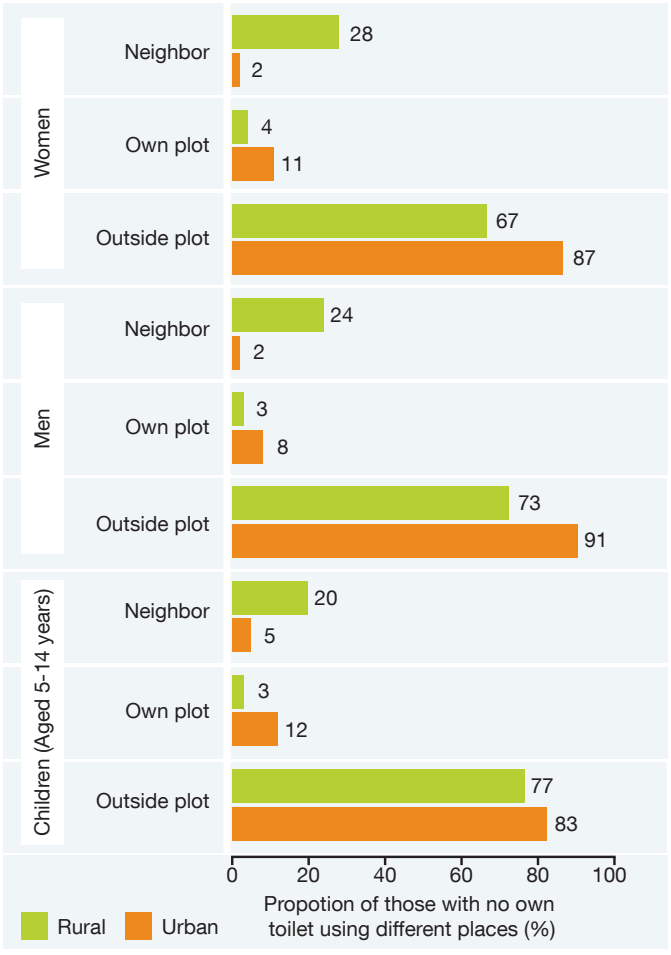
Households who do not own toilets are likely to spend time traveling to and from a place where they can defecate. The household survey for this study found that a large majority of these households indeed go to a place outside of the immediate vicinity of their house. At least 67% of adult women in rural areas who do not have their own toilets travel to a location that is outside of their plot (Figure 17). The proportions are higher in the case of men (73%) and children aged 5-14 years (77%) in rural areas. Moreover, the survey found that a larger proportion of people who own toilets and are living in urban areas travel outside of their plot in order to defecate. In the case of women, the difference between those living in urban and rural areas is about 20 percentage points.

Figure 18 shows that a considerable amount of time is spent traveling to the place of defecation, waiting to access toilets, and/or getting some privacy. In the case of the rural sites, the travel and waiting time among children was about 18 minutes per trip. It was slightly longer for adult males and females. Travel and waiting time in the urban sites were about half as long as in the rural sites. The amount of lost time is actually larger than what is indicated by the amount of time spent per trip. The reason is that, on average, people need to make this trip more than once in a day. Women in the rural sites and men in the urban sites traveled to their place of defecation at an average of 1.2 times a day. This means that the amount of time lost for women in the rural sites averages about 24 minutes per day. It is important to

note that the values in Figure 18 underestimate the amount of time spent for accessing toilets. The reason is that the estimates are focused only on defecation and excludes urination.

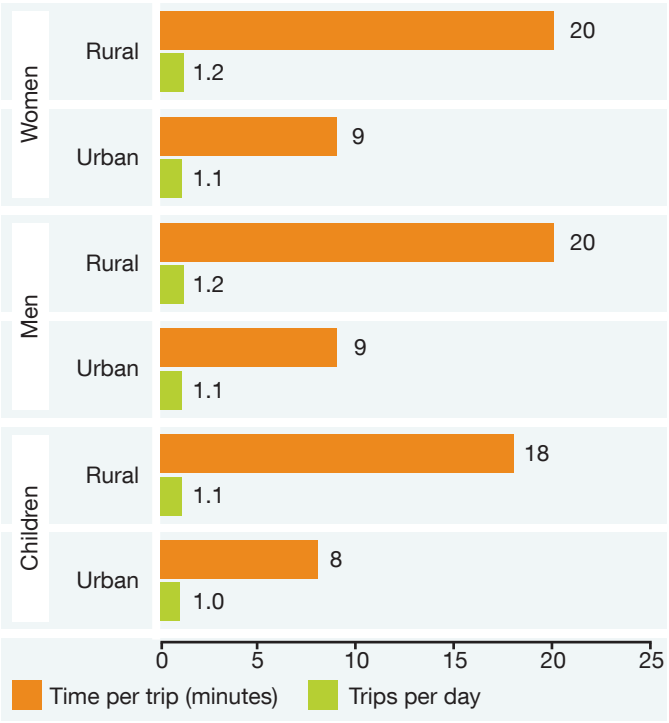
There is also time loss in case of children under the age of five years. Figure 19 shows that about 33% of the families in the sites accompanied young children when they defecate. This means a time loss not only for the child but also for the person who needs to accompany the child to the place of defecation. In addition, there is some evidence that children under the age of five tend to visit the toilet more often. The survey results show that young children in urban areas visited their place of defecation at an average 1.74 times in a day (Annex Table D3). This was about 49% higher than the average for adult males who are living in urban areas.

FIGURE 17: PLACE OF DEFECATION OF HOUSEHOLDS WITH NO "OWN" TOILET, % OF RESPONSES



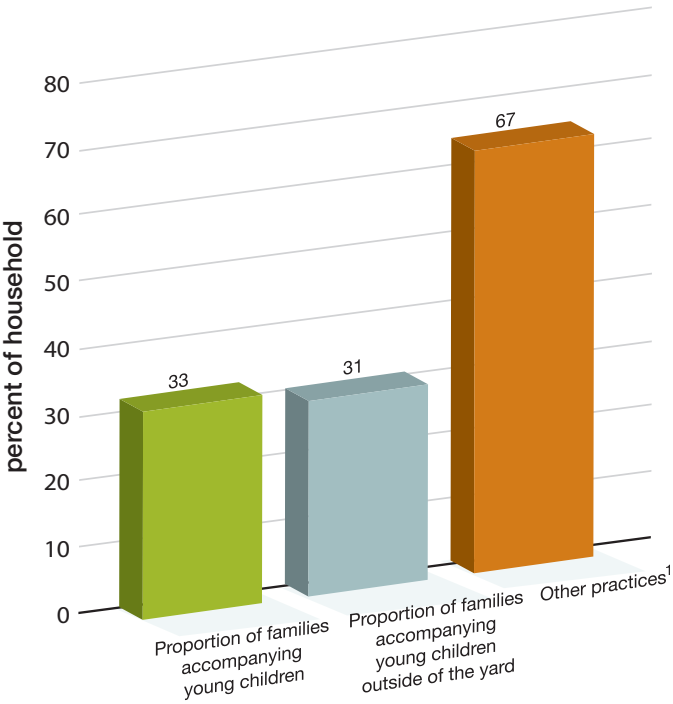
Source: Annex Table D1

FIGURE 18: DAILY TIME SPENT ACCESSING TOILET OUTSIDE PLOT FOR THOSE WITH NO TOILET



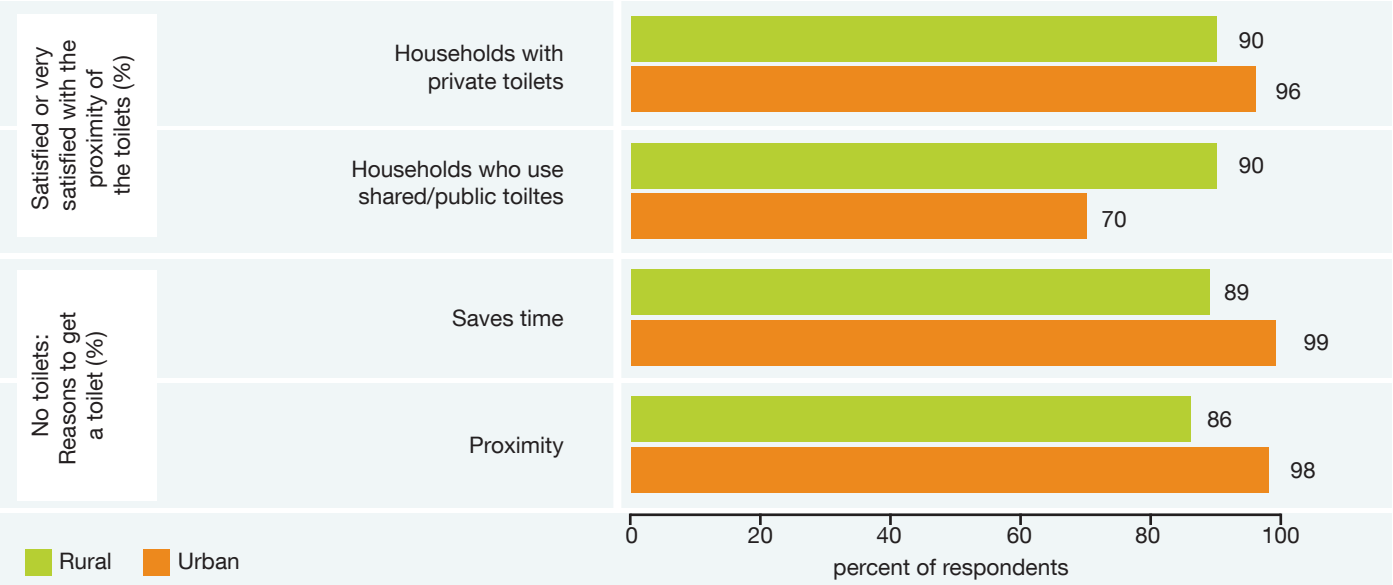
Source: Annex Table D2

FIGURE 19: PRACTICES RELATED TO YOUNG CHILDREN



[1] This includes children who defecate in the yard and other means of stool disposal.
Source: Annex Table D3

FIGURE 20: PREFERENCES RELATED TO TOILET CONVENIENCE, % OF RESPONSES



Source: Annex Table D4

4.3.2 TIME SAVING PREFERENCES AND UNIT VALUES OF TIME

There is evidence that households appreciate the value of time associated with having private toilets. Figure 20 shows that about 98% of households who do not have toilets in the urban sites cited proximity as an important characteristic of having private toilets. A slightly higher proportion (99%) of these households agreed that having private toilets saves time. The survey also found that households in the rural sites have a slightly lower appreciation of the time savings.

The importance of proximity is also revealed in the survey results for households that already have toilets. Figure 20 shows that 90% of rural and 96% of urban households with private toilets said they were satisfied or very satisfied with the proximity of their toilets. The proportion of households who were satisfied or very satisfied with proximity of their toilets was considerably lower for those that only have access to shared/community toilets in the urban sites.

Table 18 provides the average rankings on toilet preferences with respect to convenience and is based on FGDs conducted in the six study sites. The highest ranked responses were having a latrine being near or in the house and being able to go quickly when the need arises. The participants cited that the first feature allowed them to save time which could be used for other activities. Another reason cited was the feeling of safety for women especially when they need to use the toilet at night or when it is raining. On the other hand, the participants who cited the ability to use the toilet quickly said that not having to wait in a queue was the reason for their preference. The respondents in Taguig went one step further by mentioning that controlling the urge to defecate or urinate can have negative health consequences.

While the preferences of men and women appear to be very close to each other, there is a noticeable difference in the rankings for rural and urban households. In the case of rural households, the ability to go quickly only ranked second to having a latrine near the house. This result was driven mostly by the results of the FGDs in Bayawan and the upland region of San Fernando.

The household questionnaire asked the respondents to rank three options out of 13 choices on what they would do if they had an extra 30 minutes in a day. This was asked to get a sense of what the respondents could have done with the time losses discussed earlier. In processing the results, three points were given to an option that was ranked first, two points were given to an option that was ranked second and one point was given to an option that was ranked third. Figure 21 shows the results for the options that received the highest proportion of the total points possible. It indicates that leisure, sleep/rest, performance of household chores

and working or helping with income generation were the top four choices among the households in the urban and rural sites, regardless of toilet access. Among those who own toilets, the top choices were leisure (urban sites) and sleep/rest (rural sites). On the other hand, top choices for households who do not own toilets were household chores (urban and rural sites) and sleep/rest (urban sites).

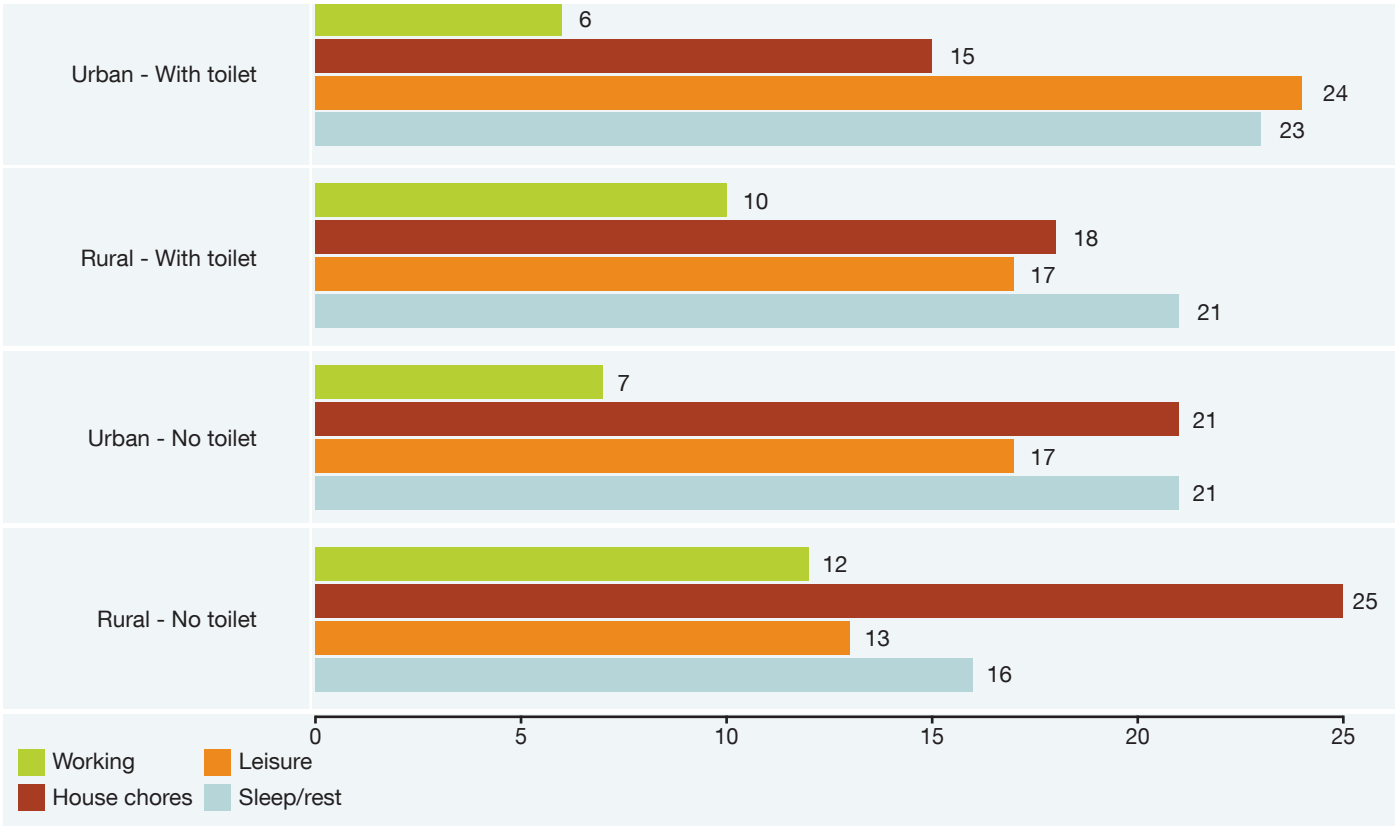
The findings above support the earlier decision to use a value of time that is lower than regional GDP per person — i.e., 30% of regional GDP per capita for adults and 15% of regional GDP per capita for children. While it can be argued that the proportions used are somewhat arbitrary, it captures the point that not all of the spare time is used for income generating activities.

TABLE 18: PREFERENCES RELATED TO TOILET CONVENIENCE

Attribute	Sites						Region		Gender		All Sites
	Alabel	Bayawan	Pugaro	San Fernando -Coastal	San Fernando -Upland	Taguig	Urban	Rural	Male	Female	
Latrine being near the house	3.0	1.0	1.0	2.3	1.3	2.7	2.4	1.5	1.8	2.1	2.0
Not having to wait in line	2.0	3.5	2.5	2.5	3.0	2.5	2.4	3.0	2.7	2.7	2.7
Being able to go quickly when the need arises	1.0	2.5	2.5	1.8	2.3	1.0	1.4	2.2	1.8	1.7	1.7
Time saving which can be used for other acts	4.0	3.0	4.0	3.5	3.5	3.8	3.8	3.3	3.6	3.6	3.6

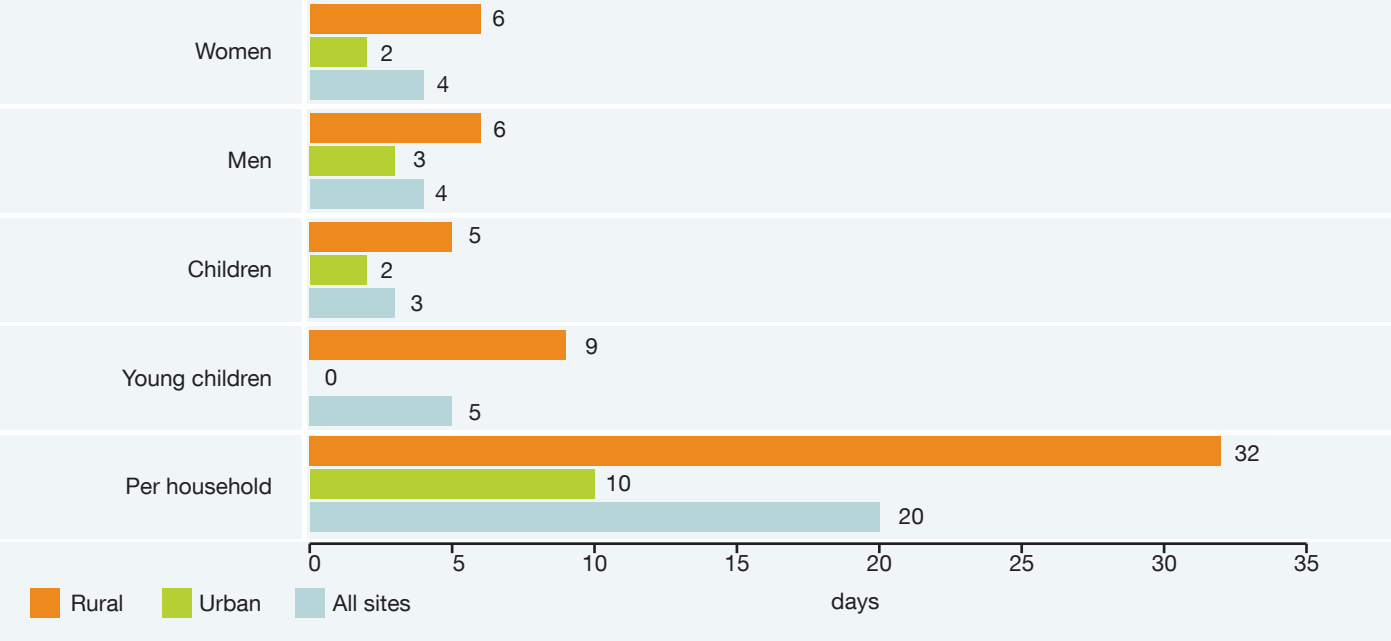
The values represent average ratings for the different features or attributes. A value of 1 means that the feature is the top priority or is the most important.
Source: Focus group discussions

FIGURE 21: OPPORTUNITY COST OF TIME — WHAT RESPONDENTS WOULD DO WITH AN EXTRA 30 MINUTES A DAY, % OF POSSIBLE POINTS



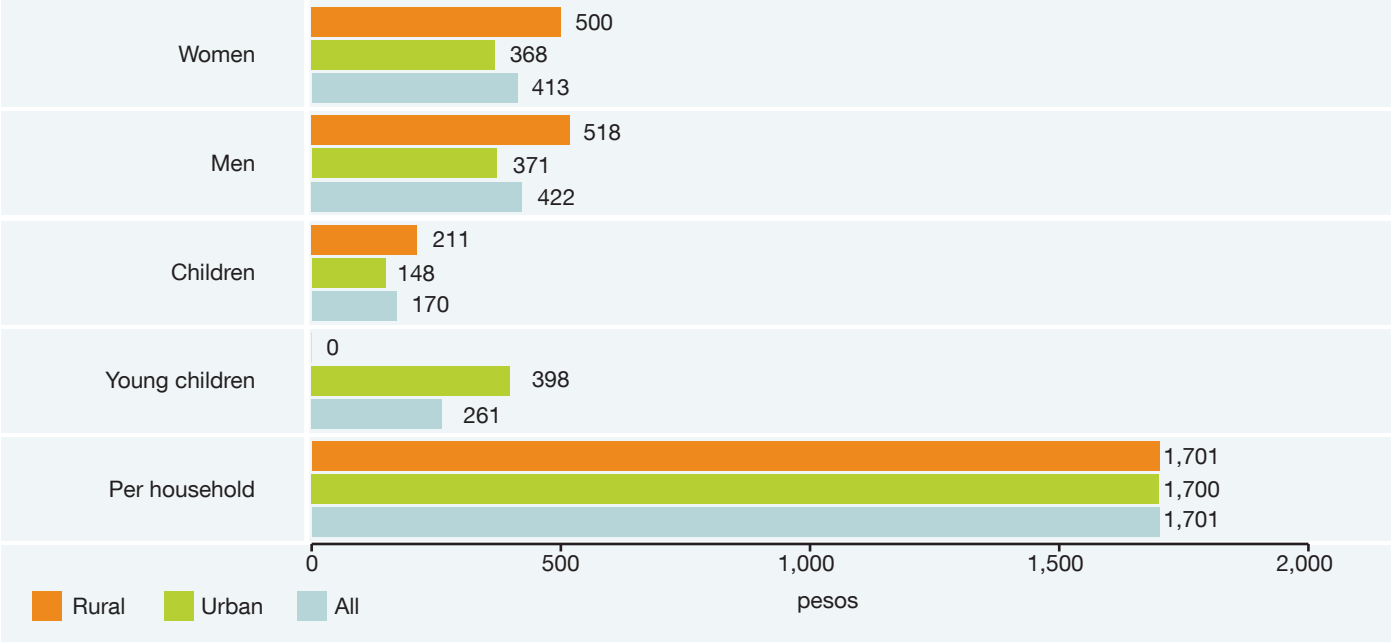
Source: ESI survey

FIGURE 22: AVERAGE NUMBER OF DAYS SAVED PER YEAR PER HOUSEHOLD MEMBER



Source: Annex Table D5

FIGURE 23: AVERAGE ANNUAL VALUE OF TIME SAVINGS PER HOUSEHOLD MEMBER, PESOS



Source: Annex Table D6

4.3.3 TOTAL VALUE OF TIME SAVED

Using the values presented in Section 4.3.2, Figure 22 shows the potential amount of time (measured in days) that could be saved by a household from having access to a private toilet. It indicates that an average of 20 days in a year could be saved by a household from having access to a toilet. Moreover, the savings for the average household in the rural sites (32 days) were more than three times larger than the savings of its counterpart in the urban sites. In the case of the rural sites, the highest potential savings came from not having to accompany a child to a place of defecation. The savings here amounted to about nine days per child per year.

The results cited above point to a potentially large underestimation of the costs from accessing toilets in the ESI Im-

pact Study (Rodriguez et al. 2008). Due to lack of data, the ESI Impact Study assumed a person who does not have his/her own toilet spends five minutes a day in finding a place to defecate. Given the average household size of 5.2 in the survey sites, this implies an annual savings of 6.6 days per household. This is only about a third of the estimated losses (20 days) which were presented in Figure 22. Assuming that the results for the study sites are representative of the entire country, this suggests that the costs associated with access time presented in the ESI Impact Study should be about three times larger.

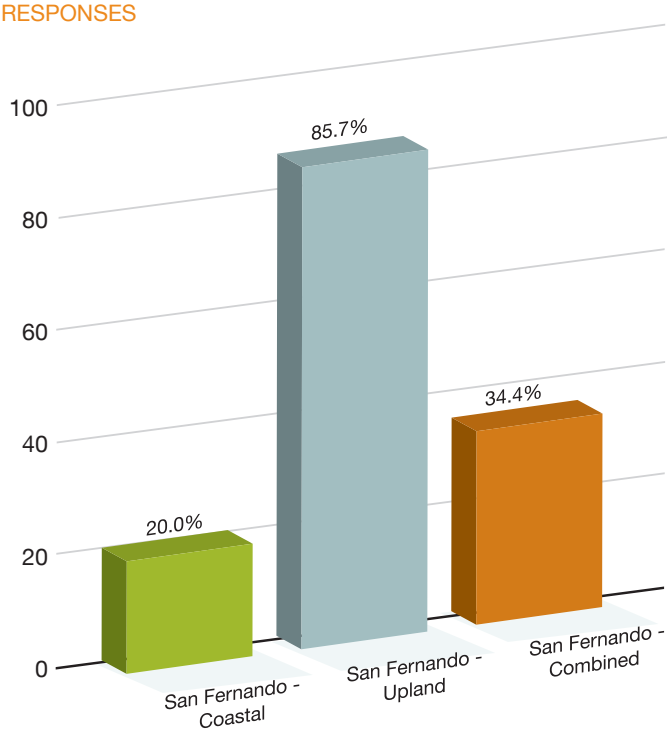
Given the results in Figure 22 and the assumptions on the value of time, Figure 23 shows the estimated annual time savings per household. It indicates that a typical household in the site can save about PhP1,700 (US$38) from having a private toilet. While time savings in rural and urban areas are almost the same, the sources of the savings are very different. While households in urban areas have higher incomes compared to rural areas, people in rural areas were found to spend more time searching for a toilet compared to their counterparts in urban areas.

It is important to note that the calculations presented above are likely to be an underestimate of the value of lost time. The reason is that these do not account for the time spent looking for a place to urinate. The magnitude by which the values are underestimated could be significant as the participants in the FGDs said that they urinate up to seven times in a day. However, valuing the time lost is tricky with women and with men who are unlikely to travel far in order to urinate, compared to a place where they have to defecate.

4.4 Reuse of human excreta

Of all the study sites, only households with UDDT-E facilities in San Fernando were found to re-use human excreta and urine as fertilizer.[21] Figure 24 shows that the practice was very common in the upland region, with 86% of the households re-using waste. However, only about a fifth of UDDT-E users in the coastal areas were estimated to re-use waste. The survey also found that the annual value from the reuse of fertilizer was slightly more than PhP500 (US$11) per household (Figure 25). These results are based on the reported savings from fertilizer because none of the UDDT-E users in the sample sold their output.

FIGURE 24: HOUSEHOLDS WITH UDDT-E FACILITIES IN SAN FERNANDO WHO ARE RE-USING FECES AND URINE, % OF RESPONSES



Source: ESI household survey

FIGURE 25: AVERAGE ANNUAL VALUE OF SAVINGS FROM REUSE WITH THE UDDT-E FACILITIES IN SAN FERNANDO, PESOS

Source: ESI household survey

[21] Manila Water also uses treated sludge from the Taguig STF as soil conditioner for sugar plantations. However, its economic value was not examined in this study.

4.5 Intangible sanitation preferences

Due to a lack of studies examining the intangible aspects of sanitation, the data presented here are based entirely from ESI fieldwork.[24] The data are from two main sources: a close ended household questionnaire which was applied to the most senior available household member, and FGDs, which were held for both men and women of different ages. These two surveys collected perceptions, opinions, and preferences from a representative section of the communities (see Section 2.3 for methods and sampling approach). Four sets of results are described here; namely, (a) an understanding of what is sanitation; (b) reason for sanitation coverage (c) satisfaction with the current sanitation option; (d) for those without a toilet, reasons to get a toilet, characteristics of a toilet, and willingness to pay for an improved toilet.

The FGD attempted to elicit how the respondents in the different sites understand the meaning of sanitation. As a whole, the responses can be divided into methods or actions on the part of the households and conditions or situations that the respondents believe to be a satisfactory state of sanitation (Table 19).

In the case of conditions, the most common response was a very general statement about a clean environment. In San Fernando-coastal and Taguig, the meaning of a clean environment was qualified to refer to the home and community. More specific answers were obtained from Taguig as the respondents also understood sanitation to mean a functioning drainage system, access to safe and clean water, and good health. The same is also true for Alabel, where the re-

TABLE 19: RESPONDENTS' UNDERSTANDING OF SANITATION

Site	Sanitation concept discussed	Classification[1]	
		Methods	Conditions
San Fernando - coastal: Poro/San Agustin	Clean environment (home & community)		•
	Good hygiene	•	
	Right attitude & discipline in maintaining cleanliness	•	
San Fernando - upland: Nagyubyuban	Clean environment		•
	Clean source of water	•	
	A toilet where people can defecate	•	
Alabel	Sanitary/clean environment		•
	Good hygiene	•	
	Clean air		•
	Pleasant view of the village		•
Bayawan	Clean environment		•
	Good nutrition	•	
	Proper washing of utensils	•	
	Proper cleaning of latrines	•	
	Proper waste disposal	•	
	Discipline in cleanliness	•	
Taguig	Clean home and environment		•
	Personal hygiene	•	
	Functioning drainage system (not clogged)		•
	Correct way of waste disposal	•	
	Good health		•
	Access to safe water and clean toilet		•

Source: Focus group discussions

[1] Methods are responses that refer to actions or measures that can lead to improved sanitation conditions. On the other hand, conditions are situations that the respondents believe to be a satisfactory state of sanitation.

[22] Interested readers may also consult SuSEA (2008), USAID (2007), and USAID and the City of San Fernando (2006).

spondents cited clean air and a pleasant view of the village. The most common response in the case of methods was good hygiene. Other responses include cleaning of utensils, latrines and proper waste disposal. The respondents in San Fernando-upland also cited having a toilet where people can defecate in their understanding of sanitation. It is also important to note that the respondents in barangay Pugaro (Dagupan) said that they had no idea what sanitation means.

Table 20 shows the reasons for the current sanitation coverage of households. It indicates that the main reason for not having a toilet is economic in nature. This is reflected in the relatively high rankings for "cost is too high" and "no budget." This is supported in the FGDs by the finding that "poverty" is a reason for not having toilets. Lack or the absence of space for which to build a toilet appears to be the second most important reason for not having toilets. Consistently cited in the FGDs, it also ranked second in the household surveys for urban areas. Based on the household surveys, other major reasons for not having toilets are low water level (rural areas) and (non-) ownership of the dwelling (urban areas).

While the FGDs did not provide a clear idea on the rankings for each locality, there were many reasons cited for having toilets. The impacts on health and the desire for cleaner surroundings were common responses in rural and urban

TABLE 20: REASONS FOR CURRENT SANITATION COVERAGE — TOP RESPONSES

Location	Household interview	Focus Group Discussions	
	Why people do not have toilets	Why families with toilet have a toilet	Why families without toilets do not have a toilet
Alabel	1. Cost is too high 2. Low water level 3. Toilet ruined by flood	1. Could not tolerate smell and experienced health problems 2. Grew up having toilets	1. Lack of space
Bayawan	1. Cost is too high 2. Newly transferred 3. Never been offered toilet facilities	1. Intervention: Toilets were donated 2. Intervention: Households transferred to units with toilets	(none cited)
Dagupan	1. Cost is too high 2. Do not own house/land 3. No space in or near the house	1. Embarrassment associated with being seen defecating in the open 2. Pollution	1. Poverty
San Fernando - coastal	1. Cost is too high[1] 2. No budget	(none cited)	1. Poverty 2. Lack of space
San Fernando - upland	[not applicable][2]	1. Intervention: Introduced to EcoSan 2. Could not tolerate smell and experienced health problems	(none cited)
Taguig	1. Cost is too high 2. No space in or near the house 3. Do not own house/land	1. Intervention: Toilets were donated [3] 2. Intervention: Introduced to EcoSan 3. Intervention: Households transferred to units with toilets 4. Deteriorating environment made the children sick 5. Desire to have cleaner and healthier surroundings	1. Poverty 2. Lack of space
Average urban	1. Cost is too high 2. No space in or near the house 3. Do not own the house/land	1. Could not tolerate smell and experienced health problems[4] 2. Pollution 3. Realization of health benefits 4. Embarrassment of being seen in the open 5. Realization that they were the ones being adversely affected by open defecation 6. Exposure to housing that had toilets 7. Grew up having toilets	1. Poverty 2. Lack of space

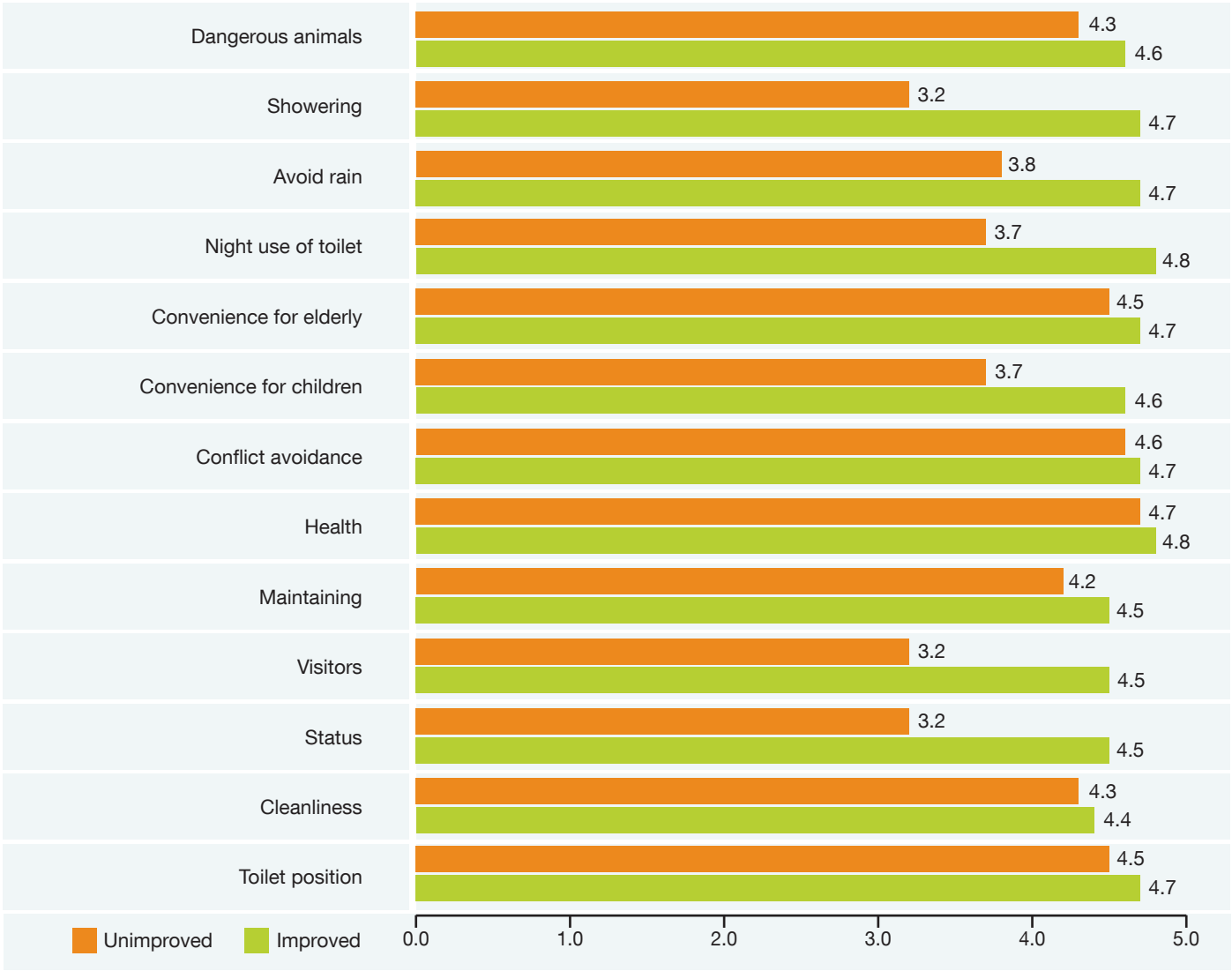
[1] There were only two respondents in the HH survey for OD. [2] The sample does not include OD. [3] These five options had equal rankings.
[4] The seven reasons had equal rankings.
Source: FGDs

areas. In the course of the FGD, the respondents mentioned that the absence of toilets led to open defecation. The respondents also said that the human excreta, animal excreta and solid wastes led to illnesses among the households. Intervention, be it from government agencies and other institutions, also appears to be an important reason for the presence of toilets among rural households. For example, the local government unit in San Fernando introduced the EcoSan concept to households that did not have toilets. The shame and embarrassment associated with practicing open defecation was also cited as a reason for having toilets. Some respondents in the FGD said that, when defecating in the open, they covered their faces with their hands or a piece of cloth to avoid being recognized by their neighbors.

The respondents in the household survey were asked about their level of satisfaction with their existing toilets. In doing so, they were given a set of attributes to rank between 1 (not satisfied) to 5 (very satisfied). The findings from the household are presented in Figure 26. It indicates that households with access to improved sanitation have a high level of satisfaction with their toilet options as the average ratings for the attributes ranged from 4.4 to 4.8. Households that do not have access to improved sanitation still appear to be satisfied but to a lesser degree.

The household survey asked households without toilets to rate possible reasons for acquiring toilets. They were asked to rate each reason on a scale of one (not important) to five

FIGURE 26: LEVEL OF SATISFACTION WITH CURRENT TOILET OPTION, IMPROVED VERSUS UNIMPROVED[1]



Source: Annex Table E1

[1]1= not satisfied to 5 = very satisfied

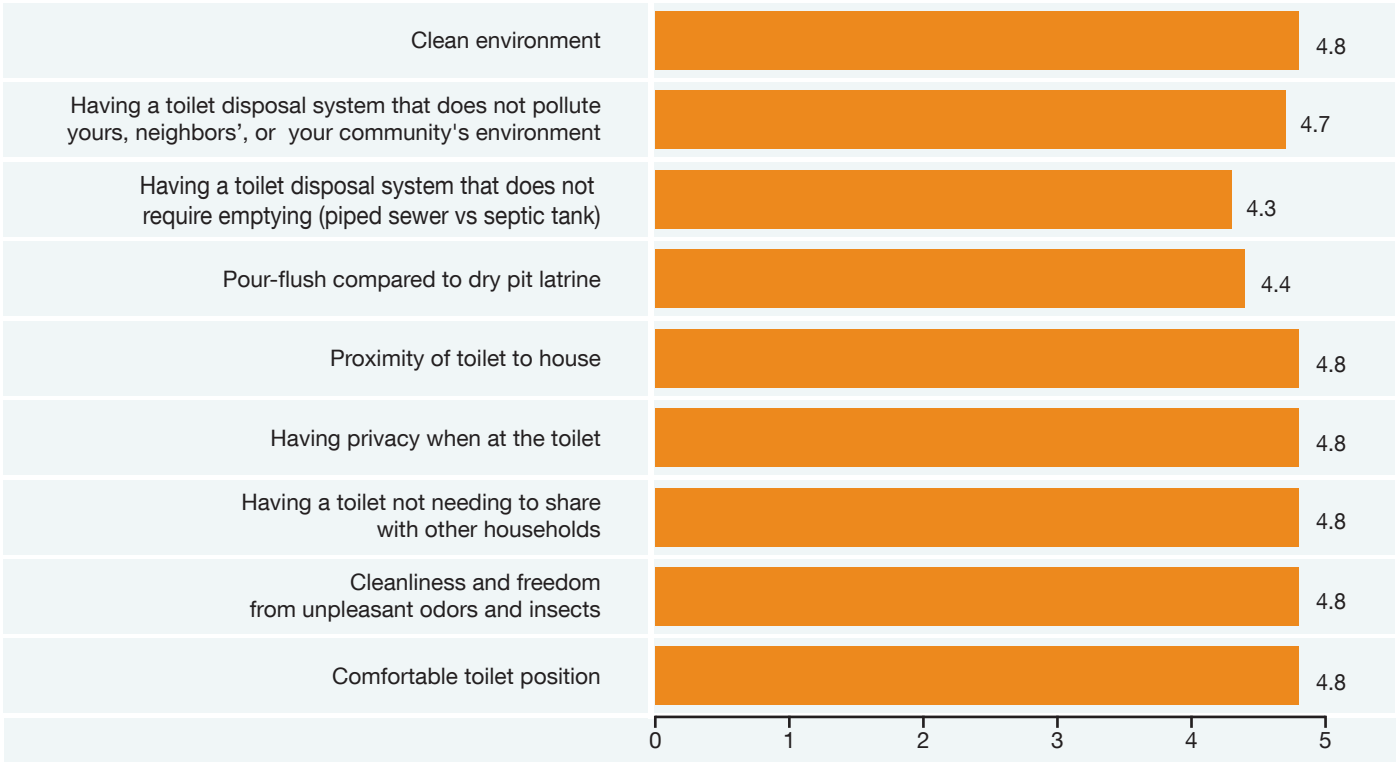
(important). Figure 27 shows that all of the choices were deemed important by the respondents. The scores were very close to each other and it is difficult to identify the main reason with a high degree of confidence. However, the top answers were (a) comfortable toilet position comfort (comfort), having privacy at the toilet (privacy), and cleanliness and freedom from unpleasant odors and insects (cleanliness).

The survey results also revealed that the respondents with no toilet are willing to pay an average of about PhP2,500 (US$56) for an improved toilet (Annex Table E1). This value is very low and is not sufficient to finance the construction of a standard toilet. At best, such an amount could only afford a dry pit latrine.[23] The respondents showed a strong preference (78% of respondents) for toilets that are connected to a septic tank.

The value provided above is a rough estimate and was not obtained using a rigorous approach for calculating willingness to pay for improved toilets. A more rigorous approach was conducted by Harder et al. (2011) in estimating the willingness to pay for sanitation services in Dagupan City. The study found that households were willing to pay an average of PhP552 per year for desludging services.[24] It also found that households were willing to pay PhP1,224 per year for a sewerage system. In comparing the findings with the costs of the facilities, the study concluded that the willingness to pay of the households was sufficient to finance desludging services in the city. However, PhP1,244 annually per household is not sufficient to pay for a sewerage system.

Table 21 shows some of the concerns of households who practice open defecation. Of the options provided, it seems that the highest concern was for the safety of their children (37%). This result supports the finding in Figure 27 where the households who do not have access to improved sanitation indicated a lower level of satisfaction in terms of allowing children to use toilets without supervision.

FIGURE 27: REASONS TO GET A TOILET FOR THOSE CURRENTLY WITHOUT TOILET ACCESS, AVERAGE



Source: Annex Table E2

[1]1= not important to 5 = very important

[23] Estimates of toilet costs are presented in Chapter 6.

[24] This assumes that septic tanks are desludged every three years.

TABLE 21: CONCERNS OF THOSE PRACTICING OPEN DEFECATION, % OF RESPONDENTS

Attribute	No. Responding	Responses (%)		
		Never	Sometimes	Often
Have you felt in danger when going for OD?	221	54	28	18
Are you worried about the safety of your children?	209	38	25	37
Have you heard about someone being attacked by animals?	221	87	11	2

Source: ESI household survey

TABLE 22: PREFERENCES RELATED TO TOILET COMFORT AND STATUS

Attribute	Sites					Region		Gender		All Sites
	Alabel	Bayawan	Pugaro	San Fernando -Coastal	San Fernando -Upland	Taguig	Urban	Rural	Male	Female	
Comfort[1]											
Position of the toilet	5.7	3.0	3.0	3.5	3.0	4.3	4.2	3.2	4.2	3.4	3.8
Size of the cubicle	5.3	4.5	4.0	4.8	6.0	5.2	4.9	5.1	5.5	4.6	5.0
Cleanliness	1.7	1.0	2.0	2.3	1.5	1.7	1.9	1.6	1.5	1.8	1.7
Smell	3.0	2.0	3.0	2.8	3.3	2.7	2.8	2.7	2.4	3.1	2.7
Enclosed nature (private)	1.3	4.5	4.5	3.8	3.3	2.0	2.7	3.8	3.2	3.0	3.1
Aversion to the presence of animals	4.0	6.0	4.5	4.5	4.0	5.2	4.7	4.8	4.5	5.0	4.8
Status[2]											
Not being seen as going to the toilet	3.3	1.5	2.0	3.5	2.5	3.5	3.3	2.5	2.8	2.8	2.8
Pride in owning your own toilet	2.7	1.5	2.0	1.3	1.3	1.2	1.6	1.3	1.4	1.7	1.5
Having an expensive fancy toilet model	1.3	4.0	3.5	1.8	3.5	2.7	2.3	3.1	2.9	2.7	2.8
Being able to invite certain kinds of guests to the home, or having them accept the invitation	2.7	3.0	2.5	3.8	2.8	2.8	3.0	3.2	3.1	2.8	3.0

[1] The values represent the average ratings for the six attributes. A value of 1 means that the feature is the most important while a value of 6 means that the feature is the least important.
[2] The values represent the average ratings for the four attributes. A value of 1 means that the feature is the most important while a value of 4 means that the feature is the least important.
Source: Focus group discussions

The relatively high level of satisfaction, especially among those who have access to improved toilets and the concerns of households who practice open defecation, can be appreciated better in the context of the responses to questions on toilet preferences in the FGD.

The respondents were asked to rank a number of features with respect to comfort, and status. In terms of comfort, the respondents placed the highest priority on cleanliness (Table 22). The rankings were also very similar across genders and for sites. Of the five study sites, only the respondents in Alabel had a different preference in this category. The top response in this study site was having an enclosed toilet, highlighting an apparent preference for more privacy. However, their preference for cleanliness came a very close second.

The FGDs also asked the respondents about the intangible gains they derive from owning a toilet. In this regard, the highest rank was for the pride associated with having a toilet (Table 22). The finding was consistent across genders and sites. One exception is Alabel, where the highest rank was given to "having an expensive fancy toilet." The feature of not being seen going to the toilet was also a top choice in Bayawan and Dagupan. The reasons mentioned for the choice were not having to ask permission from anybody when they need to use the latrine. Toilet ownership was also viewed as an indication in the community that the social status of the household has improved. Other features that were rated highly by specific groups are:

- Having a fancy and expensive type of toilet (households with desludged septic tanks in Alabel; men with private toilets in Poro/San Agustin, San Fernando; and women with access to sewers in Taguig)
- Confidence in inviting guests to their home without having to bring the guests to their neighbor's toilet (men in Pugaro, Dagupan; and women with UD-DT-E toilets in Nagyubyuban, San Fernando)
- Not being seen going to the toilet (women in Pugaro, Dagupan; and men in Bayawan)

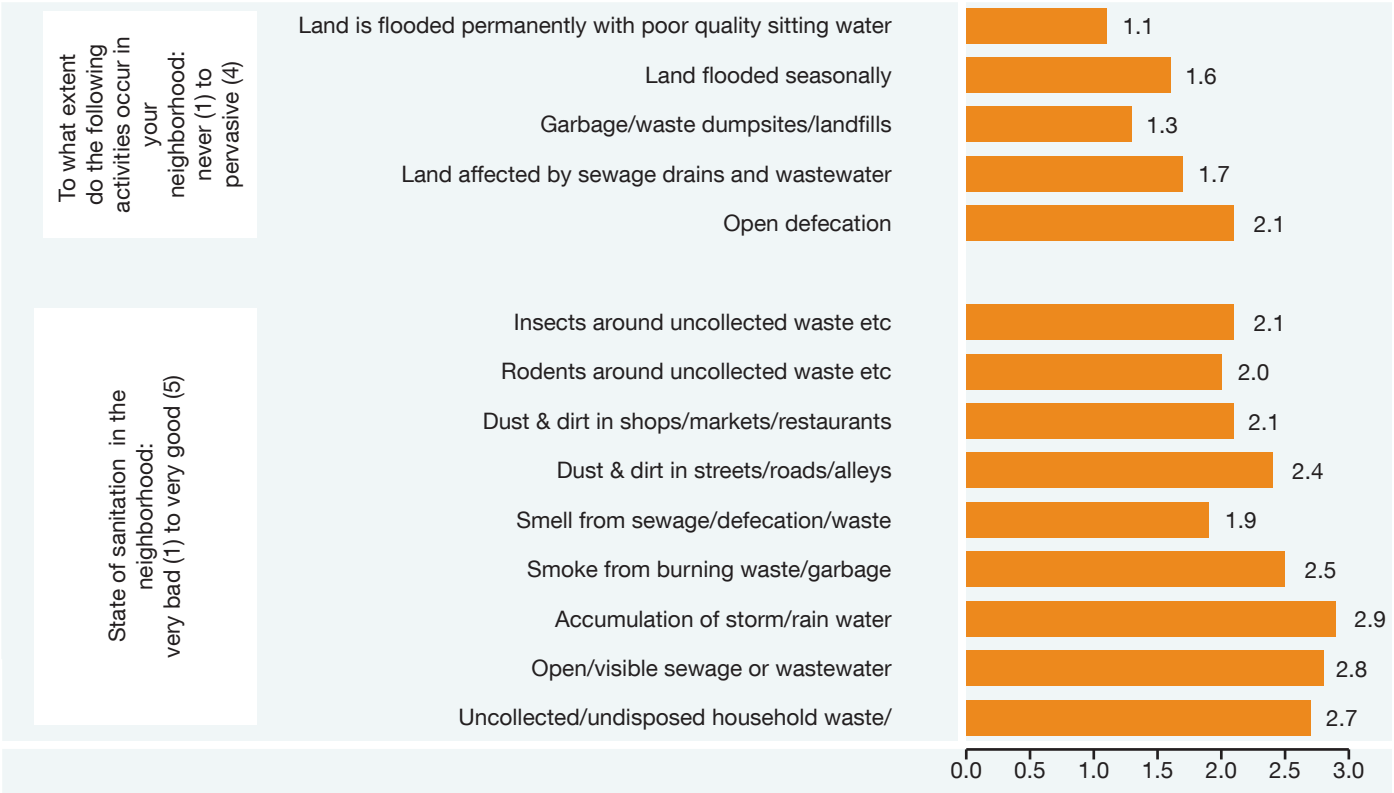
The first response was given by groups that already have toilets and are probably seeking an upgrade of their facilities. On the other hand, the last two responses were provided by groups who have a history of practicing open defecation.

