

Solid Waste Neighbourhood Self-Management: A Case Study in Bogor, Indonesia

Soekmana Soma

PUSTRA

Ministry of Public Works

ABSTRACT

This paper reports on the results of a pilot project case study entitled "Solid Waste Neighbourhood Self-Management" (SWNSM) in Bogor, Indonesia. As a case study project on "Practical Policy Innovations in Urban Infrastructure Development and Management in Asian Metropolitan Areas and Large Cities," it is associated with the United Nations Centre for Regional Development (UNCRD) and Urban Management Programme - Asia.

SWNSM is based on the principle of moving solid waste management away from inadequate centralization and into far more manageable divisions of neighbourhood areas. A key component of this approach is the implementation of recycling, reusing, and composting. The SWNSM project objective is to highlight possibilities for applying the system in a wider area, including other cities in Indonesia.

SWSNM is a relatively new concept in solid waste management. In early 1990, it was applied in several locations in Jakarta by various non-government organizations (NGOs). While only one location (involving a recycling programme) remains in operation, considerable experience has nevertheless been gained with the SWNSM system in the Bogor area. Consisting of small-scale management, the system involves consultant supervision of several workers, and is headed by a consultant staff.

Recommendations from this case study include: further development of the SWNSM system, improvements in implementation, and expansion of the programme to a wider area.

INTRODUCTION

One example of an area applying "on-site" waste management (i.e., SWNSM) is that of Bogor Raya Permai - an estate of 100 homes in North Bogor. This area presents a particularly unique case because of its "zero disposal" management - specifically, all wastes are collected and treated on site.

The key component of SWNSM is the implementation of recycling, reusing, and composting. In the case of Bogor Raya Permai this was particularly relevant because, prior to project implementation, workers living near the estate found that a sizable portion of its refuse contained valuable resources (i.e., refuse that could be sold or re-used). Under the SWNSM system, twenty-seven Bogor Raya Permai households utilize household composters (for wet or organic materials) designed by the Center for Research and Development of Human

Settlement, (PUSLITBANGKIM), under the Ministry of Public Works. The households' remaining dry waste is picked up by crews at the front yard for recycling. The process is clean, neat, hygienic, and safe for the crews. The other estate households store their wet and dry wastes in the front yard for collection by crews every second day. The crews then separate the wastes in the communal composting area.

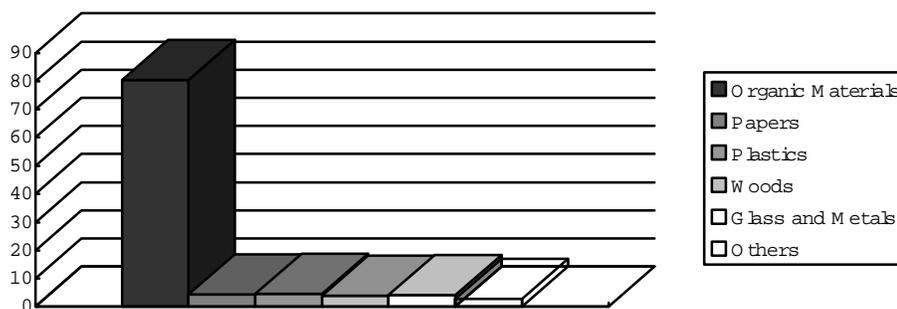
HISTORY

Garbage has always been an element of civilization. However, as the public has become increasingly concerned about environmental threats and resource conservation, it has become less accepting of waste. This holds true in the Bogor municipality, where some aspects of managing solid wastes have proven difficult to solve. Until recently, little emphasis was placed on on-site treatment. Given the current rate of waste generation, people in the municipality will soon require more land for disposal, and the local sanitation section will require more money for collection and transportation. In Bogor, disposal practices of open-dumping and controlled landfill have had adverse environmental effects. Changes are thus required in the way Bogor municipality, and all parties concerned, manage their solid waste.

The Bogor SWNSM programme was the creation of Futura Hijau Lestari (FHL), an environmental consulting firm, with the full support of the Bogor municipality and a local real estate developer. It is based on the concept of shifting solid waste management from inadequate centralization towards more manageable divisions of neighbourhood areas. Recycling, reusing, and composting methods are integral to this process.

The idea was triggered by the results of a study conducted by Alphaville Baru on solid waste characteristics (1989). It was discovered that domestic solid waste in the Bogor area had a content of 80.5 per cent organic materials, 4.25 per cent paper, 4.35 per cent plastics, 3.8 per cent wood, 3.89 per cent glass and metal, and 2.71 per cent others (see figure 2).

