4.1.3 PRODUCTIVITY COSTS

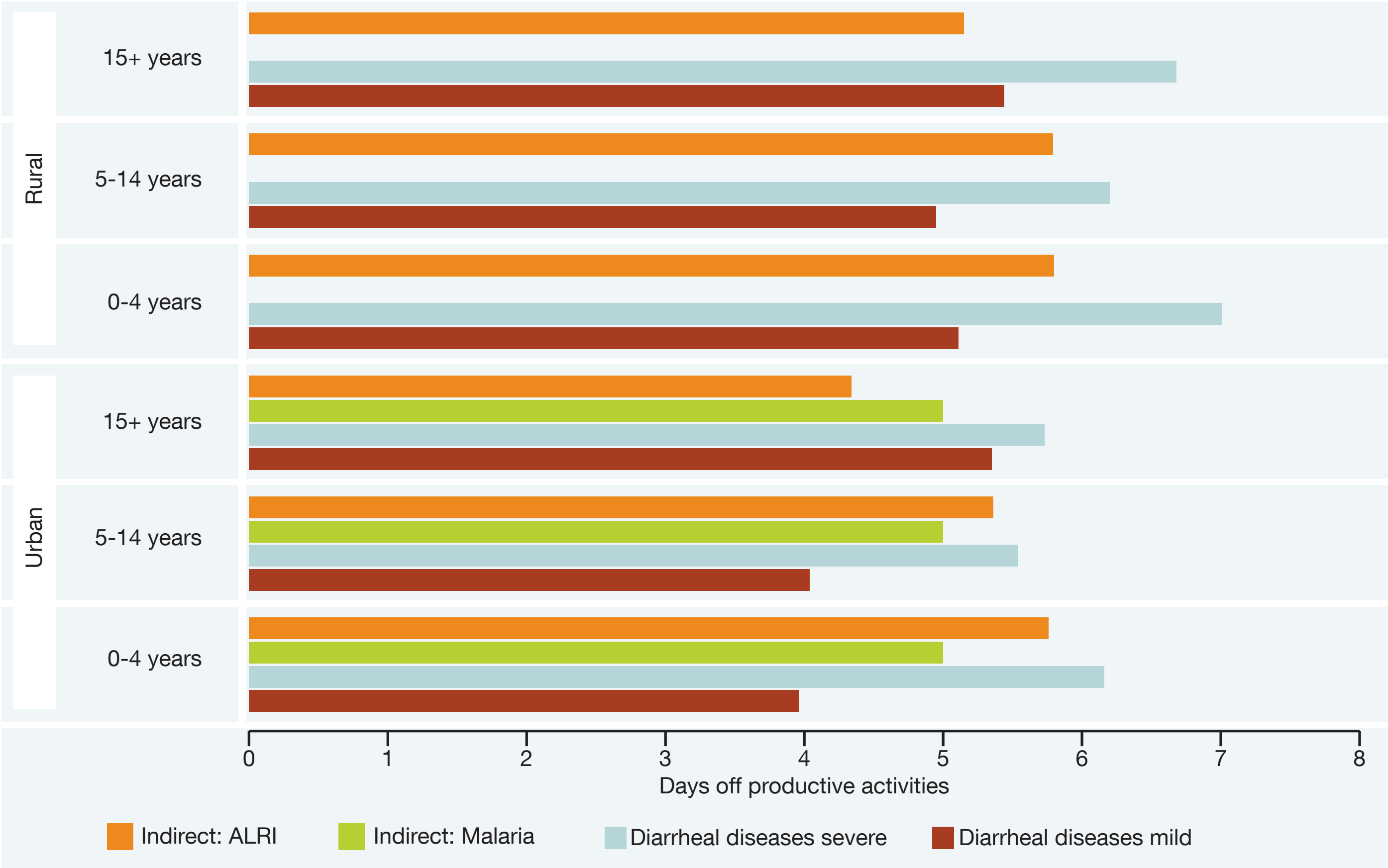
Health-related productivity costs are calculated by multiplying time off of work or school to the disease rates, per population age group. The economic cost of time lost due to illness reflects an opportunity cost of time or an actual financial loss for adults with paid work. The unit costs for all locations are based on the national average wage. In order to take into account variations in employment patterns, a conservative value is given for adults – at a rate of 30% of the average income – 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 5, the time of the child carer is applied at 15% of the average income.

The household survey also revealed practices related to carers looking after the sick people. The average number of days to take care for the sick person in rural areas is 3.4 days, at 13.7 hours/day, while the average number of days in urban areas is 4.3 days, at 13.3 hours per day. Table 15 shows that the greatest productivity costs are incurred due to illness of children under five, in both urban and rural areas. This is because the disease prevalence for children under five years is higher than for other age groups. The actual figures may be even greater as the children's parents are also involved in the care of their ill children, causing additional loss of productive time.

4.1.4 MORTALITY COSTS

For the mortality cost estimation, this study adopted data from some international studies, which are compiled and presented in the Table 16. The figures are estimated by combining the annual risk of death per age group with the average value of life. Poor sanitation, through its important implications for child nutritional status, is associated with higher rates of diarrheal disease and acute lower respiratory infection (ALRI), as well as increased mortality from a range of childhood diseases. However, there is no adequate national data source that provides precise information on the link between diarrheal disease and other diseases.

FIGURE 10: NUMBER OF DAYS AWAY FROM PRODUCTIVE ACTIVITIES, PER DISEASE WITH RESPECT TO PERSON'S AGE



4.1.5 AVOIDED HEALTH COSTS

Central to the arguments of improving sanitation and hygiene are the health improvements. Limited evidence exists on the actual health impact of sanitation or hygiene programs on health outcomes in Indonesia and this study draws on international evidence. Figure 11 shows the different risk exposure scenarios being compared in this study, and the reduced risk of fecal-oral disease and helminthes infection associated with movements 'up' the sanitation ladder. 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 where sewerage systems are currently only available at urban areas.

The answers given by household respondents to the question, "Have you noticed an observable change in the rate of diarrheal disease in any household members since you received the new latrine?", are shown in the Table 17. At least 80% of respondents in all categories answered that they do not feel any observable change in diarrheal disease rates in any household member since they received a new latrine. A

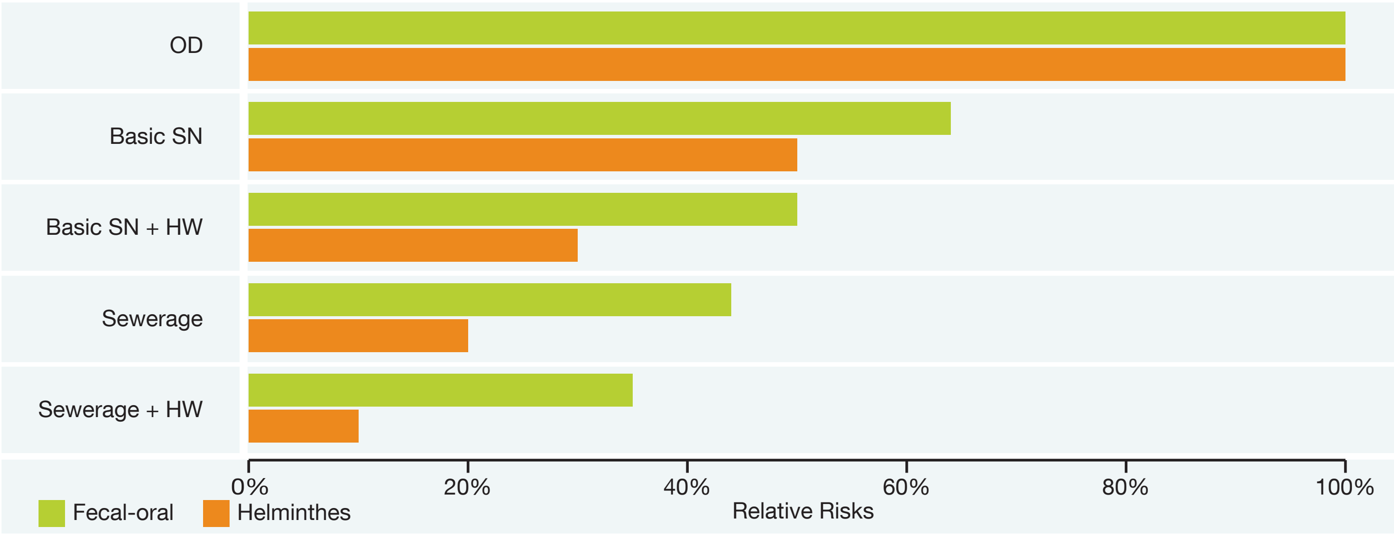
TABLE 15: AVERAGE PRODUCTIVITY COST PER PERSON PER YEAR IN FIELD SITES, BY DISEASE, AGE GROUP AND RURAL/URBAN LOCATION (US$)

Disease	Rural			Urban		
	0-4 Years	5-14 Years	15+ Years	0-4 Years	5-14 Years	15+ Years
Diarrheal disease mild	11.73	6.22	6.80	2.69	1.91	3.07
Diarrheal disease severe	5.82	4.23	6.82	2.32	1.71	1.33
Malaria	0.00	0.00	0.00	0.02	0.02	0.03
ALRI	2.31	3.67	2.40	3.14	2.97	2.53
Total	**19.86**	**14.11**	**16.02**	**8.17**	**6.60**	**6.96**

TABLE 16: AVERAGE MORTALITY COST PER PERSON PER YEAR IN FIELD SITES, BY DISEASE, AGE GROUP AND RURAL/URBAN LOCATION

Disease	Rural			Urban		
	0-4 Years	5-14 Years	15+ Years	0-4 Years	5-14 Years	15+ Years
Diarrheal disease	11.49	0.50	0.52	11.49	0.50	0.52
Malaria	0.04	-	-	0.04	-	-
ALRI	3.23	-	-	3.23	-	-
Total	**14.76**	**0.50**	**0.52**	**14.76**	**0.50**	**0.52**

FIGURE 11: RELATIVE RISK OF FECAL-ORAL DISEASES AND HELMINTHES OF DIFFERENT RISK EXPOSURE SCENARIOS



Key: OD – open defecation or unimproved sanitation; SN – sanitation; HW – hand washing, reflecting basic hygiene interventions small proportion perceived that receiving new latrine leads to “Probably less” or ”A lot less” diarrheal disease. Note that many of those answering from the septic tank and sewerage categories were moving up from other improved sanitation options, and hence the health effects are expected to be relatively fewer than for those previously practicing open defecation. These data are considered to be weaker than the international evidence presented in Figure 11, which are based on more rigorous scientific studies.

Table 18 summarizes the total costs of poor sanitation and hygiene in Indonesia, per household for the selected field sites, and total costs at national level. Health care is the main contributor to cost averted of improved sanitation, representing between 60% and 70% of total health costs in both rural and urban sites (Figure 12). The costs averted in this table are utilized in the cost-benefit calculations in Chapter 8. Each study site has different costs averted values according to their sanitation development situations.

4.2 WATER

Water is abundant in most parts of Indonesia. In 2004, internal freshwater resources per capita were 15,500 m^3, which is significantly higher than other Asian countries such as India (1,185 m^3) and China (2,183 m^3). In terms of major water resources, Indonesia has a large number of small and medium-sized rivers. A major characteristic of most Indonesian rivers is the high variability of runoff due to the distinct separation between rainy and dry season. Most of the rivers are located in the more humid western half of the

TABLE 17: PERCEIVED DIFFERENCE IN DIARRHEAL INCIDENCE SINCE IMPROVED SANITATION, IN ALL FIELD SITES

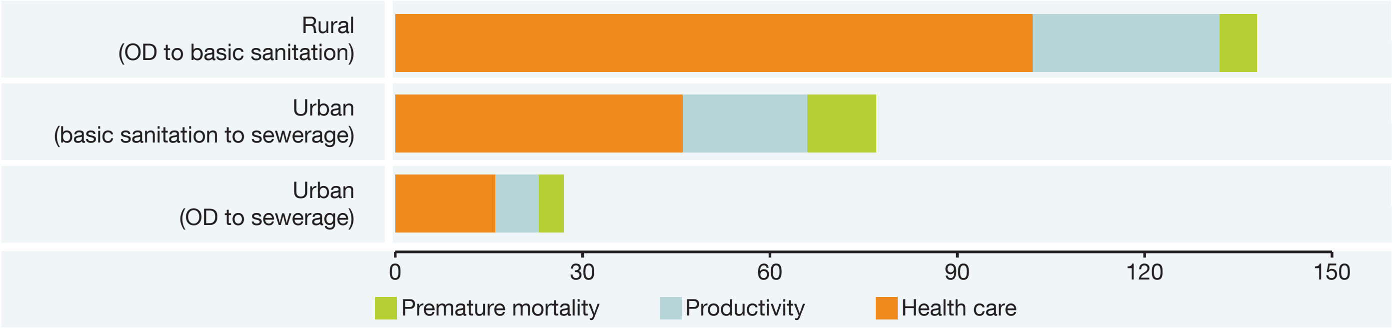
Sanitation coverage	Households in sample	Answer to question “have you noticed an observable change in diarrheal disease rates in any household members since you received the new latrine?”			
		A lot less	Probably less	No	Probably more
Shared/public	36	0%	0%	97%	3%
Dry pit	5	0%	20%	80%	0%
Wet pit	71	7%	8%	83%	1%
Septic tank	187	5%	11%	80%	4%
Sewerage with treatment	121	2%	3%	95%	0%

Note: Total responses for this question were 452 out of 1,500 respondents; the remaining respondents did not give any answer.

TABLE 18: ANNUAL COSTS PER HOUSEHOLD OF POOR SANITATION AND HYGIENE, AND ANNUAL COSTS AVERTED OF IMPROVED SANITATION (IN US$, 2008)

Costs	Costs (baseline risk)		Costs averted		
	Rural	Urban	Rural (OD to basic sanitation)	Urban (OD to sewerage)	Urban (basic sanitation to sewerage)
Health care	202	74	102	46	16
Productivity	80	33	30	20	7
Death	10	15	6	11	4
Total	**292**	**123**	**138**	**76**	**27**

FIGURE 12: HEALTH COSTS AVERTED OF IMPROVED SANITATION OPTIONS



Indonesian archipelago, i.e. the islands of Sumatra, Java and Kalimantan. Some of the rivers of major importance for human settlements include[14] Cisadane (Banten, West Java), Ciliwung (Jakarta), Citarum (West Java) (prior to construction of the Saguling Reservoir), Kali Brantas (East Java), and Bengawan Solo (Central Java). The first four of these rivers run through highly densely populated areas, where human activities – both domestic and industrial – release large quantities of wastewater to Indonesia's great rivers. Kali Brantas, for example, receives about 150 tons/day of wastewater, 60% originating from domestic wastewater and the remaining 40% from industries[15]. Citarum River in West Java, is also indicated to be highly polluted with domestic and industrial waste, with E. coli in the water reaching 50,000/100 ml[16].

Biochemical oxygen demand (BOD) is high due to intakes from agriculture, industry and domestic sources. The ESI Phase 1 study estimated that in 2005, domestic sources contributed to 2.1 million tons of BOD per year to inland water sources. The BOD came from an estimated 6.4 million tons of feces and 64 million m^3 of urine countrywide, plus at least 854 million m^3 of gray water from urban areas. As well as BOD, water resources are also contaminated by bacteriological and pharmaceutical elements.

With small populations and abundant water resources, pollutants would be diluted naturally. However, given the high density of population in many parts of Indonesia such as JABODETABEK[17] area, Bandung, Surabaya and Medan, the natural dilution process is not sufficient. Water quality indicators presented below suggest that significant pollution is taking place in some parts of the country. Furthermore, over-extraction of water from some rivers and other water sources for irrigation purposes leads to reduced flow, thus greater pollution as well as depletion of the water resources.

4.2.1 WATER RESOURCES

Table 19 presents a summary of water sources in the two rural and three urban field sites used to take water samples. In Tangerang District, although Cisadane river passes through the area, the local population do not identify the Cisadane as their source of water. However, Cisadane River is the source of water supply for the local water supply utility in Tangerang City. Similarly, in Lamongan District, despite the presence of a large river, local people tend to use ground water as their water source.

The outskirts of Payakumbuh and Malang are upstream of several rivers, which are also the water sources for the local water supply utility in each area. The households interviewed in the ESI study sites generally identified their sources of drinking and clean water, in declining order of importance, as: 1) ground water, 2) spring water, and 3) surface water. Ground water is extracted from dug wells and pump wells, while spring and surface water are treated, then transferred to and distributed by local water supply utilities. The samples of water from Payakumbuh and Mergosono showed low turbidity, although the samples were taken during rainy season on January 2010 in rivers laden with wastewater and solid waste.

TABLE 19: NUMBER OF WATER SAMPLES TAKEN IN FIELD SITES, BY WATER SOURCE

No.	Sample site	Surface	Dug well	Borehole	Piped water	Total
1	Banjarmasin City	1	-	-	5	**6**
2	Payakumbuh City	5	2	-	1	**8**
3	Malang City	5	1	2	9	**17**
4	Lamongan District	3	2	2	-	**7**
5	Tangerang District	-	6	-	-	**6**
TOTAL		**14**	**11**	**4**	**15**	**44**

[14] Source: *Status Lingkungan Hidup Indonesia*, 2004, KLH; Puslitbang SDA
[15] *Badan Pengendalian Lingkungan Hidup Daerah*/BPLHD (Environmental Control Agency) East Java, 2008
[16] *Pusat Penelitian dan Pengembangan Sumber Daya Air* (Research Center for Water Resources), MPW, 2006
[17] 'Jabodetabek' is an acronym for the conglomerate of the 5 cities of Jakarta, Bogor, Depok, Tangerang and Bekasi, which more and more grow together to one huge metropolitan area in the 20+ million inhabitants.

4.2.2 WATER QUALITY AND ITS DETERMINANTS

Ground water and surface water quality are affected by soil condition and the practices of the surrounding communities. Payakumbuh and Malang are located on upland plains. Water quality is good in almost all rivers, as the fast flowing water allows for natural dilution.

In Banjarmasin, the quality of river water is poor. The color and turbidity of the water are not as good as in Payakumbuh and Malang. Local people use rivers as disposal sites for solid waste and domestic wastewater, leading to occasional outbreaks of diarrheal disease. It is common for people to use rivers as "one stop shops", to dispose of waste, as a source of water for bathing and washing, and children's playgrounds. The larger rivers are used for transportation. Learning from larger cities like Jakarta, 'clean river action' has become a major issue for local governments and communities. Floating solid waste in rivers and poor water quality lead to higher treatment costs for water supply companies, and dirty and poor maintained rivers and lakes spoil the aesthetic view and affect aquatic life.

There are two regulations on water quality standards in Indonesia. Government Regulation 82/2001 on Water Quality Management and Water Pollution Control classifies water by its designated use – for example, raw water that is designated to be processed for drinking water is Class 1 – and sets water quality standards for each class of water. Ministry of Health Decree 907/Menkes/SK/VII/2002 on the Criteria for and Monitoring of Drinking Water Quality sets forth more specific criteria for drinking water quality standards. Table 20 shows water quality standards established by these two statutes.

The water quality measurements in the ESI study were performed based on the type of water source and its designated use, as follows:

- **Piped water.** The measured parameter is residual chlorine, which protects users from water borne disease. Ministry of Health Decree 907/Menkes/SK/VII/ 2002 states that the adequate level of residual chlorine from outlet reservoir to the farthest consumers is ≥ 0.2 mg/l (see Table 26).
- **Surface water.** The water quality measurement for surface water covers physical parameters (turbidity, temperature, conductivity), chemical parameters (nitrate, ammonia, COD, BOD, and DO), and bacteriology (E. coli). People use surface water mainly for bathing and washing, and spring water for drinking (after boiling). Also, some local water supply utilities source raw water from springs.
- **Groundwater.** The water quality measurement parameters for ground water consist of E. coli, turbidity, conductivity, and ammonia. The samples were taken from both dug wells and boreholes. Water samples from boreholes were tested only for conductivity and ammonia content.

TABLE 20: WATER QUALITY STANDARDS REGULATION

Parameters	Ministry of Health (MoH) Decree No. 907/2002	Government Regulation No.82/2001	Unit
E Coli	0	250	in 250ml
Biochemical Oxygen Demand (BOD)		2	mg/liter
Chemical Oxygen Demand (COD)		1	mg/liter
Turbidity	5		NTU
Conductivity			microS/cm
Dissolved Oxygen (DO)		6	mg/liter
Nitrate	50	10	mg/liter
Ammonia	1.5	0.5	mg/liter
Temperature	±3°C	±3°C	°C
pH	6,5 – 8,5	6-9	
Chlorine (Cl)	≥0.2	0.03	mg/liter

The water quality surveys were performed by PT Sucofindo Laboratories. The results show that some of the values are above or below the thresholds for drinking water or raw water that is designated to be processed for drinking water, set by the water quality standards regulations. These figures indicate pollution or inadequate levels of certain parameters in water bodies. For example, the piped water results show that samples from Banjarmasin, Payakumbuh, and Malang have inadequate levels of residual chlorine. People therefore need to treat this water for drinking using techniques such as boiling, coagulant, filtration and/or disinfectant.

The results for E. coli existence could not be verified and were therefore inconclusive. However, many surface water sources reportedly showed visual contamination with human feces, which are likely to contain E. coli bacteria.

Decree 907/Menkes/SK/VII/2002 sets the maximum acceptable level of turbidity at 5 NTU. For this parameter, the water samples from almost all rivers and dug wells were well above this threshold. For example, water from Kalayan River in Banjarmasin had a turbidity of 19 NTU, water from Batang Lampasi River in Payakumbuh had a turbidity of 11 NTU, water from a dug well at a site in Payakumbuh had a turbidity of more than 200 NTU, and water from Bengawan Solo River in Lamongan District, a turbidity of 916 NTU. Such high turbidity levels result from the large volumes of waste disposed of into these water bodies.

Ammonium content in water comes from organic degradation or human excreta. The acceptable maximum ammonium content for drinking water is 1.5 mg/l. Almost all water samples had an ammonium content below the threshold value, with the exception of water from a dug well in Payakumbuh, which had an ammonium content of 2 mg/l.

Biochemical processes in water bodies such as nitrification lower the pH level of the water. The ideal pH value is 7 (neutral), and the acceptable range is between pH 6.5 and pH 8.5. The pH level of almost all the water samples was within the acceptable range, except for the water samples from Batang Lampasi River in Payakumbuh and spring water from Karangan River in Malang.

Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are parameters indicating the existence of organic materials that lead to water pollution. The higher the BOD and COD concentrations, the greater the water pollution. The maximum threshold value is 2 mg/l for BOD and 10 mg/l for COD (Government Regulation 82/2001). Water samples from Bengawan Solo River, Dusun Badurame Lake, and Anyar Lake in Lamongan District had BOD and COD concentrations in excess of these thresholds.

Dissolved oxygen (DO) is also a parameter indicating the presence of organic materials that lead to water pollution. The higher the DO value, the lower the water pollution, and vice versa. The minimum threshold for DO is 6 mg/l. Water samples from Kelayan River in Banjarmasin and a dug well in Mergosono, Malang had DO values below the minimum. Low levels of DO adversely affect aquatic life and may result in foul smelling water.

The acceptable water temperature range is ± 3°C from ambient temperature. All water sample temperatures were within the acceptable water temperature range.

The following figures provide a graphical presentation of selected water quality readings. Water samples were taken from piped water, surface water, dug wells and boreholes. As shown in Table 21, a total of 44 samples were taken across the study sites. All the results portrayed in the figures correspond to the sample numbers shown in Table 26. Detailed results of the water quality measurements are presented in the Annex, in Table F 6.

TABLE 21: WATER SAMPLE NUMBERS AND SAMPLE SITES

No.	Sample site location	Sample No.
1	Banjarmasin City	1 - 6
2	Payakumbuh City	7 - 14
3	Malang City	15 - 31
4	Lamongan District	32 - 38
5	Tangerang District	39 - 44

Figure 13 shows that water turbidity was generally below the maximum set by law, with the exception of the samples from a dug well from Payakumbuh and of surface water in Lamongan, which had turbidity in excess of 200 NTU. All surface water samples contained high levels of nitrate.

Figure 14 presents the COD and BOD readings. Again, all surface water samples had BOD and COD readings in excess of the legal maximum.

Figure 15 shows the extent of isolation of sewage at the field sites. Use of non-flush latrines (over rivers, ponds or ditches), hanging latrines, defecation in bushes, wrap and throw are categorized as open defecation. Many people in Payakumbuh, Lamongan and Tangerang still defecate in hanging latrines over rivers or ponds to feed their fish. In Banjarmasin and Tangerang, people living on riverbanks defecate in hanging latrines over rivers. Hence, the rates of open defecation in these field sites is high.

Despite these views, using rivers for latrines and disposing of household wastewater has unarguably led to serious surface water pollution. This not only damages the environment, but also spoils the scenery. Cleaning up rivers is becoming a major concern to governments and communities. In a metropolitan areas such as Jakarta, deterioration of water quality resulting from disposal of solid waste and domestic wastewater in rivers means that water supply utilities have to spend more on water treatment.

FIGURE 13: TURBIDITY AND NITRATE CONTENT READINGS

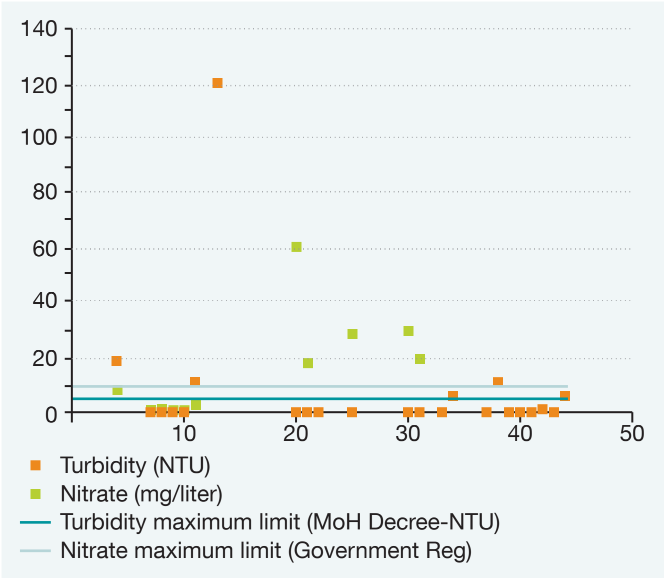


FIGURE 14: BOD AND COD READINGS

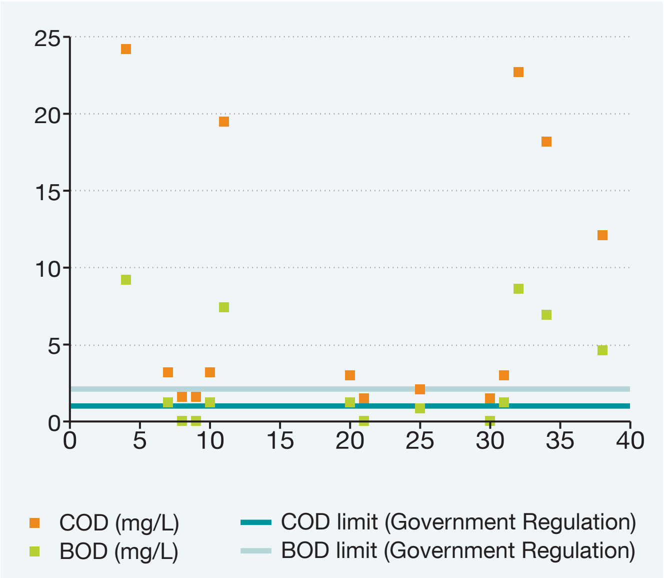
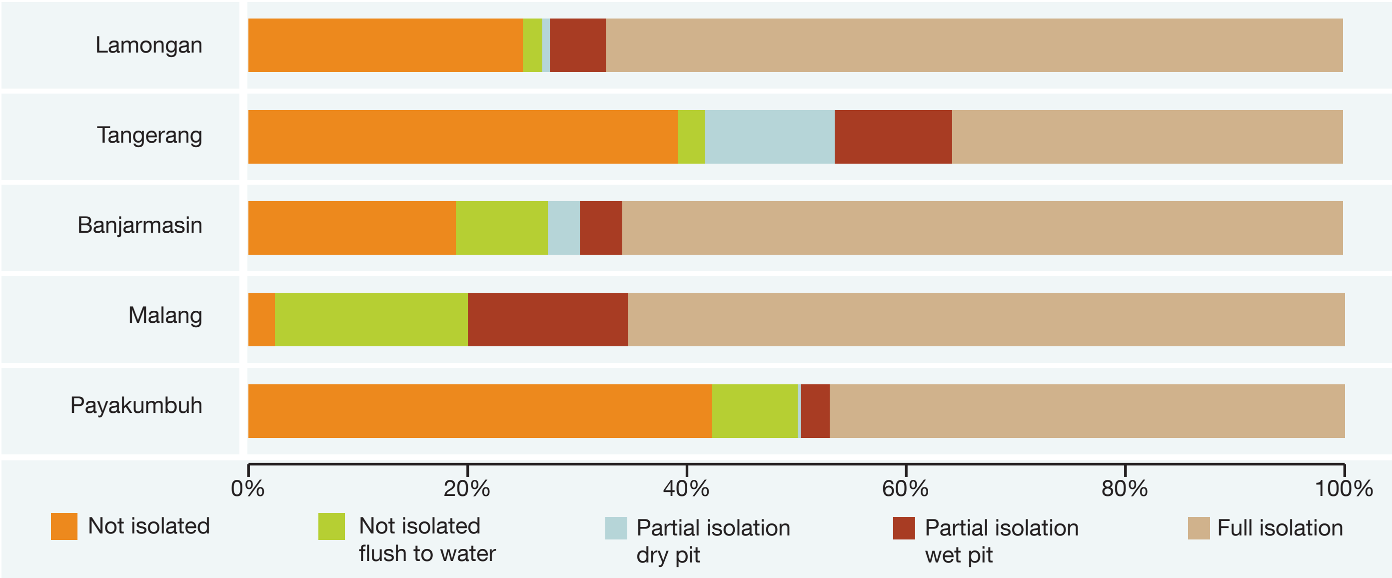


FIGURE 15: EXTENT OF ISOLATION OF HUMAN EXCRETA IN FIELD SITES



4.2.3 HOUSEHOLD WATER ACCESS AND TREATMENT COSTS

One of the major impacts of polluted water sources such as wells, springs, rivers and lakes is that it requires more intensive water treatment, which increases costs for human activities. According to the national development planning agency, BAPPENAS, for every 1 mg/liter additional BOD concentration in a river from which water supply utilities source water, average water treatment cost increases 25%.[18] As well as causing financial loss, pollution of rivers and lakes also spoils the scenery and adversely affects aquatic life. Accessing cleaner water from other, more distant sources increases the access costs to households and water supply utilities. Households that do not take precautionary measures to treat their drinking water are exposed to higher risk of infectious disease or poisoning due to the chemical content of the polluted water. Figure 16 shows household water sources (primary sources of drinking water). Piped water service coverage is currently only available in urban areas.

According to the household survey, average monthly cost of accessing water costs per household ranges from US$0 to US$1 for rural sites and US$0 to US$3.62 for urban sites. Zero payment is for unprotected water sources, as users can access the water free of charge (Figure 17). The average monthly cost of accessing water in urban areas, even for non-piped water (protected and unprotected), tends to be higher than in rural areas. This may be because people living in urban areas purchase water from vendors or, where access to wells is restricted, from well owners. People living in rural areas, however, have greater access to land to make dug wells. Access to piped water in rural areas is almost zero because they are not covered by water supply utilities.

Figure 18 presents a data summary of the responses by households to the question about the characteristics of poor quality water, for three major water sources in rural and urban areas. Respondents mentioned that non-piped protected water has the best quality for daily water consumption, especially in urban areas. Less than 10% of respondents using non-piped protected water in urban areas complained about bad appearance, and less than 5% complained about bad smell, bad taste, and solids content of their water. In rural areas, the characteristics of non-piped protected water appear to be adequate, except for solids content (turbidity), with which almost 15% of the respondents were dissatisfied. Respondents in urban areas are generally not satisfied with their water, mainly because of its poor appearance; while for those in rural areas, the greatest concern was about the solids content (22% of respondents). Piped water in urban areas appears to provide no guarantee of better water quality, as about 15% of respondents were not satisfied with the turbidity of their water.

FIGURE 16: MAIN HOUSEHOLD WATER ACCESS (%)

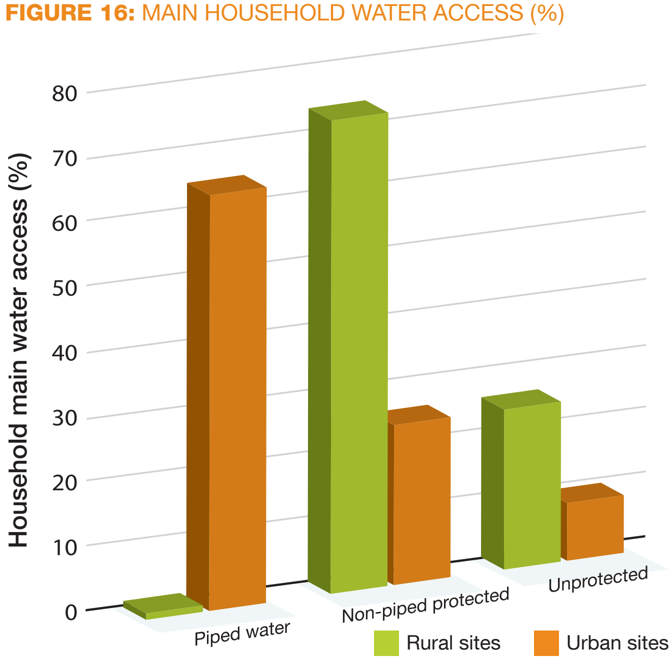
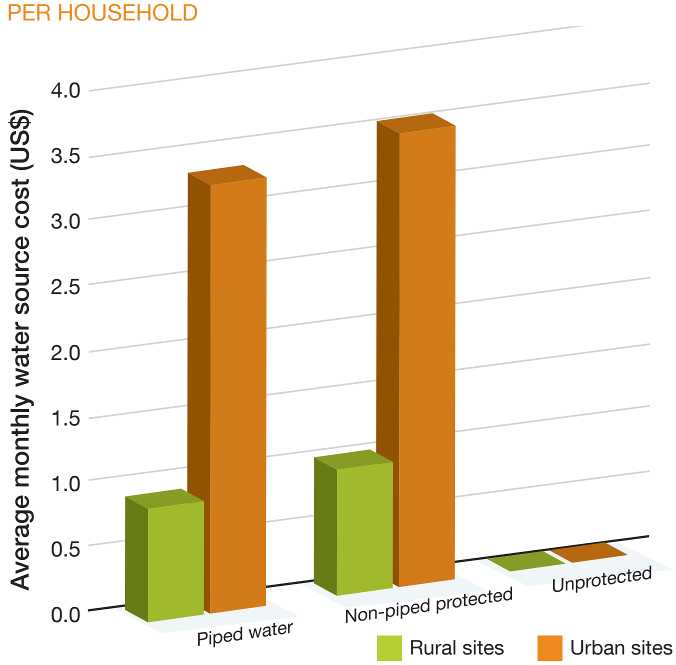


FIGURE 17: WATER ACCESS COSTS, MONTHLY AVERAGE PER HOUSEHOLD



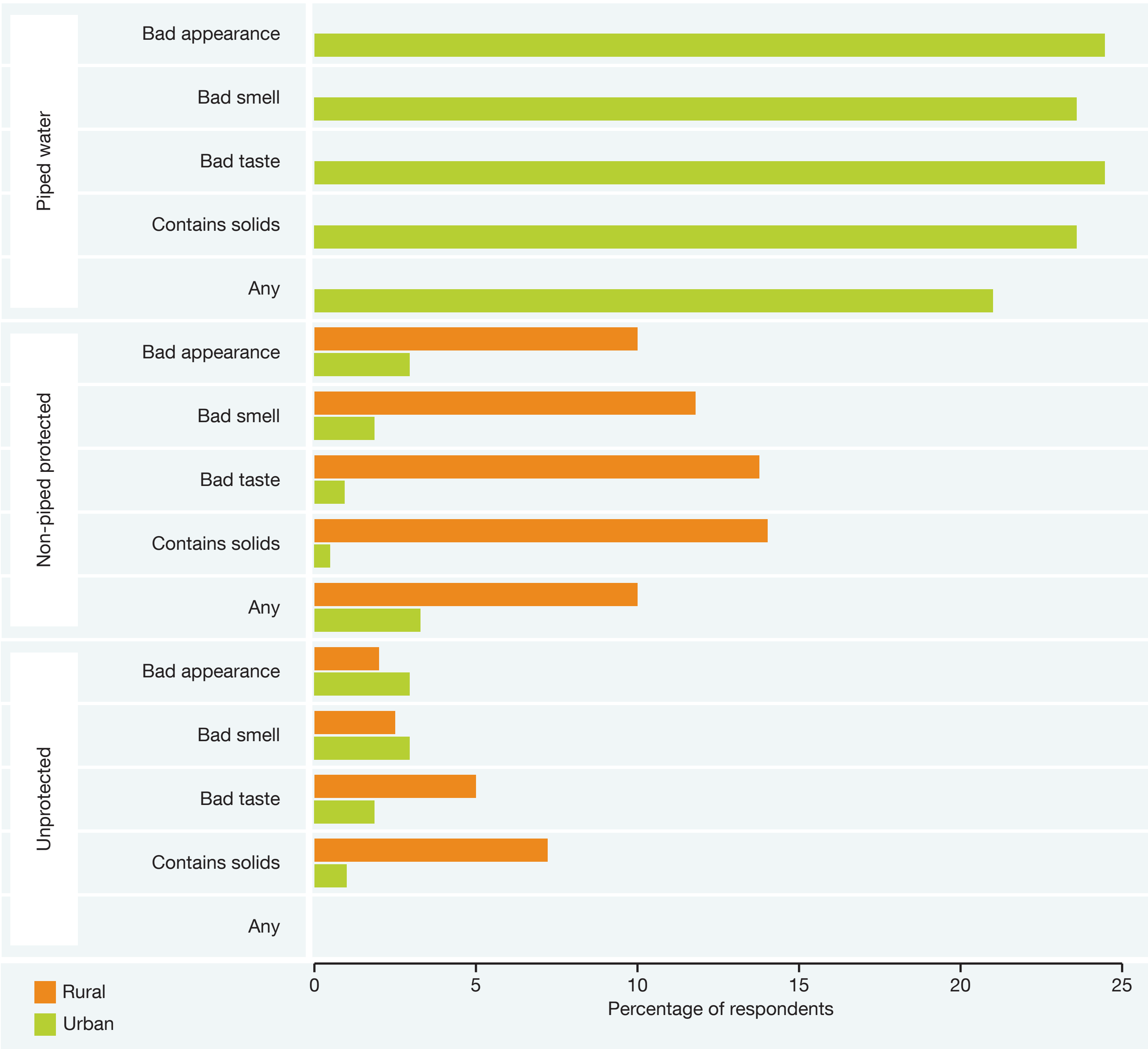
[18] ISSDP Advocacy Materials, Sanitation Development Technical Team (TTPS) of the National Development Planning Agency (BAPPENAS), 2007.