4.6 External environment

"External" environment refers to the area outside the toilet itself and is not related to toilet use. It can include living areas, public areas, and private land, which can all be affected by open defecation practices and unimproved toilet options. The consequences on water pollution will not be discussed here because it has already been covered in Section 4.2. The sources of data are the ESI surveys: physical location survey, household interviews, and focus group discussions. Given that the external environment is also spoiled from other sources of poor sanitation — mainly inadequate solid waste management practices — these have also been assessed to understand the contribution of each, and relative preferences regarding their improvement.

Figure 28 shows scoring of the quality of environmental sanitation. It shows that the respondents are aware that flooding does not occur often in the sites and that open

FIGURE 28: SCORING OF DIFFERENT TYPES OF LIVING AREA



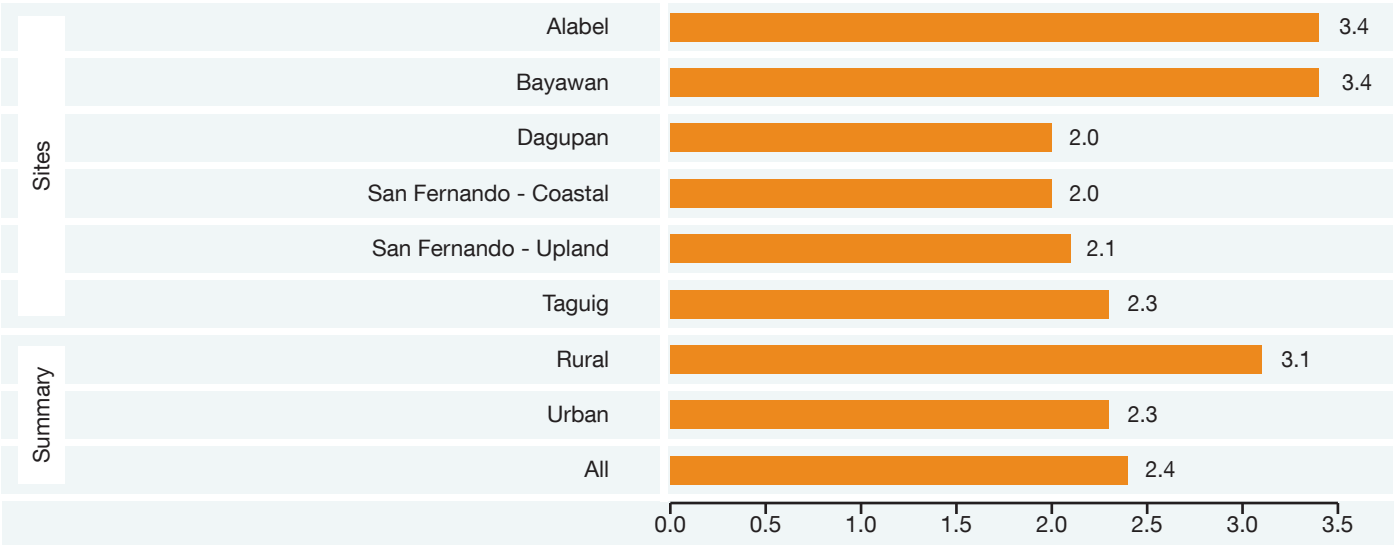
Note: 1 = very bad to 5 = very good; Source: Annex Table F1

defecation occurs in their neighborhood sometimes. However, the respondents recognize that the state of sanitation in their neighborhood can stand improvement. All the characteristics stated in the questionnaire had an average rating of less than three out of a possible five (very good). The lowest ratings were given to the presence of rodents and insects (2.0), and the smell from sewage, defecation and waste (1.9).

In attempting to get an overall picture of the state of sanitation in the sites, a simple average of the scores is presented in Figure 29. It suggests that the state of sanitation, as rated by the respondents, in all the sites can stand improvement. Moreover, the ratings of rural households were higher than their counterparts in the urban sites. Among the study sites, the highest ratings were for Alabel and Bayawan. While indicative of the state of sanitation, it is difficult to read too much into these findings because the values were based on a subjective assessment of the respondents.

It is important to note that households which have access to improved sanitation facilities may still contribute to pollution in the environment. Figure 30 summarizes some findings for households that have access to toilets, septic tanks, and pit latrines in the study sites. Among those who have access to toilets, about a third and slightly more than a tenth of the respondents in the study sites urinated and defecated in the open, respectively. Close to a fifth of the respondents also disposed of the stool of their children in the environment. In all cases, the poor practices appear to be more prevalent among urban households. Septic tank management practices also require improvement. Among households with facilities over the age of five years, about 50% emptied their septic tanks. Of these households, about 7% did so more than five years from the date of the survey. This implies that almost half of the households with such septic tanks have neither desludged their facility nor did so in a period beyond the period in which such facilities should be emptied. In the case of pit latrines, about 80% of those who responded said that their facilities sometimes overflow. Moreover, about 60% said that their pits have experienced seepage or flooding. However, some care needs to be exercised in interpreting the findings for pit latrines because of the very low response rate. Out of the 187 households that own dry and wet pits, only 30 households from the upland region of San Fernando responded to the questions. Hence, there is no information to say whether the other sites experienced seepage/flooding or pit overflow.[25]

FIGURE 29: OVERALL STATE OF SANITATION IN THE STUDY SITES[1]



Source: Annex Table F1
[1]1 = very bad to 5 = very good

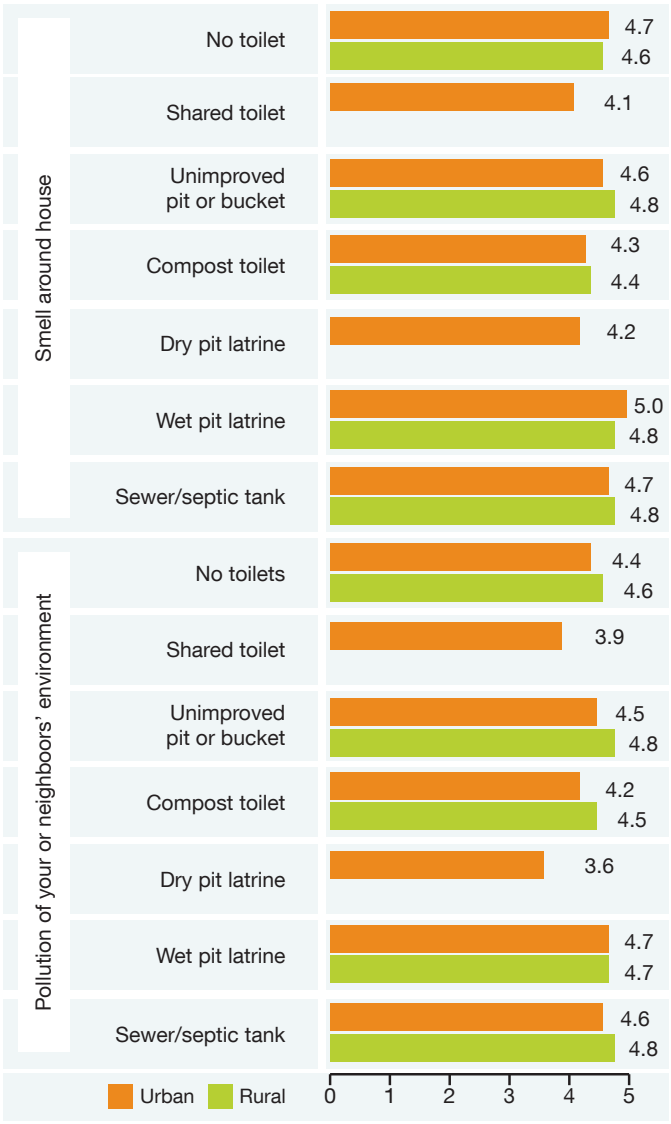
[25] Other sites which have pit latrines are Alabel, Dagupan, and the coastal region of San Fernando.

FIGURE 30: PROPORTION OF HOUSEHOLDS WITH UNIMPROVED SANITATION PRACTICE, %

Source: Annex Table F2

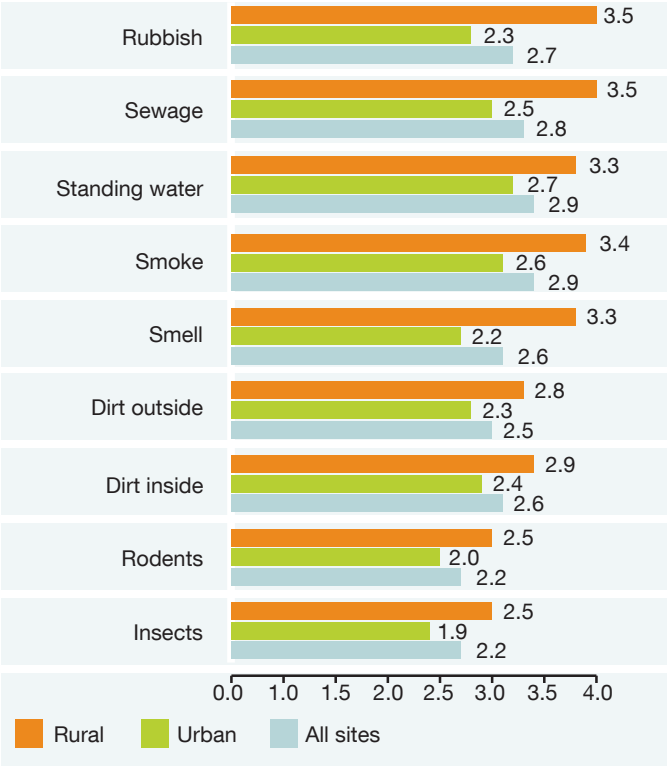
The respondents were also asked regarding the perceived benefits of improved sanitation in terms of reducing pollution in the neighborhood or community and in reducing smell around the house. A score of five means that the households are very satisfied while a score of one means that they are not satisfied. Figure 31 presents the responses for households with different sanitation facilities in rural and urban areas. It shows that the different groups were highly satisfied with the way in which their facilities reduce pollution in their neighborhood and smell inside their homes. However, the ratings of households with dry pit latrines and shared toilets in terms of reducing pollution were lower than the other households.

FIGURE 31: IMPLICATION OF CURRENT TOILET OPTION FOR EXTERNAL ENVIRONMENT[1]



Source: Annex Table F3
[1]1 = not satisfied, 5 = very satisfied

FIGURE 32: PERCEPTIONS OF ENVIRONMENTAL SANITATION STATE, BY OPTION TYPE[1]



Source: Annex Table F4
[1]1 = very bad, 5 = very good

The previous paragraphs described the state of sanitation in the sites by examining the evaluation of the respondents of the various aspects of sanitation. The general implication of the findings was that, by the respondents' own account, more work needs to be done in order to achieve satisfactory sanitary conditions. Crucial to understanding why these conditions occurred and perhaps the willingness of the respondents to address them is how important they perceive improved sanitation conditions. In the household survey, the respondents were asked about the importance of selected aspects of sanitation. They were asked to give a score of one (not important) to five (very important) to each of the aspects presented in Figure 32. The results indicate that they place the highest level of importance on the collection and disposal of waste, garbage or rubbish (rubbish, 2.7); open, visible sewage or wastewater (sewage, 2.8); accumulation of rain and storm water (standing water, 2.9); smoke from burning waste, garbage and rubbish (smoke, 2.9); and smell from sewage, defecation and waste (smell, 2.6). There are three points about the results that are worth noting. First, it seems that the level of importance assigned to these aspects was not too high as the averages fall below the mid-point

(three) of the range of possible ratings (one to five). Second, the importance of these aspects was higher for the rural sites relative to the urban sites. Finally, cross-tabulating these results with their assessment of sanitation conditions (Figure 29) suggests that the aspects on which they put the highest importance were generally those aspects which received the most positive evaluation. The only major exception appears to be smell, which was ranked as being among the most important aspects and yet had a state which they assessed as not being too good.

4.7 Project performance and actual benefits in the field sites

4.7.1 PROJECT COVERAGE

Many of the sanitation options in the field sites were made available to the households through projects initiated and implemented by government, donor agencies, private firms and NGOs. Table 23 summarizes the sanitation options received by households through recent projects/programs. It excludes households that continue to practice open defecation or facilities that were constructed in the absence of

TABLE 23: SANITATION COVERAGE INFORMATION PER FIELD SITE

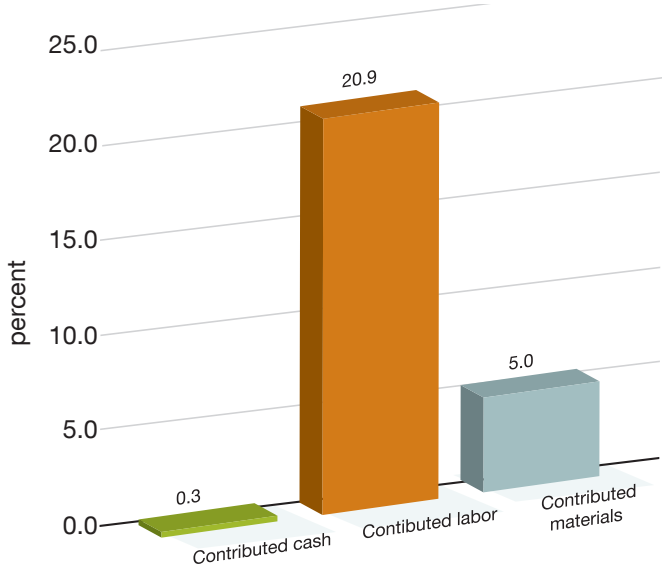
Site	Setting	Intervention	Households		Project Years		Project Name	Institutions Involved
			Interviewed in ESI survey	Reached by program	Start	End		
Alabel	Rural	STF	44	Over 14,000	2006[1]	2007[1]	Southern Mindanao Integrated Zone Management Project[3]	DENR, JBIC
Bayawan	Rural	Toilets & constructed wetland	180	700	2004	2006[3]	Covered under Local Housing Board Act of 1999 of the local government.	Local government & GTZ
Dagupan	Urban	Community toilets	65	approx. 800[4]	na	2007[5]	na	Local government
San Fernando	Rural & Urban	UDDT-E	64	215	2004	2010	ISSUE 1 and ISSUE 2	Local government, CAPS, WASTE, SWAPP, IDEEAS, FSSI, DGIS
	Urban	Community toilets	65	125[6]	na	na	na	Local government
Taguig	Urban	STF	91	Over 200,000[7]	2006	2007	Component of the Third Manila Sewerage Project	Manila Water Company Incorporated, World Bank, Land Bank of the Philippines
		Sewer system at Centennial Village	84	1,140[8]	na	1995[9]	Centennial Village was constructed under the management of the Bases Conversion Development Authority (BCDA). The operation and management of the sewerage facilities were turned over to Manila Water, which in turn rehabilitated the facilities under the Second Manila Sewerage Project.	BCDA, Manila Water, World Bank

[1] Construction began in February 2006 and the STF was inaugurated in Oct 2007.
[2] The STF is one of seven treatment facilities constructed under the project.
[3] Houses turned over to the beneficiaries.
[4] Based on the 2007 Census, barangay Pugaro had a population of 4,063 persons.
[5] The facilities were completed in September 2006 but turned over on January 2007.
[6] Based on the FGD, these represent the number of households using the community toilets at barangay San Agustin.
[7] The STF is projected to serve an area that has more than a million persons. Apart from Taguig, it also services San Juan, Mandaluyong, Pasig, Makati, Pateros and Cainta.
[8] This represents the number of housing units at the Centennial Village.
[9] Completion of the Centennial Village.

any recent initiatives beyond that of the household. As expected, the projects differ in terms of the facilities provided to the households. The projects in Dagupan were confined to the provision of latrines. In contrast, the project in Bayawan was broader as the local government provided homes that had built-in toilets and a constructed wetland for the community. There was a mix of projects in San Fernando, ranging from simple distribution of urine diversion-dehydration toilets to those that provided houses (Fishermen's Village in Barangay Poro).

The projects/programs were implemented on the initiative of local government units (San Fernando, Dagupan), a private sector operator on behalf of a public authority (Taguig) and the national government (Alabel). However, NGOs, donor agencies and other private institutions also played an important role in funding and implementation of the projects. For example, the provision of urine-diversion toilets in San Fernando was funded by the Directorate General of International Cooperation (DGIS) of the Netherlands Ministry of Foreign Affairs, with NGOs and private institutions including CAPS, Solid Waste Management Association of the Philippines (SWAPP) and others providing coordination, capacity building, technical advice, etc. In the case of the STF in Taguig, the World Bank lent money to Manila Water through the Land Bank of the Philippines (LBP), a government financial institution.

FIGURE 33: CONTRIBUTION OF HOUSEHOLDS, %



Source: Annex Table F6

Out of the 1,270 households included in the ESI survey, 374 households received toilets through various projects. Within this group, more than 96% (358 households) of the households received toilets from the program or an agency or the local government. The households also contributed to the programs (see Figure 33). Most of the contribution was in the form of labor (21%) and very few of the households contributed cash (less than 1%). The average labor contribution was about 6 days.

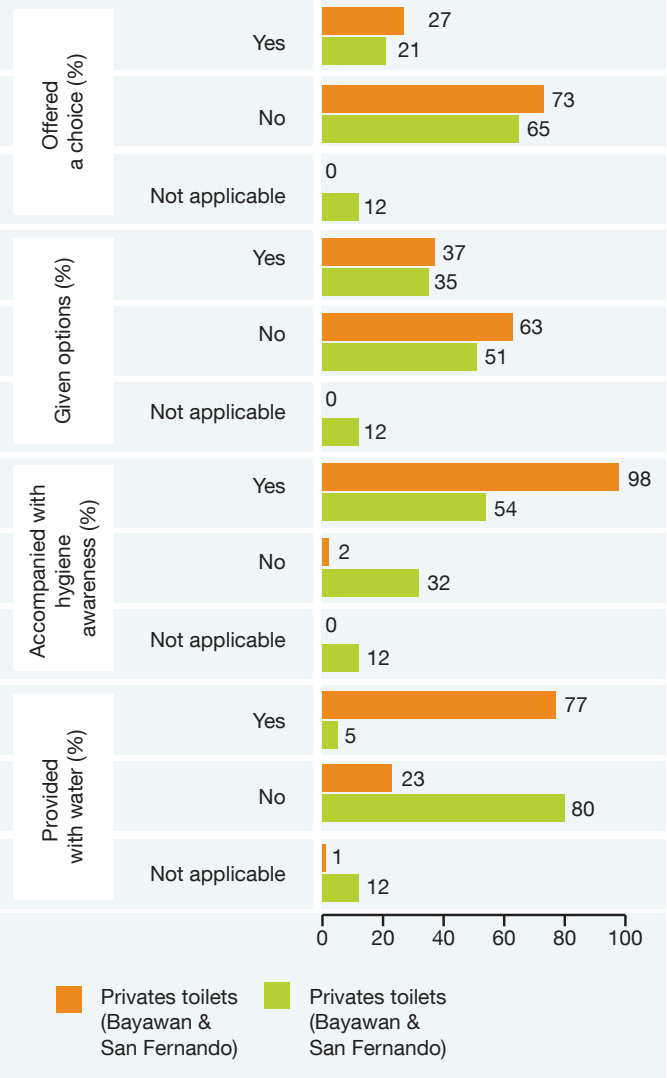
It is important to note that 180 of the respondents in Figure 33 were beneficiaries of the Gawad Kalinga Village in Bayawan. As part of the project, these households contributed labor, on average about seven days per household, but not cash. However, these households are also expected to pay a monthly amortization of PhP280 (US$6) for the house for 15 years. This means that financial contributions are being paid for the toilets through their monthly amortization.[26]

Based on the household survey, Figure 34 summarizes other key features of these projects. First, it indicates that the majority of the respondents were neither offered a choice nor given alternative options with respect to the facilities provided. Second, most of the programs were accompanied by an information campaign, especially for the households that received private toilets. Third, only 5% of the households that were given access to community toilets said that they were also provided access to water. This is in sharp contrast to households which were provided private toilets, where 77% of the households claimed that they also received access to water. However, this finding must be interpreted with care because 73% of the beneficiaries were from the Gawad Kalinga relocation site at Bayawan. If the respondents from this site were removed from the analysis, then only about a third of the beneficiaries were provided access to water. While not discounting the need for water in promoting hygiene practices, it is important to note that the remaining households received urine diversion-dehydration toilets that only require water for cleaning.

The analysis above excluded households in Alabel and Taguig because no toilets were provided in these survey sites. While households in these sites did not participate in the decision to construct the treatment facilities, the beneficia-

[26] A quantitative analysis of the contribution of the households to the costs of the facilities is provided in Section 6.2.

FIGURE 34: CHOICE TO PARTICIPATE AND OTHER BENEFITS PROVIDED TO THE HOUSEHOLDS %



Source: Annex Table F7

ries have a choice in selecting the firm that will empty their septic tanks. However, the options are a bit more limited in Taguig. The reason is the presence of an environmental charge that is automatically included in the water bill of the households. This fee is designed to support the sanitation services provided by the water utility.

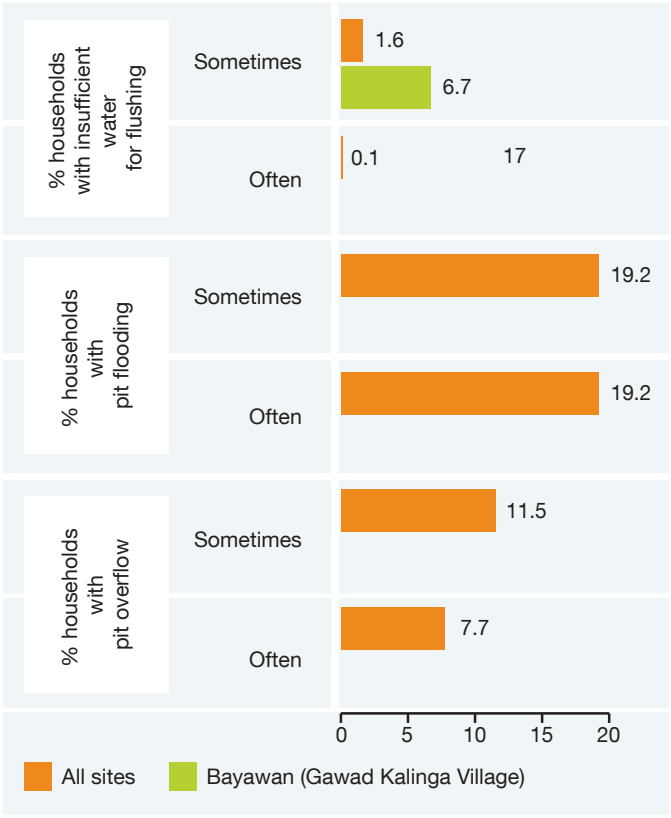
4.7.2 APPROPRIATENESS OF TECHNOLOGY

Figure 35 summarizes a few indicators related to the appropriateness of the technologies in the sites. It indicates that about 1.6% of the households in all sites said that there is not enough water for flushing. This finding was mostly due to beneficiaries at the Gawad Kalinga Village, where about 7% of respondents said that water is sometimes not sufficient for flushing. Referring only to owners of dry pit latrines, Figure 35 also shows that some of these households experienced flooding or overflowing in their pits.

4.7.3 SELECTED IMPACTS ON TARGET BENEFICIARIES

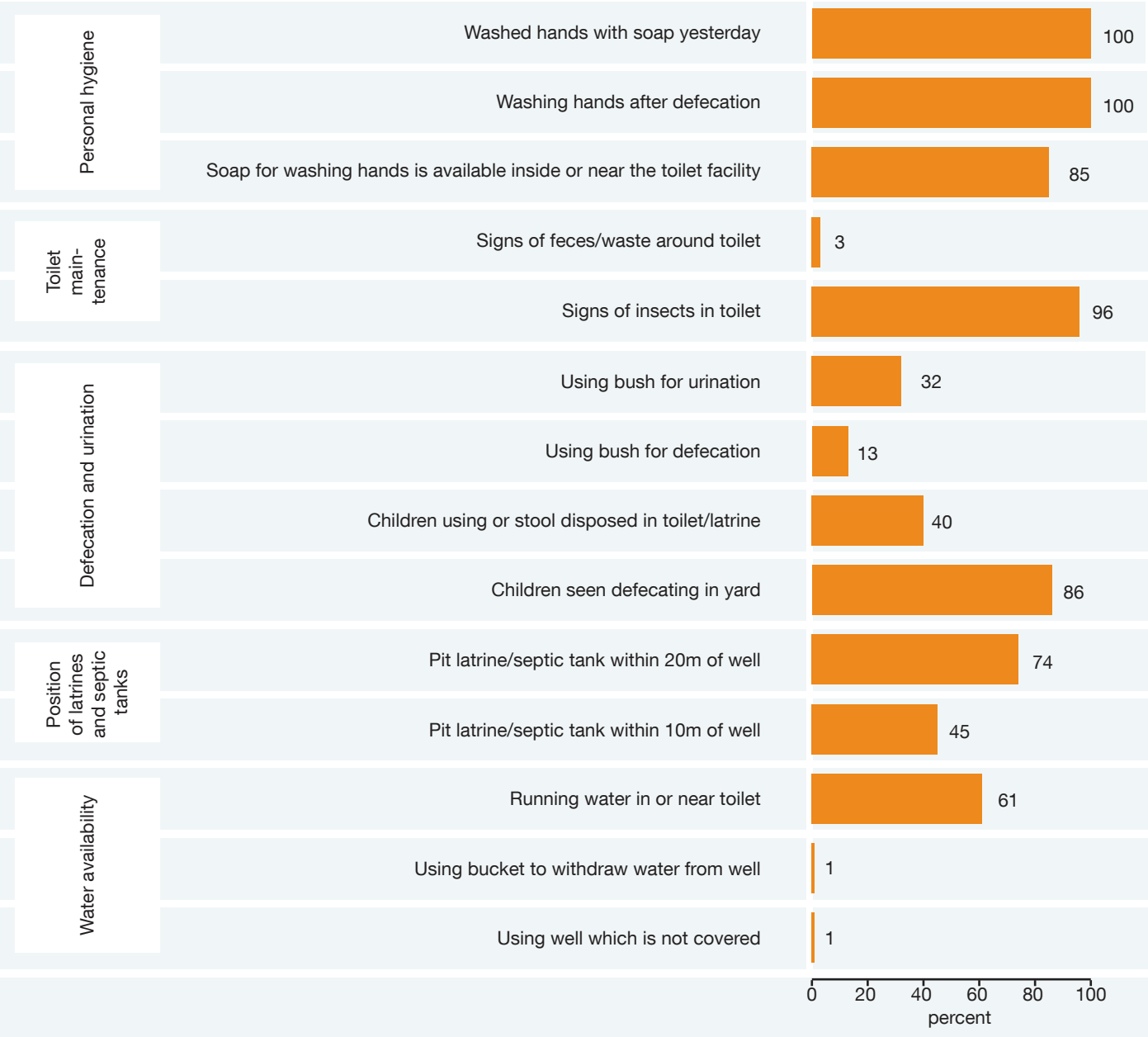
Initiatives to implement sanitation improvements may be assessed in different ways. In the case of projects, it is possible to compare the quantity and quality interventions against the project targets. Another way would be to examine the impact on the target beneficiaries after the project completion. Figure 36 focuses on the latter. It summarizes selected performance indicators for all interventions, regardless of the presence of projects in all the field sites. The indicators represent the (a) behavior of the survey respondents with respect to hygiene, toilet maintenance, defecation, and urination, (b) positioning of latrines and septic tanks, and (c) water availability. The information was drawn from the household questionnaire and observational instruments. Details for the specific sites are presented in Annex Tables F9 and F10.

FIGURE 35: APPROPRIATE TECHNOLOGY %



Source: Annex Table F8

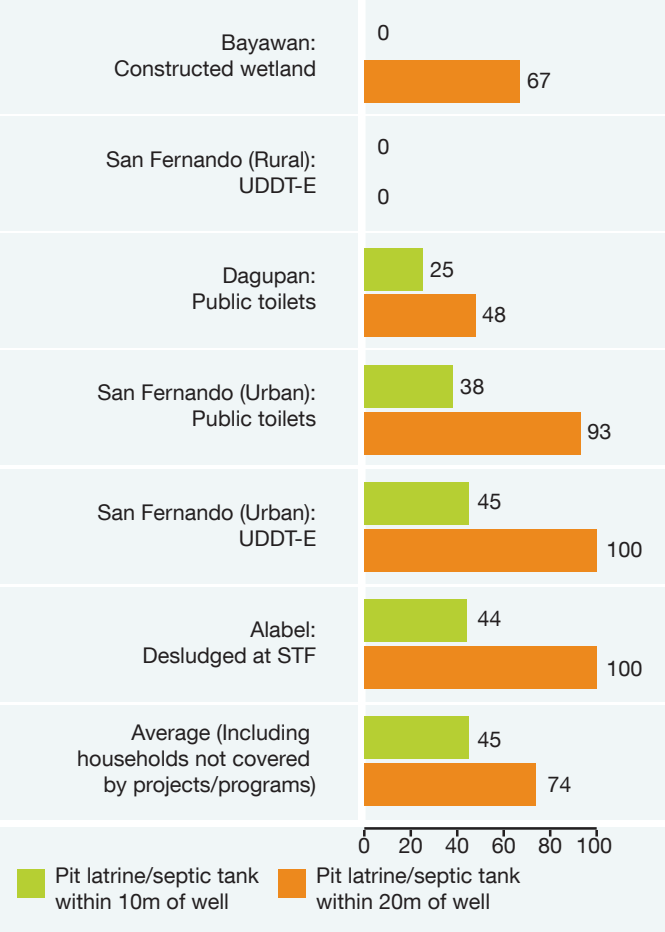
FIGURE 36: INDICATORS FOR HOUSEHOLDS WITH ACCESS TO TOILET FACILITIES, %



Source: Annex Table F9 and F10

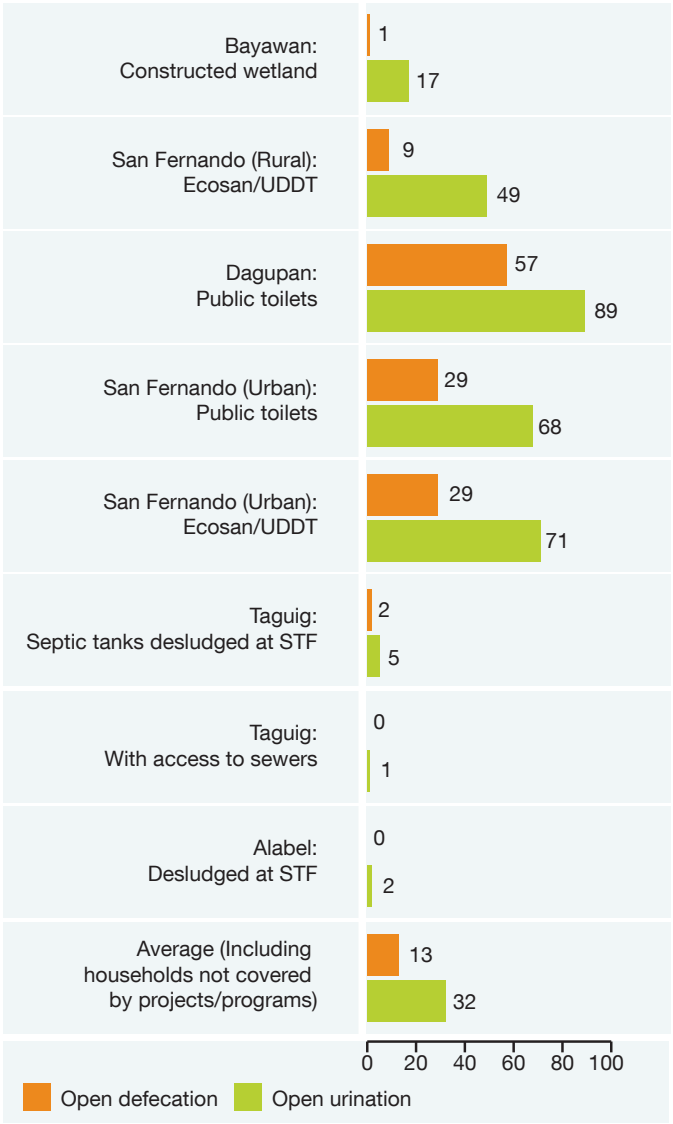
Figure 36 shows that, on the basis of handwashing behavior, the respondents practice good personal hygiene as all the respondents claimed to wash their hands after defecation. However, the enumerators in the survey found that only about 85% of the toilets had soap inside or near the cubicle. This implies that some of the respondents washed their hands elsewhere or brought the soap with them to the toilet. It may also be an indication that the earlier findings on handwashing behavior are overstated. While personal hygiene practices were impressive, toilet maintenance and design could stand improvement as the enumerators observed that 96% of the facilities had insects in the toilet. Moreover, the respondents mentioned that quite a few of them still defecate or urinate in the open. More than half of the respondents also do not dispose of the stool of their children properly and continue to observe children defecating in the yard. The enumerators also found that running water in or near the toilet was only available 61% of the time. This means that many households have to haul water to flush or clean the latrines every time they use it.

FIGURE 37: PIT LATRINES/SEPTIC TANKS WITHIN 10 TO 20 METERS FROM A WELL, % OF HOUSEHOLDS



Source: Annex Table F9 and F10

FIGURE 38: OPEN DEFECATION AND URINATION IN THE PROJECT SITES, % OF HOUSEHOLDS



Source: Annex Table F9 and F10

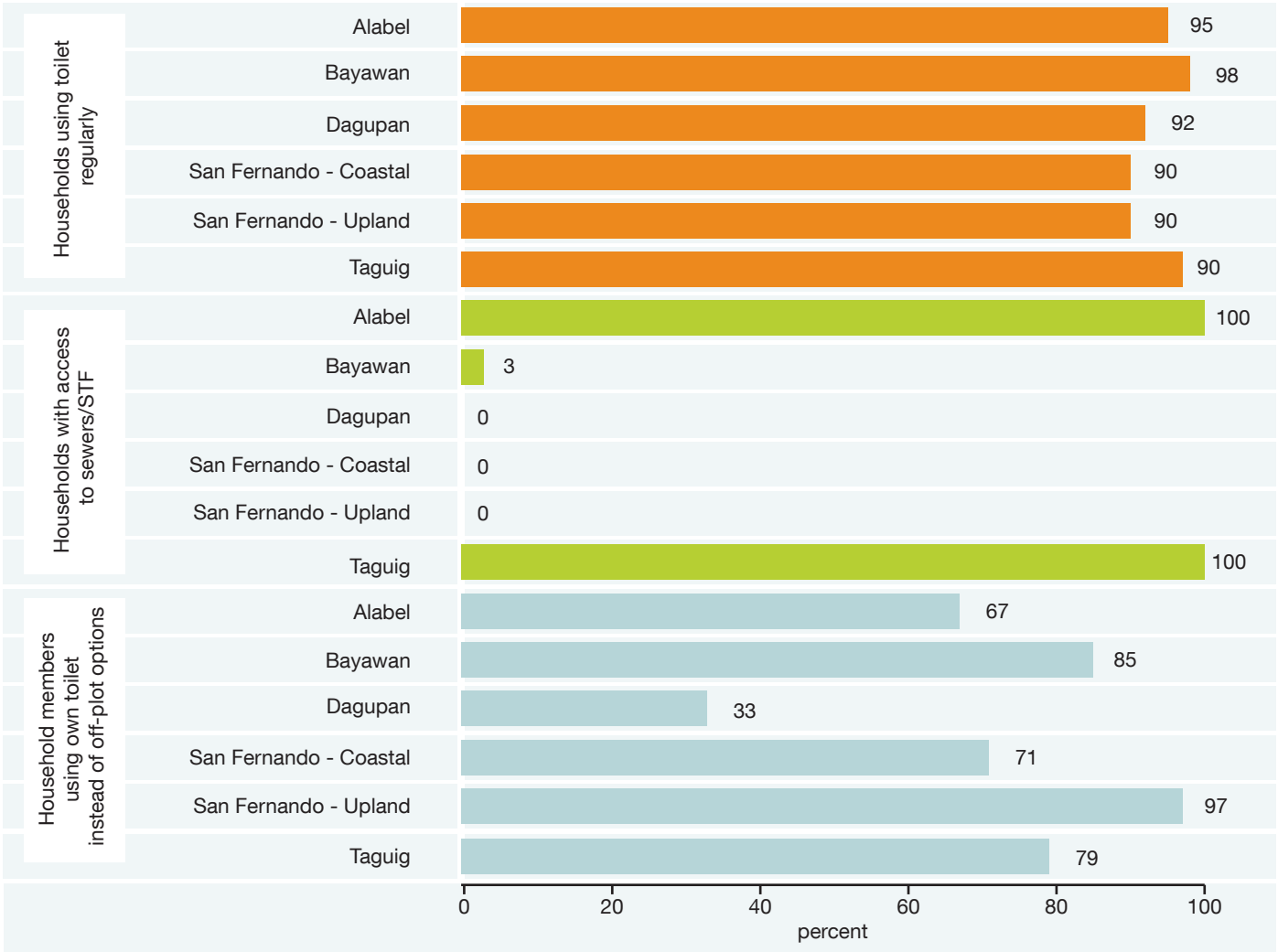
There might also be room for improvement in the positioning of septic tanks and pit latrines as more than 40% of these facilities are located 10 to 20 meters from wells (see Figure 37). However, this result must be interpreted with care because the actual risks associated with the position of the latrines and septic tanks are also influenced by factors like soil type and condition (permeability), depth to aquifer, gradient, quality of wells, etc. In addition, the opportunity to construct facilities which are far enough from water sources might be severely constrained in urban areas.

Despite the availability of toilets, there is still evidence that households continue to defecate and/or urinate in the open. This appears to be a more serious problem among households that have access to UDDT-E facilities in San Fernando (both rural and urban sites) and public toilets in Dagupan and San Fernando (Figure 38). On the other hand, the proportion of households practicing open defecation was higher among those who have access to public toilets (Dagupan and San Fernando) and UDDT-E users (urban regions of San Fernando).

4.7.4 IDEAL TO ACTUAL BENEFITS

There are a number of reasons that may prevent the full realization of the benefits from a sanitation intervention. For example, the extent to which the health benefits are realized from an improved sanitation option depends on whether the facility is used by the beneficiary. If very few of the beneficiaries actually use a sanitation facility, then the likelihood of getting diseases will not be very different

FIGURE 39: ADJUSTMENT VARIABLES FOR BENEFITS, % OF RESPONSES



Source: Annex Table F11

from those who practice open defecation or use inferior options. In other words, the benefits from having access to improved sanitation will be limited. In the case of hygiene, the health gains from having access to improved sanitation options might be reduced if the beneficiaries do not wash their hands after defecating. Hence, it is important to check if such a practice is common among the beneficiaries. Similar arguments can be made for the other benefits of improved sanitation — water source, water treatment, access time, and reuse.

This study will attempt to capture the inability to fully realize the gains from an intervention by making a distinction between ideal and actual benefits, and adopting the following procedure: First, the benefits quantified in Sections 4.1 to 4.4 will be treated as gains occurring under ideal conditions — i.e., where sanitation facilities are used at optimal levels, maintained properly, and complemented with appropriate hygiene practices. Second, the benefits will be adjusted with the aid of selected indicators from the field sites. The adjusted values will be called actual benefits in the analysis. The actual and ideal benefits will then be used to generate two sets of efficiency measures — ideal and actual conditions — in Chapter 7.

Figure 39 shows selected indicators for the field sites. It indicates that at least 90% of the households in the sites use their (improved) toilets regularly. This implies a high likelihood that the health benefits from improved sanitation are going to be realized for these sites. All households in the sample for Alabel (urban barangays only) and Taguig have access to treatment facilities. This is due to the presence of

the STF in both sites and the sewer system at the Centennial Village in Taguig. The opposite is true for the households in Dagupan and San Fernando. This implies that the full benefits of improved sanitation are less likely to be realized from the two sites because off-site sludge and wastewater disposal facilities are not available. The proportion of household members using off-plot options represents the potential for realizing the gains associated with access time. Figure 39 indicates that the beneficiaries from Dagupan are the least likely to obtain the full benefits because a large proportion of them still have to walk to a place of defecation. The full set of indicators for the field sites is presented in Annex Table F11. These values will be used to estimate the actual efficiency of sanitation interventions.

There are two important points to note about the calculation of actual and ideal benefits. First, the values presented in Figure 39 should be seen as an initial step in developing a set of measures that could be used for evaluating the actual benefits. Some of the indicators may be refined further with more available information. For example, the proportion of people who wash their hands after defecation may be augmented with information on the frequency with which they do it. A person who washes his/her hands is less likely to get sick if he/she engages in the practice more often. Some of the indicators might also have to be combined with other measures to generate a more accurate assessment of actual practices. For example, handwashing may be combined with information on the cleanliness of the toilet bowl or the cubicle itself, or even food preparation. However, the development of such indicators and how these will be used to adjust the benefits can be the subject of further studies. For all its limitations, the indicators presented in this study highlight the point that the full benefits of improved sanitation may not be realized in the absence of changes in hygiene behavior and use of toilet facilities. Second, the non-optimal use of public facilities such as STFs and community toilets will have cost implications for the analysis. Given the fixed costs of installing these facilities, non-optimal use implies that costs per households will be higher compared to optimal use. The actual impacts on costs per household are discussed in Chapter 6.

4.8 Summary of local benefits

Table 24 summarizes the local benefits associated with access to improved sanitation under ideal conditions. It presents the quantitative benefits for the rural and urban sites that were reported earlier. These represent the estimated gains per household on an annual basis. The table also reports the qualitative benefits that were not quantified in the analysis. The majority of these benefits were sourced from the surveys and FGDs in the study sites.

The quantified benefits suggest that gains associated with access time are likely to be the highest source of benefits for rural and urban households. However, this must be interpreted with care because of two reasons. First, health care costs averted are likely to be the largest individual source of benefits in urban sites if households that practice open defecation are provided with toilets that have access to sewers. Second, combined health benefits (i.e., health care + productivity + mortality) of moving from open defecation to toilets that have access to sewers provide the largest source of benefits to rural and urban households.

TABLE 24: SUMMARY OF LOCAL IMPACTS OF SANITATION IMPROVEMENT

Benefit	Benefits of improved sanitation and hygiene		
	Quantitative benefit (PhP/household, annual)		Qualitative Benefit
	Rural	Urban	
Health			
Health care costs averted			Health burden and quality of life • Avoided pain and discomfort because of illness: 9 DALYs averted per 1000 households per year for basic sanitation and 15 with improved WWM. Note: The values represent simple averages for all the sites. • Avoided income losses from other diseases associated with poor sanitation.
OD to Basic	1,061	1,114	
OD to Sewerage	1,663	1,745	
Productivity costs averted			
OD to Basic	422	778	
OD to Sewerage	668	1,231	
Mortality costs averted			
OD to Basic	430	323	
OD to Sewerage	655	430	
Water			
Savings from access costs	55	403	Overall quality • Improved water quality (smell, appearance, lower contaminants, etc.) for drinking, domestic purposes, recreation and other purposes. All the respondents who accessed drinking water from unprotected sources said that the water had a bad appearance. Another 11% of these respondents said that the water had a bad taste. Among respondents who accessed water from non-piped protected sources, 10% said that the water had a bad appearance or the presence of sediments.
Savings from treatment costs	28	85	
Access time	1,701	1,700	• Convenience associated with having access to private toilets: Of the 4 choices provided to respondents, the strongest preference was given to "being able to go quickly when the need arises." • Additional: time loss associated with urination: Some respondents in the FGDs said that they urinate up to 7 times a day. The estimated gain from access to improved sanitation could have been larger if these were taken into account.
Intangibles	nc	nc	• On the aspect of comfort, the respondents gave the highest priority to cleanliness. • On the aspect of status, the respondents gave the highest priority to the pride associated with having a private toilet. This was complemented by the results of the FGD where some of the participants cited greater confidence in inviting guests to their home after receiving a toilet. In addition, there were respondents who said that they had to cover their faces, so that they will not be recognized, whenever they defecate in the open. • Privacy was also important as "not being seen going to the toilet" was ranked second by the respondents on the aspect of status. • Safety was also important as 37% of the respondents said that they were often worried whenever their children had to defecate in the open. In the FGD, some of the participants said that having toilets made them feel safer, especially for women using toilets at night or when it is raining.
External Environment	nc	nc	• The responses to the ESI household survey showed that the state of the environment in the study sites could stand improvement. With scores ranging from 1 (very bad) to 5 (very good), the poorest scores were given to smell from sewage/defecation/waste (1.9), rodents around uncollected waste (2.1), and insects around uncollected waste (2.1). The average of scores in all sites given to various environmental conditions was 2.4.
Reuse	561	551	• The benefits could have been larger if the reuse of human excreta as biogas was included in the analysis. Similar results could be expected if the reuse of sludge and wastewater from off-site treatment plants was included.

Note: nc = not calculated; OD = open defecation

V. National Benefits of Improved Sanitation and Hygiene

This chapter presents the national impacts of improvements in sanitation. In particular, it presents the results on:

- Tourism (Section 5.1)
- Businesses and foreign investment (Section 5.2)
- Sanitation reuse markets (Section 5.3)
- National health (Section 5.4)

5.1 Tourism

Tourism is an important economic activity in the Philippines. In 2007 alone, the country attracted 2.9 million visitors that spent close to US$4.5 billion (NSCB 2008).[27] Virola (2009) cited that the direct gross value added from tourism accounted for about 6.2% of GDP from 2000 to 2007. He also noted that the employment share to total employment of industries directly related to tourism averaged 9.5% between 2000 and 2008.[28]

Decisions of tourists to visit a country can be influenced by sanitation conditions. The quality of water resources (for drinking water and recreation), quality of the environment (smell and sights), food safety (hygiene and food preparation), general availability of toilets in public places, and health risks can affect the decisions of tourists to visit a destination. Disease epidemics, whether or not these are influenced by sanitation conditions, are also likely to discourage tourists from visiting a site. One example is the outbreak of typhoid fever in Calamba, Laguna in 2008 that was suspected to be caused by contaminated and inadequately treated water (Tayag 2008). Home to more than 200 resorts, news of the outbreak affected tourism in the area. A newspaper report cited that one owner estimated a 60% decline in the number of regular customers at the time of the outbreak (PDI 2008). A disease epidemic is not a necessary condition for a sanitation-related decline in tourism. The World Bank (2003) noted an observed 60% fall in hotel occupancy rates in 1997 at Boracay island, one of the top tourist destinations in the Philippines, after a DENR water quality monitoring report which declared that high levels of coliform made the water unsafe for recreational activities.

While it is difficult to quantify the monetary impacts, this study attempted to assess the relationships between selected aspects of sanitation and tourism. The analysis is based on a survey of 189 visitors at the Ninoy Aquino International Airport who were about to leave the Philippines. Nearly three-fourths of the respondents came from North America and Europe (Table 25). Asia, Australia/New Zealand and Africa accounted for the remainder of the respondents. The visitors were in the country either as tourists (75%) or on business (25%). Staying in the country for an average of more than two weeks, about 70% of these visitors either stayed with friends or relatives (27%) or in hotels that cost less than US$90 per night (43%).

The visitors were asked to rate how much they enjoyed selected sites in the country. A value of five was assigned if the site was enjoyed "very much" while a value of one was assigned if the visitor did not enjoy the site ("not at all"). The results are shown in Figure 40. As a whole, the survey findings indicate that the visitors most enjoyed their visits to beaches and forests in the Philippines. The average rating for the capital (Manila) was slightly lower and the lowest rating was given to historical sites in the country. However, their assessment of these sites was still above the midpoint (three) of the possible range of scores (one to five). Hence, it might still be possible to conclude that the tourists enjoyed their trip to the capital and historic sites but it was not as much as to the other sites in the country.

[27] This does not include the estimated 180,739 overseas Filipinos who went back to the country and spent US$343.85 million (NSCB 2008).

