

## X. GETTING RID OF URBAN WASTES

The problems of solid waste are overwhelming Asian cities. This session helped share experiences and good practices of waste management in different cities.

Ms. Mary Jane Ortega described her administration's efforts in San Fernando, Philippines, to change archaic systems and develop new arrangements for waste segregation, transportation, and controlled dumping. Mayor Ortega emphasized that waste management, just like other critical urban problems, is best tackled in partnership with communities. She described how the NIMTO (not in my term of office) phenomenon—when political leaders refrain from taking far-sighted but not 'popular' decisions—is afflicting Asian cities. Mayors were urged to avoid this syndrome and act with foresight on waste management issues.

Mr. A.H. Md. Maqsood Sinha described the process of decentralized community-based composting, which has been introduced by his organization in Dhaka and other cities across Bangladesh. This innovative process has several benefits in addition to reducing the cost of managing the enormous amount of domestic waste. It frees land that would have otherwise been used for centralized landfilling, creates employment, and reduces the extensive use of chemical fertilizer in the soil. The presentation went on to draw pertinent lessons from the experiment.

Dr. Kunitoshi Sakurai put forth a very useful step-by-step guide for improving solid waste management in cities. He outlined the problems

related to municipal solid waste management in Asian cities and highlighted the fact that even though provision of collection and disposal services for municipal refuse often consumes as much as 20 to 40 percent of municipal revenues, it is not perceived as deserving high priority. He also emphasized that institutional strengthening and sound management practices are essential requirements to ensure efficient service provision, and listed some key strategies towards better solid waste management.

One of the most pertinent issues raised in the ensuing discussion was related to waste management in slums and informal settlements. The poor and disadvantaged people who inhabit such settlements are the worst affected by the pollution and unsanitary living conditions caused by waste mismanagement. Local governments, through mayors and other city officials, play a key role in decision making for urban waste management. This role must be performed in partnership with a wide cross-section of stakeholders in order to ensure sustainability.

*Suggestions for improved, efficient, and effective waste management emphasized reduction in the volume of waste entering the municipal system.*

Suggestions for improved, efficient, and effective waste management emphasized, first and foremost, reduction in the volume of waste entering the municipal system. This can be done through adoption of techniques such as waste segregation at source, community-based composting, etc. It was also highlighted that legislation related to solid waste needs to be strengthened and stringently enforced. Also, inclusion of the informal sector in solid waste management, especially collection, segregation, and recycling is important. Private-sector participation emerged as a useful mechanism that is being used by a number of cities across Asia for tasks ranging from primary and secondary collection to disposal of waste. However, whatever the technological and management options adopted, community awareness and involvement are critical to the success of the intervention.

**MARY JANE C. ORTEGA**

Mayor, City of San Fernando, Philippines

San Fernando City lies 270 kilometers north of Manila. It became a city by an Act of Congress in 1998. The population is 102,000 during weekends but about 130,000 to 150,000 during weekdays because, aside from being a provincial and regional capital, it is also a center of education and trade. The city prides itself in being one of the most peaceful cities of a peaceful region.

**Municipal Solid Waste Disposal System**

San Fernando generates an average daily per capita waste of 0.30 kilograms. Out of the 59 barangays or villages, only 26 barangays, mostly urban, are serviced by the open dumpsite in Barangay Canaoay, a village near the airport. The 33 barangays in the rural mountain area resort to backyard dumping, composting, or burning.

As the host of Wallace Air Base, San Fernando was the recipient of a grant from USAID for the construction of a sanitary landfill in 1983. San Fernando, under then Mayor—now Governor—Justo O. Orros, Jr., bought 4.5 hectares of land as the site; USAID built the fence and building for the landfill. In 1986, USAID turned over the building, but the municipal government could not operate the landfill because of lack of such components as a backhoe, bulldozers, grader, and garbage trucks. Also the access road to the site was not then paved.

It was only in 1997 that the site was used as an alternative to the old site in Barangay Canaoay. It was not an engineered landfill; we operate it as a sanitary landfill. We work on a day-to-day basis, i.e. the backhoe digs what is needed for the garbage collection of the day, the grader covers the garbage with soil, and the bulldozer compacts the area. Our two compactors were given by the Japan

International Cooperation Agency because we were consistent winners in the Clean and Green Program.

### **Garbage Containers and Sanitary Technicians**

*We conducted consultations with stakeholders such as the sanitary technicians or garbage collectors and learned about their difficulties.*

We conducted consultations with stakeholders such as the sanitary technicians or garbage collectors and learned about their difficulties. For instance, since we do not have lifters, we used empty drums for garbage collections. These drums were distributed along the highway and in some designated areas. During garbage collection, the garbage collectors would first manually transfer some of the trash to a bamboo basket, or *tiklis*, because the full drum was too heavy to lift. When the drum was half empty, they would lift it and throw the rest of the garbage into the truck.