Figure 2. Waste Composition



Given the high percentage of organic waste material, the PUSLITBANGKIM (1996) recommended that residents compost the material in their own yards. The centre distributed low-cost plastic composters made from recycled and reused materials. Each composter cost approximately US\$10.00.

During this time, the local government was facing a crisis in managing solid waste: firstly, in reducing the amount of garbage (which totaled anywhere from 970 m³ to 2,300 m³ per day).

This problem was largely due to the city's rapid growth from an area of 2,257 ha to 11,850 ha. Secondly, the landfill site in Rancamaya had reached its capacity, and finding a new landfill location proved difficult. Thirdly, development of twenty-seven new estates increased pressure for a more adequate system. Fourthly, waste collection, transportation, and disposal had risen to over US\$10.00 per ton, yet the annual budget remained generally unchanged from year to year. As a consequence of these factors, decreases in both service area and service quality occurred. Indeed, these factors contributed to Bogor's failure to win (for five consecutive years) the national cleanest city competition (i.e., "Adipura").

FHL was very concerned about this situation. In order to expand the city's service area and improve its management quality, a preliminary study was conducted by the local sanitation section with the assistance of FHL (1996). This study recommended that all solid waste should be managed on-site in estate divisions under the operative title of "Solid Waste Neighbourhood Self-management", and people should be encouraged to use creative approaches to boost participation.

In September 1996, FHL, the local sanitation section, and a developer implemented SWNSM in Bogor's 100-home Raya Permai Estate.

SOLID WASTE MANAGEMENT PROBLEMS IN BOGOR

The rapid rate of population growth in Indonesia's cities has far outstripped the available resources and technology intended to deal with such increases. In many Indonesian urban development areas, adequate infrastructure is woefully lacking and is failing to keep pace with development. The municipality of Bogor is typical of the surrounding cities of the Jakarta metropolis. Specifically, population growth and area expansion have greatly overextended city infrastructure resources, especially in the area of solid waste management.

Because solid waste management is a dynamic field, there is no "best method" for all problems that arise. However, in the situation being considered, there are four important issues that must be taken into account in order to determine the impacts of alternative courses of action.

First, Bogor's development area has more than quadrupled in the last five years, increasing from 2,257 ha before 1992 to its present area of 11,850 ha. Consequently, the population has grown from 256,000 in 1992 to 711,913 in 1996. Thus, both the population and service area have changed a great deal.

Even with its old municipal area, the local sanitation section covered no more than 80 per cent of the total area, with a total residential garbage collection of 426 m³. Currently, the service area is less than 50 per cent with a total collection of 619 m³.

Second, with a total population of 711,913 in 1996 and a growth rate of 3 per cent each year, Bogor has become a large city with relatively complex problems. Of the amount of money spent on the collection, transportation, and disposal of solid waste in old areas (1990), approximately 60 to 80 per cent was spent on the collection phase. New estate developments (which spread from east to west, and from south to north) theoretically require new methods in setting up collection routes if they are to be handled as part of a centralized system. This fact is important because a small percentage improvement in collection operation costs can

effect significant savings in the overall costs.

Third, disposal is currently a "no alternative" option because it is the last functional element in the solid waste management system, and is the ultimate fate of wastes that are of no further value. Owing largely to a scarcity of available land, Bogor city has already experienced great difficulty in finding adequate landfills to meet the needs of the waste generation rate, which has almost doubled during the past decade. The 4.5 ha landfill in Rancamaya, 8 km south of Bogor, has already reached its capacity.

Since 1986, the municipal government has intended to expand the Rancamaya landfill to 10 ha. However, the land is under the jurisdiction of Bogor Regency and it has been stipulated by a new law for other uses. Moreover, some people in the area are reluctant to sell their land for the disposal site.

The cheapest available land near Bogor Regency for landfill use, based on the Bogor Land Agency Report (1996), is about US\$2.00 per m². Bogor Regency has proposed a new site approximately 22 km north of Bogor city in the Galuga district. Technical evaluation and community acceptance of the disposal site location are being discussed.

Fourth, technical, financial, and institutional resources and capabilities are greatly restricted, thereby limiting Bogor's waste service coverage to less than 50 per cent of the total area. The section of city sanitation, under the Landscape Department, has only one engineer and one Bachelor's degree holder. Since 1986, the annual operations budget of this section has been relatively stable at approximately Rp 490 million to Rp 530 million (about US\$230,000 to US\$250,000 per year, or US\$0.80 per capita annually). Given its relatively small budget, as well as limited human resources, it is very difficult for the sanitation section to serve an additional area of 9.593 ha.