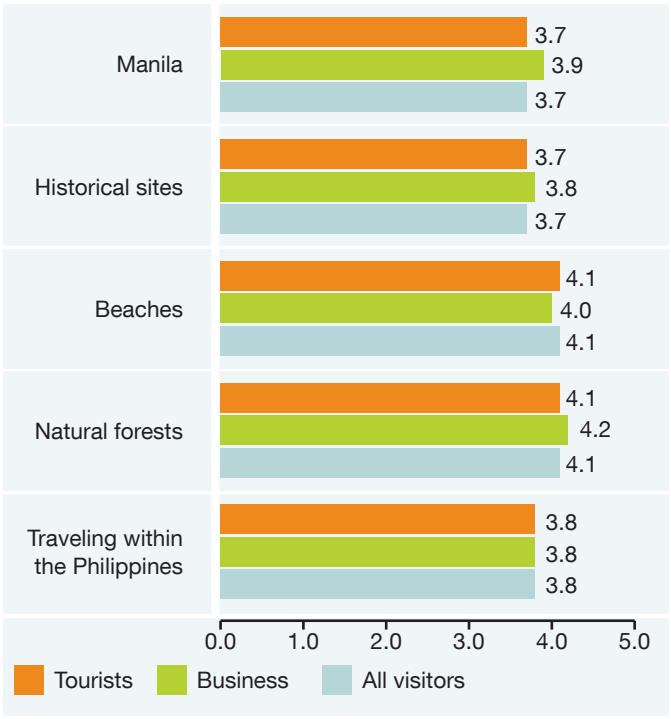
[28] The World Travel and Tourism Council (WTTC 2008) projected that in 2008 industries directly associated with tourism accounted for 4% and 3% of total employment and GDP, respectively. Incorporating industries that are indirectly associated with tourism generates significantly higher estimates of the contribution to total employment (10%) and GDP (9%).

The visitors were also asked to rate sanitary conditions in general and at selected locations in the country. They were asked to make a rating on a scale of one to five, with a value of five suggesting that sanitary conditions are "very good." As a whole, the average rating for general sanitation conditions was 2.9 (Figure 41). There was barely a difference between the perceptions of tourists and businessmen as a whole. At the extremes however, the business visitors who stayed at the cheapest hotels (less than US$60 a night) had the lowest rating for general sanitation conditions. In contrast, tourists who stayed in moderately priced hotels (US$60 to US$119 per night) had the highest rating.[29] This suggests that more work needs to be done in terms of improving the impressions of foreign visitors regarding general sanitation conditions.

While perceptions regarding general sanitation conditions were not really impressive, the assessments for specific locations were slightly better. The survey found that the ratings were somewhere between fair to good, ranging from 3.0 to 3.9. The visitors perceived that sanitation conditions in hotels were the best compared to the other locations/amenities included in the survey. On the other hand, the lowest average rating was for the capital (Manila) at 3.0. The perceptions among tourists and business travelers do not appear to differ much but business travelers were generally more generous with their ratings.

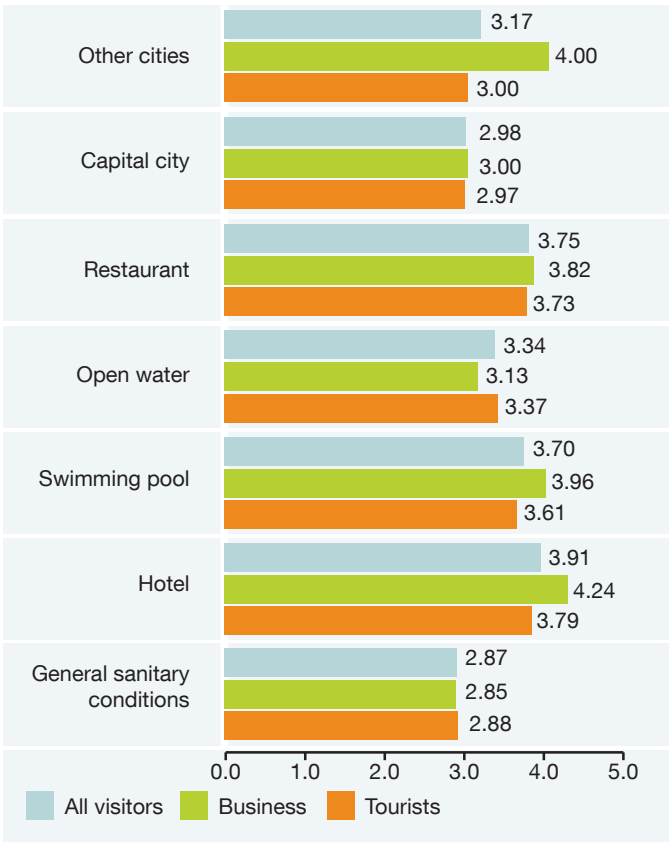
Table 26 provides more specific information on sanitation conditions as perceived or experienced by foreign visitors. The respondents were asked to rate the conditions of toilets in hotels, restaurants, airports, bus stations, and public toilets around the city. These were ranked on a scale of one ("very poor") to five ("very good"). As a whole, the highest rating was for hotels. With an average of 3.8 (fair to good), this rating was consistently the highest among tourists and businessmen. In contrast, the lowest average rating was for bus stations (2.2) and the city of Manila (2.6).

FIGURE 40: PLACES VISITED AND ENJOYMENT OF STAY[1]



[1] score: 5 = very much, 1 = not at all
Source: Annex Table G1

FIGURE 41: GENERAL SANITARY EXPERIENCE[1]



[1] score: 5 = very good, 1 = very poor
Source: Annex Table G2

[29] This ignores the responses of foreign visitors who stayed with friends or relatives, or who did not know how much was paid for their hotel rooms.

TABLE 25: BACKGROUND CHARACTERISTICS OF RESPONDENTS

Variable		Asia	North America and Europe	Australia/NZ	Others	Total
No. of tourists interviewed		21	141	24	3	189
Gender (%)	Male	90	82	92	100	85
	Female	10	18	8	0	15
Average no. of previous trips to country		1	5	4	0	4
Average length of stay of this trip (days)		12	16	16	23	16
Purpose of visit (%)	Tourist	71	77	71	0	75
	Business	29	23	29	100	25
Hotel Tariff in (US$)	1 - 29	10	8	17	0	9
	30 - 59	10	20	38	0	21
	60 - 89	29	13	8	0	14
	90 - 119	19	8	8	33	10
	120 - 149	5	6	0	0	5
	150 +	10	18	4	0	15
	Other[1]	19	28	25	67	27

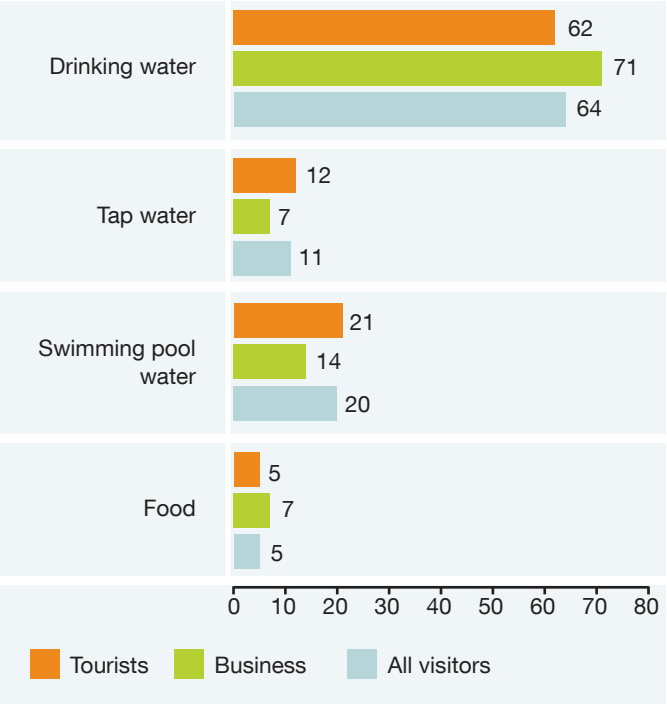
[1]Stayed with friends/family or does not know because the tariff was paid by the company
Source: ESI Tourism survey

TABLE 26: SANITARY EXPERIENCE IN RELATION TO TOILETS AND HAND WASHING[1]

Category	Hotel Tariff	N	Quality of toilets in					Toilet availability		Water and soap for hand washing		
			Hotels	Restaurants	Airports	Bus stations	Cities	% could not find when needed	% impact on stay	Restaurant	Bus stations	Cities
Tourists	1-29	14	3.3	3.2	3.9	1.9	2.2	28.6	22.2	76.9	42.9	36.4
	30-59	34	3.6	3.4	3.6	2.5	2.4	20.6	18.8	70.0	42.9	38.9
	60-89	24	3.5	3.2	3.2	2.6	2.6	25.0	13.3	85.0	40.0	33.3
	90-119	10	3.8	3.3	3.4	1.5	1.0	10.0	-	100.0	-	-
	120+	25	4.1	3.8	3.4	2.0	2.9	8.3	45.5	88.0	33.3	58.3
	Others[2]	34	3.4	3.6	3.6	2.1	2.9	14.7	13.3	70.0	41.7	50.0
	Subtotal	**141**	**3.6**	**3.5**	**3.5**	**2.3**	**2.6**	**17.9**	**20.0**	**78.6**	**39.2**	**43.2**
Business	1-29	3	5.0	4.0	5.0	-	5.0	33.3	-	100.0	-	100.0
	30-59	5	2.8	2.5	2.3	1.0	1.0	-	-	50.0	-	-
	60-89	3	4.0	3.0	3.3	2.0	2.5	33.3	-	66.7	-	50.0
	90-119	8	4.1	3.5	2.3	-	2.5	-	16.7	83.3	-	100.0
	120+	12	4.6	3.6	2.9	2.5	2.0	-	25.0	100.0	100.0	100.0
	Others[2]	17	4.3	3.8	3.5	-	3.3	-	-	91.7	-	100.0
	Subtotal	**48**	**4.2**	**3.5**	**3.1**	**2.0**	**2.8**	**4.2**	**11.8**	**87.5**	**50.0**	**80.0**
Total		**189**	**3.8**	**3.5**	**3.4**	**2.2**	**2.6**	**14.4**	**18.4**	**80.7**	**40.0**	**47.6**

[1] score: 1 = very poor to 5 = very good; N=number of respondents
[2] Stayed with friends/family or does not know because the tariff was paid by the company
Source: Annex Table G3

FIGURE 42: FACTORS OF MOST CONCERN TO TOURISTS, %[1]



[1] A respondent can identify up to 3 factors
Source: Annex Table G4

Slightly more than one in seven foreign visitors stated that they were not able to find a toilet in a time of need. This happened more often with tourists as about 17.9% of these visitors reported not finding a toilet at a time of need, or more than four times more often than businessmen. Such a situation might be a cause for concern as about 18.4% of the visitors giving a "yes" response to this question said that this had an impact on their stay.

Tourists were also asked to state their experience with respect to the availability of soap and water for handwashing in restaurants, bus stations and public toilets. The responses presented to them were on a scale of one ("never") to five ("always"). On this aspect, about 81% of the visitors said that soap and water was available sometimes to always in restaurants. About half of the respondents had the same assessment for bus stations and the city as a whole.

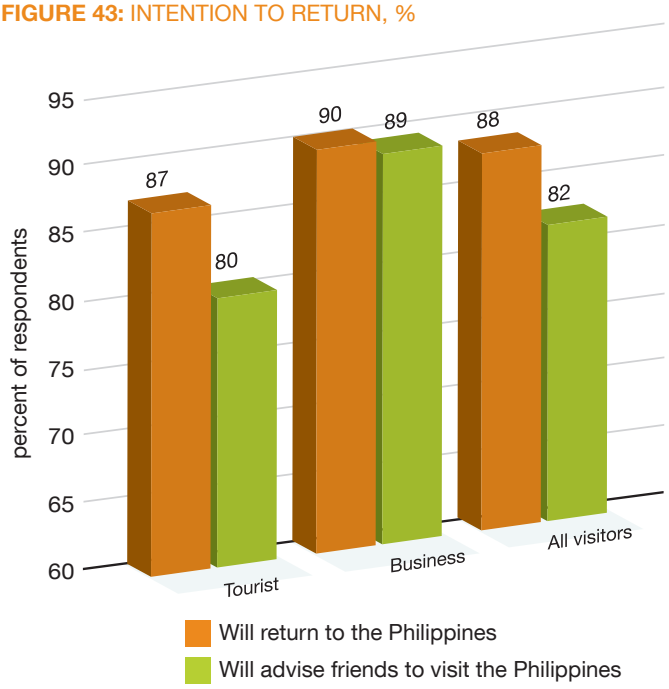
The respondents were also asked to select three out of a possible nine aspects which concerned them the most during their stay in the Philippines. Figure 42 summarizes the re-

TABLE 27: HEALTH TROUBLES EXPERIENCED BY VISITORS

Category	Hotel Tariff	N	Source of gastro-intestinal tract infections				Average number of days of		Medical care (%)				
			Total with infections	%	Water you drank	Water for hygienic purposes	Food eaten	Symptoms	Incapacitation	None	Out-patient	In-patient	Shop	Average cost (US$)
Tourists	1-29	14	7	50.0	57.1	14.3	14.3	6.9	1.4	75.0	12.5	0.0	12.5	1.0
	30-59	34	12	35.3	28.6	14.3	57.1	5.0	3.8	63.6	27.3	0.0	9.1	30.0
	60-89	24	8	33.3	66.7	0.0	33.3	2.8	1.9	62.5	0.0	0.0	37.5	5.5
	90-119	10	4	40.0	66.7	0.0	33.3	4.0	4.0	60.0	20.0	0.0	20.0	20.0
	120+	25	6	24.0	50.0	0.0	50.0	2.3	0.8	60.0	0.0	0.0	40.0	3.0
	Others[2]	34	9	26.5	50.0	0.0	37.5	5.4	3.8	50.0	12.5	12.5	25.0	42.0
	Subtotal	**141**	**46**	**32.6**	**51.4**	**5.7**	**37.1**	**4.5**	**2.7**	**62.2**	**13.3**	**2.2**	**22.2**	**17.4**
Business	1-29	3	0	0.0	-	-	-	-	-	-	-	-	-	-
	30-59	5	0	0.0	-	-	-	-	-	-	-	-	-	-
	60-89	3	0	0.0	-	-	-	-	-	-	-	-	-	-
	90-119	8	0	0.0	-	-	-	-	-	-	-	-	-	-
	120+	12	0	0.0	-	-	-	-	-	-	-	-	-	-
	Others[2]	17	2	11.8	50.0	0.0	50.0	8.5	8.5	0.0	100.0	0.0	0.0	21.0
	Subtotal	**48**	**2**	**4.2**	**50.0**	**0.0**	**50.0**	**8.5**	**8.5**	**0.0**	**100.0**	**0.0**	**0.0**	**21.0**
Total		**189**	**48**	**25.4**	**51.4**	**5.4**	**37.8**	**4.4**	**2.9**	**59.6**	**17.0**	**2.1**	**21.3**	**17.8**

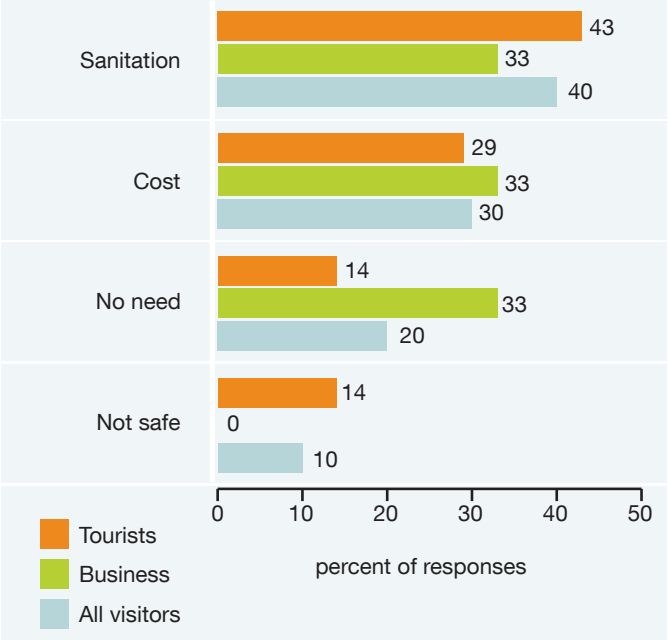
[1] Stayed with friends/family or does not know because the tariff was paid by the company; N = total number of respondents
Source: Annex Table G5

FIGURE 43: INTENTION TO RETURN, %



Source: Annex Table G6

FIGURE 44: REASONS FOR HESITATING TO RETURN, %



Source: Annex Table G7

sults from the survey and Annex Table G4 provides the details. As a whole, the key concern was with water. Drinking water emerged as a concern of 64% of all the respondents. Water in swimming pools (20%) and tap water (11%) were a far second and third among the top concerns.

Apart from impressions about sanitation conditions, actual health problems experienced by the visitors could also affect the decisions of tourists to re-visit the country or to recommend it as a destination to friends and relatives. Table 27 shows selected statistics on the gastro-intestinal tract problems faced by the visitors during their stay in the country. It indicates that about a quarter of the respondents experienced gastro-intestinal problems. Moreover, the incidence rate among tourists is nearly eight times higher than business travelers. On average, visitors felt the symptoms for slightly more than four days and were incapacitated for about three days. They also spent an average of about US$18 for treatment.

Despite the not too positive assessment of sanitation conditions, concerns and disease episodes experienced by tourists in the country, about 88% of the visitors still intend to return to the Philippines (Figure 43). In addition, 82% of the visitors said that they will recommend the country to friends.

Figure 44 shows key factors which cause tourists to hesitate to return to the country. This was a question asked to all respondents, irrespective of whether they said they intended to return. About 40% of those who responded said that sanitation was a major factor for their hesitation. Another key factor was costs. It is important to be careful with the results presented in the previous sentence because only ten respondents answered this part of the tourism questionnaire. However, this may be due in part to the finding in Figure 36 that many of the visitors plan to return to the Philippines.

While the actual contribution of sanitation conditions to visitors who do not intend to return and/or recommend the country to their friends is difficult to determine, the values presented above suggests that there is an impact. Such an effect may be felt in terms of reduced number of repeat visitors and potential visitors who did not visit on advice of friends. This represents costs to the country in terms of foregone tourism earnings. To the extent that poor sanitation contributes to the disease episodes of visitors while in the country, the number of days in which the visitor was incapacitated represents a cost to the country. The cost could be measured by the amount that they could have spent if they were not sick against the amount that they actually spent because of the illness. The spending on treatment,

which is paid to health care services in the country, would have to be subtracted from such costs.

The discussion above provides qualitative information on the possible impacts of sanitation on tourism. However, this is not sufficient to calculate the monetary impacts. Working on similar principles, the work in the ESI Impact Study (Rodriguez et al. 2008) provided a crude estimate of the costs. In assuming that poor sanitation contributes 5% to lost tourism revenues, the study estimated losses in the order of PhP2.2 billion or US$40.1 million per year (2005 prices).

5.2 Business and FDI

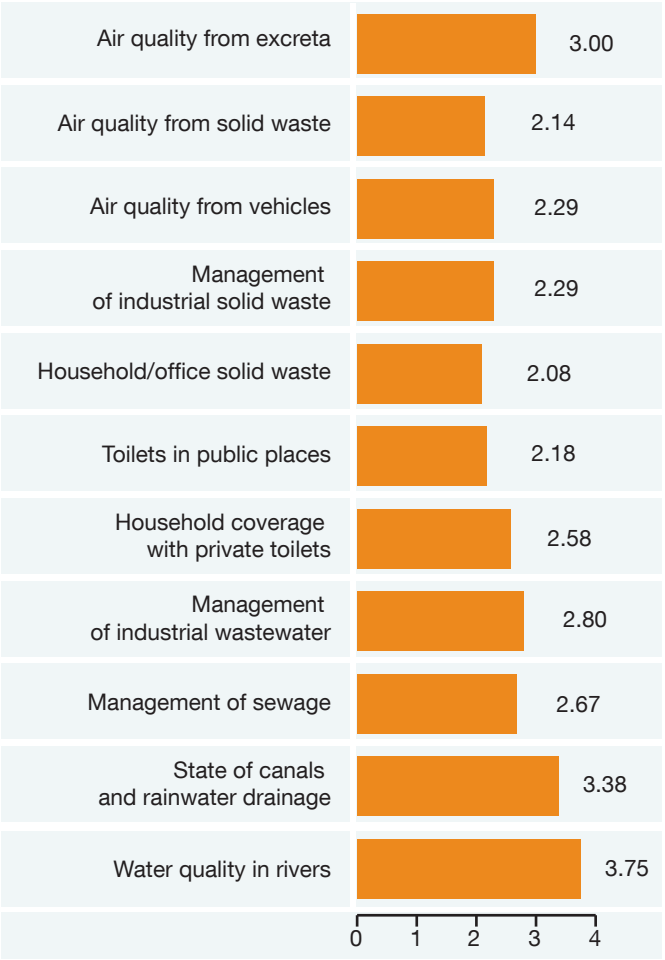
Sanitation affects the business environment, particularly the sectors that require clean water — e.g., food production and processing, including restaurants, hotels, and resorts. The business survey in the Philippines focused on establishments around Laguna Lake, the largest inland body of water in the country with a total surface area of 900 km^2. Laguna Lake is located in the major growth region of the country and its watershed spans 14 cities and 17 municipalities located within the province of Laguna and Rizal, and parts of Batangas, Cavite, Quezon, and Metro Manila.

The lake is known for its fish pens and provides other important uses such as source of municipal water supplies, transportation route, power generation, recreation and tourism, and also as waste sink. Although classified only for non-contact recreation such as fishing, boating and sailing, the lake is used for swimming in some communities and many popular lakeshore resorts near Mount Makiling extract hot spring waters for health spas and beauty treatments.

Controlling further degradation and improving water quality are significant challenges faced by local governments and lakeshore residents. Households living around the lake and the rivers flowing to it contribute more than 60% of its pollution, while industrial waste adds another 20% (Manda 2009).

The survey interviewed three hotel resort owners (two foreign and one local) near Laguna Lake. While hot springs are heated by nearby Mount Makiling, the importance of water quality cannot be ignored because the resorts offer

FIGURE 45: RATING OF ENVIRONMENTAL SANITATION CONDITIONS IN THE LOCATION OF THE BUSINESS SURVEY INTERVIEW[1]



[1] 1 = best; 5 = worst
Source: Annex Table H1

recreational swimming pools and restaurants. One restaurant owner said that clean water is important to avoid food and drinking water contamination. They often receive foreign tourists who are very sensitive to the quality of food and water.

Four food processing establishments confirmed the importance of water quality as it affects production quality and the possibility of contamination of goods for human consumption. Even abattoirs are affected by the quality of water they use during slaughtering because meat is eventually used for human consumption.

Fish pond and fish cage owners near the lake are very sensitive to water quality as it affects the quality, taste, and even the growth of aquatic life. Market vendors, on the other

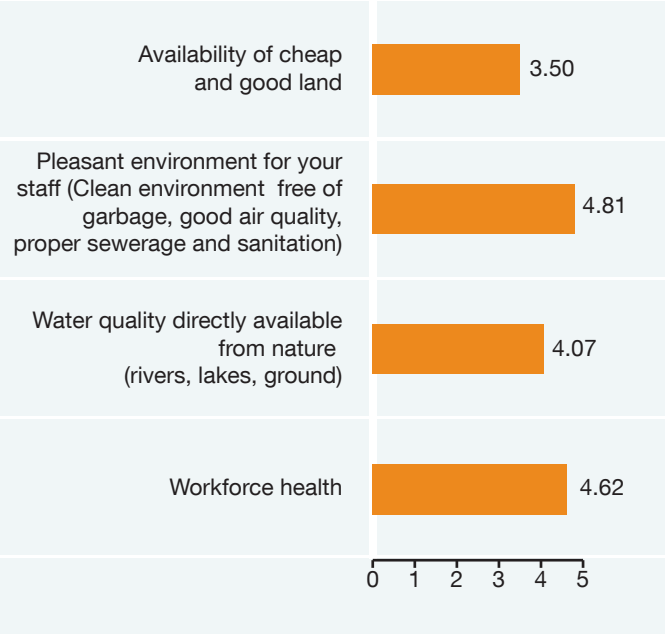
hand, are more sensitive to the cleanliness of the surroundings because it affects customers' perception of the quality of their products. Travel agencies consider sanitation as one decision factor for tourist destinations. Travelers are wary of locations and hotels that are deemed unsanitary.

Business owners were asked to rate their perceptions of sanitation in the location of their establishments on a scale of one (best) to five (worst). Except for the travel agencies, all firms are in the province of Laguna. Thus, their views generally reflect the situation in the local community and of Laguna Lake, as the closest body of water. Figure 45 summarizes the respondents' answers to the different aspects of sanitation. On average, respondents considered "water quality in rivers" in the worst possible condition. These rivers flow to Laguna Lake and are thus major concerns for the community. Many of the respondents had a high rating of the local government's management of solid waste and cited the regularity of pick-up of household and office waste.

Respondents acknowledged the importance of having a pleasant environment for the employees and customers of the business (Figure 46). The environment affects the working conditions of the staff, as well as the perceptions of customers regarding the quality of service or product. The health of the employees has an impact on their work performance, particularly if it results in absences from work and an additional burden on other staff that would carry out the responsibilities of the sick employee. While availability of cheap and good land is a consideration, many of the businesses own the land and do not pay rent, thus putting less weight on this factor. One business owner remarked that "cheap and good" are relative terms. Businesses consider the cost of land rent in their decision but noted that it did not greatly deter them from locating their businesses in Laguna. When asked about the major factors that affected their decisions, many respondents allude to the beauty of the town, being near the mountain and the lake, and the presence of hot springs. Laguna is also accessible to Metro Manila and other major cities and has good sources of water.

Business owners confirmed that poor workforce health affects their businesses (Table 28). Except for the two travel agencies, almost all considered this factor as very important in their operations. Respondents noted that absence from

FIGURE 46: IMPORTANCE OF ENVIRONMENTAL SANITATION CONDITIONS FOR LOCATING THE COMPANY[1]



[1] 1 = unimportant; 5 = important
Source: Annex Table H2

work means an increased burden on other workers and may hamper operations as their employees have well-defined responsibilities.

Similarly, poor water quality significantly affects their businesses, as a majority of their services rely on clean water. For example, hot spring resorts need clean water to fill up their swimming pools. Tourists demand clean water not only for recreation purposes but also for their own consumption. Most respondents claim that their source of water is adequate for production purposes, while five firms said that they have to treat water to ensure the quality that they serve to their customers. Resorts need to add more chlorine to swimming pools, while water/ice businesses need to treat water to meet strict requirements for human drinking.

Consistently, businesses confirmed that poor local environment affects not only their operations, but also how customers perceive the quality of their service or product. Employees are also affected through poor working conditions in performing their tasks effectively.

Respondents reported that they had lost some business days in the past due to local environmental factors. However,

TABLE 28: COSTS OF DOING BUSINESS: PRODUCTION (IN COLUMNS: MAIN SECTORS REPRESENTED)

Variable: Firms who say that ...	No. with response	Response by sector							
		Resort hotel/ restau-rant	Food pro-cessing	Water vendor/ ice plant	Abba-toir	Fish	Market	Travel	Total/ Average
Health									
Poor workforce health affects their business (Score: 1 = unimportant; 5 = important)	12	5	5	5	5	5	5	4	4.9
Water									
Water quality is adequate for production (no. of firms responding "yes")	16	4	2	0	2	2	3	1	14.0
Poor water quality affects their business (Score:1 = unimportant; 5 = important)	15	5	5	5	5	5	5	4	4.9
They treat their own water (no. of firms responding "yes")	16	3	0	2	0	0	0	0	5.0
Poor local environment (1 = unimportant; 5 = important)									
Affects customers	15	5	5	5	4	5	5	4	4.8
Affects current workers	11	5	5	5	5	4	5	4	4.8
Affects staff recruitment	3	5	5	-	-	-	-	1	3.7
Affects suppliers	3	-	5	-	-	-	5	4	4.7
Other aspects									
Loss of business days due to local environmental factors (no. of firms saying 'yes')	16	1	1	1	1	2	1	0	7.0
Fees paid for poor environment (no. of firms saying 'yes')	16	4	2	2	0	2	3	0	13.0
Considered moving facilities to other locations	16	1	1	0	1	1	0	0	4.0
The location of sales office affects business (1 = unimportant; 5 = important)	16	5	5	5	5	5	5	-	5.0
The location of sales office affects business (no. of firms saying 'yes')	16	5	5	5	5	5	5	-	5.0
Considered moving sales outlets to other parts of town (no. of firms saying 'yes')	16	1	1	0	1	1	0	0	4.0

the disruption in their business operations was caused by natural calamities, such as typhoons, which led to flooding or water overflow from the lake. While there were reports of typhoid outbreak in a nearby town in 2008, it was not a major reason to temporarily close their businesses. A study on the impacts of the typhoid fever outbreak estimated a loss of PhP29.57 million (US$664,793) in the local community and identified the source of water as the main cause of the incident (Espaldon et al. 2008). The outbreak also resulted in a shift in water use from public water utility connections to other drinking sources such as bottled mineral water. Several business owners confirmed that they pay fees to the local government and to the Laguna Lake Development Authority (LLDA) that oversees the lake. Market vendors pay sanitation fees on a daily basis to the local government for the maintenance of the public market. Two food processing companies said that they acquired permits and clearance from LLDA to discharge wastewater to Laguna Lake. In January 1997, an Environmental User Fee System (EUFS) was introduced by the LLDA in the lake region covering industrial firms in food processing, piggeries/slaughterhouses, beverages, dyes and textiles, pulp and paper, and food chains and restaurants (Nepomuceno undated). The EUFS used biochemical oxygen demand and total volume of wastewater as a major basis for the fee computation.

All respondents strongly felt that the location of the sales offices affected their business (Table 28). Each firm also has its own system of maintaining the cleanliness of the surroundings (Table 29). A fish pen owner in Laguna Lake narrated how they organize a lake clean-up three to four times a year. However, respondents do not consider moving to another location due to sanitation or environmental problems in Laguna, though some mentioned the possibility of opening up new branches in another area with similar environment and ambiance as in their current firm location.

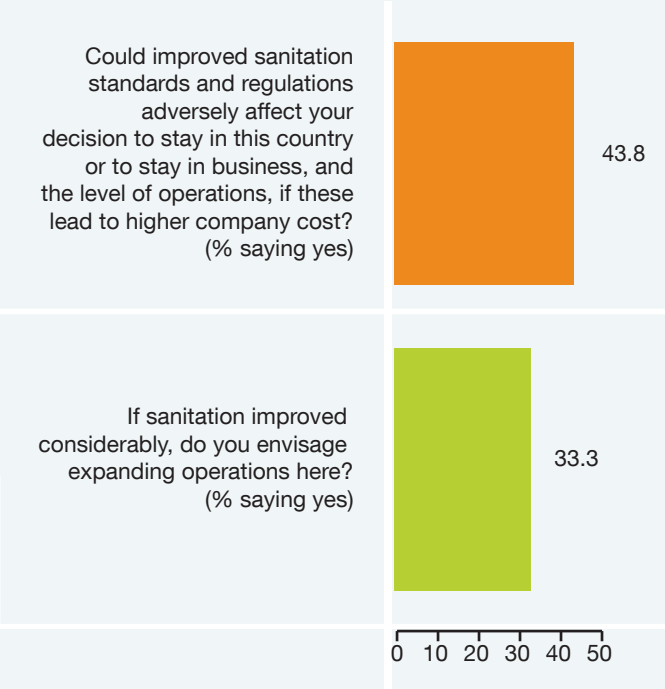
The majority of the respondents did not find it necessary to expand their operations at the moment, especially because expansion requires significant financial capital. When asked about the most important aspect of sanitation in relation to their businesses, 81% of the respondents (13 out of 16) ranked the need for clean water, followed by the cleanliness of the surroundings. There was a divide in whether their respective businesses would be adversely affected by improved sanitation standards that would result in higher company costs (Figure 47). These improved standards are beneficial not only to the company but to the local community as well. One travel agency owner remarked that they would be more confident and have more destinations to offer their clients with improved sanitation standards and regulations in the country. However, they were quick to point out that the Philippines already has a good set of laws regarding environment and sanitation and that the government should focus more on monitoring and enforcing these rules.

TABLE 29: COSTS OF DOING BUSINESS: SALES

Variable: Firms who say that ...	No. of response	Response by sector							
		Resort hotel/ restaurant	Food processing	Water vendor/ ice plant	Abbatoir	Fish	Market	Travel	Total/Average
"Measures taken to deal with poor environment include.."	15	• regular cleaning • maintenance • own recycling • segregation of wastes • hires help/ cleaning crew • annual renovation • own filter	• strict hygiene policy • no wearing of perfume • low waste policy • customized grease trap to reduce pollutant • no plastic bag, following local ordinance • regular cleaning • public bidding of recyclables	• regular cleaning • regular water testing • reuse of excess water for watering plants and cleaning surroundings	• regular cleaning • regular disinfecting • water is tested regularly	• regular cleaning • hires help/ cleaning crew • lake clean-up	• regular cleaning	• regular cleaning	
"If yes, factors preventing us from moving include.."[1]		• costs • risks	• costs • site for relocation		• costs • site for relocation	• costs			
"If no, we have not moved because.."[1]				• new location	• satisfied with current location	• costs • satisfied with current location	• satisfied with current location	• satisfied • no competition	

[1] This is a follow-up to the question on whether the firm has considered moving to another part of town.

FIGURE 47: IMPLICATIONS OF IMPROVED SANITATION FOR EXPANDING BUSINESS IN THE PHILIPPINES



5.3 Sanitation reuse markets

With an agriculture, fishery and forestry sector that accounts for close to one-fifth of GDP, there is a large market for fertilizer in the Philippines. Rough estimates from the ESI Impact Study (Rodriguez et al. 2008) indicated that, valued at 2005 prices, sales of chemical and organic fertilizer were about PhP23 billion (US$410 million) in 2004 and PhP20 billion (US$390 million) in 2006. These estimates are indicative of the potential for which fertilizer that is based on human waste can be used.

As mentioned in Section 4, only the UDDT-E users in San Fernando were re-using human excreta and urine as fertilizer. The households in this site said that their fertilizer was only used at home and only a small proportion (34%) of the households was re-using human excreta. The savings per household were valued at about PhP550 (US$12) per year.

National estimates of savings from excreta reuse, or earnings should households decide to sell their output to the market, are difficult to calculate. For one, the study has not found a study that provided an estimate of the number of households that are doing so at the national level. Hence, the estimates provided here should be interpreted as indicative of the potential savings or earnings.

The JMP (2010) estimated that about 24% of households in 2008 practiced open defecation or did not have access to improved sanitation (Table 30). Moreover, the proportion of households under such conditions was higher in rural areas (31%) than in urban areas (20%). Applying these estimates to the household population of the country in 2008 suggests that there are about 4.6 million families who could be potential UDDT-E users and that 2.8 million of these families would be located in rural areas. Assuming that all these families get access to UDDT-E facilities, practice excreta and urine reuse, and save as much as the households in San Fernando, then the potential savings for reuse amount to slightly over PhP2.5 billion (US$57.2 million) per year. About 61% of that amount is expected to be generated in rural areas.

The estimates above are optimistic and, at best, only capture the market potential. For one, not all of the households are expected to re-use waste. Assuming that the households follow the pattern in San Fernando and only 34% re-use waste, then the estimated savings fall to about PhP875 million (US$19.7 million). It is also not likely that all 4.6 million households can be provided with UDDT-E facilities because the costs of installation might be prohibitive. Space constraints might also make it more difficult to provide UDDT-E facilities to households in urban areas.

A more conservative target might be to provide half of the households who practice open defecation with access to UDDT-E facilities (Scenario 1). In this case, Table 31 indicates that the indicated gains will be about PhP155 million (US$3.5 million) per year. A more optimistic scenario which extends to half of all households with unimproved access is projected to generate benefits in the order of PhP437 million (US$9.8 million) per year.

It is important to note that the estimates provided above are incomplete. First, it excludes other uses of human waste like biogas. Second, it ignores the benefits from converting human waste which are processed at treatment facilities like the sludge as soil conditioners for agricultural land and treated wastewater for watering public green spaces (see Howell-Alipalo 2007). Finally, it excludes the potential gains to the industries that accrue to markets that provide inputs for the construction, maintenance and operations of sanitation options and facilities.

TABLE 30: ESTIMATED IMPACTS OF INCREASED REUSE OF HUMAN EXCRETA

	Rural	Urban	Total
Key coverage statistics (% of households, 2006)[1]			
Open defecation	14	4	8
Unimproved (excluding shared latrines)	14	16	15
Shared/Community toilets	3	0	1
Total	31	20	24
Number of households (millions, 2008)			
Open defecation	1.2	0.4	1.6
Unimproved (excluding shared latrines)	1.2	1.5	2.7
Shared/Community toilets	0.3	-	0.3
Total	2.8	1.8	4.6
Value of savings per household (PhP)[2]	561	541	nc
Potential benefits (millions of PhP)[3]			
Open defecation to UDDT-E	700	199	899
Unimproved (excluding shared latrines) to UDDT-E	700	796	1,496
Shared/Community toilets to UDDT-E	150	-	150
Total	1,550	995	2,545
Proportion of households reusing waste[4]	34%	34%	34%
Adjusted potential benefits (millions of pesos)[5]			
Open defecation to UDDT-E	241	68	309
Unimproved (excluding shared latrines) to UDDT-E	241	274	514
Shared/Community toilets to UDDT-E	52	-	52
Total	533	342	875
Scenario			
1: Half of households practicing OD receive UDDT-E toilets	120	34	155
2: Half of households with unimproved access receive UDDT-E toilets	266	171	437

nc = not calculated
[1] JMP (2008)
[2] Based on the savings of UDDT-E users. The values for rural sites were taken from San Fernando-upland while values for urban sites were taken from San Fernando-coastal.
[3] Assumes all households above receive UDDT-E toilets and re-use their waste.
[4] Results for San Fernando combined.
[5] Potential benefits x Proportion of households re-using

5.4 Health

The national health benefits from sanitation improvements will depend on the costs of sanitation per household, the reduction in relative risks associated with sanitation options and sanitation access coverage in the country. Information on the first two variables was discussed in Section 4 while the third was presented in Section 1.

Table 31 presents the estimated health costs associated with sanitation and the potential benefits from sanitation improvements. It indicates that the costs of sanitation in the aggregate amount to about PhP63.6 billion (US$1.4 billion) per year. The estimated costs for urban households are higher because of higher health costs per household. Households with improved facilities but no access to sewers have the highest proportion of the health costs. This result is driven solely by the number of households, nearly 13 million out of a total of 18 million, in this group. It is also worth noting that the current estimates are higher than the health-related costs in the ESI Impact Study (US$1 billion). This is due to changes in economic and demographic conditions between 2005 and 2008, sanitation coverage, refinements in the methodology and improved data sources.

TABLE 31: NATIONAL HEALTH IMPACTS OF POOR SANITATION

Item	Rural	Urban	Total
Sanitation access (% of households, 2006)			
Open Defecation[1]	14	4	8
Unimproved (includes shared)[1]	17	16	16
Improved (not sewers)[2]	67	73	nc
Improved (sewers)[3]	2	7	nc
No. of households (millions) [4]			
Open Defecation	1.2	0.4	1.6
Unimproved (includes shared)	1.5	1.5	3.0
Improved (not sewers)	6.0	6.7	12.7
Improved (sewers)	0.2	0.6	0.8
Total	8.9	9.2	18.1
Health costs per household (PhP)			
Open Defecation[5]	5,094	5,773	nc
Unimproved (includes shared)[6]	3,180	3,604	nc
Improved (not sewers)[6]	3,180	3,604	nc
Improved (sewers)[7]	2,025	2,295	nc
Total			
Estimated health costs (million PhP)[8]			
Open Defecation	6,355	2,122	8,476
Unimproved (includes shared)	4,817	5,298	10,115
Improved (not sewers)	18,957	24,272	43,229
Improved (sewers)	379	1,413	1,792
Total	30,508	33,104	63,612
HEALTH ECONOMIC BENEFITS OF SANITATION IMPROVEMENT (million PhP)			
Scenario 1: All households have access to sewers[9]	12,463	12,018	24,481
Scenario 2: OD and unimproved get access to improved sanitation (but not sewers), others stay in same category	1,194	399	1,592

Notes: nc = not calculated, [1]JMP (2008), [2]calculated as a residual, [3]2008 World Health survey, [4]estimated here, [5]CBA: annual costs per household, [6]Cost - cost averted of OD to basic, [7]Cost - cost averted of OD to sewers, [8]no. of hh x health cost per household, [9]no. of hh x (health cost/hh - cost for sewers/hh)

The estimated benefits from sanitation improvements will depend on the groups that will receive the interventions as well as the options made available to them. Scenario 1 in Table 31 illustrates the case in which all households have access to sewers. It indicates that the projected gains amount to about PhP24.5 billion (US$549.6 million) per year or slightly more than a third of the estimated health costs. However, the costs of pursuing such an objective are likely to be very high and its suitability to all parts of the country is also suspect. Without providing a specific option, Scenario 2 shows the benefits associated with having improved sanitation access to half of the households that currently do not have it. The estimated benefits amount to about slightly less than PhP1.6 billion or about US$35.8 million. This actually goes beyond the MDG goals, which the country is already close to achieving.

5.5 Summary of benefits

Sections 5.1 to 5.4 examined the broader benefits from improved sanitation in the country. It provided a range of annual benefits from sanitation markets for two scenarios. The first represents the gains from providing UDDT-E facilities to half of the population who practice open defecation. The second shows the benefits from a more optimistic scenario which extends the provision of UDDT-E facilities to half of the households that do not have access to improved sanita-

tion. Health benefits were also represented by two scenarios. The first can be treated as an upper limit as it represents the estimates from a situation in which all the households in the country have access to sewers. The second scenario, which appears more achievable in the medium term, captures the provision of access to improved sanitation (not necessarily access to sewers) to half of the population that currently have unimproved facilities. While the gains to business and tourism were not quantified in this study, the benefits from improved sanitation could also be significant. The ESI Impact Study (Rodriguez et al. 2008), for example, estimated the tourism gains to be in the order of PhP2.2 billion (US$40.1 million) per year at 2005 prices.

VI. Costs of Improved Sanitation and Hygiene

This chapter presents aggregated and disaggregated costs of sanitation options. It also describes the costs from different perspectives — investment/recurrent and payer. At the end, in Section 6.4, marginal costs of moving up the sanitation ladder are provided.

6.1 Cost summaries

This section summarizes the costs per household of various sanitation options. It provides information on investment and recurrent costs, and the expected useful life of the different facilities.[30] Investment costs were annualized to permit a comparison between the sanitation options. It also presents hygiene costs, which capture the average expenditures on soap and water for maintaining good personal hygiene, that may be combined with the sanitation options to provide a more comprehensive analysis. However, investment costs for hygiene programs were not included in the analysis due to lack of data. Site-specific information on costs is provided in Annex Tables I1 to I6.

There are wide differences in costs across the various sanitation options. Table 32 shows that the annualized costs per household in the rural sites range from PhP1,011 (US$23) for dry pits to PhP5,607 (US$126) for toilets that have access to wastewater treatment. There is also a wide variation in the expected useful life of the sanitation options. Dry pits are expected to last for about a year while other options are projected to last for more than 20 years. It is important to note that the expected lives of some toilet options were adjusted downwards to account for the frequency of use. This was the case for shared and community toilets which were assumed to last half and a third as long as private toilets, respectively.

As in the rural sites, there is also a wide disparity in the costs and expected lives of the technologies examined in the urban sites. Table 33 shows that the annualized costs per household in the urban sites range from PhP1,355 (US$31) for wet pits to PhP6,769 (US$152) for toilets that have ac-

TABLE 32: SUMMARY OF AVERAGE COST OF DIFFERENT SANITATION AND HYGIENE OPTIONS FOR RURAL HOUSEHOLDS, PESOS, 2008

Intervention	Total cost (Pesos/household/year)	Investment cost (% of total cost)	Estimated life (years)[1]	Sites[2]
Hygiene	1,217	0%	na	A,B,SF-C,SF-U
Shared toilets	2,328	68%	13	SF-U
Dry pit	1,011	93%	1	A,B,SF-C,SF-U
Wet pit	1,259	73%	6	A,B,SF-C,SF-U
UDDT-E	3,835	78%	15	SF-C,SF-U
Toilets to septic tank	3,496	77%	25	A,B
Toilets to septic tank and desludged at STF	5,426	79%	25	A
Toilets with wastewater treatment	5,607	71%	25	B

na = not applicable
[1] Refers to length of life of hardware before full replacement
[2] A: Alabel; B: Bayawan; D: Dagupan; SF-C: San Fernando-Coastal; SF-U: San Fernando-Upland; T: Taguig
Source: Annex Tables I1 to I6

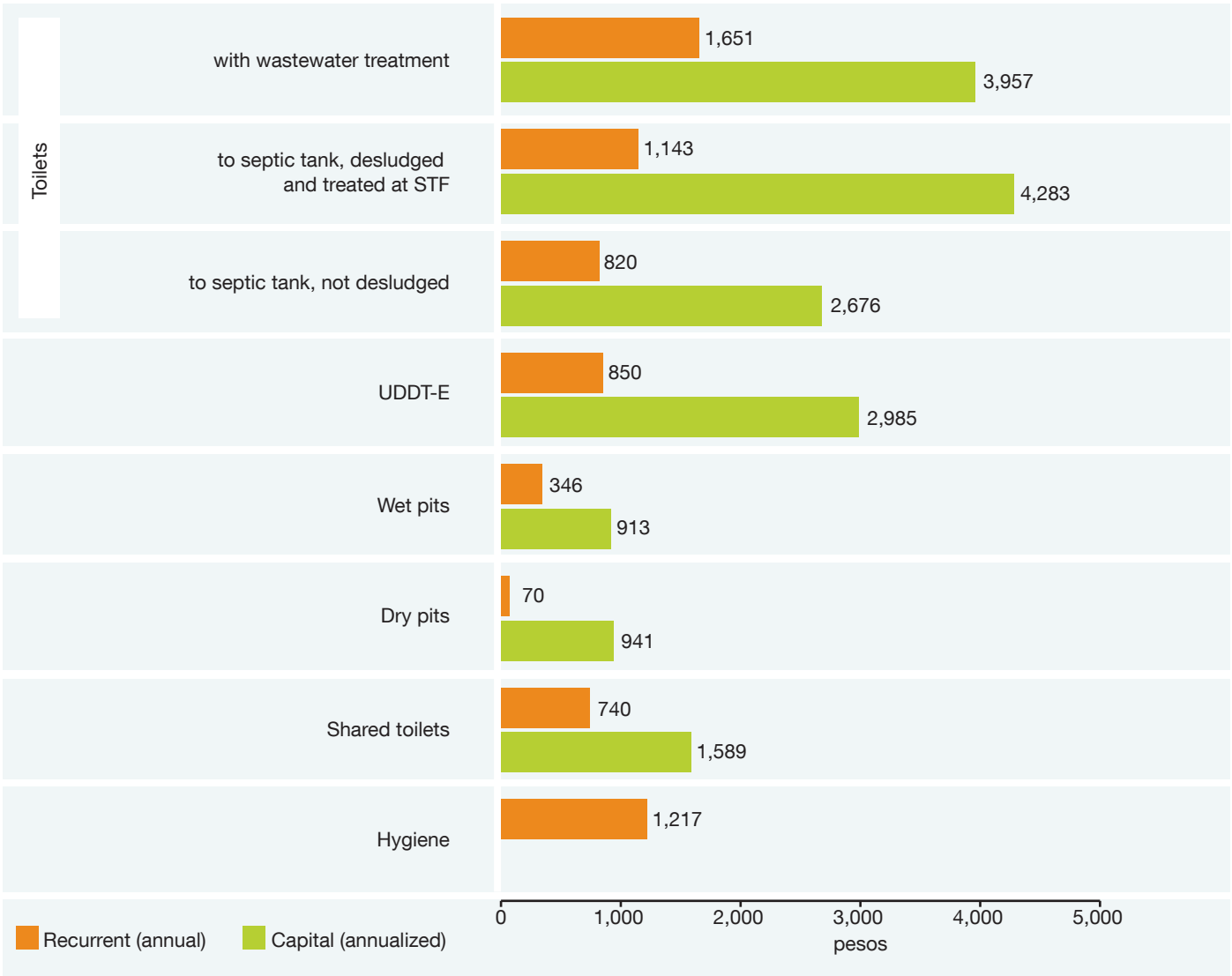
[30] Program costs, which represent expenditures for software (promotion, education, monitoring) were not included in the analysis because of a lack of information in the sites.

TABLE 33: SUMMARY OF AVERAGE COST OF DIFFERENT SANITATION AND HYGIENE OPTIONS FOR URBAN HOUSEHOLDS, PESOS, 2008

Intervention	Total cost (Pesos/household/year)	Investment cost (% of total cost)	Estimated life (years)[1]	Sites[2]
Community toilets	1,931	59%	8	D,SF-C
Shared toilets	2,263	73%	12.5	D
UDDT-E	4,113	80%	20	SF-C
Wet pit	1,355	67%	6	D,SF-C
Toilets to septic tank	4,761	78%	25	T
Toilets to septic tank and desludged at STF	6,646	66%	25	T
Toilets to sewers	6,769	81%	25	T

[1] Refers to length of life of hardware before full replacement
[2] A: Alabel; B: Bayawan; D: Dagupan; SF-C: San Fernando-Coastal; SF-U: San Fernando-Upland; T: Taguig
Source: Annex Tables I1 to I6

FIGURE 48: ANNUAL ECONOMIC COSTS PER RURAL HOUSEHOLD FOR MAJOR ITEMS, PESOS



cess to sewers. There is also a wide variation in the expected useful life of the sanitation options. Wet pits are expected to last for about six years while toilets are projected to last about four times longer.