4.2.4 HOUSEHOLD RESPONSE TO POLLUTED WATER, AND RELATED COSTS

The ways in which households respond to polluted water sources vary from changing their water seller (if they purchase water) to walking further to get free water, or treating their water. In urban areas, households tend to switch to piped water – if available and affordable – harvest rainwater, purchase bottled water, and bring in water tankers. For daily consumption, about 40% of the respondents in urban areas use piped water, while less than 1% of rural respondents enjoy this privilege. The vast majority (more than 90%) of rural households use protected or unprotected wells as their main source of water.

The results of the survey indicate that people in both urban and rural areas consider water quality, quantity and cost to be equally important. Water quality indicators consist of better taste, less turbidity, clearer color and safer for health, and the indicator of water quantity is continuous water supply. In rural areas, people prefer to use protected water sources than unprotected ones because the water is better quality and safer for health.

FIGURE 18: CHARACTERISTICS OF POOR QUALITY WATER CITED BY RESPONDENTS



As well as the various ways of coping with polluted water, the respondents also practice water treatment. The household survey found various water treatment practices: more than 80% of the respondents said that boiling water is their most regular method treating water, although the proportion of respondents doing so is slightly higher in urban areas than in rural areas (Figure 19). Boiling water before drinking is customary and people believe that raw water is not potable. Therefore, households are used to boiling water (except bottled water) at home for drinking, even if their water is of good quality.

A new market for drinking water is emerging in urban and rural areas. Small-scale enterprises process raw water into drinking water packaged in 19-liter bottles. The raw water is sourced from water tankers supplied by the local water supply utility or from bore wells or dug wells. The water is treated using a serial filtering system and disinfected using ultraviolet, ozone, or reverse osmosis, or a combination thereof. Consumers can bring their own gallon jars to the treatment plant to be refilled, or have the water delivered to the home. At around US$0.3 per gallon, this water is much cheaper than branded ready-to-drink bottled water from large water producers, which costs US$1.1 per gallon. The government has set quality standards for the treatment methods as well as quality of the treated water. Hence, these two types of bottled water are commonly perceived to be of the same quality.

The way households source their water suggests that people in urban areas are more concerned than rural households about all aspects of their water sources, including water quality, water supply continuity and availability, and time savings accessing the water.

Figure 20 presents the respondents' answers to the question: "Have you changed your water treatment practices since improved latrines have been installed?". In all almost sites, more than 80% of respondents stated that they had not changed their water treatment practices. The only exception was in Tangerang, where more than 60% of respondents had not changed their water treatment practices. The responses are closely linked to the main method of treating water (boiling water). As noted above, except in the case of ready-to-drink bottled water, households would not stop boiling water at home regardless of whether they have better quality water.

4.2.5 HOUSEHOLD WATER COSTS AVERTED FROM IMPROVED SANITATION

Table 22 shows the effect of sanitation improvement on the costs of accessing water sources and on the costs of water treatment. Household water treatment costs are higher than water access costs in all study sites. In Banjarmasin, the city with many rivers, households spend significantly more on treating and accessing water compared with the other study sites.

Annual average costs averted per household are calculated based on the assumption that after total improved sanitation, boiling water is not theoretically necessary anymore and a cheaper treatment method can be used instead. How-

FIGURE 19: HOUSEHOLDS WATER TREATMENT, BY METHOD AND RURAL/URBAN LOCATION

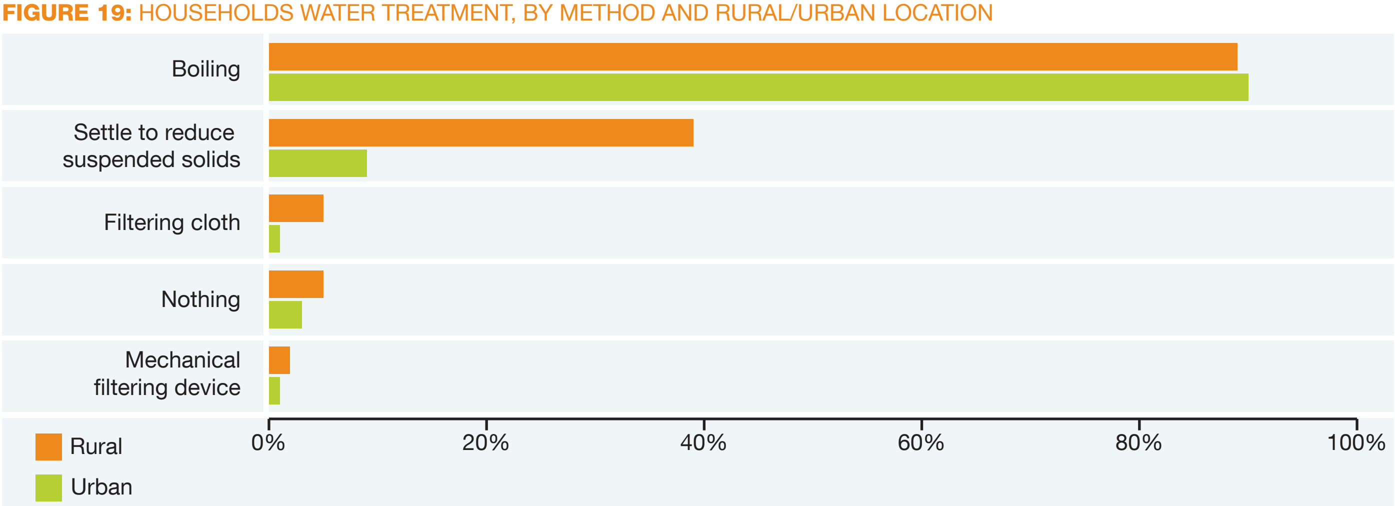


FIGURE 20: CHANGE IN WATER TREATMENT PRACTICES SINCE IMPROVED LATRINES HAVE BEEN INSTALLED

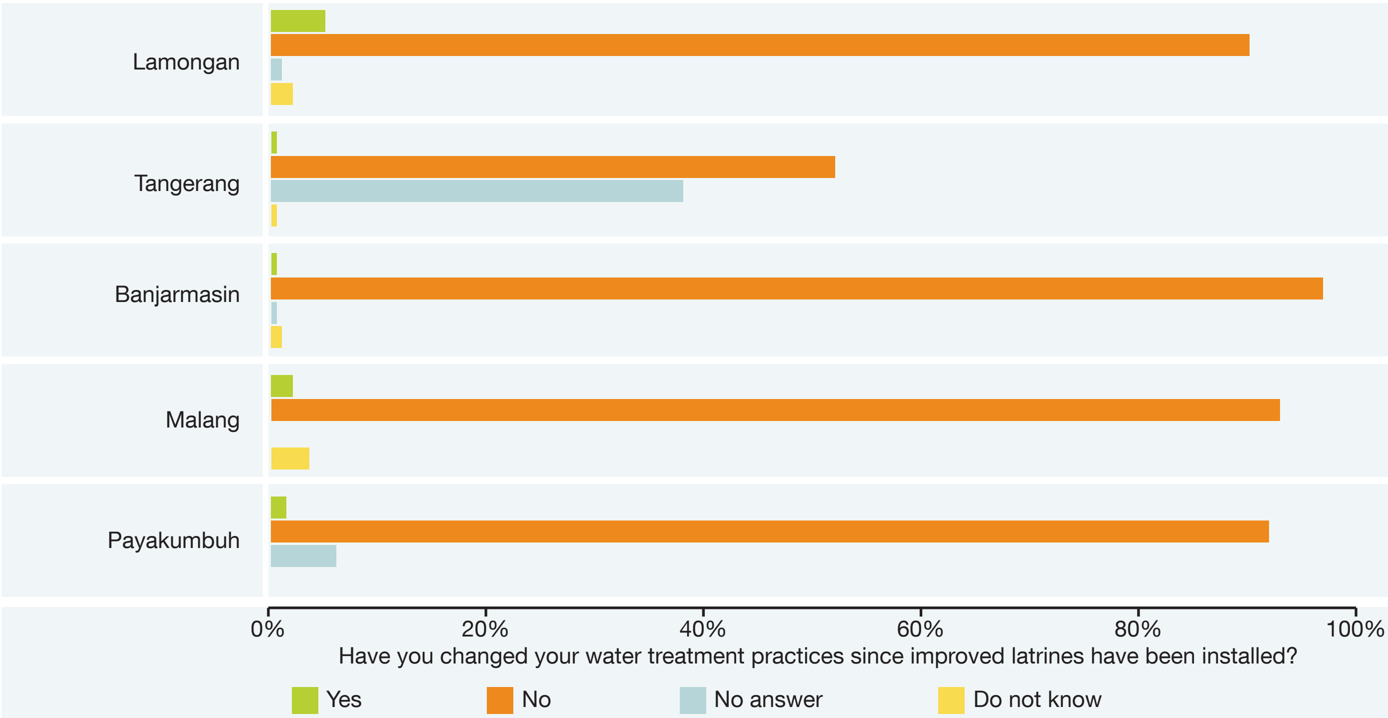


TABLE 22: WATER ACCESS AND HOUSEHOLD TREATMENT COSTS INCURRED AND AVERTED (US$)

Variable	Annual average costs per household		Annual average costs saved per household following 100% sanitation coverage	
	Water source access	Water treatment	Water source access	Water treatment
Lamongan	6	14	1	1
Tangerang	8	15	1	1
Banjarmasin	12	34	2	11
Malang	8	21	1	3
Payakumbuh	10	23	1	2

ever, given that very few households appear to be willing to change their water treatment practices, a conservative estimate for change in household practices is made. Table 22 shows that the annual costs averted per household range from US$2 to US$13 following total improved sanitation.

4.2.6 WATER USE COSTS IN NON-DOMESTIC ACTIVITIES

As well as for drinking, washing, bathing and cooking, water is also crucial for other daily activities in households and communities. In rural areas, these include water for irrigation, for agriculture and livestock and fish farming, and in urban areas include water for offices, factories, and so on. Where sanitation is poor, water treatment companies have to pay more to treat the water, although in most cases this cost is passed on to consumers, or covered by the local government budget. Table 23 presents the impacts of polluted water on water use.

TABLE 23: WATER USES AND IMPACTS OF POLLUTED WATER

Water use	Impacts of polluted water
Water treatment companies	Increased production cost
Fish farming	Additional pre-flow water treatment before entering fish ponds
Factories	Increased water treatment cost for operational purposes and for employees' use
Restaurants and hotels	Additional water treatment cost to ensure water for cooking is clean

The impact of poor water quality on these productive activities has an economic value. For example, a 1 mg/liter increase in BOD in a river that is a source of raw water for a water supply utility will increase in average national water production cost by 25%. The impacts on businesses are presented in the section on National Impacts in Chapter 5. Impacts on agriculture have not been examined because this was outside the scope of this study.

4.3 ACCESS TIME

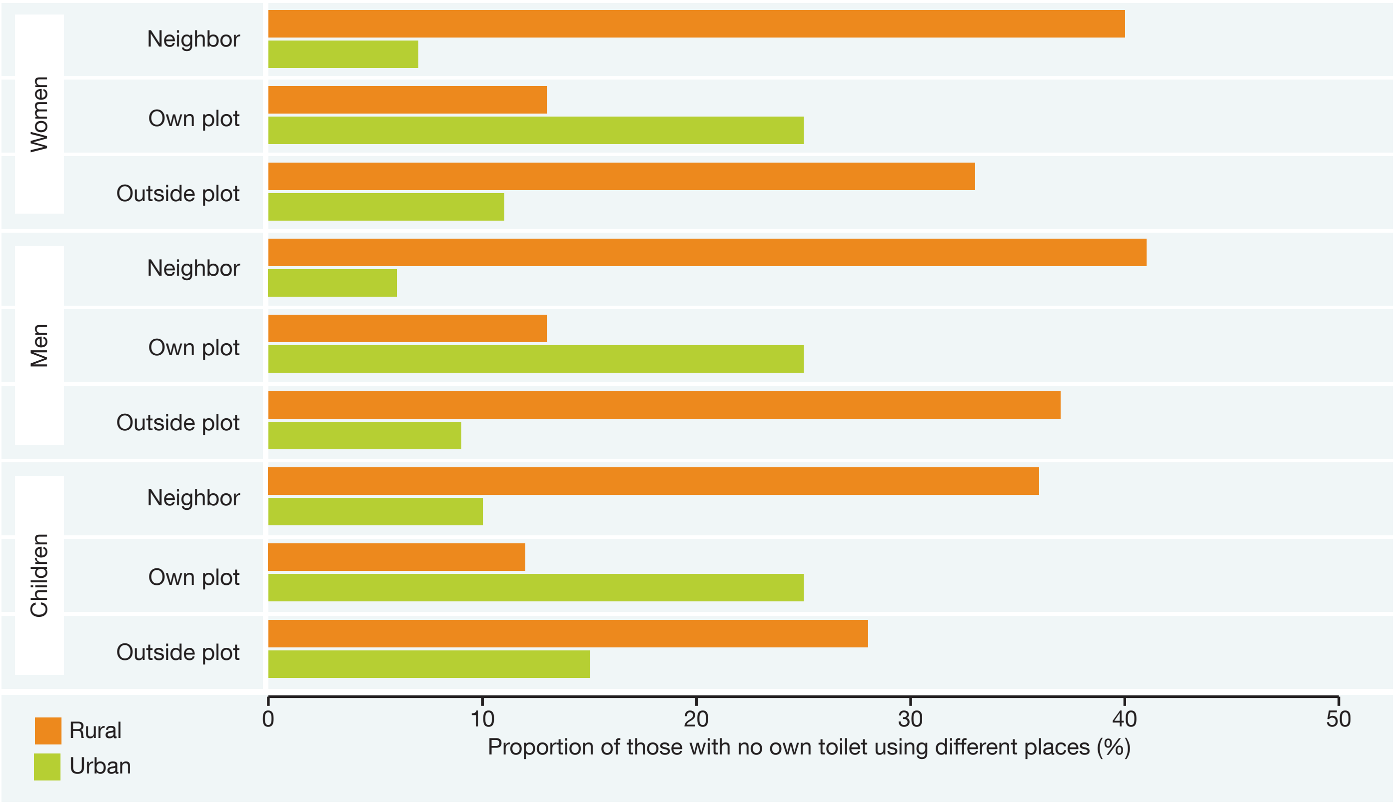
4.3.1 ACCESS TIME AND TIME SAVED

Figure 21 presents the main places of defecation of households in rural and urban areas. Compared with urban dwellers, a higher proportion of rural dwellers use a neighbor's toilet. Conversely, a larger proportion of urban households use their own plot than use a neighbor's toilet. Patterns tend to be similar for men, women and children.

Figure 22 shows that, compared with people in rural areas, people in urban areas who do not have a toilet need more time to access a toilet or a place for defecation. The higher population density of urban area means that people have to queue longer to access a toilet if they use shared or community toilets, compared with those in rural areas. In case of open defecation, people in rural areas generally have more places for defecation available to them and find it easier than urban dwellers to find "a private site" for defecation. Urination is excluded from the calculation and it is assumed that defecation takes place once a day, hence the access times are a minimum and the estimates of time savings conservative.

Figure 23 shows the proportion young children under five defecating outside the household plot. The average number of events is between 1 and 2 per day. In general, the proportion is more than 70%, except in Banjarmasin where it is 65%. This figure indicates that the majority of children under five years old, whether or not the family has own toilet, go outside the household plot to defecate. In Banjarmasin, the percentage of young children defecating outside the household plot is lower, and the number of defecation events per day is higher, compared with the other study sites, because the many rivers flow through Banjarmasin provide children with a place do defecate close to home.

FIGURE 21: PLACE OF DEFECATION OF HOUSEHOLDS WITHOUT THEIR OWN TOILET



4.3.2 TIME SAVING AND UNIT VALUES OF TIME

Figure 24 summarizes the respondents' level of satisfaction with the proximity of their place of defecation and how important proximity is to them. In both rural and urban areas, having a place to defecate within their own plot is important. Those who do not have their own toilet are not satisfied with the proximity of, and the access time associated with, their current place of defecation. Time saving, which is closely related to toilet proximity, has a value.

People who defecate in the open or use public toilets generally spend a long time queuing or finding a private place to defecate. Even people living near rivers that they use for defecating prefer to get the best spot with the cleanest water, which means getting up and going to the river early in the morning. Hence, this is time saved for households that have their own toilets. Table 24 presents the results of focus group discussions, comparing male and female perceptions of the convenience of and time savings from having a private toilet.

FIGURE 22: TIME SPENT ACCESSING TOILET FOR THOSE WITH NO TOILET, PER TRIP

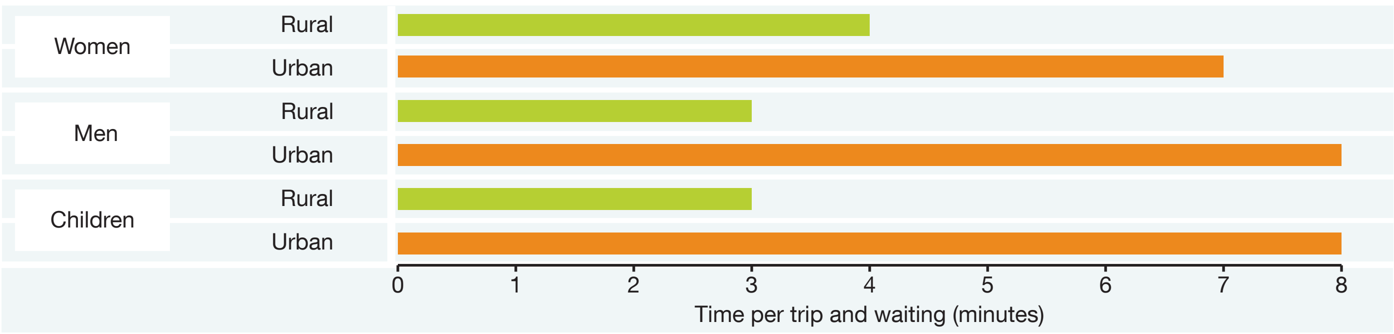


FIGURE 23: DEFECATION OUTSIDE THE HOUSEHOLD PLOT FOR CHILDREN UNDER FIVE YEARS

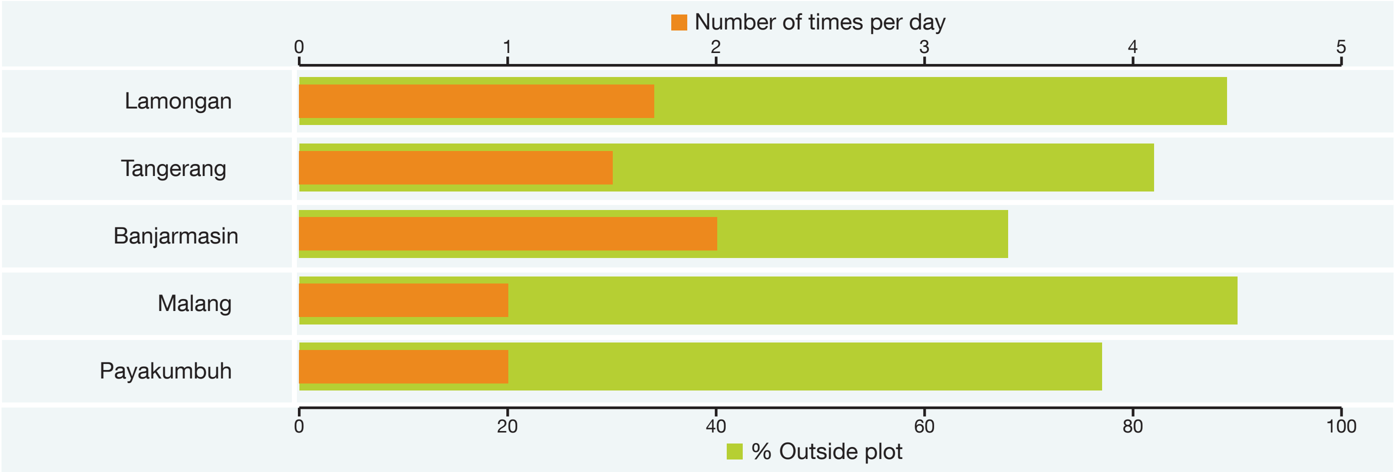


FIGURE 24: PREFERENCES RELATED TO TOILET PROXIMITY FOR THOSE WITHOUT A TOILET (%)

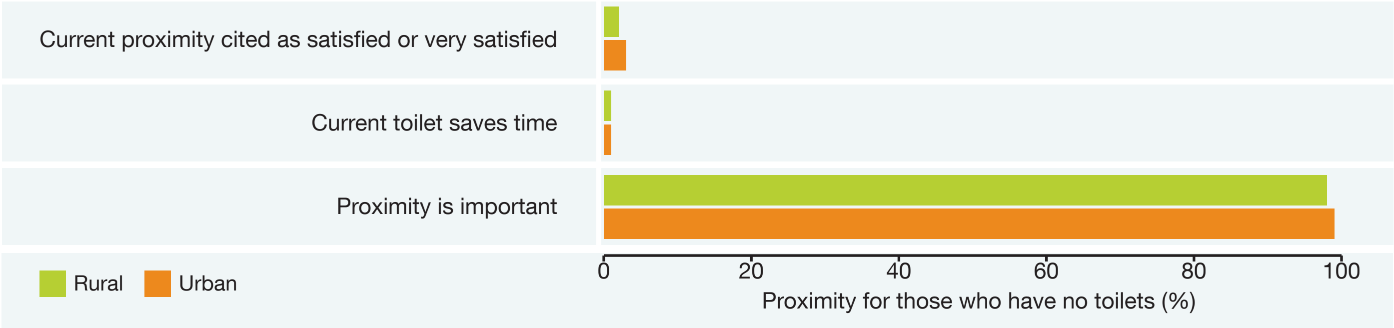


TABLE 24: MALE AND FEMALE PERCEPTIONS ABOUT TIME SAVING

Male preferences	Female preferences
• No need for queuing and save more time • Spend more time for more productive activities	• Spend less time than going to public toilets or OD • Take better care of their under-five children and babies, as well as their cooking • Children need toilet any time. They want to defecate without going too far

Figure 25 shows how female respondents would spend the extra 30 minutes a day if they had a private toilet, selected from ten activities listed in the questionnaire. Bathing and washing, which women prefer to do in privacy, are activities that are closely linked to toilet ownership, while resting and cooking are activities that women would spend more time doing if they had their own toilet. This suggests that women who do not have private toilets have less time to spend resting and cooking because they spend more time doing other time-consuming activities, including going to the toilet. The FGDs revealed that the majority of men – especially those living in urban areas – would use the time saved to do business. A similar pattern in the use of time saved was indicated across rural and urban sites, with 'bathing' (personal hygiene) and 'resting' ranked top of the list of activities people would do if they had an extra 30 minutes a day.

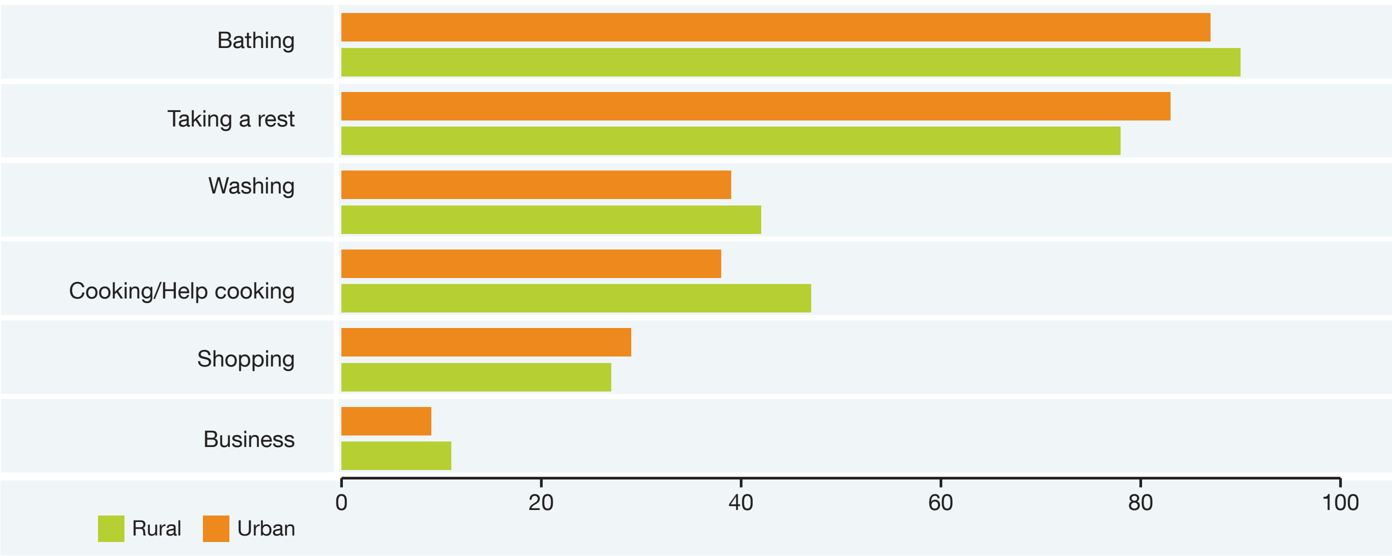
4.3.3 TOTAL VALUE OF TIME SAVED

Time is saved when people use their own toilets as they do not have to look for safe places to defecate in the open nor spend time waiting or queuing to go to the toilet. Hence, they spend less time going to the toilet. The value of time saved is calculated in the cost-benefit analysis.

The ESI Phase 1 Study calculated on a national scale the time lost from using unimproved sanitation by having to make trips to defecate in the open or waiting to use shared latrines. The population – 10% using shared toilets and 15% practicing open defecation, equal to 25% of households – was assumed to experience suboptimal access time. For these households, open defecation was assumed to require 15 minutes per day extra to find a secluded spot for defecation, while for shared latrines the extra time queuing varied from 15 minutes in rural areas to 30 minutes in urban areas. It was also assumed that access time in urban areas in Indonesia is relatively long because toilets are shared with many people, and because it is common for people to wash themselves while in the latrines, thus prolonging queuing time.

The ESI Phase 2 Study also calculated time lost, on individual basis as well as household basis, based on the household survey findings. Compared with those in the other field sites, households in Tangerang and Malang spent more time going to places to defecate in the open or in toilets outside their plots. The average time spent making trips to

FIGURE 25: HOW FEMALE RESPONDENTS WOULD SPEND AN EXTRA 30 MINUTES A DAY (%)



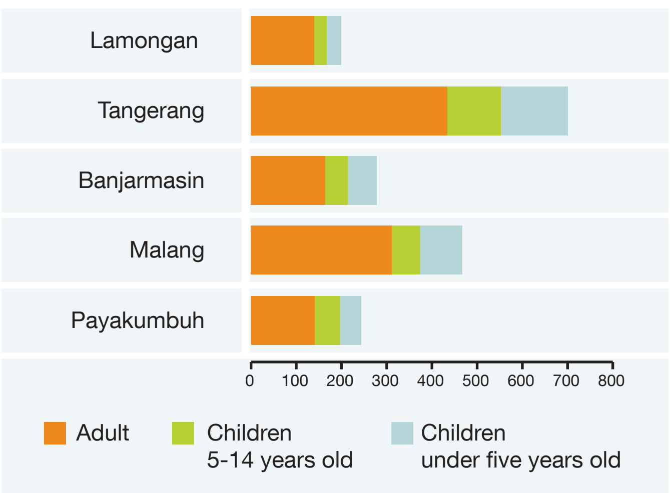
and/or waiting to defecate in these two sites was more than 8 minutes per round trip, compared with 6 minutes in the other sites. Hence, the value of the potential time saving of having private toilets is greatest in Tangerang and Malang.

Table 25 shows the average time lost per household per day at each field site. Similar to the results of ESI 1 study, these figures constitute the average time lost per household member per year, as depicted in the Figure 26. A household that shifts from open defecation to using a private toilet has the greatest potential time saving.

TABLE 25: AVERAGE TIME LOST PER HOUSEHOLD PER DAY

Study sites	Average time lost per household per day (minutes)
Lamongan	33
Tangerang	115
Banjarmasin	46
Malang	77
Payakumbuh	40

FIGURE 26: AVERAGE TIME LOST PER YEAR PER HOUSEHOLD MEMBER (HOURS)

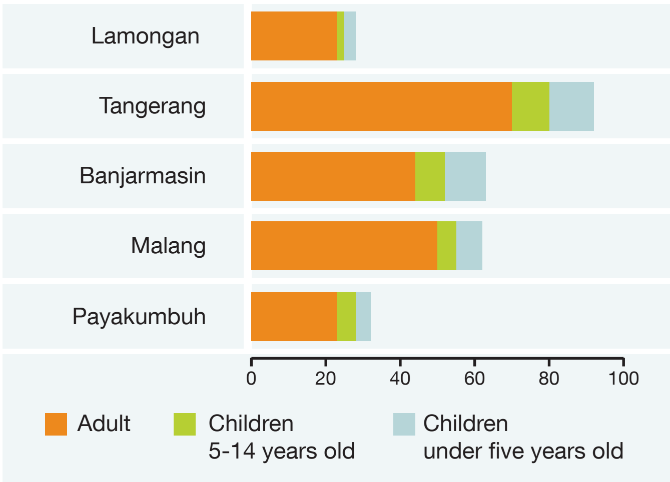


Assuming that the value of time saved per year is equivalent to 30% of the average annual income of an adult and a child's time is worth half that of an adult's, the average annual value of time saved per household member and per household is as shown in Figure 24. Calculation of the annual value of time saved uses the economic loss (in US$) of open defecation as the baseline. Such that:

- A household (HH) can save a certain amount of time – valued in monetary terms (US$X) – if the individuals in the HH use a private toilet (within their own plot area) regularly.
- A HH that uses communal toilets incurs some access time costs (US$X1) but still saves (US$X - US$X1) by not defecating in the open.
- A HH that uses shared toilet incurs some access time costs (US$X2) lost but still saves (US$X - US$X2) by not defecating in the open.

Figure 27 shows the average annual value of time savings per household and household member, for households without a private toilet that receive their own toilet.

FIGURE 27: AVERAGE ANNUAL VALUE OF TIME SAVINGS (US$)



4.4 INTANGIBLES

In the absence of studies examining the intangible aspects of sanitation in Indonesia, the data presented here are entirely from field work conducted as part of the ESI Phase 2 study. The data are from two main sources: a close-ended household questionnaire, which was answered by the most senior household member available for interview, and focus group discussions (FGDs). At each of the five main sites, three FGDs were conducted with three groups of eight: one group of women, one group of men, and one group of stakeholders (health office officials, NGOs, and community or informal leaders).

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: (a) understanding of what sanitation is; (b) reason for current sanitation option; (c) satisfaction with current sanitation option; and (d) for those without toilets, reasons to get a toilet, characteristics of a toilet, and willingness to pay for improved toilet.

In general, respondents have a good understanding of what sanitation is, although in some focus groups, their understanding was limited. They perceive sanitation as something that has to do with toilets, wastewater disposal, solid waste, drainage, and environmental health. Their knowledge of sanitation ladders varies according to the sanitation ladder options that are available locally. For instance, respondents in Payakumbuh and Lamongan were very familiar with dry pits, wet pits and septic tanks, but had little knowledge about sewerage systems. Respondents in Banjarmasin are very familiar with almost all the options on the sanitation ladder because a wide range of these options are available locally, including community toilets, shared toilets, private dry pit, private wet pit, private septic tank, and sewerage systems.

The FGDs revealed that land availability is an issue in urban areas but less so in rural areas. People in urban areas perceived the provision of toilets in public places as important due to the lack of space available for private toilets on their own plots. People in rural areas tend to perceive that provision of toilet in public places as unimportant because land for building toilets is readily available, and many households have their own toilets, albeit a simple dry or wet pit latrine. In rural areas, problems can arise when a household unknowingly digs a well close to a pit latrine currently or previously used by a neighbor.

Most parents of schoolchildren entrust provision of school toilets to the school principal, and they believe that the toilet facilities in schools are satisfactory.

Intangibles for households without their own toilets include:

- Feeling uncomfortable and insecure, and lack of privacy
- Feeling ashamed being seen by others when defecating
- Dirty toilet bowls
- Long queuing times
- Having to bring water with them to cleanse themselves after defecating
- Wet and muddy paths to the toilets
- Problems associated with defecating when it is raining or at night
- Dirty environment around the toilet area because the facilities are not kept clean
- Accidents in unstable toilets
- When busy cooking, women worry if their young children leave the house to go to the toilet

These are not issues for people who have their own toilet inside their house.

Respondents across the field sites held these general perceptions of their sanitation situation:

- It is the norm, and there is no reason to change the habits of generations. Hence, they have no awareness of what are good and bad sanitation practices.
- Due to financial constraints, sanitation is not high on their list of spending priorities.
- They believe that diseases caused by poor sanitation, such as diarrhea, are not serious and can be self treated with readily available over the counter medicines.

The FGDs revealed that the opinions of men and women about having their own toilet differed in some respects, as shown in Table 26. Women are more concerned about safety, for themselves and for their children, while men are more concerned about practicality (proximity of the toilet). However, men and women did share the same opinions about access time and cleanliness.

Hanging toilets on rivers or ponds are common in all the field sites. As well as being practical and comfortable, people defecate in these toilets to feed their fish in the ponds. Using a hanging toilet on a river means there is no need to flush as the feces are washed away by the river. Respondents also said that because these toilets are in the open air, they are able to breathe more easily and there are few or no unpleasant odors.

However, the respondents did mention several drawbacks of using hanging toilets, including :

- The risk of accident, especially for children and elderly using the toilet at night or in the rainy season
- Lack of privacy
- The time taken to go from the house to the toilet. Women are concerned about leaving their house-

hold chores, such as taking care of their children and cooking, to go to the toilet

Table 27 summarizes the FGD findings on the risks and problems associated with using hanging toilets at the field sites.

Figure 28 shows the respondents' level of satisfaction with their current toilets. Compared with those using unimproved sanitation, respondents with improved sanitation have a higher level of satisfaction for every aspect assessed.