So, we innovated. We replaced the drums with concrete garbage containers in the shape of the *tiklis* so that people cannot steal or move them elsewhere. These concrete containers were marked *NABUBULOK* and *HINDI NABUBULOK*, meaning biodegradable and nonbiodegradable, respectively. This was also our way of educating the people to segregate wastes at source.

We chose the *tiklis* shape so that we could put the bamboo basket into the containers. Now our garbage collectors do not have to transfer the garbage manually. All they have to do is lift the bamboo baskets and throw the waste directly into the truck. Another reason for the use of *tiklis* is that they are biodegradable, unlike plastic bags. We have asked weavers to weave wire along the ears and bottom of the baskets to make them stronger. We have a village that specializes in weaving bamboo baskets; thus, they gain an additional means of livelihood.

The garbage collectors also complained about the varied kinds of trash they pick up, especially from hospitals. We contacted the

hospitals about this and encouraged them to use the incinerator purchased by the Regional Medical Center. In our educational drive, we also emphasized that no dead animals should be thrown in the garbage containers.

Since our garbage trucks are few and prone to breakdowns, we encouraged the wealthier villages to purchase their own garbage trucks. Three barangays have already done so. We pay them a certain sum to cover the salaries of drivers and garbage collectors.

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## **Waste Pickers**

There are 20 waste pickers who were originally working at the open dumpsite at Canaoay. They travel 12 kilometers daily and when they complained that the cost of transportation had increased, I offered them a small capital grant for a livelihood project. This would save them from commuting while at the same time help the city government train new waste pickers in the new area. They showed interest in being helped with other livelihood activities, but wanted to continue working as waste pickers. When I asked them to choose one or the other, they chose to remain waste pickers. This proves that there is money in recyclable materials.

The waste pickers are not city government employees but are under contract with the *barangay* captain of Mameltac, the site of the sanitary landfill. In turn, the *barangay* captain pays the city P5,000 monthly for the exclusive right to pick the recyclables and he sells them to a factory 200 kilometers south of the city. This factory sends a truck to pick up the recyclable materials every two weeks. As our way of supporting the wastepickers, our City Health Office gives them annual health checks. We also constantly remind them not to allow their minor children to help them at the landfill.

The sanitary technicians used to pick the recyclables themselves and would even allow their friends to come up into the truck to select and pick trash while making the routes. We discouraged this because it scattered plastic and paper from the truck during segregation. Besides, this practice reduced the quantity of trash available to the waste pickers.

### **Social Impact**

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*We have encouraged tour visits for that Council and other NGOs.*

The Parish Pastoral Council used to be against the landfill because they had not seen a model landfill. The concept they had of landfills is what we have in Manila, which is far from being a model. We have encouraged tour visits for that Council and other NGOs to the landfill site. We have also asked the school principals to bring students on a field trip once a year to the landfill and to the ten-hectare botanical garden so that students can appreciate the importance of waste management and the greening of the countryside.

We explained to the different stakeholders the "not in my backyard" (NIMBY) and the "not in my term of office" (NIMTO) syndromes. NIMBY refers to people who throw their trash into idle land but not their backyard, and to people who want their trash collected but not dumped in their own community. NIMTO refers to most political leaders, who do not want to confront the problem of trash. They do not care if a leachate affects an aquifer; instead they leave the problem for the next chief executive. Normally, the mayors' term of office is only three years but we can be re-elected twice, for a total of nine years.

We espouse that we should tackle the problems now. We have seven hectares of land and we are in the process of acquiring another two hectares. We hope to increase the area to ten hectares, and with proper recycling, composting, and waste management, we hope to stretch the life span of the landfill to at least fifteen years.

## **Solid Waste Ecological Enhancement Program**

San Fernando is one of the six LGUS participating in the Solid Waste Ecological Enhancement Program (SWEEP) of the Department of Environment and Natural Resources (DENR), through which we were given a feasibility study grant for a landfill by the Canadian International Development Agency through the World Bank. Golder Associates, a Canadian firm, won the bid for the feasibility studies. They required an increase in the original landfill area of 4.5 hectares. While we were in the process of negotiating for the acquisition of additional land, Golder started the feasibility study.

During their visits, we learned more about the proper operation of a landfill. Aside from engineering landfill experts, they also sent a sociologist who advised us as we conducted public consultations on the need for an engineered landfill, on properly managing the relocated residents of the newly acquired land, and on other important benefits of the landfill. They also advised us that our soil is mainly clay that could be used to line the future engineered landfill. We were also advised not to dig deeper than three meters so as not to affect the aquifer.