Figure 48 illustrates the main contributors to economic cost in rural areas. It indicates that annualized investment costs range from PhP913 (US$21) per household (wet pit latrines) to PhP4,283 (US$96) per household (toilets with septic tanks and access to a STF) in the rural sites. Recurrent costs range from PhP70 (US$1.6) (dry pits) to PhP1,651 (US$37) (toilets with wastewater treatment) per household per year. As a whole, annualized investment costs account for the majority of the costs of the technologies. The highest contribution was found for dry pits (93%), and this is due to the very low costs for maintenance and operations (recurrent costs of such facilities.)

Figure 49 illustrates the main contributors to economic cost in urban areas. It indicates that annualized investment costs range from PhP913 (US$21) per household (wet pit latrines) to PhP5,477 (US$123) per household (toilets with access to sewers) in the urban sites. On the other hand, recurrent costs range from PhP443 (US$10) per household per year (wet pit latrines) to PhP2,250 (US$51) per household per year (toilets have access to a STF). As with rural areas, annualized investment costs dominate the costs of the facilities. The highest shares were found for UDDT-E facilities (80%) and toilets that have access to sewers (81%). The lowest contribution of investment costs to total costs is for community toilets (59%).

The costs presented above assume that facilities are used at optimal rates. Costs per household are likely to rise if facilities are under-utilized because of fixed costs, such as

FIGURE 49: ANNUAL ECONOMIC COSTS PER URBAN HOUSEHOLD FOR MAJOR ITEMS, PESOS

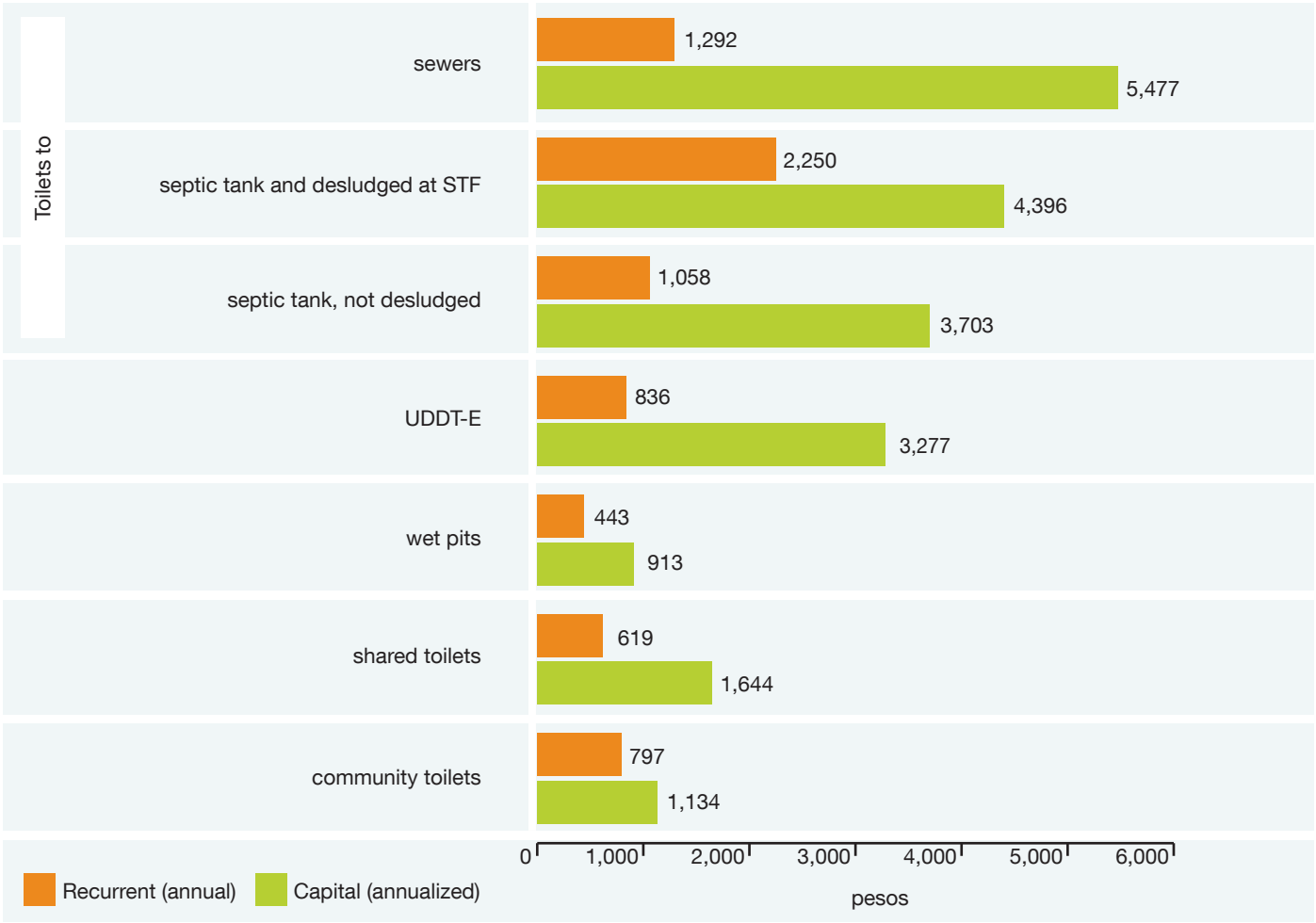


TABLE 34: ACTUAL AND OPTIMAL USE OF TREATMENT FACILITIES, 2008

	Alabel (STF)	Bayawan (Constructed wetland)	Taguig (STF)	Taguig (Sewer system at Centennial Village)
Number of users (households)				
Optimal use	6,760	800	45,708	1,140
Actual use	240	800	34,667	1,140
Investment costs (pesos per household)				
Optimal use	10,160	15,327	7,398	18,934
Actual use	286,182	15,327	9,754	18,934
Recurrent costs (pesos per household)				
Optimal use	394	187	1,192	234
Actual use	2,520	187	1,192	234

construction costs, salaries of regular employees, etc. Table 34 shows how costs per household rise with the under-utilization of the various treatment facilities in the study.

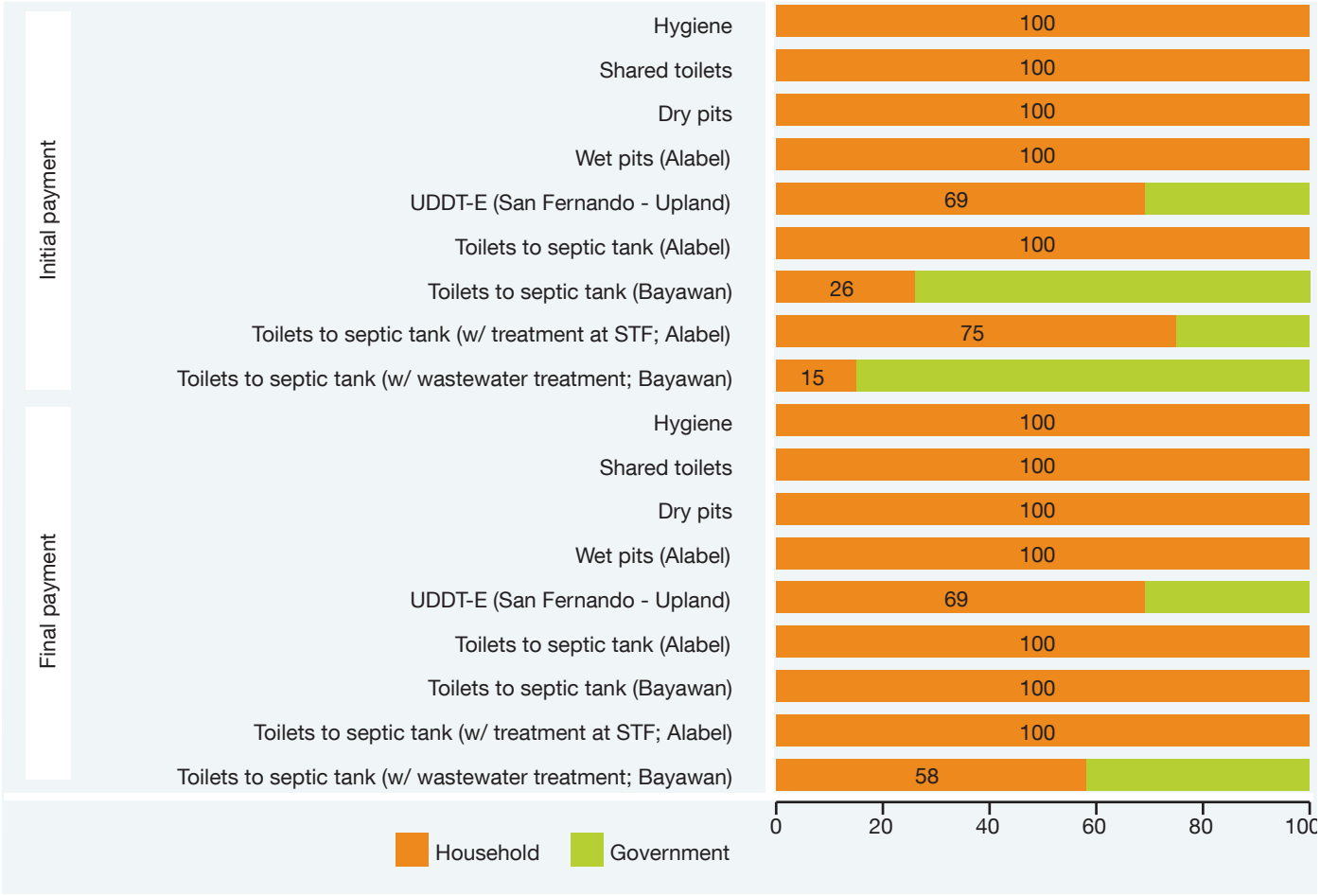
6.2 Financing sanitation and hygiene

This section discusses the various groups that finance the sanitation options. At the outset, it is important to note two points regarding the estimates. First, the contributions of government, donor agencies, NGOs and perhaps the private sector are underestimated here. The reason is that program costs, which are more likely to be attributed to these stakeholders, are excluded in the analysis because of lack of data. Second, there are a few situations in which the costs attributed to households are underestimated. One example is Bayawan, where the household contributed labor in the construction of the housing unit (not just the toilet) but was not valued in the costing of the toilet because of insufficient information. Third, all values are based on annualized investment costs per household. As mentioned earlier, this adjustment permits a comparison across sanitation options, and between investment and recurrent costs. Finally, the results are distinguished by the stakeholder that makes initial and final payments. Initial payments are attributed to stakeholders that provide the initial outlay. On the other hand, final payments are attributed to stakeholders that eventually shoulder the costs.

Figure 50 shows the financial sources of funding for the various options in the rural sites. It indicates that households are generally responsible for making the initial payments on the different sanitation options. However, there are a number of exceptions. First, households only contributed about 69% of the costs of installing UDDT-E facilities in the upland region of San Fernando, as represented here by barangay Nagyubyuban. The reason is that the government provided the urine-diversion toilets and the substructure. Hence, only the cost of the superstructure and recurrent costs of the facility were shouldered by the households. In addition, the households contributed labor to the installation of the facilities. Second, the toilets in Bayawan are represented by households in the Gawad Kalinga Village. This is part of a housing project in which the costs of the housing units, including the toilets and septic tanks, were paid for by government. In the calculation of the initial costs, only the contribution of the households to maintaining and operating the toilets were counted. Third, about 75% of the initial payments for toilets to septic tanks (desludged at a STF) in Alabel were paid for by the households. This essentially represents the cost of the toilet facilities and septic tanks. The remainder of the costs, which are attributed to government, represents the construction, maintenance and operations of the STF. Fourth, the highest contribution of government is with toilets to septic tank (with wastewater treatment) in Bayawan. This is for the Gawad Kalinga Village with the costs of constructing, maintaining and operating the constructed wetland being attributed to the local government.

Figure 50 also indicates that households have a larger share of the eventual costs of the sanitation options. In the case

FIGURE 50: PROPORTION OF RURAL SANITATION COSTS FINANCED FROM DIFFERENT SOURCES, %

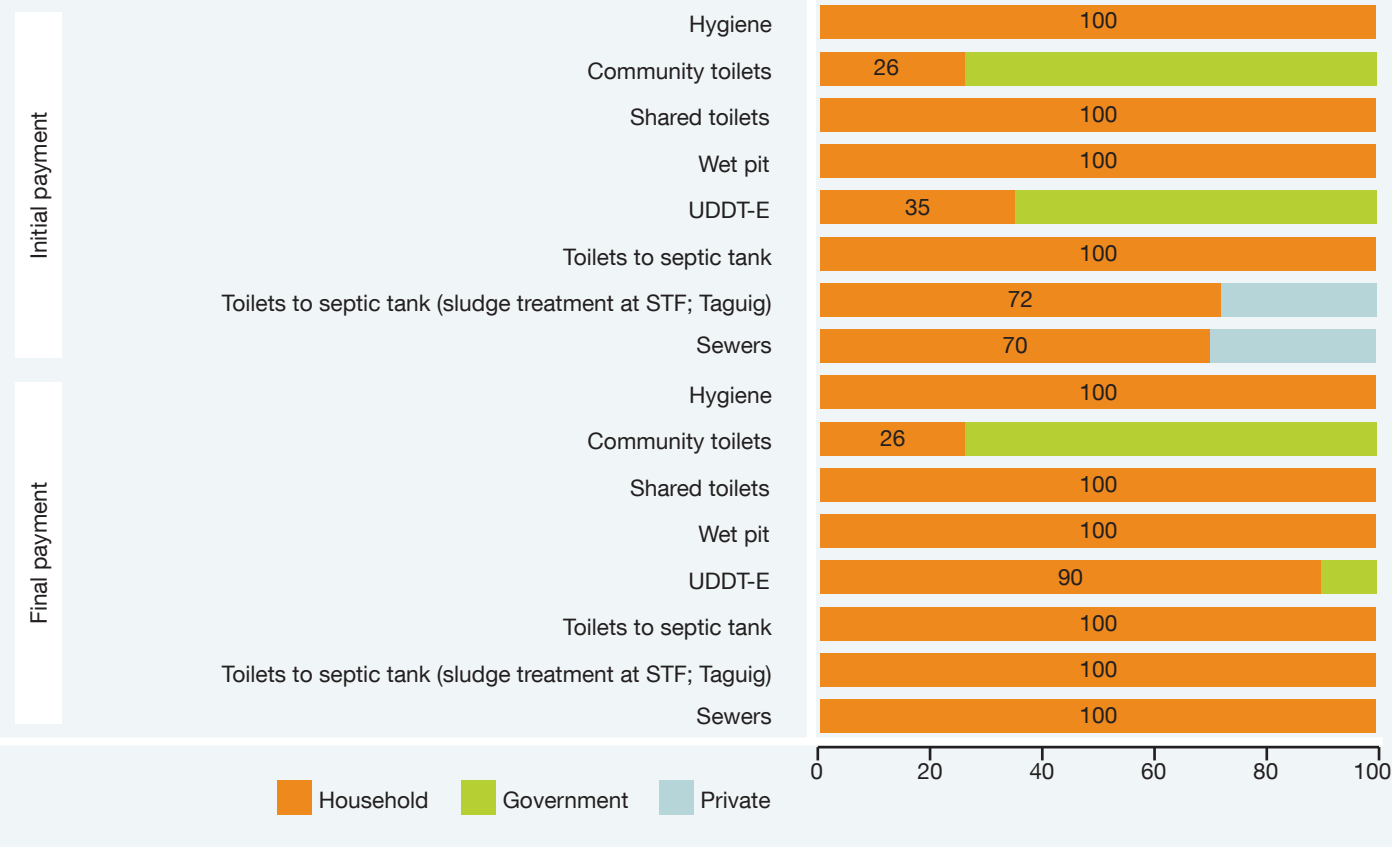


of the toilets in Bayawan, all the costs are eventually attributed to households because of the monthly amortization that they pay for the housing units. On the other hand, it is assumed that all the construction and recurrent costs of the STF in Alabel are shouldered by households through user fees.

While it is not reflected in the diagram, it is important to note that donor agencies and NGOs made an important contribution to the sanitation interventions in the rural sites. The STF in Alabel was part of the Southern Mindanao Integrated Coastal Zone Management Project (SMICZMP) which received assistance from the Japan Bank for International Cooperation (JBIC). The EcoGov project of the USAID also provided technical assistance in the operationalization of the STF. The constructed wetland in Bayawan received technical assistance from the GTZ. Finally, the Directorate General of International Cooperation (DGIS) of the Netherlands Ministry of Foreign Affairs funded the capacity building and infrastructure for urine-diversion toilets in San Fernando. NGOs and private institutions provided coordination, capacity building and advice.

Figure 51 shows the financial sources of funding for the various options in the urban sites. The story is more or less similar to rural sites in the sense that households generally shoulder the initial payments for the facilities. However, the private sector played a more active role in financing sanitation options. Some of the key points from Figure 51 are as follows: First, community toilets are represented by the facilities in barangay Pugaro of Dagupan. The construction of the facilities was funded by the local government and the contribution of the households was through the maintenance and operations of the facilities. Second, the share of households in the acquisition of UDDT-E facilities in the

FIGURE 51: PROPORTION OF URBAN SANITATION COSTS FINANCED FROM DIFFERENT SOURCES, %



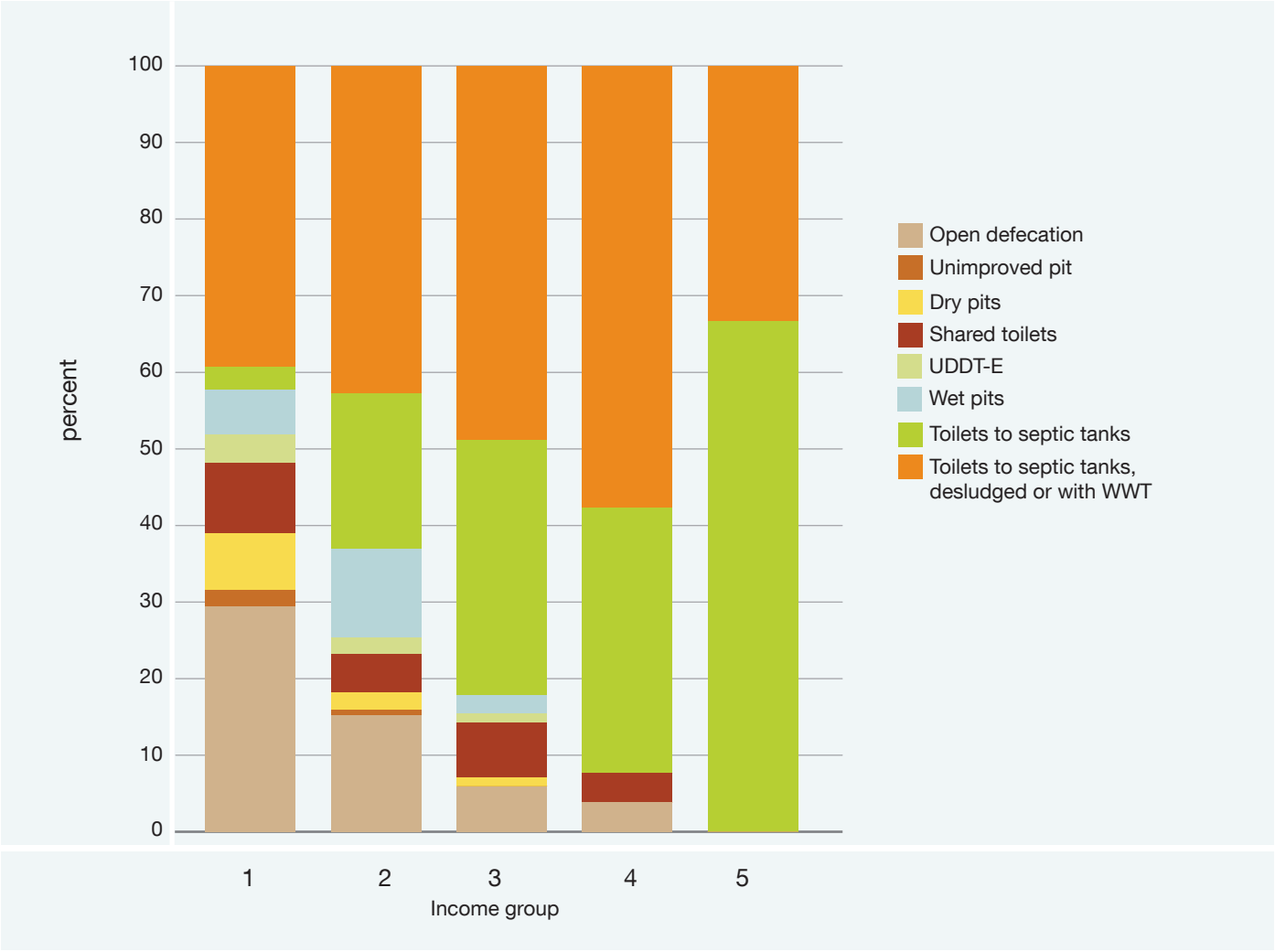
urban sites of San Fernando is lower than their counterparts in the rural sites. The reason is that part of the households in the urban sites are from the Fishermen's Village, which were beneficiaries of a housing project that was financed by the local government. Hence, the initial investment costs for these households were financed by the local government. Moreover, the local government also incurs a fraction of the recurrent costs through the collection of sludge and the provision of the ash that is necessary in the operation of the UDDT-E in the housing units. Third, the construction and recurrent costs of the STF and sewerage facilities in Taguig were initially paid from a World Bank loan to the government but ultimately paid back by the borrower who was a private firm, Manila Water. The remainder of the costs, which are paid for by the households, is attributed to the toilet facilities and septic tanks.

As with the rural sites, the household sector generally shouldered a larger proportion of the eventual costs of the facilities. This is particularly the case for the STF (Taguig) and sewer systems (Taguig)[31] and is based on the assumption that the user fees paid by the households cover the investment and recurrent costs of such facilities. In the case of the households with access to UDDT-E facilities in San Fernando, the attribution of the bulk of the costs to the households is based on the fact that they have to pay a monthly amortization for their housing units.

It is also important to note that donor agencies and NGOs had an important role in the construction of the facilities in urban areas. For example, the STF and sewer facilities in Taguig were made possible through a loan by Manila Water to the World Bank.

[31] The Manila Water charges all its consumers an environmental fee that is equal to 10% of the water bill. This supports the sanitation services provided by the firm and entitles households to empty their septic tanks on a regular five-year cycle. Households who do not have their septic tanks desludged at a pre-arranged time will have to pay an additional fee of PhP900. Households that have access to sewer lines are charged an amount equal to 40% of their water bill.

FIGURE 52: ACCESS TO SANITATION FACILITIES BY INCOME GROUP IN RURAL AREAS, PERCENT[1]



Source: Annex Table I7

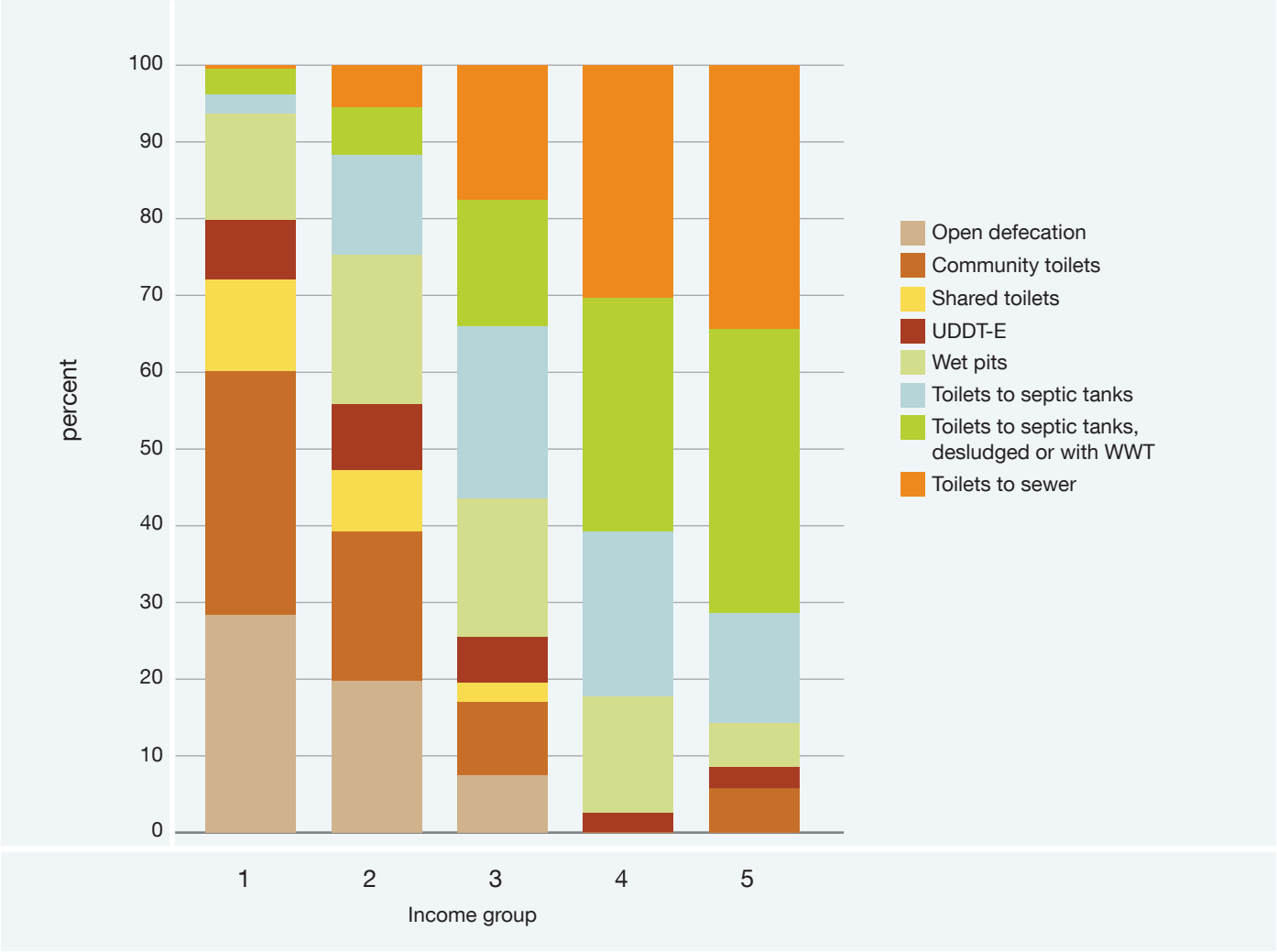
[1]The income groups are households with a monthly income of below PhP5,000 (1), PhP5,000 – 9,999 (2), PhP10,000-19,999 (3), PhP20,000-35,000 (4) and over PhP35,000 (5)

6.3 Sanitation option by income group

This study did not compare costs of the same sanitation options across income groups, but instead determined the type of technology that was available to the different households. Figure 52 shows the sanitation options for the different income groups in the rural sites. It indicates that a large proportion of the high income households (i.e., incomes over PhP20,000 per month or groups 4 and 5) had access to at least a toilet that flushes to a septic tank. It also shows that about half of the low income households (i.e., groups 1 and 2) had access to an STF or wastewater treatment. However, this finding must be interpreted with care because a large proportion of the households in this group came from the Gawad Kalinga village in Bayawan. These are beneficiaries of a relocation program who otherwise might not have had the access if not for the intervention. If Gawad Kalinga beneficiaries are removed from the analysis, then the main conclusion is that open defecation was the most common practice among the members of income groups 1 and 2.

The story does not differ much in the urban sites (Figure 53). A large proportion of the high income households had access to at least a toilet with a septic tank. In the group with the lowest income, open defecation and community toilets were the most common options. While many households in the second income group still practiced open defecation (20%), wet pits (19%) were also among the top options.

FIGURE 53: ACCESS TO SANITATION FACILITIES BY INCOME GROUP IN URBAN AREAS, PERCENT[1]



Source: Annex Table I7

[1]The income groups are households with a monthly income of below PhP5,000 (1), PhP5,000 – 9,999 (2), PhP10,000-19,999 (3), PhP20,000-35,000 (4) and over PhP35,000.

The information above provides some evidence that low income households tend to be located closer to the bottom of the sanitation ladder. Combined with earlier findings in the FGD that costs are a barrier to the acquisition of toilets, this tends to suggest that poorer households are likely to be more sensitive to the relatively high investment costs of more advanced sanitation options.

Financing sanitation options becomes a bigger issue when examined in the context of various income groups. Ignoring public facilities and services for the moment, financing is important even with private facilities. Table 35 shows the ratio of the investment costs to annual incomes of the five income groups in the study. Using the information on investment or installation costs in the study, it shows that such costs rise as a proportion of income as households select an option that is higher-up on the sanitation ladder. A household earning PhP2,500 per month, the mid-point for households belonging to income group 1, will need to invest around 3% of its annual income for the construction of a dry pit. However, this will rise to about two-and-a-half years' worth of income (255%) if the household installs a toilet that has access to a septic tank. The costs are clearly prohibitive for the low income groups, especially since these groups spend a relatively large proportion of their income on food. This is also reflected in the earlier results which

showed that (a) a relatively large proportion of households in these income groups practice open defecation (Figures 52 and 53) and (b) why some form of intervention from government and other institutions was needed for these households to gain access to improved facilities. A comparison of annualized investment costs with annual incomes obviously leads to considerably lower ratios. For example, annualized investment costs for UDDT and toilets were only about 10% of annual income for the first income group. This suggests that some form of access to credit might be necessary to allow these households to gain access to improved sanitation facilities. However, such an assertion must be interpreted with care for two reasons. First, the values indicated in the table reflect a scenario where credit is obtained at zero interest and with a duration equal to the expected life of the facility. In the case of toilets with access to septic tanks for example, this is equivalent to a zero-interest loan over a 25 year period. For facilities of similar cost to the UDDTs found in the upland region of San Fernando, it may be a loan that is 15 years long. Such financing schemes will be very difficult, if not impossible, if one relies solely on the commercial bank system. Second, even if zero-interest schemes over long periods are available, it may still be very difficult for low income households, especially for those in income group 1, to allocate the amounts necessary to pay for the loans. These two points reinforce the need to government and other institutions to assist in the provision of facilities.

While it is obvious that government and other institutions would need to help with financing the construction of public facilities such as community toilets, septage treatment facilities and sewer systems, the capacity and willingness of households to pay user fees raise issues on the sustainability of such interventions for the long term. To illustrate, an analysis implemented by Harder et al. (2011) in Dagupan City found that households in the city were willing to pay amounts that were sufficient to sustain desludging services in the city but not a sewerage program.

6.4 Costs of moving up the ladder

Table 36 shows the costs of moving up the sanitation ladder in all the field sites. In general, incremental costs are positive as a household moves up the sanitation ladder. This reflects the earlier finding that more advanced sanitation options tend to be more expensive, especially because of investment costs. However, there are two instances in which the incremental costs are negative. The first is in the move-

TABLE 35: INVESTMENT COSTS AS A PROPORTION OF HOUSEHOLD INCOME, BY INTERVENTION, PERCENT[a]

Income group	Dry pit	Wet pit	UDDT-E (Type 1)	UDDT-E (Type 2)	Toilets to septic tanks
Total Investment outlay to income					
1	3.1%	18.3%	149.3%	218.5%	531.7%
2	1.0%	6.1%	49.8%	72.8%	177.2%
3	0.5%	3.0%	24.9%	36.4%	88.6%
4	0.3%	1.7%	13.6%	19.9%	48.3%
5	0.2%	1.3%	10.7%	15.6%	38.0%
Annualized investment cost to income					
1	3.1%	3.0%	10.0%	10.9%	10.6%
2	1.0%	1.0%	3.3%	3.6%	3.5%
3	0.5%	0.5%	1.7%	1.8%	1.8%
4	0.3%	0.3%	0.9%	1.0%	1.0%
5	0.2%	0.2%	0.7%	0.8%	0.8%

[a] The values above use the midpoint of the income for each group. The only exception is group 5, which uses lower bound (PhP35,000) of incomes. The income groups are households with a monthly income of below PhP5,000 (1), PhP5,000 – 9,999 (2), PhP10,000-19,999 (3), PhP20,000-35,000 (4) and over PhP35,000 (5).

TABLE 36: INCREMENTAL COSTS OF MOVING UP THE SANITATION LADDER, ALL SITES, PESOS, 2008

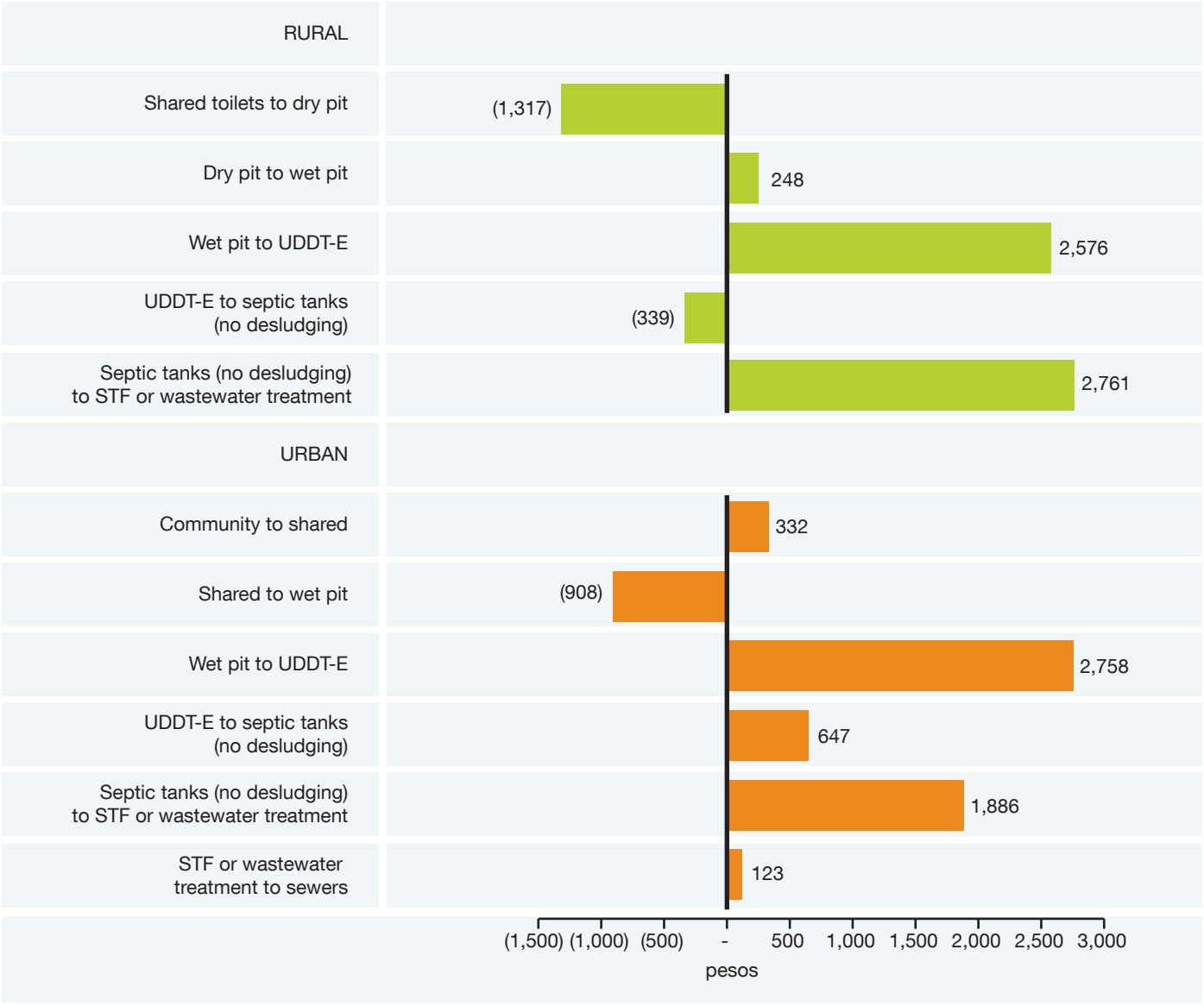
COST ITEM		TO						
		Shared toilets	Dry pits	Wet pits	UDDT-E	Toilets to septic tank	Toilets to septic tank, desludged at STF or wastewater treatment	Toilets to sewers
FROM	Community toilets[1]	332		(576)	1,844	1,999	4,322	4,838
	Shared toilets[2]		(1,317)	(1,069)	1,506	1,168	3,928[3]	n.b.
	Dry pits[2]			248	2,823	2,485	5,245	n.b.
	Wet pits				2,667	2,821	5,144	5,413[1]
	UDDT-E					154	2,477	2,656[1]
	Toilets to septic tank						2,323	2,008[1]
	Toilets to septic tank, desludged at STF or wastewater treatment							123[1]

Notes: Unless specified otherwise, simple average of rural and urban households; n.b. = no basis
[1] based on urban sites only; [2] based on rural sites only; [3] simple average of STF treatment and constructed wetland
Source: Annex Table I8

ment from community to shared toilets. The other is in the movement from community and shared toilets to a dry pit latrine.

The observed pattern for all sites is also generally reflected in rural and urban areas (Figure 54). In rural sites, the incremental costs of moving from dry pits and onwards are positive. However, the incremental costs of moving from a shared toilet to a dry pit and from UDDT-E to septic tanks are negative. On the other hand, the incremental costs are negative as the household moves from a shared toilet to a wet pit latrine in an urban area. While there might be differences in the magnitudes, the pattern of the cost changes are also the same for the specific sites covered in the study. It is also important to note that some caution must be exercised in interpreting the incremental costs of moving from an UDDT-E facility to a toilet that has access to a septic tank in the rural sites. The reason is that there is no single rural (and urban) site in which the costs of both facilities were evaluated. Hence, differences in incremental costs are likely to be severely compromised by inter-site price and cost variations.

FIGURE 54: INCREMENTAL COSTS OF MOVING UP THE SANITATION LADDER, RURAL AND URBAN SITES, PESOS, 2008



VII. Efficiency of Improved Sanitation and Hygiene

This Chapter synthesizes the information in Chapters 4 to 6 to present the efficiency of sanitation options under ideal and actual conditions. Alongside the quantitative cost-benefit and cost-effectiveness ratios, it also discusses the non-quantified impacts. The chapter consists of four sections:

- Efficiency of sanitation interventions, compared with open defecation (Section 7.1)
- Efficiency of moving from improved sanitation options to other options "higher" up the sanitation ladder (Section 7.2)
- Cost variations and their impacts on efficiency estimates (Section 7.3)
- Contextualization of the results in a national context (Sections 7.4 and 7.5)

7.1 Efficiency of sanitation improvements compared to no facility

7.1.1 QUANTITATIVE ANALYSIS

Economic analysis combines evidence on the costs and benefits of the sanitation improvements. Efficiency indicators are introduced in Chapter 3 and defined in the Glossary. All the indicators presented here were calculated by estimating costs and benefits over a planning horizon of 20 years, and discounting future costs and benefits to the present day using a discount rate of 8%.

Table 37 summarizes the results for the rural sites under ideal and actual settings. Under ideal settings, the efficiency indicators show that all the sanitation options yield positive net benefits. The BCRs were all greater than unity and the NPVs for all the options were positive. Internal rates of return for all the projects were also high, with the lowest rate still exceeding 25%. Among the various sanitation options, the most favorable estimates were found for wet pits. This intervention not only had the highest BCRs and NPVs but also required the least time to recover the initial investment (lowest PBB). Dry pits had the second best favorable BCRs and NPVs and, like wet pits, initial investments can be recovered within a year. In contrast, the least favorable estimates were found for toilets with access to wastewater treatment (1.6) and shared toilets (1.7). The findings suggest that low-cost technologies, particularly dry and wet pits, are worth pursuing especially for low-income groups.

The cost-effectiveness measures, which are focused more on targets associated with human health, were most favorable to dry pit latrines, followed closely by wet pit latrines. UDDT-E facilities, closely followed by toilets with access to a STF and wastewater treatment facilities, were found to have the highest costs for achieving the specified targets. These findings also imply that low-cost options provide the cheapest means to achieve health targets.

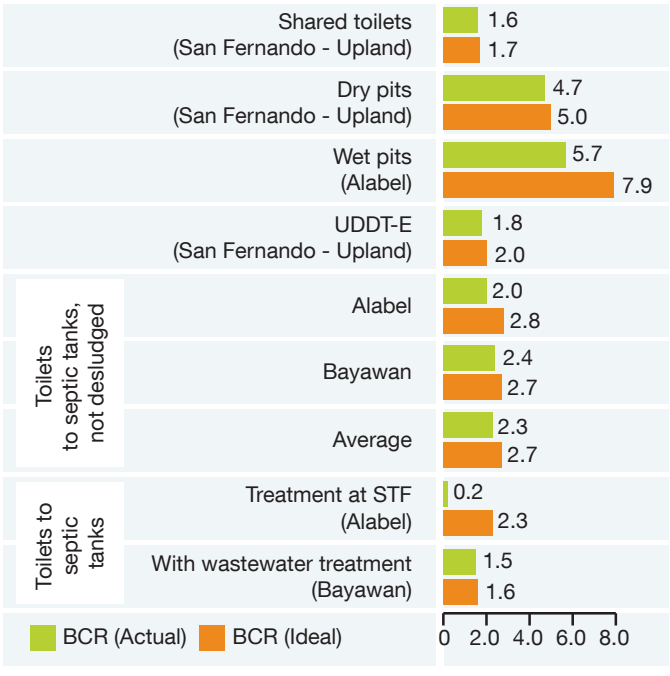
The efficiency indicators associated with actual conditions were, as one might expect, less favorable than the estimates under ideal conditions. The difference was very noticeable for the toilet facilities that have access to a STF. A BCR that was less than unity under actual program conditions suggests that something is wrong with the utilization of such facilities. Moreover, the BCR (actual use) was greater than unity for toilets that had access to septic tanks but not the STF. This means that the problem lies solely with the STF. On closer inspection of the data, the source of the poor BCR was the under-utilization of the STF in Alabel (see Chapter 6). With very few households being served relative to the optimal scale of operations, estimated investment and maintenance costs per household under actual conditions were also higher than what these should be.

TABLE 37: RURAL AREA EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Shared toilets	Dry pits	Wet pits	UDDT-E	Toilets to septic tank	Toilets to septic tank and desludged at STF	Toilets with wastewater treatment
Sites[1]		SF-U	SF-U	A	SF-U	A, B	A	B
No. of households of ESI survey		24	24	28	14	216	44	180
Cost-benefit measures (Weighted average for sites)								
Benefits per peso of input (Php)	Ideal	1.7	5.0	7.9	2.0	2.7	2.3	1.6
	Actual	1.6	4.7	5.7	1.8	2.3	0.2	1.5
Internal rate of return (%)	Ideal	38	>100	>100	35	46.9	31.3	25.2
	Actual	33	>100	>100	31	36.8	-13.8	20.8
Payback period (years)	Ideal	5.0	1.0	1.0	4	4.0	5.0	6.0
	Actual	>20	1.0	1.0	11	6.8	8.0	>20
Net present value (PhP)	Ideal	15,426	38,630	79,827	31,379	57,844	56,456	44,038
	Actual	12,968	35,817	54,467	26,919	44,470	(233,672)	32,732
Cost-effectiveness measures (Weighted average for sites)								
Cost per DALY averted (PhP)	Ideal	264,037	112,226	133,339	371,808	227,374	325,280	343,512
	Actual	294,868	125,330	140,390	415,222	234,738	2,354,029	350,945
Cost per case averted (PhP)	Ideal	1,017	432	506	1,432	854	1,242	2,866
	Actual	1,135	483	532	1,599	882	8,989	3,008
Cost per death averted (PhP)	Ideal	4,505,503	1,915,005	2,694,546	6,344,488	3,738,315	6,694,415	5,070,759
	Actual	5,031,594	2,138,614	2,837,046	7,085,311	3,865,941	48,446,955	5,178,443

[1] A = Alabel, B = Bayawan, SF-U = upland region of San Fernando
Source: Annex Tables J1 to J3

FIGURE 55: BENEFIT-COST RATIO, ALL SANITATION OPTIONS IN ALL RURAL SITES, IDEAL VS ACTUAL SETTING



Source: Annex Table J1 to J3

Figure 55 illustrates the site-specific BCRs for the sanitation options in the rural sites. It shows that all interventions yield benefits which are higher than costs under ideal conditions. The highest net benefits accrue to the wet pits in Alabel while the lowest net benefits are for the toilets with access to wastewater treatment (constructed wetland) in Bayawan.

Table 38 summarizes the results for the urban sites. Under ideal settings, the estimated BCRs and NPVs show that all the sanitation options yield net benefits. The IRRs for all the projects were also quite high, with the lowest rate about 26%. Among the various sanitation options, the most favorable estimates were found for toilets that flush to septic tanks. These were followed by wet pits and toilets that had access to STF or sewers. In contrast, UDDT-E facilities had the lowest BCR. Payback periods were also generally quite short, with all but one facility requiring less than five years to recover costs. The main difference with rural sites is that relatively expensive options, i.e., from toilets to septic tanks, have very favorable efficiency measures.

TABLE 38: URBAN AREA EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Community toilets	Shared toilets	UDDT-E	Wet Pits	Toilets to septic tank	Toilets to septic tank and desludged at STF	Sewerage
Sites[1]		D,SF-C	D	SF-C	D,SF-C	T	T	T
No. of households of ESI survey		65	48	50	122	92	91	84
Cost-benefit measures (Weighted average for sites)								
Benefits per peso of input (Php)	Ideal	2.9	2.3	1.5	4.5	5.6	4.3	4.3
	Actual	1.7	1.3	1.3	2.8	4.5	3.4	3.6
Internal rate of return (%)	Ideal	>100	47.7	25.9	>100	>100	>100	95.3
	Actual	47	12	17	>100	>100	87	66
Payback period (years)	Ideal	2	4	8	1	2	2	3
	Actual	4	8	>20	2	2	3	>20
Net present value (PhP)	Ideal	29,966	28,290	24,413	45,928	196,324	201,358	194,005
	Actual	11,660	7,011	6,740	24,037	151,932	154,601	149,133
Cost-effectiveness measures (Weighted average for sites)								
Cost per DALY averted (PhP)	Ideal	131,408	114,753	458,985	123,941	442,426	400,517	434,768
	Actual	143,206	125,055	512,579	137,019	454,031	423,640	444,755
Cost per case averted (PhP)	Ideal	495	435	1,744	469	1,620	1,477	1,268
	Actual	540	474	1,948	519	1,663	1,562	1,627
Cost per death averted (PhP)	Ideal	3,054,696	2,713,390	10,193,025	2,232,613	10,424,838	9,604,657	8,150,356
	Actual	4,233,751	2,957,007	11,383,228	2,460,908	10,698,270	10,159,166	10,455,063

[1] A = Alabel, D = Dagupan, SF-C = coastal region of San Fernando, T = Taguig
Source: Annex Tables J4 to J6.

The results for the cost-effectiveness measures tend to favor low-cost technologies, particularly shared toilets and wet pit latrines. As with the rural sites, the least favorable estimates were found for UDDT-E facilities. Toilets that have access to septic tanks were found to have relatively high costs for achieving the specified health targets. However, cost-effectiveness ratios tend to fall when households that have septic tanks also have access to STFs and sewer systems. While the findings here tend to favor low-cost technologies in meeting health targets, the estimates provide evidence on the potential contribution of off-site treatment facilities in urban regions.

The efficiency indicators under actual conditions were also less favorable than the estimates under ideal conditions. The differences are most noticeable with community toilets, shared toilets and wet pit latrines. For these technologies, the BCRs under actual conditions were only about 60% of their counterparts under actual conditions.

Figure 56 shows the site-specific BCRs for all the sanitation options in all the urban sites. It indicates that all interventions yield benefits which are higher than costs. The highest net benefits accrued to toilets with access to septic tanks (not desludged) in Taguig while the lowest net benefits were for the UDDT-E facilities in the coastal region of San Fernando. The results also show considerable inter-site variation in the BCRs of wet pits. In Dagupan, the BCR for wet pits was estimated to be 5.2. This is about 40% higher than the BCR of 3.7 for the coastal region of San Fernando.

