Budget sheets and buy-in: financing community-based waste management in Siem Reap, Cambodia

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ABSTRACT This paper details some of the difficulties in financing a community-based waste management (CBWM) project for the collection of waste in Siem Reap, Cambodia. It presents a series of financing scenarios based on several potential logistical arrangements. The financial variables investigated include labour costs and honorariums, collection fees, charges for secondary collection, land and equipment costs, and educational programmes. The case study illustrates how the loss of a political champion and a lack of cooperation by a private waste collection company derailed the financing of a CBWM project despite the presence of other favourable conditions for its success. The waste collection company's participation was fundamental to ensuring the affordability of secondary waste collection, and this one financial element greatly affected the feasibility of the entire system. The paper concludes that without buy-in and financial cooperation from all stakeholders, the best laid plans for CBWM (and the accompanying budget sheets) are rendered irrelevant.

KEYWORDS Cambodia / community-based waste management / project financing / Siem Reap / waste collection

I. THE RESEARCH PROJECT

It has been estimated that up to 50 per cent of residents in low- and middle-income countries do not receive waste collection services.[1] Such is the case in the town of Siem Reap, Cambodia (Figure 1), where only 50 per cent of the town's garbage is collected daily.[2] In some places, communities have been able to self-organize in order to offer waste management services to local residents. From the spring of 2004 to the summer of 2005, the authors were part of a research team that assessed the feasibility of a community-based waste management (CBWM) system in an area of the town of Siem Reap that did not receive municipal waste collection services.

Waste collection services, contracted to a private waste hauler (MICC), are provided by the municipality to only the central part of the town. There are a number of reasons for this arrangement. First, the municipality cannot afford to provide service to all residents. For residents who are outside the service area, there are substantial costs associated with transporting their own waste to the municipal dumpsite (approximately 10 kilometres from town) and paying the tipping fees, which are prohibitively expensive for anyone other than MICC. Second, outside of the central town, the poor quality of local infrastructure limits truck access to houses. Most roads in

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the peri-urban area are dirt roads and become almost impassable in the rainy season. Finally, many of the residents who live directly adjacent to the river that runs through Siem Reap do not have legal tenure of their land, and government eviction of these residents presents an occasional threat. It is possible that the municipality is withholding waste services to deny legitimacy to these settlers. Illegal settlements often lack a number of municipal services, including waste collection.[3]

In situations where waste collection services are not offered by the municipality, CBWM may be an alternative. Although each CBWM project design is distinct, such projects generally include the primary collection of household waste, its transportation to a local waste storage location, and then its secondary removal to a local dumpsite. The secondary removal function may be performed by municipal staff or a private contractor. A community-based organization (CBO) is usually established to perform the ongoing administrative functions of CBWM; the commune leaders in the study area have indicated that they are interested in creating and participating in such an organization.

II. THE STUDY AREA

The town of Siem Reap is situated in the administrative district of Siem Reap, which comprised 10 communes and had a population of 131,846 in 2004.[4] The study area for this project is located on either side of the Siem Reap River, to the south of the town (Figures 1 and 2), and includes approximately 1,000 households arranged in a linear pattern along the river and the roads on either side of it. The study area is not bounded by any one administrative district, but contains parts of two communes (Siem Reap and Sala Kamrauek). This river-based study area was chosen because the disposal of uncollected waste directly into the river is both an environmental concern and an aesthetic concern in a town that relies on tourism revenue. Siem Reap is the gateway to Angkor Wat, a UNESCO world heritage site that attracts one-third of Cambodia's tourist dollars.[5] The survey that we conducted of 300 households in the two communes as part of the background research for this study confirmed that river disposal is a problem in the community.[6] While only 18 per cent of respondents admitted to disposing of their trash in the river, 41 per cent claimed that their neighbours used the river for disposal. Other self-reported methods of waste disposal included burning (70 per cent), burying (14 per cent) and disposal in public spaces and streets (11 per cent).

III. METHODOLOGY

The research team included researchers from both the Royal University of Phnom Penh (RUPP) and the University of Toronto. We worked in partnership with the local Department of the Environment, local commune authorities and provincial government officials in Siem Reap. Our study included a literature review, a household survey, a waste characterization study and a series of interviews with such key informants as commune leaders, provincial and municipal government authorities, local educators and religious figures. The household survey served as a community needs assessment, a process that Anschütz suggests may lead

at the University of Toronto. Mr Phourng Lina of the Department of the Environment's Office for Pollution Control in Siem Reap provided both translation services and indispensable research assistance for this work.

1. van de Klundert, A and J Anschütz (2001), "Integrated sustainable waste management – the concept", WASTE, Gouda, The Netherlands.

2. Siem Reap Department of Environment (2003), "Report on solid waste management in Siem Reap", Siem Reap, Cambodia.

3. Wang'ombe, J (1995), "Public health crises of cities in developing countries", *Social Sciences and Medicine* Vol 41, pages 857–862.

4. Siem Reap Province, Department of Planning (2008), "Siem Reap in figures," accessed online at www.siemreap-town.gov.kh/en.

5. D'Monte, D (2005), "How much difference does UNESCO make?", *The Art Newspaper*, accessed online at www.globalheritagefund.org.

6. Full details of the survey can be found in Parizeau, K, V Maclaren and Lay Chanthy (2006), "Waste characterization as an element of waste management planning: lessons learned from a study in Siem Reap, Cambodia", *Resources, Conservation and Recycling* Vol 49, No 20, pages 110–128.

FIGURE 1
Map of Siem Reap, Cambodia

SOURCE: Prepared by the Cartography Office, Department of Geography, University of Toronto.