Golder and Associates knew that our budget was limited to P80 million, and we wanted an engineered landfill that could address the problems of leachate, methane gas collection, and vermin. They assured us that with that budget, we could have a functional and environment-friendly landfill.

We have submitted the feasibility study to DENR for their Environmental Certificate Clearance, and have made arrangements with the World Bank for a loan to construct the landfill. The loan is payable in 15 years with a three-year grace period. So far, we have had the support of all community residents, although some detractors made an issue

about putting the next generation into debt because of the loan. I told them the project would benefit not only today's generation, but also the next. Therefore, they should share in the cost.

Through SWEEP, we undertook a two-week study tour in the USA in 1998. In one location, we saw a landfill beside a subdivision. There was a buffer zone and pipes installed for emitting scents. Cinnamon is emitted at lunch time and lime or lemon in the evening. We cannot afford to do that. However, we planted 200 scented trees and fragrant flowering plants on our landfill site so that aside from beautifying the place, we could have fragrant scents.

Our landfill, although not yet engineered, is a site for study tours by LGUs. Such visitors are briefed about our City Development Strategy (CDS), which was developed through technical assistance from the World Bank. In the CDS, the environment is one of our main thrusts because we believe that aside from helping create a sustainable environment, it is the key for tourism and economic growth. The visitors are also briefed about how we maintain, operate, and make the landfill healthy and beautiful. We have shown them that lack of funding is not a deterrent to improving the status quo. Through innovation, consultation, participation, and the wholehearted support of all sectors of the community, we can move ahead.

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### **Solid Waste Association of the Philippines**

During our visit to the USA, we were hosted by the Solid Waste Association of North America (SWANA), which has been in existence for 36 years. I suggested that we form a Solid Waste Association of the Philippines (SWAP), composed of the LGUs participating in SWEEP, so that we could echo what we have learned.

A year later, the World Bank and USAID funded the first National Solid Waste Conference

in Manila. Before this, we met in Cebu to share best practices in solid waste management, when the organization of SWAP became a reality. During the Solid Waste Conference, we presented the draft constitution and by-laws of SWAP. These were approved by the participants and SWAP was registered with the Securities and Exchange Commission. SWANA presented SWAP a plaque on its organization and technical assistance was made available to our members.

## Conclusion

Education in whatever field cannot be done overnight. It is a slow, tedious process. We should concentrate on the youth but we should not neglect the adults. We must share the different best practices in the Philippines, but recognizing that one single best practice cannot answer the needs for comprehensive solid waste management. While recycling is good, it is only one component. In the US, 35 percent recycling is the target, but here in Asia, we can perhaps reach 60 percent, because there is money in trash and in a developing country, that is important. We have to teach our households to segregate at source, but we have the waste pickers to complete the segregation.

Composting, recycling, and reusing wastes are all good practices, but are not enough to address all the problems of waste. Landfills are also needed, and if we want to maximize the life of our landfills, all sectors have to cooperate to observe the different best practices.

Collecting garbage is a role of local government. We have to implement the user-pays principle. At present, our constituents feel that their taxes should answer for garbage collection, as this is one of the basic services due them. We collect garbage fees only from business establishments at a very minimal rate. During consultations, residents

*If we want to maximize the life of our landfills, all sectors have to cooperate to observe the different best practices.*

agreed to pay a minimal amount for garbage collection, but this was not enough to cover the cost of waste management. Thus, we further agreed that once the engineered landfill is in place, we would also collect garbage fees from residential areas.

The homes in squatter areas cannot afford to pay garbage fees, but that does not mean that this service will be denied them. In our squatter areas, as well as in 22 *barangays* that have been adopted by CBOs and NGOs, there is an Operation MIA ken MULA, which is advice to clean our surroundings and plant trees.

The Philippine Navy, which is based in our city, has been helping us clean the beaches on two days every month for the past two years. This has raised cleanliness awareness among residents in coastal areas.

**A.H. MD. MAQSOOD SINHA AND IFTEKHAR ENAYETULLAH**

Waste Concern, Dhaka City, Bangladesh

Dhaka, the capital of Bangladesh, is one of the fastest growing metropolises in the world, with an annual average growth rate of 6.6 percent. The population of Dhaka megacity in 1999 was estimated at 10.4 million in an area of 1,353 km<sup>2</sup>, while that of Dhaka City Corporation (DCC) was estimated at 6 million in an area of 344 km<sup>2</sup>. The six million residents of Dhaka generate about 3,000 tonnes of solid waste per day. The City Corporation is responsible for management of this enormous quantity of solid waste, only 42 percent of which is collected. The rest lies on roadsides, open drains, and low-lying areas, contributing to the deteriorating quality of Dhaka's environment.