7.1.2 QUALITATIVE ANALYSIS

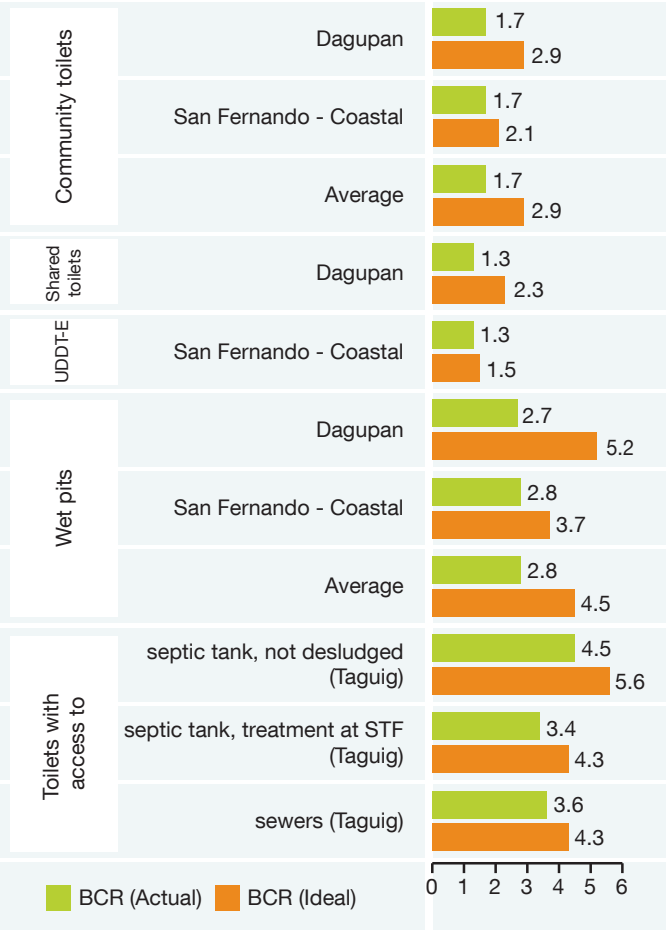
It is very likely that the efficiency indicators presented in the previous section are underestimating the net benefits. The reason is that there are a number of on-site and off-site benefits which were not included in the analysis.

Among the on-site benefits excluded in the analysis are other diseases associated with poor sanitation such as hepatitis

and parasitic diseases. Time savings associated with urination is another on-site benefit which was not incorporated in the analysis.

More favorable efficiency estimates are also likely to be obtained if it is possible to quantify the intangibles — comfort, prestige, personal safety of women and children, etc. With the details discussed in Chapter 4, the key results from the ESI household surveys and FGDs are as follows: First, the FGDs found that the respondents have a common desire for cleaner surroundings. The respondents also said that the absence of toilets contributed to the practice of open defecation in their areas. Second, the respondents feel a sense of shame associated with open defecation. Some respondents said that they covered their faces, either with their hands or a piece of cloth, to avoid being recognized by their neighbors whenever they defecate in the open. On the other hand, households that have private toilets claimed a feeling of pride associated with owning such a facility. The source of this pride varies from one group to the next. Some said that owning a private toilet no longer required them to ask permission from their neighbors in order to use the toilets. For others, having a private toilet was viewed as an improvement in their social status in the community. Those who previously did not have toilets also expressed confidence in inviting guests to their homes. Third, about three out of four respondents in the household survey said that their biggest concern was for the safety of their children. This is consistent with the finding in the FGD that the respondents prefer a household that is near the house. The FGD also found that the preference for proximity was also based on its potential to save time and the feeling of safety for women at night or when it is raining. While valuing the intangibles is difficult to do, the household survey asked the respondents about their willingness to pay for an improved toilet. The average value provided by the respondents was about PhP2,500 (US$56), an amount which is only capable of purchasing a dry pit latrine, while most of the respondents (78%) expressed preference for a toilet that is connected to a septic tank.

FIGURE 56: BENEFIT-COST RATIO, ALL SANITATION OPTIONS IN ALL URBAN SITES, IDEAL VS ACTUAL SETTING



Source: Annex Table J4 to J6

Off-site benefits include the impacts on tourism, business and aesthetics (external environment). The impacts of reduced water pollution on fisheries and the recreational uses of water are also potentially important considerations.

7.2 Efficiency of alternatives for moving up the sanitation ladder

7.2.1 QUANTITATIVE ANALYSIS

This section discusses the incremental net benefits for movements up the sanitation ladder. This is important for decision makers who are considering investments in more advanced sanitation options. The analysis is relevant to the Philippines because many households already have access to unimproved sanitation options compared to open defecation. Hence, in most cases, the key question might be to upgrade from a low cost option (e.g., dry pits and community toilets) to more expensive technologies (e.g., septic tanks and treatment facilities). The question is also relevant from the viewpoint of upgrading the facilities of households

that already have access to improved sanitation facilities — e.g., constructing an STF or sewer systems.

Table 39 presents performance indicators as rural households move up the sanitation ladder. The results are mixed and vary from one improvement to the next. Based on the BCRs, the movement from shared toilets to private dry pits led to higher net benefits. In contrast, a movement from dry pits to UDDT-E facilities has a BCR that is less than unity. An upgrade from UDDT-E toilets to toilets that flush to septic tanks generated higher net benefits but further improvements which incorporate sludge and wastewater treatment had lower net benefits. However, the findings should be treated with care because the apparent reductions in net benefits as households move up the sanitation ladder were driven solely by the relatively large increases in the investment and recurrent costs of the interventions.

Table 40 presents performance indicators associated with moving up the sanitation ladder in the urban sites. Based on the BCRs, only movements from shared toilets to wet pit latrines and from UDDT-E to toilets to septic tanks have positive net benefits. As in the rural sites, the apparent reductions in net benefits for movements up the sanitation ladder were caused by the relatively large increases in the costs of the interventions. In the case of the cost effectiveness indicator, the results indicate lower costs of meeting health targets as septic tanks are desludged and treated at a STF or toilets have access to treated sewer systems.

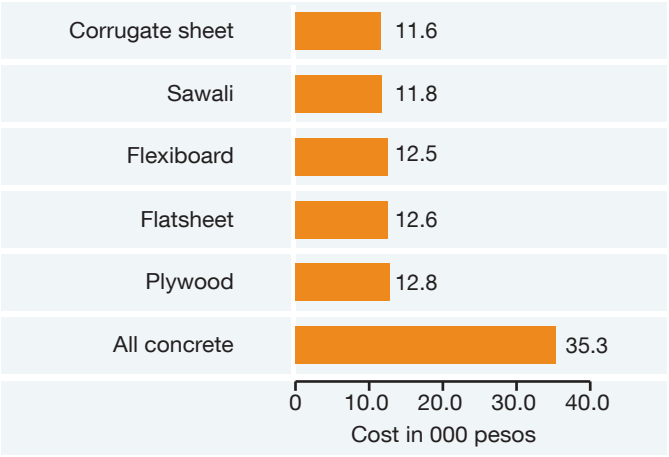
7.2.2 QUALITATIVE ANALYSIS

The qualitative impacts discussed in Section 7.1.2 may have an effect on the results provided above. For example, well-functioning sludge and wastewater treatment facilities are more effective in reducing environmental contamination compared to septic tanks or wet pit latrines. However, the former carry a higher investment and recurrent cost than the latter, and also usually involve the use of more water for flushing. Better isolation and/or effluent removal from water released to the environment means lower pollution and higher potential gains associated with fisheries and recreational activities in inland waters. Another example is the use of treated sludge as soil conditioners and recycling treated wastewater (see Howell-Alipalo 2007). Both represent gains in the form of higher farm productivity and water savings, respectively. Non-quantified benefits such as aesthetics (external environment), tourism and business might also be higher for more advanced sanitation options. All these benefits have the potential to raise the incomes not only of the direct beneficiaries of sanitation improvements but of the other households as well. Accounting for these impacts may raise the benefit-cost ratio of a sanitation improvement from a wet pit to toilets that have access to off-site treatment facilities. However, the extent to which capturing these benefits will improve the viability of more advanced sanitation options is difficult to determine.

7.3 Cost variations and the efficiency estimates

Costs could vary within a particular technology. This could be due to differences in materials used as well as the size of the facility. Figure 57 provides an example by showing the differences in costs for UDDT-E facilities that use different materials for the walls of the superstructure. Given the many different and combinations of materials for constructing toilets and treatment facilities, this section will not attempt to estimate the efficiency indicators for different variations within a given sanitation technology. Rather, it will calculate the economically feasible level of costs for selected technologies. This is done by estimating the level of investment costs that will make the BCR equal to unity for a given technology. The analysis effectively identifies the maximum costs for selected facilities before these become economically unfeasible.

FIGURE 57: ESTIMATED COSTS OF THE SUPERSTRUCTURE FOR UDDT-E FACILITIES, BY TYPE OF WALL MATERIAL, 000 PHP, 2006 PRICES



Source: CAPS
Notes: This assumes a substructure made of concrete hollow blocks. Estimates are also available for substructures that have a steel frame. The cost of the UDDT bowl is not included in the estimates above.

TABLE 39: RURAL AREA EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER, IDEAL SETTING[1]

	TO					
FROM	Dry pits	Wet pits	UDDT-E	Toilets to septic tank	Toilets to septic tank and desludged at STF	Sewerage
Benefits per peso of input (PhP, ideal)						
Shared toilets	3.0	4.7	1.2	1.6	1.3	1.0
Dry pits		1.6	0.4	0.5	0.4	0.3
Wet pits			0.3	0.3	0.3	0.2
UDDT-E				1.4	1.1	0.8
Toilets to septic tanks					0.8	0.6
Toilets to septic tanks and desludged at STF						0.7
Payback period (years, ideal)[2]						
Shared toilets	(4)	(4)	(1)	(1)	0	1
Dry pits		0	3	3	4	5
Wet pits			3	3	4	5
UDDT-E				0	1	2
Toilets to septic tanks					1	2
Toilets to septic tanks and desludged at STF						1
Cost per DALY averted (PhP, ideal)[3]						
Shared toilets	(151,812)	(130,699)	107,771	(36,663)	61,243	79,475
Dry pits		21,113	259,582	115,148	213,055	231,287
Wet pits			238,469	94,035	191,942	210,173
UDDT-E				(144,434)	(46,527)	(28,296)
Toilets to septic tanks					97,907	116,138
Toilets to septic tanks and desludged at STF						18,232
Cost per case averted (PhP, ideal)						
Shared toilets	(585)	(511)	415	(162)	225	1,850
Dry pits		74	1,000	422	810	2,434
Wet pits			926	349	736	2,361
UDDT-E				(577)	(190)	1,435
Toilets to septic tanks					388	2,012
Toilets to septic tanks and desludged at STF						1,624
Cost per dealth averted (PhP, ideal)						
Shared toilets	(2,590,497)	(1,810,957)	1,838,985	(767,188)	2,188,913	565,256
Dry pits		779,541	4,429,483	1,823,310	4,779,410	3,155,753
Wet pits			3,649,942	1,043,769	3,999,869	2,376,213
UDDT-E				(2,606,173)	349,927	(1,273,729)
Toilets to septic tanks					2,956,100	1,332,444
Toilets to septic tanks and desludged at STF						(1,623,657)

[1]Site-specific comparisons are provided in Tables K1 to K3.
[2]A negative value suggests that the new intervention (to) has a lower payback period than the original intervention (from)
[3]A negative value suggests that the cost per DALY averted with the new intervention (to) is lower than the cost per DALY with the original intervention (from)

TABLE 40: URBAN AREA EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER, IDEAL SETTING[1]

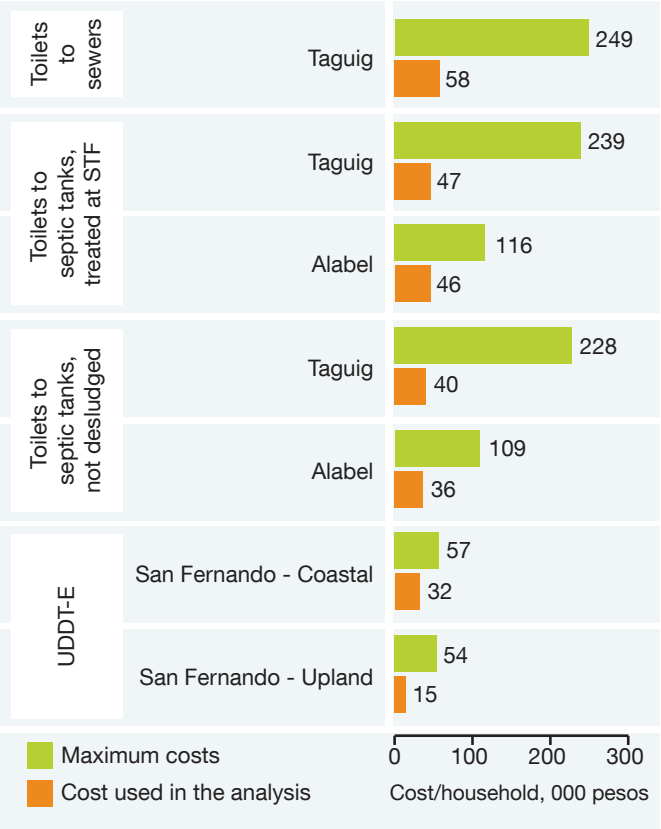
	TO					
FROM	**Shared toilets**	**Wet pits**	**UDDT-E**	**Toilets to septic tank**	**Toilets to septic tank and desludged at STF**	**Sewerage**
Benefits per peso of input (PhP, ideal)						
Shared toilets	0.8	1.5	0.5	1.9	1.5	1.5
Dry pits		1.9	0.7	2.4	1.9	1.9
Wet pits			0.3	1.3	1.0	1.0
UDDT-E				3.7	2.8	2.8
Toilets to septic tanks					0.8	0.8
Toilets to septic tanks and desludged at STF						1.0
Payback period (years, ideal)[2]						
Shared toilets	2	(1)	6	0	0	1
Dry pits		(3)	4	(2)	(2)	(1)
Wet pits			7	1	1	2
UDDT-E				(6)	(6)	(5)
Toilets to septic tanks					0	1
Toilets to septic tanks and desludged at STF						1
Cost per DALY averted (PhP, ideal)[3]						
Shared toilets	(16,656)	(7,468)	327,577	311,018	269,109	303,360
Dry pits		9,188	344,233	327,674	285,765	320,015
Wet pits			335,045	318,486	276,577	310,827
UDDT-E				(16,559)	(58,468)	(24,217)
Toilets to septic tanks					(41,909)	(7,659)
Toilets to septic tanks and desludged at STF						34,251
Cost per case averted (PhP, ideal)						
Shared toilets	(60)	(26)	1,249	1,125	982	773
Dry pits		34	1,309	1,185	1,042	833
Wet pits			1,275	1,151	1,008	799
UDDT-E				(123)	(267)	(476)
Toilets to septic tanks					(143)	(352)
Toilets to septic tanks and desludged at STF						(209)
Cost per death averted (PhP, ideal)						
Shared toilets	(341,306)	(822,083)	7,138,329	7,370,142	6,549,961	5,095,660
Dry pits		(480,777)	7,479,635	7,711,448	6,891,267	5,436,966
Wet pits			7,960,412	8,192,225	7,372,044	5,917,743
UDDT-E				231,813	(588,368)	(2,042,669)
Toilets to septic tanks					(820,181)	(2,274,482)
Toilets to septic tanks and desludged at STF						(1,454,301)

[1]Site-specific comparisons are provided in Tables K1 to K3.
[2]A negative value suggests that the new intervention (to) has a lower payback period than the original intervention (from)
[3]A negative value suggests that the cost per DALY averted with the new intervention (to) is lower than the cost per DALY with the original intervention (from)

Figure 58 shows the economically feasible investment costs for UDDT-E facilities and toilets that have access to septic tanks and treatment facilities in the various study sites. In the case of toilet facilities that have access to septic tanks (desludged and treated at a STF) in Taguig, the maximum investment cost was PhP238,900 (US$5,371). This means that such a facility in Taguig will still have a BCR that is greater than unity for as long as it is smaller than this amount. Similar estimates for Alabel (PhP116,200 or US$2,612) are lower than their counterparts for Taguig because of differences in economic (e.g., incomes), health (e.g., disease rates) and other conditions in the sites. Differences with the other technologies are due to differences across the sites and differences in the associated benefits with each intervention.

It is also important to note that the cost estimates used in the analysis were considerably lower than the maximum costs. For example, Figure 58 shows that the costs used for UDDT-E facilities in the coastal region of San Fernando were only about 57% of the maximum costs. In the case of toilets with access to septic tanks in Taguig, whether desludged or not, the costs used in the analysis could rise fivefold and the BCR would still be greater than unity.

FIGURE 58: INVESTMENT COSTS THAT WILL MAKE THE BENEFIT-COST RATIO EQUAL TO UNITY, SELECTED SITES AND TECHNOLOGIES, 000 PHP, 2008 PRICES



Note: The facility in San Fernando upland is only projected to last for 10 years.

7.4 Poverty analysis

Table 41 shows the results for three different population sub-groups. It indicates net benefits for very poor and poor households from the installation of wet pit latrines in the rural sites and community toilets in the urban sites. However, net benefits were lower in an upgrade from wet pit latrines to toilets with access to sewerage systems in urban areas. The experiment also shows that net benefits accruing to non-poor households were higher than poor and very poor households. Given the relatively high disease incidence and mortality rates for poor households, this was mostly due to the high opportunity costs (incomes) of non-poor households. However, the results here should be interpreted with care because poor households are likely to put a greater value on each peso of benefits compared to rich households. This is partially reflected in the ratio of the net benefits to the income of each household group. In the case of wet pit latrines for rural households, the net present value of the intervention is 2.17 times of the annual household income for group 1. This ratio falls substantially to 0.84 and 0.39 for households belonging to income groups 2 and 4, respectively. A similar pattern can be observed from the provision of community toilets for urban households. All this means is that the net gains relative to income tend to be larger for lower income groups.

7.5 Scaling up results for national policy making

The aim of this study goes beyond the assessment of the improvements in sanitation options in the field sites. The ultimate objective is to use the results from the sites in the formulation of national policies related to improvements in sanitation access. Field sites were carefully selected so that the results can be applied to various locations and population groups in the country. Results from Alabel and Bayawan are useful in evaluating options for rural-coastal regions which are dominated by relatively poor households

TABLE 41: EFFICIENCY MEASURES FOR THREE DIFFERENT POPULATION POVERTY PROFILES

Efficiency measure	Scenario	Rural example: OD to wet pits			Urban example: OD to community toilets			Urban example: wet pits to sewerage		
		Very poor (income group 1)	Poor (income group 2)	Non-poor (income group 4)	Very poor (income group 1)	Poor (income group 2)	Non-poor (income group 4)	Very poor (income group 1)	Poor (income group 2)	Non-poor (income group 4)
Cost-benefit measures										
Benefits per peso	Ideal	9.6	11.0	16.4	2.7	6.0	20.0	0.2	0.2	0.2
	Actual	8.4	9.3	12.4	1.5	3.7	15.1	0.7	0.7	0.7
Payback period (years)	Ideal	1	1	1	2	1	1	>20	9	2
	Actual	1	1	1	4	2	1	>20	>20	5
Net present value (PhP)	Ideal	65,006	75,362	115,968	24,971	75,288	285,779	(48,091)	(48,091)	(48,091)
	Actual	55,997	55,997	85,966	7,475	39,923	212,909	(5,540)	(5,540)	(5,540)
Net present value ($)/ Household income	Ideal	2.17	0.84	0.39	0.83	0.84	0.95	(1.60)	(0.53)	(0.16)
Cost-effectiveness measures										
Cost per DALY averted (PhP)	Ideal	50,566	53,966	62,205	161,101	174,319	201,813	514,408	556,612	644,402
	Actual	53,318	56,762	65,756	291,754	280,000	221,988	107,309	102,986	81,648
Cost per case averted (PhP)	Ideal	157	175	220	498	570	719	1,591	1,821	2,296
	Actual	165	184	232	902	916	791	332	337	291
Cost per death averted (PhP)	Ideal	719,910	1,019,781	2,629,573	2,272,948	3,332,136	7,010,338	7,257,683	10,639,746	22,384,503
	Actual	759,097	1,072,614	2,779,655	4,286,185	5,846,302	9,584,605	888,304	1,211,636	1,986,393

(Table 42). The results may be delineated further into communities where open defecation is very common (Bayawan) and those in which prevalence is relatively low (San Fernando). Dagupan and San Fernando-coastal apply to urban-coastal regions. The results for San Fernando-upland are relevant for poor households in the rural-upland regions of the country. Finally, the findings from Taguig are useful for analyses in a highly urbanized setting that has a high population density and relatively high incomes. To some extent, the findings from Dagupan and the coastal region of San Fernando facilitate a comparison with an urban setting that has a lower population density and income.

Formulating a national policy on sanitation options is a difficult task. Limited financial resources in the light of potentially large investments on sanitation options cannot be ignored. The sustainability of such investments in terms of maintenance and operations over time should also be considered. Moreover, it is unlikely that a single sanitation option fits all settings.

An important finding of this study is that low-cost sanitation options yield net benefits and have relatively short payback periods. For rural areas in an upland setting, this is exemplified by the findings for dry pits and, to a lesser extent, shared toilets in San Fernando. The positive net benefits from wet pits in Dagupan and San Fernando highlighted potential options for urban areas in a coastal setting. As a whole, such findings mean that low-cost technologies offer a viable option for situations in which stakeholders have limited resources and, as more likely in the case of urban areas, where space is also a constraint. However, there are some factors that must be taken into account before a policy is formulated regarding the sanitation options above. Since dry pits and wet pits do not last as long as other sanitation options, stakeholders must constantly raise funds in order to finance such projects. On the other hand, arrangements regarding the maintenance and operation of shared and community toilets must also be considered. Hence, low-cost options might be more useful in the short term, especially when raising funds is a serious constraint.

TABLE 42: TYPICAL NATIONWIDE SANITATION SUBGROUPS VERSUS FIELD SITE CHARACTERISTICS

Province/ city	Barangays	Location	Classification	% of urban Barangays	Population (000s, 2007)		Population density (persons/ km²)	Average annual family income	GDP per capita	Poverty incidence (% of families)	Sanitation coverage (% of households, 2006)		
					Province/ city	Barangays	2007	000 PhP, 2006	2007, 000 PhP, current prices	2003	OD	Unimproved	Shared
Alabel	Poblacion (U), Kawas (R), Maribulan (R), Baluntay (R)	Socck-sargen (12)	1st class municipality	8%	71.9	34.0	132.9	113.9	57.8	37.0	13.0	6.0	na
Bayawan	Banga (R), Tinago (U), Villareal (R)	Central Visayas (7)	3rd class city	18%	110.3	17.9	157.7	144.3	69.8	58.3	25.5	2.6	na
Dagupan	Pugaro (U)	Ilocos (1)	2nd class city	100%	149.6	4.1	4,020.3	142.4	38.1	10.8	8.7	2.0	na
San Fernando - coastal	Poro (U), Ilocanos Sur (U), San Agustin (R)	Ilocos (1)	3rd class city	19%	114.8	11.0	1,073.2	142.4	38.1	14.7	na	0.1	3.8
San Fernando - upland	Nagyubyuban (R)	Ilocos (1)	3rd class city	19%	114.8	1.2	1,073.2	142.4	38.1	14.7	na	0.1	3.8
Taguig	West Bicutan (R)	NCR	1st class city	100%	613.3	124.2	13,485.9	310.9	223.3	5.2		13.0	
Aggregate													
Rural					43,594		na	108.6	na	36.0	14.0	10.0	4.0
Urban					44,949		na	231.1	na	15.1	5.0	13.0	1.0
National					88,543		295	172.7	75.0	24.4	8.0	12.0	2.0

U = urban, R = rural, na = not available

If more funds are available and longer term impacts are a greater concern, more advanced sanitation options could be considered. UDDT-E and toilets with access to septic tanks could be considered for upland and coastal settings of rural areas, respectively. For UDDT-E facilities, some support can be found from the BCR for the upland region of San Fernando. On the other hand, the findings in Alabel and Bayawan support the case for septic tanks while the results for Taguig provide evidence of net benefits in dense urban areas. It must be noted, however, that the use of UDDT-E facilities in urban areas should be considered with caution. The findings for the urban-coastal regions of San Fernando, where only 20% of the UDDT-E users recycle waste, tend to defeat the key concept behind the approach.

Wastewater and septage treatment facilities should not be ruled out altogether. Findings in Alabel, Taguig, and Bayawan show net benefits in such technologies relative to open defecation. Moreover, lower cost-effectiveness ratios for such facilities in Taguig suggest their efficiency in addressing health-related concerns in dense urban areas. Apart from the usual cost considerations however, the size of the market should be considered before wastewater and septage treatment facilities are constructed. This is exemplified by the under-utilization of the STF in Alabel which led to a benefit-cost ratio that is less than unity under actual conditions.

7.6 Concluding remarks

As a whole, the study found that there were net benefits for all the interventions considered in the sites. These were shown by BCRs that are greater than unity and NPVs that were positive. Net benefits were generally higher for low-cost technologies, particularly dry and wet pits in rural areas and wet pits in urban areas. The BCRs were also high for toilets that flush to septic tanks, especially for the highly

urbanized setting of Taguig. Low-cost sanitation options also tend to have lower costs associated with given health targets (cost-effectiveness ratios) and faster payback periods. However, it is worth noting that the cost-effectiveness ratios improve with the introduction of sewers and other treatment facilities in dense urban areas.

Efficiency indicators under actual settings tend to be less favorable than under ideal settings. These were most noticeable for facilities with multiple users — e.g., the STF in Alabel and shared and community toilets in the urban sites. All this emphasizes the need for the proper use and operation of such facilities.

The net benefits calculated in the study might actually be underestimated. Intangible benefits such as comfort, prestige, and the personal safety of women and children were not quantified in the analysis. Benefits which accrue outside of the household (national benefits) such as aesthetics, tourism, business, and water (fisheries and other uses of inland waters) were also excluded from the quantitative analysis. Since these benefits might be more significant to sanitation options at the top of the ladder — e.g., wastewater treatment and the benefits to inland waters — the net gains from such interventions are higher than the values estimated here.

VIII. Discussion

8.1 Study messages and interpretation

8.1.1 MAIN MESSAGES

The key finding of the study is that there are net benefits associated with all of the interventions evaluated. The benefit-cost ratios were greater than one for all interventions, ranging from 1.5 (UDDT-E facilities in urban areas) to 7.9 (wet pit latrines in rural areas). With few exceptions, net benefits are less favorable as households move up the sanitation ladder. In general, these are explained by higher incremental costs compared to incremental benefits. Exceptions include the movement from (a) shared toilets to dry pit latrines in rural areas and (b) shared toilets to wet pit latrines in urban areas; where the costs of facilities located higher in the sanitation ladder are lower. Another exception is the movement from UDDT-E facilities to toilets with access to septic tanks in rural and urban areas, where BCRs improve despite the increase in costs. However, some care must be exercised in interpreting the latter results because of differences in site-specific conditions (e.g., incomes, initial disease rates, etc.) In addition, there are benefits which were not included in the study that could have made the results for some interventions more favorable. These include intangible benefits (e.g., comfort, prestige, privacy status and safety) environmental benefits, and impacts on tourism and business.

It is important to note that many of the quantified benefits are not financial in nature; i.e., associated with a reduction in out-of-pocket expenses due to poor sanitation. Gains in terms of averted health-related productivity and mortality losses, lost productive time due to accessing toilets and water sources and, perhaps, the reuse of human excreta in the plots of the households are non-financial in nature. The only clear financial gains are the potential for reduced health care expenditures (treatment and medication) and savings on water treatment and purchased water access costs. Health care costs in the study used prices in private health facilities. This suggests that not all of these costs have a direct financial impact on households. Patients that use public hospitals pay subsidized rates for health care and therefore have lower financial costs. The rest of the economic costs are paid for by society in the form of government subsidies.

Improved sanitation generates other benefits to society besides the potential lower government subsidies for health care. The contribution of sanitation investments to a cleaner environment, particularly water resources, benefits society as a whole. The benefits come in the form of lower clean-up costs and the potential increase in the use of water resources for activities such as fishing and recreation. Even larger benefits to the community and to the country as a whole could arise if the cleaner environment and water resources contribute to higher tourist revenues and lower business costs. All of these suggest the importance of the participation of government and other NGOs in addressing the problem of sanitation. The participation of these institutions is not limited to funding sanitation projects. It also includes campaigns to increase awareness of the importance of proper sanitation and hygiene.

The study found larger net benefits per household from sanitation options for high income households compared to low income households. However, such a result must be treated with care for the following reasons. First, each peso that is gained or saved is likely to be more important to poor households. Second, poor households have less access to improved sanitation and are therefore more vulnerable to the negative impacts of poor sanitation. Third, poor households are likely to have a lower capacity to address the negative impacts of poor sanitation. This is especially the case in paying for health care expenditures because a larger proportion of their income is allocated to food. All this suggests that, despite the lower estimated net benefits, improvements in sanitation have an important role in easing

the burden of poverty. An obvious channel by which this occurs is through lower health care costs for poor households. However, increased productivity by way of lower time lost due to illness, traveling to access latrines in the case of private toilets and perhaps traveling to access clean water sources are equally important.

There is a gender dimension to sanitation which was not quantified in the analysis but is nonetheless worth noting. The results presented here, which are based on the FGD and household surveys, are classified as (a) toilet practices, (b) toilet cleaning, and (c) toilet preference.

The FGD showed that men and women generally use toilets for defecation and urination. However, site-specific living conditions and customs caused differences in toilet practices. Males in barangay Pugaro claimed that they urinate outside of the house. On the other hand, males in barangay Nagyubyuban said that they urinate in the rice paddies. Women expressed a preference for urinating in toilets. However, some admitted to urinating in their backyard or potty chambers when they can no longer hold back the urge to do so. Women also claimed that they regularly wash their hands with soap and water after defecation and urination. While men in urban areas also made the same claim, there is some variation in the behavior of men in rural areas. Fishermen who defecate at sea said that they wash their hands only after getting home. After urinating these men either wash their hands with water or simply wipe their hands on their pants.

The FGD also found that toilet cleaning, which includes brushing the bowl with soap and water, was the primary responsibility of women. Nonetheless, men in all the sites claimed that they participate or help in toilet cleaning. Men with private toilets in Poro/San Agustin, Alabel, and Taguig claimed to be more involved and meticulous in maintaining toilets. However, men in households that do not have private toilets said that their participation in cleaning toilets was limited to flushing after use.

Based on the FGD, men and women generally share common preferences for toilets. For example, both prefer toilets that are constructed near or in the house. However, they differed in their responses on comfort issues. The majority of men claimed that they want a clean toilet because it allows them to relax while using the facility. In the case of women, personal safety was a more important concern.

8.1.2 ROBUSTNESS OF RESULTS

There are uncertainties surrounding the values of the inputs used in the quantitative analysis. Some of the main inputs are (in parenthesis are the basis for or the actual values used in the analysis):

- Value of productive time (regional GDP per capita)
- Value of premature death (human capital approach)
- Proportion of productive time lost per day due to poor sanitation (30% for adults and 15% for children under the age of five years)
- Diarrheal disease rate (WHO estimates partially adjusted by estimates from the DHS)
- Costs of sanitation options (literature search, expert opinion, surveys)

There are a number of sources of uncertainty in the values used above. The first is the presence of alternative values that could have been used in the analysis. This is the case for the values of productive time and premature death. The second is the absence of rigorous studies to support the values used in the analysis — e.g., proportion of productive time used per day. Third, there might be instances in which the values are available but these are not precise or specific enough in terms of the study sites (regional GDP and WHO disease rate) and the period of analysis (WHO disease rates). Finally, there are estimates that by nature exhibit wide variances in the estimates — e.g., costs of sanitation options. Some of these uncertainties are partially addressed by the estimates under different settings (sites) and scenarios (ideal versus actual). However, it is useful to examine how sensitive the results are to changes in these variables.

Table 43 shows the benefit-cost ratios from a sensitivity analysis of key assumptions. This involves changing an assumption in the analysis and recalculating the BCR. For example, Experiment 1 uses average wage rates in calculating the BCR instead of the GDP per capita, which was used in the baseline (results presented in Chapter 7). The results indicate that average BCR for community toilets will be slightly lower under Experiment 1 (2.4) compared to the baseline (2.5). One major conclusion from Table 44 is that the benefit-cost ratios for the different interventions

generally remain greater than one in the experiments. The only exception is for UDDT-E facilities following a 100% increase in the costs of the facilities (Experiment 7). To be more specific, the estimate refers to the costs of UDDT-E facilities in the coastal region of San Fernando (see Annex Table L9). However, such a result should be interpreted with care. In the baseline, the construction and installation costs of an UDDT-E facility in the site were assumed to be PhP32,172 (US$723). A 100% increase brings the cost of the facility to a level that is at par if not higher than the cost of a standard toilet that has access to a septic tank, and makes it less likely that a household will invest in such an expensive UDDT-E facility.

The results in Table 43 also suggest that the benefit-cost ratios are most sensitive to changes in the inputs used for valuing premature death (Experiment 2) and to a lesser extent the costs of sanitation options (Experiments 6 and 7). For Experiment 2, the benefit-cost ratio is estimated to rise by 0.8% for a one percent increase in the input used for valuing premature death. This also suggests that, on the whole, the estimated benefit-cost ratios are generally conservative because the current values used for premature death (based on the human capital approach) are only about a third of the estimates with the VSOL approach.

8.1.3 GENERALIZING RESULTS

The selection of the field sites and groups of respondents in the study were motivated mostly by the existence of recently completed sanitation programs. The outcomes of the study are relevant for the following settings in the Philippines:

- Urban regions that have relatively high incomes and population densities: Taguig
- Urban regions that have relatively low incomes and population densities: Dagupan and San Fernando-Coastal
- Rural coastal regions: San Fernando-Coastal and Alabel
- Rural upland regions: San Fernando-Upland

This suggests that the application of results to a national assessment will require cognizance of the conditions within towns or provinces or regions in the country. Such conditions include existing sanitation coverage, health status, incomes, access to water, population density, age composition of the population, sanitation options under consideration, etc.

8.2 Utilization of results in decision making

8.2.1 POTENTIAL USES OF RESULTS

The results of the study have many uses in the decision making processes in the sanitation sector. It can be used as a

TABLE 43: BENEFIT-COST RATIOS UNDER ALTERNATIVE ASSUMPTIONS

Technology	Baseline	Experiment[2]						
		1	2	3	4	5	6	7
Community toilets	2.5	2.4	6.1	3.3	2.6	2.4	2.1	1.9
Shared toilets	2.0	2.1	5.1	2.7	2.2	2.1	1.6	1.3
Dry pit latrines	5.0	5.5	14.1	7.0	5.8	5.5	3.8	2.9
Wet pit latrines	5.6	5.4	15.9	6.6	5.7	5.5	4.1	3.3
UDDT-E	1.8	1.5	3.8	1.9	1.5	1.5	1.1	0.9
Toilets to septic tanks (no desludging)	3.7	3.6	11.2	4.1	3.7	3.6	2.9	2.5
Toilets to septic tanks (desludged and treated at STF)	3.3	3.2	9.7	3.6	3.3	3.2	2.4	1.9
Toilets with wastewater treatment (constructed wetland)	1.9	1.8	5.0	2.4	1.9	1.8	1.4	1.1
Toilets to sewer	3.3	3.2	9.3	4.0	3.4	3.3	2.5	2.1
Average responsiveness[1]	nc	0.1	0.8	0.1	0.2	0.2	(0.5)	(0.4)

Notes: [1] measured as the ratio of the percentage change in the benefit cost ratio for a 1% change in exogenous variable for the experiment; [2] Experiment 1: using average wages per region instead of GDP per region; Experiment 2: 100% of time for adults and 50% of time for children; Experiment 3: VSOL instead of GDP; Experiment 4: 10% increase in diarrheal incidence rates; Experiment 5: 10% decrease in diarrheal incidence rates; Experiment 6: 50% increase in initial costs; Experiment 7: 100% increase in initial costs
Source: Annex Table K7

source for advocacy in sanitation improvements. In particular, it can be used to emphasize the benefits associated with improved sanitation and the net benefits associated with various sanitation options. Such advocacy can be targeted to households in terms of investing in toilets. Equally important is convincing government, donors, and other institutions of the importance of investments in basic sanitation facilities and off-site treatment facilities.

The findings and approach can also be used in selecting the appropriate sanitation interventions in various sites. This is particularly important in identifying the technologies that will yield the highest net returns in the long term. In situations where funds are scarce, the study also showed that there are net benefits from investments in low-cost sanitation technologies. However, since many of these low-cost technologies have lower estimated useful lives, it must be emphasized that such choices are likely to be more suitable to meeting short term considerations.

The results of this study provide valuable inputs for a national analysis of sanitation options and the formulation of plans to meet national targets. As inputs for a national analysis, the results could be used to evaluate and select between options in various settings. The framework and, to a limited extent, the assumptions and data used here could also be adopted for settings or technologies that were not covered in the study.

8.2.2 TRANSLATING EVIDENCE TO ACTIONS

The results of this study are useful to various groups. Stakeholders in the water and sanitation sector can use the results for strategic plans and the formulation of budgets. The results of the cost-benefit and cost-effectiveness analysis can assist in deciding on the appropriate technologies for different settings in the country. The results from the program approach analysis also stress the importance of carefully considering suitable implementation and financing approaches for identified sanitation initiatives. On the other hand, the cost estimates can provide valuable inputs in the formulation of budgets.

To the extent that plans will be formulated at the national level, the results can be used by line agencies involved in the sanitation sector like the DOH, DILG, DPWH, and DENR. Local government units may also find these useful in the formulation of site-specific plans. In as much as donors and NGOs are consulted in the planning process, the study results can assist these institutions in their collaboration with national government agencies and local government units. It goes without saying that such results are also relevant in the projects of these donors and NGOs.

The results of the study can also be used to sensitize the media on the impacts of sanitation improvements and on the various sanitation options. This helps in the advocacy component which may eventually increase the awareness of households on the costs and benefits of sanitation improvements.

8.2.3 INTEGRATING ECONOMIC CONSIDERATIONS INTO A DECISION MAKING PROCESS

In real life, there are many factors that influence decisions, some are evidence-based while others are related to political decision making. The study showed how economic analysis, in terms of quantifying costs and benefits and eventually calculating net benefits, can be used for generating decision-making tools. The analysis could be extended for a broader analysis of options. However, such an exercise may require an extensive set of criteria. Such criteria may include the availability of resources, selection of the appropriate implementation and financing approaches, and the acceptability and willingness of the target beneficiaries in sanitation programs.

8.3 Delivering sanitation improvements to target beneficiaries

8.3.1 KEY APPROACHES IN THE DELIVERY OF SANITATION IMPROVEMENTS

There are many instances in which improvements in sanitation facilities can only be made available through projects or programs implemented by the government (national and local), donor agencies, private firms, and NGOs. There are two main reasons why this is the case. First, in the case of latrines and toilets, the households who do not have these facilities are often poor and will have difficulty in paying for such facilities. This point was illustrated in Chapter 6 through findings that (a) the highest proportion of households that practice open defecation belong to lower income

groups, and (b) the investment outlay for sanitation facilities could range from 3.1% (dry pits) to 255% (toilet with access to septic tanks) of the annual incomes of the poorest households in the study. Second, off-site treatment facilities like STFs often require investment outlays that are beyond the means of households in the community. Moreover, the fact that these facilities benefit communities rather than just one household raises questions on how the investment outlays will be financed or distributed among the potential beneficiaries.

In practice there have been many ways in which access to improved sanitation facilities have been delivered to households and communities. There are two important dimensions in this process — financial and implementation approaches.

Financial approaches refer to the manner in which funds are provided. These include direct payments for the provision of software and hardware, leveraging funds from other sources, and the use of various subsidies to encourage the beneficiaries to contribute to the investment. A range of different types of subsidies is provided in Table 44.

Implementation approaches are concerned with the way in which projects/programs facilitate the delivery of sanitation interventions to target beneficiaries. These approaches can be classified as follows (see Appendix 1 for the definitions): (a) community-led total sanitation (CLTS); (b) sanitation marketing; (c) informed choice; (d) supply-driven; and (e) strategic urban sanitation. Implementation approaches may also be accompanied by measures that motivate hygiene behavior change. It is important to note that a specific project/program may include a mix of the elements of the aforementioned approaches.

Sanitation programs/projects may also involve partnerships, or agreements between two or more stakeholders to share knowledge, skills and responsibilities. Such partnerships may be at the level of implementation and/or financing, and may involve a collaboration between the government and the private sector or different levels of government.

TABLE 44: CLASSIFICATION OF SUBSIDIES

Subsidy	Description
Direct subsidies	This represents payments (in the form of cash or vouchers) to the recipient household which is then able to "spend" to access a range of services.
Infrastructure subsidies	The use of public money to construct new infrastructure. In rural areas and some urban contexts the most common form is payment of part or all of the cost of household toilets. In urban areas public funds are typically mobilized to pay for shared elements of networks (sewers and treatment for example).
Connection subsidies	Payment of charge for connection to a sewer (which may be a barrier to use of the network).
Operational subsidies	Payment (usually government/public) to a service provider to offset some or all of the costs of supplying a service.
Subsidies to small-scale operators	Operational subsidy (in various forms) provided to bring down the costs of operation of small-scale service providers.
Cross-subsidies	This occurs when one group of users contributes to part of the costs of providing services to another group.
Consumption subsidies	This occurs when tariffs for sewerage services are kept artificially low. This represents a subsidy towards the cost of "consumption" of the service, or a consumption subsidy.
Output-based subsidies	This is provided to services successfully delivered (effective sanitation) rather than inputs (excavation, pipes and toilets).
Regulatory advantages	Inadvertent subsidies occurring when policy is used to favor certain types of service delivery.
Subsidized credit	Subsidies and guarantees to micro-finance institutions (MFIs) who can then lend money for sanitation investments to households at reduced interest rates.

Source: Evans et. al. (2009)

8.3.2 APPROACHES IN THE PHILIPPINES

Of the many programs/projects that have been implemented in the Philippines, this study initially considered reviewing 26 programs/projects that date as far back as 1991. However, this number was reduced to 10 because of the lack of available information. The projects/programs reviewed in this study are:

- Water Districts Development Project (WDDP): Sewerage, Sanitation and Drainage Development;
- Rural Water Supply and Sanitation Project (RWSSP);
- Rural Water Supply and Sanitation Project Phase V (RWSSP-V);
- Water Supply and Sanitation Enhancement Program (WSSPEP);
- Local Initiative for Affordable Wastewater — Phases 1 and 2 (LINAW);
- Environmental Governance Project (EcoGov); Manila Third Sewerage Project (MTSP);
- Integrated Support for Sustainable Urban Sanitation — Phases 1 and 2 (ISSUE);
- Sustainable Coastal Tourism in Asia (SCOTIA); and
- Sustainable Sanitation for East Asia (SuSEA) — Philippines Program.

Two of the study sites in the CBA were also components of the programs/projects reviewed here. These are the UDDT-E toilets in San Fernando (ISSUE) and the septage treatment facility in Taguig (MTSP). Annex Table K9 presents some basic information on projects examined in this study.

The earliest project began in 1999 (WTDP) and some of the most recent projects are still on-going at the time of the study (MTSP, SuSEA Philippines, and ISSUE Phase 2). A pattern in the earlier projects was the focus on water supply, with sanitation as a subsidiary component. Some of the later projects were for sanitation only.

Most of the projects were implemented by or through the local government units, with coordination at the national level by a government line agency. The three projects funded by USAID (LINAW, EcoGov, and SCOTIA) were managed by a contractor with limited involvement of national government agencies. The Third Manila Sewerage Project was implemented by a private concessionaire (Manila Water Company Incorporated). With the exception of USAID-sponsored projects, the main sources of funding for projects were grants and loans from development banks and bilateral donors. For LINAW and SCOTIA, the USAID provided "catalyst" funding to its contractor, which was used to leverage the investment costs of infrastructure from local government sources and the local private sector.

Figure 59 summarizes the implementation approaches and partnerships involved in the 10 projects reviewed in the study. It indicates that the supply-driven and strategic urban sanitation were the most common approaches. It is important to note that it contains elements of various implementation approaches. The SuSEA project for example, had all but one (sanitation marketing) of the implementation approaches. The MTSP had elements of strategic sanitation and hygiene behavior change. Partnerships in implementation were the most common among the projects/programs reviewed. In the case of SCOTIA, all partnership arrangements in the study were present. The specifics of the implementation approaches and partnership arrangements are presented in Annex Table K10.

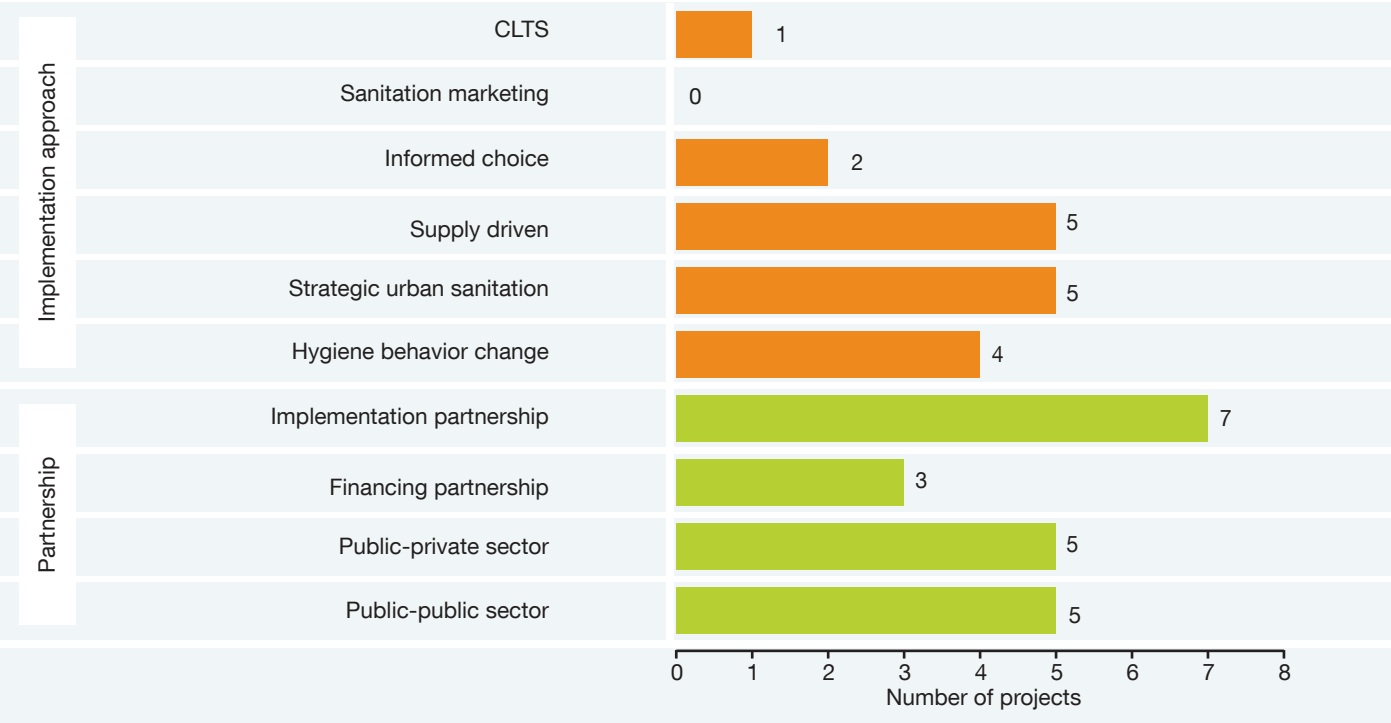
Based on project documents, the outputs (hardware only) of the different projects were as follows:

- WDDP: 2,056 toilet bowls distributed to households and 400 septic tanks constructed;
- ISSUE: 215 urine-diversion toilets distributed to households;
- RWSSP: 60,817 pit latrines for households, 242 toilets in schools, and 117 public toilets;
- EcoGov (as of mid-2009): communal septic tanks for 40 households, 12 wastewater treatment plants, with an additional seven by the end of September 2009;
- RWSSP-V: toilets in 47 schools and 11 public toilets
- LINAW: an estimated 144,000 people with access to improved sanitation after the project; and
- SCOTIA: five wastewater treatment facilities, five reed bed treatment systems, and ten UDDT-E facilities.

8.3.3 A CALL FOR A MORE THOROUGH ASSESSMENT OF APPROACHES

A thorough assessment of the program approaches has been very difficult to conduct in the Philippines for two reasons. First, there is a lack of project documentation evaluating project success, especially after project completion. Sample

FIGURE 59: IMPLEMENTATION APPROACHES AND PARTNERSHIPS IN THE 10 PROJECTS



Source: Annex Table K10

sizes have also been very limited and hence unable to make reliable inferences. Second, some of the approaches (CLTS, informed choice, and social marketing) are fairly new to the Philippines, which make it difficult to get a clear picture of their longer term impacts and efficiency in delivering sanitation services compared to other approaches. However, evaluating the effectiveness of the approaches is important in order to ensure that the target beneficiaries get the most from projects/programs. It is also essential in avoiding mistakes committed in previous projects.

Given the above, this paper makes a call for further studies in the evaluation of the various implementation and financing approaches in the sanitation sector. Such studies could include developing a clear and robust framework and indicators with which the approaches could be evaluated. Moreover, the difficulties encountered in attempting such a study in the Philippines seem to indicate that initial attempts might be with analyses that are cross-country in nature or in countries where there is a sizeable number of well-documented projects.

IX. Recommendations

This chapter outlines the key recommendations of the study. Many of these recommendations are not new and are simply reiterated on the strength of the findings of the current study.

Recommendation 1: Intensify efforts to increase access to improved sanitation

Despite the progress of the country in meeting the MDG targets for sanitation, there is a sizeable number of people who still practice open defecation or use unimproved sanitation facilities. Chapter 1 showed that about 24% of the Philippine population, or about 21.7 million people, did not have access to improved sanitation facilities as of 2008. Moreover, there is evidence that existing "improved" sanitation facilities may require upgrades, re-design or repair. The SuSEA project, for example, cited the presence of septic tanks that do not comply with standards set by the DOH. In the case of the community toilets in Bgy. Pugaro, Dagupan, this study found that some of the facilities are in a state of disrepair. While the extent to which this is occurring at the national level is unknown, it indicates that a segment of the population is still partially exposed to the dangers associated with poor sanitation.