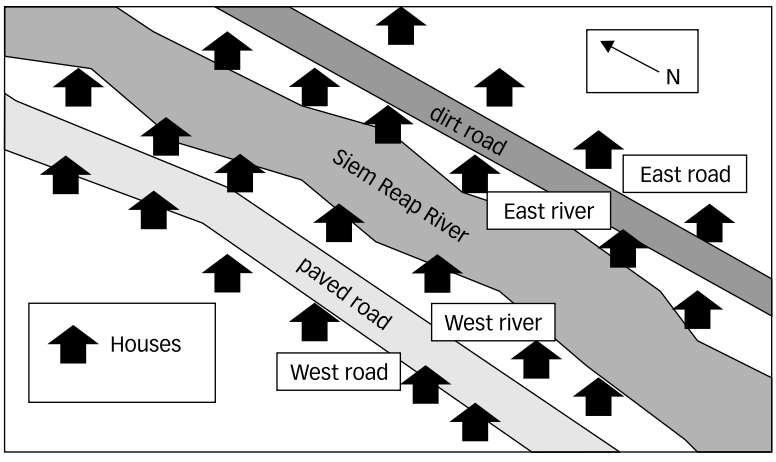

FIGURE 2
Schematic diagram of household locations in the study area

to better-designed CBWM projects.[7] This paper will focus on results from the survey and from key informant interviews that pertain to the creation of budget estimations used to assess the financial feasibility of a CBWM project in the study area. Other aspects of the feasibility study not covered here (including details of the waste characterization study) are discussed at length in another paper.[8]

Researchers and students from RUPP administered the household survey in the summer of 2004. In order to identify potential differences in waste behaviours and attitudes by location, the sample was drawn from four strata: households located on the east side of the river; households located away from the river along the east road; households along the west side of the river; and households along the west road. After a random start at each location, every third house within the stratum was approached for inclusion in the sample. The survey took place over a period of four days, during daylight hours, and was directed to the wife or mother of the household wherever possible, since women usually have primary responsibility for waste management tasks in Cambodia. A follow-up survey approximately one year after the first survey assessed the impact on attitudes towards waste and waste behaviour of an intervening environmental education programme.

The purpose of the education programme was to raise awareness in the community about the benefits of CBWM and about environmental problems in general, with a specific focus on solid waste. The importance of an awareness-raising programme as an element of CBWM project design has been cited as an important success factor by numerous researchers, particularly because of its potential to influence willingness-to-pay for the new collection service.[9] Staff from RUPP organized three sets of training workshops for the community in January and February 2005. The training also provided information about the proposed CBWM project and what the community would have to do to make a waste collection service available and run effectively. About 150 individuals attended the two workshops and all were encouraged to disseminate the results to their neighbours when they returned home.

IV. COMMON FINANCIAL DIFFICULTIES IN CBWM

A common stumbling block in CBWM projects is the creation of sustainable funding structures. A number of studies have reported a range of financial problems and successes in these types of projects after they have been implemented. However, there is currently little literature describing the process of financial planning for CBWM. The most relevant detailed discussion of this type is Zurbrügg and colleagues' description of a community-based composting project in Bangladesh.[10] In this case, two financial scenarios were modelled around the variable of volume of material composted. In the scenarios described in this paper, multiple variables are explored in order to depict an array of possible outcomes.

A significant challenge for many CBWM projects is that cost recovery is often low,[11] especially when the serviced population is poor and has difficulty paying collection fees.[12] Reliance on NGO funding can create external dependencies, and governments frequently cannot or will not contribute funds to CBWM.

7. Anschütz, J (1996), "Community-based solid waste management and water supply projects: problems and solutions compared, a survey of the literature", Working Document 2, Urban Waste Expertise Programme, accessed online at www.waste.nl.

8. See reference 6.

9. See, for example, Pfammatter, R and R Schertenleib (1996), "Non-governmental refuse collection in low-income urban areas: lessons learned from selected schemes in Asia, Africa and Latin America", Swiss Federal Institute for Environmental Science and Technology (EAWAG) and SANDEC, Duebendorf, Switzerland; also Muller, M S, A Iyer, M Keita, B Sacko and D Traore (2002), "Differing interpretations of community participation in waste management in Bamako and Bangalore: some methodological considerations", *Environment and Urbanization* Vol 14, No 2, October, pages 241–257; and Moningka, L (2000), "Community participation in solid waste management: factors favouring the sustainability of community participation, a literature review", UWEP Occasional Paper, WASTE, Gouda, The Netherlands.

10. Zurbrügg, C, S Drescher, I Rytz, A H Md Maqsood Sinha and I Enayetullah (2005), "Decentralized composting in Bangladesh, a win–win situation for all stakeholders", *Resources, Conservation and Recycling* Vol 43, pages 281–292.

11. See reference 7.

12. Assaad, R (1996), "Formalizing the informal? The transformation of Cairo's refuse collection system", *Journal of Planning Education and Research* Vol 16, pages 115–126.

The pay and status of labourers engaging in waste collection are also often low, so there is not much motivation for them to work either effectively or over the long term.[13] Further, the difficulties in financing CBWM may affect the continuity of payments to community waste workers, and ultimately derail the project. For example, in a CBWM project on the edges of Abidjan, Côte d'Ivoire, youth workers were not paid the wages they were promised because householders were not paying their waste collection fees. The workers stopped providing the service and this project eventually failed.[14] Finding a way to provide sufficient payment to waste workers is important to the success of CBWM projects.

Another challenge faced by CBWM projects is arranging for secondary collection. The involvement of local authorities from the start of the project is essential for getting their cooperation in this task.[15] The cost of secondary collection can also be a heavy burden in CBWM financing schemes. Some researchers suggest that the municipality should cover secondary collection from general revenues rather than obligating the newly serviced community to pay for it.[16] Other research, examining the issue of collection fees from the perspective of the residents, supports this suggestion. Anand found that residents were much less willing to pay for secondary collection than for primary collection in a community-based waste collection programme in Madras/Chennai, India, and he also notes that secondary waste collection is crucial to a project's sustainability.[17]

V. POTENTIAL FUNDING SOLUTIONS

Regular fee payments are essential for the sustainability of CBWM projects, and can be encouraged through the creative application of flexibility with respect to payment timing and method. Offering a lower collection fee at the beginning of the programme may be effective in obtaining higher fee payment rates later. For example, in Dhaka, the CBWM organization known as Waste Concern originally charged Taka 10 per month for household collection, and later raised this by 50 per cent once residents had become accustomed to the benefits of the service and had come to appreciate its reliability.[18] The use of sanctions (such as fines from local authorities), innovative collection methods (such as applying waste collection fees to utility bills) and incentives can also be means to motivate residents to pay for waste services.