There is, however, a gradual recognition of waste as a resource. In an attempt to recover the value from organic waste, Waste Concern, a

research-based NGO, initiated a pilot project in 1995 for community-based decentralized composting, integrated with primary collection of solid waste. Its purpose was to develop a composting technique that was not capital intensive; was located near urban residential areas; caused minimum nuisance from odors and flies; produced an environmentally safe product; and was suited to Dhaka's urban conditions.

Table X.1 shows the physical composition of solid waste from different areas of Dhaka City. It may be seen from the Table that a major portion (70 to 80 percent) of the solid waste in the mixed, residential, and commercial areas is organic (food and vegetable waste, garden waste, tree trimmings, and straw). This large proportion of organic waste indicates the potential of recycling it into compost. There is a good market for compost, because the land use in Greater Dhaka and its adjoining areas is mainly agricultural.

### Why Decentralized Composting?

The existing physical plan and socioeconomic situation of Dhaka strongly suggest decentralization of the composting system because

- a decentralized composting system is more labor intensive and less costly than centralized composting;
- such decentralization is well suited to our environmental, social, and economic conditions;
- low-cost, easily available local materials and simple technology can be used in this technique;
- such decentralization improves community participation in garbage separation and reduces the volume of solid waste at the source;

*A decentralized composting system is more labor intensive and less costly than centralized composting.*

**Table X.1. Composition of Solid Waste in the Dhaka City Corporation Area**

Component	Mixed Waste (% by weight)	Residential Waste (% by weight)	Commercial Waste (% by weight)	Industrial Waste (% by weight)
Food & Vegetable Waste	70.12	59.91	62.05	26.37
Paper Products	4.29	11.21	6.28	7.59
Plastic, Rubber, & Leather	4.71	17.67	4.62	6.01
Rags	–	–	–	–
Metals	0.13	0.15	0.28	–
Glass & Ceramics	0.25		0.37	–
Wood	0.16			–
Garden Wastes, Tree Trimmings, & Straw	10.76	8.76	2.86	4.32
Cloths	4.57		18.93	46.2
Rocks, Dirt, & Misc.	5.01	2.30	4.62	9.49
Moisture (%)	65	50	54	60

Source: World Bank

- significant improvement can be achieved in the collection of solid waste;
- the costs incurred for collection, transportation, and disposal of waste by municipal authorities are reduced; and
- income and job opportunities for the poor, socially-deprived informal workers, and small entrepreneurs are enhanced.

### **The Project: Community-based Decentralized Composting**

Waste Concern initiated a community-based decentralized composting project in Section-2 of Mirpur Housing Estate, Dhaka. A small vacant lot (1,000 square meters) was made available by the

Lions Club (Dhaka Northern) for a composting plant. The Lions Club initially allowed a three-month period to observe Waste Concern's performance. The plant has been in full operation since 1995 and the support of the Lions' Club has continued. The prime goal of this demonstration project was to explore the technical and commercial feasibility of labor-intensive, aerobic composting in Bangladesh.

### *Community Mobilization for Waste Collection*

Waste Concern gave special attention to assessing the need and aspirations of the beneficiaries, and community involvement in the project. Thus, before initiating the project, Waste Concern conducted a questionnaire survey amongst the residents of the estate to determine their opinion on solid waste management, willingness to participate in any improvement program, and their willingness to contribute. The survey revealed that more than 80 percent of the residents of the locality were not satisfied with the existing solid waste management service of the DCC. Most respondents supported the idea of an alternative door-to-door solid waste collection scheme. In addition, 77 percent of the surveyed households were willing to pay Tk15 to 60 per month to any organization for door-to-door waste collection. These findings encouraged Waste Concern to initiate the project. (The remaining 23 percent of respondents said they would not pay for this service since they are already paying conservancy tax to the DCC.)

In addition to community mobilization, Waste Concern has also been working to build awareness among the city dwellers regarding source separation, recycling, and resource recovery of solid waste. Waste Concern has developed posters, training manuals, training programs, and research for building awareness. It has also established links

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with the residents' association in the project neighborhood.

### *Identification of Potential Users of Compost*

Before starting the project, we conducted a detailed survey of farmers as potential users of compost, which showed that there was good demand for compost in Dhaka and adjoining areas. In fact, 94 percent of the farmers in one area were interested in buying compost. It was alarming to note from the survey that present farm yields were less than that 10 years before. Nearly 80 percent of the farmers blamed this on excessive use of chemical fertilizer and lack of organic manure. Most respondents stated that they were not using organic manure simply because it was unavailable.