The points above suggest a need to intensify investments to increase access to improved sanitation and to rehabilitate and redesign existing facilities. The costs of doing so can be significant. ESI-1 attempted to quantify the costs associated with poor sanitation on health, water for drinking and other uses, toilet access and tourism. The current study attempted to refine some of these costs and take a closer look at the several intangible benefits from improved sanitation through field surveys, interviews and focus group discussions. One important finding in refining the costs is in the time spent accessing a private toilet. In ESI-1, it was assumed that a person who does not have access to a private toilet spends about five minutes a day in accessing a place to defecate. This is equivalent to about 6.6 days a year for an average family. The current study showed that the assumptions in ESI-1 underestimate the time losses. Information from the field sites indicate that the time losses are about 20 days in a year for the average household, with disproportionately large losses for the average rural household (32 days). The field surveys and FGDs also attempted to elicit information on the difficult-to-quantify dimensions associated with poor sanitation. For households that recently acquired access to private toilets, some of the key findings include (a) the pride felt by the household in owning the facility, (b) the confidence to invite guests to their homes, (c) perceived benefits of not being seen by others when a person goes to a toilet. The study also found that there is a sense of shame and embarrassment from practicing open defecation. Some respondents in the FGDs claimed to have covered their faces with their hands or a piece of cloth to avoid being recognized by their neighbors while practicing open defecation.

Apart from avoiding the costs of not having access to improved sanitation, the call for greater investments is also supported by the finding that there are net gains from such investments. For the urban sites in this study, it was estimated that a one peso investment in an improved sanitation facility can yield net returns ranging from PhP1.5 (UDDT-E) to PhP5.6 (toilets with access to septic tanks). For the rural sites, the benefits per peso of investment range from PhP1.6 (toilets with access to wastewater treatment) to PhP7.9 (wet pits). Moreover, the finding that the net returns are highest for dry pits in rural areas and second highest for wet pits in urban areas suggest that investments do not have to be for the relatively expensive options.

Recommendation 2: There is a need for more active participation of government, donor agencies and other institutions in addressing the need for improved sanitation.

Many of the people who do not have access to improved sanitation facilities are poor. Section 6.3 of this study found that the highest rates of open defecation were for low income households. Among those residing in rural areas, around 29% and 15% of the survey respondents belonging to income groups 1 and 2, or households earning less than PhP10,000 a month, practice open defecation. The pattern is not too different for urban areas. Apart from the higher probability that these families do not own housing units, the cost of sanitation facilities relative to the incomes of these households is relatively high. For households earning about PhP2,500 per month or income group 1, the total investment costs, which just represent expenditures for installing facilities, can range from 3% (dry pits) to 255% (toilets with access to a septic tank) of annual household income. The study also showed that the costs can be significant even if such households were provided long term loans at zero interest. In the case of families belonging to income group 1 for example, this could be around 10% of annual household income. While this might not seem large, it is important to note that such families already allocate a very large proportion of their incomes to food. These stress the point that poor households will have difficulty financing sanitation facilities. This argument is further supported by the findings from the FGDs where respondents cited economic factors for not having a toilet. In this exercise, the highest ranked reasons for not having a toilet were "cost is too high" and "no budget.". Hence, it is essential for government and other institutions to take an active role in providing access to poor households. Since this is already being done, as exemplified in the study sites, it may therefore be interpreted as a call for more active participation.

The costs provided in the previous paragraph focus more on access to on-site sanitation facilities. It goes without saying that government and other institutions should be more active in facilitating the construction of off-site treatment facilities.

Recommendation 3: In providing access to improved sanitation, there is a need to define priorities.

Recognizing resource constraints, it is essential for decision makers to define their priorities. These priorities go beyond target groups as it is also necessary to identify whether benefits are for the long or short term.

The focus should be on target groups that are most vulnerable, especially in locations that are lagging behind in terms of access to improved sanitation. Clearly, the most vulnerable group are children under the age of five years. This means a strong focus on poor regions or locations where a larger proportion of the population are children. A strong emphasis should also be given to rural areas since these continue to lag behind urban areas. However, areas where poor urban households are concentrated should not be overlooked because of the higher risks of disease transmission. Specific attention also appears to be needed in Mindanao, especially the ARMM, because this region continues to be behind the rest of the country in terms of sanitation improvements.

Defining the planning horizon over which sanitation benefits are projected to be realized is also very important. If the objective is to provide benefits over the short term, the low cost technologies (e.g., pit latrines and community toilets) might be sufficient. Apart from favorable BCRs, these interventions also have a relatively short payback period. For example, this study found that investment costs for dry and wet pit latrines can be recovered within a year. However, these interventions have a short expected life. Decision makers, be it the households, government or donor agencies, will therefore have to raise funds constantly in order to replace these facilities. If the objective is to generate benefits over the long term, then interventions that are higher up the sanitation ladder, including treatment facilities, are more attractive. In saying this however, provisions either in the form of funds or mechanisms must be made for the proper maintenance and operations of these projects.

Recommendation 4: In providing access to improved sanitation, key institutions must be cognizant of initial conditions and potential in project sites.

In selecting between the specific options, decision makers must be aware of the initial conditions of the target beneficiaries. Such an understanding is essential to increasing the success and sustainability of the option that is chosen.

This is supported by the findings in the study that an option could have divergent efficiency indicators in different sites. Observations from the sites also provide evidence for this recommendation, where some of the BCRs and other efficiency indicators are substantially less favorable under actual conditions compared to ideal conditions. An example is Alabel, where the STF was being under-utilized at the time of the survey. This led to unfavorable efficiency indicators under actual program conditions, which contradicted the results under ideal conditions. The UDDT-E users in the coastal region are also an example. The study found that only about one in five users in the site was recycling human waste. While the efficiency indicators were favorable to the technology in the site, the finding that the majority of the beneficiaries were not re-using seems contrary to the concept of EcoSan.

Where appropriate, this must be complemented with a review of the capacity and training needs of local government units to implement and maintain sanitation projects. This should cover social, technical and environmental aspects of sanitation as well as current implantation approaches. The objective of the exercise is to develop appropriate responses, including procedures, guidance and training courses.

Recommendation 5: Sanitation projects must be adequately monitored and evaluated.

Adequate and continuous monitoring and evaluation of sanitation projects is a must. This helps identify problems and proper action in the implementation of the projects, and is supported by study findings that actual BCRs are lower than ideal BCRs, which suggest that the facilities are not being used at optimal levels. This recommendation is also based on observations in the selected study sites. For example, during a site visit of the ESI research team to barangay Pugaro in 2009, it was observed that some of the community toilets were in a state of disrepair and not being used. A similar observation was cited by the survey team in the upland region of San Fernando. The initial intention in the site was to survey 49 beneficiaries. However, only 17 were interviewed because the rest of the beneficiaries were no longer using the facilities provided to them. The reasons range from households having a standard toilet which made the UDDT-E facility redundant to households not having the funds to construct the superstructure that will house the toilet provided.

Lessons from monitoring and evaluation of projects will also help in determining if these are replicable in other sites. Moreover, these provide information on the adjustments necessary to ensure greater success of future projects. Impact studies should also be implemented in order to examine the extent to which the target beneficiaries gained from the project. Unfortunately, the PAA component of this study found very little documentation on these activities. It found a lack of follow up work on completed projects and, if it was being done, a lack of documents from which to base the analysis.

On a broader scale, a review of the enabling environment (legislation, rules, regulations and guidance) should be conducted. This should assess the dissemination and effectivenesss of previous projects on the enabling environment and identify needs and gaps for further work.

Recommendation 6: Further education and information campaigns on personal hygiene and on the maintenance of sanitation facilities are needed.

Further education and information campaigns are needed in the area of sanitation. This includes the usual campaigns being conducted on personal hygiene and more. One example is septage management. In the course of the survey, and with supporting evidence from other studies, it was found that many households have not desludged their toilets or did so way beyond the prescribed period. Apart from the risks involved with overflowing septic tanks, such a practice also erodes the ability of the facility to reduce the release of effluents in the environment. Informing households about the risks associated with overflowing septic tanks and the proper maintenance of these facilities is one of the many small steps in reducing the costs of poor sanitation. Another example is finding that open defecation and urination are still present even for households that already have access to toilets. The surveys conducted in this study found that at least 49% of respondents who have access to either UDDT-E or community toilets in San Fernando and Dagupan still urinate in the open. In the case of households with access to community toilets in Dagupan, about 57% of the respondents said that they continue to practice open defecation. While putting an end to such practices may well require a mix of interventions, efforts and information campaigns should continue if only to emphasize the risks and costs as-

sociated with such practices.

Perhaps the information campaigns should also go as far as defining sanitation. While they seem to be aware of the consequences of poor sanitation, some participants in the FGD do not appear to have a full grasp of the meaning of sanitation. This is reflected in the mix of explanations provided during the exercise. At the extreme, the respondents in barangay Pugaro, Dagupan said that they do not understand the meaning of sanitation.

Following the results of the program approach analysis, education and information campaigns should not be limited to the beneficiaries of improved sanitation access. It should also extend to building understanding in local government units so that sanitation is given a higher priority in public spending.

Recommendation 7: Stricter enforcement of sanitation laws and ordinances.

The first chapter of this study presented a list of sanitation laws and ordinances which go as far back as 50 years. Despite this, there are signs that such laws are not being followed. The SuSEA project for example cited the case of septic tanks not complying with the standards set by the DOH.

Recommendation 8: Further research on the impacts of poor sanitation.

Following the limitations cited in Chapter 8, there is clearly a need for more research in the sanitation sector. These include:

- Generating more specific information on access to sanitation facilities. The current practice involves collecting information on the facilities available to households. There is no national information on the state of existing facilities; i.e., whether these facilities are functioning properly. There is also very little information on whether the design of such facilities conforms to pre-determined specifications, as is the case with septic tanks.
- Generating reliable site-specific and age-group-specific incidence and mortality rates for sanitation-related diseases such as diarrhea, helminthes, etc. Value of statistical life estimates for the Philippines will also enhance estimates on the value of premature death associated with poor sanitation. These are very important because, as shown by the results in ESI-1, health related costs represent the largest proportion of the costs of poor sanitation. In the current cost-benefit analysis, avoided health costs were also among the major benefits associated with each intervention.
- Establishing rigorous and site-specific quantitative links between sanitation and (a) disease incidence (attribution factors), (b) tourism, (c) water use and access, (d) water quality, (e) environment and (f) business activity. This involves identifying a rigorous methodology and estimates for establishing the magnitude of the benefits associated with improved sanitation, and if possible, with specific sanitation options. This can be relevant especially in the case of treatment systems which are likely to cause an improvement in the quality of the environment as a whole and of water bodies. The improvements associated with these resources could in turn translate to a clearer understanding of the benefits to tourism and business activities. In the current study, STFs and sewer systems were found to have lower efficiency indicators than on-site facilities such as dry and wet pits. Part of the explanation here could be due to the inability of the study to fully account for the environmental and health benefits associated with such off-site interventions.
- Generating more reliable estimates of the potential benefits from the reuse of human waste as fertilizer and biogas. This includes households (UDDT-E) and the reuse of wastewater and sludge treated in STFs.
- Establishing stronger evidence on the performance of projects in actual settings. This also includes recently introduced programs in the Philippines such as CLTS, and the evaluation of the various financial and implementation approaches.

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Annex 1: Implementation Approaches

There are six types of implementation approaches. These are:

- **Community-led total sanitation (CLTS)** involves facilitating a process to inspire and empower rural communities to stop open defecation and to build and use latrines, without offering external subsidies to purchase hardware such as pans and pipes. It focuses on igniting a change in sanitation behavior rather than constructing toilets. As the name implies, it concentrates on the whole community rather than on individual behaviors — collective benefit from stopping open defecation (OD) can encourage a more cooperative approach. It is fundamental that CLTS involve no individual household hardware subsidy and does not prescribe latrine models. It includes encouragement of local innovation for low cost toilet models using locally available materials so that people can select an affordable model that suits them best. (Kar & Pasteur, 2005; Kar & Chambers, 2008).

- **Sanitation marketing:** Sanitation marketing uses marketing techniques to achieve social objectives associated with sanitation. It is composed of four components — product, price, place and promotion (WSP, 2004). It works on the principle that the latrines should be affordable (price), responsive to the needs of users (product), and installed at the home of the user (place). Promotion, on the other hand, represents the effective use of various means to create awareness and convince consumers to use the product. Social marketing projects generally work by supporting and developing the local private sector and small-scale entrepreneurs to develop such skills and products. Households then buy the toilet of their choice directly from the private sector operator.

- **Informed choice:** This is based on providing consumers a full understanding of the costs and benefits of all available options of a toilet, including the options for individual components. Through the approach, households, communities and municipalities are informed about the benefits and disadvantages of different sanitation technology options before making their own decision as to which option/s to adopt.

- **Supply-driven:** This is a top-down supply-driven approach in which sewers or toilets are provided from a central planning viewpoint with "one-size-fits-all" solutions, giving people little choice in the technology they receive. Bureaucrats or technocrats determine the type of technology, costs and expected contribution of the users. The approach generally fails to take into account the expressed needs and conditions of the users of the sanitation facilities.

- **Strategic urban sanitation:** Based on a concept first proposed by Albert Wright of the World Bank, strategic urban sanitation was developed into a practical approach by GHK Research and Training in association with WEDC and Water and Sanitation Program, South Asia, 2000 and further developed and applied in Latin America and the Caribbean by Rosenweig and Perez (2002). It is based on the following principles:
  - Focus on town-wide solutions that expand coverage to as many residents as possible.
  - Ensure that any plan to improve sanitation services is financially sustainable.
  - Consult households on sanitation options that are currently in use and according to their expectations.
  - Engage in public consultations to discuss the options with stakeholders.
  - Include a specific health component.
  - Select an appropriate model for managing the provision of sanitation solutions.

- **Hygiene behavior change:** This involves initiatives to change the sanitation and water-related behavior of people towards improved hygiene practices. The traditional, and now generally discredited approach, is the rather didactic "hygiene education" — essentially telling people about the diseases associated with water and excreta, and what they should change in their behavior to avoid these. In recent years the emphasis has changed to a more participatory approach based on adult learning.

Annex Tables

ANNEX TABLE A1: COVERAGE, % OF HOUSEHOLDS, BY REGION

Region	2000			2007		
	Improved	Unimproved	No toilet	Improved	Unimproved	No toilet
Philippines	62.9	28.4	8.7	76.3	18.0	5.7
National Capital Region (NCR)	75.6	23.4	1.0	87.2	12.6	0.2
Cordillera Administrative Region (CAR)	54.8	41.6	3.5	78.6	20.9	0.5
1 Ilocos Region	71.5	27.0	1.5	87.3	12.7	-
2 Cagayan Valley	65.7	32.3	2.1	84.0	16.0	0.1
3 Central Luzon	73.6	22.9	3.4	89.0	10.9	0.2
4 Southern Tagalog	68.6	23.3	8.1	86.2	13.6	0.2
5 Bicol Region	55.5	28.9	15.6	74.4	25.3	0.4
6 Western Visayas	54.2	31.5	14.3	77.0	22.3	0.7
7 Central Visayas	53.2	25.7	21.1	71.1	28.6	0.4
8 Eastern Visayas	54.2	21.9	23.9	71.5	27.9	0.6
9 Zamboanga Peninsula, Western Mindanao	50.8	35.5	13.8	73.6	26.0	0.4
10 Northern Mindanao	61.5	32.2	6.3	80.2	19.7	0.1
11 Davao Region, Southern Mindanao	60.2	34.2	5.6	73.3	26.5	0.3
12 SOCCSKSARGEN, Central Mindanao	52.2	40.4	7.5	77.1	22.8	0.2
13 Caraga	65.3	24.8	9.9	82.8	16.8	0.5
Autonomous Region of Muslim Mindanao (ARMM)	26.0	62.0	12.0	51.1	48.9	0.1

Note: The values for each region and year may not add up to 100 because of rounding

ANNEX TABLE A2: SELECTION OF FIELD SITES FOR ECONOMIC STUDY

Site		Project/ Agency	Intervention		Direct beneficiaries	
No	Location		Specific Intervention	Classification[1]	Households[2]	Others
1	Alabel	DENR, funded by JICA	Septic Tank and Septage Treatment Facility	OSWT & OSTS	Yes	
2	Bayawan City	DILG/GTZ	Engineered Wetland/ Wastewater Treatment	OSTS	Yes	
3	Bayawan City	GTZ/Gawad Kalinga	UDDT-E	OSWT	Yes	
4	Dagupan	SIDA/SUSEA/ LGU	Toilets	OSWT	Yes	
5	Dumaguete	Linaw	Septic Tanks	OSWT	Yes	
6	Dumaguete	Linaw	Aerobic Pond	OSTS		Public market
7	Rodriguez (formerly Montalban)	Manila Water	Septage Treatment Facility	OSTS	Yes	
8	San Fernando City	ISSUE/CAPS	UDDT-E Toilets	OSWT	Yes	
9	Taguig	Manila Water	Septage Treatment Plant	OSTS	Yes	
10	U.P. Diliman	Manila Water	Septic Tank and Septage Treatment Facility (STF)	OSTS	Yes	
11	Antipolo City	EcoAsia	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
12	Caba	ISSUE	UDDT-E Toilets	OSWT	Yes	
13	Cabilao	PCWS	Toilets	Others		School
14	Calbayog	Linaw	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
15	Don Victoriano	PCWS	Biogas Septic Tank	OSWT	Yes	
16	Dumaguete	Linaw	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
17	El Nido	SCOTIA	UDDT-E	OSTS	Yes	
18	El Nido	SCOTIA	Sewerage and Central Treatment Project	PS	Yes	
19	El Nido	SCOTIA	Wastewater Treatment	OSTS		Public market
20	Giluntugan Island, Mactan	SCOTIA	UDDT-E	OSWT	Yes	
21	Ilocos Sur	DILG/GTZ	Toilets	Others		Bus terminal, school
22	Malaybalay	Linaw	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
23	Marikina City	Linaw	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
24	Maycauyan	PSA	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
25	Mindoro Oriental	DILG/GTZ	Toilets	Others		Bus terminal
26	Moalboal	SCOTIA	UDDT-E	OSWT	Yes	
27	Moalboal	SCOTIA	Wastewater Treatment	OSTS		Resort

ANNEX TABLE A2: SELECTION OF FIELD SITES FOR ECONOMIC STUDY (CONTINUED)

Site		Project/ Agency	Intervention		Direct beneficiaries	
No	Location		Specific Intervention	Classification[1]	Households[2]	Others
28	Naga City	Linaw	Wastewater treatment	OSTS		Hospital, public market, slaughterhouse
29	Nueva Vizcaya	DILG/GTZ	Toilets	Others		Bus terminal
30	Panglao	SCOTIA	Reed Bed System	OSTS		Bar/Restaurant
31	San Fernando City	ISSUE/CAPS	UDDT-E toilets	OSWT		School
32	San Fernando City	ISSUE/CAPS	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
33	Santol	ISSUE	UDDT-E Toilets	OSWT	Yes	
34	Sorsogon	ISSUE	UDDT-E Toilets	OSWT	Yes	
35	Sta. Rosa	ISSUE	UDDT-E Toilets	OSWT	Yes	
36	Sta. Rosa	PSA	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
37	Surigao City	PCWS	Biogas Septic Tank	OSWT	Yes	
38	Tagbiliran City	DILG/GTZ	DEWATS	OSTS	Yes	
39	TBD	PCWS	Biogas Septic Tank - Experimental use	OSWT	Yes	
40	Zamboanga City	PSA	Wastewater Treatment	OSTS		Hospital, public market, slaughterhouse
41	Bais	ISSUE	UDDT-E Toilets	OSWT	Yes	
42	Balicasag Island, Panglao	SCOTIA	UDDT-E	OSWT	Yes	
43	Danao	ISSUE	UDDT-E Toilets	OSWT	Yes	
44	Sabang, Puerto Galera	SCOTIA	UDDT-E	OSWT	Yes	
45	Sabang, Puerto Galera	SCOTIA	Sewerage and Central Treatment Plant	PS	Yes	
46	Tingloy Island	PCWS	UDDT-E	OSWT	Yes	
47	Tiaong, Brgy. Pugaro, Dagupan	PCWS	Biogas Septic Tank	OSWT	Yes	
48		Local Government	Public Toilets	OSN	Yes	

[1] OSN = on-site sanitation, OSWT = on-site disposal, watertight tank (includes UDDT), OSTS = on-site treatment system, PS = piped collection system
[2] Sites for which households are the direct beneficiaries of the projects.

ANNEX TABLE A 3. ASSESSMENT OF ADVANTAGES AND LIMITATIONS OF DIFFERENT DESIGN OPTIONS

No.	Design	Advantages	Limitations
		Designs involving field data collection	
1	Economic study designed entirely for research purposes, including matching and randomization of comparison groups	• Addresses the specific questions of the research • Highly scientific design	• Expensive and long time period • May not capture health impact • Limited generalisability
2	Economic research attached to other research studies (e.g., randomized clinical trial)	• Captures health impact with degree of precision • Can conduct additional research on other impacts • Add-on research cost is small • Statistical analysis possible	• Expensive and long time period • Few ongoing clinical trials • Requires collaboration from start • Trials may not reflect real conditions • Limited comparison options
3	Economic research attached to pilot study, with or without randomization	• Add-on research cost is small • Options are policy relevant • Matched case-control possible • Can start research in mid-pilot	• Few pilot programs available • Pilots often not designed with scientific evaluation in mind (e.g., before vs. after surveys) • Pilot conditions not real life • Limited comparison options
4	Economic research attached to routine government or NGO/donor programs, without randomization	• Reflects real life conditions (e.g., uptake and practices) • Research addresses key policy questions • Matched case-control possible	• No research infrastructure • No scientific design • Limited comparison options
		Designs involving secondary data collection	
5	Collection of data from a variety of local sources to conduct a modeling study	• Relatively low cost • Short time frame feasible • Can compare several options and settings in research model • Can mix locally available and non-local data	• Results imprecise and uncertain • Actual real-life implementation issues not addressed
6	Extraction of results from previous economic studies	• Low cost • Results available rapidly • Gives overview from various interventions and settings	• Limited relevance and results not trusted by policy makers • Published results themselves may not be precise

ANNEX TABLE A 4. DISEASES LINKED TO POOR SANITATION AND HYGIENE, AND PRIMARY TRANSMISSION ROUTES AND VEHICLES

Disease	Pathogen	Primary transmission route	Vehicle
Diarrheal diseases (gastro-intestinal tract infections)			
Rotavirus diarrhea	Virus	Fecal-oral	Water, person-to-person
Typhoid/Paratyphoid	Bacterium	Fecal-oral and urine-oral	Food, water + person-person
Vibrio cholera	Bacterium	Fecal-oral	Water, food
Escherichia Coli	Bacterium	Fecal-oral	Food, water + person-person
Amebiasis (amebic dysentery)	Protozoa [1]	Fecal-oral	Person-person, food, water, animal feces
Giardiasis	Protozoa [1]	Fecal-oral	Person-person, water (animals)
Salmonellosis	Bacterium	Fecal-oral	Food
Shigellosis	Bacterium	Fecal-oral	Person-person +food, water
Campylobacter Enteritis	Bacterium	Fecal-oral	Food, animal feces
Helicobacter pylori	Bacterium	Fecal-oral	Person-person + food, water
Protozoa			
Other viruses [2]	Virus	Fecal-oral	Person-person, food, water
Malnutrition	Caused by diarrheal disease and helminthes		
Helminthes (worms)			
Intestinal nematodes [3]	Roundworm	Fecal-oral	Person-person + soil, raw fish
Digenetic trematodes (e.g., Schistosomiasis Japonicum)	Flukes (parasite)	Fecal/urine-oral; fecal-skin	Water and soil (snails)
Cestodes	Tapeworm	Fecal-oral	Person-person + raw fish
Eye diseases			
Trachoma	Bacterium	Fecal-eye	Person-person, via flies, fomites, coughing
Adenoviruses (conjunctivitis)	Protozoa [1]	Fecal-eye	Person-person
Skin diseases			
Ringworm (Tinea)	Fungus (Ectoparasite)	Touch	Person-person
Scabies	Fungus (Ectoparasite)	Touch	Person-person, sharing bed and clothing
Other diseases			
Hepatitis A	Virus	Fecal-oral	Person-person, food (especially shellfish), water
Hepatitis E	Virus	Fecal-oral	Water
Poliomyelitis	Virus	Fecal-oral, oral-oral	Person-person
Leptospirosis	Bacterium	Animal urine-oral	Water and soil - swamps, rice fields, mud

Sources: WHO http://www.who.int/water_sanitation_health/en/ and [75, 76]

[1] There are several other protozoa-based causes of GIT, including
- Balantidium coli – dysentery, intestinal ulcers
- Cryptosporidium parvum - gastrointestinal infections
- Cyclospora cayetanensis - gastrointestinal infections
- Dientamoeba fragilis – mild diarrhea
- Isospora belli/hominus – intestinal parasites, gastro-intestinal infections

[2] Other viruses include:
- Adenovirus – respiratory and gastro-intestinal infections
- Astrovirus – gastro-intestinal infections
- Calicivirus – gastro-intestinal infections
- Norwalk viruses – gastro-intestinal infections
- Reovirus – respiratory and gastro-intestinal infections

[3] Intestinal nematodes include:
- Ascariasis (roundworm - soil)
- Trichuriasis trichiura (whipworm)
- Ancylostoma duodenale/Necator americanus (hookworm)
- Intestinal Capillariasis (raw freshwater fish in Philippines)

ANNEX TABLE A 5. WATER QUALITY MEASUREMENT PARAMETERS PER LOCATION, AND TEST METHOD

Parameter	Test	Location	Test conducted for		
			Surface water	Well water	Piped tap water
E-coli (cfu/100 ml)	Coliscan	Laboratory	Yes	Yes	No
Biological Oxygen Demand (BOD5) (mg/L)	5 day incubation	Laboratory	Yes	No	No
Chemical Oxygen Demand (COD) (mg/L)	5 day incubation	Laboratory	Yes	No	No
Dissolved Oxygen (DO) (mg/L)	Hach DO Probe	On-site and Laboratory	Yes	No	No
Nitrate (NO3-) (mg/L)	Hach Photometer	Laboratory	Yes	No	No
Ammonical Nitrogen (mg/L)	Hach Photometer	Laboratory	Yes	Yes	No
Conductivity (µS/cm)	YSI Conductivity Meter	Laboratory	Yes	Yes	No
Turbidity (NTU)	TurbidiMeter	On-site and Laboratory	Yes	Yes	No
pH	pH Probe	On-site and Laboratory	Yes	No	No
Water temperature (oC)	Hach ThermoProbe	On-site and Laboratory	Yes	No	No
Residual chlorine (Cl) (in places provided with centralized chlorinated water supply) (mg/L)	Field Kit	On-site	No	No	Yes

ANNEX TABLE A 6. KEY FORMULAS, VARIABLES AND DATA SOURCES FOR CALCULATING MONETIZED BENEFITS

Impacts included	Variable	Data sources
1. HEALTH *(All calculations are made using disaggregated data inputs on disease and age grouping: 0-4 years, 5-14 years, 15+ years)*		
1.1 Health care savings *Calculation:* *[Prevalence or incidence X Attribution to poor sanitation X ((% seeking outpatient care X visits per case X unit cost per visit (medical and patient)) +* *(Inpatient admission rate X days per case X unit cost per day (medical and patient))] X Proportion of disease cases averted*	Diarrheal disease incidence (0-4 years)	DHS
	Diarrheal disease incidence (over 5 years)	WHO stats
	Helminthes prevalence	Global review
	Indirect diseases incidence (malaria, ALRI)	WHO statistics
	Malnutrition prevalence	UNICEF/WHO statistics
	Attribution of fecal-oral diseases to poor sanitation	WHO. Value = 88%
	Attribution of helminthes to poor sanitation	Global review. Value = 100%
	% disease cases seeking health care	DHS, SES, ESI household survey, health statistics
	Outpatient visits per patient	Health facility statistics, ESI household survey
	Inpatient admission rate	
	Inpatient days per admission	
	Health service unit costs	
	Other patient costs (transport, food)	ESI household survey
	% disease cases averted	International literature review
1.2 Health morbidity-related productivity gains *Calculation:* *[Prevalence X Attribution to poor sanitation X Days off productive activities X Value of time] X Proportion of disease cases averted*	Days off productive activities	ESI household survey
	Basis of time value: GDP per capita	National economic data World Bank data Average product per capita (at sub-national level, where available) – 30% for adults, 15% for children
1.3 Premature mortality savings *Calculation:* *[Mortality rate X Attribution to poor sanitation X Value of life] X Proportion of disease cases averted*	Mortality rate (all diseases)	National and WHO statistics
	Basis of time value: GDP per capita	National economic data World Bank data Annual value of lost production of working adults (human capital approach), from the time of death until the end of (what would have been) their productive life.
	Discount rate for future earnings	Government cost of capital estimate (8%)
	Long-term economic growth	Assumption
	Value-of-statistical-life	Meta-analyses from developed country studies
1.4 Disability-adjusted life-years (DALY) averted *Calculation:* *DALY = YLD+YLL* *YLD: discounted disability based on weight and years equivalent time* *YLL: discounted future years of healthy life lost*	Duration of disability	ESI household survey
	Disability weighting	WHO burden of disease project
	Healthy life expectancy	WHO statistics
	Discount rate for future disease burdens	Government cost of capital estimate (8%)
	Morbidity and mortality rates	Various: see 1.1 and 1.3 (above)

ANNEX TABLE A 6. KEY FORMULAS, VARIABLES AND DATA SOURCES FOR CALCULATING MONETIZED BENEFITS (CONTINUED)

Impacts included	Variable	Data sources
2. WATER (for household use) *(weighted average costs were estimated for each water source and for each household water treatment method)*		
2.1 Household water access savings *Calculation:* *Annual costs X % costs reduced, per water source*	Drinking water sources (%) in wet and dry seasons	ESI household survey
	Annual financial cost per household, per water source	ESI household survey; ESI market survey
	Annual non-financial cost per household, per water source	ESI household survey
	Proportion of access cost reduction under scenario of 100% improved sanitation, per water source	ESI household survey; assumption
2.2 Household water treatment savings *Calculation:* *(% households treating water per method X annual cost) X % households who stop treating*	Proportion of households treating their water, by method	ESI household survey, validated by other national statistics (DHS, SES)
	Full annual cost per water treatment method	ESI household survey; ESI market survey
	Proportion of households currently treating who stop treating under scenario of 100% improved sanitation	ESI household survey; assumption: as well as stopping treatment, households may switch to an alternative –cheaper – treatment method if the cleaner water sources enable different water purification methods
3. ACCESS TIME SAVINGS *(weighted average costs estimated for each age category and gender — young children, children and male and female adults)*		
Calculation: *% household members using OD X Time saved per trip due to private toilet X average trips per day X value of time*	Household composition (demographics)	ESI household survey
	Sanitation practice, by age group	ESI household survey
	Average round trip time to access site of open defecation or shared toilet	ESI household survey
	Average number of round trips to defecation site per day	ESI household survey
	Basis of time value: GDP per capita	National economic data World Bank data Average product per capita (at sub-national level, where available) – 30% for adults, 15% for children
4. EXCRETA REUSE GAINS *(reuse of excreta as fertilizer from either UDDT or double-vault pit latrine; and reuse of energy value from biogas digester)*		
Calculation: *(% households using product themselves X value in own use) + (% households selling product X selling price)*	% households using reuse methods	ESI household survey
	% households using product themselves	ESI household survey
	% households selling product to others	ESI household survey
	Selling price	ESI household & market survey
	Value in own use	ESI market survey; assumption

ANNEX TABLE A 7. HOUSEHOLDS SAMPLED VERSUS TOTAL HOUSEHOLDS PER VILLAGE/COMMUNITY

Site	Number of households	Improved					Unimproved				
		Sewerage (treated)[1]	Septic tanks (desludged and treated)	Septic tanks (not yet desludged)[2]	Wet pit latrines	Dry pit latrines (UDDT-E)	Dry pit latrines (others)	Shared	Public	Pit latrines (unimproved)	OD	Total
Alabel	Sample											
	Actual		44	77	34						70	225
	Planned		44	77	34						70	225
	Total		44	889	57						433	1,423
	% Sampled											
	Actual		100	9	60						16	16
	Planned		100	9	60						16	16
Bayawan	Sample											
	Actual		180								37	217
	Planned		181								33	214
	Total		488								33	521
	% Sampled											
	Actual		37								112	42
	Planned		37								100	41
Dagupan	Sample											
	Actual			9	61			48	65		40	223
	Planned			70				49	53		30	202
	Total			408				119	143		30	700
	% Sampled											
	Actual			17				40	45		133	32
	Planned			17				41	37		100	29
San Fernando	Sample											
	Actual				61	47			65	7	2	182
	Planned				74	61			31	0	22	188
	Total				614	63			31	-	22	730
	% Sampled											
	Actual				10	75			210	-	9	25
	Planned				12	97			100	-	100	26
San Fernando - Upland	Sample											
	Actual					17	24	39				80
	Planned					49	38					87
	Total	1				17	107					124
	% Sampled											
	Actual					100	59					65
	Planned					288	36					70

ANNEX TABLE A 7. HOUSEHOLDS SAMPLED VERSUS TOTAL HOUSEHOLDS PER VILLAGE/COMMUNITY (CONTINUED)

Site	Number of households	Improved						Unimproved				
		Sewerage (treated)[1]	Septic tanks (desludged and treated)	Septic tanks (not yet desludged)[2]	Wet pit latrines	Dry pit latrines (UDDT-E)	Dry pit latrines (others)	Shared	Public	Pit latrines (unimproved)	OD	Total
Taguig	Sample											
	Actual	84	91	92							76	343
	Planned	82	79	83							69	313
	Total	3350	1456	9872							400	15,078
	% Sampled											
	Planed	3	6	1							19	2
	Actual	2	5	1							17	2
All sites	Sample											
	Actual	84	315	178	156	47	24	87	130	7	225	1,190
	Planned	82	304	230	108	61	-	49	84	0	224	1,142
	Total	3,350	1,988	11,169	671	63	-	119	174	-	918	18,452
	% Sampled											
	Actual	3	16	2	23	75	-	nc	75	-	25	6
	Planned	2	15	2	16	97	-	nc	48	-	24	6

Notes: Total number of households is based on estimates conducted prior to the survey.
[1] Decentralized Conventional treatment
[2] Many of the households here have access to desludging

ANNEX TABLE A 8. SAMPLE SIZES OF OTHER SURVEYS IN STUDY SITES

Site	Group	Focus Group Discussion		Health facilities		Water quality measurement		
		Women	Men	Hospital	Clinic	Wells	Surface	Piped water
Alabel	Unimproved	8	9	1	-	7	5	3
	Improved	11	8					
	Sub-total	**19**	**17**					
Bayawan	Unimproved	5	5	1	2	2	8	5
	Improved	10	10					
	Sub-total	**15**	**10**					
Dagupan	Unimproved	4	6	2	-	6	4	0
	Improved	10	10					
	Sub-total	**14**	**16**					
San Fernando	Unimproved	5	5	1	1	13	10	5
	Improved	20	21					
	Sub-total	**25**	**26**					
Taguig	Unimproved	5	6	2	-	2	8	6
	Improved	15	14					
	Sub-total	**20**	**20**					
Total	**Unimproved**	27	31	7	3	30	35	19
	Improved	66	63					
	Total	**93**	**94**					

ANNEX TABLE B 1. HEALTH RATES FOR DISEASES, BY SITE, VALUES ARE PER 1000 PERSONS

Disease	Average rural sites	Average urban sites	Alabel	Bayawan	Dagupan	San Fernando - Coastal	San Fernando - Upland	Taguig
Number of cases (All age groups)								
Direct diseases								
Diarrhea	779.8	808.9	715.4	879.3	856.2	733.6	673.8	819.3
Helminthes	374.2	380.2	372.5	379.0	396.7	370.0	371.6	373.3
Number of cases (Under the age of 5 years)								
Direct diseases								
Diarrhea	4,120.6	4,159.5	4,142.0	4,121.1	4,159.5	4,151.2	4,120.6	4,159.5
Helminthes	369.7	369.7	369.7	369.7	369.7	369.7	369.7	369.7
Indirect diseases								
Malnutrition	274.7	233.7	278.0	270.0	285.0	285.0	285.0	162.0
Malaria	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
ALRI	67.6	46.0	55.7	67.4	46.0	50.6	67.6	46.0
Total (under 5s)	4,833.0	4,809.2	4,845.8	4,828.5	4,860.5	4,856.8	4,843.3	4,737.5
Number of deaths (All age groups)								
Direct diseases								
Diarrhea	0.26	0.16	0.19	0.29	0.16	0.16	0.23	0.16
Helminthes	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00
Number of deaths (under the age of 5 years)								
Direct diseases								
Diarrhea	1.32	0.87	1.09	1.41	0.82	0.95	1.42	0.82
Helminthes	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Indirect diseases								
Malnutrition	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Malaria	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.01
ALRI	0.60	0.35	0.46	0.60	0.35	0.40	0.60	0.35
Measles	0.11	0.06	0.08	0.11	0.06	0.07	0.11	0.06
Other diseases	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Total (under 5s)	2.22	1.47	1.82	2.31	1.41	1.61	2.33	1.41

ANNEX TABLE B 1. HEALTH RATES FOR DISEASES, BY SITE, VALUES ARE PER 1000 PERSONS (CONTINUED)

Disease	Average rural sites	Average urban sites	Alabel	Bayawan	Dagupan	San Fernando - Coastal	San Fernando - Upland	Taguig
Disability Life Years (DALYs): All age groups								
Direct diseases								
Diarrhea	1.13	1.17	1.03	1.27	1.23	1.06	0.97	1.18
Helminthes	2.25	2.29	2.24	2.28	2.39	2.23	2.24	2.25
Disability Life Years (DALYs): Under the age of 5 years								
Direct diseases								
Diarrhea	6.0	6.0	6.0	5.9	6.0	6.0	5.9	6.0
Helminthes	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Indirect diseases								
Malnutrition	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7
Malaria	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ALRI	5.7	5.2	5.5	5.8	5.7	5.7	5.8	4.6
Measles	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.8
Other diseases	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Total (under 5s)	17.5	16.9	17.2	17.6	17.5	17.5	17.6	16.0

ANNEX TABLE B 2. COMPARISON OF DATA SOURCES FOR SELECTED DISEASES

Disease	Age	Data source	Cases/1000 persons
Diarrhea	Under 5	ESI Survey	138.89
		DHS	2,765.89
		WHO (2005)	4,140.79
		WHO rates (used in ESI 1)	4,506.95
		FHSIS	29.16
	Age 5-14	ESI Survey	345.62
		WHO (2005)	520.00
		WHO rates (used in ESI 1)	327.80
		FHSIS	3.51
	Age 15+	ESI Survey	628.57
		WHO (2005)	260.00
		WHO rates (used in ESI 1)	163.90
		FHSIS	2.10
Helminthes	Under 5	Brooker (2003)	369.66
	Age 5-14	Brooker (2003)	459.66
		SuSEA Survey (2008)	490.00
	Age 15+	Brooker (2003)	342.47
Malnutrition			
Severe underweight (<-3SD)	Under 5	FNRI (2003)	88.00
Moderate underweight (-2 to -3 SD)		FNRI (2003)	192.00
Mild underweight (-1 to 2 SD)		FNRI (2003)	293.00
Non-underweight (>-1SD)		FNRI (2003)	427.00
Malaria	Under 5	WHO (2005)	0.39
		FHSIS	0.39
	Age 5-14	FHSIS	0.37
	Age 15+	FHSIS	0.18
ALRI	Under 5	WHO (2005)	56.54
		DHS	2,867.46
		FHSIS	14.43
	Age 5-14	FHSIS	3.98
	Age 15+	FHSIS	2.26
Hepatitis A&E	Under 5	FHSIS	0.04
	Age 5-14	FHSIS	0.08
	Age 15+	FHSIS	0.05

ANNEX TABLE B 3. EVIDENCE ON TREATMENT SEEKING BEHAVIOR FOR OTHER DISEASES

Data source by disease, rural/urban and year	Observations	% seeking treatment from					No treatment (%)
		Public provider	Private formal clinic	Private informal care	Pharmacy	Self treatment	
Diarrhea							
ESI Sites (2008, urban)							
0-4 years	65	42.0	9.5	3.8	68.9	62.5	4.6
5-14 years	13	46.2	15.4	0.0	76.9	61.5	0.0
15 and over	27	11.9	17.8	0.0	65.4	59.3	7.4
ESI Sites (2008, rural)							
0-4 years	24	45.8	12.5	0.0	37.5	54.2	12.5
5-14 years	11	45.5	9.1	0.0	45.5	54.5	9.1
15 and over	36	16.2	16.2	0.0	50.0	60.2	11.1
ESI All sites (2008, all sites)							
0-4 years	89	43.1	10.5	2.6	60.0	60.2	6.7
5-14 years	24	45.8	12.5	0.0	62.5	58.3	4.2
15 and over	63	14.6	16.7	0.0	56.5	54.0	9.5
DHS (2003): 0-4 years							
All sites	714	32.4	-	-	17.78	22.4	
Rural	-	36.2	-	-	15.10	23.4	
Urban	-	28.6	-	-	20.50	21.3	
Symptoms of ALRI							
ESI Sites (2008, urban)							
0-4 years	110	28.6	19.0	4.2	62.5	70.0	5.5
5-14 years	16	0.0	18.8	0.0	73.3	62.5	0.0
15 and over	12	18.5	27.7	0.0	60.0	63.6	0.0
Diarrhea							
ESI Sites (2008, rural)							
0-4 years	76	42.5	10.3	6.4	53.3	53.3	6.6
5-14 years	10	61.3	0.0	8.8	60.0	70.0	0.0
15 and over	6	33.3	0.0	0.0	83.3	33.3	0.0
ESI All sites (2008, all sites)							
0-4 years	186	34.6	15.0	5.2	58.7	63.2	5.9
5-14 years	26	29.9	4.3	4.3	68.0	65.4	0.0
15 and over	18	24.1	18.0	0.0	68.8	52.9	0.0
DHS (2003): 0-4 years							
All sites	1,835	46.3		-	-	-	-
Rural	-	50.5		-	-	-	-
Urban	-	42.9		-	-	-	-

ANNEX TABLE B 4. UNIT COSTS ASSOCIATED WITH TREATMENT OF DISEASES

Health provider	Outpatient cost (PhP)		Inpatient cost (PhP)		
	Health care	Incidentals[1]	ALOS[2]	Health care[3]	Incidentals[1]
			Diarrhea		
Formal care					
Rural (ref)	645	64	4	2,910	71
Urban (ref)	693	64	4	3,464	71
Informal					
Rural (ref)	55				
Urban (ref)	55				
Pharmacy					
Rural (ref)	212				
Urban (ref)	219				
Self-treatment					
Rural (ref)	64				
Urban (ref)	64				
			Helminthes		
Formal care					
Rural (ref)	319	64			
Urban (ref)	365	64			
Informal					
Rural (ref)	55				
Urban (ref)	55				
Pharmacy					
Rural (ref)	119				
Urban (ref)	117				
Self-treatment					
Rural (ref)	64				
Urban (ref)	64				
			ALRI and Malaria		
Formal care					
Rural (ref)	545	46	5	3,535	58
Urban (ref)	593	46	5	4,248	58
Informal					
Rural (ref)	27				
Urban (ref)	27				
Pharmacy					
Rural (ref)	199				
Urban (ref)	199				
Self-treatment					
Rural (ref)	64				
Urban (ref)	64				

[1] Incidentals: non-health patient costs such as transport, food, and incidental expenses, per outpatient visit and per inpatient stay.
[2] ALOS: average length of stay. [3] Inpatient health care costs are presented per stay

ANNEX TABLE C 1. WATER QUALITY[1]

Site/ Barangay	Rural/ Urban	Water Source	Water Classification	Residual Chlorine (ppm)	BOD (mg/L)	COD (mg/L)	Turbidity (NTU)	Conductivity (mS at 25°C)	DO (mg/L)	Nitrate (mg/L)	Ammoniacal Nitrogen (mg/L)	pH	E .coli	Coliform[3]	Water uses[2]
ALABEL															
Kawas	Rural	Canal / Ditch	Surface	-	9	15	43	637	2.8	0.27	< 0.2	7.0	positive	positive[1]	-
Dumulok	Rural	Mofong Lake	Surface	-	3	17	7	142	6.3	0.05	< 0.2	6.0	negative	positive[2]	CBD
Kawas	Rural	Public Hand Pump	Bore Hole	-	-	-	-	1,039	-	-	< 0.2	-	negative	negative	CBD
Poblacion	Urban	Private Hand Pump	Bore Hole	-	-	-	-	1,610	-	-	3.82	-	negative	positive[2]	B
Poblacion	Urban	Communal Hand Pump	Bore Hole	-	-	-	-	590	-	-	< 0.2	-	positive	positive[1]	CBD
Poblacion	Urban	HH Private Tap	Piped	R1 = 0; R 2 = 0	-	-	-	-	-	-	-	-	-	-	CB
Poblacion	Urban	Water from distribution plant (after chlorination feeder)	Piped	R1 = 0.11; R 2 = 0.06	-	-	-	-	-	-	-	-	-	-	CBD
Poblacion	Urban	Storage Tank	Piped	R1 =0; R 2 =0	-	-	-	-	-	-	-	-	-	-	CBD
Kawas	Rural	Piped Water from Bore hole Note: This replaces HH Private Tap since it has not been in use for 3 years.	Bore Hole	-	-	-	-	816	-	-	< 0.2	-	negative	negative	B
	Rural	Maturation Pond (open): Alabel STF	Surface	-	27	83	6	100	5	0.09	0.29	6.0	negative note: positive for Coliform MPN value= >8.0 MPN/ 100mL	negative	
Poblacion	Urban	Creek (discharge area) - open channel	Surface	-	9	10	46	627	4.3	0.59	< 0.2	7.0	positive	positive1	B
	Rural	Maribulan River	Surface	-	25	50	53	454	4.4	0.3	< 0.2	7.0	negative	positive2	B
Poblacion	Urban	Private HH - Piped Water (via Solar Powered Distribution system)	Dug Well	-	-	-	-	666	-	-	< 0.2	-	negative	negative	CBD
Bagacay	Rural	HH Private Tap (from Solar Powered Distribution System)	Dug Well	R1 = 0; R 2 = 0	-	-	-	-	-	-	-	-	-	-	CBD
Bagacay	Rural	Open Dug Well	Dug Well	-	-	-	-	690	-	-	< 0.2	-	negative	negative	CBD

ANNEX TABLE C 1. WATER QUALITY[1] (CONTINUED)

Site/ Barangay	Rural/ Urban	Water Source	Water Classification	Residual Chlorine (ppm)	BOD (mg/L)	COD (mg/L)	Turbidity (NTU)	Conductivity (mS at 25°C)	DO (mg/L)	Nitrate (mg/L)	Ammoniacal Nitrogen (mg/L)	pH	E .coli	Coliform[3]	Water uses[2]
BAYAWAN															
GK Village	Rural	Coastline / Beach (within WW discharge area)	Surface	-	14	287	28	41,200	3.6	-	< 0.2	8.4	negative	positive[2]	B
GK Village	Rural	Pond (open)	Surface	-	7	37	4	1,318	1.2	-	7.34	7.0	negative	positive[2]	-
Manampa	Rural	Manampa Spring (Source of Bayawan water district)	Surface	-	16	62	184	262	5.6	0.33	< 0.2	7.0	negative	positive[2]	CBD
Bayawan City	Rural	Pagatban River	Surface	-	11	62	79	1,812	5.4	0.24	< 0.2	8.0	negative	positive[2]	CBD
GK Village	Rural	Community Public Well	Bore Hole	-	-	-	-	1,454	-	-	< 0.2	-	negative	positive[2]	CB
GK Village	Rural	Private Well (Dug Well)	Bore Hole	-	-	-	-	702	-	-	< 0.2	-	negative	positive[2]	CB
Tinago	Urban	HH Tap Water	Piped	R1 = 0.22; R2 = 0.30	-	-	-	-	-	-	-	-	-	-	CBD
GK Village	Rural	HH Tap Water	Piped	R1 = 0.11; R2 = 0.10	-	-	-	-	-	-	-	-	-	-	CBD
GK Village	Rural	Household Tap Water	Piped	R1 = 0.09; R2 = 0.11	-	-	-	-	-	-	-	-	-	-	CBD
Bayawan City	Urban	Bayawan Water District	Piped	R1 = 0.35; R 2 = 0.50	-	-	-	-	-	-	-	-	-	-	CBD
Banga	Rural	Household Tap Water	Piped	R1 = 0.34; R 2 = 0.40	-	-	-	-	-	-	-	-	-	-	CBD
Tinago	Urban	Coastline / Beach Area	Surface	-	1	821	9	38,900	5	-	< 0.2	8.4	positive	positive[1]	B
DAGUPAN															
Pugaro	Urban	Pugaro River	Surface	-	150	250	52	12,890	7.2	0.49	< 0.2	8.6	negative	positive[2]	-
Pugaro	Urban	Manamikdak Creek	Surface	-	50	83	15	1,988	5.4	< 0.001	< 0.2	8.9	negative	positive[2]	-
Pugaro	Urban	Stagnant Water (inside the community)	Surface	-	111	185	30	5,810	3.9	< 0.001	3.96	8.8	negative	positive[2]	-
Pugaro	Urban	Public Open Well	Dug Well	-	-	-	< 0.3	1,040	-	-	< 0.2	-	negative	negative	CBD
Pugaro	Urban	Public Well	Bore Hole	-	-	-	-	564	-	-	< 0.2	-	negative	negative	CBD
Pugaro	Urban	Private Hand Pump	Bore Hole	-	-	-	-	1,168	-	-	6.61	-	negative	negative	CBD
Pugaro	Urban	Public Hand Pump	Bore Hole	-	-	-	-	505	-	-	< 0.2	-	negative	negative	CBD
Pugaro	Urban	Public Well (inside school) - Jetmatic converted from hand pump	Bore Hole	-	-	-	-	463	-	-	< 0.2	-	negative	negative	CBD
Pugaro	Urban	Coastline (beach area)	Surface	-	50	597	3.4	44,200	3.3	< 0.001	< 0.2	9.1	negative	positive[2]	B
Pugaro	Urban	Public Well	Bore Hole	-	-	-	-	1028	-	-	< 0.2	-	negative	positive[2]	CBD