Incentives can be used to motivate fee collectors and encourage the long-term financial viability of the project. The incentives often range from 10 to 15 per cent of the total fees collected.[19] In Ouagadougou, Burkina Faso, fee collectors receive a financial bonus if they collect the waste fees of more than 90 per cent of their list of monthly service subscribers.[20]

Even when the community is willing to pay fees, it is important to have an effective fee structure. Differential fee structures may require businesses and other heavy waste producers to pay more for their waste collection services in order to cross-subsidize low-volume household waste collection,[21] or the fees for poor households may be subsidized by larger payments from wealthier households. In addition to fee structures, other programme design factors, such as frequency of collection, type of collection system and labour and equipment costs, will affect the financial feasibility of a CBWM system.

13. See reference 7.

14. Cissé, G (2003), "From community-based organization to low-income private contract for solid waste collection in a poor settlement", CWG Workshop, 9–14 March, Dar es Salaam.

15. See reference 9, Moningka (2000).

16. See reference 9, Pfammatter and Schertenleib (1996).

17. Anand, P B (1999), "Waste management in Madras revisited", *Environment and Urbanization* Vol 11, No 2, October, pages 161–176.

18. Enayetullah, I and A H M M Sinha (2000), "Community-based decentralized composting: experience of Waste Concern in Dhaka", in A H M M Sinha and I Enayetullah (editors), *Community-based Solid Waste Management: The Asian Experience*, Waste Concern, Dhaka, Bangladesh, pages 63–77.

19. See reference 7.

20. ENDA/WASTE co-publication (1997), "La participation de la communauté à la gestion des déchets solides à Burkina Faso: collecte des ordures ménagères à Ouagadougou", accessed online at www.waste.nl.

21. See reference 7.

VI. CBWM PROJECT DESIGN CONSIDERATIONS

a. Frequency of collection

Because of the heat and humidity in Cambodia and the high organic content of the waste stream (66 per cent by weight, as assessed in the waste characterization study), most residents in the study area are accustomed to disposing of their waste at least once a day. In the household survey, 61 per cent of respondents reported daily household waste disposal. In addition, waste collection services in the town of Siem Reap are offered on a daily basis. For these reasons, all of the financial scenarios examined in this paper assume daily waste collection services in the study area (as opposed to weekly or bi-weekly collection).

b. Type of collection system

A number of collection systems can be used in CBWM. Three arrangements that may be useful in this study area are: door-to-door collection (waste collectors approach residences and ask for their waste, or ring a bell to notify residents to bring out their wastes); set-out collection (residents leave their waste outside their houses by the road for collection); and collection from multiple drop-off sites.

Ali and Snel[22] describe a system of CBWM that involved communal bins for waste disposal at multiple drop-off sites in Karachi, Pakistan. An independent evaluation found that this system was successful in improving the cleanliness of the area. However, their evaluation of multiple case studies also indicates that other projects have problems finding space for the bins, managing the maintenance of the bins, and siting the bins, due to residents' reluctance to live near communal trash drop-offs. Also, for all residents to have convenient access to a drop-off bin, the study area in Siem Reap, with its linear layout, would require a greater number of bins than would a block-based community.

A project in Khulna city, Bangladesh, opted for a door-to-door, community-based waste collection system because it found that the travelling distance for the conventional drop-off system deterred residents from using the communal bins. Instead, many residents dumped their waste in open spaces or drains.[23] It can be assumed that using drop-off sites in the study area may produce similar results, in that residents may opt to continue more convenient and environmentally damaging waste disposal projects rather than travel to drop-off sites.

A drawback of the door-to-door collection system is that waste is not collected if residents are not at home when the collectors come by. Set-out collection addresses this limitation, but a problem with this system is that animals and pests are attracted to waste left out in the open (as was observed during the waste characterization study). Despite this problem, the study team and key informants agreed that set-out collection would be the most suitable system for the community. Suggestions for solving the animal problem included asking residents to purchase secure waste receptacles or raised waste stands. Since these costs would be borne by the residents, they are not included in the financial scenarios below.

22. Ali, M and M Snel (1999), "WELL study – lessons from community-based initiatives in solid waste", London School of Hygiene and Tropical Medicine, UK, and WEDC, Loughborough University, UK.

23. Khulna City Corporation and Swiss Agency for Development and Cooperation (2000), "Community-based pilot project on solid waste management in Khulna city: general project description", accessed online at www.wsp.org/publications/sa.

c. Labour and equipment needs

Because of the length and linear nature of the study area, the waste collectors would need to use a motorcart (Photo 1) to bring the waste from all parts of the collection area to the secondary collection point. If the collectors were working by hand, they would not be able to collect the same volume that can be carried in the motorcart and would need to make multiple trips on foot to the local storage area for subsequent secondary collection. One of the scenarios assumes that the community purchases two handcarts to assist with collection. In this arrangement, the handcarts could be used to assist with collection areas that are within walking distance of the local storage area, or to assist in collection along the dirt road in the rainy season when the heavier motorcart may have difficulties getting through the mud.