### *Collection of Solid Waste*

The door-to-door system introduced by Waste Concern now collects two tonnes of domestic organic waste (free from toxic and clinical wastes) per day from 700 households in the project area. Modified rickshaw vans are used for collection. Solid waste from the restaurants and vegetable markets is also collected.

The door-to-door solid waste collection scheme of Waste Concern has a demonstration effect as well. Some 200 households are participating in a similar program run by another CBO, while adjoining neighborhoods have also started door-to-door solid waste collection schemes and formed CBOs. Waste Concern plans to expand its waste collection activities to 1,000 households and has also launched an environmental awareness program with the help of the community.

For door-to-door waste collection, the households each pay a monthly charge of Tk15. Initially the fee was Tk10 per month, and was

*Adjoining neighborhoods have also started door-to-door solid waste collection schemes and formed CBOs.*

increased as households appreciated more the benefits and service. Income from the solid waste collection service is spent on the wages of the part-time van drivers and waste collectors. The system is thus self-sustaining. Waste Concern is planning to ask other CBOs working in the adjoining neighborhoods to bring their collected solid waste to the recycling and resource recovery plant.

*The system is self-sustaining.*

### *Composting Technique*

Two composting techniques were tested: the Chinese covered pile system and the Indonesian windrow technique. From field experimentation, it was found that the former was not appropriate for community-based projects due to odor problems, although it may be a viable option for composting in larger dumpsites. The Indonesian technique has some odor when the windrows are turned, but this is tolerable.

Thus, we used the aerobic Indonesian windrow technique. The collected solid waste is separated and sorted in the resource recovery (composting) plant located within the community. A carbon-nitrogen ratio of 35 to 50 is optimum for aerobic composting. The carbon-nitrogen ratio of solid waste is slightly higher (carbon, 22.6 percent; nitrogen, 0.4 percent) in Dhaka. At higher carbon-nitrogen ratios, nitrogen may be a limiting nutrient. In our project, we use chicken and cattle manure to optimize the nitrogen content. Sawdust is also mixed with the waste to increase air space, enabling proper aeration and reducing the density of the compost mixture.

The compostable organic waste is heaped into piles under a covered shed, which improves the efficiency of the decomposition. In addition, the shed protects the compost workers from rain and heat. To enable the bacteria to obtain sufficient oxygen, the pile is aerated using bamboo aerators.

A pile temperature of 55-65 °C is optimum for aerobic composting. Turning over the pile along with the bamboo aerators is the method used to maintain pile temperature. Turning associated with watering facilitates rapid decomposition and also moves the nondecomposing materials from the exterior of the pile into the interior, providing new food sources for the bacteria. The temperature of the pile determines when to turn it. The temperature is monitored and records are kept of temperature trends. The process of composting has very little odor.

The composting process requires 40 days for decomposition and another 15 days for maturing. After maturing, the compost is screened into different grades and packed for marketing. Waste Concern is trying to reduce the decomposition time by using inoculums (compost digester) to accelerate decomposition. At present, 500 kg of compost is produced every day from two tonnes of solid waste. Six women from the informal sector are working in the composting plant.

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### *Marketing of Compost*

There is a good market for compost around Dhaka. At present Waste Concern sells its compost to a number of outlets such as fertilizer marketing companies and nurseries at Tk2.5 to 5.0 per kg. The quality of compost is monitored in the laboratories of the Soil Science Department of Dhaka University.

We are now trying to promote the sale of nutrient-enriched composts (compost blended with chemical fertilizer) and have signed a memorandum of understanding with a fertilizer marketing company, which will purchase our bulk compost, enrich it, and market the product. The Ministry of Agriculture has approved six brands of enriched compost specifically for rice, wheat, potatoes, vegetables, tobacco, and tea.

## Financial Feasibility of the Project

Production of compost involves fixed costs in construction of the composting plant and its operational costs. The construction cost of our three-tonne capacity plant was around US\$10,000. Annual operating costs total about US\$4,000, which includes salaries of the manager and 12 workers, and cost of utilities and raw materials. Annual income from the project is at present US\$10,500, about 80 percent of which is from compost sales, the remainder being the charges to households for the service. The return on investment shows that the project is viable.

## Other Benefits from the Project

Apart from the financial benefit, there are a number of other advantages of decentralized composting, as proven by our plant, such as

- lower waste management costs by reducing the volume of solid waste—a three-tonne community-based plant can save DCC nearly US\$18,000 and 1,095 square meters of landfill area per year;
- improvement in the overall environment of the neighborhood by minimizing illegal disposal of waste on roads, drains, and vacant lots;
- generation of employment for the poor, especially women, and new prospects for small entrepreneurs to take part in the recycling business; and
- the process returns organic matter to the soil and minimizes the use of chemical fertilizers.