For the household interviews, the respondents were asked to score each aspect on a scale of 1 (not satisfied) to 5 (very satisfied). Visual aids were used to help the respondents express their opinion of their current toilet (see Figure 29). Respondents were asked about their level of satisfaction in terms of :

- toilet position
- toilet cleanliness (free from dirt, smell, and insects)
- toilet ownership (status)
- being able to offer a clean facility for visitors
- health (avoiding diseases related to poor hygiene and sanitation)
- avoiding conflict
- convenience for children
- convenience for elderly
- night use of toilet
- use of toilet when raining
- using toilet for bathing as well as defecating
- avoiding attacks by dangerous animals (snakes, etc.) and insect bites

TABLE 26: PREFERENCES RELATED TO TOILET CONVENIENCE FROM THE FOCUS GROUP DISCUSSIONS

Preferences (rural and urban unless stated otherwise)	
Male preferences	**Female preferences**
• Land is available, but need to ensure adequate distance from neighbor's pit latrine • A source of pride • No need to bring water for cleansing after defecation (rural) • No need to queue for public toilets or arrive early to get the best spot for open defecation (rural) • Clean and comfortable facility (rural) • Environment around toilets is not dirty (rural)	• Safe to go any time, even at night and during rainy season • Offers greater privacy • No need to negotiate wet, muddy paths to toilets • No risks of accidents • No need to worry about children if they want to defecate • No flies • No need to queue for public toilets or arrive early to get the best spot for open defecation • Can keep the facilities clean and comfortable • Environment around toilets is not dirty (urban)

TABLE 27: RISK OF HANGING TOILETS

Variable	Payakumbuh	Banjarmasin	Lamongan	Malang	Tangerang
Current toilet	Hanging toilet on a pond	Hanging toilet on a river	Hanging toilet on a large pond	Pit latrine & hanging toilet on a river	Hanging toilet on a river and open defecation
Toilet quality	Simple structure made from bamboo or wood	-	Simple structure made from bamboo or wood	Simple structure made from bamboo or wood	Open defecation in yards, rivers, fields and public places
Reasons for current toilet	To feed the fish	In the fresh air, and water available to cleanse after defecating	In the fresh air, and water available to cleanse after defecating	Shared toilet beside a river, drains straight into river	Convenient to defecate into a plastic bag and dispose of anywhere
Risks of toilet	Risk of accident, especially the elderly and children	Need to get there before others & risk of accident (once led to a death)	Risk of accident	Having full latrine hole	Risk of accident
Problems with toilet	Defecating when it is raining or at night	Competing with others for space at the river	Defecating when it is raining or at night	Defecating when it is raining or at night	Long queues
	Lack of privacy	River used for bathing and washing as well as defecating	Lack of privacy	Never think of emptying septic tank	Dirty
	Women have to leave their children and cooking	Women have to leave their children and cooking	Women have to leave their children and cooking	Women have to leave their children and cooking	Women have to leave their children and cooking

FIGURE 28: LEVEL OF SATISFACTION WITH CURRENT TOILET OPTION, IMPROVED VERSUS UNIMPROVED AT ALL SITES (1 = NOT SATISFIED, 5 = VERY SATISFIED).

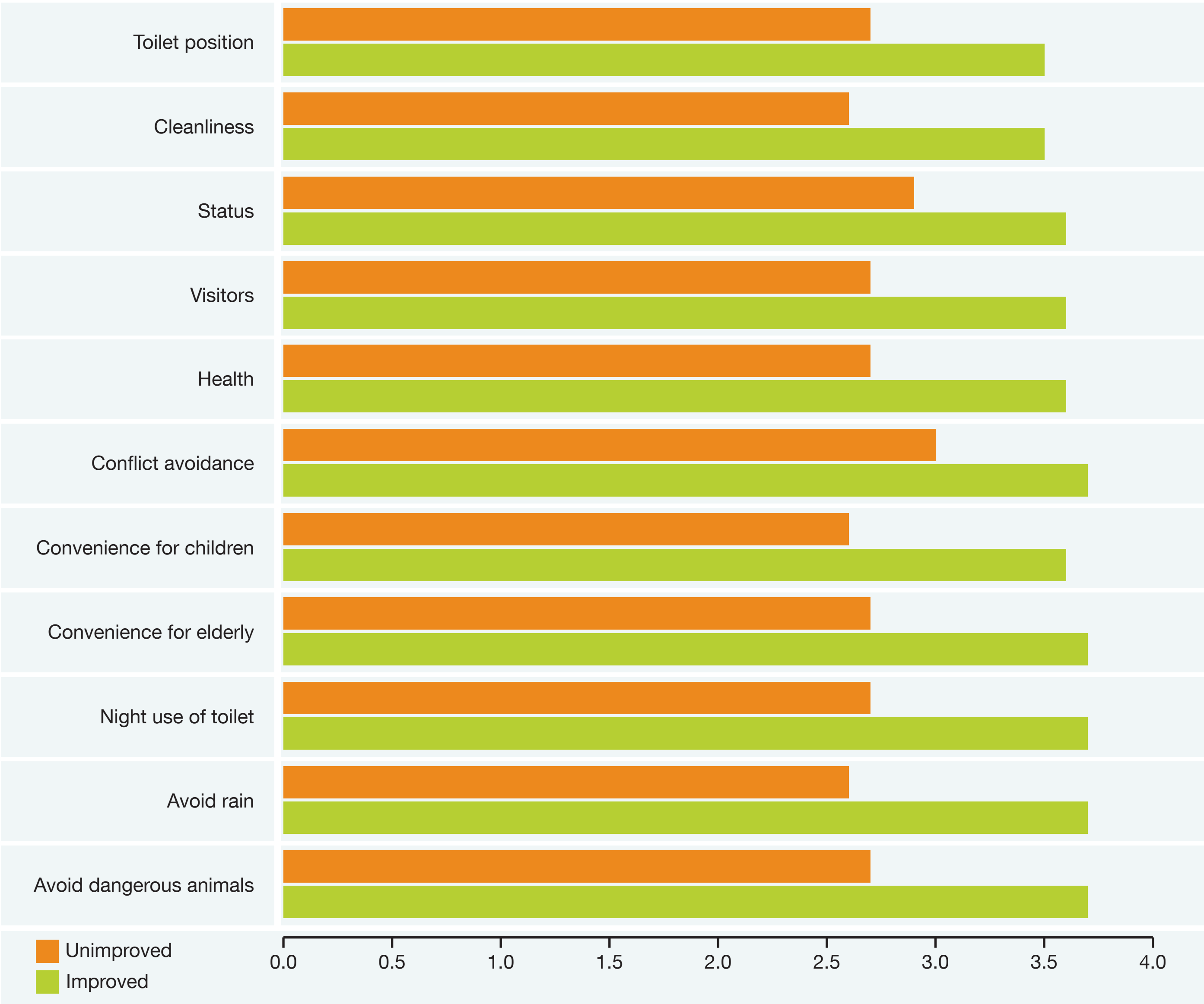


Figure 29 is an example of the visual aids used during the household interviews to answer the question: "How satisfied are you with your current sanitation option with regard to the following aspects?"

Figure 30 shows the main reasons from the focus group discussions that respondents who practice open defecation gave for not having a toilet. Across the field sites, 21% of all respondents had no toilet. Figure 30 shows that almost 60% of respondents said they had no toilet because it was too expensive. Due to financial constraints, sanitation is not high on their list of spending priorities. The second main reason for not having their own toilet was lack of space, particularly for those living in densely populated areas.

Figure 31 shows which household members have the most influence in the decision whether or not to build or upgrade a private toilet. The respondents were senior female household members (wives). They had the most influence in these decisions in only 7% of households, while in 63% of households it was the senior male member (husband) who made these decisions. Hence, it is the senior male household members who need to be convinced that that investment on sanitation is economically viable.

This information helps to answer practical questions about how sanitation programs can be delivered more effectively – that is by increasing the value of benefits by raising the awareness and participation of beneficiaries. It provides valuable input for program design and program implementation.

Respondents who currently have no private toilet were asked about reasons they would build their own toilet if they were able to do so. Each aspect given a score ranging between 1 (not important) and 5 (very important). Intangibles all scored 4 or more out of 5 (Figure 32). The top three intangible benefits of having a private toilet were proximity, cleanliness and not sharing.

Respondents who do not have their own toilets and practice open defecation had the following concerns (see Table 28):

- 37% felt sometimes in danger and 14% often in danger, from going to defecate in the open
- 19% had heard about someone being attacked by animals in the open defecation areas
- 72% expressed concern about the safety of their children when they go to defecate in the open.

These results indicate that safety is an issue when defecating in the open.

4.5 EXTERNAL ENVIRONMENT

External environment refers to the area outside the toilet itself and not related to a toilet trip, and may include living area, public areas, and private land, which can all be affected by open defecation practices and open conveyance of sewage or flooding of unimproved toilets. The consequences of water pollution have already been covered in section 4.2.

FIGURE 29: A VISUAL AID IN THE HOUSEHOLD INTERVIEW

FIGURE 30: MAJOR REASONS FOR NOT HAVING A PRIVATE TOILET

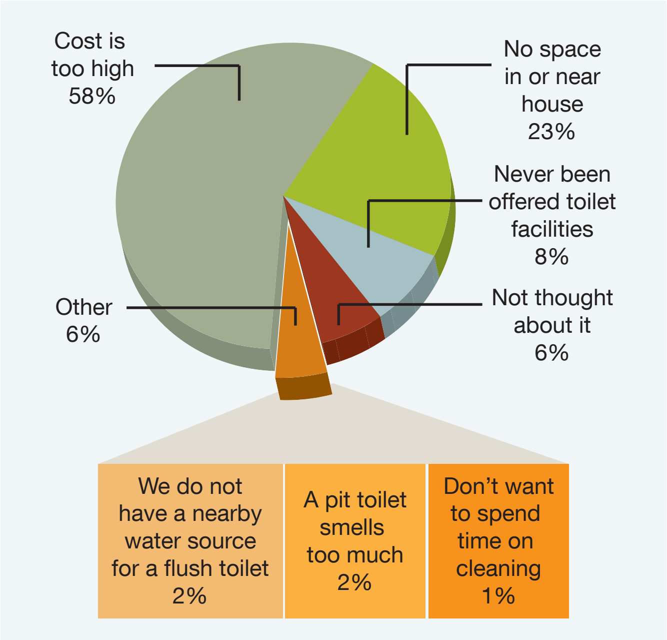
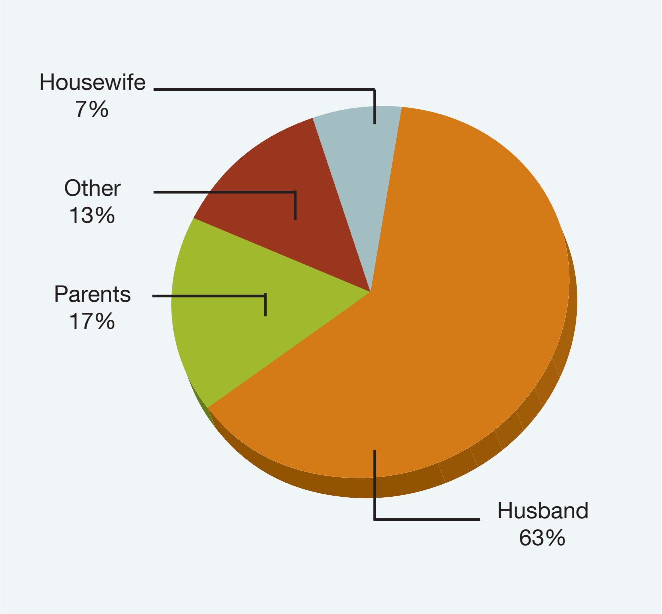


FIGURE 31: HOUSEHOLD MEMBERS THAT INFLUENCE DECISIONS ABOUT BUILDING OR UPGRADING A PRIVATE TOILET



The sources of data are mainly the ESI surveys: physical location surveys, household interviews, and focus group discussions. Given that poor solid waste management practice and its impact on the external environment is also part of poor sanitation, these have also been assessed to understand the contribution of each, and relative preferences regarding their improvement.

Physical location surveys were conducted in 5 study sites:

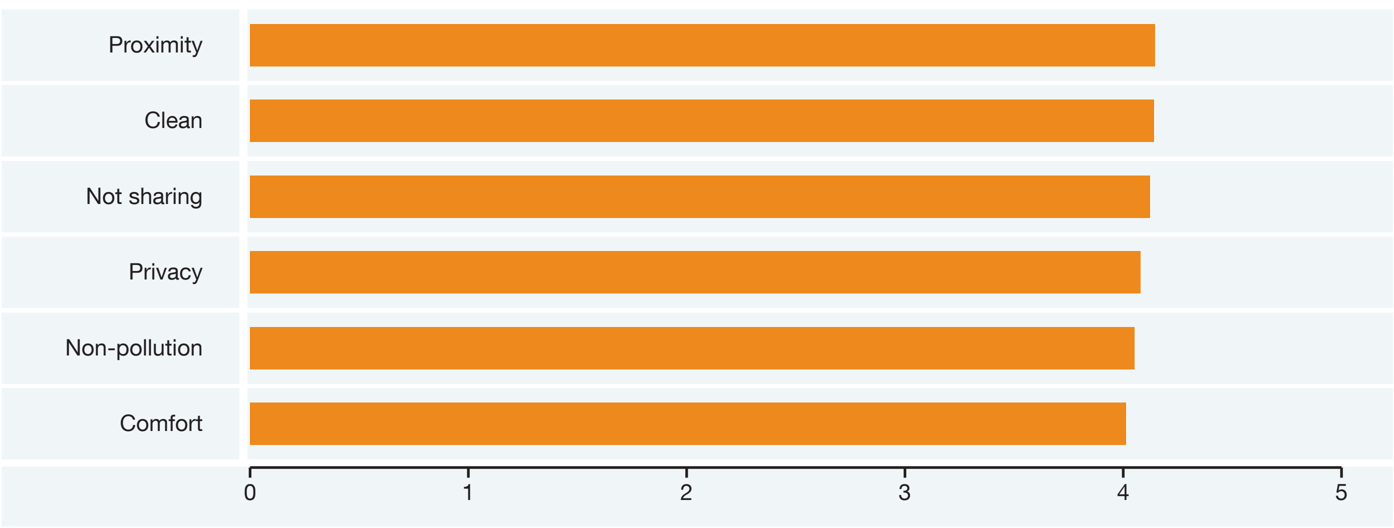
- Payakumbuh is located in a hilly area of West Sumatra. Most of the residential areas of the city are not densely populated. The city has a functioning public cleaning service which is organized by the local municipal government. Almost no piles of garbage were found along the tributaries.
- Tangerang District has an inadequate garbage collection service, so garbage is piled up everywhere. The district has many public toilets.
- Lamongan District has well maintained residential areas. Like most rural areas, population density is low. Housing is well maintained.
- Malang city is in good physical condition. Garbage is collected by the city cleaning service. Housing is well maintained.
- Banjarmasin city is located in a low plain near the estuary of Barito river. The external environment is poor. Many households dispose of their solid waste into the rivers.

Figure 33 shows the scoring of the quality of environmental sanitation in private plots based on the household surveys. On average, almost all sites are moderately dirty, but urban sites tend to be dirtier than rural sites. The detailed results presented in Figure 33 show that Tangerang had the lowest score for cleanliness from solid waste, compared with the other sites. Malang scored highest in all categories compared with the other sites, which is also consistent with the qualitative environmental assessment.

Even households that have improved toilets may continue practicing poor sanitation behaviors. Figure 34 shows sanitation practices for households that have a toilet. While very few household members practice open defecation, in some sites – notably Tangerang and Payakumbuh – people still urinate in the open, dispose of feces in hanging toilets, and dispose of children's stools in the environment. As revealed during the FGDs, some people in Payakumbuh prefer to defecate in hanging toilets in order to feed their fish (as well as preferring the open air and absence of bad smells).

Figure 35 summarizes the responses of households that use septic tanks and pits to the question: Has your septic tank or pit ever been emptied? The majority of the respondents – more than 90% in in Lamongan and Tangerang – said they had never emptied their septic tank or pit. In Malang and Payakumbuh, between 30% and 40% of respondents stated that they did not know whether their septic tanks had ever

FIGURE 32: REASONS TO GET A TOILET FOR THOSE CURRENTLY WITHOUT (1 = NOT IMPORTANT, 5 = VERY IMPORTANT)



been emptied, mainly because they had just recently moved into the property. It is likely that septic tanks that have been emptied are wet pit latrines, which are not waterproof and could potentially pollute the groundwater.

Figure 36 shows how satisfied households are with their current toilet option with regard to its perceived impact on the external environment. For all categories, the respondents are, in general, fairly satisfied with their current option. In general, there is no significant difference in the levels of satisfaction for sewerage, septic tank and wet pit latrine.

Compared with the other field sites, households in Banjarmasin that practice open defecation were more satisfied with the perceived impact of their current toilet option on the environment. As discussed elsewhere in this report, these households see nothing wrong with using the rivers that run through the city for washing, bathing and defecating.

Perceptions of the condition of the external environment are shown in the Figure 37. Again, respondents scored this aspect on a scale of 1 (not satisfied) to 5 (very satisfied). In general, they perceived the condition of the external environment to be good. The FGDs revealed that open defecation areas are perceived to be dirty. While urban sites score slightly higher than rural sites, there was little difference between the perceptions of households with improved sanitation and those without, except regarding the presence of rodents and insects.

4.6 SUMMARY OF LOCAL IMPACTS

Table 29 summarizes the local quantitative and qualitative benefits of improved sanitation and hygiene.

TABLE 28: CONCERNS OF THOSE PRACTICING OPEN DEFECATION

Concern	No. responding	Responses	
		Never	Yes
Have you felt in danger when going for OD?	348	50%	50%
Are you worried about the safety of your children?	351	28%	72%
Have you heard about someone being attacked by animals?	352	81%	19%

FIGURE 33: SCORING OF THE QUALITY OF ENVIRONMENTAL SANITATION BY GENDER OF RESPONDENT (SCORE: 5 = CLEAN, 1 = VERY DIRTY)

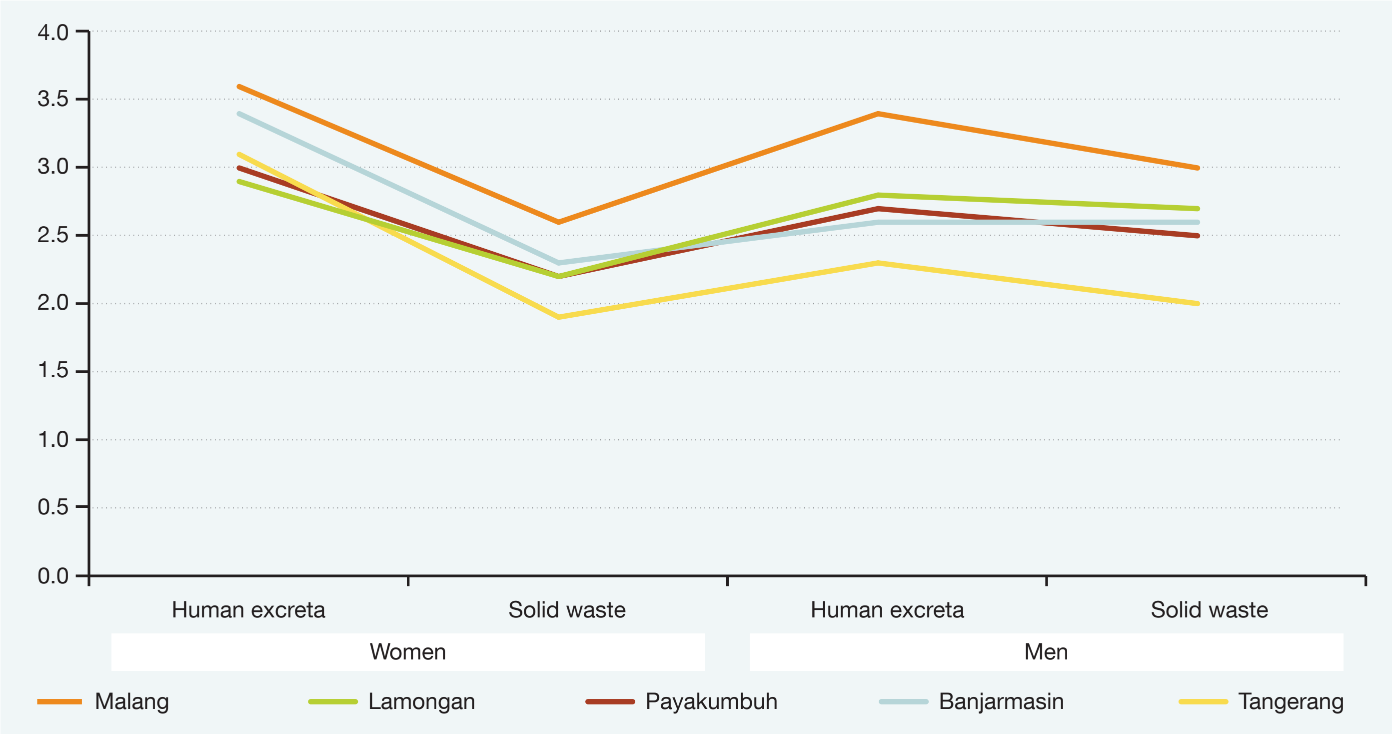


FIGURE 34: UNIMPROVED SANITATION PRACTICES BY HOUSEHOLDS THAT HAVE TOILETS

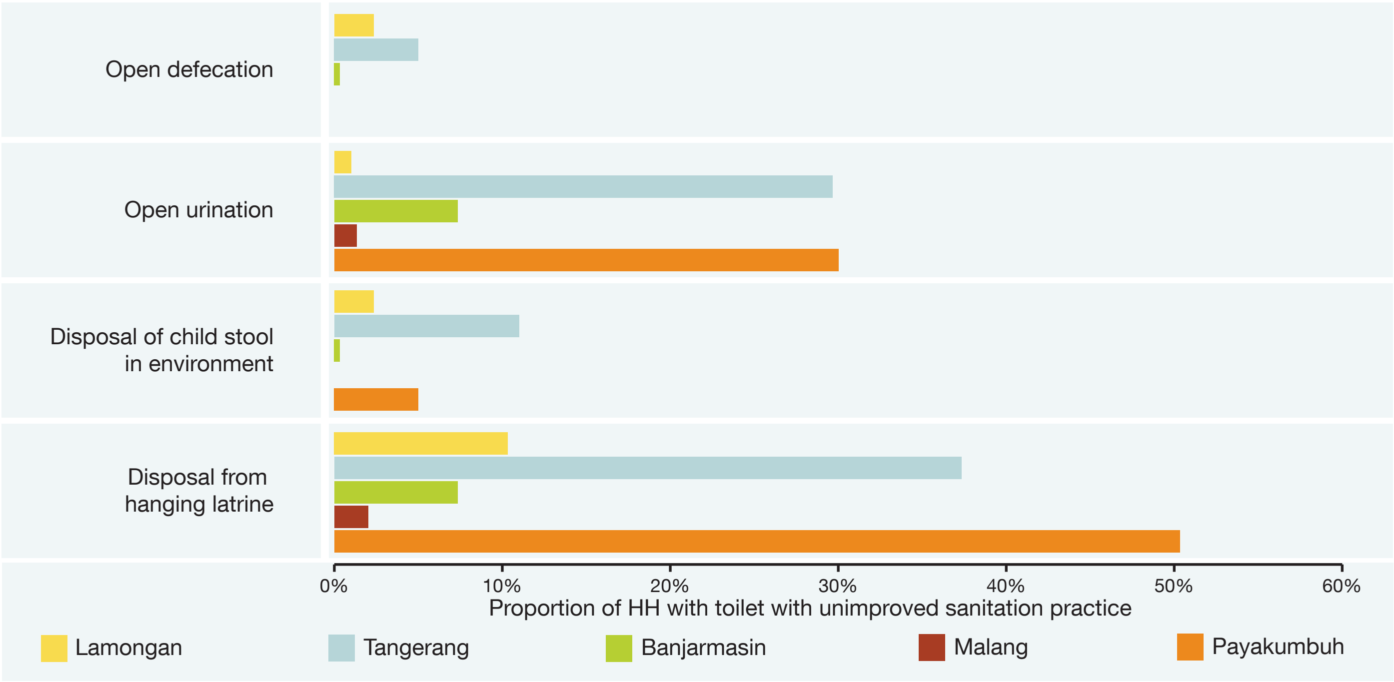


FIGURE 35: EMPTYING OF SEPTIC TANKS AND PITS (%)

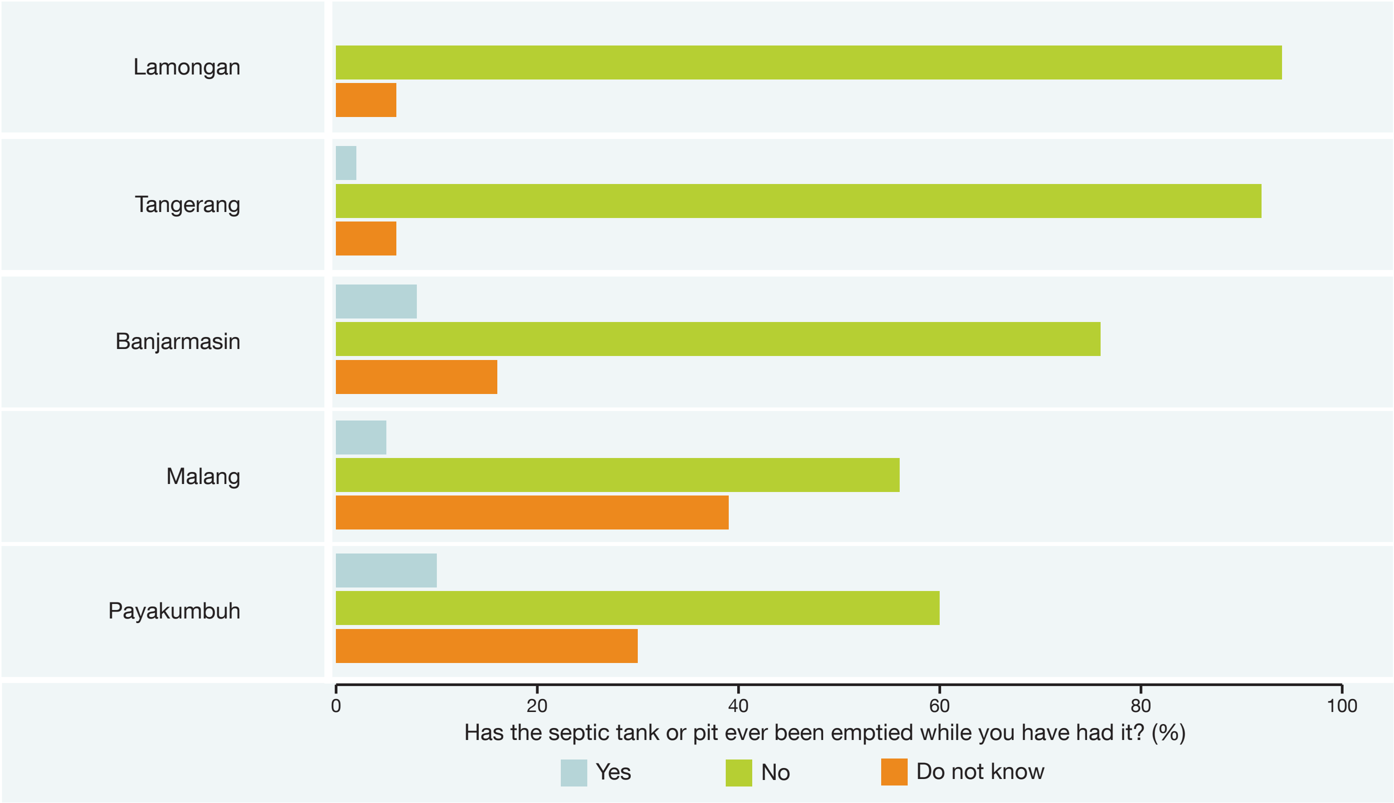


FIGURE 36: LEVEL OF SATISFACTION WITH IMPACT OF CURRENT TOILET OPTION ON THE QUALITY OF THE EXTERNAL ENVIRONMENT (SCORE: 5 = VERY SATISFIED, 1 = NOT SATISFIED)

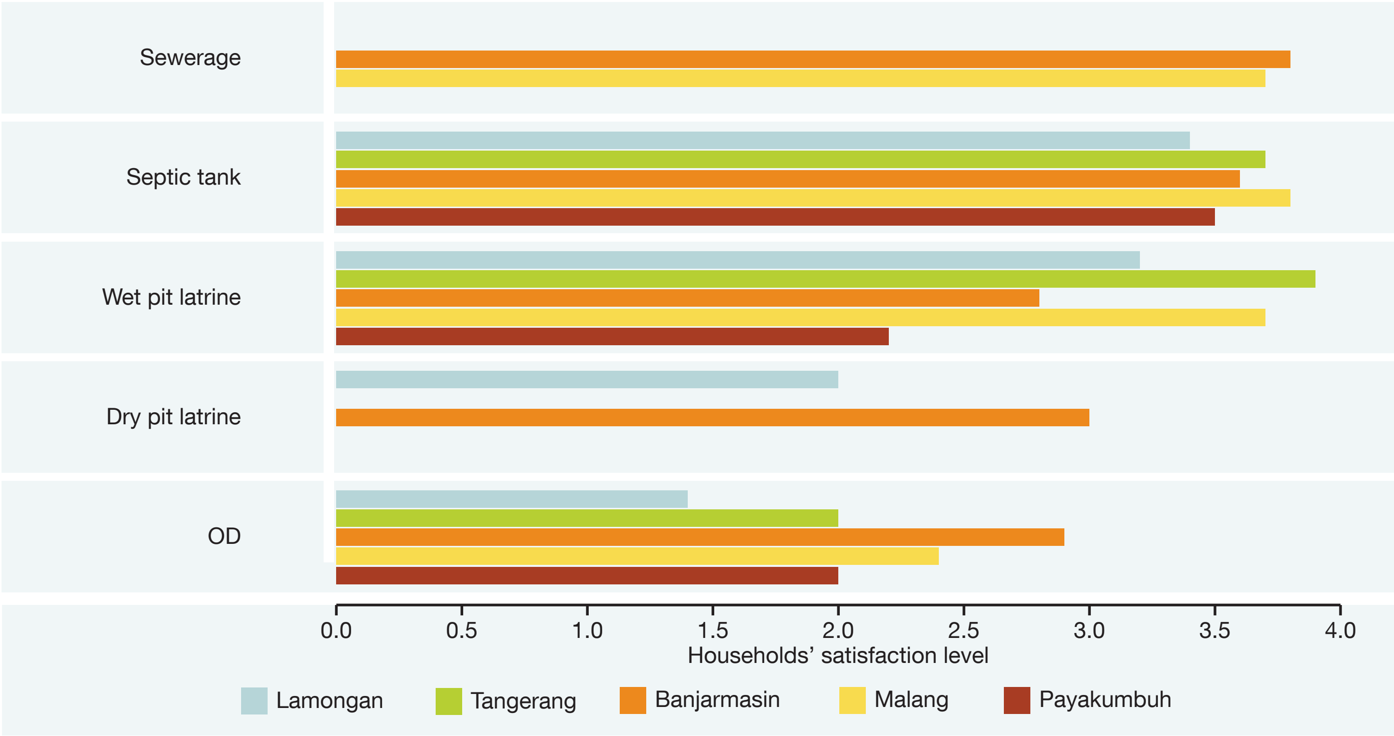


FIGURE 37: PERCEPTIONS OF THE EXTERNAL ENVIRONMENTAL (SCORE: 5 = VERY GOOD, 1 = VERY POOR)

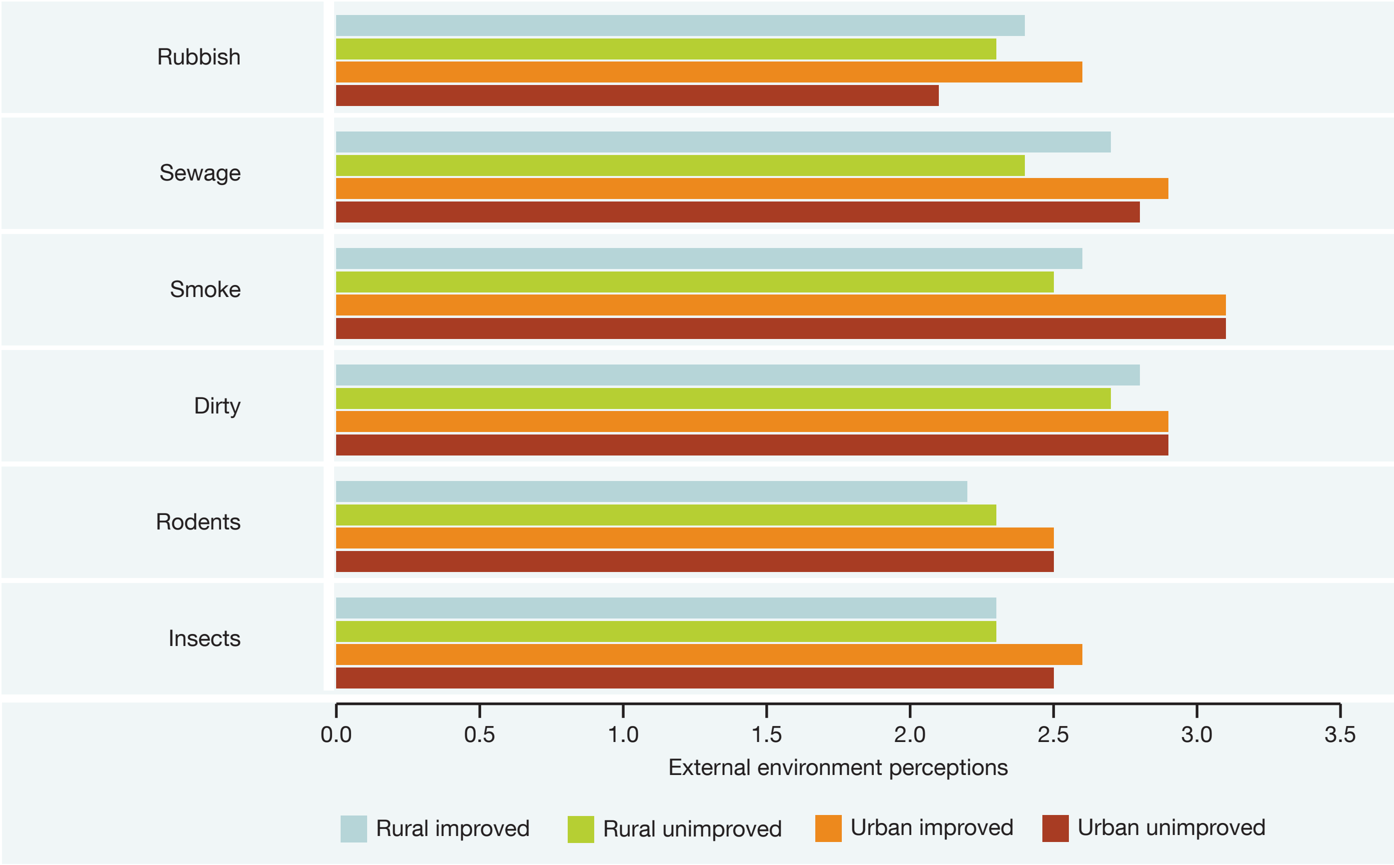


TABLE 29: SUMMARY OF LOCAL IMPACTS OF SANITATION IMPROVEMENT

Benefit	Benefits of improved sanitation and hygiene	
	Quantitative benefit	**Qualitative Benefit**
HEALTH		
Health burden/quality of life	Rural sites: • Disease per household: 18 cases • DALYs: 0.12 • Annual risk of death: 1.88 in 1,000 Urban sites: • Disease per household: 13 cases • DALYs: 0.06 • Annual risk of death: 2.19 in 1,000	• Less pain and suffering • Reduced inconvenience of lost time • Parents worry less and take less time off productive activities to care for sick children
Health care benefit per person per year	Rural sites: • 0-4 years: US$151.34 • 5-14 years: US$43.62 • 15 + years: US$16.65 Urban sites: • 0-4 years: US$36.70 • 5-14 years: US$18.50 • 15 + years: US$8.50	Households do not need to spend so much on health care and health-seeking costs
Productivity benefit per person per year	Rural sites: • 0-4 years: US$19.86 • 5-14 years: US$14.11 • 15 + years: US$16.02 Urban sites: • 0-4 years: US$8.17 • 5-14 years: US$6.60 • 15 + years: US$6.96	People are more productive when they are healthy and are more willing to pay to be healthy
Mortality benefit per person per year (only under-five children)	Rural: US$19.86 Urban: US$8.17	People become more aware of the risks of sanitation when they understand the links, and are more willing to pay to save lives
WATER		
Overall quality		Better quality and more aesthetically pleasing environment
Average costs saved per household for domestic uses	Rural: US$2 Urban: US$6	Better water quality: better taste, less turbidity, better color, and safer; continuous water supply at affordable price
Non-domestic uses	Preventing an increase of BOD by 1 mg/liter in a source of raw water for clean water company will avoid 25% increase in national average clean water production costs	Reduced costs to obtain clean water for other productive activities such as livestock and fish farming, factories and restaurants
ACCESS TIME (annual value of time savings)	Rural: US$60 Urban: US$52	• Adults have more time for more productive activities • Children can go to the toilet any time without having to go far and spending a lot of time
INTANGIBLES	• Respondents with improved sanitation have a higher level of satisfaction (more than 70%) for every assessment aspect than those without unimproved sanitation (average 50%) • No need to be concerned about the safety of their children when they go to defecate (72% of respondents)	• Private toilets eliminate queuing • Women take better care of their children and babies, as well as their cooking • Safe to go any time, especially at night and during rainy season • Having more privacy and pride • No wet (slippery) and muddy path along the way to toilets • Reduced risk of accidents • No need to worry about children if they want to defecate • No flies • No need to go earlier to queue for the public toilets or get a good spot for open defecation • Can keep the facilities clean and comfortable • No dirty environment around toilets
EXTERNAL ENVIRONMENT	• Improved sanitation areas have higher scores of perception on environmental sanitation states than unimproved sanitation areas • Also have higher level of satisfaction with the external environment	No dirty environment and unpleasant odors around living areas, public areas, and private land

V. National Benefits of Improved Sanitation and Hygiene

This chapter presents the potential impacts of improved sanitation on:

- Tourism (section 5.1)
- Businesses and foreign investment (section 5.2)
- Sanitation markets (section 5.3)
- National health (section 5.4)
- National water resources (section 5.5)

5.1 TOURISM

Tourism is an important economic activity in Indonesia and provides a significant source of foreign exchange revenues. In 2008, it provided US$7.4 billion of revenue, the third highest contributor of foreign exchange revenues, after oil & gas and palm oil. It also provides an important source of local government tax income, as well as jobs for 6.7 million Indonesians[19].