The waste characterization study used a motorcart to collect from 50 houses spread along the entire length of the study area. It takes approximately 2.5 hours to walk the distance along the paved road on the west and to return along the dirt road on the east. If the waste collection team comprised a motorcart driver and a collector on foot to remove trash from the roadside and place it in the motorcart, the route would be covered at a slow walking pace. To collect from all of the houses on both sides of the road, the route would essentially be covered twice (2.5 hours × 2 = 5 hours). Allowing for a slower pace due to stops at each household, it is likely that a waste collection team of a driver and a walking collector could service the entire study area in an eight-hour day.

PHOTO 1
Photo of the motorcart used to collect household waste during the waste characterization study. The financial scenarios assume the use of similar equipment for the project's collection system
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VII. FINANCING CONSIDERATIONS IN THE STUDY AREA

Lessons from the literature, the above design considerations and discussions with key informants informed the creation of three different financing scenarios in the study area. Basic assumptions about monthly costs for each scenario can be found in Table 1. The costs were established from the household survey results, discussions with local partners, the worker hired to assist with the waste characterization study, and CSARO (Community Sanitation and Recycling Organization), a Phnom Penh NGO involved in CBWM. All prices are quoted in US dollars (US$ 1 = ca. 4,000 Riels).

a. Monthly costs

Labour. CSARO workers earn about US$ 150 per month for a full-time route. This is a generous rate of pay by local standards because poverty reduction is an aim of this organization. MICC rates are considerably lower. The cost of renting a motorcart with driver in Siem Reap is US$ 250 per month. Labour costs assume one full-time collector on foot (and one motorcycle driver, in the scenario where community members invest in a motorcycle and motorcart themselves). The financial scenarios used in this study cover a range of labour costs. For example, the low end of the monthly labour costs (US$ 125) uses MICC rates of pay for a driver (US$ 75) and one worker (US$ 50). The high end uses an amount between CSARO's and MICC's rates of pay for workers (US$ 100), plus the cost of renting a motorcycle owner's services (US$ 250).

Fuel. This cost assumes a fuel use of four litres per day (based on a conservative extrapolation of fuel use during the waste characterization study) at a cost of US$ 0.88 per litre, yielding a total cost of approximately US$ 105 per month.

Equipment maintenance. RUPP researchers estimate monthly equipment maintenance costs at US$ 20.

Secondary collection. The price for secondary collection has yet to be finalized with MICC. Unfortunately, there is no comparable precedent here. After considerable negotiation, MICC remained adamant that it should receive 50 per cent of all fees collected. A set of calculations has been added to each scenario to assess the financial viability of this proposal.

Fee collection incentive. The scenarios assume that the community-based organization will be responsible for fee collection and management of the programme. Two of the scenarios give 10 per cent of the fees collected to the organization as an incentive to achieve a high fee collection rate among residents.

Education programme. Costs for educational efforts are listed as a flat US$ 100 per month in one of the three scenarios, and as a percentage of revenues (5 per cent) in another, while no funds are allocated for education in Scenario 2. This cost, where it is included, is payment for ongoing educational efforts (for instance by door-to-door waste stewards) and other liaison work. As discussed in more detail below, education has been related to an increased willingness-to-pay for waste collection services in the study area. We assume that intensive education will be needed in the first year of the project to encourage residents to change their waste disposal practices. There are many forms that this educational programming could take, according to the preferences of the CBO. For example, the community could hire one full-time worker to act as a

TABLE 1
Monthly costs, capital costs and revenue assumptions for all scenarios

Monthly costs	**US$**
Labour	125–350
Fuel	105
Equipment maintenance	0–20
Secondary collection	Negotiable
Fee collector honorarium	10% of fees
Education	100, or 5% of fees
Monthly capital cost payments	**US$**
Uniforms	30
Motorcycle	650
Motorcart	240
Handcart (may be used in addition to motorcart)	130
Land for storage prior to secondary removal	0–500
Monthly revenues (assuming a US$ 1 fee)	**US$**
100% fee payment rate	1,000
90% fee payment rate	900
75% fee payment rate	750
60% fee payment rate	600
40% fee payment rate	400
Commercial fees	ca. 100

promoter and information resource, or they could hire multiple part-time workers to promote the project and act as waste stewards. Alternatively, these funds could be spent on occasional awareness-raising events in the community.

b. Capital costs

Equipment. The equipment costs for uniforms, handcarts, etc. are based on similar costs incurred by CSARO.

Land costs. It is possible that local land may be donated by a local resident for waste storage before secondary removal, but this issue is still unresolved. Therefore, one of the scenarios includes a payment for land purchase.

The financial scenarios include a monthly loan repayment cost of 10 per cent of the total loan value for capital costs. This monthly rate of repayment assumes that the community organization obtains a loan to pay for the capital costs incurred and repays the loan on a monthly basis over a 12-month loan period. The average bank interest rate for a loan in Cambodia is approximately 20 per cent per annum. At this rate, the original loan would be paid off in one year. After the loan repayment term, the financial viability of the project would change and would probably improve. It will be important for the community organization to re-evaluate both component costs and household fees at the end of the repayment term. The following scenarios are meant to model the first year of operation, when the operating costs of a CBWM system would need to include interest paid on loans.

c. Revenues

Fees. Although the fee payment rates change in the following scenarios, it is assumed that all households would pay the same monthly fee of US$ 1, the amount paid by MICC's current customers. A cross-subsidizing system could be accommodated within this fee structure if the average household fee remains close to US$ 1. One of the scenarios models the possibility of a lower fee rate of US$ 0.75.

Fee payment rate. The first household survey revealed that 50 per cent of the respondents in the study community were willing to pay US$ 1 per month for a door-to-door collection service and 14 per cent said that they might pay. The remaining households were not willing to pay for collection. After the education programme, the reported willingness-to-pay among the "yes" group rose slightly to 54 per cent, while the "maybe" group rose to 31 per cent, for a total of 85 per cent who were definitely or maybe willing to pay. Based on these results, and recognizing that most previous research has found that stated willingness-to-pay can often be much lower than actual payments,[24] we include payment rates of 75 per cent, 60 per cent and 40 per cent in the scenarios below. We also include an optimistic scenario of 90 per cent fee payment, based on the somewhat surprising finding of one study by Salequzzamana and colleagues[25] that, after one year of operations, more than 90 per cent of the residents at different sites in Bangladesh were paying for their community-based collection service despite the fact that before the programmes started only about one-third said that they would be willing to pay for collection.