*A three-tonne community-based plant can save DCC nearly US\$18,000 and 1,095 square meters of landfill area per year.*

## Lessons Learnt

The following conclusions and lessons can be drawn from the pilot project of Waste Concern.

*People do not object to paying a higher service charge once they see tangible improvements.*

- *The success of a community-based program depends largely on identifying and addressing the communities' needs while sustainability of the project depends on involving them in the cost-recovery/cost-sharing process.* Our experience showed that people do not object to paying a higher service charge once they see tangible improvements.
- *Community-based projects have a demonstration effect.* In our case, the number of participating households increased over time and CBOs formed to create similar services.
- *NGOs can play an important role in initiating and demonstrating new concepts and providing technical know-how and training to others.* The idea of a community-based composting plant was a new concept in Dhaka. DCC was not interested and even the Lions Club was initially skeptical. Waste Concern gave several presentations explaining the project activity before the Lions Club was convinced to help.
- *A small-scale compost plant can be located within the community, provided that an appropriate scientific composting method is followed.* Special attention should be given to avoiding odor problems and maintaining aerobic conditions.
- *A decentralized compost plant can be commercially viable.* Many entrepreneurs are approaching Waste Concern for technical assistance and training.
- *Women from the informal sector are interested to work in composting plants, and*

*it is socially acceptable.* Most of the female workers in our plant previously worked in garment factories and as domestic help.

- *Marketing of compost is the major problem.* This problem can be overcome by involving specialized fertilizer marketing companies. Compost enriched with nutrients is more easily marketable in rural areas than raw compost. Media can also play a vital role in popularizing compost. Government has to develop a policy conducive to marketing compost.

Despite the achievements of Waste Concern, however, the program has been slow to expand. Replication of the concept in other communities, city corporations, and municipalities has been rather difficult. At the national level in Bangladesh, there is no policy on solid waste management for city corporations and municipalities.

## Prospects

There are several trends and developments that make us optimistic about future progress. The most important and long-term benefit from Waste Concern's pilot project is the growing awareness, which has made a significant contribution to the national and local debate on solid waste management. For the first time in Bangladesh, urban organic waste is being recovered in an economically sustainable and viable manner. Almost all the national newspapers in Bangladesh have published special features on our project. Several hundred representatives from government authorities, external support agencies, universities, the private sector, journalists, and foreign delegates have visited the site since it opened in 1995. Some of them are beginning to question the traditional assumption that waste management should be centralized as the sole

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responsibility of local authorities. Others are beginning to appreciate that most of the urban waste in Bangladesh can be utilized positively with economic and environmental benefits.

### **Replication of the Project by Government and Municipal Authorities**

Recently, the Ministry of Environment and Forests, with support from UNDP under its Sustainable Environment Management Program, initiated replication of our project in four wards of the DCC area. Moreover, the World Bank and Swiss Development Cooperation are planning to replicate the project in Khulna, the third largest city in the country. DCC has recently agreed to provide land to Waste Concern for establishing a community-based composting plant. The Public Works Department has also provided public land in six government residential colonies in Dhaka for the same purpose. It is now believed that as awareness grows, government policy and market forces will combine to realize the huge potential of composting throughout Bangladesh.

### **KUNITOSHI SAKURAI**

Professor, University of Okinawa, Japan

Through the Rio Earth Summit, it was widely recognized that the developing world's growing urban populations need attention and that the most critical and immediate problem facing developing-country cities is the impact of urban pollution derived from inadequate water, sanitation, drainage, and solid waste services; poor urban and industrial waste management; and air pollution, especially from particulates. This set of problems is collectively dubbed the "brown agenda". The Earth Summit also recognized that local authorities and local

communities are best able to take concrete action on their urban environment. Without doubt, mayors have to play a crucial role in the protection of city residents' well-being from deterioration of the urban environment.

One of the most important environmental problems facing cities is pollution from municipal solid waste. This document provides a guide for mayors to improve the management of this waste.

### **Existing Situation of Municipal Solid Waste Management in Asian Cities**

Municipal solid waste is defined to include refuse from households; nonhazardous solid waste from industrial, commercial, and institutional establishments (including hospitals); market waste; yard waste; and street sweepings. Municipal solid waste management (MSWM) encompasses the functions of collection, transfer, treatment, recycling, resource recovery, and disposal of municipal solid waste.

The first goal of MSWM is to protect the health of the population, particularly that of low-income groups. Other goals include promotion of environmental quality and sustainability, support of economic productivity, and employment generation. Achievement of MSWM goals requires sustainable solid waste management systems, which are adapted to and carried out by the municipality and its local communities.