In 2008, Indonesia was visited by almost 6.5 million foreign visitors, which was a significant increase from 4.8 million foreign visitors in 2006 and 5.5 million visitors in 2007. The tourist industry is expected to grow by 6.4% annually from 2008 to 2015[20].

The preference of tourists to choose Indonesia for their holiday destination is influenced by many factors. One set of factors is related to the sanitary conditions of the country, such as the quality of water resources, quality of outdoor environment (cleanliness and freedom from unpleasant odors), food safety and hygiene, general availability of toilets offering comfort and privacy in hotels, restaurants, and bus stations; and the related health risks of all the above. Experience shows that better sanitary conditions will attract 'high-value' tourists, i.e. those who are willing to pay more for their holiday. Currently foreign tourists spend on average US$137 per day and stay for an average 8.6 days, giving average revenue per tourist visit of US$1,180.

The ESI Phase 2 study attempts to explore the impacts of the sanitary condition of the country generally, and tourism resorts specifically, on tourists' preferences to visit Indonesia and recommend Indonesia to their family and friends when they return home. As well as tourists going on holiday, business visitors were also included. A total of 144 holiday tourists and 110 business visitors were interviewed in Soekarno-Hatta international airport at the departure gate before leaving Indonesia. The survey was conducted in English and was also available in Malay to include more Asian tourists. It took 10 days to reach the target sample population of 250 visitors. Tourists were approached and explained the purpose of the survey. If they agreed, they would be given a questionnaire form to fill out. On average, each respondent took about 10 to 15 minutes to complete the questionnaire.

Table 30 shows the profile of the respondents of the business and tourism survey.

On average, tourists rate their enjoyment at between 3.0 and 3.5, out of a maximum score of 5.0, while visiting places such as Jakarta, historical/temple sites, beaches, and natural or forest areas (Figure 38). Most of the respondents who answered 1 or 2 (least enjoy) said that the historical site/temples and natural/forest areas that they visited were dirty and polluted.

[19] President's speech at the opening of Visit Lombok Sumbawa 2012 and the International Ecotourism Business Forum, Mataram, West Nusa Tenggara, 6 July 2009

[20] Statistical Report on Visitor Arrivals to Indonesia

TABLE 30: BACKGROUND CHARACTERISTICS OF RESPONDENTS

Region of origin		Asia	Australia and New Zealand	Europe	North America	Africa	Total
Number of tourists interviewed		118	60	56	18	2	254
Gender (%)	Male	79%	68%	54%	56%	50%	61%
	Female	21%	32%	46%	44%	50%	39%
Average number of previous trips to Indonesia		5	8	6	3	9	6
Average length of stay of current trip		10	14	13	12	15	13
Purpose of visit (%)	Tourist	46%	70%	61%	72%	50%	60%
	Business	54%	30%	39%	28%	50%	40%
Hotel daily tariff in US$	< 30	3%	10%	16%	6%		8%
	30-59	25%	10%	18%	44%		21%
	60-89	34%	35%	27%	22%		32%
	90-119	23%	22%	7%	22%		19%
	120-149	12%	13%	16%	6%		13%
	150 +	4%	10%	16%	0%	100%	9%

FIGURE 38: PLACES VISITED BY TOURISTS (% RESPONDENTS) AND ENJOYMENT OF STAY (SCORE: 5 = VERY MUCH, 1 = NOT AT ALL)

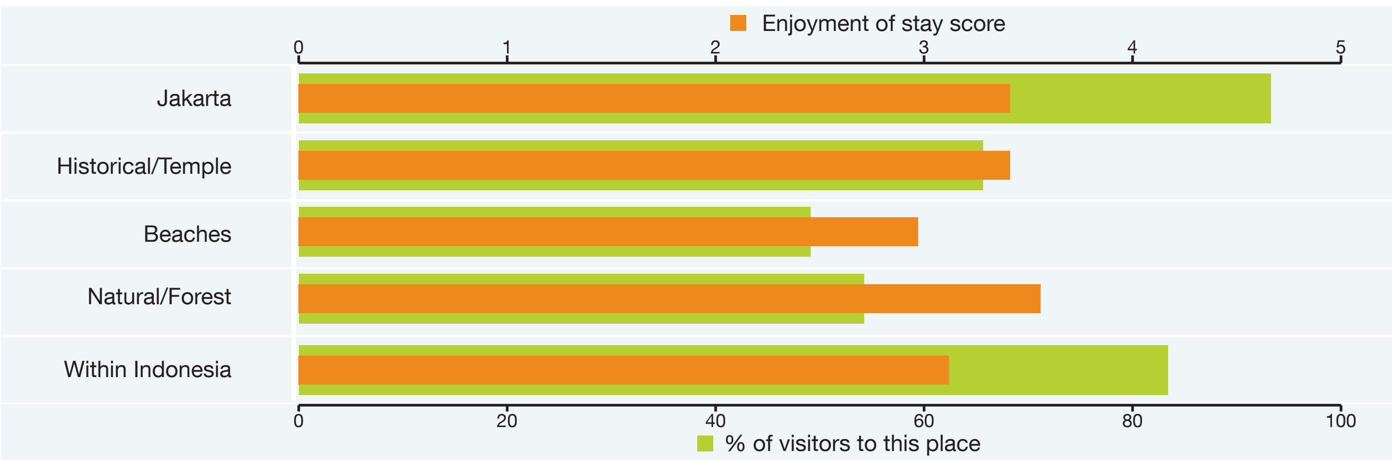


Figure 39 shows that on average, respondents perceived that general sanitary conditions of public places, such as open water and areas in the capital and other cities, to be poorer than those in private places, such as hotels, swimming pools, and restaurants. 'High-value' visitors who spend more than US$90 per night in a hotel said that the sanitary conditions are very good (average score is 4). This shows that in Indonesia sanitary conditions differ from place to place.

Figure 40 show respondents' perceptions of the quality of toilets in airports, bus stations, and other places around the city, which were poorer than their perceptions of toilets in private places, such as hotels and restaurants.

In terms of toilet availability, fewer than 1% of respondents said they could not find a toilet when needed. Figure 41 shows the sanitation issues of most concern to the respondents (3 responses per respondent). The top four concerns were with food, drinking water, unsanitary toilets and tap water quality.

Out of 254 respondents, there were 80 occurrences of gastro-intestinal illness, or 31% of respondents. More tourists were sick (52 people or 36%) than business visitors (28 people, or 26%). Out of different possible causes, both tourists and business visitors perceived food to be the number one cause of gastro-intestinal illness. For tourists this

FIGURE 39: GENERAL SANITARY EXPERIENCE (SCORE: 5 = VERY GOOD, 1 = VERY POOR)

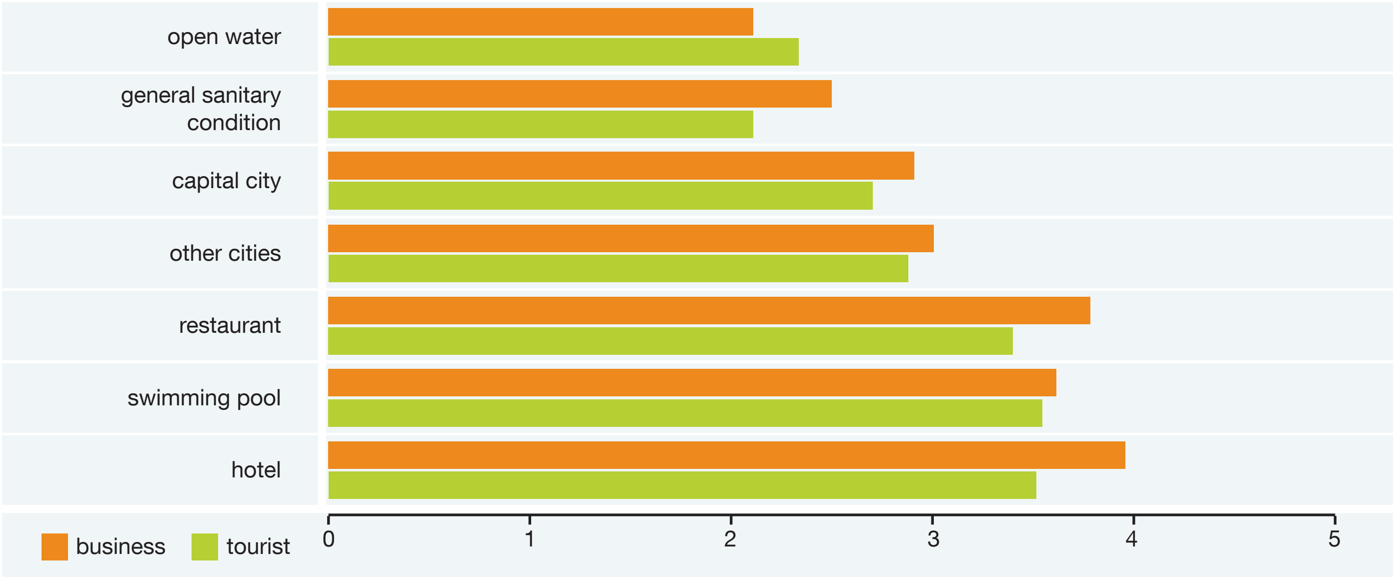


FIGURE 40: SANITARY EXPERIENCE IN RELATION TO TOILETS AND HAND WASHING (SCORE: 5 = VERY GOOD, 1 = VERY POOR)

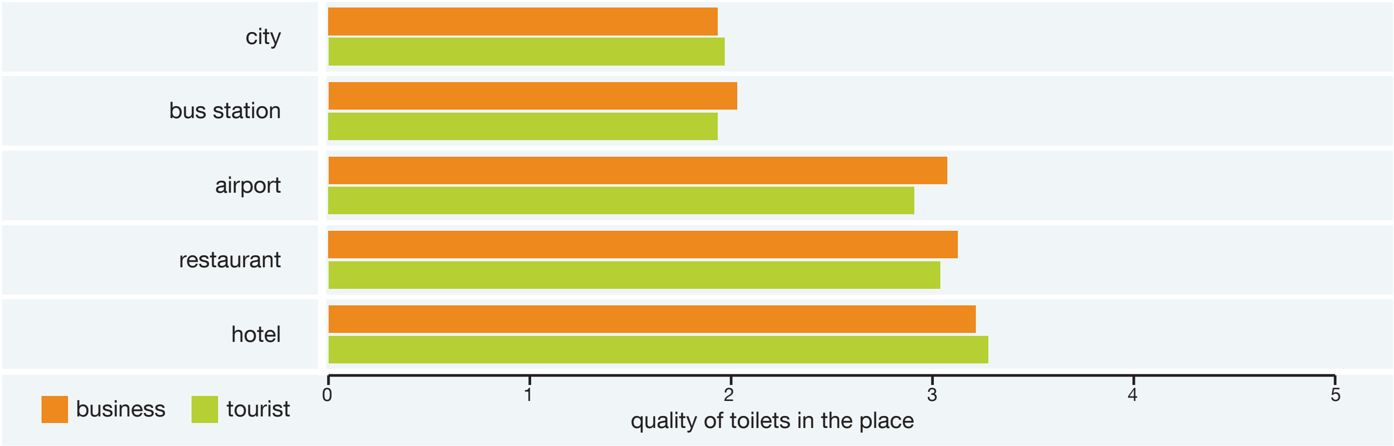
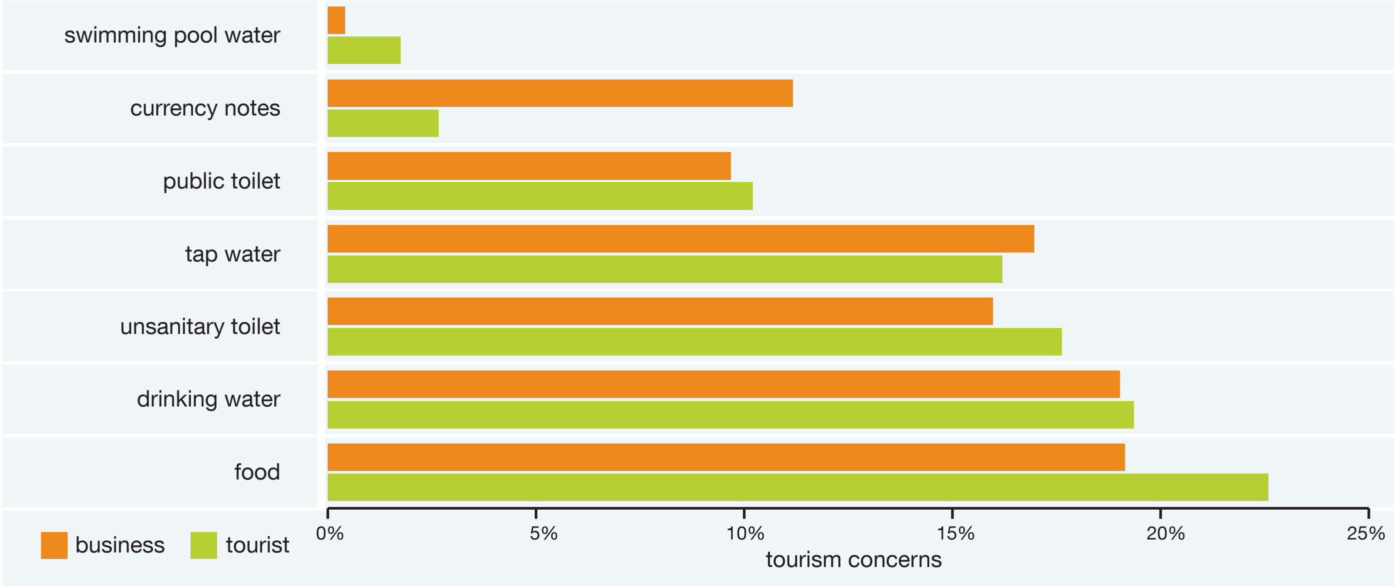


FIGURE 41: WHAT FACTORS WERE MOST CONCERNING? (% CITING, 3 RESPONSES PER RESPONDENT)



was followed by drinking water and dirty environment, and for business visitors this was followed by water for washing and drinking water. Respondents stated that they suffered on average 3 days of symptoms and 2 days of being too unwell to conduct normal activities. 35% of those sick went to a medical clinic while 26% chose to buy medicines in a shop/drug store. The remaining 39% did not seek medical care. On average, business visitors who got sick spent more on treatment (US$68) than tourists, who spent on average US$25.

Most respondents said that they were willing to return to Indonesia (85%), while only 3% said they would not return, and 13% were not sure about it. The majority of respondents said they would advise friends to come (74%), while others said they would not advise friends to come (9%), and 16% were not sure about it (Figure 42).

When they were asked the reasons for their hesitance to return to Indonesia, almost 50% of visitors mentioned sanitation condition as the main factor, followed by safety and cost (Figure 43). This is a strong indication to tourist agencies and government departments of the need to pay more attention to improving sanitary conditions in Indonesia.

5.2 BUSINESS AND FOREIGN DIRECT INVESTMENT

The business survey was conducted in Jakarta and Bandung. Jakarta was selected because it is the capital city and the location of many international and national companies; and Bandung because it is a major tourist destination with many international and national restaurants and hotels. Bandung is also a city with many textile factories: textiles and their related products are estimated to contribute approximately 10% to exports and are one of Indonesia's top

FIGURE 42: INTENTION OF VISITORS TO RETURN TO INDONESIA

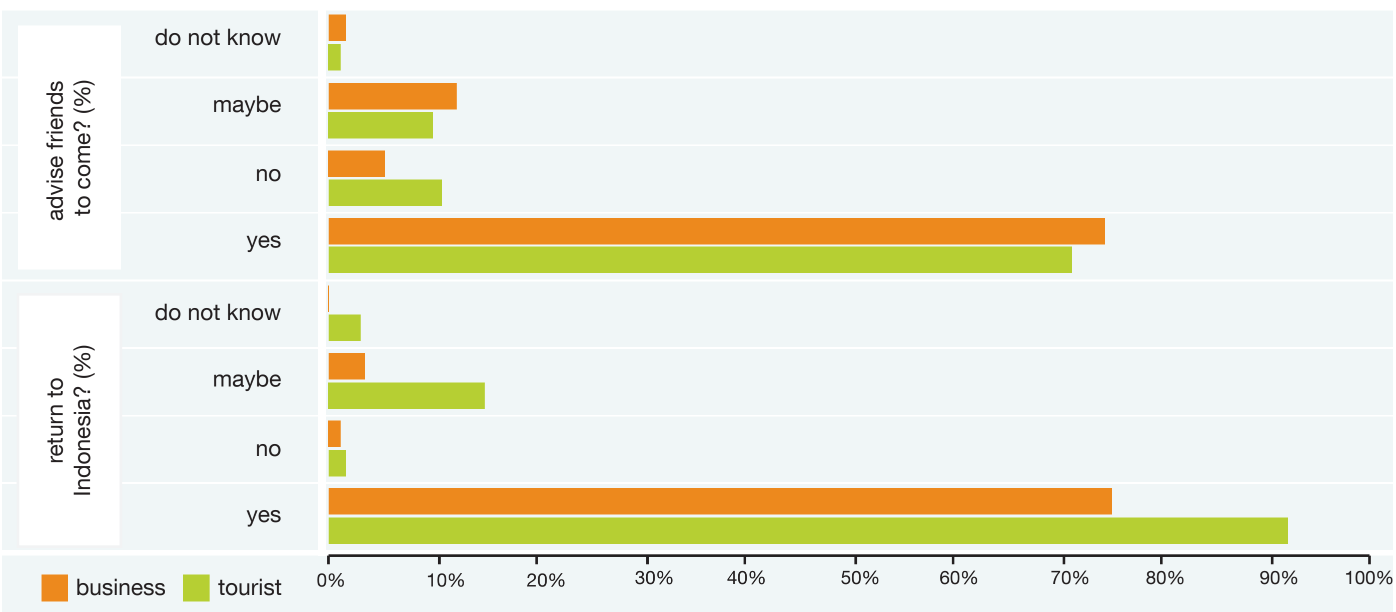
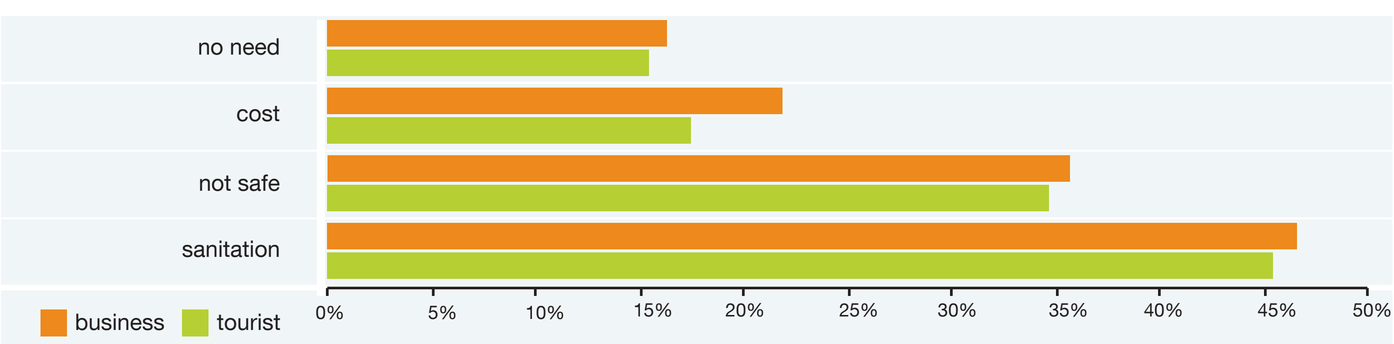


FIGURE 43: REASON FOR HESITANCY TO RETURN



ten non-oil and gas export commodities[21]. Also, the city experienced a major garbage disposal problem a few years ago.

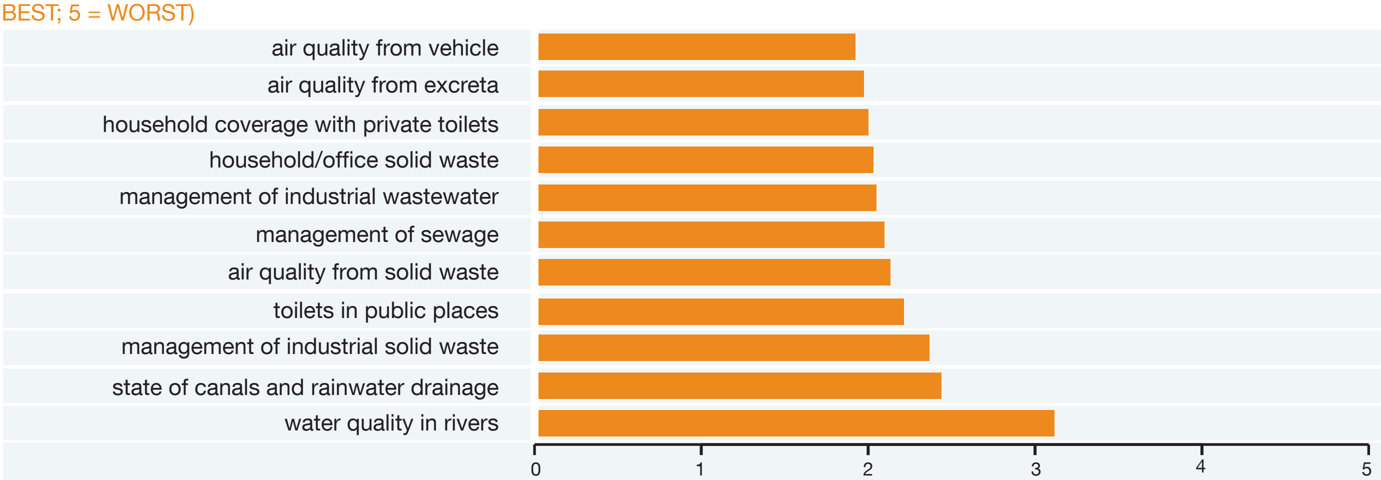
As reported in Chapter 5.1, on average visitors rated their enjoyment at around 3.0 (out of 5.0) while visiting various places in Indonesia (Figure 44).

A separate survey conducted in a small selection of restaurants, hotels, garment factories and food processing companies in Jakarta and Bandung gathered opinions and preferences about environmental sanitation. The respondents were asked about the quality of river water, the state of canals and rainwater drainage, management of sewage, management of industrial wastewater, household coverage with private toilets, toilets in public places, household/office solid waste, management of industrial solid waste, air quality from vehicles, air quality from solid waste, and air quality from excreta. Figure 45 shows the respondents' concerns about the environmental sanitation condition. They were most concerned about water pollution in rivers, followed by the poor state of canals and rainwater drainage, poor management of industrial solid waste, and lack of adequate toilets in public places.

A pleasant environment for staff – one that is clean with good air quality and good sanitation – was a top priority for companies that are considering locating their business, especially for the food industry (food processing and restaurants). Figure 46 also shows that other important factors influencing company location include workers' health and quality of water available. As well as these factors, the development of the city's infrastructure and supportive public policies in their sector are important influencing factors.

FIGURE 44: PLACES VISITED BY BUSINESS VISITOR (% RESPONDENTS) AND ENJOYMENT OF STAY

FIGURE 45: RATING OF ENVIRONMENTAL SANITATION CONDITIONS IN THE LOCATION OF THE BUSINESS SURVEY INTERVIEW (1 = BEST; 5 = WORST)



[21] Ministry of Trade (http://www.depdag.go.id), 2009

FIGURE 46: IMPORTANCE OF INFLUENCING FACTORS FOR COMPANY LOCATION (1 = UNIMPORTANT; 5 = IMPORTANT)

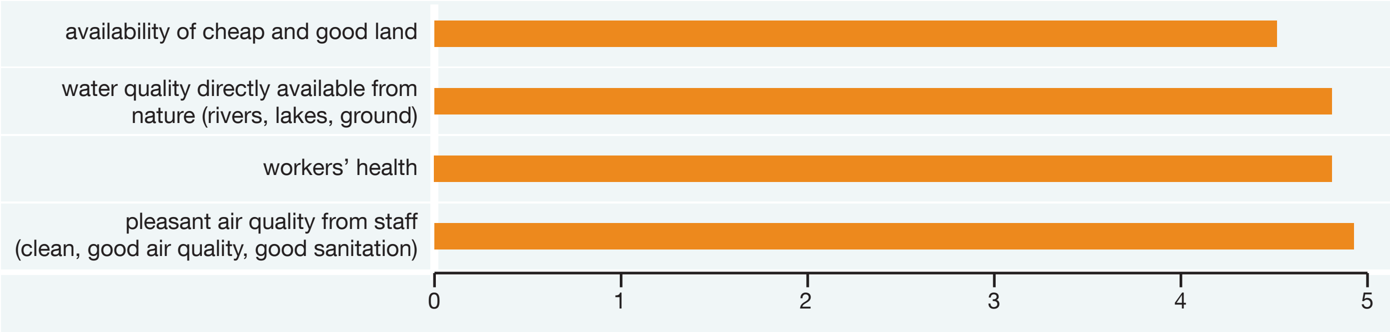


TABLE 31: INDONESIA HOUSEHOLD SANITATION PROFILE – JMP MARCH 2010

	Urban		Rural	
	Proportion	**Number of HH (Million)**	**Proportion**	**Number of HH (Million)**
Improved	67%	13	36%	9
Shared	9%	2	11%	3
Unimproved	8%	2	17%	4
Open Defecation	16%	3	36%	9

5.3 SANITATION MARKETS

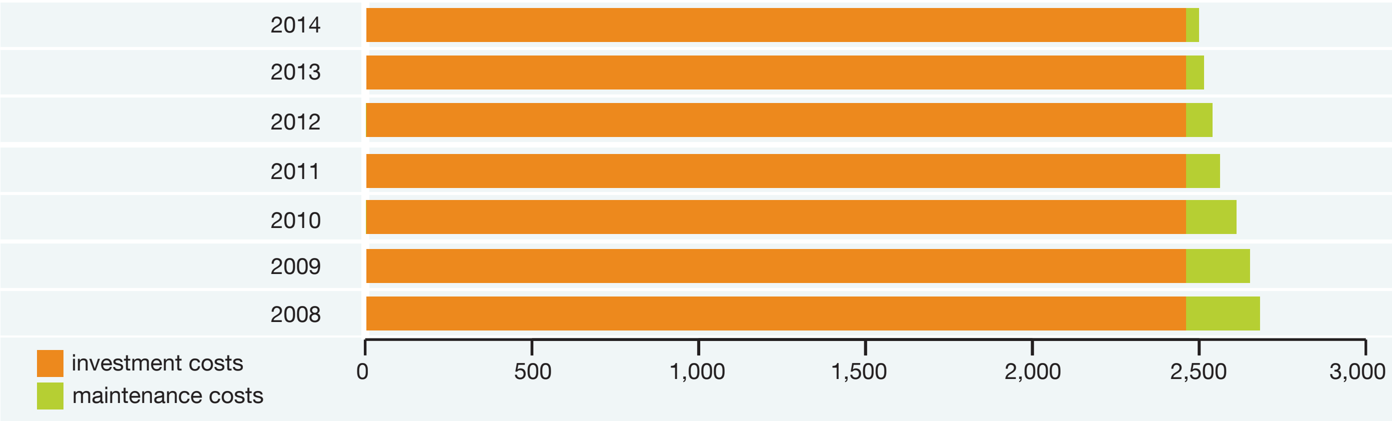
The Government of Indonesia has set targets to make Indonesia free from open defecation by 2014. It means that households that still practice open defecation will have to use toilets, either private, shared or community toilets. The number of households practicing open defecation accounts for a major share of the overall sanitation market potential. The calculation of the sanitation market size is based on the following assumptions:

- The market potential covers initial investment costs (sanitation material as well as related services such as mason services) and annual maintenance costs.
- The initial sanitation ladders consist of moving from open defecation or an unimproved or shared toilet, to an improved private toilet with septic tank.
- The unit price of a septic tank is adopted from the "Sanitation System & Technology Option Reference Book – TTPS, 2010", which is US$1000 for a private toilet with a technically standardized septic tank.
- The annual maintenance cost is the average annual maintenance costs of private toilet found in study sites (see Chapter 6).

The Joint Monitoring Programme for water supply and sanitation estimates the use of improved sanitation facilities in Indonesia (the March 2010 update reports 2008 figures). A summary of coverage rates and populations benefitting is shown in Table 36. These figures serve as the baseline to calculate the total potential market size to achieve the PPSP target by the end of 2014 with additional costs of moving up from shared and unimproved toilets to private toilets with septic tank.

According to the above assumptions and the sanitation profile (Table 31), the total potential sanitation market size is 16.67 million new toilet units, which are worth US$17.3 billion. This figure includes new toilet investment costs of US$16.8 billion and cumulative maintenance costs of US$500 million from 2008 until 2014. Figure 47 shows the market size projection, assuming equal coverage gains in each year until 2014. For planning and budgeting purposes, it will be necessary to select sanitation technologies and models that are affordable and demanded by the populations they serve – the actual unit costs may be lower than these values (especially in rural areas) or indeed higher, for more advanced sewerage and treatment systems in large, densely-populated and higher-income urban centers.

FIGURE 47: PROJECTION OF INDONESIA SANITATION MARKET SIZE (US$ MILLION)



5.4 HEALTH

The ESI Phase 1 Study reported that poor sanitation and hygiene caused significant burden of disease in Indonesia through illness and premature death. Table 32 shows the estimated number of episodes and deaths attributed to poor sanitation for these selected diseases: diarrheal diseases, helminthes, scabies, trachoma, hepatitis A, hepatitis E, malnutrition and other diseases related to malnutrition.

Using the national DHS data as a data source, it is estimated that 89 million cases of diarrhea were attributed to poor sanitation and hygiene,[22] while 28 million cases of scabies were estimated to be attributed to poor hygiene practices. The national health information system reported that 3 million malnourished children, a million cases of helminthes, and an additional 1 million cases of illness related to malnutrition, are attributed to poor sanitation and hygiene. Other studies suggest significantly higher rates of disease than those reported by government records. In East Asia, helminthes are cited to have the prevalence rate of 36% (roundworm), 28% (whip worm) and 26% (hook worm), which would lead to more than fifty million cases. Three million malnourished children may also be a significant underestimate, in a country where 28% (5.4 million) of the under-five children are estimated to be severely or moderately underweight.

The total number of deaths attributed to poor sanitation and hygiene exceeds 50,000, of which 24,000 are accounted for by direct diseases (mainly diarrhea) and 26,000 by

TABLE 32: ESTIMATED NUMBER OF ANNUAL CASES AND DEATHS ATTRIBUTED TO POOR SANITATION AND HYGIENE, 2006[1]

Disease	Morbidity (cases)	Mortality (deaths)
DIRECT DISEASES		
Diarrheal disease	89,417,461	22,880
Helminthes	1,054,048	56
Scabies	28,659,082	583
Trachoma	174,079	-
Hepatitis A	715,330	702
Hepatitis E	23,770	21
Sub-total	120,043,770	24,242
INDIRECT DISEASES RELATED TO MALNUTRITION AMONG CHILDREN UNDER FIVE YEARS		
Malnutrition	3,073,220	na
ALRI	1,066,935	8,049
Malaria	87,818	1,887
Measles	na	3,528
Other	na	11,282
Protein energy malnutrition	na	1,144
Sub-total	4,227,973	25,890
Total	124,271,743	50,132

[1] Economic Impacts of Sanitation in Indonesia. A five-country study conducted in Cambodia, Indonesia, Lao PDR, the Philippines, and Vietnam under the Economics of Sanitation Initiative (ESI) Phase 1, Research Report, WSP-EAP, World Bank Office Jakarta, August 2008.

[22] Estimated using data from the National DHS 2007 which collected diarrheal incidence rates for the under five population (2.5 cases per child per year).

indirect diseases related to malnutrition. These latter deaths include only under-five children and therefore underestimate the total deaths in all age groups. These data however are already five years old, and require updating. Economic development and increasing coverage of basic services are expected to reduce the overall number; however, offsetting this is the increasing population size and the remaining challenges of slum populations.

The potential impact of increased local government engagement has been demonstrated by the government of Payakumbuh City, where sanitation has been mainstreamed in the city development program since 2006. In a speech at the City Sanitation Summit in 2008, the city's mayor stated that the provision and improvement of household toilets, via the CLTS approach, had resulted in a reduction in the city's health subsidy budget from around US$290,000 per year to be less than US$100,000 per year within 2 years[23].

5.5 WATER

Human excreta and wastewater directly disposed of into water bodies, such as rivers and lakes, are major causes of the serious pollution of surface water in Indonesia. For every 1 mg/liter additional BOD concentration in a river from which water supply utilities source water, average water treatment cost increases 25%[24]. Research on surface water quality in Citarum River in West Java by the West Java Environmental Control Body (*Badan Pengendalian Lingkungan Hidup Daerah*/BPLHD) in 2004 showed that the high BOD in this river is due to intakes from domestic (44%-55%), industry (0%-42%), crop agriculture (10%-36%) and livestock agriculture (3% -10%) sources[25].

With human populations – especially around rivers and streams – growing over time, and in the absence of any serious efforts to control this pollution, the situation can only get worse. More than 19% of people dispose of untreated human excreta into water bodies (rivers), producing around 4,400 tons phosphorous per year in these rivers. A 2006 study by West Java BPLHD revealed that domestic wastewater contributed up to 80% of the total surface water pollution in West Java. Thus, the water in all rivers in West Java that pass through urban areas like Bogor, Depok, Bekasi, Bandung and Cirebon are not fit for use without treatment[26].

The most recent data from the Bekasi City BPLHD revealed that almost all rivers in Bekasi are contaminated by E. coli bacteria. E. coli concentrations in the city's two largest rivers (Kali Malang and Kali Bekasi) are between 80,000 MPN/100 ml and 100,000 MPN/100 ml, which far exceeds the maximum threshold of 1,000 MPN/100 ml. As a consequence, the local drinking water company has to spend more on water treatment[27].

The situation is much the same in Jakarta and Surabaya. In 2002, the Environmental Technology Directorate of the Agency for Technology Testing and Application (Badan Pengkajian dan Penerapan Teknologi/BPPT) reported that 70% of the wastewater disposed of in rivers in the Jakarta area was domestic wastewater, and average BOD was more than 90 mg/l. In Surabaya, research by local water supply utility Perum Jasa Tirta reported in 2004 that 87% of the wastewater disposed of in rivers in Surabaya was domestic wastewater, with the remainder coming from industry. The large volume of organic material in domestic wastewater absorbs oxygen in the water and has caused the disappearance of many important river biota: there are now very few wild fish in Surabaya's rivers.

These facts serve to remind all stakeholders of the urgency and importance of improving sanitation. The environmental damage caused by uncontrolled disposal of domestic wastewater into water bodies can no longer be ignored.