Commercial fees. CSARO charges US$ 5–10 per month for commercial waste collection in Phnom Penh; MICC negotiates its prices with Siem Reap businesses on a case-by-case basis. This is a flexible revenue category that depends on the details of fee structure. The scenarios assume revenue of approximately US$ 100 from commercial sources, which is a best estimate since some commercial establishments may have been missed in the original survey work and a rate of payment for these establishments has not yet been negotiated. Households running businesses may require special payment arrangements. For example, they could pay only the commercial rate for waste collection and be exempt from paying household fees. This is another design element that would need to be decided by the community organization.

24. For example, willingness-to-pay for a community-based collection service in Bangalore was 72 per cent before the project started, but the actual payment rate ranged from 36 to 50 per cent after the project began. See reference 9, Moningka (2000).

25. Salequzzamana, M, S Awal and M Alam (accessed October 2003), "Willingness-to-pay for community-based solid waste management and its sustainability in Bangladesh", accessed online at http://www.mesa.edu.au/aaee_conf/Salequzzaman_Awal-Alam.PDF.

VIII. SCENARIOS

Following is a set of financial scenarios for the CBWM project in the study area (Tables 2 to 8). They are meant to show a range of prices for secondary collection that may be affordable by the community.

a. Scenario 1: high expenditure / honorarium / education

In this scenario, the project pays 10 per cent of the collected fees to the volunteer community organizers as an honorarium for collecting a high percentage of fees (Table 2). It is assumed that not all residents in the study area will pay the fee for the waste collection service; 60 per cent, 75 per cent and 90 per cent fee payment rates are modelled to give a hypothetical range of how different fee payment rates affect the financial feasibility of the project. These higher rates of fee payment are assumed

to be the result of the 10 per cent collected fee incentives for fee collectors and the US$ 100 cost for educational efforts.

The high expenditure scenario includes renting a motorcart and hiring a driver, which assumes higher monthly costs than if the community itself invested in a motorcart and paid on a monthly instalment plan (as modelled in Scenario 2). However, monthly rental avoids the risks of taking out a loan and the risk of incurring this purchase cost should the project fail part way through the year.

In this scenario, it is assumed that two handcarts would be purchased to assist with collection. It is also assumed that land would not be donated for the storage of waste before secondary removal. The land is valued at a cost of US$ 500, as suggested by local officials. Ten per cent of the purchase price of the land and equipment is included as a monthly repayment cost.

The collector is paid US$ 100 per month. This amount is less than that received by CSARO workers in the CBWM project in Phnom Penh but is twice the rate paid to MICC workers. The higher payment rate is justified from a poverty reduction perspective (such as that taken by CSARO). In addition, fair wages are conducive to retaining workers and achieving project sustainability.[26]

26. See reference 9, Pfammatter and Schertenleib (1996).

The total monthly costs add up to US$ 654 (US$ 575 + US$ 79) without the secondary collection costs. Depending on the rate of fee payment, the project will be able to afford secondary collection at a price of between – US$ 14 (US$ 540 + US$ 100 – US$ 654) and US$ 256 (US$ 810 + US$ 100 – US$ 654) per month (the negative dollar value at the bottom of the range indicates that this is not a financially viable scenario).

TABLE 2
Scenario 1 worksheet: costs and revenues before secondary collection

Operating cost items	Monthly operating costs (US$)	Capital cost items	Monthly capital cost payments (US$)	Fee payment type and rate	Monthly revenues (net of honorarium) (US$)
Motorcart rental and driver's wages	250	Uniforms	(30)	60% residential fee payment	(600–10%) = 540
Collector's wages	100	10% monthly payment for uniforms	3	75% residential fee payment	(750–10%) = 675
Fuel	105	Land for waste storage pre secondary removal	(500)	90% residential fee payment	(900–10%) = 810
Equipment maintenance	20	10% monthly payment for land	50		
Education	100	Two handcarts	(260)	Commercial fees	ca. 100
Honorarium	Subtracted from fee totals	10% monthly payment for handcarts	26		
TOTAL	**575**	**TOTAL**	**79**	**TOTAL**	**640–910**

As noted above, MICC has recently suggested that the project pay 50 per cent of all fee revenue for secondary collection services. In this scenario, giving 50 per cent of the fees to MICC for secondary waste removal affects the affordability of the project as displayed in Table 3.

The resulting negative value of the funds remaining in each fee payment rate scenario indicates that there is no fee payment rate that will support giving 50 per cent of the fees collected to MICC for secondary waste removal. Even with a fee payment rate of 100 per cent, the net revenues are negative. Because the community can afford to pay up to US$ 256 for secondary collection (assuming a 90 per cent fee payment rate and US$ 1,000 in revenues including commercial fees), the greatest percentage of revenues that the community can afford to pay MICC for its services, even with a high fee payment rate of 90 per cent, is 25.6 per cent.

b. Scenario 2: low expenditure / motorcart

This scenario models a more capital-intensive arrangement (Table 4). The community purchases a motorcart, and ten per cent of the purchase price is included as a monthly cost for the first year until the motorcart is paid off. In addition, this scenario does not include handcarts and so assumes that the collector will walk alongside the motorcart for household collection. Labour is priced at the same level as for MICC workers (US$ 50 for the collector and US$ 75 for the driver). This scenario therefore requires more of its workers for lower rates of pay, and may not be as successful in retaining employees.

This scenario does not pay the community organization a 10 per cent honorarium and does not include funding for ongoing educational efforts. Because of this lack of educational efforts and incentives, lower fee payment rates are modelled than in the high expenditure scenario.