Solid waste in Bogor generally comes from different sources, namely residential areas, (i.e., well-planned, flat alley, hilly alley, and real estate), commercial districts, markets, and streets.

OBJECTIVES AND BENEFICIARIES

The SWNSM Bogor Pilot Project has several important objectives. First and foremost is to create a model on which to base future solid waste management and recycling systems. Indonesia has one "megalopolis," or large urban agglomeration (namely, Jabotabek, which consists of Jakarta, Bogor, Tangerang, and Bekasi), five metropolitan areas, and twenty-seven major cities, all in need of solid waste management overhauls. It is intended that Bogor will serve as a model to be replicated in these cities. The second objective is to channel the sanitation section's limited resources into the key areas of transportation and human resources. The third objective is to improve service and implement recycling for the benefit of the neighbourhood and local population. The fourth objective is to increase workers' salaries. The fifth objective is to promote recycling and the reuse of goods and materials, by enhancing opportunities for recycling throughout the municipal area. Finally the sixth objective involves increasing awareness and understanding regarding the need for waste reduction, the potential for recycling, and the value of discards and residuals that yield secondary materials.

APPROACH

Successful implementation, under the guidance and coordination of the consulting agency, will require cooperation in all aspects of the operation. There are five basic strategies of the SWNSM action plan. Firstly, the consultant agency should be responsible for gathering information, organizing, model maintenance and supervision, as well as the promotion and marketing of the recycling and reuse of components (including composting). Secondly, real estate developers should donate a parcel of land for composting and recycling activities, as well as for landfill (if necessary). Thirdly, the municipal government should maintain legal authority over operations, as well as provide such basic services as law enforcement and transportation. Fourthly, neighbourhood community organizations (which may consist largely of household mothers) should assist the project by separating organic and inorganic wastes into different containers. Fifthly, workers must be responsible for the day-to-day process of collecting, recycling, and composting. It is, moreover, the goal of this pilot project to follow an approach that is not only practical and innovative, but socially responsible as well. Thus, key areas of consideration include the roles of women and workers. As such, the goal of the Bogor project is not only to provide a successful model for waste management, but also a template for the improvement of basic social conditions.

RECYCLING

Recycling is the process by which materials are diverted from the waste stream and reprocessed to produce secondary materials. These materials once again enter the production cycle for consumer and industrial goods. A recycled material can flow back into its initial use circuit or can be reprocessed into other goods. The recycling loop is an endless "moebius" loop, divided into sections to represent the three stages of recycling (see diagram, below).

At the top of the loop are producers, who sell items to both commercial and household consumers. Consumers separate consumption residues into waste and recyclables. The recyclables are then sold to sub-recyclers located near the neighbourhood. Local sub-recyclers consume various recycled goods, including paper, glass, metal, plastics, used oil, and batteries. These materials are then sold to recycler centres. Recycler centres, after sorting and processing the materials, market them as secondary materials to producers in Jakarta.

Perspectives on the reuse of goods as a means of minimizing waste vary from generation to generation, and from country to country (some may recall returnable milk bottles, delivered to each household by neighbourhood milkmen). Today, drums made of plastic or steel are categorized as "reusable materials." Obviously, reuse opportunities must be pursued with caution and common sense, particularly in cases where public health and safety area concerned. Reuse can contribute significantly towards achieving waste reduction.

LEADERSHIP

The project is managed under the leadership of a former NGO worker, recently hired by FHL to conduct the SWNSM pilot project in Bogor. He has extensive experience in several water and sanitation projects in East Nusatenggara, Sulawesi, Kalimantan, and Irian Jaya. He is expected to manage the same type of project, but with a larger scope (and thus more complex situations). He encourages the participation of housemothers by providing them with lessons

on solving solid waste management problems. The highest priority is to reduce waste, followed by reuse and recycling, and, as a last resort, discarding in landfills. In addition, everyone is given an opportunity to recycle - indeed, this is the motto of the lessons. Each household is designated recycling work, assisted by three recyclers, and is responsible for separation of organic and inorganic waste. Also, to spread the idea of household composting, FHL has prepared a leaflet to be distributed to housemothers.