[23] The Major of Payakumbuh City speech in the Opening Ceremony of Sanitation Summit, November 5th, 2008
[24] Indonesia Sanitation Sector Development Program (ISSDP), 2007.
[25] http://www.bplhdjabar.go.id/,09 October 2006
[26] http://www.bplhdjabar.go.id/,09 October 2006
[27] http://newspaper.pikiran-rakyat.com, May 12th, 2009

VI. Costs of Improved Sanitation and Hygiene

This chapter presents the cost results in different forms and from different perspectives to aid understanding the nature of costs: in section 6.1, a breakdown of investment, recurrent and program costs; in section 6.2, a breakdown by category of financier (payer); in section 6.3, a breakdown of unit costs for different wealth quintiles; and in section 6.4, a presentation of the marginal costs of moving up different 'rungs' on the sanitation ladder.

6.1 COST SUMMARIES

Table 33 and Table 34 show a summary of sanitation and hygiene costs in rural and urban study sites, respectively. Site-specific costs are provided in Annex I. The hygiene costs in column 2 are distinct from sanitation costs, but it can be added to sanitation costs to estimate the combined costs of hygiene and sanitation interventions. Capital costs refer to putting hardware in place, while program costs reflect software (promotion and awareness raising campaign prior to the facility construction, education and monitoring).

In rural areas, hardware investment cost ranges from US$53 per household for dry pit latrine to US$557 per household for septic tank. The rural community toilet, which in Tangerang site is SANIMAS and serves around 100 households, costs US$ xx per household. The SANIMAS option

TABLE 33: SUMMARY OF AVERAGE COST PER HOUSEHOLD IN RURAL AREAS FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (US$, 2009)

Cost Item	Hygiene[1]	Community	Shared	Dry pit	Wet pit	Septic tank
INVESTMENT COSTS: INITIAL ONE-OFF SPENDING						
1. Capital	2	151	130	53	70	557
2. Program	0.1	28	0.0	0.0	0.0	0.0
Sub-total	2	179	130	53	70	557
RECURRENT COSTS: AVERAGE ANNUAL SPENDING						
3. Operation	9.0	0.2	4.0	7.0	7.0	13.0
4. Maintenance	0.0	0.8	4.5	7.4	7.3	12.1
Sub-total	9.0	1.0	9.0	14.0	14.0	25.0
AVERAGE ANNUAL COST CALCULATIONS						
Duration[2]	3	20	10	5	5	20
Cost/household	10	19	28	27	32	82
Cost/capita[2]	2	4	6	5	6	16
OF WHICH:						
% capital	9%	80%	69%	48%	55%	69%
% program	0%	15%	0%	0%	0%	0%
% recurrent	90%	5%	31%	52%	44%	31%
Observations[4]	208	23	98	41	54	224

[1] Mainly soap purchase cost; [2] Refers to length of life of hardware before full replacement ; [3] Based on 5 persons per HH; [4] Number of households (respondents)

is the only one with program costs measured, as it was developed under the government's and NGO's initiative, with US$28 investment cost per household spent, or around 15% of total investment costs.

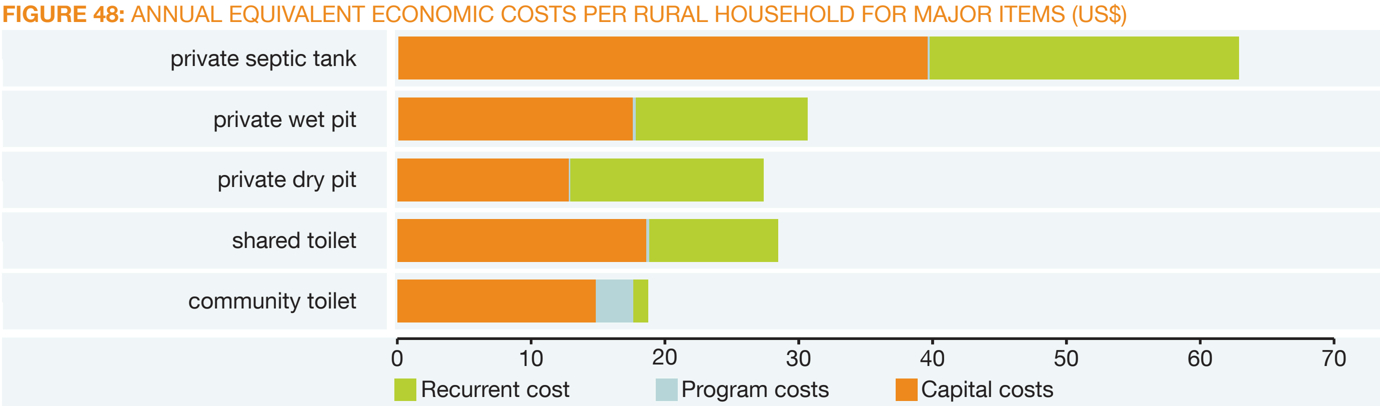
Figure 48 illustrates the main components of annualized costs in rural areas. When converted to annualized life cycle costs, taking into account the expected duration of the investment, annual costs per household vary from US$19 per year for SANIMAS to US$82 for septic tank. Capital costs are the dominant part of the overall costs. However, in the absence of maintenance in the SANIMAS intervention, there is a high risk that the facility will not last for 20 years, or that people will continue to use it even when it is functional (due to poor hygienic conditions of the facility). Hence there needs to be am element of the SANIMAS program that raises awareness on the importance of facility maintenance and institutes a mechanism for proper operations and maintenance to take place.

TABLE 34: SUMMARY OF AVERAGE COST PER HOUSEHOLD IN URBAN AREAS FOR DIFFERENT SANITATION AND HYGIENE OPTIONS, USING FULL (ECONOMIC) COST (US$, 2009)

Cost Item	Hygiene[1]	Community		Shared	Wet pit	Septic tank	Communal sewerage[2]	Sewerage + treatment[3]	
		Optimal	Actual					Optimal	Actual
INVESTMENT COSTS: INITIAL ONE-OFF SPENDING									
1. Capital	2	316	503	104	60	369	479	473	2,198
2. Program	0.1	0	0	13	13	13	0	0.6	3
Sub-total	2	316	503	117	73	382	479	474	2,201
RECURRENT COSTS: AVERAGE ANNUAL SPENDING									
3. Operation	9.0	4	6	3	8	7	13	13	36
4. Maintenance	0.0	3	5	8	13	23	32	39	54
Sub-total	9.0	7	11	11	21	30	45	52	90
AVERAGE ANNUAL COST CALCULATIONS									
Duration[4]	3	20		10	5	20	20	20	20
Cost/household	10	39	62	28	37	70	87	100	317
Cost/capita	2	8	12	6	7	14	17	20	63
OF WHICH:									
% capital	9%	83%	83%	55%	40%	53%	56%	48%	71%
% program	0%	0%	0%	7%	8%	2%	0%	0%	0%
% recurrent	91%	17%	17%	38%	53%	45%	44%	52%	29%
Observations[5]		29		92	116	318	137	46	46

[1] Mainly soap purchase cost; [2] Malang city; [3] Banjarmasin city; [4] Refers to length of life (years) of hardware before full replacement; [5] Number of households (respondents)

FIGURE 48: ANNUAL EQUIVALENT ECONOMIC COSTS PER RURAL HOUSEHOLD FOR MAJOR ITEMS (US$)



For urban sites, wet pit latrine is the lowest investment cost at US$73 per household. Shared latrine is higher at US$117, with private septic tank at US$382. The private sewerage and treatment system at Banjarmasin site and the communal sewerage system in Malang site have the highest investment cost at around US$480 per household. These results reflect the optimal capacity use of the sewerage systems. However, when account is taken of the actual capacity use of the sewerage and treatment system in Banjarmasin site, the cost per household increased to over US$2,000 per household. The community toilets in Banjarmasin increase from US$316 to US$503 per household due to some household members still going to rivers for defecation.

Figure 49 illustrates the main components of annualized costs in urban areas. Similar to the rural areas, the capital costs are the most dominant part of the overall costs. The difference between optimal and actual costs are shown clearly for sewerage network and the community toilets. The contribution of program costs to the annualized costs is small compared to the capital costs and recurrent costs. However, program implementers should be aware of the fact that minimum or even zero budget allocation on program costs for awareness raising and capacity building of the targeted beneficiaries may lead to less effective intervention. Key stakeholders, especially beneficiaries, may not be fully aware of the program, which can be a key determinant of program success (see Chapter 7). For instance, respondents or participants in the focus group discussions in Banjarmasin mentioned that they were not well informed of any initiatives on sanitation development. This led to lack of public willingness to connect their toilets with the sewerage system, thus using less than 15% of the treatment plant's capacity, even after more than 10 years of operation.

6.2 FINANCING SANITATION AND HYGIENE

The contribution of funds for sanitation initiatives depends on which sanitation options are selected and who initiates the intervention. Figure 50 and Figure 51 show the proportional contributions of different parties to total sanitation costs at rural and urban sites, respectively. The figures show that community toilets (SANIMAS) and sewerage systems receive major support from the government (central and/or local government). In some cases of SANIMAS, NGOs contribute financially, also successfully creating community demand or awareness.

For city sewerage systems, the government is responsible for the provision and financing of the entire sewerage networks, while households are only responsible for providing their own toilets and connection from their house to the sewerage network. As well as the connection fee, households also pay a monthly fee which contributes to operations and maintenance. The other sanitation options are on-site systems, whose financing usually fall under the responsibility of households.

FIGURE 49: ANNUAL EQUIVALENT ECONOMIC COSTS PER URBAN HOUSEHOLD FOR MAJOR ITEMS (US$)

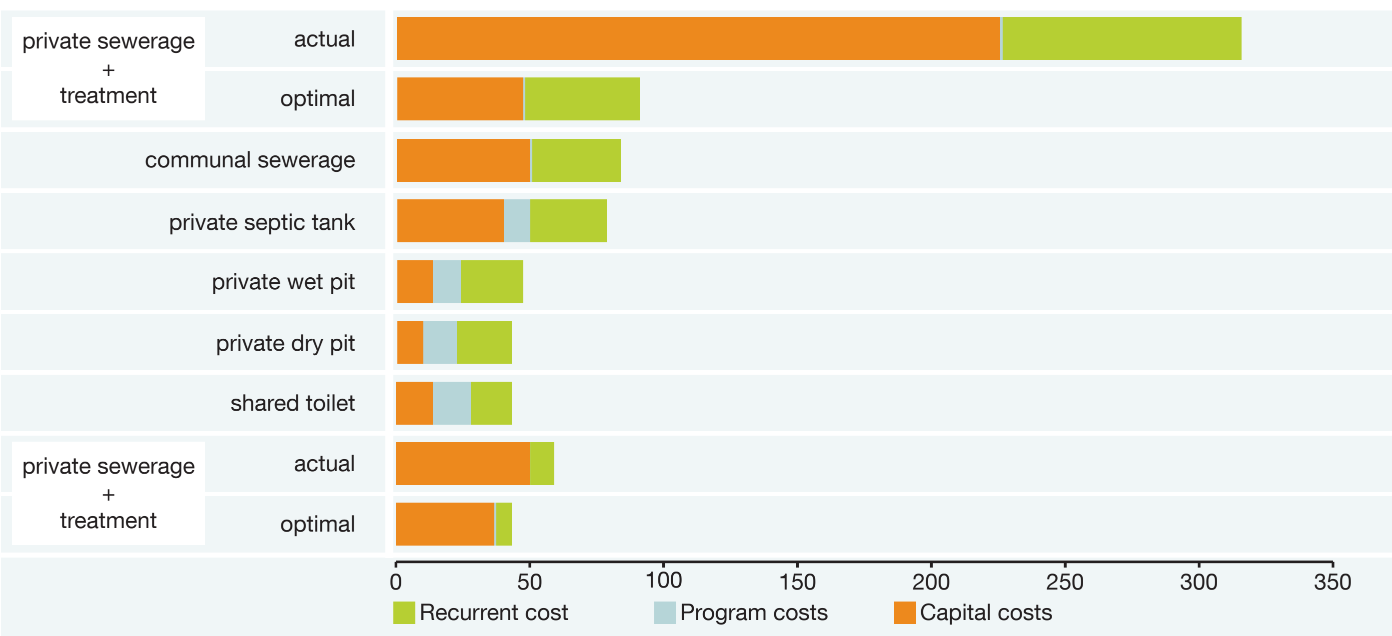


FIGURE 50: PROPORTION OF RURAL SANITATION COSTS FINANCED FROM DIFFERENT SOURCES (%)

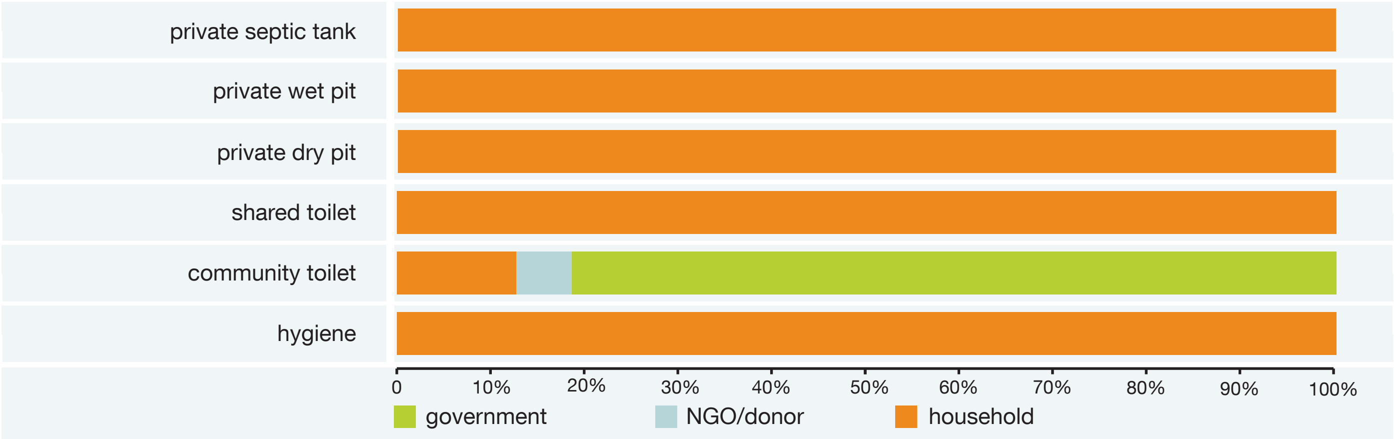


FIGURE 51: PROPORTION OF URBAN SANITATION COSTS FINANCED FROM DIFFERENT SOURCES (%)

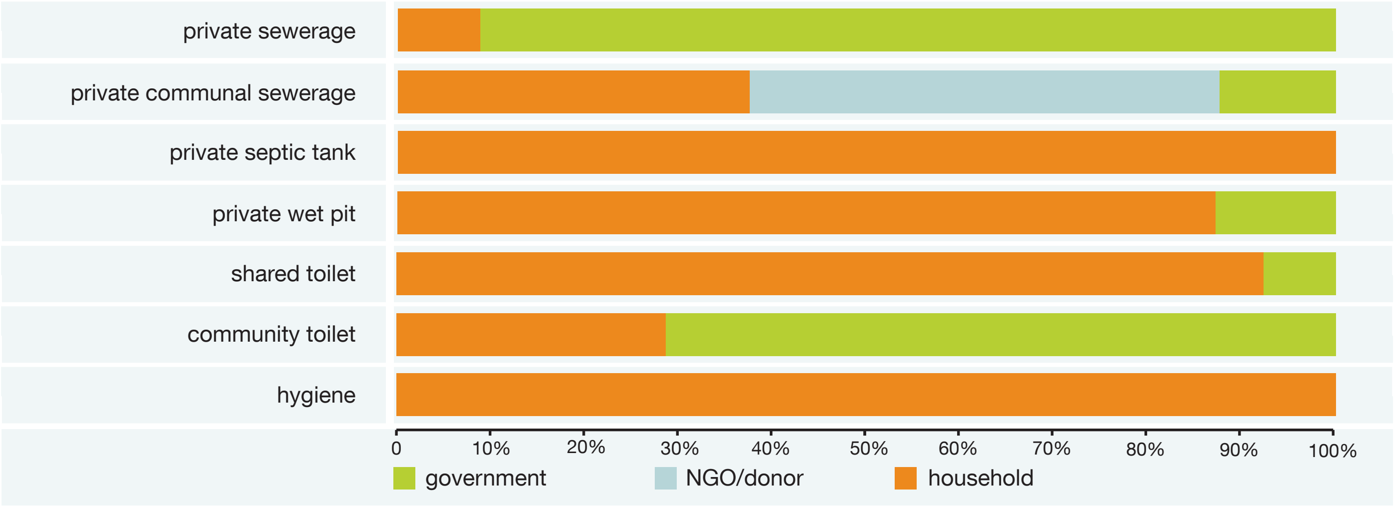
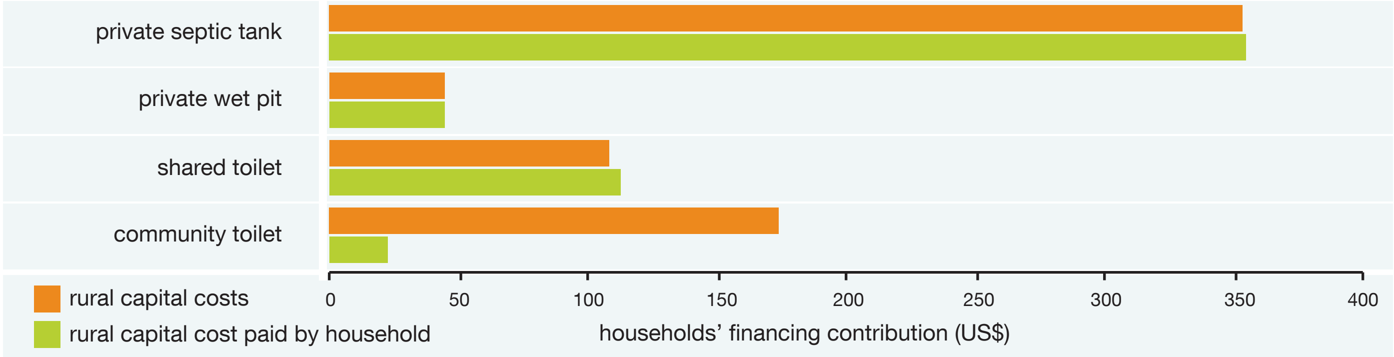


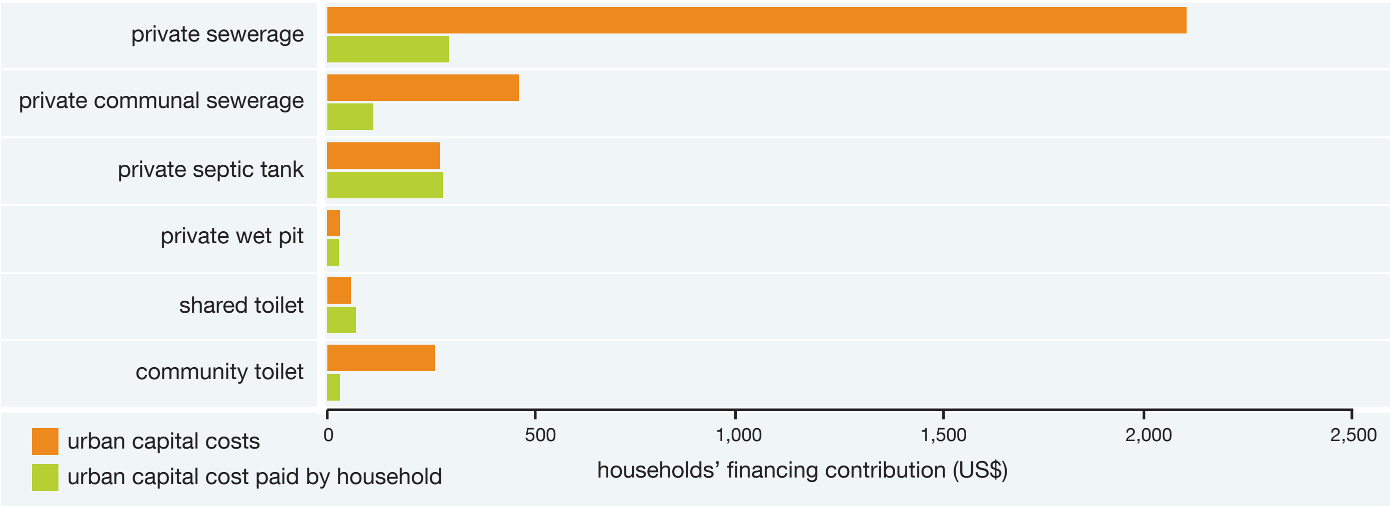
FIGURE 52: CAPITAL COST PAID BY HOUSEHOLDS AT RURAL SITES



The local government of Payakumbuh city contributed through financing of program costs, as part of CLTS implementation. The local government initiated campaigns and community facilitation to raise the awareness of poor households in Payakumbuh to move up their sanitation ladder from open defection to the most affordable sanitation options, which are private dry or wet pit. The latrines, however, were financed by households.

Figure 52 and Figure 53 show the variation between sanitation options of capital cost paid by households at rural sites and urban sites, respectively. The figures reflect that the financing sources for high initial capital of the sanitation options such as community toilets (SANIMAS) and sewerage systems are mainly from the Government. Meanwhile, the ones with low initial capital like private on site toilets (dry pit, wet pit and septic tank) are mainly from households.

FIGURE 53: CAPITAL COST PAID BY HOUSEHOLDS AT URBAN SITES



The figures indicate that the decision to improve a sanitation facility is influenced partly by the initial investment cost, and the recurrent costs. Households with lower cash income tend to be more sensitive to the initial investment costs, and hence they tend to choose sanitation options that need a lower initial outlay of funds. Such an understanding should obviously be considered by program implementers in selecting technological options when they initiate a particular sanitation intervention.

6.3 SANITATION OPTION BY WEALTH QUINTILE

The wealth quintile analysis tabulates the proportion of households receiving each sanitation option by their ownership of assets. Figure 54 shows that richer households are more likely to select septic tanks in rural areas, compared to poorer households. Likewise, poorer households are much more likely to access community or shared toilets compared to rich (top quintile) households.

In urban sites, there is an interesting finding that sewerage connection is not linked to the wealth of a household, but the financing mechanism. In Banjarmasin, all capital costs including the connection fee are fully borne by the local government and the households only pay for construction of toilet room at home. Nevertheless, households' willingness to connect seems still relatively low. This is likely to be due to the absence of dedicated program costs to increase the population's awareness of the system.

6.4 COSTS OF MOVING UP THE LADDER

Costs of moving 'up' the sanitation ladder are presented in Table 35 for rural sites and Table 36 for urban sites. Conceptually, community toilet projects such as SANIMAS are categorized as an improved public toilet, and its position in term of sanitation ladder level is below private wet pit latrine. However, the cost per household reached with SANIMAS community toilets is higher than shared latrine or private wet pit latrine. Therefore, moving 'up' the sanitation ladder from community toilets to private wet pit latrines can lead to a theoretical cost saving. However, households using SANIMAS do so for justifiable reasons such as lack of land availability or the attraction of not spending their own resources on a private toilet. For example, community toilets for rural areas are in Tangerang district. The locations where the present study was conducted are around industrial areas and are densely populated. For some households, it is difficult to provide enough space for family toilets and they tend to use SANIMAS as provided by the government.

A similar situation takes place in the community toilets for urban areas in Banjarmasin. The city has 17 units of community toilets (SANIMAS) at different sites, which serve around 1,200 households. Almost all construction costs were born by the government. The provision of SANIMAS was partly intended to decrease the number of households practicing open defecation at the rivers around the city. Almost all required investment costs were provided by the government. Therefore, cheaper private toilet options such as pit latrine or septic tank would not necessarily lead the population to construct their own private toilets, as they would more likely be responsible for the financing.

Figure 56 shows the incremental costs of moving up the sanitation ladders from various initial sanitation ladders to the top sanitation ladders at rural sites (septic tank) and at urban sites (urban sewerage systems). The incremental costs at rural sites show a linear trend according to the initial sanitation ladders. Wet pit, the cheapest option, needs higher incremental costs to move up to septic tank than from community and shared toilets. However, the ability of a household to move up the ladder depends on the availability of land within households' own plot to develop a private toilet including septic tank, and the financing incentive and mechanism. For example, the costs of all household connections to the sewerage systems are fully subsidized by the local government and the households pay a monthly fee (sewage treatment charge) and are responsible for building toilets in their home.

FIGURE 54: PROPORTION OF RURAL HOUSEHOLDS SELECTING DIFFERENT SANITATION OPTIONS, BY WEALTH QUINTILE

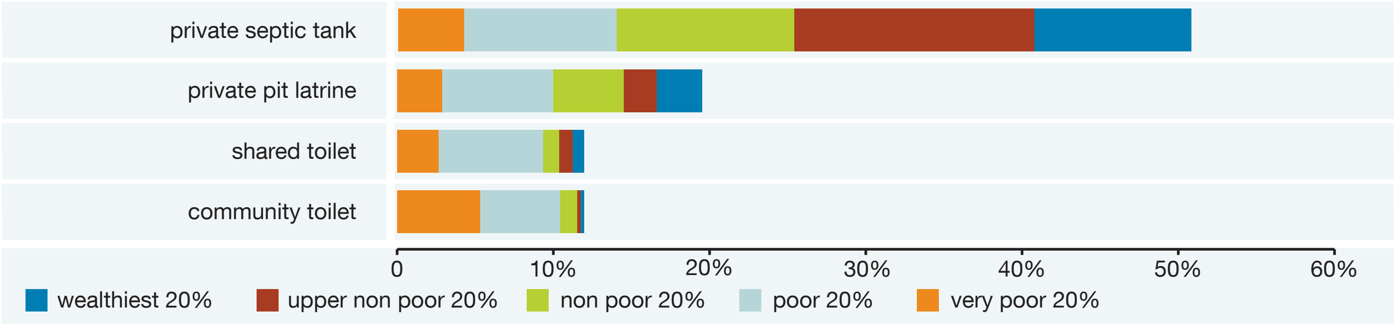


FIGURE 55: PROPORTION OF URBAN HOUSEHOLDS SELECTING DIFFERENT SANITATION OPTIONS, BY ASSET QUINTILE

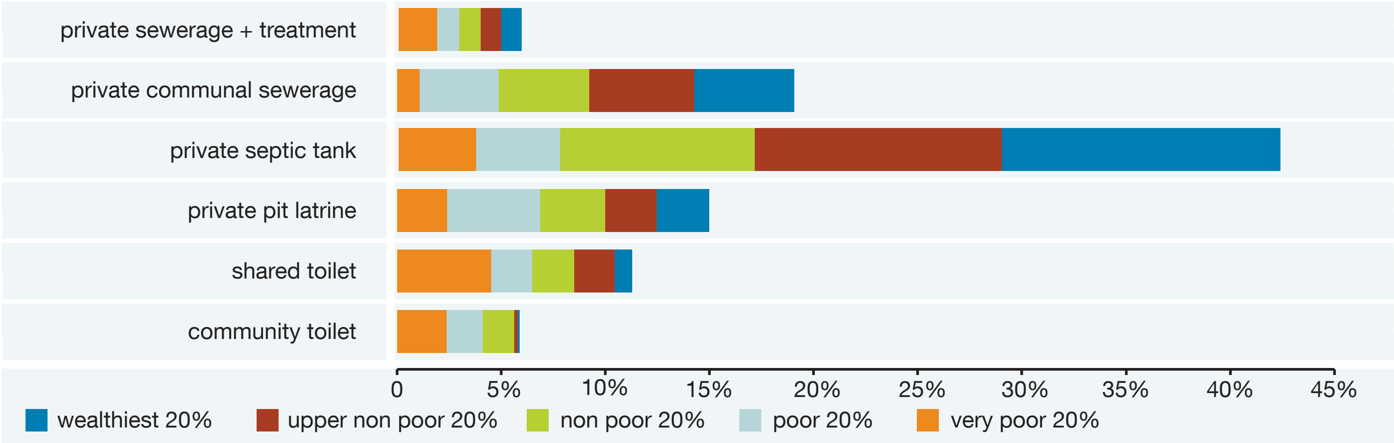


TABLE 35: INCREMENTAL COSTS PER HOUSEHOLD OF MOVING UP THE SANITATION LADDER AT RURAL SITES (US$, 2009)

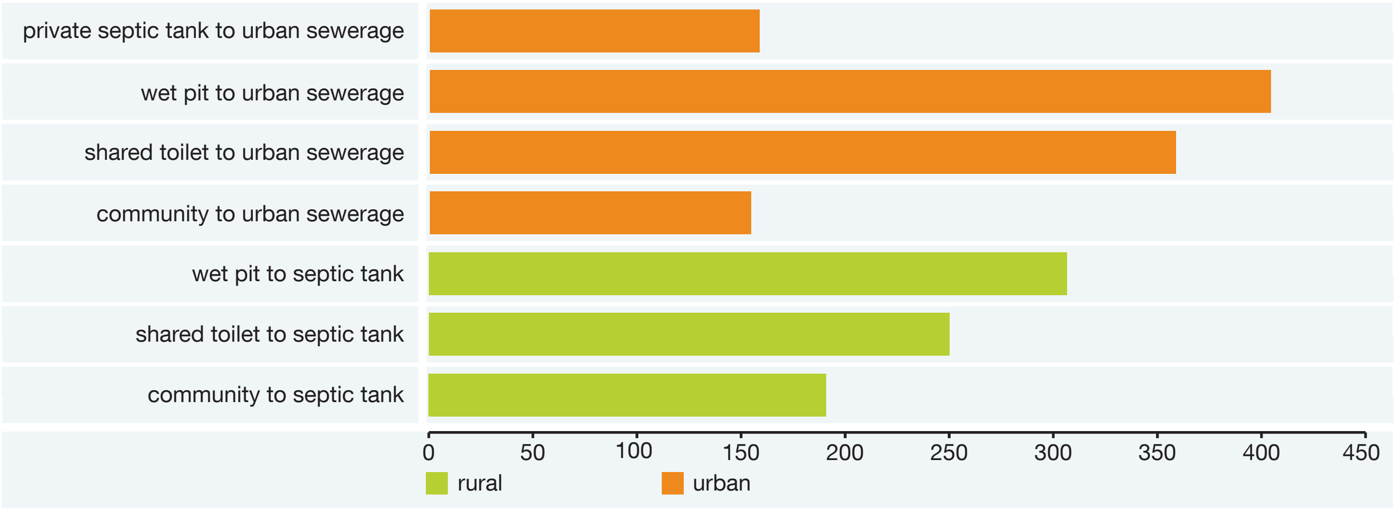
		Target position on sanitation ladder				
		Community	Shared	Dry pit	Wet pit	Septic tank
Initial sanitation ladder	Private wet pit	-	-	-	-	295
	Private dry pit	-	70	-	25	319
	Shared	63	-	-70	-45	249
	Community	-	-65	-133	-108	186

TABLE 36: INCREMENTAL COSTS PER HOUSEHOLD OF MOVING UP THE SANITATION LADDER AT URBAN SITES (US$, 2009)

		Target position on sanitation ladder					
		Community	Shared	Private wet pit	Private septic tank	Communal sewerage	Private sewerage + treatment*
Initial sanitation ladder	Communal sewerage					0	-3
	Private septic tank	-	-	-	-	189	185
	Private wet pit	244	-	-	219	407	404
	Private dry pit	263	58	19	237	426	423
	Shared	205	-	-39	180	368	365
	Community	-	-205	-244	-25	163	160

* Assumed to operate at its optimal capacity

FIGURE 56: INCREMENTAL COSTS PER HOUSEHOLD OF MOVING UP THE SANITATION LADDER (US$)



VII. Sanitation Program Design and Scaling Up

This chapter evaluates selected sanitation programs in terms of their program approaches, their performance in relation to outputs produced, their successes and their failures.

7.1 PROGRAM APPROACHES APPLIED IN FIELD SITES

Table 37 shows the start and finish dates, number of households reached, and coverage of sanitation programs in the ESI field sites.

7.1.1 WSLIC 2 IN LAMONGAN DISTRICT

The sanitation intervention in Lamongan District was Water and Sanitation for Low Income Communities (WSLIC 1 and WSLIC 2), which included clean water, sanitation, training and community empowerment and hygiene components. WSLIC 1 ran from 1993 to 1999, and WSLIC 2 started in 2000. The WSLIC 2 Program in Lamongan was 72% financed by a World Bank loan, while the local government contributed 8% and the community 20% of the program cost (4% in cash and 16% in-kind). Compared with other WSLIC 2 locations, Lamongan district has the largest number of toilets financed by a revolving fund scheme, which is at the core of the program. The program includes construction of household toilets, school toilets, and sewerage system (SPAL).

As well as infrastructure and hardware development, the program also carries out prevention and treatment for environmental-related diseases, including soil, water and stool tests, school deworming, community health counseling, and practical managerial and financial training, as well as training in water treatment and sanitation system operation and maintenance, and health community counseling.

A University of Indonesia study shows that the program has increased the number of private toilet in some villages. Table 37 shows the overall coverage achieved by the project and Table 38 shows the number of toilets built per year from the start of the program to the latest year of data.

TABLE 37: SANITATION COVERAGE INFORMATION PER FIELD SITE

Site	Rural/urban	Households			Project start		Project end	
		Interviewed in ESI survey	Of which reached by program*	%	Year	Coverage (%)	Year	Coverage (%)
1	Lamongan, rural	300	243	81	2001 - 2002	13 villages Revolving fund: 547 HH Self-Financing: 2346 HH	2007	79 villages Revolving fund: 30,323 HH CLTS: 2,040 HH Self-financing: 13,643 HH
2	Tangerang, rural	300	246	82	2007	-	2008	493 HH
3	Banjarmasin, urban	300	210	70	2000	(200 HH)	Ongoing	904 HH (status Feb 2008)
4	Malang, urban	300	252	84	1986	100 HH	1999	737 HH
5	Payakumbuh, urban	300	252	84	2007	48% (4,661 HH)	Ongoing	50.5% (4,871 HH) (status Nov 2009)

TABLE 38: NUMBER OF PRIVATE TOILETS BUILT IN LAMONGAN UNDER WSLIC 2

Year	Units from revolving fund financing scheme	Units from self-financing
2001/2	574	2,346
2003	510	1,570
2004	371	1,011
2005	466	180
2006	1,638	n.a.

n.a - data not available

Although 73% of sanitation facilities were secured through the revolving fund financing scheme, in reality the scheme has been challenging to implement. Participants found it hard to pay the installments, as most of them are very poor. On the other hand, intensive health and hygiene behavior promotion has made the community more sanitation aware and motivated them to build their own private toilets. Table 39 shows the total number of beneficiaries of the sanitation program as of 2008.

TABLE 39: TOTAL NUMBER OF WSLIC 2 BENEFICIARIES IN LAMONGAN, 2008

No	Subdistrict	No of beneficiaries		
		Village (rural)	HH	Population
1	Turi	8	4,488	23,432
2	Pucuk	3	2,162	9,547
3	Brondong	1	1,204	3,248
4	Ngimbang	1	765	3,188
5	Bluluk	2	1,673	6,643
6	Glagah	2	593	3,414
	Total	17	10,885	49,472

Source: Lamongan District Health Office, 2008

7.1.2 COMMUNITY-BASED SANITATION (SANIMAS) IN TANGERANG DISTRICT

Several years ago, Tangerang experienced a diarrhea outbreak that was attributed to poor sanitation. The Tangerang District Health Office noted that around 70% of the local population – most on the north coast in districts such as Kresek, Kronjo, Pakuhaji, and Mauk – do not have proper toilet facilities.

SANIMAS, a community-based sanitation intervention, engages the local community in the planning phase, technology options assessment and construction, and is operated and maintained by the community, with assistance from facilitators[28].

The first SANIMAS in Tangerang was launched in 2008, in Pisangan Periuk, Sepatan District, where almost 80% of households had no private toilets. Financing of the construction of the SANIMAS facility was shared by national government (IDR100 million), regional government (IDR200 million), Bremen Overseas Research and Development Association (BORDA), BEST (IDR50 million), and the community (IDR2 million), for a total of IDR352 million (about US$35,000). The other SANIMAS facilities constructed in Tangerang district are in Sukadiri subdistrict, which serves 326 households; Pagedangan subdistrict, which serves 62 households; and Sepatan subdistrict, which serves 105 households.[29]

In Tangerang, the technology option is MCK++[30]. This technology option uses the brown water flushed from the toilet to produce biogas. The septic tank is connected to an airtight biogas digester plant, which is made from reinforced concrete and installed underground beside the facility. Inside the digester, methane bacteria treat the wastewater and produce methane biogas. The local community uses the biogas for cooking. The gray water from bathing and washing passes through a sand filter before releasing into the drainage system (see Figure 57).