The rates of resident fee payment are 40 per cent, 60 per cent and 75 per cent in this scenario. The low end estimate is based on the assumption that about half of the 85 per cent of respondents from the follow-up survey who stated that they would be willing or may be willing to pay the US$ 1 fee will actually pay it. Also included in this scenario is a lower fee of 3,000 Riels (US$ 0.75), with hypothetical payment rates of 60 per cent, 75 per cent and 80 per cent; it is assumed that the lower fee increases willingness-to-pay.

TABLE 3
MICC 50 per cent fee proposal for Scenario 1

Residential fee payment rate	Monthly revenues (US$ 1 fee + commercial fees) (US$)	50% remaining after paying MICC (US$)	Fixed costs to be subtracted (monthly costs, capital costs and honorarium) (US$)	Remaining funds (US$)
60%	600 + 100 = 700	350	575 + 79 + 60 = 714	350–714 = –364
75%	750 + 100 = 850	425	575 + 79 + 75 = 729	425–729 = –304
90%	900 + 100 = 1,000	500	575 + 79 + 90 = 744	500–744 = –244

TABLE 4
Scenario 2 worksheet: costs and revenues before secondary collection

Operating cost items	Monthly operating costs (US$)	Capital cost items (US$)	Monthly capital cost payments (US$)	Fee payment type and rate	Monthly revenues (US$ 1 fee) (US$)	Fee payment type and rate	Monthly revenues (US$ 0.75 fee) (US$)
Labour (collector and driver)	125	Uniforms	(30)	40% residential fee payment	400	60% residential fee payment	450
Fuel	105	10% monthly payment for uniforms	3	60% residential fee payment	600	75% residential fee payment	562.50
Equipment maintenance	20	Motorcycle	(650)	75% residential fee payment	750	80% residential fee payment	600
		10% monthly payment for motorcycle	65	Commercial fees	ca. 100	Commercial fees	ca. 100
		Motorcart	(240)				
		10% monthly payment for motorcart	24				
TOTAL	**250**	**TOTAL**	**92**	**TOTAL**	**500–850**	**TOTAL**	**550–700**

Total costs before secondary collection are US$ 342 (US$ 250 + 92). Based on a US$ 1 fee, the project can afford to pay between US$ 158 (US$ 500 – US$ 342) and US$ 508 (US$ 850 – US$ 342) for secondary collection. Based on a US$ 0.75 fee, the project can afford to pay between US$ 208 (US$ 550 – US$ 342) and US$ 358 (US$ 700 – US$ 342) for secondary collection. This scenario presents a wide range of costs; it is important to note that without educational efforts or an honorarium, it is likely that the fee payment rate will be at the lower end of the range.

In this scenario, giving 50 per cent of the fees to MICC for secondary waste removal affects the affordability of the project as displayed in Tables 5 and 6.

Assuming the community pays MICC 50 per cent of its revenues, the breakeven point for Scenario 2's US$ 1 fee is a 58 per cent fee payment rate, while for the US$ 0.75 fee it is much higher at 78 per cent. Thus, it is possible to meet MICC's demand for 50 per cent of total fees while achieving positive net revenues. The major reasons why this scenario is potentially financially feasible and the first scenario is not are that Scenario 2 assumes that the workers are paid lower wages, that the community will not have to pay a large amount of money to buy land for secondary collection storage space, and that the fee collectors are able to attain relatively high fee payment rates (58 to 78 per cent) without being paid an honorarium. Unfortunately, none of these assumptions is necessarily tenable or sustainable in the study area.

TABLE 5
MICC 50 per cent fee proposal for Scenario 2 – US$ 1 fee

Residential fee payment rate	Monthly revenues (US$ 1 fee + commercial fees) (US$)	50% remaining after paying MICC (US$)	Fixed costs to be subtracted (monthly costs, and capital costs (US$)	Remaining funds (US$)
40%	400 + 100 = 500	250	250 + 92 = 342	250–342 = –92
60%	600 + 100 = 700	350	250 + 92 = 342	350–342 = 8
75%	750 + 100 = 850	425	250 + 92 = 342	425–342 = 83

TABLE 6
MICC 50 per cent fee proposal for Scenario 2 – US$ 0.75 fee

Residential fee payment rate	Monthly revenues (US$ 0.75 fee + commercial fees) (US$)	50% remaining after paying MICC (US$)	Fixed costs to be subtracted (monthly costs, and capital costs (US$)	Remaining funds (US$)
60%	450 + 100 = 550	275	250 + 92 = 342	275–342 = –67
75%	562.50 + 100 = 662.50	331.25	250 + 92 = 342	331.25–342 = –10.75
80%	600 + 100 = 700	350	250 + 92 = 342	350–342 = 8

c. Scenario 3: medium expenditure / honorarium

In this scenario, it is assumed that motorcart services are rented on a monthly basis at a rate of US$ 250 per month, and no handcarts are used to assist with collection (Table 7). No equipment maintenance is included in this scenario as it is assumed that the owner/leaser of the vehicle will cover these costs. The waste collector is paid US$ 75 per month in this scenario.

Ten per cent of fee payment is allocated to a fee collector and 5 per cent is allocated to educational activities. Figures are given for hypothetical fee payment rates of 60 per cent, 75 per cent and 90 per cent.

The total monthly costs in this scenario add up to US$ 433 (US$ 430 + US$ 3) before secondary collection. In this scenario, the community can afford to pay from US$ 177 (US$ 610 – US$ 433) to US$ 432 (US$ 865 – US$ 433) per month for secondary collection, depending on fee payment rates. In this final scenario, giving 50 per cent of the fees to MICC for secondary waste removal affects the affordability of the project as follows (Table 8).