ANNEX TABLE C 1. WATER QUALITY[1] (CONTINUED)

Site/ Barangay	Rural/ Urban	Water Source	Water Classification	Residual Chlorine (ppm)	BOD (mg/L)	COD (mg/L)	Turbidity (NTU)	Conductivity (mS at 25°C)	DO (mg/L)	Nitrate (mg/L)	Ammoniacal Nitrogen (mg/L)	pH	E .coli	Coliform	Water uses[2]
SAN FERNANDO															
Poro	Rural	Coastline (Beach area)	Surface	-	58	578	9	36,600	4.4	0.04	< 0.2	8.4	negative	positive[2]	-
Ilocanos Sur	Urban	Coastline (Beach area)	Surface	-	108	1073	6	39,400	4.3	-	< 0.2	8.4	negative	positive[2]	-
Ilocanos Sur	Urban	HH Tap Water	Piped	R1 = 0.05; R2 =0.05	-	-	-	-	-	-	-	-	-	-	CBD
Ilocanos Sur	Urban	HH Tap Water	supplied water near main source	R1 = 0.05; R2 =0.06	-	-	-	-	-	-	-	-	-	-	CBD
Poro	Rural	Community Well	Bore Hole	-	-	-	-	627	-	-	< 0.2	-	negative	negative	CBD
Poro	Urban	Private Deep Well	Bore Hole	-	-	-	-	976	-	-	< 0.2	-	negative	positive[2]	CB
Poro	Rural	HH Tap Water	Piped	R1= 0; R2 =0	-	-	-	-	-	-	-	-	-	-	CBD
Poro	Rural	HH Tap Water	supplied near main source	R1= 0.10; R2 =0.10	-	-	-	-	-	-	-	-	-	-	CBD
Lon-Oy	Rural	Spring , Groundwater (MLUWD)	Surface	-	2	8	4.7	102.5	5	0.06	3.96	5.5	negative	positive[2]	CBD
Naguirangan	Rural	Spring , Groundwater (MLUWD)	Bore Hole	-	-	-	-	546	-	-	0.44	-	negative	negative	CBD
Bauang	Rural	Spring , Groundwater (MLUWD)	Bore Hole	-	-	-	-	420	-	-	< 0.2	-	negative	negative	CBD
Dili	Rural	Spring , Groundwater (MLUWD)	Bore Hole	-	-	-	-	477	-	-	< 0.2	-	negative	negative	CBD
Poro	Rural	Creek	Surface	-	55	805	11	34,800	3.8	0.1	< 0.2	8,2	negative	positive[2]	B
Ilocanos Sur	Urban	Canal / Small Creek (discharge area - from the city to the sea)	Surface	-	164	392	46	763	1.1	-	5.14	7.7	negative	positive[2]	-
San Agustin	Urban	Coastline (beach area)	Surface	-	20	805	3.3	36,400	4.1	-	< 0.2	8.5	negative	positive[2]	B
San Agustin	Urban	Canal / Estero	Surface	-	352	475	108	921	1.2	-	14.83	8.1	negative	positive[2]	-
San Agustin	Urban	HH Tap Water	Piped	-	-	-	-	-	-	-	-	-	-	-	-
San Agustin	Urban	HH Private Deep Well	Bore Hole	-	-	-	-	1,163	-	-	3.38	-	negative	positive[2]	CBD
San Agustin	Urban	HH Private Dug Well	Dug Well	-	-	-	4	580	-	-	0.73	-	negative	positive[2]	CB
San Agustin	Urban	HH Public Well / Hand Pump	Bore Hole	-	-	-	-	1,437	-	-	2.79	-	negative	positive[2]	CBD
Nagyubyu-ban	Rural	Spring Water	Surface	-	5	8	0.22	644	1.8	0.12	< 0.2	7.2	negative	negative	CBD
Nagyubyu-ban	Rural	Spring Water	Surface	-	2	5	0.59	486	1.6	0.35	< 0.2	7.1	negative	positive[2]	CBD

ANNEX TABLE C 1. WATER QUALITY[1] (CONTINUED)

Site/ Barangay	Rural/ Urban	Water Source	Water Classification	Residual Chlorine (ppm)	BOD (mg/L)	COD (mg/L)	Turbidity (NTU)	Conductivity (mS at 25°C)	DO (mg/L)	Nitrate (mg/L)	Ammoniacal Nitrogen (mg/L)	pH	E .coli	Coliform	Water uses[2]
Nagyubyuban	Rural	Creek	Surface	-	5	12	1.31	592	3.2	0.32	< 0.2	7.9	negative	positive[2]	-
Nagyubyuban	Rural	Private Well	Bore Hole	-	-	-	-	642	-	-	< 0.2	-	negative	positive[2]	CBD
Nagyubyuban	Rural	Public Well	Bore Hole	-	-	-	-	514	-	-	< 0.2	-	negative	positive[2]	CBD
Nagyubyuban	Rural	Dug Well	Dug Well	-	-	-	0.95	353	-	-	< 0.2	-	negative	negative	CBD
Nagyubyuban	Rural	Groundwater	Bore Hole	-	-	-	-	622	-	-	< 0.2	-	negative	positive[2]	CBD
Nagyubyuban	Rural	Groundwater	Bore Hole	-	-	-	-	825	-	-	< 0.2	-	negative	positive[2]	CBD
TAGUIG															
Taguig City	Urban	Taguig River	Surface	-	124	149	36	384	<0.05	-	7.05	7.4	negative	negative	-
Diego Silang	Urban	Pond (open)	Surface	-	30	47	12	618	1.4	-	11.16	7.0	negative	positive[2]	-
Centennial Village	Urban	Pond (open)	Surface	-	24	60	14	747	1	-	2.06	5.9	negative	positive[2]	-
Western Bicutan	Urban	Creek	Surface	-	352	616	89	799	<0.05	-	41.41	7.7	negative	positive[2]	-
Western Bicutan	Urban	Creek	Surface	-	180	435	299	1,432	0.7	-	32.31	10.2	negative	positive[2]	-
Western Bicutan	Urban	Creek	Surface	-	29	74	32	374	<0.05	-	11.46	10.2	negative	negative	-
La Mesa Dam, Balara, Quezon City	Urban	La Mesa Dam -Intake Water	Surface	-	18	23	6	111	3	-	<0.2	8.3	negative	positive[2]	CBD
La Mesa Dam, Balara, Quezon City	Urban	La Mesa Dam -Treated Water	Surface	-	11	14	3	121	2.2	-	<0.2	7.5	negative	positive[2]	CBD
Centennial Village	Urban	HH Water Supply (Tap Water)	Piped	R1= 0.63; R2= 0.69	-	-	-	-	-	-	-	-	-	-	CBD
Diego Silang	Urban	HH Water Supply (Tap Water)	Piped	R1= 0.10; R2= 0.16	-	-	-	-	-	-	-	-	-	-	CBD
Manila Water distribution line	Urban		Piped	R1= 1.33; R2= 1.39	-	-	-	-	-	-	-	-	-	-	CBD
Western Bicutan	Urban	HH Water Supply (Tap Water)	Piped	R1= 1.08; R2= 1.08	-	-	-	-	-	-	-	-	-	-	CBD
Western Bicutan	Urban		Piped	R1= 0.93; R2= 0.98	-	-	-	-	-	-	-	-	-	-	CBD
Manila Water distribution line	Urban		Piped	R1= 1.33; R2= 1.39	-	-	0	-	-	-	-	-	-	-	CBD
Western Bicutan	Urban	Public Standpipe	Shallow Well	-	-	-	-	128	-	-	<0.2	-	negative	negative	CBD
Western Bicutan	Urban	Unprotected Well (Open) ;	Dug Well	-	-	-	4	2,270	-	-	<0.2	-	negative	positive[2]	-

Notes:
[1] Philippine National Standards for Drinking Water 2007

	E Coli	Total Coliform	BOD (mg/L)	COD (mg/L)	Turbidity (NTU)	DO (ml/L)
Philippine National Standards for Drinking Water 2007	None	<1.1 MPN/100mL	None	None	5 NTU (nephelo-metric turbidity unit)	0.3 min detected at the farthest point of distribution system; 1.5 max detected at any point in the distribution system
DENR Administrative Order No. 35 Effluent Guidelines; Inland waters Class C	None	10,000 MPN/100 mL	50	100	None	None
DENR Administrative Order No. 35 Effluent Guidelines; Coastal waters Class SC	None	None	100	200	None	None
DENR Admin. Order No. 34 Classification/Water quality Criteria, Fresh Surface waters Class AA	None	50 MPN/100 mL	1	none	5 mg/L	None
DENR Admin. Order No. 34 Classification/Water quality Criteria, Fresh Surface waters Class A	None	1,000 MPN/100 mL	5	none	5 mg/L	None
DENR Admin. Order No. 34 Classification/Water quality Criteria, Fresh Surface waters Class B	None	1,000 MPN/100 mL	5	none	5 mg/L	None
DENR Adm. Order No. 34 Classification/Water quality Criteria, Fresh Surface waters Class C	None	5,000 MPN/100 mL	7-10	none	5 mg/L	None
DENR Admin. Order No. 34 Classification/Water quality Criteria, Fresh Surface waters Class D	None	None	10-15	none	3 mg/L	None

[2] C: Cooking, B: Bathing, D: Drinking
[3] Positive1 = positive for E Coli, Positive2 = negative for E Coli but positive for coliform with a reading that is higher than 8 MPN/100 ml

ANNEX TABLE C 2. WATER POLLUTION FROM POOR SANITATION AND WASTEWATER MANAGEMENT (% OF HOUSEHOLDS)

Province/Region	Barangay	Degree of isolation		
		None	Partial	Full
Alabel	Baluntay	0.0	0.0	100.0
	Kawas	0.0	89.6	10.4
	Bagacay	0.0	0.0	100.0
	Poblacion	9.5	64.8	25.7
	Maribulan	0.0	0.0	100.0
Bayawan	Banga	0.0	100.0	0.0
	Tinago	0.0	100.0	0.0
	Villareal	5.9	94.1	0.0
	GK Village	0.0	2.2	97.8
	Pugaro	14.8	85.2	0.0
San Fernando: Upland	Nagyubuyuban	0.0	100.0	0.0
San Fernando: Coastal	San Agustin	0.0	100.0	0.0
	Fishermen's village (Poro)	0.0	100.0	0.0
	Ilocanos Sur	0.0	100.0	0.0
Taguig	Western Bicutan	0.6	48.4	51.0
Summary				
by rural/urban classification				
Rural		0.2	56.2	43.6
Urban		5.5	69.8	24.7
by site				
Alabel		4.4	76.0	19.6
Bayawan		0.5	16.6	82.9
Dagupan		14.8	85.2	0.0
San Fernando		0.0	100.0	0.0
Taguig		0.6	48.4	51.0
All sites		3.6	65.0	31.4

[1] Only includes households that defecate in rivers, lakes and other water bodies, also applies to wet and pit latrines
[2] Combines 3 toilet types: (a) non-desludged septic tanks, (b) shared toilets, (c) public toilets. Also includes septic tanks that were desludged more than 5 years ago or desludged at a period not known to the respondent
[3] Those with access to sewers (Taguig) or have had their septic tanks desludged within the last 5 years

ANNEX TABLE C 3. WATER ACCESS AND TREATMENT PRACTICES, AND RELATED COST, PER SITE

Field site	Piped water (treated)		Non-piped protected source						Non-piped unprotected source	
			Bottled water		Tanker truck		Others			
	% access	Average monthly cost	% access	Average monthly cost	% access	Average monthly cost	% access	Average monthly cost	% access	Average monthly cost
Alabel	43.1	42.8	2.7	25.5	-	-	54.2	0.9	-	-
Bayawan	69.6	136.6	19.4	125.0	-	-	10.6	0.9	0.5	-
Dagupan	-	-	8.1	152.8	-	-	91.9	0.7	-	-
San Fernando - Coastal	10.2	161.3	34.1	273.0	-	-	55.7	5.3	-	-
San Fernando - Upland	-	-	-	-	-	-	95.2	0.5	4.8	0.3
Taguig	51.9	540.9	46.1	363.6	0.6	884.0	1.5	139.8	-	-
Summary										
Rural	37.6	143.5	15.3	184.0	-	-	46.0	1.8	1.1	0.2
Urban	33.5	422.3	26.3	351.5	0.2	884.0	40.0	4.4	-	-
All sites	35.0	316.1	22.4	310.8	0.2	884.0	42.1	3.4	0.4	0.2

ANNEX TABLE C 4. HOUSEHOLDS CITING POOR WATER QUALITY, BY SITE

Water source	Site	Alabel	Bayawan	Dagupan	San Fernando - coastal	San Fernando - upland	Taguig	Rural	Urban	All
Piped water (treated)	Bad appearance[1] (%)	14.4	5.3	na	100.0	na	7.4	5.5	11.2	9.0
	Bad smell (%)	1.0	2.6	na	61.1	na	5.1	2.4	4.3	3.6
	Bad taste (%)	0.0	0.7	na	55.6	na	4.0	1.2	3.2	2.5
	With sediments (%)	3.1	0.7	na	55.6	na	4.0	1.2	4.3	3.2
Bottled water	Bad appearance[1] (%)	0.0	0.0	0.0	0.0	na	0.0	0.0	0.0	0.0
	Bad smell (%)	0.0	0.0	0.0	3.3	na	1.3	0.0	0.9	0.7
	Bad taste (%)	0.0	4.8	0.0	11.7	na	3.8	4.7	2.7	3.2
	With sediments (%)	0.0	0.0	0.0	3.3	na	0.0	3.1	0.0	0.7
Non-piped protected source (including untreated piped): others	Bad appearance[1] (%)	14.8	8.7	0.0	13.0	27.5	0.0	17.0	1.7	10.3
	Bad smell (%)	1.6	8.7	0.0	3.0	6.3	20.0	3.7	0.4	2.2
	Bad taste (%)	7.4	4.3	0.0	4.0	3.8	0.0	5.7	0.0	3.2
	With sediments (%)	12.3	13.0	0.0	24.0	12.5	20.0	17.0	0.4	9.7
Non-protected sources	Bad appearance[1] (%)	na	0.0	na	na	50.0	100.0	100.0	100.0	100.0
	Bad smell (%)	na	0.0	na	na	0.0	0.0	0.0	0.0	0.0
	Bad taste (%)	na	0.0	na	na	0.0	25.0	0.0	25.0	11.1
	With sediments (%)	na	0.0	na	na	0.0	0.0	0.0	0.0	0.0

ANNEX TABLE C 5. CITED REASONS FOR USING WATER SOURCES - ALL SITES[1]

Water source[2]	Reason	Rural	Urban	All	Alabel	Bayawan	Dagupan	San Fernando - Coastal	San Fernando - Upland	Taguig
Piped water (treated)	Quality (%)	52.1	29.4	37.8	54.6	51.7	na	18.9	na	17.4
	Quantity (%)	4.8	1.1	2.5	0.0	5.3	na	1.5	na	1.1
	Cost (%)	10.3	14.3	12.8	0.0	11.3	na	20.4	na	22.5
	Safety (%)	14.5	18.3	16.9	20.6	14.6	na	16.8	na	15.2
Bottled water[3]	Quality (%)	25.0	17.3	19.0	50.0	31.0	11.1	16.5	na	16.5
	Quantity (%)	0.0	0.9	0.7	0.0	0.0	0.0	0.9	na	1.3
	Safety (%)	65.6	69.5	68.7	50.0	64.3	83.3	68.8	na	68.4
Non-piped protected: Others	Quality (%)	43.0	36.6	40.2	53.3	39.1	37.6	35.2	33.8	0.0
	Quantity (%)	1.0	0.0	0.6	0.8	0.0	0.0	0.0	2.5	0.0
	Cost (%)	1.0	3.4	2.1	0.0	8.7	3.4	1.0	1.3	20.0
	Safety (%)	17.0	22.1	19.3	12.3	21.7	22.0	33.3	3.8	60.0
Non-piped unprotected source[4]	Quality (%)	80.0	na	80.0	na	100.0	na	na	75.0	na

na = not applicable

[1] Reasons under quality include good taste, good color and clarity, and less or no solids, sediments or particles. Safety was included because it is usually the primary reason behind the choice of households for drinking water.
[2] Tanker trucks were not included because there were no responses.
[3] "Bottled water" costs not included because there were no responses.
[4] No responses for quantity, cost and safety of "unprotected" sources.

ANNEX TABLE C 6. TREATMENT PRACTICES (ALL SITES)

Field site	HH in sample	Treatment practice (% of total responses)						
		Boiling	Chlorine	Filter (mechanical)	Filter (home-made)	Stand and settle for removal of solids & sediments	other	none
Alabel	225	1.3	-	-	-	-	-	98.7
Bayawan	217	17.7	-	-	0.5	0.5	0.5	80.9
Dagupan	223	25.3	0.9	-	-	-	-	73.8
San Fernando - Coastal	84	18.3	-	-	11.0	-	-	70.7
San Fernando - Upland	178	16.9	13.0	0.6	-	-	-	69.6
Taguig	343	14.2	-	5.4	3.0	1.2	0.3	75.8
Summary								
Rural	452	12.7	0.7	0.2	2.3	0.2	0.2	83.7
Urban	818	16.4	2.7	2.2	1.2	0.5	0.1	76.7
All sites	1,270	15.1	2.0	1.5	1.6	0.4	0.2	79.2

ANNEX TABLE C 7. WATER ACCESS AND HOUSEHOLD TREATMENT COSTS AVERTED

Site	Annual average costs saved per household following 100% sanitation coverage	
	Water source access	Water treatment
Alabel	36.3	0.5
Bayawan	63.3	35.6
Dagupan	26.1	117.2
San Fernando - Coastal	208.6	24.0
San Fernando - Upland	1.4	49.3
Taguig	843.4	117.1
Average rural	55.2	28.0
Average urban	402.5	85.5

ANNEX TABLE D 1. PLACE OF DEFECATION OF HOUSEHOLDS WITH NO "OWN" TOILET

Sites	Women				Men				Children (aged 5-14 years)			
	N	Neighbor (%)	Own plot (%)	Outside plot (%)	N	Neighbor (%)	Own plot (%)	Outside plot (%)	N	Neighbor (%)	Own plot (%)	Outside plot (%)
Alabel	70	0.0	4.3	95.7	93	0.0	3.2	96.8	98	0.0	3.1	96.9
Bayawan	20	5.0	20.0	75.0	17	5.9	11.8	82.4	32	9.4	15.6	75.0
Dagupan	253	31.6	3.6	64.8	330	27.9	2.1	70.0	286	23.8	2.1	74.1
San Fernando	3	0.0	0.0	100.0	2	0.0	0.0	100.0	0	-	-	-
Taguig	14	35.7	28.6	35.7	12	25.0	25.0	50.0	22	27.3	18.2	54.5
Summary												
Rural	299	28.4	4.3	67.2	388	24.5	2.6	72.9	372	19.9	2.7	77.4
Urban	61	1.6	11.5	86.9	66	1.5	7.6	90.9	66	4.5	12.1	83.3

N=number of responses

ANNEX TABLE D 2. DAILY TIME SPENT ACCESSING TOILET FOR THOSE WITH NO TOILET

Sites	Women		Men		Children	
	Time per trip and waiting	No. of times per day	Time per trip and waiting	No. of times per day	Time per trip and waiting	No. of times per day
Alabel	16.76	1.19	17.00	1.22	14.20	1.08
Bayawan	14.58	0.96	13.98	1.00	14.75	1.00
Dagupan	12.38	1.28	12.22	1.15	12.03	1.14
San Fernando	15.00	1.00	16.00	1.00	6.00	1.00
Taguig	8.26	0.98	7.24	1.03	5.75	0.85
Summary						
Rural	19.97	1.16	19.90	1.21	18.38	1.07
Urban	9.24	1.06	9.27	1.07	8.06	0.98
All sites	12.87	1.10	12.97	1.12	11.19	1.01

ANNEX TABLE D 3. PRACTICES RELATED TO YOUNG CHILDREN

Site	Sample size[1]	Parents accompanying young children		Parents accompanying their children outside the yard		Average number of times visited in the day prior to the survey	Other practices[2]	
		Count	%	Count	%		Count	%
Alabel	11	0	-	0	-	-	11	100.0
Bayawan	6	0	-	0	-	-	6	100.0
Dagupan	20	18	90.0	17	85.0	1.67	2	10.0
Taguig	21	1	4.8	1	4.8	3.00	20	95.2
Summary								
Rural	7	0	-	0	-	-	7	100.0
Urban	51	19	37.3	18	35.3	1.74	32	62.7
All sites	58	19	32.8	18	31.0	1.74	39	67.2

[1] This refers to the total number of families who responded to the question. The response rate to this question is quite low, representing only about 24.3% of all families who have children. Also note that there were no responses for San Fernando.
[2] This represents children who defecated within the yard or other means of disposal.

ANNEX TABLE D 4. PREFERENCES RELATED TO TOILET CONVENIENCE, FROM HOUSEHOLDS

Site	Perceived benefits of sanitation (B6.1): proximity cited as satisfied or very satisfied		Those without toilet: reasons to get a toilet	
	Those with toilet	Those without toilet	Saves time (B7.16)	Proximity is an important characteristic (B7.17)
Alabel	91.0	na [1]	98.6	95.7
Bayawan	90.6	na [1]	78.4	81.1
Dagupan	100.0	61.9	100.0	95.0
San Fernando - Coastal	80.2	83.1	100.0[2]	100.0[2]
San Fernando - Upland	55.6	89.7	na [1]	na [1]
Taguig	96.6	na [1]	100.0	98.7
Summary				
Rural	90.3	89.7	89.2	86.5
Urban	96.3	69.7	99.3	98.0
All sites	93.8	73.3	96.0	94.2

[1] na= none of the households in the survey share or use public toilet
[2] Two observations only

ANNEX TABLE D 5. AVERAGE TIME SAVED PER PERSON OR HOUSEHOLD PER YEAR (IN DAYS)

Site	Women	Men	Children	Adult time with young children	Average per person	Average per household
Alabel	5.0	5.3	3.9	0.0	4.68	19.2
Bayawan	3.5	3.5	3.7	0.0	3.63	16.8
Dagupan	4.0	3.6	3.5	5.4	3.70	23.1
San Fernando	3.8	4.1	1.5	0.0	3.90	18.6
Taguig	2.0	1.9	1.2	4.4	1.69	10.7
Summary						
Rural	5.9	6.1	5.0	8.5	5.69	32.4
Urban	2.5	2.5	2.0	0.0	2.33	10.4
All sites	3.6	3.7	2.9	5.2	3.40	20.0

ANNEX TABLE D 6. VALUE OF TIME PER PERSON/HOUSEHOLD PER YEAR (IN PESOS)

Site	Women	Men	Children	Adult time with young children	Average per person
Alabel	429	448	165	-	1,389
Bayawan	353	354	187	-	1,310
Dagupan	222	197	96	572	1,399
San Fernando	210	224	42	-	945
Taguig	567	523	172	465	1,973
Summary					
Rural	500	518	211	-	1,701
Urban	368	371	148	398	1,700
All sites	413	422	170	261	1,701

ANNEX TABLE E 1. LEVEL OF SATISFACTION WITH CURRENT TOILET OPTION

Characteristic	Those with improved sanitation					Those with unimproved sanitation			
	Sewer / septic tank	Wet pit latrine	Dry pit latrine	Compost toilet	Average	Unimproved pit or bucket	Shared toilet	No toilet	Average
Toilet position	4.75	4.67	3.04	4.38	4.66	4.00	4.56	4.25	4.54
Cleanliness	4.58	4.51	2.71	3.72	4.44	3.29	4.33	5.00	4.31
Status	4.60	4.60	3.17	4.41	4.54	3.29	3.22	4.50	3.25
Visitors	4.59	4.77	3.00	4.22	4.55	4.14	3.16	4.75	3.22
Maintaining	4.54	4.62	3.71	4.13	4.50	4.00	4.15	4.75	4.16
Health	4.83	4.75	3.79	4.45	4.76	4.00	4.71	4.50	4.68
Conflict avoidance	4.68	4.81	4.17	4.42	4.68	4.53	4.63	4.75	4.64
Convenience for children	4.71	4.56	3.00	4.05	4.58	3.33	3.68	5.00	3.69
Convenience for elderly	4.72	4.88	4.14	4.49	4.72	3.33	4.55	4.75	4.53
Night use of toilet	4.85	4.78	3.50	4.78	4.79	3.86	3.63	5.00	3.66
Avoid rain	4.82	4.66	2.26	4.61	4.70	3.57	3.83	5.00	3.84
Showering	4.83	4.71	1.71	4.28	4.69	3.60	3.15	5.00	3.19
Dangerous animals	4.78	4.53	2.52	3.84	4.59	3.14	4.35	5.00	4.32

ANNEX TABLE E 2. IMPORTANT CHARACTERISTICS OF A TOILET FOR THOSE CURRENTLY WITHOUT

Characteristic	No. of responses	Average score
Comfortable toilet position	220	4.83
Cleanliness and freedom from unpleasant odors and insects	220	4.81
Having a toilet not needing to share with other households	219	4.76
Having privacy when at the toilet	220	4.83
Proximity of toilet to house	218	4.79
Pour-flush compared to dry pit latrine	215	4.44
Having a toilet disposal system that does not require emptying (piped sewer vs septic tank)	216	4.28
Having a toilet disposal system that does not pollute your, neighbors', or your community's environment	220	4.68
Clean environment	219	4.80
Willingness to pay for improved toilet?	221	2,534
Type of toilet they would get (%)		
Toilet to piped sewer		1.7
Toilet to septic tank		78.2
Wet pit		19.2
Ventilated pit latrine		0.9

ANNEX TABLE F 1. SCORING OF DIFFERENT TYPES OF LIVING AREA

Item	Site						Averages		
	Alabel	Bayawan	Dagupan	San Fernando-Coastal	San Fernando-Upland	Taguig	Rural	Urban	All
State of sanitation in the neighborhood: very bad (1) to very good (5)									
Uncollected/ undisposed household waste/ garbage	3.6	4.2	1.8	1.9	2.0	2.6	3.5	2.3	2.7
Open/visible sewage or wastewater	3.6	4.1	2.2	2.0	2.3	2.5	3.5	2.5	2.8
Accumulation of storm/rain water	3.2	3.8	2.8	2.2	2.6	2.6	3.3	2.7	2.9
Smoke from burning waste/ garbage	3.4	4.1	2.1	2.1	2.0	2.8	3.4	2.6	2.5
Smell from sewage/ defecation/waste	3.4	4.0	1.6	1.9	2.2	2.2	3.3	2.2	1.9
Dust & dirt in streets/roads/alleys	3.2	3.0	2.1	2.2	1.9	2.3	2.8	2.3	2.4
Dust & dirt in shops/markets/ restaurants	3.3	2.9	2.2	2.2	2.3	2.4	2.9	2.4	2.1
Rodents around uncollected waste etc	3.4	2.3	1.7	1.7	2.0	1.9	2.5	2.0	2.0
Insects around uncollected waste etc	3.4	2.6	1.6	1.6	1.7	1.8	2.5	1.9	2.1
Simple average	3.4	3.4	2.0	2.0	2.1	2.3	3.1	2.3	2.4
To what extent do the following activities occur in your neighborhood: Never (1) to Pervasive (4)									
Open defecation	1.8	1.3	3.7	2.5	1.9	1.5	1.6	2.4	2.1
Land affected by sewage drains and wastewater	1.8	1.5	2.1	1.9	1.3	1.7	1.5	1.9	1.7
Garbage/waste dumpsites/landfills	1.9	1.4	2.7	1.8	1.6	1.5	1.5	1.9	1.3
Land flooded seasonally	1.9	1.7	2.0	2.4	1.1	1.9	1.7	2.1	1.6
Land flooded permanently with poor quality sitting water	1.8	1.5	1.4	1.8	1.0	1.3	1.5	1.5	1.1
Simple average	1.8	1.5	2.4	2.1	1.4	1.6	1.6	2.0	1.6

ANNEX TABLE F 2. PROPORTION OF HOUSEHOLDS WITH AND WITHOUT TOILET WITH UNIMPROVED SANITATION PRACTICE

Site	Households with access to toilet			Households with septic tanks			Last time septic tanks were desludged (for septic tanks aged 5 years and above)			Households with pit latrines		Households with no toilet	
	B1.5 Open defecation (sometimes, often)	B1.6 Open urination (sometimes, often)	B1.8 Disposal child stool in environment[1]	Built 2-5 years ago and desludged	Built more than 5 years ago and desludged	Age of septic tank unknown and desludged	Within the last 5 years	More than 5 years ago	Don't know	Experience seepage/ flooding into pit	Pit overflowed (yes, sometimes)	B7.7 Disposal child stool in environment	B7.10 See children defecating in yard
Alabel	0.6	1.9	7.7	25.0	47.6	nr	90.0	10.0	-	nr	nr	62.9	81.4
Bayawan	0.6	16.7	1.7	-	nr	-	nr	nr	nr	na	na	54.1	83.8
Dagupan	39.3	73.8	41.0	nr	28.6	nr	50.0	-	50.0	nr	nr	77.5	75.0
San Fernando - Coastal	18.8	55.1	19.9	na	na	na	na	na	na	nr	nr	100.0	50.0
San Fernando - upland	27.4	81.0	22.6	na	na	na	na	na	na	60.0	80.0	na	na
Taguig	0.7	3.4	20.2	na	53.0	50.0	94.9	5.1	-	na	na	69.7	68.4
Summary												-	-
Rural	6.3	30.2	7.4	5.0	28.8	-	73.3	26.7	-	60.0	80.0	50.0	86.5
Urban	16.2	34.2	25.5	31.3	56.4	50.0	95.3	3.8	0.9	nr	nr	74.8	70.9
All sites	12.6	32.7	18.9	12.5	50.4	14.3	92.6	6.6	0.8	60.0	80.0	66.7	76.0

na = not applicable, nr = not reported

[1] Responses such as: put in drain or ditch, thrown in garbage, buried in ground, left in the open, used diaper then buried, and used diaper then thrown into the river

ANNEX TABLE F 3. IMPLICATION OF CURRENT TOILET OPTION FOR EXTERNAL ENVIRONMENT

Characteristic	Improved sanitation					Unimproved sanitation			
	Sewer / septic tank	Wet pit latrine	Dry pit latrine	Compost toilet	Average	Unimproved pit or bucket	Shared toilet	No toilet	Average
Pollution of your or neighbors' environment (question B6.1)									
Alabel	4.7	4.5			4.6				
Bayawan	4.6				4.6			4.8	4.8
Dagupan	5.0	5.0			5.0		4.6		4.6
San Fernando - coastal		4.6		4.2	4.4		4.6		4.6
San Fernando - upland			3.6	4.6	3.9	3.9	4.4		4.4
Taguig	4.8				4.8				
Average rural	4.8	4.7		4.5	4.8		4.6		4.6
Average urban	4.6	4.7	3.6	4.2	4.5	3.9	4.4	4.8	4.4
Average all	4.7	4.7	3.6	4.3	4.7	3.9	4.6	4.8	4.5
Smell around house (question B6.1)									
Alabel	4.8	4.7			4.8				
Bayawan	4.7				4.7			5.0	5.0
Dagupan	5.0	5.0			5.0		4.7		4.7
San Fernando		4.7		4.1	4.4		4.6		4.6
Taguig			4.2	4.8	0.0	4.1	4.7		0.0
Average rural									
Average urban	4.8	4.8		4.4	4.8		4.6		4.6
Average all	4.7	5.0	4.2	4.3	4.6	4.1	4.7	5.0	4.6

ANNEX TABLE F 4. PERCEPTIONS OF ENVIRONMENTAL SANITATION STATE, BY OPTION TYPE

Site	Intervention/ Control	Level of improved (Q I3)[1]					Perception of environmental sanitation state (Q I1)[2]								
		Open defecation	Stagnant water	Garbage	Flooded seasonally	Flooded permanently	Rubbish	Sewage	Standing water	Smoke	Smell	Dirt outside	Dirt inside	Rodents	Insects
Alabel	Intervention	1.6	1.7	1.8	1.9	1.8	3.7	3.7	3.4	3.4	3.5	3.2	3.3	3.4	3.3
	Control	2.5	1.9	2.1	2.2	1.9	3.3	3.5	3.0	3.4	3.2	3.2	3.3	3.4	3.5
Bayawan	Intervention	1.1	1.5	1.3	1.7	1.5	4.4	4.4	4.0	4.3	4.3	3.1	3.0	2.3	2.6
	Control	2.5	1.5	2.0	1.7	1.6	2.8	2.6	2.6	3.1	2.3	2.8	2.8	2.4	2.6
Dagupan	Intervention	3.6	2.1	2.7	2.0	1.4	1.8	2.3	2.9	2.1	1.6	2.0	2.2	1.7	1.6
	Control	3.7	2.0	2.7	2.1	1.5	1.7	2.1	2.4	2.2	1.8	2.5	2.3	1.8	1.8
San Fernando															
Nagyubyuban	Intervention	2.0	1.5	1.9	1.0	1.0	1.5	2.1	2.1	1.4	1.7	1.7	2.2	1.8	1.6
	Control	1.9	1.2	1.5	1.1	1.0	2.0	2.3	2.7	2.1	2.3	1.9	2.3	2.0	1.7
Poro (Fishermen's Village)	Intervention	1.2	1.4	1.3	1.3	1.2	2.3	2.2	2.3	2.4	2.0	2.3	2.2	2.4	1.8
	Control	2.4	1.9	2.1	2.4	2.1	1.9	2.3	2.5	2.0	1.4	2.1	2.0	1.8	1.8
San Agustin	Intervention	2.9	1.9	1.7	2.7	2.0	1.9	1.9	2.0	2.1	2.0	2.3	2.3	1.6	1.7
	Control	2.9	2.3	1.9	2.8	2.0	1.8	1.9	2.2	2.0	1.9	2.1	2.3	1.3	1.4
Taguig	Intervention	1.2	1.5	1.3	1.7	1.2	2.6	2.7	2.7	2.9	2.4	2.4	2.6	2.1	2.0
	Control	2.7	2.4	2.2	2.7	1.6	2.3	1.9	2.1	2.3	1.6	1.8	1.9	1.2	1.2
Summary															
Rural		1.6	1.5	1.5	1.7	1.5	3.5	3.5	3.3	3.4	3.3	2.8	2.9	2.5	2.5
Urban		2.4	1.9	1.9	2.1	1.5	2.3	2.5	2.7	2.6	2.2	2.3	2.4	2.0	1.9
All		2.1	1.7	1.8	1.9	1.5	2.7	2.8	2.9	2.9	2.6	2.5	2.6	2.2	2.2

[1] Represents average response (1 = not important to 5 = very important)
[2] Represents average response (1 = very bad to 5 = very good)

ANNEX TABLE F 5. RANKING IMPORTANCE OF ENVIRONMENTAL SANITATION, BY OPTION TYPE

Site	Intervention/ Control	Level of improved (Q I3)		Importance according to perception of environmental sanitation management (Q I.2)								
		Q I.4[1]	Q I.5[2]	Rubbish	Sewage	Standing water	Smoke	Smell	Dirt outside	Dirt inside	Rodents	Insects
Alabel	Intervention	2.7	2.2	4.8	4.9	4.6	4.7	4.8	4.7	4.8	4.8	4.8
	Control	2.8	2.4	4.9	4.9	4.8	4.8	4.9	4.8	4.9	4.8	4.8
Bayawan	Intervention	2.7	2.6	4.8	4.7	4.5	4.2	4.5	3.7	3.7	4.5	4.4
	Control	2.9	2.4	4.4	4.3	3.9	3.4	4.5	3.3	3.3	3.9	3.9
Dagupan	Intervention	2.5	2.0	5.0	4.8	4.6	4.9	5.0	4.9	4.9	5.0	5.0
	Control	2.4	2.2	4.9	4.6	4.1	4.6	4.8	4.7	4.5	4.8	4.9
San Fernando												
Nagyubyuban	Intervention	2.5	2.3	4.7	4.2	4.0	4.5	4.6	4.3	4.4	4.4	4.4
	Control	2.3	2.1	4.8	4.2	4.2	4.5	4.4	4.7	4.2	4.7	4.8
Poro (Fishermen's Village)	Intervention	2.9	2.8	5.0	4.9	4.6	4.7	4.6	4.7	4.7	4.9	5.0
	Control	2.3	2.2	4.9	4.7	4.6	4.7	4.9	4.6	4.7	4.9	4.9
San Agustin	Intervention	2.6	2.2	4.8	4.6	4.4	4.5	4.6	4.5	4.4	4.8	4.8
	Control	2.4	2.3	4.9	4.4	4.1	4.4	4.6	4.5	4.5	4.8	4.9
Taguig	Intervention	2.8	2.6	5.0	4.7	4.7	4.7	4.9	4.7	4.5	4.9	4.9
	Control	2.8	2.6	4.9	4.9	4.7	4.7	4.9	4.7	4.5	4.9	4.9
Summary												
Rural		2.7	2.4	4.8	4.6	4.4	4.4	4.6	4.2	4.1	4.6	4.6
Urban		2.7	2.4	4.9	4.7	4.6	4.7	4.8	4.7	4.6	4.9	4.9
All		2.7	2.4	4.9	4.7	4.5	4.6	4.7	4.5	4.5	4.8	4.8

[1] What level of priority do you think the local government should give to improve waste collection and to implement laws for improving sanitation conditions in your neighborhood? (Response: 1 = low priority to 3 high priority)
[2] Do you think the local government already has the funds to deal with the major causes of sanitary conditions in your neighborhood? (Response: 1 = no funds to 3 = sufficient funds)

ANNEX TABLE F 6. FINANCING FROM HOUSEHOLD AND PROJECT SOURCES

Site	Rural/ urban	Intervention	Sample	Households who received toilets from an external program/ agency/community	Of the households who received toilets from external/programs/ community			
					% who contributed cash	% who contributed labor	Labor contribution (man-days)	% of households who contributed materials
Bayawan	Rural	Constructed wetland	180	180	0.0	27.8	7.1	0.0
Dagupan	Urban	Community toilets	65	65	0.0	0.0	-	0.0
San Fernando	Rural	UDDT-E	47	47	0.0	29.8	3.7	27.7
	Urban	Community toilets	65	49	0.0	8.2	4.9	0.0
		UDDT-E	17	17	5.9	41.2	3.0	29.4
Totals			374	358	0.3	20.9	5.9	5.0

ANNEX TABLE F 7. HOUSEHOLD CHOICES AND OTHER INTERVENTIONS

Site	Rural/ urban	Intervention	Number of households interviewed	Was household given a choice to participate? (%)			Was household given a choice of options (%)			Hygiene awareness (%) - Did the program/community provide hygiene awareness at the same time?			Water intervention offered (%) - Did the program/community provide water services to your household?		
				Yes, voluntary	No, not voluntary	Not applicable	Yes, choice available	No, choice not available	Not applicable	Yes	No	Not applicable	Yes	No	Not applicable
Alabel	Rural	STF (desludged)	44	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
		Septic tanks (not desludged)	77	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
	Urban	Wet latrines	28	3.6	0.0	96.4	0.0	3.6	96.4	0.0	3.6	96.4	0.0	3.6	96.4
Bayawan	Rural	Constructed wetland	180	21.7	78.3	0.0	22.2	77.8	0.0	97.8	1.7	0.0	91.1	7.8	1.1
Dagupan	Urban	Shared toilets	48	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
		Public toilets	65	6.2	93.8	0.0	26.2	73.8	0.0	46.2	53.8	0.0	4.6	95.4	0.0
		Wet latrines	61	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
San Fernando	Rural	UDDT-E	47	44.7	55.3	0.0	74.5	25.5	0.0	95.7	4.3	0.0	46.8	53.2	0.0
		Dry pit latrines	24	37.5	8.3	54.2	29.2	16.7	54.2	41.7	4.2	54.2	8.3	37.5	54.2
		Shared toilets	39	28.2	10.3	61.5	33.3	5.1	61.5	35.9	2.6	61.5	5.1	33.3	61.5
	Urban	Public toilets	65	35.4	35.4	24.6	43.1	27.7	24.6	61.5	9.2	24.6	6.2	64.6	24.6
		UDDT-E	17	41.2	58.8	0.0	94.1	5.9	0.0	100.0	0.0	0.0	5.9	94.1	0.0
		Wet latrines	61	3.3	4.9	91.8	6.6	1.6	91.8	8.2	0.0	91.8	1.6	6.6	91.8
Taguig	Urban	STF (desludged)	91	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
		Septic tanks (not desludged)	92	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
		Decentralized sewerage	84	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0
All sites			1,023	11.4	26.4	61.9	15.6	22.2	61.9	32.9	4.8	61.9	19.5	18.2	62.1

ANNEX TABLE F 8. APPROPRIATE TECHNOLOGY

Site	Rural / urban	Intervention	Number of households interviewed	% households with insufficient water for flushing		% households with pit flooding		% households with pit overflow	
				Sometimes	Often	Sometimes	Often	Sometimes	Often
Alabel	Rural & Urban	STF (desludged)	44	0.0	0.0	-	-	-	-
		Septic tanks (not desludged)	77	1.3	0.0	-	-	-	-
	Urban	Wet latrines	28	0.0	0.0	-	-	-	-
Bayawan	Rural	Constructed wetland	180	6.7	0.0	-	-	-	-
Dagupan	Urban	Shared toilets	48	0.0	0.0	-	-	-	-
		Public toilets	65	0.0	1.5	-	-	-	-
		Wet latrines	61	0.0	0.0	-	-	-	-
San Fernando	Rural	UDDT-E	47	0.0	0.0	-	-	-	-
		Dry pit latrines	24	0.0	0.0	21.7	21.7	13.0	8.7
		Shared toilets	39	2.7	0.0	0.0	0.0	0.0	0.0
	Urban	Public toilets	65	0.0	0.0	-	-	-	-
		UDDT-E	17	0.0	0.0	-	-	-	-
		Wet latrines	61	0.0	0.0	-	-	-	-
Taguig	Urban	STF (desludged)	91	0.0	0.0	-	-	-	-
		Septic tanks (not de-sludged)	92	1.1	0.0	-	-	-	-
		Decentralized sewerage	84	0.0	0.0	-	-	-	-
All sites			1,023	1.6	0.1	19.2	19.2	11.5	7.7

- not applicable or no response

ANNEX TABLE F 9. ACTUAL PROGRAM PERFORMANCE IN RELATION TO KEY SELECTED INDICATORS FOR PROGRAM EFFECTIVENESS, RURAL AND MIXED SITES ONLY

Variable	Bayawan		SF		Alabel		
	Constructed wetland	UDDT-E	Dry pit latrines	Shared toilets	Wet Latrines	STF (desludged)	Septic tanks (not desludged)
Households interviewed	Local government	Local government	mix	mix	mix	Households	Households
Provider of facilities	Local government	-	-	-	-	National government	-
Toilets	5,607.5	3,906.3	1,748.4	2,328.5	1,259.1	5,426.0	4,080.2
Treatment facilities	180	47	11	15	1	0	0
Approx. cost/HH (PhP, annualized costs, capital and recurrent)	5,607.5	3,906.3	1,748.4	2,328.5	1,259.1	5,426.0	4,080.2
Number of toilets not provided by government, NGOs, donors and other institutions	180	47	11	15	1	0	0
% of households, with members who sometimes or often:							
Use bush for defecation	0.6	8.5	45.8	20.5	0.0	0.0	1.3
Use bush for urination	16.7	48.9	87.5	82.1	0.0	2.3	2.6
Had children defecating in yard	99.4	100.0	95.8	97.4	92.9	100.0	93.5
% of households who:							
Had children using or stool disposed in toilet/latrine	77.8	34.0	33.3	23.1	46.4	47.7	45.5
Washed hands with soap yesterday	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Wash hands after defecation	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% of households with members who were observed:							
Using well which is not covered	0.0	0.0	0.0	0.0	0.0	12.5	12.5
Using bucket to withdraw water from well	0.0	0.0	0.0	0.0	0.0	15.4	12.2
Pit latrine/septic tank within 10m of well	0.0	0.0	0.0	22.7	66.7	43.8	30.2
Pit latrine/septic tank within 20m of well	66.7	0.0	0.0	22.7	100.0	100.0	72.1
Signs of feces/waste around toilet	-	-	-	-	0.0	2.9	4.0
Signs of insects in toilet	-	-	-	-	92.9	94.4	98.0
Running water in or near toilet	-	-	-	-	46.7	66.7	61.2
Soap available inside or near the toilet facility for washing hands	-	-	-	-	60.0	91.7	88.0

- not applicable or no response

ANNEX TABLE F 10. ACTUAL PROGRAM PERFORMANCE IN RELATION TO KEY SELECTED INDICATORS FOR PROGRAM EFFECTIVENESS, URBAN SITES ONLY

Variable	Dagupan			San Fernando			Taguig		
	Shared toilets	Public toilets	Wet latrines	Public toilets	UDDT-E	Wet latrines	STF (de-sludged)	Septic tanks (not desludged)	Decentralized sewerage
Households interviewed	48	65	61	65	17	61	91	92	84
Provider of facilities									
Toilets	mix	Local government	Households	Local government	Local government	Mix	Households	Households	Households
Treatment facilities	-	-	-	-	-	-	Private firm	-	Private firm
Approx. cost/HH (PhP, annualized costs, capital and recurrent)	2,262.9	1,596.3	1,259.1	2,266.1	4,143.5	1,451.7	6,646.3	4,760.8	6,768.9
Number of toilets not provided by government, NGOs, donors and other institutions	0	65	0	49	17	5	0	0	0
% of households, with members who sometimes or often:									
Use bush for defecation	52.1	56.9	16.4	29.2	29.4	14.8	2.2	0.0	0.0
Use bush for urination	87.5	89.2	49.2	67.7	70.6	44.3	5.5	3.3	1.2
Had children defecating in yard	77.1	38.1	59.0	73.8	64.7	60.7	98.9	94.5	98.8
% of households who:									
Had children using or stool disposed in toilet/latrine	18.8	7.7	32.8	27.7	29.4	26.2	37.4	38.0	33.3
Washed hands with soap yesterday	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Wash hands after defecation	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% of households with members who were observed:									
Using well which is not covered	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Using bucket to withdraw water from well	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pit latrine/septic tank within 10m of well	74.5	25.0	82.8	37.9	45.5	78.0	-	-	-
Pit latrine/septic tank within 20m of well	97.9	48.4	96.6	93.1	100.0	96.6	-	-	-
Signs of feces/waste around toilet	-	-	-	-	-	-	-	-	-
Signs of insects in toilet	-	-	-	-	-	-	-	-	-
Running water in or near toilet	-	-	-	-	-	-	-	-	-
Soap available inside or near the toilet facility for washing hands	-	-	-	-	-	-	-	-	-

- not applicable or no response

ANNEX TABLE F 11. ACTUAL PROGRAM PERFORMANCE IN RELATION TO KEY SELECTED INDICATORS FOR PROGRAM EFFECTIVENESS

Impact	Indicator	Site (setting)					
		Alabel	Bayawan	Dagupan	SF - Coastal	SF - Upland	Taguig
		rural/ urban	rural	urban	rural/ urban	rural	urban
First step health improvement (basic sanitation)	% household members using improved toilet regularly	95%	98%	92%	90%	90%	97%
Second step health improvement (WWM)	% households connected to sewerage and sewerage treated	100%	3%	0%	0%	0%	100%
Health (hygiene intervention)	% households washing hands after defecation	100%	100%	100%	100%	100%	100%
Water source	% of households with facilities that partially or fully isolate water from human excreta	96%	100%	85%	100%	100%	99%
Water treatment	% households using non-boiling household water treatment methods	98%	79%	69%	83%	82%	82%
Access time	% household members using own toilet instead of off-plot options	67%	85%	33%	71%	97%	79%
	-Men	73%	87%	35%	73%	96%	84%
	-Women	76%	86%	42%	70%	97%	84%
	-Children 5-14	58%	80%	28%	68%	96%	73%
	-Children 0-4	45%	85%	16%	71%	100%	63%
Reuse	Own use: % households applying human excreta in own land or using human excreta for fertilizer	0%	0%	0%	21%	88%	0%

ANNEX TABLE G 1. PLACES VISITED (% RESPONDENTS) AND ENJOYMENT OF STAY

Category	Hotel tariff	N	Manila		Historical sites		Beaches		Natural forests		Traveling within the Philippines	
			%	Score	%	Score	%	Score	%	Score	%	Score
Tourist	1-29	14	92.9	3.4	35.7	3.6	78.6	4.2	64.3	4.3	85.7	92.9
	30-59	34	82.4	3.4	44.1	3.3	76.5	4.2	47.1	4.1	94.1	82.4
	60-89	24	95.8	3.6	50.0	3.2	70.8	4.0	50.0	4.2	83.3	95.8
	90-119	10	100.0	3.5	30.0	3.7	60.0	4.7	30.0	4.3	90.0	100.0
	120+	25	88.0	4.2	56.0	4.1	72.0	3.9	44.0	4.1	76.0	88.0
	Others[1]	34	73.5	3.8	35.3	4.3	70.6	3.8	47.1	4.0	85.3	73.5
	Sub-total	141	85.8	3.7	43.3	3.7	72.3	4.1	47.5	4.1	85.8	85.8
Business	1-29	3	100.0	3.3	-	-	66.7	4.5	-	-	100.0	100.0
	30-59	5	80.0	3.8	-	-	40.0	2.0	20.0	2.0	80.0	80.0
	60-89	3	66.7	4.0	-	-	-	-	-	-	66.7	66.7
	90-119	8	87.5	3.6	-	-	25.0	4.0	37.5	3.7	75.0	87.5
	Others[1]	12	75.0	3.8	8.3	4.0	8.3	4.0	16.7	4.5	66.7	75.0
	120+	17	88.2	4.3	17.6	3.7	17.6	5.0	23.5	5.0	76.5	88.2
	Sub-total	48	83.3	3.9	8.3	3.8	20.8	4.0	20.8	4.2	75.0	83.3
TOTAL		189	85.2	3.7	34.4	3.7	59.3	4.1	40.7	4.1	83.1	3.8

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 2. GENERAL SANITARY EXPERIENCE

Category	Hotel tariff	N	General sanitary conditions	Hotel	Swim-ming pool	Open water	Restaurant	Capital	Other cities
Tourist	1-29	14	2.1	3.1	3.1	3.0	3.7	2.6	3.0
	30-59	34	2.5	3.8	3.6	3.1	3.6	2.9	2.0
	60-89	24	3.3	3.7	3.6	3.5	3.5	3.1	3.5
	90-119	10	3.0	4.0	3.8	3.5	4.1	2.7	-
	120+	25	3.2	4.0	4.3	3.9	3.9	3.3	3.0
	Others[1]	34	3.0	3.8	3.1	3.2	3.8	3.1	4.0
	Sub-total	141	2.9	3.8	3.6	3.4	3.7	3.0	3.0
Business	1-29	3	2.0	4.0	5.0	-	5.0	1.0	-
	30-59	5	2.0	3.0	3.0	2.0	3.0	3.3	-
	60-89	3	2.7	4.0	4.0	-	3.7	2.5	-
	90-119	8	2.6	4.1	3.6	3.0	3.5	3.0	4.0
	Others[1]	12	3.0	4.6	4.0	4.0	3.7	3.1	3.0
	120+	17	3.3	4.6	4.7	3.6	4.1	3.2	5.0
	Sub-total	48	2.8	4.2	4.0	3.1	3.8	3.0	4.0
TOTAL		189	2.9	3.9	3.7	3.3	3.8	3.0	3.2

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 3. SANITARY EXPERIENCE IN RELATION TO TOILETS AND HAND WASHING

Category	Hotel tariff	N	Quality of toilets in					Toilet availability		Water and soap for hand washing		
			Hotels	Restaurants	Airports	Bus stations	City	% could not find when needed	% impact on stay	Restaurants	Bus stations	City
Tourist	1-29	14	3.3	3.2	3.9	1.9	2.2	28.6	22.2	76.9	42.9	36.4
	30-59	34	3.6	3.4	3.6	2.5	2.4	20.6	18.8	70.0	42.9	38.9
	60-89	24	3.5	3.2	3.2	2.6	2.6	25.0	13.3	85.0	40.0	33.3
	90-119	10	3.8	3.3	3.4	1.5	1.0	10.0	-	100.0	-	-
	120+	25	4.1	3.8	3.4	2.0	2.9	8.3	45.5	88.0	33.3	58.3
	Others[1]	34	3.4	3.6	3.6	2.1	2.9	14.7	13.3	70.0	41.7	50.0
	Sub-total	141	3.6	3.5	3.5	2.3	2.6	17.9	20.0	78.6	39.2	43.2
Business	1-29	3	5.0	4.0	5.0	-	5.0	33.3	-	100.0	-	100.0
	30-59	5	2.8	2.5	2.3	1.0	1.0	-	-	50.0	-	-
	60-89	3	4.0	3.0	3.3	2.0	2.5	33.3	-	66.7	-	50.0
	90-119	8	4.1	3.5	2.3	-	2.5	-	16.7	83.3	-	100.0
	120+	12	4.6	3.6	2.9	2.5	2.0	-	25.0	100.0	100.0	100.0
	Others[1]	17	4.3	3.8	3.5	-	3.3	-	-	91.7	-	100.0
	Sub-total	48	4.2	3.5	3.1	2.0	2.8	4.2	11.8	87.5	50.0	80.0
TOTAL		189	3.8	3.5	3.4	2.2	2.6	14.4	18.4	80.7	40.0	47.6

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 4. WHAT FACTORS WERE OF MOST CONCERN?