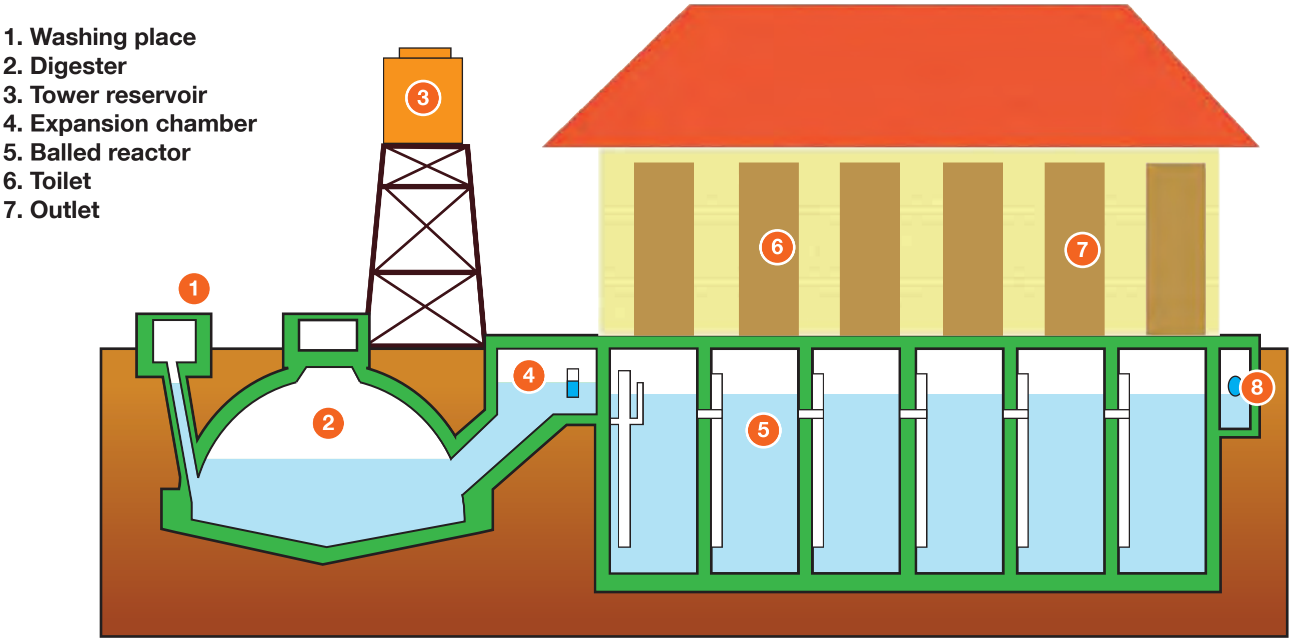
These sanitation facilities have many advantages for the community. For a small fee (IDR1000), users can avoid long queues, have a safe and comfortable place to defecate, and continuous access to clean water for washing and bathing.

7.1.3 BANJARMASIN SEWERAGE SYSTEM

Banjarmasin is one of the few cities in Indonesia to have a sewerage network and wastewater treatment plant. The first sewerage system was built between 1998 and 2000 under the Integrated City Infrastructure Development Program (*Program Pembangunan Prasarana Kota Terpadu*/P3KT)

[28] Directorate of Diseases Control and Enviromental Health, Department of Public Works, WSES Workshop, November 2009
[29] BEST (the facilitator NGO) Tangerang, 2008
[30] MCK++ is a SANIMAS term used to describe a shared toilet facility, plus decentralized wastewater treatment system, plus biodigester.

FIGURE 57: TYPICAL DESIGN OF MCK++ IN TANGERANG DISTRICT[1]



[1] Source: Kreatif Energi Indonesia

of the Kalimantan Urban Development Project (KUDP). Around 77% of the funds came from an IBRD loan, with national government contributing 17% and local government 6% of the total. In 2006, Banjarmasin became a Indonesia Sanitation Development Program (ISSDP) Phase I target location. Set up under this program, the cross-sectoral Banjarmasin City Sanitation Working Group (*Kelompok Kerja/Pokja Sanitasi Kota*) planned a systematic integration of sanitation development. The working group carefully mapped the existing sanitation situation in a City Sanitation White Book, and building on this baseline developed a city sanitation strategy (CSS) that detailed a five-year strategic approach to develop the city's sanitation system, including domestic wastewater, solid waste and drainage. Banjarmasin entered the monitoring and evaluation phase of ISSDP Phase I in 2009. Some sanitation projects in the CSS – notably those aimed at expanding coverage of the sewerage system – received funding commitment from the central government and donors.

Up until 2007, the sewerage system served only population of Lambung Mangkurat, or about 1% of the city's population. In 2010, the sewerage system was extended to Kayu Tangi and Pekapuran Raya. A second extension phase, scheduled to be fully operational by 2015, will bring coverage of the sewerage system up to 75% of the city's population. Non-domestic subscribers, including commerce, industry and government, make up a large proportion (41.5%) of the total (see Table 40).

TABLE 40: COMPOSITION OF PD PAL SUBSCRIBERS

HH Group	% of subscribers	Average monthly payment (US$)
A1	12 %	1
A2	43%	1
A3	3 %	3
A4	0.5 %	17
Commercial, Industry, Government/Institution, etc.	41.5 %	17

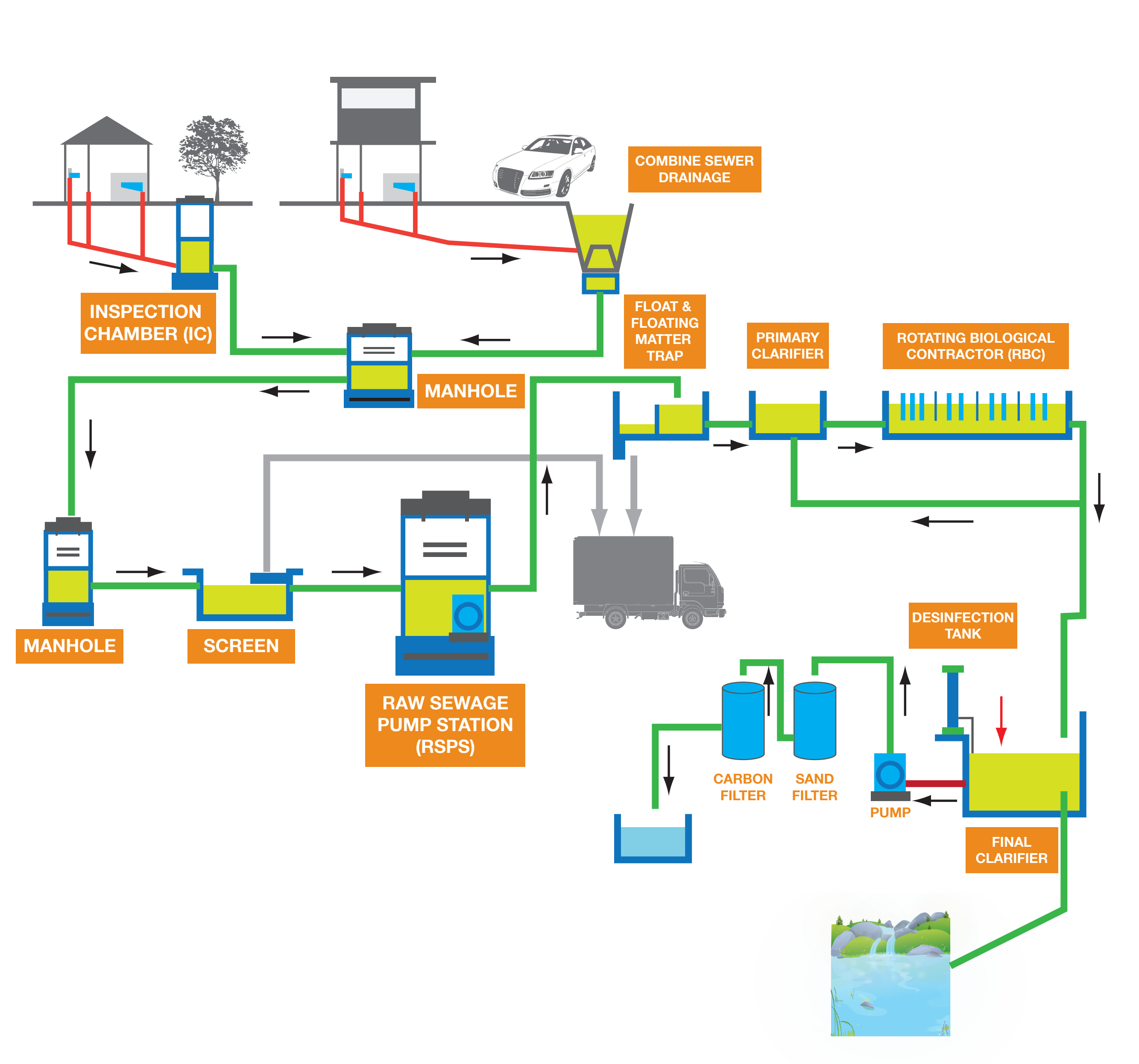
Initially managed by a technical implementation unit of the Banjarmasin city government water utility, the sewerage system is now managed by PD PAL, a new local government wastewater management enterprise. Wastewater entering the sewerage system undergoes primary treatment, and passes through a rotating biological contactor (RBC), settling tank, and sand filter before being discharged into water bodies (Figure 58). Study findings indicate that reduction of COD, BOD, suspended solids, and ammonia is more than 90% efficient (see Table 41).

TABLE 41: REDUCTION OF WASTEWATER PARAMETERS, AND EFFICIENCY OF THE BANJARMASIN WASTEWATER TREATMENT PLANT[1]

No	Parameter	Reduction figures		Treatment efficiency (%)
		Influent	Effluent	
1	COD (Chemical Oxygen Demand	(500 – 700) mg/l	(50 – 70) mg/l	> 90
2	BOD (Biochemical Oxygen Demand)	(250 – 300) mg/l	(20 – 25) mg/l	> 90
3	SS (Suspended Solid)	(250 – 300) mg/l	< 25 mg/l	> 90
4	N¬3 – N (Ammonia)	(15 – 20) mg/l	< 1	> 90

[1] Source : City Sanitation Strategy - Banjarmasin , Pokja Sanitasi Kota Banjarmasin, March 2008

FIGURE 58: SCHEMATIC DIAGRAM OF BANJARMASIN SEWERAGE SYSTEM[1]



[1] Source : City Sanitation Strategy - Banjarmasin, *Pokja Sanitasi Kota Banjarmasin*, March 2008

However, as of December 2010, only 4,277 households were connected to the system, or about 18% of its potential of 24,000 households. PD PAL cites at least three reasons for this low coverage. First, people's lack of awareness of the need for a wastewater treatment system in the city. Second, the limited coverage of the main pipelines due to budget constraints, which means that coverage expansion prioritizes locations that are easiest to reach. Third, difficulties obtaining permission from communities to install underground in their areas.

In fact, PD PAL has been allocating less than 1% of the total sewerage system development budget to sanitation awareness campaigns, hence the reluctance of many households to connect to the sewage system. The focus group discussions conducted in Banjarmasin as part of the ESI study corroborated this: respondents said they had received very little information about the health benefits of good sanitation and how these are linked to the sewerage system. Furthermore, respondents already connected to the sewage system had a number of complaints, including having to deal with backwash of wastewater from the system during floods.

7.1.4 COMMUNITY-BASED SEWER SYSTEM (CBSS) – MALANG CITY

The Community-Based Sewer System (CBSS) in Malang City was pioneered by local volunteer Agus Gunarto in 1985.

This initiative was triggered by a diarrhea outbreak in Malang that resulted in many fatalities among children from poor families. Open defecation was the main cause of this epidemic, as many households used rivers as their toilet as well as for washing, bathing and cooking.

The main sanitation intervention is a communal sewerage system connected to private toilets. The first facility was constructed in Tlogomas, on the outskirts of Malang city. The system was then replicated in five nearby areas with majority poor populations (Watugong, Mergosono, Bareng, Samaan, and Gadang), with support from NGOs, multilateral donors and the city government. Most of the communities in these areas are poor.

Financing for the initial program in Tlogomas was raised in full by the community, without additional support from government or donors. For over a year, funds were collected from the community to pay for the initial construction work, which took about two years to complete. Although the first six households were connected to the CBSS in 1987, it took about ten years for all members of the community to get connected to the system.

The CBSS consists of a network of collecting pipes, laid beneath footpaths or below existing drains, which connect the sewage system to a network of houses. The treatment plant is located at the lowest point in the system, so the flow depends entirely on gravity. Wastewater is filtered through an anaerobic suspended biomass tank, before being released into the local watercourse.

The initial CBSS development raised community awareness and encouraged the villagers not to defecate in the open. After collecting funds and planning technical aspects of the system, the community set about constructing the system using local laborers and masons. The work began with the construction of the treatment plant and progressively worked up the main collection network and connecting to households. Some houses did not have enough spaces for private toilets, thus communal or shared toilet facilities were the logical solution in such densely populated area.

The proportion of funds raised by the community ranged from 10% in Samaan to 100% in Tlogomas. The funds were managed by a special committee set up by the community. Users pay a monthly service charge for the operation and maintenance of the facility. One or two people, usually locals, are hired to maintain the treatment plant. Funding of major repairs and long term maintenance is handled on an ad-hoc basis and requires special collection of funds.

There are approximately 1,105 households in the five villages covered by the CBSS. A study conducted by WSP in 2000 found that 404 households were connected to the CBSS in Malang. Malang municipality was included in ISSDP Phase 2 in 2009 and is a target location for the Urban Sanitation Development Program (USDP) 2010-2014.

7.1.5 COMMUNITY-LED TOTAL SANITATION (CLTS) IN PAYAKUMBUH

In Payakumbuh City, sanitation is a mainstream development priority. In less than three years, sanitation programs such as ISSDP, P2KP and Pamsimas have taken off and had a positive impact on people's health. These include three programs – Clean and Healthy Lifestyle Campaign, Sanitation for Schools, and Community-Led Total Sanitation – that aim to improve people's sanitation awareness.[31]

Launched in 2007, the CLTS program in Payakumbuh aims to trigger the community to build household latrines. Sanitation options range from simple pit latrine to septic tank, but toilet construction is not subsidized. The program covers 16 villages in West Payakumbuh, North Payakumbuh, East Payakumbuh and Latina subdistricts.

Led by the city health office, all local stakeholders are engaged in all aspects of the program, from planning through maintenance of the facilities. The triggering process begins with briefing the community about the program. This is followed by a series of sanitation awareness raising activities, which include participatory mapping of the location, calculation of the volume of feces produced by the community in a year and awareness of the consequences of not disposing of this properly, transect walks to open defecation areas to interview villagers defecate in the open, and explanation of food and drink become contaminated with fecal matter. At focus group discussions, the villagers discuss why they defecate in the open, and are encouraged to feel ashamed of their behavior. They also discuss construction of affordable sanitary toilets and the importance of having a commitment to building them. In the final stage of the triggering process, the community makes a written statement on a large sheet of paper of its collective commitment to stop open defecation and build sanitary toilets, which is displayed in a prominent position as a reminder to everyone. Arrangements are then made for the CLTS team to come back to the village at a later date to check on its progress.[32]

As Table 42 below shows, ownership of private toilets has increased in all CLTS target locations since the inception of the program.

Local government has reported a decrease in the prevalence of diseases, including diarrhea, skin infections, intestinal infection, and pneumonia, since inception of the CLTS program in Payakumbuh, as indicated by the reduced cost of the municipal health insurance scheme over a two-year period.

7.2 COMPARISON OF PROGRAM APPROACHES AND PERFORMANCE

The ESI household survey revealed that, in general, households have the freedom to choose whether to participate in the sanitation initiatives. Figure 59 shows the extent of household choice and participation in decision making. The sanitation programs encourage communities to voluntarily own better sanitation facilities. However, in Lamongan the survey returned a different result: only one respondent received a latrine from a sanitation program, while the rest of the surveyed households said they had paid for construction of the toilet themselves.

TABLE 42: OWNERSHIP OF PRIVATE TOILETS BEFORE AND AFTER INCEPTION OF THE CLTS PROGRAM IN PAYAKUMBUH[1]

No	Subdistrict	No. of Households with Private Toilets (pit latrine or septic tank)		
		Before Triggering (2006)	After Triggering	
			December 2009	December 2010
1	East Payakumbuh	1,187	3,738	4,349
2	South Payakumbuh	814	1,150	1,513
3	Latina	373	703	870
4	West Payakumbuh	454	5,297	6,045
5	North Payakumbuh	1,577	3,909	4,556
	Total	**4,405**	**14,797**	**17,378**

[1] Source : Payakumbuh Municipal Health Office, 2011

[31] www.sanitasi.or.id
[32] Source: Payakumbuh CLTS Implementation Report, 2008

FIGURE 59: PROPORTION OF HOUSEHOLDS WHO SAID THEIR PARTICIPATION IN THE PROGRAM WAS VOLUNTARY

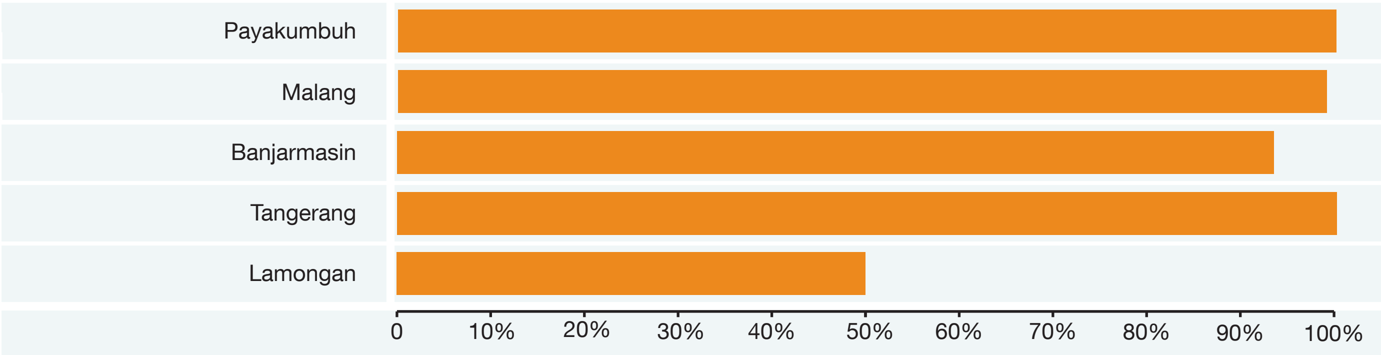
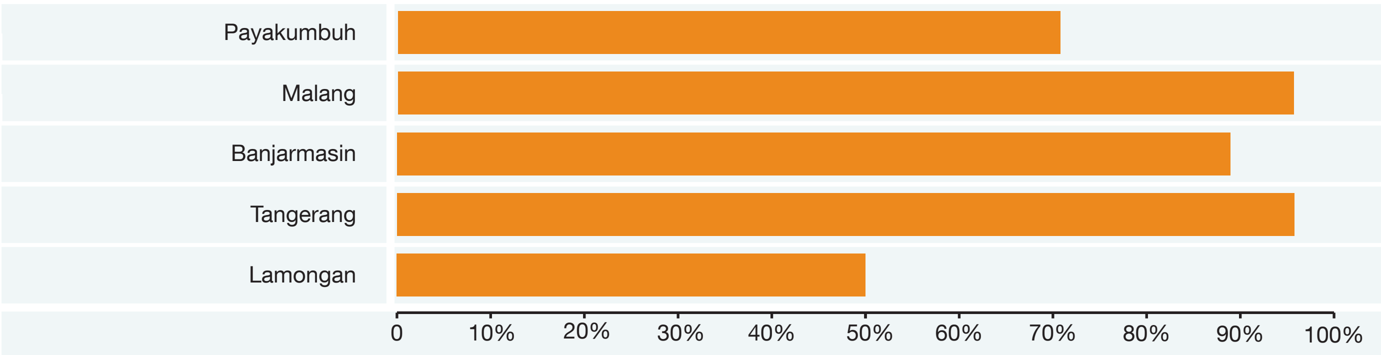


FIGURE 60: PROPORTION OF HOUSEHOLDS OFFERED MORE THAN ONE SANITATION OPTION



More than 70% of the respondents said that they were given more than one sanitation option, allowing them to choose an option that was affordable to them and met their preferences (Figure 60). Offering options is important because it shows to the community that proper sanitation need not be expensive. While communities in Tangerang and Malang were given a full range of options, in Payakumbuh, the options were fewer. The most likely reason for this is that the CLTS program focuses not on subsidizing latrine construction, but on triggering a change in behavior away from open defecation. The CLTS facilitators do not lecture or advise on sanitation habits, and do not provide external solutions, such as toilet designs. Rather, the aim is to trigger the community to make the decision to build their own toilets using simple technology, such as pit latrines.

The average financial contribution of households varied by site and sanitation option selected. On-site systems such as shared toilets, wet pit toilets, and septic tank toilets tend to be funded by households (Figure 61 and Figure 62). The septic tank option is considerably more expensive than the shared option or private pit latrines.

Respondents in Tangerang, Malang and Payakumbuh reported having sufficient water for flushing, no pit flooding and no pit overflow. In Lamongan, about 10% of respondents said that they often or sometimes had pit flooding, and 5% had experienced pit overflow. In Banjarmasin, 1.3% of respondent often had pit flooding and pit overflow (Figure 63).

Table 43 presents selected indicators of the overall effectiveness of the five sanitation interventions, that serve as inputs to the cost-benefit analysis (see Chapter 8).

Key conclusions from these indicators of program effectiveness are:

- The proportion of children using toilets is generally still low.
- Handwashing with soap is not regularly practiced by respondents in Banjarmasin and Tangerang.
- Although Banjarmasin has the lowest figure for open defecation, this is because use of hanging latrines was not categorized as open defecation.

Figure 64 compares selected key indicators of program effectiveness across the study locations.

FIGURE 61: HOUSEHOLD CONTRIBUTION TO TOTAL COST OF TOILET CONSTRUCTION IN RURAL SITES

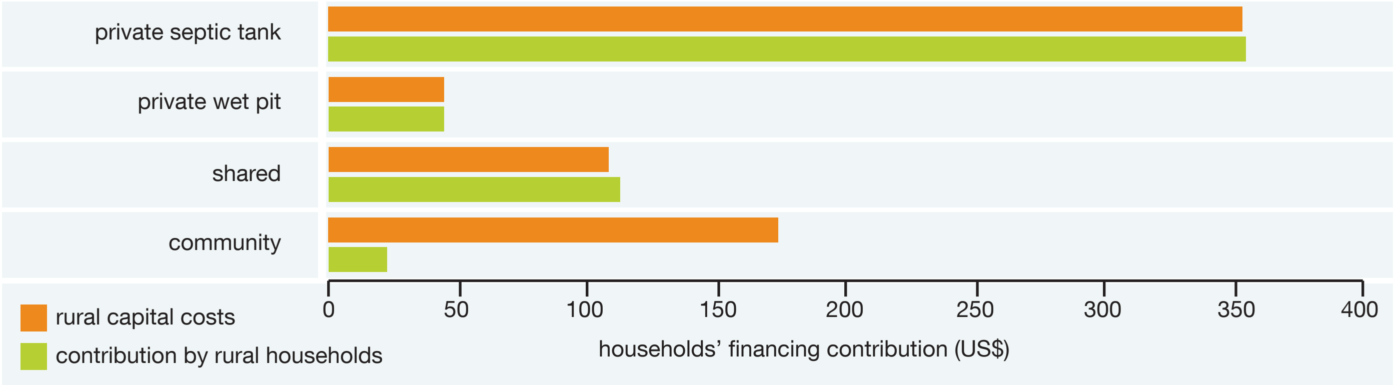


FIGURE 62: HOUSEHOLD CONTRIBUTION TO TOTAL COST OF TOILET CONSTRUCTION IN URBAN SITES

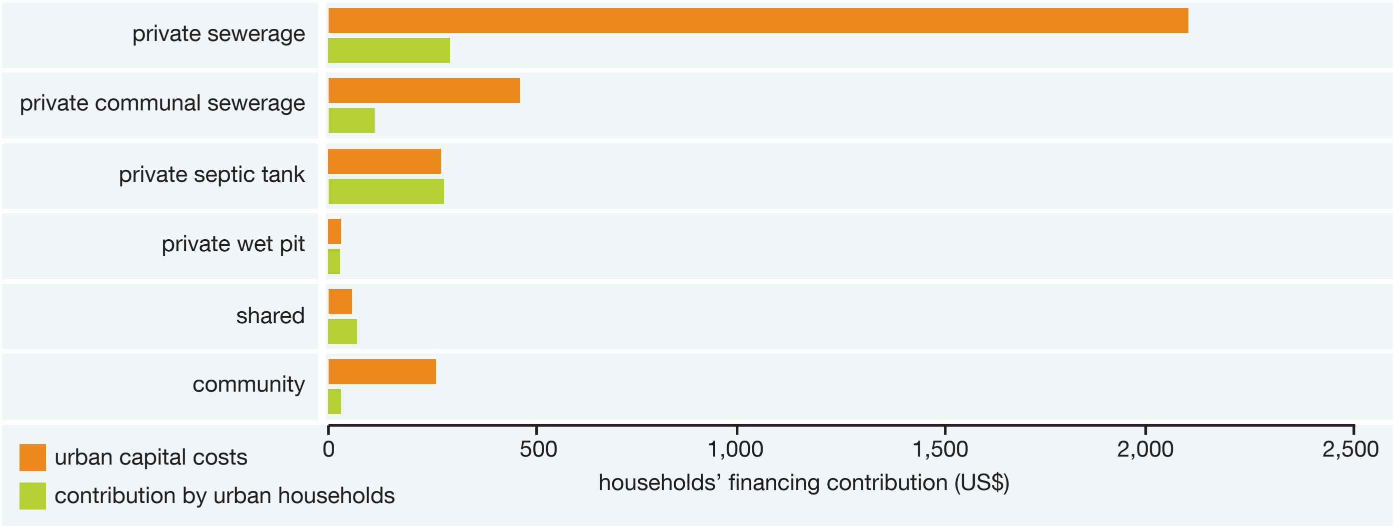


FIGURE 63: FREQUENCY OF SUPPLY OF WATER FOR FLUSHING, AND OF PIT FLOODING AND PIT OVERFLOW

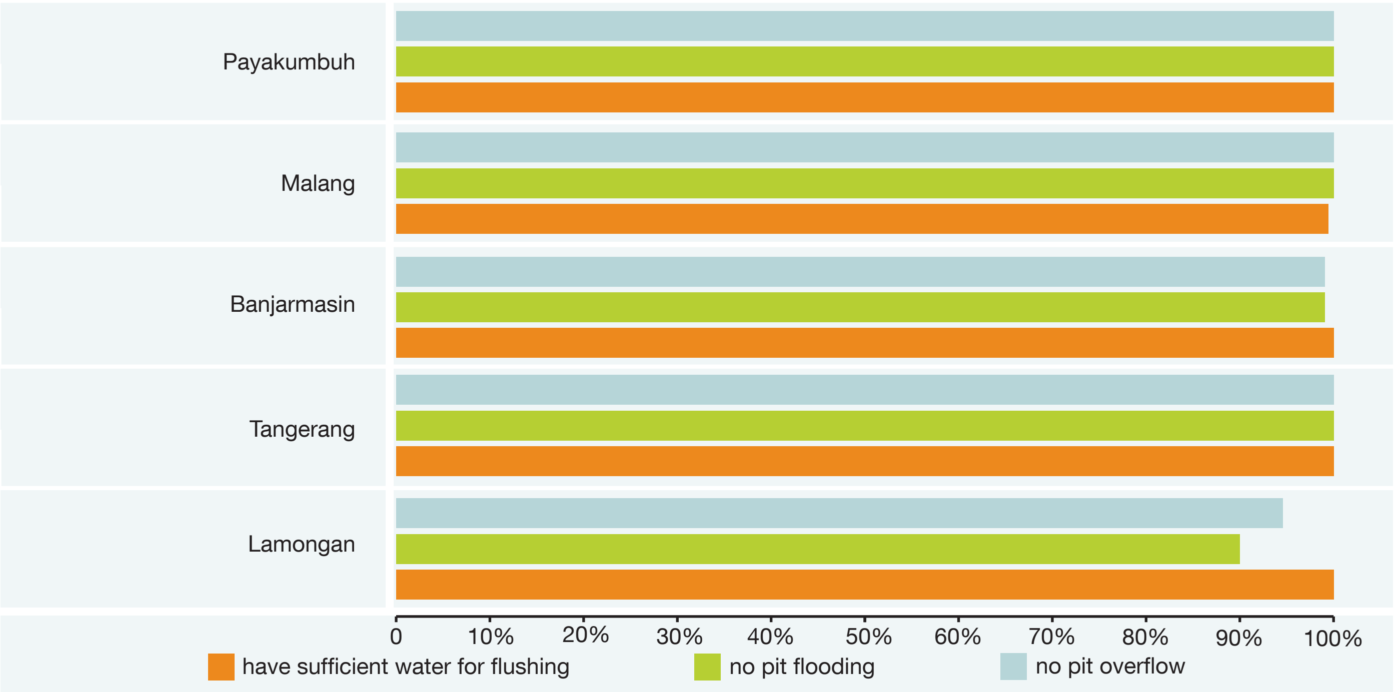
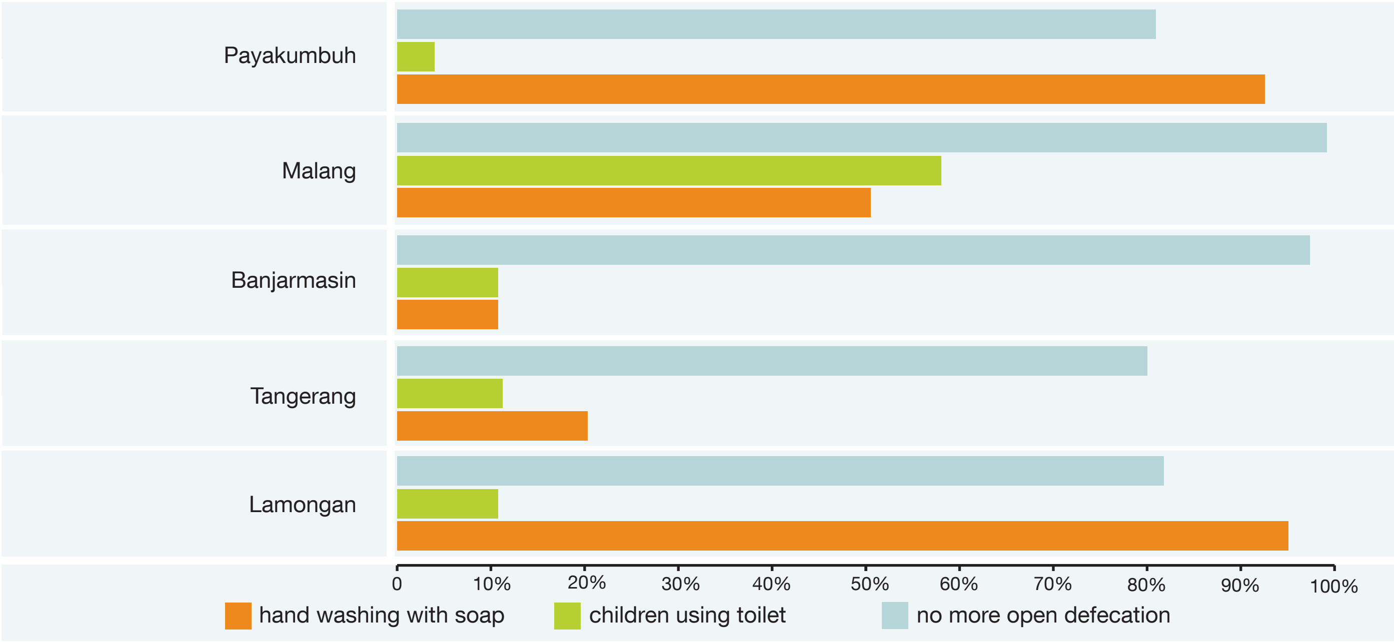


TABLE 43: SELECTED INDICATORS OF OVERALL PROGRAM EFFECTIVENESS

Variable	Rural sites		Urban sites		
	Lamongan	Tangerang	Banjarmasin	Malang	Payakumbuh
Years of program	7	1	Still ongoing	13	Still ongoing
% household members using their improved toilet regularly	81%	82%	70%	84%	84%
HOUSEHOLD CONTRIBUTION TO COST (FINANCIAL & NON-FINANCIAL)					
Community	100%	30%	11%	na	na
Shared	100%	100%	100%	100%	82%
Private dry pit	100%	100%	100%	100%	0%
Private wet pit	100%	100%	100%	100%	71%
Private septic tank	100%	100%	100%	100%	100%
Private sewerage	na	na	9%	na	na
Community sewerage	na	na	na	37%	na
SANITATION PRACTICES AMONG HOUSEHOLDS:					
Using bush or outdoor sites for defecation (sometimes or often)	16%	20%	2%	1%	17%
Using bush or outdoor sites for urination (sometimes or often)	23%	29%	2%	4%	26%
Children using latrine	12%	13%	12%	57%	5%
Children defecating in yard	39%	55%	29%	31%	36%
Washed hands with soap yesterday	96%	21%	12%	50%	94%
Washing hands after defecation (sometimes or often)	87%	4%	7%	32%	84%
WATER SOURCES AND SOAP FOR WASHING HANDS					
Using unprotected wells	21%	4%	31%	20%	16%
Pit latrine/septic tank within 10m of wells	63%	71%	52%	67%	81%
Signs of feces or waste around toilets	8%	9%	19%	5%	9%
Signs of insects in toilets	6%	7%	27%	4%	15%
Running water in or near toilets	68%	74%	38%	36%	37%
Soap available for washing hands	25%	35%	14%	19%	25%

FIGURE 64: COMPARISON OF SELECTED KEY INDICATORS OF PROGRAM EFFECTIVENESS



7.3 BROADER ANALYSIS OF THE PROGRAM APPROACHES

7.3.1 WSLIC 2 (WATER AND SANITATION FOR LOW INCOME COMMUNITIES 2)

Program Information. WSLIC 2 is a community-driven development project in Indonesia under the Ministry of Health, and implemented by Ministry of Health, Ministry of Home Affairs, Ministry of Public Works, and Ministry of National Education. The project objective is to improve the level of health, productivity, and quality of life of low-income communities through behavior change, environment-based health services, clean water supply and safe sanitation. Regarded as an appropriate, accessible, sustainable, and effective participatory program, WSLIC 2 attempted to develop an integrated water supply, sanitation and hygiene improvement action plan in each sub-project community. The initial revolving fund system was later superseded by the CLTS approach.

Program Location. The program ran from 2000 to 2009, and covered 2,461 villages in 36 districts of eight provinces, across Indonesia (South Sumatra, West Sumatra, West Nusa Tenggara, East Java, West Java, Bangka Belitung, South Sulawesi, and West Sulawesi).

Program Intervention. The sanitation component of WSLIC 2 program was SANIMAS. Although the initial revolving fund scheme for construction of household toilets worked well in some areas and communities, their overall impact on low-income beneficiaries and sanitation coverage was limited. People's willingness to repay the loan was very low and led to discontinuity of the sanitation loans. In practice, the loans were often treated as large hardware subsidies, with little effort from the beneficiaries to pay them back.[33]

According to the latest WSLIC 2 progress report, the revolving fund scheme provided 23,560 household loans in 860 communities. This represented 27 loans for household toilets in each community, which is equivalent to an 11% increase in sanitation coverage within the project communities covered to date.[34]

Funding. According to a LP3ES report[35], the sources of fund for WSLIC 2 were: IDA loan (72.5%), AusAID

[33] Robinson, Andy, "Indonesia National Program for Community Water Supply and Sanitation Services, Improving Hygiene & Sanitation Behavior and Services", World Bank, December 2005)

[34] *Kajian Cepat terhadap Program Pengentasan Kemiskinan Pemerintah RI*, LP3ES, Oct 2007

[35] *Kajian Cepat terhadap Program Pengentasan Kemiskinan Pemerintah RI* (Rapid Assessments of the GoI Poverty Alleviation Program), LP3ES, Oct 2007

grant (6.1%), national and regional budgets (11.4%), and community contribution (9.9%). Each program location received a budget allocation of between IDR195 million (US$18,773) and IDR280 million (US$26,957). The community is responsible for operation and maintenance of the facilities, for which users pay a monthly fee.