MSWM is a major responsibility of local government. It is a complex task that requires appropriate organizational capacity and cooperation between numerous stakeholders in the private and public sectors. MSWM in most Asian cities is highly unsatisfactory and frequently a source of complaint by the public and anxiety to concerned officials.

In low-income Asian countries, large cities such as Calcutta and Karachi generate around 0.4 to 0.7 kilograms of solid waste per capita per day,

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while in middle-income countries, cities like Bangkok, Kuala Lumpur, and Manila generate around 0.5 to 1.0 kilograms of waste per capita per day. The amount of solid waste generated in large Asian cities is typically 3,000 to 5,000 tonnes per day.

Most Asian cities dispose of their solid waste in landfills. Recycling is limited to "waste picking" by the informal sector. The difficulty of finding and managing landfills, combined with the strain of keeping up with growing demands, has led to inadequate solid waste collection, recycling, and disposal systems.

Solid waste generation is expected to increase substantially with economic growth. For example, while Mumbai produces 1.2 million tonnes of solid waste per year, Tokyo, with about the same population, produces 4.5 million tonnes. The increased amounts of domestic and commercial waste that are generated tend to include more nonbiodegradable or toxic components. The increased use of disposable plastic syringes is complicating the management of medical wastes in many countries. The increasing amount of industrial toxic waste adds to the problem, both because of its impact on health and the high cost of cleanup.

MSWM frequently suffers more than other municipal services when budget allocations and cuts are made. Even though provision of collection and disposal services for municipal refuse often consumes as much as 20 to 40 percent of municipal revenues, it is not perceived as deserving high priority. Cost recovery is not emphasized and the financially starved agencies are unable to meet operating and maintenance costs or capacity expansion needs. Efforts of people employed to collect, dispose of, and recycle wastes are rarely appreciated.

Institutional strengthening and sound management practices are required to ensure

efficient service provision. Collection should be decentralized to the local municipal level or lower, while disposal responsibilities should be at the level of the metropolitan region to ensure that the process is environmentally sound. More attention needs to be paid to financing capital requirements as well as meeting recurring costs. Municipalities should strive to recover the costs of collection through user charges, while disposal costs could be met through local taxes and/or intergovernmental transfers, given the environmental benefits of sound disposal.

The potential role of the private sector (both informal and formal) in MSWM needs to be explored. Recycling of solid wastes could reduce pressure on the collection, disposal, and handling systems. Informal-sector waste pickers already operate marginal recycling operations in many Asian cities. There are ample opportunities for participation by the private sector and community groups in dealing with household wastes. Contracting out the management of transfer stations, processing facilities, landfills, and special industrial waste facilities is a feasible option.

*The potential role of the private sector (both informal and formal) in MSWM needs to be explored.*

## **Five Strategic Measures to Improve MSWM**

### *1. Firm Commitment of the Relevant Authorities for Better MSWM*

Credibility of the authorities is vital. This can be attained through the following.

- Establish an appropriate and sustainable service level based on the people's willingness to pay and the authority's capacity; allocate human and financial resources necessary for the achievement of that level; and keep the promise to the people.

*Mistreatment of private contractors will lead to disastrous results.*

- Establish adequate legislation on MSWM and enforce it strictly (e.g. anti-littering laws).
- Maintain communications with service users and contractors. Delivery of reliable services is a prerequisite for user cooperation such as proper use of refuse bins and timely payment of user charges. Fair treatment of private contractors through punctual fee payment, etc. is a precondition for successful contractual work. Mistreatment of private contractors will lead to disastrous results.

## 2. *Strategic Planning*

Planning is the essential path to cost-effective use of limited resources. Some steps to take include the following.

- Carry out basic surveys to determine the present state of MSWM and identify service demand and supply, problems and potentials, and priority areas. A solid waste generation survey and MSWM service survey are essential. An old Chinese proverb says that if you know your enemy (MSWM problems) and yourself (available resources) you will never lose in 100 battles.
- Project future service demands and the required supply.
- Plan and implement the improvement of MSWM in a step-by-step process.
- Use pilot projects to study technical feasibility and socioeconomic viability of new approaches and disseminate the results after necessary modifications.
- Pursue multisectoral approaches to achieve cost-effective improvement,

e.g. cooperation with the education sector through school education on solid waste management; cooperation with the tourism industry through clean-up campaigns.

### 3. *Waste Minimization First*

In line with the internationally recognized waste management hierarchy, the first priority should be given to waste minimization (reduction at source). It should be followed by reuse, recycling, treatment, and land disposal, in that order. Some relevant measures include the following.