TABLE 7
Scenario 3 worksheet: costs and revenues before secondary collection

Operating cost items	Monthly operating costs (US$)	Capital cost items	Monthly capital cost payments (US$)	Fee payment type and rate	Monthly revenues (net of honorarium and education charge) (US$)
Motorcycle and motorcart rental and driver's wages	250	Uniforms	(30)	60% residential fee payment	(600–15%) = 510
Collector's wages	75	10% monthly payment	3	75% residential fee payment	(750–15%) = 637.50
Fuel	105			90% residential fee payment	(900–15%) = 765
Honorarium and education (15%)	Subtracted from fee totals			Commercial fees	ca. 100
TOTAL	**430**	**TOTAL**	**3**	**TOTAL**	**610–865**

TABLE 8
MICC 50 per cent fee proposal for Scenario 3

Residential fee payment rate	Monthly revenues (US$ 1 fee + commercial fees) (US$)	50% remaining after paying MICC (US$)	Fixed costs to be subtracted (monthly costs, capital costs, and honorarium (US$)	Remaining funds (US$)
60%	600 + 100 = 700	350	430 + 3 + 90 = 523	350–523 = –173
75%	750 + 100 = 850	425	430 + 3 + 112.50 = 545.50	425–545.50 = –120.50
90%	900 + 100 = 1,000	500	430 + 3 + 135 = 568	500–568 = –68

As in Scenario 1, there is no fee payment rate that will result in positive net revenues if the community is paying 50 per cent of its collected fees to MICC. Assuming a high 90 per cent fee payment rate (and therefore total revenue of US$ 1,000 and net revenue of US$ 432), the greatest percentage of total revenue that the community could afford to pay to MICC is 43.2 per cent. Although not meeting MICC's demands, this revenue percentage is fairly high and leaves room for the possibility that just a small top-up from local authorities would make secondary collection feasible.

IX. DISCUSSION

All of the above scenarios indicate that the design of a CBWM system, the project component costs, fee payment rates and educational efforts all affect the financial feasibility of a project.

The labour-related costs in Scenarios 3 and 1 are higher than those in financially feasible Scenario 2, partly because of the costs of renting a motorcycle and motorcart instead of buying one. Despite the risks involved in taking out a loan for a capital purchase, it seems that investing in a motorcycle and cart makes more financial sense for the community, especially when the loan is being paid back over an entire year. The three scenarios modelled above also demonstrate that labour costs are dependent on both the number of staff employed and the rates of pay that the community decides upon. While there is a strong rationale for using a community-based service as a means to mediate poverty through generous staff wages (as CSARO does), this analysis suggests that the service needs to be financially sustainable first and foremost. We therefore recommend that the community pay its collectors wages commensurate with those paid to MICC's waste collectors in the town of Siem Reap.

The lack of honorarium in Scenario 2 makes that service model more affordable, if potentially less sustainable. However, Scenario 3 suggests that investment in community education and honorariums for fee collectors are worth the costs if they result in higher fee payment rates. We recommend that the community invest in community education on both broad environmental issues and on waste management in particular. We also recommend that the community-based waste management system include a percentage-based honorarium for its fee collectors in order to maintain high fee payment rates.

In summary, we recommend a set-out waste collection system that incorporates elements of all three scenarios, including the purchase and financing of a motorcycle, a motorcart and other equipment; workers' wages commensurate with the wages paid by MICC; fee collector honorariums based on fee payment rates; and environmental education for community members.

The secondary collection fee to be charged by MICC remains the biggest uncertainty regarding feasibility, and cannot be resolved without further negotiation. For this reason, the project has remained stalled.

In order to better appreciate the impasse between MICC and other stakeholders (including the community, government representatives and the research team), it is useful to consider not just the positions that these actors have taken but also the interests behind these actions. In particular,

the reliance on a private company to provide non-replaceable services (namely, secondary removal of waste and gaining access to the final disposal site) introduces a profit motive to the dynamic of the CBWM project. The key informant interviews indicate that non-commercial community stakeholders (including commune leaders, government workers, local educators and religious figures) may have diverse motives for supporting a community-based waste management system, such as aesthetic, environmental, health-related or governance concerns. While these interests may cause conflict at times, in this particular situation it is the financial restraints imposed by MICC that have impeded the progress of the CBWM project.

MICC representatives have not been open to a discussion on service payment based on their costs. They have not provided the community with estimates of the costs that would be associated with their participation in this project, and have instead insisted on 50 per cent of any revenue generated by the project. Their attitude suggests that MICC is more interested in tapping whatever monetary potential exists in the community than in providing waste management services to a currently unserviced area. This is not a surprising attitude from a profit-driven organization.

In order to overcome this impasse, it is important to recognize the distinctly economic interests of MICC. Potential solutions include offering a government subsidy to cover MICC's costs in the study area, or increased government pressure on MICC to undertake secondary collection from the study area as a part of their current contract with the municipality. The former strategy is unlikely because of the financial constraints faced by local government, while the latter strategy is no longer as feasible as it once was. In May 2004, at the beginning of this study, the community had strong support for their proposed collection scheme from the governor of Siem Reap province. However, when a new governor was appointed to the province after the elections in 2005, this support disappeared because he had no interest in or knowledge of community-based programs. With little political support after this point, there was no pressure on MICC to change its position.

Alternatively, the community could seek financial assistance (from government or NGO sources, perhaps) to bypass MICC and finance secondary collection and final disposal themselves. This option would not be the most cost effective; because MICC already owns collection trucks and has a contract for reduced-cost access to the local dumpsite, money would be best spent through these existing structures. However, MICC's unwillingness to negotiate with the community leaves few options. This case study highlights the crucial importance, noted previously in the literature, of obtaining cooperation from local authorities (or their private sector partners) in arranging for secondary collection. It also supports the assertion by Kingdon[27] that policy champions, or what he refers to as "policy entrepreneurs" (in this case, the governor), can play a key role in making or breaking a policy solution.