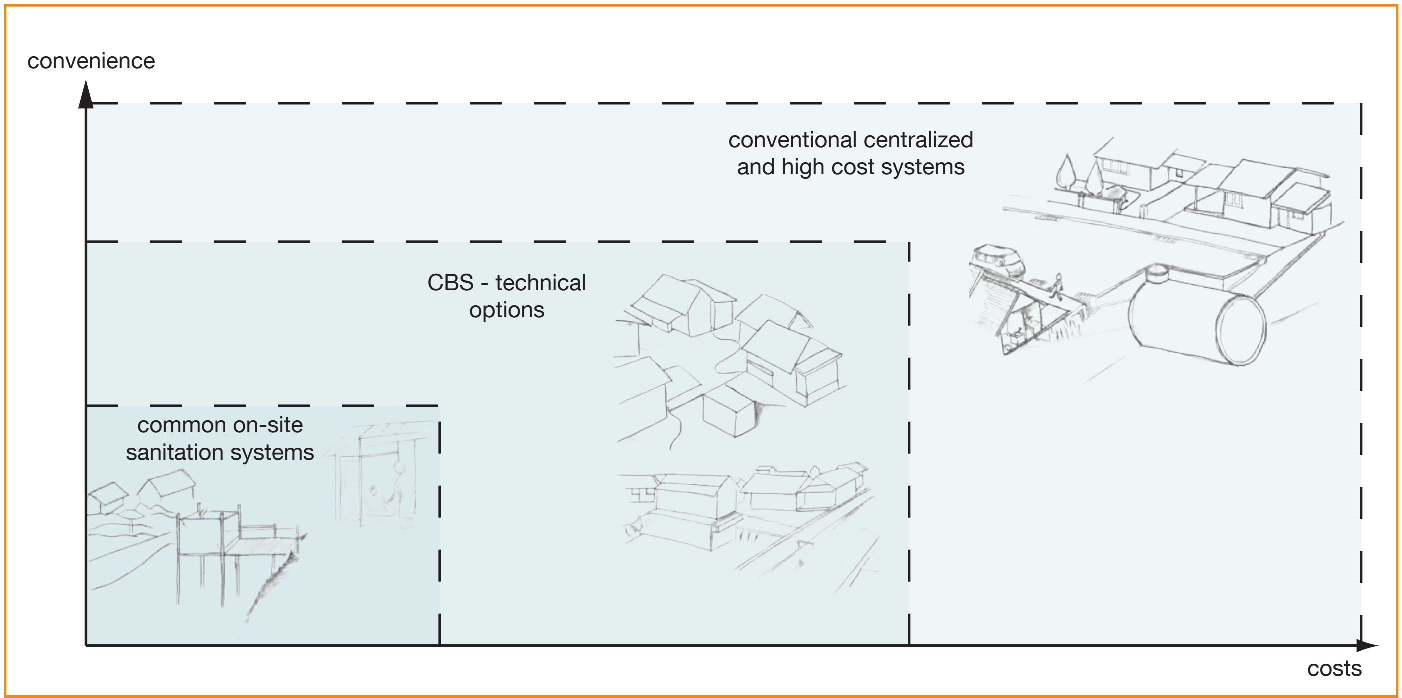
Monitoring and evaluation. A rapid evaluation by LP3ES (Institute for Social and Economic Research, Education, and Information) in October 2007 in six villages found that more than five years since the inception of WSLIC 2, the water supply and sanitation facilities constructed were working properly and still being used by the community. The introduction of the CLTS approach in 2004-2005 had raised people's awareness of health and hygiene behavior, and some had built their own private toilets now that a reliable water supply was available. Diarrhea incidence in project locations had also decreased as people stopped defecating in the open and started handwashing with soap regularly before eating and after defecating.

7.3.2 SANIMAS

Program Information. SANIMAS is a community-based sanitation (CBS) option designed for poor urban communities. It was implemented with the involvement of community and other stakeholders such as local NGOs and government through a process of empowerment. The approach was an alternative option to fill the significant 'gap' between inappropriate sanitation such as open defecation and absorption pit, and the expensive conventional centralized sewerage collection and treatment system. Besides providing facilities and infrastructure, the program also promoted health and hygiene behavior. In SANIMAS, communities found their own informed demand and were given education about sanitation, hygiene, and diseases. The communities were encouraged to organize the operation and maintenance of sanitation infrastructure, and sometimes according to requirements and abilities, sanitation infrastructures were planned, designed and constructed for and together with the community. The approaches were highly demand responsive and relied on active participation as well as contributions from target communities and municipalities.[36] Figure 65 shows how SANIMAS fills the gap in sanitation options.

Local governments act as facilitators, allocate local budget, and carry out monitoring and evaluation. The five principles of SANIMAS are: demand-responsive approach/DRA,

FIGURE 65: SANIMAS FILLS THE GAP[1]



[1] Source: BORDA

[36] Directorate of Diseases Control and Enviromental Health, Department of Public Works, WSES Workshop, November 2009

participation (community involvement), technical options (of facility/infrastructure), self-selection process, and capacity-building.

SANIMAS was a component of the WASPOLA project, a development cooperation between the Indonesian Government and the Australian Government coordinated by WSP. BORDA, a German NGO, working together with Indonesian NGOs, was appointed to implement the SANIMAS project to assist the communities, local governments, and local facilitators in designing, planning, and implementing community-based sanitation (CBS) activities. To ensure the quality of project implementation, BORDA had assistance from several national NGOs.

Program Location. In 2003, SANIMAS was piloted in seven districts/municipalities (Blitar, Pasuruan, Kediri, Mojokerto, Sidoarjo, Pamekasan, and Denpasar). In 2006, SANIMAS was replicated in 345 locations in 157 municipalities in 27 provinces across Indonesia. As of 2010, SANIMAS 1, SANIMAS 2, and SANIMAS 3 had been implemented.

Program Intervention. A range of technology options is available under SANIMAS. MCK Plus is a public toilet block, connected to a decentralized wastewater treatment system, plus a biodigester (see chapter 7.1.2) This sanitation option is suitable for densely populated areas with a high proportion of rented accommodation and a shortage of land on which to build private toilets. The second and third options are shared septic tank connected to up to 20 households and shallow sewer connected to between 50 and 100 households. Both these options are suited to densely populated areas where the beneficiaries have to have enough land to build a private toilet on their own plot.

Monitoring and evaluation. In 2006, WASPOLA conducted outcome monitoring in seven SANIMAS pilot project locations and two control locations in Bali and East Java. The study revealed that in general the facilities were functioning well, that users were satisfied, and that proper and detailed financial records were being kept. The study also showed that more than 75% of people living near SANIMAS facilities had used these toilets for defecating. However, there were some reports of facilities no longer being used after falling into disrepair because user fees had not been collected regularly to pay for their maintenance. Community participation and women's participation in particular were found to be lacking, despite the aim of the program to give users a full voice in decision making.

A WSP study of Community-Based Sewer System (CBBS), the SANIMAS program pioneered in Tlogomas, Malang, found that the most sustainable operating and maintenance systems were in locations, such as Tlogomas and Mergosono, where external contribution was minimal. Despite more than half the population living below the poverty line, people in Mergosono were willing to pay a significant part of the investment cost of the CBSS. Whether the system is totally or partially financed by the community, lower income families contribute a higher percentage of their monthly income than higher income groups. This is particularly a clear example of how low-income households are willing to pay for something they consider to be necessary and appropriate (see Table 44 and Table 45).

Although all five systems have yet to meet effluent standards, individually each has achieved a significant reduction in environmental pollution. The pollution load originating from the community had been halved, although the systems do not meet national technical standards.

TABLE 44: COMMUNITY CONTRIBUTION TO THE COST OF CBSS DEVELOPMENT

Location	Community contribution	Government subsidy	Other source (NGO, private sector)
Tlogomas	100%	-	-
Watugong	51.7%	5.8%	42.3%
Mergosono	86.5%	13.5%	-
Bareng	47.6%	52.4%	-
Samaan	9.8%	90.2%	-

TABLE 45: COMPOSITION OF THE CBSS SUBSCRIBERS BY MONTHLY HOUSEHOLD DISPOSABLE INCOME[1]

Location	Household disposable income (US$)				
	< 30	30 - 45	45 - 60	60 - 70	> 70
Tlogomas	0%	10%	20%	20%	50%
Watugong	0%	36%	27%	18%	18%
Mergosono	29%	29%	15%	21%	7%
Bareng	25%	25%	0%	0%	50%
Samaan	13%	0%	50%	38%	0%
Average	13%	21%	23%	21%	21%

[1] Source: Community-Based Sewer Systems in Malang, Indonesia, Sean Foley, Anton Soedjarwo, Richard Pollard, WSP, 2000.

Building sustainable CBSS will require continuous financial, technical and management support from the government and donors, as well as increased community participation and awareness of hygiene behavior.

7.3.3 SEWERAGE OR CENTRALIZED SYSTEM

Program Information. Regarded as a high cost technology option compared with on-site sanitation systems, only a few cities in Indonesia (Bandung, Banjarmasin, Balikpapan, Cirebon, Jakarta, Medan, Solo, Tangerang, and Yogyakarta) have centralized sewage systems. In recent years, however the government has revised its policy framework for sustainable urban sanitation, in response to growing urbanization and increased pollution of water sources and wastewater in larger cities. The new target is that by 2014, 5% of people living in 16 districts or cities will be served by city-scale sewerage systems.[37]

Funding. Initial construction was funded by grants or loans to local governments from donors such as the World Bank and ADB. Operators have made additional investment in the systems, for installation of new connections, purchase of equipment and other capital outlays. However, financing the cost of expanding the systems falls to local and national governments as borrowing from financial institutions is almost impossible since most of the wastewater management systems (except those in Bandung and Jakarta) are still far from full cost recovery.

Monitoring and evaluation. A 2006 study by the Environmental Services Program (ESP)[38] assessed four main aspects (institutional, management, financial and technical) of nine centralized wastewater systems. Of the nine, five (in Solo, Medan, Balikpapan, Bandung, and Cirebon) are managed by the local government water supply utility, and two (in Jakarta, and recently in Banjarmasin) by a special local government-owned enterprise. The remaining two (in Tangerang and Yogyakarta) are under direct local government management.

The study found that only two of the nine wastewater management systems – in Bandung and Jakarta – have managed to achieve full cost recovery, but even they could improve their financial performance.

Wastewater in eight of the nine sewage systems is treated by aeration pond, aerated lagoon and activated sludge process, or a combination of these. The exception is the wastewater treatment plant in Balikpapan, which uses a rotating biological contactor. Evaluation of system performance found that the average COD and BOD reduction is approximately 50%. The highest COD reductions were recorded in Yogyakarta (89%) and Prapat (85%), and the highest BOD reductions in Banjarmasin (89%), Prapat (85%) and Yogyakarta (88%). The lowest COD and BOD reductions were found in two wastewater treatment plants in Cirebon.

[37] Directorate of Program Development presentation on Ministry of Public Works WSES policy, strategy, and programs, National conference on community based WSES , November 2009

[38] The ESP is a five-year program which was developed by USAID/Indonesia in response to the Presidential Initiative of 2002 to improve sustainable management of water resources. This initiative supports activities in the following three key areas: (i) Access to clean water and sanitation services (ii) Improved watershed management (iii) Increasing the productivity of water

7.3.4 COMMUNITY-LED TOTAL SANITATION (CLTS)

Program Description. Community-Led Total Sanitation (CLTS) was launched in Indonesia in May 2005 through a series of pilot projects funded by the Water and Sanitation Policy Formulation and Action Planning (WASPOLA) project implemented by the Ministry of Health.

Recognizing that merely providing toilets does not guarantee their use, nor result in improved sanitation and hygiene, CLTS focuses on the behavioral change needed to ensure real and sustainable improvements – investing in community mobilization instead of hardware, and shifting the focus from toilet construction for individual household to the development of open defecation free villages. By raising awareness that as long as people continue to defecate in open area (even a minority) everyone is at risk of disease, CLTS triggers the community's desire for change, propels them into action and encourages innovation, mutual support, and appropriate local solutions, thus leading to greater ownership and sustainability.

Following the success of the pilot, CLTS replaced WSLIC 2 (revolving fund scheme) in 2005. The approach subsequently proved successful in locations across Indonesia, and in 2007, the Government of Indonesia in cooperation with the World Bank adopted the CLTS approach for the PAMSIMAS project, implemented in 115 districts across Indonesia. The Asian Development Bank (ADB) has also adopted CLTS in the sanitation program Clean Water Sanitation and Health (CWSH) in 20 districts in Indonesia.[39]

Implementation and scaling up of CLTS in Indonesia has involved governmental and non-governmental institutions at various levels. The Ministry of Health, especially the Directorate General of Disease Control and Environmental Health, is a key institution in CLTS implementation. Other central government bodies and ministries involved in CLTS include the National Development Planning Agency, Ministry of Home Affairs, and Ministry of General Affairs. Ad-hoc institutions at national and local level, and the national WSES working group are also involved.

Location. The CLTS pilot project ran in six districts across Indonesia: Sumbawa (West Nusa Tenggara), Lumajang (East Java), Muara Enim (South Sumatera), Bogor (West Java), Sambas (West Kalimantan), and Muaro Jambi (Jambi). The approach has since been replicated in various locations by both government and non-government agencies.

Between 2008 and 2012, the government plans to trigger 10,000 villages using this approach. As of April 2009, 923 villages had received CLTS triggering and 715 villages had been declared open defecation free. About 325,600 people have gain access to improved sanitation facilities in 21 districts.[40]

Monitoring and evaluation. As part of the IDS research project, 'Going to Scale? The Potential of Community-Led Total Sanitation, between 2006 and 2008, a study was made of nine villages in three districts that applied the CLTS approach. The study found that the success of the CLTS approach was influenced by both internal and external factors. Key internal factors were: sanitation being seen as a village priority, a sense of individual responsibility to contribute to public good, basic awareness of the benefits of using latrines and handwashing with soap, being ashamed about defecating in the open, and women being able to influence their spouses to build a latrine. External factors included strong support from and continuous triggering by community leaders, ongoing external support, availability of water supply and resources for building latrines, including land, cash or in-kind materials, collective community commitment to becoming open defecation free, and government involvement.

Table 45 summarizes the four basic sanitation interventions and approaches discussed in this section.

[39] Entry of the CLTS Approach in Indonesia, Edy/Udin, Percik Magazine Dec. 2008
[40] Learning At Scale TSSM Project, Indonesia Country Update June 2009, Field Note, WSP

TABLE 46: COMMUNITY CONTRIBUTION TO THE COST OF CBSS DEVELOPMENT

No	Project/ intervention	Site Location, urban/ rural	Provinces covered/ population	HH receiving intervention	Implementer	Funder	Funding Mechanism	Annual Value	Period of Project (year to year)	Change in coverage over project period	Data sources, reports used
1	WSLIC 2: 1. SANIMAS - Private toilets - Public toilet 2. Institutional Sanitation (school toilets, village office toilets, community health center toilets, etc.) 3. Simplified sewerage (SPAL)	Rural	South Sumatera, West Sumatera, West Nusa Tenggara, East Java, West Java, Bangka Belitung, South Sulawesi, West Sulawesi	2,409 villages (2009) Target : 2000 villages / 37 districts Achievement : 2,298 villages / 37 districts	– Ministry of Health – Ministry of Home Affairs – Ministry of Public Works – Ministry of National Education	– WB (loan) – AusAID (grant) – National and local government – community contribution	– IDA credit : 72.5% – Grant (AusAID) 6.1% – National and local government 11.4% – community 9.9%	US$ 106,700,000.- (total budget)	2000 - 2009		– Rapid Evaluation Study of poverty alleviation program WSLIC 2 and PAMSIMAS, LP3ES, October 2007 – Study of WSLIC 2 by Indonesia University 2001 – 2006 – Indonesia National Program for Community Water Supply and Sanitation Services, Improving Hygiene and Sanitation Behavior Services, Andy Robinson, Dec 2005 – www.wslic2.go.id – MoH presentation at WSES national workshop, Nov 2009
2	SANIMAS: – MCK plus latrines – Shared septic tank – Simplified sewerage / shallow sewer	Urban/ Rural	South Sumatera, West Sumatera, West Nusa Tenggara East Java, West Java, Bangka Belitung, South Sulawesi, West Sulawesi	345 locations (2008) 21,000 low income rural communities	Ministry of Public Works, local government	National government, local government APBD, BORDA, community contribution	– National government : material IDR 100 million – Local government : construction IDR 200 million, community empowerment IDR 50 million – BORDA : community empowerment IDR 50 million – Community (in-kind & in-cash) : 2-4%		2001 - 2004 (pilot project - WB and BORDA Indonesia) 2005 to date (Replication of program on national scale with different funding schemes)		– Sanimas Outcome Monitoring Study Final Report, Waspola, April 2006 – SANIMAS presentation at the 2nd Philippine National Summit, July 2009 – Pro-poor Water and Wastewater Management in Small Towns – Case Study, UN Economic and Social Commission for Asia and the Pacific, year ….. – www.pu.go.id – www.indonesia.go.id – www.kimpraswil.go.id
	– CBSS (Community Based Sewer System) / SANIMAS Malang Construction of communal septic tank	Malang City, subdistrict Tlogomas, Watugong, Mergosono, Bareng, Samaan					Community contribution ranged from 100% in Tlogomas to 10% in Samaan	IDR 1,991,506,462 (budget year 1999)			Community-Based Sewer Systems in Malang, Indonesia, Sean Foley, Anton Soedjarwo, Richard Pollard, WSP (2000)
3	Sewerage system: – construction of sewerage system and WWTP	Urban	West Java, South Kalimantan, East Kalimantan, Jakarta, North Sumatera, Central Java, Banten, Yogyakarta	- 2.33% - 1.65% - coverage of city scale centralized system	PD PAL, local water supply utilities, local health offices	WB (IBRD loan), national government and local government		Start of program (construction) in the first half of the twentieth century (built by the Dutch). End of program is incalculable since program coverage is still way below the expected level			– Comparative Study of Centralized Wastewater Treatment Plants in Indonesia, ESP USAID, September 2006 – Banjarmasin Sanitation Whitebook, Program Development Technical Team, August 2007
4	CLTS: Triggering to stop open defecation	Urban/ rural	West Sumatera, South Sumatera, Jambi, West Java, Banten, East Java, West Kalimantan, West Nusa Tenggara,	138,733 households (under WSLIC 2) 10,000 villages (2008 – 2012) - Per April 2009: 932 villages have received CLTS triggering and 715 villages declared ODF	– Ministry of Health (Directorate General of Disease Control and Environmental Health) – National Planning Agency – Ministry of Home Affairs – Ministry of General Affairs – National WSES Working Group	World Bank Government	No subsidy for the basic sanitation infrastructure. Funding is needed for training and visits (for triggering, mentoring, monitoring, etc.)		2005 -		– Community Based Total Sanitation Strategy, Ministry of Health (2008) – CLTS Payakumbuh reports – Payakumbuh Sanitation Whitebook, Payukumbuh Sanitation Working Group and Municipal Government, 2007 – Institutional Dimensions of Scaling Up of CLTS in Indonesia, Edy Priyono, 2008 – CLTS, Learning from Community in Indonesia, Owin Jamasy & Nina Shatifan, May 2008 – Community Led Total Sanitation (CLTS) in Indonesia, Bowo Leksono, Percik Magazine Dec. 2008 – Learning At Scale TSSM Project, Indonesia Country Update June 2009, Field Note, WSP

7.4 ANALYSIS OF PROGRAM APPROACHES

7.4.1 PERFORMANCE OF PROGRAM APPROACHES

Overall, the sanitation programs that were analyzed in this study have made an important contribution to sanitation improvement in Indonesia. Nevertheless, the program implementation has several shortcomings. WSLIC 2 succeeded in improving water supply access, but the revolving sanitation fund, which was the mainstay of WSLIC 2 sanitation program, did not fully succeed, and was unable to reach the poorest communities. Other issues of the WSLIC 2 program were: lack of awareness of low cost sanitation options, social gap between community leaders and poor households, lack of clear hygiene improvement strategy and community facilitators' lack of knowledge and experience of health and hygiene behavior. Therefore, only a part of these participatory processes were translated into concrete actions.

The SANIMAS program has built public toilets, shared septic tanks, and simplified sewerage systems that are still being used and work well. However, a few shortcomings were noted, such as the lack of community access to information and training, and participation of users in the SANIMAS development process. Under-specification of materials was also an issue. The CBSS program in Malang using the SANIMAS approach is a good example of a community initiative identifying and implementing sanitation solutions. CBSS was initiated, funded, organized, built, and operated by the community, and then replicated with support from local governments, NGOs, external support agencies, and the private sector. The program achieved widespread awareness and broad improvements in personal hygiene practice among the communities.

Sewerage systems exist in less than ten cities in Indonesia, and these networks are estimated to reach only 2.33% of the total population (National Census, 2007), which is one of the lowest coverage levels in Asia. The systems cover a small part of these cities, mainly city centers and commercial areas. Performance of these sewerage systems varies from city to city. Only two (in Jakarta and Bandung) have achieved full cost recovery. Users are generally reluctant to pay service fees unless sewerage charges are collected through water bills. Hence, most rely on government subsidies to meet operating and maintenance costs. System expansion is largely dependent on government support. Treatment plants are generally idle due to insufficient flow, broken pumps or both.

By focusing on triggering behavior change, CLTS has resulted in reduced open defecation. In villages where every household uses its own toilet or a shared toilet with other households, diarrhea incidence and outbreaks of vomiting have declined. Environmental benefits include ditches and water drainage free from human feces. People are more concerned about safety and are aware that defecation in rivers may harm other people. Unlike WSLIC 2 program, CLTS was successful in reaching the poorest households, but was relatively difficult and expensive to scale up and hence likely to be less cost effective in reaching large and diverse populations. To deliver a more efficient program, a solution needs to combine both 'sanitation marketing' and 'total sanitation' elements into the sanitation and hygiene promotion component (TSSM/SToPs). Another downside of the CLTS program is lack of effort from project facilitators to encourage the community to resolve technical problems, such as constructing toilets in dense settlements and swampy areas after a triggering process. Project facilitators who have poor understanding of the behavior change concept tend to see a triggering process as a one-off event rather than analyzing and responding to local contexts. With local project units focusing on meeting their water supply targets, CLTS claimed to have served its purpose once some toilets had been built.[41] Community members not engaging in the CLTS process was not due to lack of potential, but rather because facilitators or informal leaders have not been able to trigger villagers into action. Among the constraining factors were poor leadership, divided community, dependency on external assistance, resistance from influential authority figures and lack of water supply. Yet, there was not any clear operational strategy to shift from open defecation to total sanitation. After a heavy-duty CLTS program, communities were not willing to move on to improved hygiene behaviors that are equally important for health impact.

Despite the challenges left by various sanitation-related programs, access to safe sanitation in intervention areas has

[41] The CLTS Story in Indonesia, Empowering Communities, Transforming Institutions, Furthering Decentralization, Nilanjana Mukherjee & Nina Shatifan, October 2008).

increased in the past few years (increased use of pour flush latrine from 64% in 2004 to 69% in 2007). People have a growing awareness of hygienic and healthy behavior. Support from the government in the areas of management, finance and technical issues, as well as community awareness and high level of community involvement has greatly contributed to the success of these sanitation-related programs.

Performance monitoring and evaluation is crucial to program sustainability and effectiveness. Government data on sanitation indicators need to be more accurate than at present. A study by EHRA found that in 2006, 69.3% of the Indonesian population had access to 'proper' sanitation (e.g. toilet with a septic tank and or pit latrine). This figure exceeds the MDG target for sanitation coverage, although the quality of the infrastructure was not considered.[42]

7.4.2 INFORMATION, EDUCATION, AND COMMUNICATION (IEC): DEMAND-DRIVEN APPROACH VERSUS PROJECT-DRIVEN APPROACH

In response to historical experience of water supply and sanitation projects, after five years of preparation, in 2003 the Government of Indonesia introduced a national policy on Development of Community-based Water Supply and Environmental Sanitation. Past experience indicated existing water supply and sanitation facilities were not functioning properly mainly due to lack of active community involvement during the planning, construction, operation, and maintenance processes. A limited range of sanitation options had led communities to select options that neither met their demands nor were compatible with local conditions, including culture, managerial capacity, and geographic conditions. As a result of this low level of community involvement, the water supply and sanitation facilities were not properly maintained, which is the main cause of the poor sustainability and ineffective use of these facilities. As a result, these facilities and services had not provided long lasting benefits to users. Many studies found that programs that fully engaged the community and adopted a demand-driven approach have better sustainable infrastructure management, compared with programs that adopt a project-driven or supply-driven approach, in which planners and engineers assess people's needs at a specific project site to determine the type of service provided, generally not taking into account the expressed needs and conditions of the sanitation facilities users.

A sustainable sanitation program requires not only hardware, but also software intervention, including information, education and communication (IEC) campaigns. IEC media may take the form of educational and communication tools such as documentary film shows, radio shows, posters, banners, distribution of booklets leaflets, open-air drama, or targeted folk music. The main focus of IEC material development is creating local demand for sanitation.

Of the four program approaches analyzed, CLTS had the strongest IEC component. Through mass, focused use of IEC media, CLTS zeroes in on software rather than hardware development. The triggering processes in CLTS program, such as fecal calculation, defecation mapping, contamination flow, and focus group discussions are all part of the IEC campaign. A strong IEC component was also found in the sanitation marketing process, which was combined with CLTS to achieve total sanitation. The IEC campaigns included promoting options to masons, village contests and events, product demonstrations, and hygiene promotion and support, through IEC media such as leaflets, posters, videos, district radio, infomercials, local television programs, and village billboards.

The SANIMAS and WSLIC 2 programs also made use of IEC media in the hygiene promotion campaigns, training and focus group discussions, to encourage people to adopt health and hygiene behaviors and empower them to make community action plans for the proposed sanitation facility.

Examples of programs with a strong demand-driven approach are CLTS and CBSS in Malang, especially in Tlogomas subdistrict. These two programs received no government subsidies to build sanitation facilities. The cost of construction was met by the community, as an impact of their awareness of the importance of having sanitary toilets.

[42] EHRA study of six cities in Indonesia (Surakarta, Denpasar, Banjarmasin, Blitar, Jambi, Payakumbuh) found that of the total number of household toilets with a septic tank on average only about 25% have been emptied since they were installed. Of those that have been emptied, only 17% had been emptied in the previous five years.

Other programs adopting a demand-driven approach are SANIMAS and WSLIC 2. These programs were very demand responsive and relied on active participation as well as contribution from target communities and municipalities. The communities were given choices and assisted to select the most appropriate technology for their sanitation facilities. But unlike CLTS and CBSS Malang in Tlogomas subdistrict, SANIMAS and WSLIC 2 received financial support from the government to build toilets. Compared with community-funded programs, sanitation programs in Indonesia that provide financial subsidies for toilet construction do not leverage demand for sanitation in general as well, and are not as successful at engaging the private sector in creating market mechanisms that could offer a range of options for poor people, thereby leveraging health improvement.[43]

The WSLIC 2 revolving fund scheme had drawbacks too, while the CBSS program in Malang (SANIMAS), which had the lowest level of financial subsidy, was more effective initiative than any of the programs that relied on financial subsidies.

The major drawbacks of the demand-driven, or community-based approach are the often poor quality engineering design due to lack of qualified technical advice, and the prolonged timeline for completion of the project.

7.4.3 CHOICE OF SANITATION TECHNOLOGY OPTIONS

The choice of sanitation technology options for a particular sanitation program is influenced by social, technical, economic, and environmental acceptability. Social acceptability is related to the culture or religious beliefs of a target community. For instance, a study by WSP in East Java found that cleansing with water after defecating is common practice in most communities. People who do not have their own toilets or who practice open defecation reported that one of the benefits of defecating in rivers is the availability of water for cleansing after defecating. Thus, latrine options need to consider water availability even if cleansing occurs in places other than latrines.[44]

Technical acceptability relates to site conditions, space availability, availability of local building materials and technical capacity. For example, septic tanks are not an appropriate option for swampy areas such as the slum areas of Banjarmasin. Better options would be a centralized sewage system or shared septic tank. In hilly areas such as Bandung, development of off-site systems would be technically problematic, and the investment, operation, and maintenance costs would be very high. The logical choice of sanitation technology would be septic tanks, or an off-site system divided into clusters, each with its own wastewater treatment plant.

Economically acceptable means the capital costs of the facility are within available budget, and the community can afford regular payments to cover operation and maintenance expenses, hence improving the sustainability of the sanitation facility. The CBSS in Tlogomas, Malang is a good example of an economically acceptable technology. Here the community was willing to contribute to the capital cost, and make regular payments to cover the OM costs, amounting on average to less than 1% of their monthly household expenditure. In addition, there is an explicit undertaking by the community that they will also be responsible for any additional repair cost when required. Another example is the construction of communal toilets in a densely populated area in Jatiuwung, Tangerang district. Here as well as in-kind contributions, the community also made a 2–4% cash contribution to the construction of communal toilets, and are willing to pay a service fee that they find economically acceptable.

Environmentally acceptable means that water usage reflects water availability and the system takes into account the quality of groundwater and its surrounding ecosystem. In a slum and densely populated area where there is little space between houses, building a private toilet with septic tank is not environmentally acceptable as it could result in contamination of groundwater. Here the better option is to build public toilets or a centralized wastewater treatment plant on suitable plots, such as in Denpasar under the SANIMAS program.

[43] Percik Magazine, December 2008

[44] Opportunities to Improve Sanitation: Situation Assessment of Sanitation in Rural East Java, Indonesia. Jaime Frias. Water and Sanitation Program. 2008.

Sanitation options offered by unsubsidized programs such as CLTS in low-income communities are very simple, inexpensive constructions with a short life span. In East Java these are roofless superstructures with a wooden frame and walls made from plastic, gunny sacks or bamboo mats. The slab is bamboo and clay-lined with a wooden lid, and the pit is unlined.[45]

Sanitation facilities with a longer life span, such as city-scale sewerage/centralized systems and septic tanks, are generally more expensive. Although well-constructed and maintained septic tanks have a lifespan of 20 years or more, and about 65% of urban households in Indonesia are connected to septic tanks, there is the threat of groundwater contamination in densely populated areas.

7.4.4 PROGRAM REPLICATION

Generally, sanitation programs covered by this study are replicable under certain circumstances. It requires tremendous efforts and financial support, which committing parties should be aware of. The CBSS program in Malang is a viable option for small towns in Indonesia. The system may not be replicable down to the last detail, but it can and should be used as a model and adapted to fit local conditions. Currently, the CBSS program has been replicated in other subdistricts in Malang including Watugong, Mergosono, Samaan, Bareng, and Gadang. Further program replication would require support from local government and other third parties, including NGOs, external support agencies, and the private sector.

The replication of WSLIC 2 is WSLIC 3 or PAMSIMAS. However, unlike WSLIC 2, PAMSIMAS also serves urban areas, and its replication is subsidized by national and local government, and the Ministry of Public Works acts as the executing agency of PAMSIMAS. The target is to reach 5,000 villages or neighborhoods between 2007 and 2012, and the target for additional replication by local government and communities is to reach about 1,000 villages or neighborhoods.

CLTS replication requires the involvement of various government and non-government institutions, including the Ministry of Health, NGOs, community health centers, village midwives, village authorities, volunteers and informal leaders. Under the current decentralized system of government, sanitation is a local government's responsibility. Therefore, it is district government that decides which approach to adopt, although national government can encourage local governments to adopt a particular option and to scale up.

CLTS replication must be initiated by intensive sharing of information within the government bureaucracy, to provide a clear picture of the basics of CLTS and how this approach can be used to improve health conditions, particularly environmental health. An important principle in CLTS scaling up is ensuring that the system is able to run without any sophisticated inputs (Narendranath 2007). Hence, the use of existing human resources and organizations is recommended, such as the community health center with sanitarians and village midwives as frontline facilitators in the villages. The biggest challenge is the availability of village midwives and their willingness to live in the assigned village, because only by staying for quite some time in a village can these midwives become good facilitators.[46]

Sewerage systems that require large investment are being expanded with support from multilateral and bilateral aid agencies. In order to deal with the massive public investment, the modular system concept was proposed in the mid 1990s. This concept involves dividing urban areas by population density and other physical factors, then developing independent sanitation solutions for these areas. These modules can then be linked through trunk sewers as economies of scale develop. For the next five years, the government will focus more on optimizing the development of existing sewerage systems, by constructing additional networks and household connections.[47]

[45] TSSM Project : Indonesia Country Update June 2009 (Learning at Scale)
[46] Institutional Dimensions of Scaling Up of CLTS in Indonesia, Edy Priyono, 2008
[47] Indonesia, Overview of Sanitation and Sewerage Experience and Policy Option, Sukarma & Pollard, 2001, www.indonesia.go.id.

7.4.5 ISSUES THAT DETERMINE CHOICES OF INTERVENTION AND PROGRAM DESIGN

Cost and efficiency. The cost-effectiveness of hygiene promotion or interventions such as handwashing campaigns is closely related to the availability of water and sanitation facilities. Most Indonesians use water for anal cleansing after defecation, thus out-of-reach water is taken as a major barrier to use toilets, washing hands, and general hygiene. The hygiene interventions would be less cost-effective if water and sanitation facilities are either inadequate or not available.

For toilet construction, the use of local materials, such as bamboo, mud, or palm fronds, and familiar building techniques will significantly reduce costs. Moreover, CLTS does not provide financial support for toilet construction or any required external design. The important issue is for households to make their own decision to stop open defecation and build the easiest and most affordable toilets as low-cost facilities that can easily be improved and upgraded later.

Although community driven, WSLIC 2 did not really succeed in delivering access to improved sanitation among poor households. Lack of awareness about low-cost sanitation options is one of the most likely causes. Toilets constructed under government sanitation programs tend to promote solid walled and roofed toilet enclosures, with a pour-flush toilet pan and offset, and solid-lined pit with some form of vent pipe. For poor communities this type of toilet is not affordable without some form of subsidy. Low-cost toilet construction should be considered if more effective sanitation programs for the poor is a goal. By using local materials, familiar building techniques, and local labor, the costs will be significantly reduced, and will be more useful for the targeted community.

The SANIMAS example shows that facilities using more sophisticated technology are very costly, are used by only a few people, and fees will place a significant burden on poor families. SANIMAS design and construction must also take into account local conditions, including water availability, local culture and characteristics, and the financial capacity of the local community.

Energy use. Sanitation facilities in low income areas should incorporate energy-saving technology to reduce operation costs. In Tlogomas, the CBBS is constructed in such a way that wastewater flows directly to a treatment plant located at the lowest point of the system, and then discharged into a river or local water course. The flow of wastewater depends entirely on gravity, hence using less energy than a pump operated system.

In Jatake village in Jatiuwung subdistrict, the SANIMAS public toilets produce biogas that the locals use for cooking and lighting, thereby reduced the need for regular energy. However, the proper operation and maintenance of the biogas system is essential to its sustainability.

Water use. Lack of water is a major constraint even when people are aware of the benefits of using toilets and are ready to build them. People with limited access to clean water tend to restrict the amount of water they use for cooking and drinking. They would not want to waste water on flushing toilets or washing clothes. Even pour-flush options, which require a minimum volume of water, would be difficult to maintain in areas with limited water supply.

In East Nusa Tenggara (NTT) where drought is an annual occurrence, only 26.6% of the population uses goose neck water-sealed toilets; the rest defecate in the open, increasing the prevalence of diarrhea. Pit latrines require less water than 'regular' toilets, but the waste often decomposes slowly and the smell is unbearable. The Indonesian Institute of Science is developing new technology to deal with sanitation problems in arid area. The Biotoilet is a dry toilet that uses sawdust to accelerate waste decomposition. Within five months, the waste is decomposed, forming compost. This technology has been piloted in three areas in Bandung (the LIPI Center of Applied Physics Research, Daarut Tauhid Islamic Boarding School, and Kiara Condong ward).[48] Although the pilot has been successful, the challenge lies in its social and cultural acceptability.

Polluting discharge. Improper discharge of wastewater leads to waterborne diseases such diarrhea. In urban slums, households often discharge toilet waste directly into rivers

[48] www.targetmdgs.org

because they do not have the space to build a septic tank. Kusuma Bangsa in Pemecutan Kaja ward, Denpasar has had a high incidence of diarrhea and other water-borne diseases due to lack of proper sanitation facilities and frequent floods, which have contaminated shallow wells and bored wells. Before the SANIMAS program began, about 80% of the rented rooms and houses in which the majority of the local population live had small bathrooms and toilets without proper septic tanks. Wastewater from the toilets was discharged into a nearby stream. During the rainy season, water from this waste and rubbish filled stream swamped most houses in the area. The SANIMAS solution was to construct a simple sewage system, which includes a wastewater treatment plant that treats around 60m^3 of black and grey water per day. Inexpensive and easy to operate and maintain, this DEWATS technology reduces the pollution load by up to 90%[49].