INSTITUTIONAL SET-UP

The SWNSM project began with a pilot project conducted in Bogor's Raya Permai Estate. This estate was selected on the basis of developer and housemother support for the project, and the availability of collectors, a leader, and a recycling site. Most importantly, this area was beyond the local sanitation section's service boundary. The chances for success thus appeared promising. In September 1996, FHL and a developer established the SWNSM. The consultant asked the neighbourhood committee to work together in establishing a system that treated the community's solid waste on-site, specifically through composting and recycling programmes.

FINANCING

Money is the lifeline of all businesses. In a small project such as SWNSM, it is needed for financing land, refuse vehicles (carts), labour, safety equipment, (e.g., gloves, boots, and helmets), and maintenance.

The developer donated land for compost and recycling processes, as well as three refuse carts. The carts are simple mechanical devices, requiring only periodic maintenance, and are used for residential collection. The consultant is responsible for the day-to-day operation and maintenance costs.

Cost analyses for project operation and maintenance are as follows: first, the annual landfill cost per household is US\$0.48; landfill cost avoidance is thus US\$48. Second, the annual land haul cost is US\$2, land haul cost avoidance is thus US\$200. Third, revenue from the sale of compost is approximately US\$4,200 per year. Fourth, the cost of processing, including labour, is US\$2,400 per year. Fifth, fees collected from households total US\$442 (each) per year. Net annual value gained is therefore US\$2,490.

TECHNICAL STANDARDS

Approximately twenty-seven houses use a household composter made from recycled materials. This very simple composter was designed by PUSLITBANGKIM under the Ministry of Public Works.

The composter is designed for a family of five to seven members, and is made from recycled fiber or plastic, with a diameter of 50 cm and a height of 80 cm. The objectives to be achieved

from this system are:

- i. to prevent the breeding of rodents, flies, and other insects;
- ii. minimize the nuisance of stray dogs and cats that scatter waste piles;
- iii. reduce the amount of landfill trash;
- iv. prevent workers' contact with leeches; and
- v. process waste into useful compost.

The composter generally reaches its capacity in five to seven months, after which it requires one or two weeks' drying in open air. Incentives have been initiated for households using composters through reductions to monthly management costs.

SIGNIFICANT STEPS

At every step of solid waste management, waste problems must be considered. The following two issues have been focal points for the waste problems in Bogor (and, indeed, other cities in Indonesia).

First, it should be clarified that the "problem" of waste is not so much slowing down the ever-increasing volume of waste as it is actually decreasing (i.e., reversing) the volume of waste. Given the shortage of final disposal sites, the present systems cannot cope with disposal anymore. It is therefore necessary not only to restrain the increment of waste, but also to lessen it. It is possible to reduce the volume of waste disposed in landfills if citizens, the national government, and the private sector (including industries) establish reduction methods and work towards their implementation via a self-disposal system, rather than a centralized system. In the Bogor example, the high percentage of organic waste prompted the consultant to recommend that the community turn its waste into compost (both on-site and at communal sites).

Second, the total cost of waste disposal (including social costs) will be reduced as a result of a more appropriate sharing of disposal costs. People who do not pay attention to the consequences of their waste generation forget that their inaction ultimately results in higher total costs for waste collection, transport, and disposal. In order to reduce the total cost, community members must produce less waste and manage their own garbage.

LESSONS LEARNED

Making SWNSM pay off is not easy. Making people understand the importance of self-management is a challenge. To help convince people about the value of recycling, reusing, and composting, the consultant must show (e.g., through slide films) the possible health impacts on workers resulting from activities in the composting site. Persuading neighbourhood members to actually comply with a mandatory source-separation policy is nevertheless a challenge. Audiovisual presentations are sometimes given by the project leader or a housemother in a monthly meeting occasion called "Arisan" (attended, as well, by house servants). A recurring theme in the Arisan is the need for more and better information for neighbourhood communities, in order to raise awareness of problems as well as identify ways to promote composting and recycling. There is significant public demand to "get the message out" on such issues as why composting, waste minimization, and recycling are needed; what

can be done with specific materials to keep them out of the waste stream; where materials can be recycled; and how to implement composting, waste minimization, and recycling programmes in businesses and schools. Education never stops - and it is certainly the key to success in waste management.

In addition to the above, the consultant must convince residents and plant sellers to use compost made from garbage. To date, the larger market has not been fully developed - but this would be necessary if the programme were to succeed in replicating SWNSM in all Bogor estates. Even though net annual value gained from this initial pilot project appears minimal, when multiplied by fifty or even twenty estate areas, the impacts would be significant. The most important factor in all communities is to work hard to reduce the volume of trash requiring disposal in landfills. SWNSM is a crucial and sensible part of integrated waste management systems.

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