Another form of financial assistance that would have a positive impact on the feasibility of the project is a subsidy from local government or from an NGO for some of the start-up costs, such as land purchase or equipment purchase. Unfortunately, this source of funding was not available in Siem Reap and is unlikely to be available for large-scale implementation of CBWM projects in Cambodia.

27. Kingdon, J W (2003), *Agendas, Alternatives and Public Policy*, Second Edition, Longman, New York, 280 pages.

X. CONCLUSION

The above financial scenarios rest upon certain assumptions and premises. For example, for a CBWM project to be effective, local buy-in is important. As noted above, the reluctance of MICC to negotiate with the CBO has stalled the implementation of a CBWM project. However, MICC is not the only actor whose buy-in is necessary to make CBWM a success in the study area. The key informant interviews revealed that representatives from provincial and municipal government, the two communes in the study area, a school and a *wat* in the study area were all extremely supportive of the proposed project. Without this support, we would not have enjoyed the level of community access required to complete our study.

Local buy-in is also central to creating a community-based organization that has authority and legitimacy in the study area, especially since Cambodian communes have an increasing amount of power and influence with respect to local services.[28] An effective CBO is also required in order to actualize the fee payment rates, participation rates and educational programmes modelled above.

Finally, meaningful community participation is also required for the success of a CBWM project. If people are not willing to pay the fees for the service, the financial structures proposed here will not be successful. Community buy-in for all of the elements listed above was generally strong for the proposed project. However, buy-in from the private sector and provincial government was not. Without buy-in from all stakeholders, the best laid plans for CBWM (and the accompanying budget sheets) are rendered irrelevant.

28. Romeo, L and L Spyckerelle (2004), "Decentralization reforms and commune level services delivery in Cambodia", Case Study submitted at a Workshop on Local Government Pro-Poor Service Delivery, 9–13 February, Manila.

REFERENCES

Ali, M and M Snel (1999), "WELL study – lessons from community-based initiatives in solid waste", London School of Hygiene and Tropical Medicine, UK, and WEDC, Loughborough University, UK.

Anand, P B (1999), "Waste management in Madras revisited", *Environment and Urbanization* Vol 11, No 2, October, pages 161–176.

Anschütz, J (1996), "Community-based solid waste management and water supply projects: problems and solutions compared, a survey of the literature", Working Document 2, Urban Waste Expertise Programme, accessible online at www.waste.nl.

Assaad, R (1996), "Formalizing the informal? The transformation of Cairo's refuse collection system", *Journal of Planning Education and Research* Vol 16, pages 115–126.

Cissé, G (2003), "From community-based organization to low-income private contract for solid waste collection in a poor settlement", CWG Workshop, 9–14 March, Dar es Salaam.

D'Monte, D (2005), "How much difference does UNESCO make?", *The Art Newspaper*, accessible online at www.globalheritagefund.org.

Enayetullah, I and A H M M Sinha (2000), "Community-based decentralized composting: experience of Waste Concern in Dhaka", in A H M M Sinha and I Enayetullah (editors), *Community-based Solid Waste Management: The Asian Experience*, Waste Concern, Dhaka, Bangladesh, pages 63–77.

ENDA/WASTE co-publication (1997), "La participation de la communauté à la gestion des déchets solides à Burkina Faso: collecte des ordures ménagères à Ouagadougou", accessible online at www.waste.nl.

Khulna City Corporation and Swiss Agency for Development and Cooperation (2000), "Community-based pilot project on solid waste management in Khulna city: general project description", accessible online at www.wsp.org/publications/sa.

Kingdon, J W (2003), *Agendas, Alternatives and Public Policy*, Second Edition, Longman, New York, 280 pages.

Moningka, L (2000), "Community participation in solid waste management: factors favouring the sustainability of community participation, a literature review", UWEP Occasional Paper, WASTE, Gouda, The Netherlands.

Muller, M S, A Iyer, M Keita, B Sacko and D Traore (2002), "Differing interpretations of community participation in waste management in Bamako and Bangalore: some methodological considerations", *Environment and Urbanization* Vol 14, No 2, October, pages 241–257.

Parizeau, K, V Maclaren and Lay Chanthy (2006), "Waste characterization as an element of waste management planning: lessons learned from a study in Siem Reap, Cambodia", *Resources, Conservation and Recycling* Vol 49, No 20, pages 110–128.

Pfammatter, R and R Schertenleib (1996), "Non-governmental refuse collection in low-income urban areas: lessons learned from selected schemes in Asia, Africa and Latin America", Swiss Federal Institute for Environmental Science and Technology (EAWAG) and SANDEC, Duebendorf, Switzerland.

Romeo, L and L Spyckerelle (2004), "Decentralization reforms and commune level services delivery in Cambodia", Case Study submitted at a Workshop on Local Government Pro-Poor Service Delivery, 9–13 February, Manila.

Salequzzamana, M, and S Awal and M Alam (accessed October 2003), "Willingness-to-pay for community-based solid waste management and its sustainability in Bangladesh", accessible online at http://www.mesa.edu.au/aaee_conf/Salequzzaman_Awal-Alam.PDF.

Siem Reap Province, Department of Planning (2008), "Siem Reap in figures," accessible online at www.siemreap-town.gov.kh/en.

Siem Reap Department of Environment (2003), "Report on solid waste management in Siem Reap", Siem Reap, Cambodia.

van de Klundert, A and J Anschütz (2001), "Integrated sustainable waste management – the concept", WASTE, Gouda, The Netherlands.

Wang'ombe, J (1995), "Public health crises of cities in developing countries" *Social Sciences and Medicine* Vol 41, pages 857–862.

Zurbrügg, C, S Drescher, I Rytz, A H Md Maqsood Sinha and I Enayetullah (2005), "Decentralized composting in Bangladesh, a win–win situation for all stakeholders", *Resources, Conservation and Recycling* Vol 43, pages 281–292.