Other issues. Sanitation choices do not necessary correlate to wealth: many households living below the poverty line defecate in improved latrines and one-third of the richest (40% of the population) defecate in rivers (National Census, 2004). Studies in East Java found that other needs often take priority over latrines. Preferences have little to do with a family's ability to pay and more with a household's choice of expenditure. Underlying these preferences are poor awareness of potential benefits of latrines, poor awareness of latrine designs, models, and sanitation options, lack of understanding of health risks of defecating in rivers, and social acceptance of open defecation. However, people are willing to pay for improved sanitation that offers practical and social benefits (which are perceived to be more important than health and environmental benefits), such as accessibility, increased property value, time savings, secured proximity, privacy, and comfort (not feeling rushed). Water availability for anal cleansing is another consideration in choice of sanitation option.[50]

In contrast, in Tlogomas, Malang, it was the unhealthy living conditions leading to the death of several people following a diarrhea outbreak in 1985 that triggered people to stop defecating in the open and start using improved sanitation. Hence, it can be concluded that increased awareness can trigger investment in sanitation for health and environmental benefits.

Formative research on hygiene and health conducted by Environmental Services Program (ESP) in September 2006 in several urban, rural and peri-urban areas found that the perceived ideal toilet should have a goose neck water seal, with a bucket full of water beside the toilet and water dipper within reach. The toilet should look clean and not smell, have good drainage and be of a comfortable size. This 'ideal' toilet was found mostly in urban areas. In rural communities, the main factor preventing people from building toilets was lack of funds, although some of them were reported to have high incomes.

People are willing to invest in improved sanitation for several reasons, including: the desire to have facilities that they perceive as part of modern life, to safeguard their privacy, enhance their self image and the assurance of being able to defecate anytime, even when it is raining or at night when it is uncomfortable and unsafe to defecate in the open.

[49] DEWATS Treatment System Indonesia, BORDA
[50] Opportunities to Improve Sanitation: Situation Assessment of Sanitation in Rural East Java, Indonesia. Jaime Frias. Water and Sanitation Program. 2008.

VIII. Efficiency of Improved Sanitation

This chapter synthesizes the information presented in Chapters 4 to 7 to present sanitation option efficiency under both ideal and actual program conditions. Alongside the quantitative cost-benefit and cost-effectiveness ratios, non-quantified impacts are also presented. The chapter consists of three sections:

- Efficiency of sanitation interventions, compared with no option (section 8.1).
- Efficiency of moving from improved sanitation options to other options 'higher' up the sanitation ladder (section 8.2).
- Contextualization of the results in a national context and use of the results to scale up sanitation (section 8.3).
- Overall cost-benefit assessment, taking into account all the elements (section 8.4).

8.1 EFFICIENCY OF SANITATION AND HYGIENE IMPROVEMENTS COMPARED TO NO FACILITY

8.1.1 QUANTITATIVE ANALYSIS

Economic analysis combines evidence on the cost and benefits of sanitation improvements already presented in earlier chapters, giving a number of alternative measurements of efficiency. As previously mentioned, each study site has atypical characteristics and therefore combining the results would be inappropriate; hence a separate presentation of economic analysis is made for each site. However, the results can be perceived as indicative figures of the economic performance of sanitation improvement.

The following paragraphs will describe the ideas of where the benefit values come from which covers all economic costs incurred once a household with no toilet builds a toilet option with respect to its sanitation ladder alternative. The analysis starts from rural sites and then to urban site situations. Cultural and environmental situation background may influence economic value generation either among different sites or between urban and rural situations.

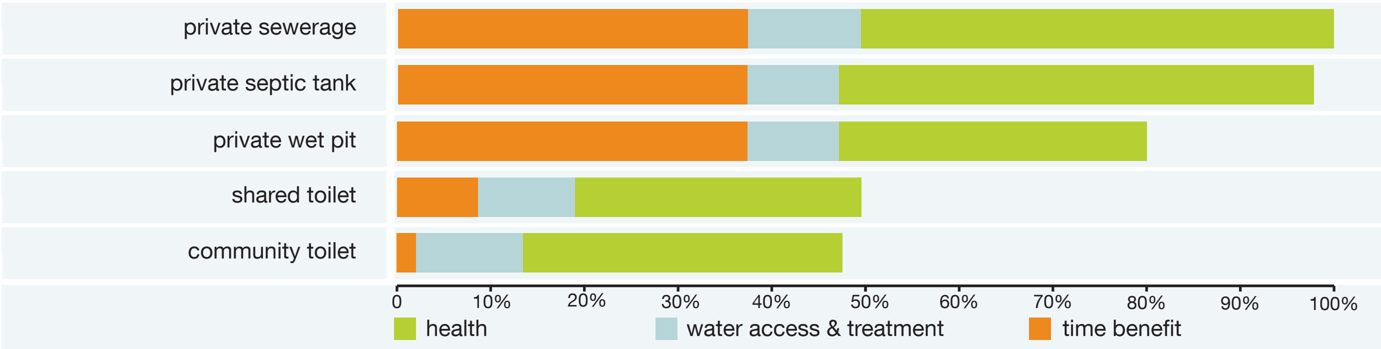
The benefit value drivers

As a prelude to the quantitative analysis, the following paragraphs describe the benefit value driver components. The benefit value drivers are:

- Being healthy and avoiding all related costs due to sickness such as disease treatment, transportation costs for having treatment and unproductive time.
- Time benefits from having a private toilet (less travel and no queuing time).
- Reduced water treatment and water access costs due to better environmental sanitation.

Figure 66 shows an example set of benefit value drivers using the case of urban study sites in Banjarmasin. The full benefit is represented as 100% which is obtained by choosing sanitation options that have the full economic benefit, such as private toilet with septic tank or sewerage and wastewater treatment. The notion of the full economic benefit means that it consists of all benefit value components i.e. "health benefit", "time benefit" and "water treatment and water access". The other options on the sanitation ladders are rewarded proportionally according to their total nominal benefit value as a fraction of the full benefit value. For example, private toilet connected to sewerage systems at its optimal capacity can deliver total present value of benefits of US$1,166 (the full benefit, 100%) over a 20-year period, while private wet pit toilet can deliver total benefit US$391 or 80% of the full benefit over the same period with an additional reinvestment at Year 11, as it has 10 years expected life.

FIGURE 66: EXAMPLE OF THE BENEFIT VALUE DRIVERS' CONTRIBUTION IN BANJARMASIN



The figures also show that the main benefits come from being healthy and avoiding spending due to sickness (paying for the doctor, medicines and transports to get to health facilities). The second largest benefit is the value of access time savings. Households receiving private toilets enjoy the greatest time savings as they do not need to travel or queue for their toilet needs. For those who use shared or community toilets, the time savings contribution is relatively smaller as they still need time to queue for their toilet needs.

The last benefit comes from water access and water treatment. The estimated values reflect potential gain for households in term of annual cost reduction for drinking water treatment before and after improved sanitation. This value is assumed, based on the fact that some households will decide not to boil their drinking water anymore and/or choose a cheaper treatment method. Water source access costs may also be reduced due to closer sources of water supply becoming cleaner and more usable for meeting domestic needs.

Benefit-cost analysis at rural sites

Table 47 and Table 48 show BCR figures for rural sites at Lamongan District and Tangerang District respectively. They present results under both optimal and actual program conditions. The notion of optimal efficiency refers to a condition of full achievement of all key performance indicators of sanitation programs. Meanwhile, actual efficiency refers to the existing achievement of sanitation programs which by definition are less than 100% of the optimal efficiency.

The differentiations of benefit values between 'optimal' and 'actual' come from the following assumptions:

- Benefit-cost figures vary depending on whether a system is operating at intended capacity ('optimal') or current capacity ('actual').
- Optimal cost figures come from engineering standards for particular sanitation ladders, while actual cost figures come from field survey data. In some cases the actual costs are less than the optimal costs due to under-specification of sanitation. For instance, one can use substitute materials to get cheaper materials option but sacrificing their quality and life time. Such lower costs give more chance for poor households to afford private sanitation provision. However, the under specification sanitation leads to shorter life time and needs more recurrent investment. Hence in terms of annual cost equivalent, it may not be cheaper to invest in below standard specifications.
- Ideal benefit figures are also related to program effectiveness. They are measured by sanitation utilization rates. A fully utilized sanitation option is in an ideal situation where household members always use their toilet every time they need it. While actual benefit figures come from underutilized sanitation where household members, for any reasons, do not always use their toilet when they need it. In this case, the actual benefit values used to be less than the ideal benefit values.

The study results for Lamongan District reveal all performance parameters are beyond their minimum feasible values:

- Benefit-cost ratio: both its optimal and actual benefit values of every ladder exceed its cost figures. The top sanitation ladder option in Lamongan District is private toilet with onsite septic tank. The BCR value reveals that for every US$1 input of investment costs generates US$3 under optimal program conditions and US$2 under actual conditions. The BCR figures for other sanitation options are more favorable as the input of investment costs are much cheaper while generated economic benefits (at household level) are almost similar.
- Internal rate of return: All sanitation options have IRR of greater than 100%, which means that each year the investment value is more than repaid. Only private septic tank under actual conditions has IRR below 100%, at 79%.
- Payback period: For shared and private pit toilets it takes less than 1 year for a household to recover its initial investment costs. For private septic tank, the optimal payback period is 2 years and 3 months, while the actual is 2 years and 10 months
- Net present value (NPV): All NPV values are positive. It means the investments on any sanitation ladder deliver positive net economic gains.

The results for Tangerang district are similar to Lamongan. All benefit-cost figures show sanitation options to be economically attractive, and for some cases the performance is higher than for Lamongan.

Figure 67 shows how benefit figures of all sanitation ladder options at rural sites cover their investment costs. As detailed in Figure 48 (Chapter 6), septic tanks are shown to be the highest sanitation ladder option for rural sites in terms of annualized cost, and hence have the least favorable benefit-cost ratios in both Lamongan and Tangerang districts.

The study also estimates the effect of basic hygiene interventions in addition to the sanitation intervention. The basic hygiene practice is hand washing with soap (HWWS). In the rural areas, such an additional intervention delivers additional values of health benefit. Adding hygiene practices to sanitation interventions increases program efficiency and decreases the cost per DALY averted. It means the additional generated benefit values can cover required input costs (costs for soaps and other related hygiene expenses). It also implies that hygiene practice is an important factor to decrease health risks. Figure 68 shows the higher Net

TABLE 47: RURAL AREA (LAMONGAN DISTRICT) EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED WITH "NO TOILET"

Efficiency measure	Scenario	Shared toilet	Private wet pit	Private septic tank
COST-BENEFIT MEASURES				
Benefits per US$ input (US$)	Optimal	6.7	6.1	3.3
	Actual	5.4	5.1	2.7
Internal rate of return (%)	Optimal	>100%	>100%	>100%
	Actual	>100%	>100%	79%
Pay-back period	Optimal	8 months	5 months	2 years 3 months
	Actual	10 months	6 months	2 years 10 months
Net present value (US$)	Optimal	1,498	1,757	2,081
	Actual	1,174	1,394	1,379
COST-EFFECTIVENESS MEASURES				
Cost per DALY averted (US$)	Optimal	423	548	945
	Actual	522	485	1,378
Cost per case averted (US$)	Optimal	3	4	7
	Actual	4	5	10
Cost per death averted (US$)	Optimal	38,513	49,905	86,234
	Actual	47,489	61,535	125,819

The field sites: 1) Geger, 2) Keben, 3) Badurame and 4) Turi.

TABLE 48: RURAL AREA (TANGERANG DISTRICT) EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED WITH "NO TOILET"

Efficiency measure	Scenario	Community toilet	Shared toilet	Private wet pit	Private septic tank
COST-BENEFIT MEASURES					
Benefits per US$ input (US$)	Optimal	3.0	4.7	7.8	4.3
	Actual	2.5	3.9	6.0	3.7
Internal rate of return (%)	Optimal	44%	>100%	>100%	100%
	Actual	64%	>100%	>100%	79%
Pay-back period	Optimal	3 years 3 months	1 year 1 month	5 months	2 years
	Actual	4 years	1 year 4 months	5.5 months	2 years 3 months
Net present value (US$)	Optimal	908	1,266	2,064	2,371
	Actual	662	945	1,525	1,769
COST-EFFECTIVENESS MEASURES					
Cost per DALY averted (US$)	Optimal	1,628	1,148	1,024	1,562
	Actual	1,988	1,401	1,034	1,725
Cost per case averted (US$)	Optimal	9	7	5	8
	Actual	10	8	7	9
Cost per death averted (US$)	Optimal	63,868	50,789	40,157	61,608
	Actual	77,983	62,013	49,031	68,061

The field sites: 1) Sarakan, 2) Kayu Agung, 3) Sukasari, and 4) Tanjakan Villages

Present Values (NPVs) of benefit (optimal as well as actual) as the result of adding hygiene practices to the sanitation interventions.

The cost-effectiveness ratios indicate what a household has to pay to get "one additional unit of health benefit". Figure 69 shows the cost per case averted at both rural sites. The figures imply that in order to prevent a case of disease, a household using a septic tank needs to pay more than a household using any other sanitation ladder options. However, the figures omit other benefits such as time saving and intangible benefits.

Benefit-cost analysis at urban sites

Table 49, Table 50 and Table 51 show that, for urban sites, the optimal and actual performance of sanitation interventions are similar to those in rural areas: all economic performance parameters are above their minimum economically viable values. The results for Banjarmasin are described below:

- Benefit-cost ratio (BCR): the optimal economic benefits value of every sanitation option exceeds the costs. The most expensive sanitation ladder option is the sewerage system in Banjarmasin whose investment costs at optimal capacity are US$473 per household connection. Its BCR value is 1.1, which means if the systems operate at their optimal capacity, they could deliver economically viable results. However, in 2009 the system was operating at 14% capacity, thus giving significantly higher investment costs per household connection (US$2,201). Such a high investment cost obviously makes it hard to achieve economic viability. With its low capacity utilization, every US$1 input of investment generates US$0.25 output of economic benefit. The BCR figures for the other sanitation options are much higher as the investment costs are much lower while generated economic benefits are similar.
- Internal rate of return: the IRRs for shared, private pit latrine and toilet with septic tank are favorable, at rates of between 30% and well over 100%. For community toilets the IRR is 15% at optimal functioning, reduced to 5% at actual rates of capacity utilization. For off-site treatment, IRR is 12% at optimal functioning, reduced to a negative figure at actual rates of capacity utilization.

FIGURE 67: COMPARISON OF RURAL BCR VALUES OF DIFFERENT SANITATION LADDER AND AT DIFFERENT SITES

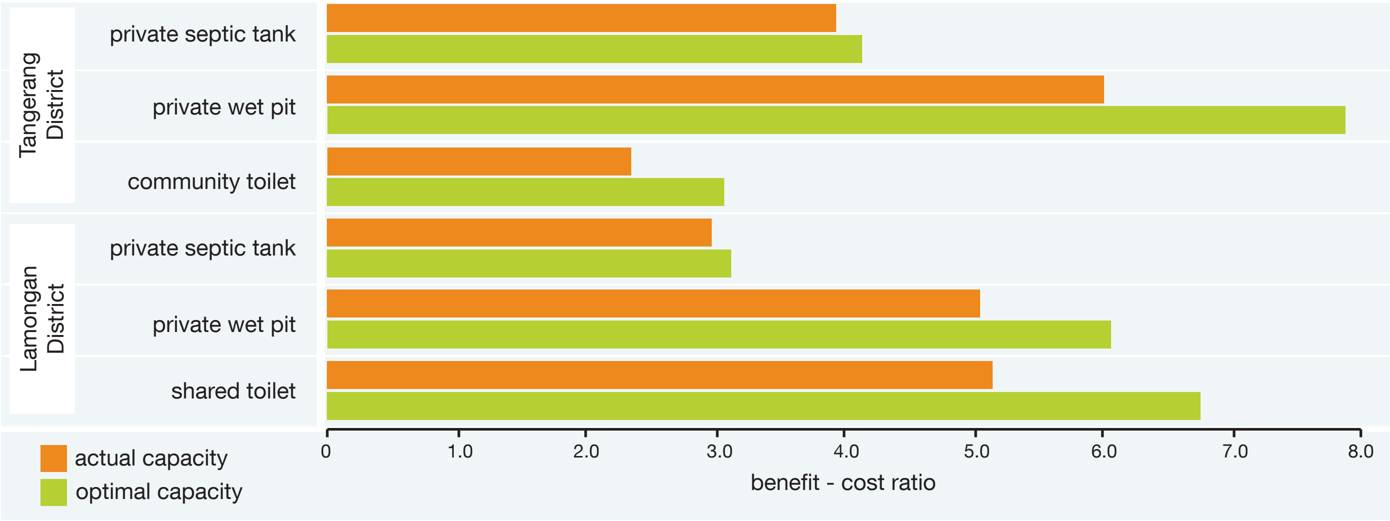


FIGURE 68: COMPARISON OF NET PRESENT VALUE OF SANITATION ONLY AND OF SANITATION + HYGIENE PRACTICES FOR TOILET WITH SEPTIC TANK AT RURAL SITES

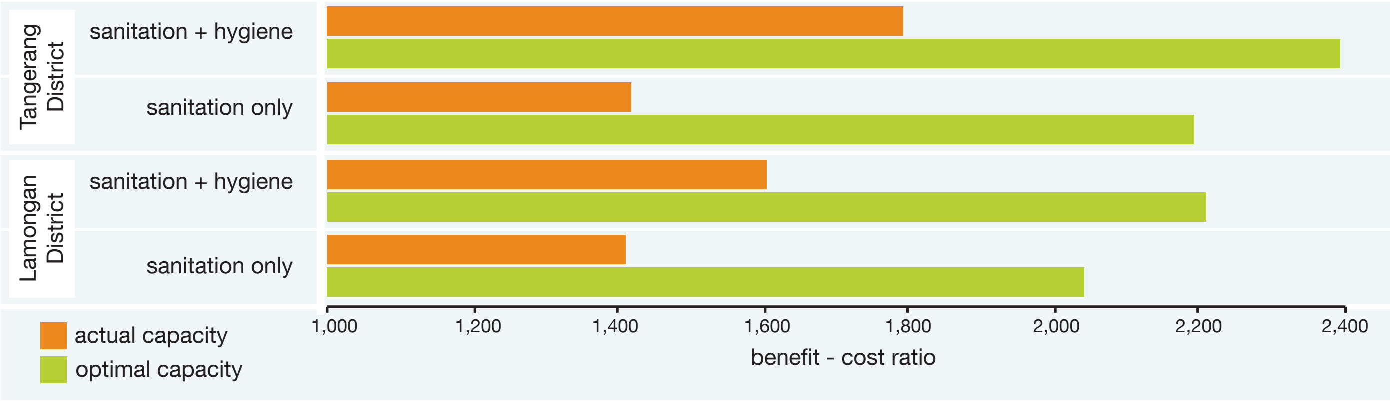
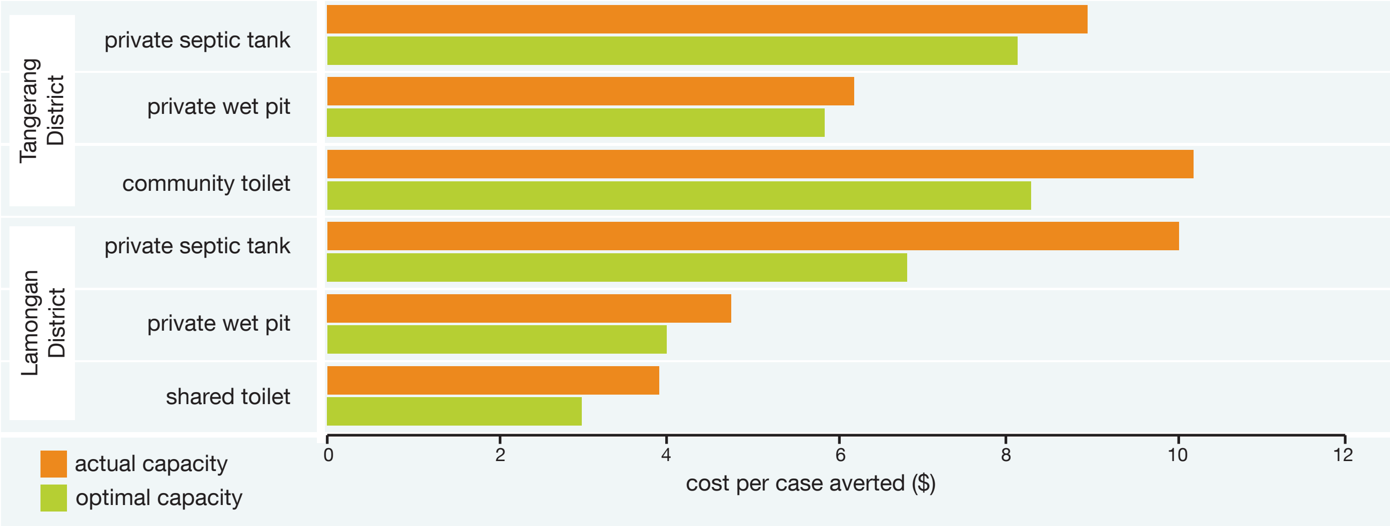


FIGURE 69: COST PER CASE AVERTED ($) AT RURAL SITES



- Payback period: shared, private pit latrine and toilet with septic tank all have payback periods of less than 3 years at optimal rate of toilet use by households, and less than 7 years for actual use. At optimal capacity utilization, the maximum payback period is around 8 years for off-site treatment, which is well below the expected length of life of 20 years.
- Net present value (NPV): All NPV values at optimal capacity are positive, which means that investment in toilets with any sanitation ladder options are economically viable.The differentiations of benefit values between 'optimal' and 'actual' are based on the same assumptions as the ones for rural analysis. In case of Banjarmasin sewerage systems, the BCR figure at its actual capacity (by January 2010) is 0.2 (less than 1), Payback Period more than 20 years and NPV = -2,395. A similar case also happens to the community toilets (SANIMAS) which operates at about 70% of their capacity and the BCR value is 0.9. Some of the targeted beneficiaries sometime still go to rivers for their toilet related activity purposes (defecation, washing, bathing etc.).

Figure 70 shows benefit-cost ratio figures of selected sanitation options at urban sites are greater than their investment costs (BCR>1). Refer to Figure 49 in chapter 6, private toilet connected to sewerage systems and community toilets, which need higher annual equivalent investment costs per household than other sanitation ladder options.

The cost effectiveness figures for urban sites show almost similar values for all sanitation ladder options. The urban sites figures imply that in order to prevent a case of disease risk, at optimal capacity utilization, a household with private toilet connected to communal sewerage pays more than using any other sanitation ladder options. In the case of sewerage systems in Banjarmasin, its actual cost per case/episode averted is extremely high compared to the other sanitation ladder options.

TABLE 49: URBAN (BANJARMASIN) EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED WITH "NO TOILET"

Efficiency measure	Scenario	Community toilet	Shared toilet	Private wet pit	Private septic tank	Private off-site treatment
COST-BENEFIT MEASURES						
Benefits per US$ input (US$)	Optimal	1.4	2.3	2.8	1.8	1.1
	Actual	0.9	1.4	1.9	1.2	0.25
Internal rate of return (%)	Optimal	15%	97%	>100%	88%	12%
	Actual	5%	30%	>100%	41%	Negative
Pay-back period	Optimal	8 years 11 months	2 years	9 months	2 years 2 months	8 years 2 months
	Actual	16 years 10 months	4 years	1 year 3 months	7 years	>20 years
Net present value (US$)	Optimal	159	333	617	772	139
	Actual	-56	107	291	382	-2,395
COST-EFFECTIVENESS MEASURES						
Cost per DALY averted (US$)	Optimal	1,502	993		1,299	978
	Actual	2,142	1,416		1,198	1,395
Cost per case averted (US$)	Optimal	9	6		8	6
	Actual	13	9		11	8
Cost per death averted (US$)	Optimal	47,948	31,696		41,462	31,419
	Actual	68,399	45,215		59,146	44,820

The field sites: 1) Pekapuran Laut, 2) Kelayan Luar

TABLE 50: URBAN (MALANG) EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED WITH "NO TOILET"

Efficiency measure	Scenario	Shared toilet	Private wet pit	Private septic tank	Private off-site treatment
COST-BENEFIT MEASURES					
Benefits per US$ input (US$)	Optimal	2.8	4.3	2.5	2.3
	Actual	2.3	3.6	2.1	1.9
Internal rate of return (%)	Optimal	>100%	>100%	100%	55%
	Actual	>100%	>100%	65%	43%
Pay-back period	Optimal	1 year 8 months	7 months	2 years	3 years
	Actual	2 years 2 months	8 months	2 years 6 months	3 years 7 months
Net present value (US$)	Optimal	503	1,302	1,226	1,328
	Actual	369	1,007	872	977
COST-EFFECTIVENESS MEASURES					
Cost per DALY averted (US$)	Optimal	1,200	1,661	2,253	1,944
	Actual	1,433	1,486	2,692	2,133
Cost per case averted (US$)	Optimal	9	12	16	38
	Actual	10	14	19	46
Cost per death averted (US$)	Optimal	34,484	47,741	65,224	157,589
	Actual	41,200	57,039	77,926	188,278

The field sites: 1) Kedung Kandang, 2) Lowowaru, 3) Mergosono, 4) Tlogomas, 5) Arjowinangun and 6) Dinoyo

TABLE 51: URBAN (PAYAKUMBUH) EFFICIENCY MEASURES FOR MAIN GROUPINGS OF SANITATION INTERVENTIONS, COMPARED WITH "NO TOILET"

Efficiency measure	Scenario	Shared toilet	Private wet pit	Private septic tank
COST-BENEFIT MEASURES				
Benefits per US$ input (US$)	Optimal	1.8	2.3	1.4
	Actual	1.5	1.7	1.8
Internal rate of return (%)	Optimal	50%	>100%	16%
	Actual	68%	>100%	30%
Pay-back period	Optimal	2 years 11 months	1 year 3 months	6 years 9 months
	Actual	3 years 8 months	1 year 11 months	6 years 6 months
Net present value (US$)	Optimal	273	530	336
	Actual	144	266	243
COST-EFFECTIVENESS MEASURES				
Cost per DALY averted (US$)	Optimal	1,674	1,995	2,714
	Actual	1,988	1,649	2,435
Cost per case averted (US$)	Optimal	8	10	13
	Actual	10	12	12
Cost per death averted (US$)	Optimal	38,847	46,293	63,518
	Actual	46,137	54,980	56,990

The field sites: 1) Talawi, 2) Kotopanjang, 3) Payolinyam and 4) Kubu Gadang

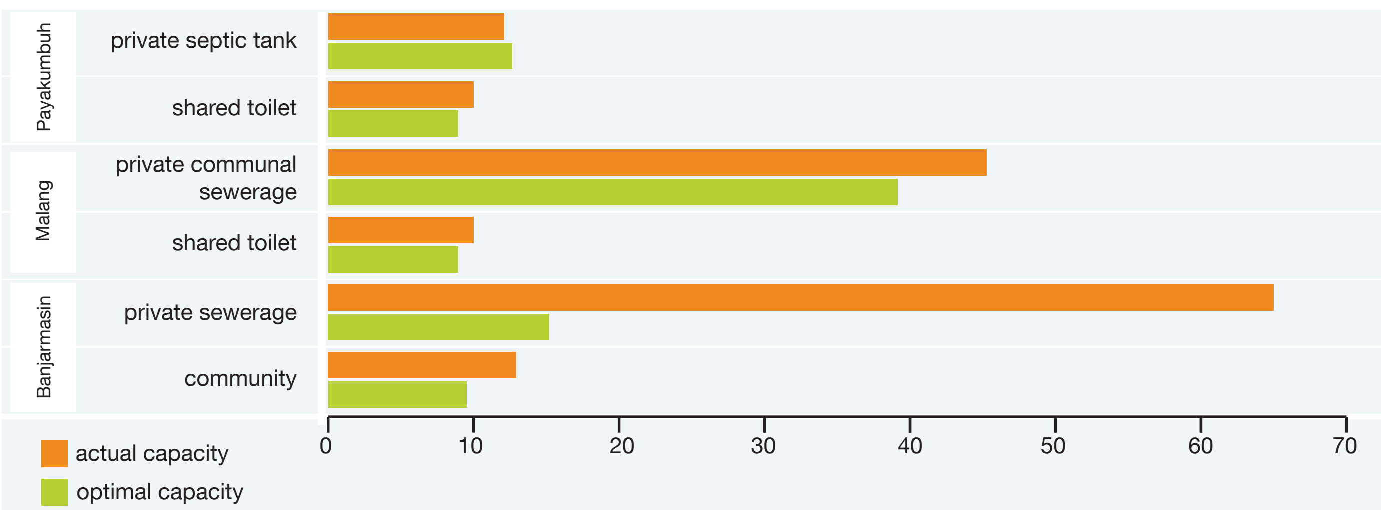
Cost-effectiveness figures are mainly influenced by:

- Total investment costs of a household to develop a toilet.
- Generated benefit in terms of avoided or reduced health risks due to toilet ownership. Greater reduced risks lead to lower cost per health gain achieved.

Figure 71 shows the comparison of cost per case/episode averted at urban sites. Community toilets, shared toilets and septic tank toilets deliver relatively low cost per case averted compared to private toilet connected to communal sewerage. In the case of Payakumbuh, as mentioned in the previous chapter, the sanitation investment costs are very low. The CLTS approach in Payakumbuh has creates significant awareness to the importance of possessing a private toilet. In addition, the local culture of West Sumatera with its cohesiveness and collectivist spirit also contributed to the way people built their toilets. Many households built their toilets with minimum input costs. They used sand and (sometimes) cement received from their neighbors. They collectively purchased a molding tool so that they can make the toilet part by themselves from cement-sand mixtures. The owners were involved in the construction processes together with masons. Such situations reduced cash capital spending significantly. However, the total capital costs for toilet investment per household may be greater than the current figure as the value of time of the household devoted to the toilet construction has not been included.

FIGURE 70: COMPARISON OF URBAN BCR VALUES OF DIFFERENT SANITATION LADDER OPTIONS AND AT DIFFERENT SITES

FIGURE 71: COMPARISON OF URBAN COST PER CASE AVERTED (US$)



The situation is very similar in Malang city, where people built their communal sewerage systems collectively. People contributed by direct involvement in the construction as well as providing some of the required materials. Although not as low as in Payakumbuh, the capital costs for toilet investment per household were much reduced. In contrast, the highly capital-intensive sewerage system in Banjarmasin, coupled with its low actual capacity utilization, leads to very high cost per case averted of more than US$60, compared with other options and sites, where it is <US$15. To improve this situation and increase the number of household connections, greater community awareness of the importance of sanitation is needed.

8.1.2 QUALITATIVE ANALYSIS

The benefits of household sanitation reach far beyond the above quantified benefits. There are also several intangible benefits or non-monetized benefits which are not easily expressed in quantitative units, such as comfort and better environment. The above benefit value measurements (CBA and CEA) take into account only the reduced risks and time associated with ceasing to practice open defecation. Traditionally, CBA and CEA give zero weight to intangibles and variables not included in analysis. For instance, according to the cost per case/episode averted figures, ones would conclude that community and shared toilets, which are typically outside houses, are the best options. In fact, there are many other sanitation activities that can be done in improved toilet facilities and bathrooms that have a positive value, especially for women, such as bathing, female hygiene, washing, and cleaning home appliances.

Chapter 4.4 described the concerns that households with no private toilets have, particularly for women. Women are generally most concerned about safety, for themselves and for their children. Men, on the other hand, are more concerned about practicality. Both men and women rate reduced access time and cleanliness as important factors in getting a toilet. Among other non-monetized benefits are comfort, privacy, and less time spent queuing. In addition, improved toilets enhance the owner's perceived social status. Almost all respondents agreed that improved sanitation leads to a cleaner environment, which is very important.

However, there are also factors that make people with improved toilets continue to use toilet options defined as 'unimproved', such as hanging toilets on a river or on a fish pond. For instance, some people in Payakumbuh prefer to defecate in hanging toilets on a pond to feed their fish, as well as preferring the open air and absence of bad smell that tends to accumulate in toilets that are not properly cleaned. Another interesting finding from the Banjarmasin site is the preference of households for open defecation in rivers in front of or behind their houses. People living on the riverbanks use the rivers as a kind of one-stop shop for carrying out daily activities, including defecation.

As well as the above household and community level benefits, there are also larger scale benefits of improved sanitation – the knock-on effects on tourism, business and the sanitation supply market. According to the tourism and business surveys, there are clear knock-on effects:

- Tourism: the sanitary condition of public places affects how tourists enjoy their stay in Indonesia. While sites most frequented by tourists (e.g. beaches, hotels) tend to have good sanitation facilities, the general sanitary conditions in Indonesia was rated as 48% satisfactory by the respondents. This is a challenge for the Government of Indonesia, especially the components of government that are responsible making tourism businesses more aware of sanitary conditions.
- Business: Improved sanitation will enhance the quality of life and increase the productivity of businesses through cleaner natural resources (such as water supply) and increased employee productivity.

The sanitation supply market will also gain significant benefit from increasing people's awareness of and demand for sanitation-related goods and services. As mentioned previously, the total potential sanitation market size (by 2014) is about 16.67 million new toilets worth US$17.3 billion. This figure consists of new toilet investment costs of US$16.8 billion and cumulative maintenance costs from 2008 to 2014 of US$500 million. Therefore, increased investment by households and government leads to huge business opportunities for mason services, and sanitation materials and products.

8.2 EFFICIENCY OF ALTERNATIVES FROM MOVING UP THE SANITATION LADDER

The previous section analyzed the economic performance of household sanitation options compared with 'no toilet' as the baseline. This section evaluates the incremental economic performance of moving up the sanitation ladder. This analysis is important because there are many households with basic sanitation that may consider upgrading their existing sanitation option. For example, households that use shared toilets or community toilets may wish to move up to private pit, private septic tank or private sewerage (communal or larger scale). The analysis is most relevant for households whose current sanitation option has yet to come to the end of its useful life. If, on the other hand, a household's sanitation option/system has broken down and requires capital investment in maintenance or replacement, then the comparison with 'no toilet' as the baseline is more relevant, as the household could return to open defecation or move to an option lower down the ladder, such as hanging toilet or public toilet.

Benefit-cost analysis of moving up ladders in rural sites

Table 52 and Table 53 show the economic performance of moving up the sanitation ladders in the rural districts of Lamongan and Tangerang, respectively. At both study sites, the highest option on the sanitation ladder is septic tank and the initial points on the sanitation ladder, for comparison, are shared latrine and private wet latrine. Benefit value drivers of moving from shared latrine to private septic tank come from water access and treatment, time saving and increased health benefit; and of moving from private wet latrine to private septic tank, from improved water access and treatment and increased health benefit as it is assumed that improved wastewater management reduces health risks in the broader sense. Moving up the ladder could be economically justified if the incremental benefits exceed the marginal costs incurred. Overall, each step of moving up the ladder has favorable economic performance, with benefit-cost ratios exceeding 2, except pit latrine to septic tank in Tangerang which has a cost-benefit ratio of 1.5.

Moving up the sanitation ladder is an option for households that wish to improve the quality of the environment as well as gain the benefits quantified above such as health, water and time benefits (Figure 72). This option should be promoted particularly in dense and highly populated areas like the study sites in Tangerang. In some particular contexts, such as locations with heavy surface water pollution and where land is scarce, the option of moving up from unimproved shared options to communal sewerage is highly attractive. In this case, non-quantified benefits of improved wastewater management play an important role in the decision. Therefore, local governments should promote and initiate raising community awareness and facilitate implementation of sanitation options.

Benefit-cost analysis of moving up ladders in urban sites

Similar analyses were conducted of moving up the sanitation ladder at urban sites. The results show that some options are not economically viable due to marginal costs outweighing incremental benefits. For instance, in Banjarmasin the cost of moving from wet pit latrine to septic tank toilet is US$160 per household, while the incremental economic benefit is US$106. Also, the marginal cost outweighs the incremental benefits of moving up the ladder from shared toilet to private septic tank or to private communal toilet in Malang, and from private wet pit latrine to private septic tank in Payakumbuh. However, note again that the quantified benefit values do not include the full environmental benefits.

The ultimate sanitation solution, especially for urban areas, is urban sewerage systems or at least communal sewerage or on-site treatment systems. As population density tends to increase over time, land prices rise and land availability diminishes. Therefore, on plot (but outside the house) systems such as dry pit, wet pit and septic tank will no longer be viable due to land scarcity.

This study does not take into account the land cost for urban on-site systems. If land scarcity (that leads to extremely high land prices) were taken into account in the calculations, movement up the ladder from on-site isolation to communal sewerage or even to larger-scale centralized sewerage will probably become more economically viable. This assumes that the land where the water treatment plant is located outside downtown or in less populated areas, where land prices are correspondingly lower.