Category	Hotel tariff	N	Drinking water	Tap water	Swimming pool water	Food
Tourist	1-29	14	57	29	14	0
	30-59	34	57	7	29	7
	60-89	24	62	15	15	8
	90-119	10	50	25	25	0
	120+	25	67	17	17	0
	Others[1]	34	69	0	25	6
	Sub-total	141	62	12	21	5
Business	1-29	3	50	0	0	50
	30-59	5	0	0	100	0
	60-89	3	100	0	0	0
	90-119	8	50	0	50	0
	120+	12	75	25	0	0
	Others[1]	17	100	0	0	0
	Sub-total	48	71	7	14	7
TOTAL		189	64	11	20	5

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 5. HEALTH TROUBLES

Category	Hotel tariff	N	GIT					Average number of days of:		Medical care (%)				
			N	%	Water you drank	Water for hygienic purposes	Food eaten	Symp-toms	Incapa-citation	No	OP	IP	Shop	Av. Cost (US$)
Tourist	1-29	14	7	50	57	14	14	7	1	75	13	0	13	1
	30-59	34	12	35	29	14	57	5	4	64	27	0	9	30
	60-89	24	8	33	67	0	33	3	2	63	0	0	38	6
	90-119	10	4	40	67	0	33	4	4	60	20	0	20	20
	120+	25	6	24	50	0	50	2	1	60	0	0	40	3
	Others[1]	34	9	26	50	0	38	5	4	50	13	13	25	42
	Sub-total	141	46	33	51	6	37	5	3	62	13	2	22	17
Business	1-29	3	0	0	-	-	-	-	-	-	-	-	-	-
	30-59	5	0	0	-	-	-	-	-	-	-	-	-	-
	60-89	3	0	0	-	-	-	-	-	-	-	-	-	-
	90-119	8	0	0	-	-	-	-	-	-	-	-	-	-
	120+	12	0	0	-	-	-	-	-	-	-	-	-	-
	Others[1]	17	2	12	50	0	50	9	9	0	100	0	0	21
	Sub-total	48	2	4	50	0	50	9	9	0	100	0	0	21
TOTAL		189	48	25	51	5	38	4	3	60	17	2	21	18

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 6. INTENTION TO RETURN

Category	Hotel tariff	N	Return to Philippines? (%)				Advise friends to come? (%)			
			Yes	No	Maybe	Do not know	Yes	No	Maybe	Do not know
Tourist	1-29	14	93	0	7	0	69	15	15	0
	30-59	34	85	3	9	3	76	6	15	3
	60-89	24	88	0	8	4	86	5	5	5
	90-119	10	90	0	10	0	90	0	10	0
	120+	25	92	0	8	0	87	0	13	0
	Others[1]	34	82	3	12	3	76	3	18	3
	Sub-total	141	87	1	9	2	80	4	13	2
Business	1-29	3	67	0	0	33	33	0	33	33
	30-59	5	60	20	20	0	80	0	20	0
	60-89	3	100	0	0	0	100	0	0	0
	90-119	8	88	0	13	0	67	0	33	0
	120+	12	100	0	0	0	100	0	0	0
	Others[1]	17	94	6	0	0	100	0	0	0
	Sub-total	48	90	4	4	2	89	0	9	2
TOTAL		189	88	2	8	2	82	3	12	2

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE G 7. REASONS FOR HESITATING TO RETURN TO THE PHILIPPINES

Category	Hotel tariff	N	Reasons for hesitancy in returning (% cited)							
			Main				Contributory			
			Sanitation	Cost	No need	Not safe	Sanitation	Cost	No need	Not safe
Tourist	1-29	14	-	-	-	-	50	0	50	0
	30-59	34	0	0	100	0	0	33	67	0
	60-89	24	-	-	-	-	-	-	-	-
	90-119	10	100	0	0	0	-	-	-	-
	120+	25	0	100	0	0	-	-	-	-
	Others[1]	34	50	25	0	25	50	0	50	0
	Sub-total	141	43	29	14	14	29	14	57	0
Business	1-29	3	0	0	100	0	0	0	100	0
	30-59	5	0	100	0	0	-	-	-	-
	60-89	3	-	-	-	-	-	-	-	-
	90-119	8	-	-	-	-	-	-	-	-
	120+	12	-	-	-	-	-	-	-	-
	Others[1]	17	100	0	0	0	-	-	-	-
	Sub-total	48	33	33	33	0	0	0	100	0
TOTAL		189	40	30	20	10	25	13	63	0

[1]Others = either stayed with friends/family or does not know because the tariff was paid by the company

ANNEX TABLE H 1. RATING OF ENVIRONMENTAL SANITATION CONDITIONS IN THE LOCATION OF THE BUSINESS SURVEY INTERVIEW (1 = BEST; 5 = WORST)

Variable	Resort hotel/ Restaurant	Food processing	Water vendor/ Ice plant	Abattoir	Fish	Market	Travel	All
Number of companies	4	2	2	2	2	3	2	17
Water quality in rivers	3.8	3.0	5.0	4.0	4.0	3.0	3.5	3.75
State of canals and rainwater drainage	3.0	3.0	4.5	3.0	3.5	3.7	3.0	3.38
Management of sewage	2.0	-	-	-	-	-	3.0	2.67
Management of industrial wastewater	-	2.0	-	3.0	-	-	3.5	2.80
Household coverage with private toilets	2.3	2.5	2.0	3.0	3.0	-	3.0	2.58
Toilets in public places	2.0	3.0	2.5	2.0	-	1.3	4.0	2.18
Household/office solid waste	2.5	2.0	1.5	2.0	1.5	-	2.5	2.08
Management of industrial solid waste	-	2.0	-	2.0	-	1.7	5.0	2.29
Air quality from vehicles	2.5	2.5	3.0	1.5	1.0	1.7	4.0	2.29
Air quality from solid waste	1.5	-	-	1.0	1.0	5.0	2.5	2.14
Air quality from excreta	-	-	-	-	-	-	3.0	3.00

- no answer or not applicable

ANNEX TABLE H 2. IMPORTANCE OF ENVIRONMENTAL SANITATION CONDITIONS FOR LOCATING THE COMPANY

Variable	Resort hotel/ Restaurant	Food processing	Water vendor/ Ice plant	Abattoir	Fish	Market	Travel	All
Workforce health	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.6
Water quality directly available from nature (rivers, lakes, ground)	5.0	3.0	3.0	3.0	5.0	5.0	4.0	4.1
Pleasant environment for company staff (clean environment free of garbage, good air quality, proper sewerage and sanitation)	4.5	5.0	5.0	5.0	5.0	5.0	4.0	4.8
Availability of cheap and good land	4.0	4.0	5.0	3.0	1.0	na	4.0	3.5

na = no answer

ANNEX TABLE I 1. ALABEL AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Hygiene	Wet pits	Toilets to septic tank	Toilets to septic tank and desludged at STF
Investment costs: Initial one-off spending				
1. Capital	-	913	3,331	4,283
2. Program	-	-	-	-
SUB-TOTAL	-	913	3,331	4,283
Recurrent costs: Average annual spending				
3. Operation	573	131	186	397
4. Maintenance	-	215	563	746
5. Program	-	-	-	-
SUB-TOTAL	573	346	749	1,143
Average annual cost calculations				
Duration[1]	-	6	25	25
Cost/household	573	1,259	4,080	5,426
Cost/capita	120	-	-	-
Of which:				
% capital	0%	0%	0%	0%
% program	0%	0%	0%	0%
% recurrent	100%	0%	0%	0%
Observations[2]				
Rural	225	6	77	17
Urban		0	0	0
Total	225	6	77	17

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 2. BAYAWAN AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Hygiene	Toilets to septic tank	Toilets with wastewater treatment
Investment costs: Initial one-off spending			
1. Capital	-	2,395	3,957
2. Program	-	-	-
SUB-TOTAL	-	2,395	3,957
Recurrent costs: Average annual spending			
3. Operation	995	373	560
4. Maintenance	-	478	1,091
5. Program	-	-	-
SUB-TOTAL	995	851	1,651
Average annual cost calculations			
Duration[1]	-	25	25
Cost/household	995	3,246	5,607
Cost/capita	187	610	1,054
Of which:			
% capital	0%	74%	71%
% program	0%	0%	0%
% recurrent	100%	26%	29%
Observations[2]			
Rural	215	180	180
Urban			
Total	215	180	180

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 3. DAGUPAN AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Community toilets	Shared toilets	Wet pits
Investment costs: Initial one-off spending			
1. Capital	1,087	1,644	913
2. Program	-	-	-
SUB-TOTAL	1,087	1,644	913
Recurrent costs: Average annual spending			
3. Operation	412	412	131
4. Maintenance	97	206	215
5. Program	-	-	-
SUB-TOTAL	510	619	346
Average annual cost calculations			
Duration[1]	8	13	6
Cost/household	1,596	2,263	1,259
Cost/capita	275	390	217
Of which:			
% capital	68%	73%	73%
% program	0%	0%	0%
% recurrent	32%	27%	27%
Observations[2]			
Rural			
Urban	65	48	61
Total	65	48	61

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 4. SAN FERNANDO (COASTAL REGIONS) AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Hygiene	UDDT-E	Community toilets	Wet pits
Investment costs: Initial one-off spending				
1. Capital	-	3,277	1,181	913
2. Program	-	-	-	-
SUB-TOTAL	-	3,277	1,181	913
Recurrent costs: Average annual spending				
3. Operation	1,100	-	542	324
4. Maintenance	-	836	542	215
5. Program	-	-	-	-
SUB-TOTAL	1,100	836	1,085	539
Average annual cost calculations				
Duration[1]	na	20	8	6
Cost/household	1,100	4,113	2,266	1,452
Cost/capita	204	810	420	269
Of which:				
% capital	0%	80%	52%	63%
% program	0%	0%	0%	0%
% recurrent	100%	20%	48%	37%
Observations[2]				
Rural	33	33		
Urban		17	65	61
Total	33	50	65	61

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 5. SAN FERNANDO (UPLAND) AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Hygiene	Shared toilets	Dry pits	UDDT-E
Investment costs: Initial one-off spending				
1. Capital	-	1,589	941	2,297
2. Program	-	-	-	-
SUB-TOTAL	-	1,589	941	2,297
Recurrent costs: Average annual spending				
3. Operation	1,100	542	70	480
4. Maintenance	-	198	-	401
5. Program	-	-	-	-
SUB-TOTAL	1,100	740	70	881
Average annual cost calculations				
Duration[1]	-	13	1	10
Cost/household	1,100	2,328	1,011	3,178
Cost/capita	231	488	212	666
Of which:			-	-
% capital	0%	68%	93%	72%
% program	0%	0%	0%	0%
% recurrent	100%	32%	7%	28%
Observations[2]				
Rural	84	24	24	14
Urban	-	-	-	-
Total	84	24	24	14

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 6. TAGUIG AVERAGE COST PER HOUSEHOLD FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (PESOS, YEAR 2008)

Cost Item	Toilets to septic tank	Toilets to septic tank and desludged at STF	Sewerage
Investment costs: Initial one-off spending			
1. Capital	3,703	4,396	5,477
2. Program	-	-	-
SUB-TOTAL	3,703	4,396	5,477
Recurrent costs: Average annual spending			
3. Operation	425	1,021	542
4. Maintenance	633	1,229	750
5. Program	-	-	-
SUB-TOTAL	1,058	2,250	1,292
Average annual cost calculations			
Duration[1]	25	25	25
Cost/household	4,761	6,646	6,769
Cost/capita	938	1,309	1,334
Of which:	-	-	-
% capital	78%	66%	81%
% program	0%	0%	0%
% recurrent	22%	34%	19%
Observations[2]			
Rural	-	-	-
Urban	92	91	84
Total	92	91	84

[1] Refers to length of life of hardware before full replacement
[2] Number of households

ANNEX TABLE I 7. PROPORTION OF HOUSEHOLDS SELECTING DIFFERENT SANITATION OPTIONS, BY SITES, BY RURAL-URBAN REGIONS

Cost Item	Income group 1	Income group 2	Income group 3	Income group 4	Income group 5	Average
Open defecation						
Alabel	68	20	4	-	-	31
Bayawan	19	14	14	50	na	17
Dagupan	26	14	9	-	-	18
San Fernando-Coastal	2	2	-	-	-	1
Taguig	71	39	10	-	-	22
Unimproved pits						
San Fernando-Upland	10	7	-	-	na	8
Community toilets						
Dagupan	36	27	20	-	-	29
San Fernando-Coastal	48	36	27	-	na	37
Shared toilets						
Dagupan	25	22	14	-	-	22
San Fernando-Upland	41	50	75	100	na	46
Dry pits						
San Fernando-Upland	33	21	13	-	na	29
UDDT-E						
San Fernando-Coastal	26	33	27	20	25	28
San Fernando-Upland	16	21	13	-	na	17
Wet pits						
Alabel	20	27	4	-	-	15
Dagupan	14	32	46	80	100	27
San Fernando-Upland	24	29	45	80	25	34
Alabel	10	47	51	39	67	34
Dagupan	-	5	11	20	-	4
Taguig	11	30	34	25	17	27
Toilets to septic tanks, desludged or with WWT						
Taguig	16	17	27	38	43	27
Alabel	2	5	42	61	33	20
Bayawan	81	86	86	50	na	83
Sewers						
Taguig	2	14	29	38	40	24

ANNEX TABLE I 7. PROPORTION OF HOUSEHOLDS SELECTING DIFFERENT SANITATION OPTIONS, BY SITES, BY RURAL-URBAN REGIONS (CONTINUED)

Cost Item	Income group 1	Income group 2	Income group 3	Income group 4	Income group 5	Average
Rural						
Open defecation	29	15	6	4	0	20
Unimproved pits	2	1	0	0	0	1
Community toilets	0	0	0	0	0	0
Shared toilets	9	5	7	4	0	7
Dry pits	7	2	1	0	0	5
UDDT-E	4	2	1	0	0	3
pits	6	12	2	0	0	6
Toilets to septic tanks	3	20	33	35	67	15
Toilets to septic tanks, desludged or with WWT	39	43	49	58	33	43
Toilets to sewers	0	0	0	0	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**
Urban						
Open defecation	28	20	8	0	0	16
Unimproved pits	0	0	0	0	0	0
Community toilets	32	19	10	0	6	17
Shared toilets	12	8	3	0	0	6
Dry pits	0	0	0	0	0	0
UDDT-E	8	9	6	3	3	7
Wet pits	14	19	18	15	6	16
Toilets to septic tanks	2	13	23	22	14	14
Toilets to septic tanks, desludged or with WWT	3	6	17	30	37	12
Toilets to sewers	0	5	18	30	34	11
Total	**100**	**100**	**100**	**100**	**100**	**100**

ANNEX TABLE I 8. INCREMENTAL COSTS OF MOVING UP THE SANITATION LADDER

	Facility	TO						
		Shared toilets	Dry pits	Wet pits	UDDT-E	Toilets to septic tank	Toilets to septic tank, desludged at STF or wastewater treatment	Sewers
FROM	**Alabel**							
	Wet pits					2,821	4,167	
	Toilets to septic tank						1,346	
	Bayawan							
	Toilets to septic tank						2,361	
	Dagupan							
	Community toilets	667			(337)			
	Shared toilets				(1,004)			
	San Fernando (Coastal)							
	Community toilets			(814)	1,847			
	Wet pits				2,662			
	San Fernando (Upland)							
	Shared toilets		(1,317)		849			
	Dry pits				2,166			
	Taguig							
	Toilets to septic tank						1,886	2,008
	Toilets to septic tank, desludged at STF or wastewater treatment							123
	Average: All rural sites							
	Community toilets							
	Shared toilets		(1,317)	(1,069)	1,506	1,168	3,928[a\]	
	Dry pits			248	2,823	2,485	5,245	
	Wet pits				2,576	2,237	4,998	
	UDDT-E					(339)	2,422	
	Toilets to septic tanks						2,761	
	Average: All urban sites							
	Community toilets	332		(576)	2,182	2,830	4,715	4,838
	Shared toilets			(908)	1,850	2,498	4,383	4,506
	Dry pits							
	Wet pits				2,758	3,405	5,291	5,413
	UDDT-E					647	2,533	2,656
	Toilets to septic tank						1,886	2,008
	Toilets to septic tank, desludged at STF or wastewater treatment							123

ANNEX TABLE I 8. INCREMENTAL COSTS OF MOVING UP THE SANITATION LADDER (CONTINUED)

	Facility	TO						
		Shared toilets	Dry pits	Wet pits	UDDT-E	Toilets to septic tank	Toilets to septic tank, desludged at STF or wastewater treatment	Sewers
FROM	**Average: All sites[1]**							
	Community toilets[2]	332		(576)	1,844	1,999	4,322	4,838
	Shared toilets[3]		(1,317)	(1,069)	1,506	1,168	3,928	n.b.[4]
	Dry pits[3]			248	2,823	2,485	5,245	n.b.
	Wet pits				2,667	2,821	5,144	5,413[2]
	UDDT-E					154	2,477	2,656[2]
	Toilets to septic tank						2,323	2,008[2]
	Toilets to septic tank, desludged at STF or wastewater treatment							123[2]

Notes: [1] Unless specified otherwise, simple average of rural and urban households; [2] based on urban sites only; [3] based on rural sites only; [4] n.b.= no basis

ANNEX TABLE J 1. ALABEL (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only			Sanitation & Hygiene		
		Wet pits	Toilets to septic tank	Toilets to septic tank and desludged at STF	Wet pits	Toilets to septic tank	Toilets to septic tank and desludged at STF
Number of observations		28	36	44	28.0	36	44
Cost-benefit measures					0.0		
Benefits per peso of input (PhP)	Ideal	7.9	2.8	2.3	5.4	2.5	2.0
	Actual	5.7	2.0	0.2	4.0	1.9	0.3
Internal rate of return (%)	Ideal	>100	40.8	31.3	>100	41.2	30.4
	Actual	>100	25.6	-13.8	>100	25.9	-14.3
Payback period (years)	Ideal	1.0	4.0	5.0	1.0	4.0	5.0
	Actual	1.0	6.0	8.0	1.0	>20	>20
Net present value (PhP)	Ideal	79,827	59,141	56,456	79,871	59,185	53,896
	Actual	54,467	33,778	-233,672	54,511	33,822	-236,232
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	133,339	370,936	325,280	149,973	320,161	328,195
	Actual	140,390	390,553	2,354,029	99,073	332,109	2,100,760
Cost per case averted (PhP)	Ideal	506	1,407	1,242	570	1,010	1,244
	Actual	532	1,481	8,989	2,837,046	1,262	7,960
Cost per death averted (PhP)	Ideal	2,694,546	7,495,988	6,694,415	3,046,318	5,396,973	6,619,105
	Actual	2,837,046	7,892,411	48,446,955	3,046,318	6,747,272	42,329,408

ANNEX TABLE J 2. BAYAWAN (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only		Sanitation & Hygiene	
		Toilets to septic tank	Toilets with wastewater treatment	Toilets to septic tank	Toilets with wastewater treatment
Number of observations		180	180	180	180
Cost-benefit measures					
Benefits per peso of input (PhP)	Ideal	2.7	1.9	2.2	1.6
	Actual	2.4	1.7	2.0	1.5
Internal rate of return (%)	Ideal	48.1	27.1	47.2	25.2
	Actual	39.0	22.6	38.2	20.8
Payback period (years)	Ideal	4.0	6.0	4.0	6.0
	Actual	7.0	18.0	7.0	>20
Net present value (PhP)	Ideal	57,584	49,881	55,380	44,038
	Actual	46,608	38,576	44,404	32,732
Cost-effectiveness measures					
Cost per DALY averted (PhP)	Ideal	198,661	324,271	233,282	343,512
	Actual	203,575	332,291	238,330	350,945
Cost per case averted (PhP)	Ideal	744	1,214	1,947	2,866
	Actual	762	1,244	2,043	3,008
Cost per death averted (PhP)	Ideal	2,986,781	4,875,262	3,443,602	5,070,759
	Actual	3,060,647	4,995,833	3,516,731	5,178,443

ANNEX TABLE J 3. SAN FERNANDO-UPLAND (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only			Sanitation & Hygiene		
		Shared toilets	Dry pits	UDDT-E	Shared toilets	Dry pits	UDDT-E
Number of observations		24	24	14	24	24	14
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	1.7	5.0	2.0	1.2	2.4	1.5
	Actual	1.6	4.7	1.8	1.2	2.3	1.4
Internal rate of return (%)	Ideal	37.8	>100	35.3	29.9	>100	28.5
	Actual	33.1	>100	30.8	25.5	>100	24.2
Payback period (years)	Ideal	5.0	1.0	4.0	7.0	1.0	5.0
	Actual	>20	1.0	11.0	>20	1.0	>20
Net present value (PhP)	Ideal	15,426	38,630	31,379	8,853	32,057	22,397
	Actual	12,968	35,817	26,919	6,396	29,244	17,938
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	264,037	112,226	371,808	296,414	187,683	373,601
	Actual	294,868	125,330	415,222	320,408	202,876	403,844
Cost per case averted (PhP)	Ideal	1,017	432	1,432	1,144	724	1,441
	Actual	1,135	483	1,599	1,236	783	1,558
Cost per death averted (PhP)	Ideal	4,505,503	1,915,005	6,344,488	5,084,556	3,219,437	6,408,598
	Actual	5,031,594	2,138,614	7,085,311	5,498,481	3,481,526	6,930,311

ANNEX TABLE J 4. DAGUPAN (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only			Sanitation & Hygiene		
		Community toilets	Shared toilets	Wet pits	Community toilets	Shared toilets	Wet pits
Number of observations		65	48	61	65	48	61
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	2.88	2.29	5.25	1.86	1.67	2.89
	Actual	1.73	1.32	2.72	1.23	1.06	1.65
Internal rate of return (%)	Ideal	>100	47.7	>100	>100	41.5	>100
	Actual	46.9	12.3	>100	33.2	12.3	>100
Payback period (years)	Ideal	2	4	1	2	4	1
	Actual	4.00	8.00	2.00	>20	>20	>20
Net present value (PhP)	Ideal	29,966	28,290	53,161	24,906	23,230	48,101
	Actual	11,660	7,011	21,483	6,600	1,951	16,423
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	131,408	114,753	103,306	170,505	159,889	74,021
	Actual	143,206	125,055	112,581	181,202	172,358	159,803
Cost per case averted (PhP)	Ideal	495	435	389	355	379	279
	Actual	540	474	424	684	649	603
Cost per death averted (PhP)	Ideal	3,054,696	2,713,390	2,401,443	2,199,301	2,338,027	1,728,976
	Actual	4,233,751	2,957,007	2,617,053	4,233,751	3,993,367	3,733,769

ANNEX TABLE J 5. SAN FERNANDO-COASTAL (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only			Sanitation & Hygiene		
		Community toilets	UDDT-E	Wet pits	Community toilets	UDDT-E	Wet pits
Number of observations		65	50	61	65	50	61
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	2.1	1.5	3.7	1.4	1.3	2.1
	Actual	1.7	1.3	2.8	1.2	1.0	1.7
Internal rate of return (%)	Ideal	75.5	25.9	>100	55.1	3.4	>100
	Actual	44.8	17.0	>100	28.9	-12.2	>100
Payback period (years)	Ideal	3	8.00	1	4	10.00	2.00
	Actual	4	>20	2.00	>20	>20	>20
Net present value (PhP)	Ideal	19,876	24,413	38,694	13,241	15,186	32,060
	Actual	12,214	6,740	26,591	5,580	-2,487	19,957
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	182,914	458,985	144,575	131,033	328,801	198,762
	Actual	204,272	512,579	161,456	244,543	355,423	214,855
Cost per case averted (PhP)	Ideal	695	1,744	549	499	1,252	757
	Actual	776	1,948	613	931	1,353	818
Cost per death averted (PhP)	Ideal	4,062,099	10,193,025	2,063,783	2,924,621	7,338,752	4,436,316
	Actual	4,536,416	11,383,228	2,304,763	5,460,370	7,936,182	5,024,788

ANNEX TABLE J 6. TAGUIG (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED TO "NO TOILET"

Item	Scenario	Sanitation only			Sanitation & Hygiene		
		Toilets to septic tank	Toilets to septic tank and desludged at STF	Sewerage	Toilets to septic tank	Toilets to septic tank and desludged at STF	Sewerage
Number of observations		92	91	84	92	91	84
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	5.6	4.3	4.3	4.3	3.5	3.6
	Actual	4.5	3.4	3.6	3.5	2.9	3.0
Internal rate of return (%)	Ideal	>100	>100	>100	>100	>100	95.3
	Actual	>100	3.0	69.9	>100	87	65.9
Payback period (years)	Ideal	2	2	3	2	2	3
	Actual	2.00	3.00	3.00	>20	>20	>20
Net present value (PhP)	Ideal	196,324	201,358	202,288	192,870	193,074	194,005
	Actual	151,932	154,601	157,416	148,478	146,318	149,133
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	442,426	400,517	394,448	430,845	440,100	434,768
	Actual	454,031	423,640	404,794	438,881	461,261	444,755
Cost per case averted (PhP)	Ideal	1,620	1,477	1,455	1,163	1,288	1,268
	Actual	1,663	1,562	1,493	1,611	1,688	1,627
Cost per death averted (PhP)	Ideal	10,424,838	9,604,657	9,459,108	7,505,658	8,275,767	8,150,356
	Actual	10,698,270	10,159,166	9,707,210	10,393,606	10,843,079	10,455,063

ANNEX TABLE K 1. ALABEL (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO	HYGIENE IMPACT	
		Toilets to septic tank	Toilets to septic tank	Toilets to septic tank and desludged at STF
		Toilets to septic tank and desludged at STF		
Cost-benefit measures				
Benefits per peso of input (PhP)	Ideal	0.8	0.9	0.9
	Actual	0.1	0.9	1.0
Internal rate of return (%)	Ideal	(9.5)	0.4	(0.9)
	Actual	(39.4)	0.3	(0.5)
Payback period (years)	Ideal	1	-	-
	Actual	2	-	-
Net present value (PhP)	Ideal	(2,684)	44	(2,561)
	Actual	(267,450)	44	(2,561)
Cost-effectiveness measures				
Cost per DALY averted (PhP)	Ideal	(45,656)	(50,775)	2,914
	Actual	1,963,476	(58,444)	(253,269)
Cost per case averted (PhP)	Ideal	(165)	(397)	2
	Actual	7,508	(219)	(1,030)
Cost per death averted (PhP)	Ideal	(801,573)	(2,099,015)	(75,310)
	Actual	40,554,544	(1,145,138)	(6,117,546)

ANNEX TABLE K 2. BAYAWAN (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO	HYGIENE IMPACT	
		Toilets to septic tank	Toilets to septic tank	Toilets to septic tank and desludged at STF
		Toilets to septic tank and desludged at STF		
Cost-benefit measures				
Benefits per peso of input (PhP)	Ideal	0.7	0.8	0.9
	Actual	0.7	0.8	0.9
Internal rate of return (%)	Ideal	(21.0)	(0.9)	(1.9)
	Actual	(16.4)	(0.8)	(1.8)
Payback period (years)	Ideal	2	-	-
	Actual	11	-	-
Net present value (PhP)	Ideal	(7,703)	(2,204)	(5,844)
	Actual	(8,033)	(2,204)	(5,844)
Cost-effectiveness measures				
Cost per DALY averted (PhP)	Ideal	125,610	34,621	19,241
	Actual	128,716	34,755	18,654
Cost per case averted (PhP)	Ideal	470	1,203	1,652
	Actual	482	1,281	1,764
Cost per death averted (PhP)	Ideal	1,888,481	456,822	195,497
	Actual	1,935,185	456,084	182,610

ANNEX TABLE K 3. SAN FERNANDO-UPLAND (RURAL), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO			HYGIENE IMPACT		
		Shared toilets		Dry pits	Shared toilets	Dry pits	UDDT-E
		Dry pits	UDDT-E	UDDT-E			
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	3.0	1.2	0.4	0.7	0.5	0.8
	Actual	3.0	1.2	0.4	0.8	0.5	0.8
Internal rate of return (%)	Ideal	-	(2.5)	-	(7.9)	-	(6.8)
	Actual	-	(2.3)	-	(7.6)	-	(6.6)
Payback period (years)	Ideal	(4)	(1)	3	2	-	1
	Actual	-	-	10	-	-	-
Net present value (PhP)	Ideal	23,204	15,953	(7,250)	(6,572)	(6,572)	(8,982)
	Actual	22,848	13,951	(8,897)	(6,572)	(6,572)	(8,982)
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	(151,812)	107,771	259,582	32,377	75,458	1,794
	Actual	(169,538)	120,354	289,893	25,540	77,546	(11,379)
Cost per case averted (PhP)	Ideal	(585)	415	1,000	127	292	10
	Actual	(653)	463	1,116	101	300	(41)
Cost per death averted (PhP)	Ideal	(2,590,497)	1,838,985	4,429,483	579,054	1,304,432	64,110
	Actual	(2,892,981)	2,053,717	4,946,698	466,887	1,342,913	(155,000)

ANNEX TABLE K 4. DAGUPAN (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO			HYGIENE IMPACT		
		Community toilets		Shared toilets	Community toilets	Shared toilets	Wet pits
		Shared toilets	Wet pits	Wet pits			
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	0.8	1.8	2.3	0.6	0.7	0.6
	Actual	0.8	1.6	2.1	0.7	0.8	0.6
Internal rate of return (%)	Ideal	-	-	-	-	(6.2)	-
	Actual	(34.6)	-	-	(13.7)	-	-
Payback period (years)	Ideal	2	(1)	(3)	-	-	-
	Actual	4	(2)	(6)	-	-	-
Net present value (PhP)	Ideal	(1,676)	23,195	24,872	(5,060)	(5,060)	(5,060)
	Actual	(4,649)	9,822	14,472	(5,060)	(5,060)	(5,060)
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	(16,656)	(28,102)	(11,446)	39,097	45,137	(29,285)
	Actual	(18,151)	(30,625)	(12,474)	37,995	47,303	47,221
Cost per case averted (PhP)	Ideal	(60)	(106)	(46)	(140)	(56)	(110)
	Actual	(65)	(115)	(50)	144	174	179
Cost per death averted (PhP)	Ideal	(341,306)	(653,253)	(311,947)	(855,395)	(375,364)	(672,467)
	Actual	(1,276,743)	(1,616,698)	(339,955)	-	1,036,359	1,116,716

ANNEX TABLE K 5. SAN FERNANDO-COASTAL (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO			HYGIENE IMPACT		
		Community toilets		UDDT-E	Community toilets	UDDT-E	Wet pits
		UDDT-E	Wet pits	Wet pits			
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	0.7	1.8	2.4	0.7	0.8	0.6
	Actual	0.8	1.7	2.3	0.7	0.8	0.6
Internal rate of return (%)	Ideal	(49.6)	-	-	(20.4)	(22.5)	-
	Actual	(27.8)	-	-	(15.9)	(29.2)	-
Payback period (years)	Ideal	5	(2)	(7)	1	2	1
	Actual	-	(2)	-	-	-	-
Net present value (PhP)	Ideal	4,537	18,818	14,281	(6,634)	(9,227)	(6,634)
	Actual	(5,474)	14,377	19,852	(6,634)	(9,227)	(6,634)
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	276,072	(38,339)	(314,410)	(51,881)	(130,184)	54,187
	Actual	308,307	(42,815)	(351,123)	40,271	(157,157)	53,399
Cost per case averted (PhP)	Ideal	1,049	(146)	(1,195)	(196)	(492)	207
	Actual	1,171	(163)	(1,334)	155	(594)	205
Cost per death averted (PhP)	Ideal	6,130,926	(1,998,316)	(8,129,242)	(1,137,478)	(2,854,273)	2,372,533
	Actual	6,846,813	(2,231,652)	(9,078,465)	923,954	(3,447,047)	2,720,024

ANNEX TABLE K 6. TAGUIG (URBAN), EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARING DIFFERENT POINTS ON THE SANITATION LADDER

Item	Scenario	FROM/TO			HYGIENE IMPACT		
		Toilets to septic tank		Toilets to septic tank, desludged at STF	Toilets to septic tank	Toilets to septic tank, desludged at STF	Sewerage
		Toilets to septic tank, desludged at STF	Sewerage	Sewerage			
Cost-benefit measures							
Benefits per peso of input (PhP)	Ideal	0.8	0.8	1.0	0.8	0.8	0.8
	Actual	0.8	0.8	1.0	0.8	0.8	0.8
Internal rate of return (%)	Ideal	-	-	-	-	-	-
	Actual	-	-	66.9	-	77.9	(4.0)
Payback period (years)	Ideal	-	1	1	-	-	-
	Actual	1	1	-	-	-	-
Net present value (PhP)	Ideal	5,034	5,964	930	(3,454)	(8,283)	(8,283)
	Actual	2,669	5,485	2,815	(3,454)	(8,283)	(8,283)
Cost-effectiveness measures							
Cost per DALY averted (PhP)	Ideal	(41,909)	(47,979)	(6,069)	(11,581)	39,583	40,320
	Actual	(30,390)	(49,237)	(18,847)	(15,150)	37,621	39,961
Cost per case averted (PhP)	Ideal	(143)	(166)	(22)	(457)	(189)	(186)
	Actual	(101)	(170)	(70)	(52)	126	135
Cost per death averted (PhP)	Ideal	(820,181)	(965,730)	(145,549)	(2,919,181)	(1,328,890)	(1,308,752)
	Actual	(539,104)	(991,060)	(451,956)	(304,665)	683,913	747,853

ANNEX TABLE K 7. SENSITIVITY ANALYSIS: COST-BENEFIT RATIOS (IDEAL SETTING)

Technology	Site	Experiment							
		Baseline	1	2	3	4	5	6	7
Community toilets	Dagupan	2.9	2.8	7.1	3.8	3.0	2.8	2.2	1.7
	San Fernando-Coastal	2.1	2.0	5.1	2.8	2.2	2.0	2.1	2.1
	Simple average	2.5	2.4	6.1	3.3	2.6	2.4	2.1	1.9
Shared toilets	Dagupan	2.3	2.2	5.8	2.9	2.4	2.2	1.7	1.3
	San Fernando-Upland	1.7	1.9	4.5	2.5	2.0	1.9	1.5	1.2
	Simple Average	2.0	2.1	5.1	2.7	2.2	2.1	1.6	1.3
Dry pit latrines	San Fernando-Upland	5.0	5.5	14.1	7.0	5.8	5.5	3.8	2.9
Wet pit latrines	Alabel	7.9	7.6	23.6	8.9	8.0	7.7	5.7	4.5
	Dagupan	5.2	5.1	14.2	6.4	5.4	5.1	3.9	3.1
	San Fernando-Coastal	3.7	3.6	9.9	4.5	3.8	3.6	2.8	2.3
	Simple average	5.6	5.4	15.9	6.6	5.7	5.5	4.1	3.3
UDDT-E	San Fernando-Coastal	1.5	1.3	3.3	1.6	1.3	1.3	1.0	0.8
	San Fernando-Upland	2.0	1.7	4.3	2.1	1.7	1.7	1.3	1.0
	Simple average	1.8	1.5	3.8	1.9	1.5	1.5	1.1	0.9
Toilets to septic tank (no desludging)	Alabel	2.8	2.7	8.5	3.2	2.9	2.8	2.0	1.5
	(no desludging)	2.7	2.6	7.6	3.3	2.7	2.6	2.7	2.7
	Taguig	5.6	5.4	17.5	5.8	5.6	5.5	4.1	3.2
	Simple average	3.7	3.6	11.2	4.1	3.7	3.6	2.9	2.5
Toilets to septic tank (desludged and treated at STF)	Alabel	2.3	2.2	6.5	2.7	2.3	2.2	1.6	1.2
	Toilets to septic tank	4.3	4.1	12.9	4.6	4.3	4.2	3.3	2.7
	(desludged and treated at STF)	3.3	3.2	9.7	3.6	3.3	3.2	2.4	1.9
Toilets with wastewater treatment (constructed wetland)	Bayawan	1.9	1.8	5.0	2.4	1.9	1.8	1.4	1.1
Toilets to sewer	Taguig	4.3	4.2	13.1	4.6	4.4	4.3	3.1	2.5
All interventions	Simple average	3.3	3.2	9.3	4.0	3.4	3.3	2.5	2.1

Notes: Experiment 1: using average wages per region instead of GDP per region; Experiment 2: 100% of time for adults and 50% of time for children; Experiment 3: VSOL instead of GDP; Experiment 4: 10% increase in diarrheal incidence rates; Experiment 5: 10% decrease in diarrheal incidence rates; Experiment 6: 50% increase in initial costs; Experiment 7: 100% increase in initial costs

ANNEX TABLE K 8. SENSITIVITY ANALYSIS: ELASTICITY (% CHANGE IN CBA RATIO/% CHANGE IN THE EXOGENOUS VARIABLE)

Technology	Site	*Experiment*						
		1	2	3	4	5	6	7
Community toilets	Dagupan	0.1	0.6	0.1	0.3	0.3	-0.5	-0.4
	San Fernando-Coastal	0.1	0.6	0.1	0.3	0.3	0.0	0.0
	Simple average	0.1	0.6	0.1	0.3	0.3	-0.3	-0.2
Shared toilets	Dagupan	0.1	0.7	0.1	0.3	0.3	-0.5	-0.4
	San Fernando-Upland	0.1	0.6	0.1	0.3	0.3	-0.5	-0.4
	Simple Average	0.1	0.6	0.1	0.3	0.3	-0.5	-0.4
Dry pit latrines	San Fernando-Upland	0.1	0.6	0.1	0.2	0.2	-0.6	-0.5
Wet pit latrines	Alabel	0.1	0.9	0.1	0.1	0.1	-0.6	-0.4
	Dagupan	0.1	0.7	0.1	0.2	0.2	-0.5	-0.4
	San Fernando-Coastal	0.1	0.7	0.1	0.2	0.2	-0.5	-0.4
	Simple average	0.1	0.8	0.1	0.2	0.2	-0.5	-0.4
UDDT-E	San Fernando-Coastal	0.1	0.6	0.1	0.2	0.2	-0.5	-0.4
	San Fernando-Upland	0.1	0.6	0.1	0.2	0.2	-0.5	-0.4
	Simple average	0.1	0.6	0.1	0.2	0.2	-0.5	-0.4
Toilets to septic tank (no desludging)	Alabel	0.1	0.9	0.1	0.1	0.1	-0.6	-0.5
	Bayawan	0.2	0.8	0.1	0.1	0.2	0.0	0.0
	Taguig	0.1	0.9	0.0	0.1	0.1	-0.5	-0.4
	Simple average	0.1	0.9	0.0	0.1	0.1	-0.4	-0.3
Toilets to septic tank (desludged and treated at STF)	Alabel	0.1	0.8	0.1	0.2	0.2	-0.6	-0.4
	Taguig	0.1	0.9	0.0	0.1	0.1	-0.5	-0.4
	Simple average	0.1	0.8	0.0	0.1	0.1	-0.5	-0.4
Toilets with wastewater treatment (constructed wetland)	Bayawan	0.1	0.7	0.1	0.2	0.3	-0.5	-0.4
Toilets to sewer	Taguig	0.1	0.9	0.0	0.1	0.1	-0.6	-0.4
All interventions	Simple average	0.1	0.8	0.1	0.2	0.2	-0.5	-0.4
	Minimum	0.1	0.6	0.0	0.1	0.1	-0.6	-0.5
	Maximum	0.2	0.9	0.1	0.3	0.3	0.0	0.0
	Range	0.1	0.4	0.1	0.3	0.3	0.6	0.5
	Standard deviation	0.0	0.1	0.0	0.1	0.1	0.2	0.1

Notes: Experiment 1: using average wages per region instead of GDP per region; Experiment 2: 100% of time for adults and 50% of time for children; Experiment 3: VSOL instead of GDP; Experiment 4: 10% increase in diarrheal incidence rates; Experiment 5: 10% decrease in diarrheal incidence rates; Experiment 6: 50% increase in initial costs; Experiment 7: 100% increase in initial costs

ANNEX TABLE K 9. BASIC FEATURES OF SANITATION PROGRAMS

No.	Project name	Sites	Implementing agency	Funding source	Project value (m US$)	Start year	End year
1	Water Districts Development Project: Sewerage, Sanitation and Drainage Development (WDDP)	Cabanatuan, San Fernando, Candon, Calbayog, Panabo and the province of Palawan	LBP/LGU	World Bank (loan)	17.9	1999	2006
2	Rural Water Supply and Sanitation Project (RWSSP)	20 poorest provinces[1]	DPWH	ADB/ government	31.3	1997	2004
3	Rural Water Supply and Sanitation Project Phase V (RWSSP-V)	Ilocos Sur, Nueva Vizcaya, Occidental Mindoro and Oriental Mindoro	DILG	JBIC/ government	9	2001	2007
4	Water Supply and Sanitation Enhancement Program (WSSPEP)	(nationwide)	DILG/NWRB	AUSAID/WSP	1.9	2002	2006
5	Local Initiative for Affordable Wastewater (Phases 1 and 2) (LINAW)	Dumaguete, Iloilo, Muntinlupa, Naga, Calbayog and Malaybalay	USAID Contractor through LGUs	USAID	0.8	2003	2007
6	Environmental Governance Project (EcoGov)	Northern Luzon, Central Visayas, Western, Central and Southern Mindanao, including the Autonomous Region of Muslim Mindanao (ARMM)	USAID Contractor through LGUs	USAID	19	2004	2009
7	Manila Third Sewerage Project (MTSP)	Metro Manila	LBP/Manila Water	World Bank (loan)/local	84.5	2005	2010
8	Integrated Support for Sustainable Urban Sanitation (Phases 1 and 2) (ISSUE)	San Fernando	CAPS	DGIS (Netherlands)	0.4+	2004	2010
9	Sustainable Coastal Tourism in Asia (SCOTIA)	Mactan Island, Moalboal Island, Panglao Island, El Nido, Puerto Galera, Balayan Bay	USAID Contractor through LGUs	USAID	1.5	2004	2008
10	Sustainable Sanitation for East Asia (SuSEA) – Philippines Program	Bauko Municipality , Dagupan City , Guian , General Santos City , Polomolok , Alabel	WB Contractors through DOH and DENR	SIDA/SuSEA	3.0	2007	2010

[1] The provinces were Benguet, Abra, Mountain Province, Ifugao, Kalinga, Apayao, Batanes, Aurora, Romblon, Masbate, Guimaras, Antique, Southern Leyte, Eastern Samar, Biliran, Basilan, Agusan Sur, Surigao Sur, Sulu, Tawi-Tawi

ANNEX TABLE K 10. BASIC INTERVENTIONS AND PROGRAM APPROACHES OF SANITATION PROGRAMS

Item	Project name										Summary
	WDDP	RWSSP	RWSSP-V	WPEP[1]	LINAW	ECOGOV	MTSP	ISSUE	SCOTIA	SuSEA	
Target beneficiaries											
Households (Direct)	x	x					x	x		x	5
Others		x	x	x	x	x	x		x	x	8
Output: Hardware											
Sewerage and drainage systems	x						x				2
Septic tanks	x					x			x		3
Toilet bowls and related facilities	x	x	x					x	x		5
Treatment facilities (STF, wastewater, sewer)					x	x	x		x	x	5
Water supply		x	x								2
Output: Software											
Sewerage treatment plan and/or design	x					x				x	3
Capacity building of LGUs/local communities	x	x		x						x	4
Health and hygiene education/promotion		x			x					x	4
Other information campaigns							x	x		x	3
Water quality and monitoring program		x								x	2
Contribution to local ordinances						x				x	2
Knowledge products				x	x					x	3
Implementing approach											
CLTS										x	1
Sanitation marketing											0
Informed choice									x	x	2
Supply driven	x	x	x					x		x	5
Strategic urban sanitation					x	x	x		x	x	5
Hygiene behavior change		x					x	x		x	4
Partnership arrangements											
Implementation partnership		x		x	x	x		x	x	x	7
Financing partnership	x						x		x		3
Private/public sector partnership					x	x		x	x	x	5
Public/public partnership		x	x	x					x	x	5
Documents reviewed											
Project completion report	x	x	x		x				x		5
Case studies/field studies & other reports				x	x		x	x	x	x	6
Midterm review										x	1

[1] The implementation approach for the WSSPEP was not assessed.


wsp
water and
sanitation program