- Introduce economic incentives such as a deposit-refund system to promote recycling. In this system, customers pay a deposit for, e.g. a beer or soft-drink can or bottle, and get back the deposit when they return the container.
- Carry out workable pilot projects on home composting/gardening with the aim of improving nutrition and reducing waste at source. Migration of young people to towns causes a sudden change in their diets resulting in an imbalance in nutrition. Home composting/gardening to produce vegetables and fruits can be a solution to this problem. Such a practice can reduce the frequency of solid waste collection as well as service cost, and prolong the life of landfills.
- Strengthen health education using all available media to motivate people toward better health practices such as source reduction of solid waste.

#### 4. *Improvement and Cost Saving in Collection Services*

*Improvement and cost saving in collection will generate the financial resources necessary for sanitary landfills.*

The collection service is the most expensive unit process of MSWM. Improvement and cost saving here will generate the financial resources necessary for sanitary landfills. There are several ways to achieve these aims.

- Conduct time and motion studies of collection works to identify areas requiring improvement.
- Standardize refuse bins that people can afford and phase out the use of 55-gallon steel drums.
- Select less sophisticated vehicles that can be maintained locally. Vehicle size should take into account maneuverability on local roads. Vehicles with a low waste-loading point and tipping facility are preferable.
- Determine collection service areas, routes, frequency, and schedules to provide necessary directions to drivers, contractors, and the public/service users so that all parties can collaborate effectively.
- Use the services of private contractors wisely.

#### 5. *Use of Savings for Final Disposal Improvement*

Careful siting and management are the key to a successful landfill project.

- Select the most appropriate technology for treatment and final disposal. For Asian cities, this usually means a sanitary landfill. Incineration of domestic refuse

should be carefully evaluated from the technical, environmental, and financial point of view.

- Upgrade the management of landfills in phases from crude open dumping to controlled tipping, and eventually to sanitary landfill.
- Select sites for future landfill carefully. Selection criteria include distance from collection areas, distance from nearest houses, access road, capacity/volume available, downstream water use, permeability of underlying soil, groundwater table, availability of cover soil, initial structural requirements, agreement of land owners, and distance from the nearest airstrip.
- Allocate the necessary human, physical, and financial resources for the construction and operation of the landfill. Provision of inadequate resources amounts to being penny-wise and pound-foolish. The use of private contractors for landfill operations may be a good alternative when proper management of heavy equipment by the public sector is difficult.
- Strive to achieve better communication with waste pickers, particularly with their leaders, in order to establish an orderly system at the landfill site that is acceptable to both parties. Eradication of waste picking by the police or military will result in a hostile confrontation.

## From Vicious Circles to Positive Circles

### *The Vicious Circles in MSWM and Disposal*

A vicious circle in MSWM is widely observed in Asian cities. Limited financial resources assigned to the collection service, together with poor management, make the quality of the service unsatisfactory. The refuse collection schedule is rarely met. This damages the trust of the general public in the service and their willingness to pay for it is severely eroded. As a result, the responsible authority cannot raise enough financial resources in spite of the increasing service demand caused by rapid urbanization.

Final disposal also has a vicious circle. Because of its low priority, very little money is provided to manage the site. As a result, the site is usually a crude open dump with all its negative implications. No one wants such a facility in his/her vicinity—the NIMBY (not in my back yard) syndrome. This makes the siting of future landfills within reasonable distance from the city/town center very difficult, pushing up the transportation cost and leaving a far reduced financial balance for landfill management. In addition, dump sites located far from the city/town will tend to result in illegal dumping because collection vehicle drivers often cannot resist the temptation of dumping their waste closer to the collection points.

*Dump sites located far from the city/town will tend to result in illegal dumping.*

### *Development of a Positive Circle*

Asian mayors have to break these vicious circles once and forever and establish positive circles instead. For example, if brand new vehicles are provided as a grant from the national government or some donor agencies to replace old vehicles for, say, commercial waste collection, this would be a

good opportunity for you, as mayors, to start a positive circle.

Arrival of new vehicles enables you to establish a reliable collection system for commercial waste. This will in turn facilitate the introduction of a user-pays system for commercial waste. Collected fees can be used, for example, for the improvement of existing dumps. Landfill operation can be contracted out to a local construction company to avoid the problems associated with government operations (slow decision making, poor equipment maintenance capability, lack of stand-by equipment, etc.). With your proper supervision, contractors will operate a landfill far better than will the public sector. This will turn the open dump into a controlled landfill, which will definitely make it easier for you to overcome the NIMBY syndrome in the acquisition of future sites within a reasonable distance. Thus, the positive circle begins its momentum. You must keep this momentum going and strengthen it as more resources are generated.

The above-mentioned scenario to exert a change from vicious to new positive circles is only an example. A number of other scenarios can be developed and implemented. It is up to you, as mayors, to initiate the development of an appropriate scenario for your city/town.

*With your proper supervision, contractors will operate a landfill far better than will the public sector.*