MUNICIPAL SOLID WASTE MANAGEMENT IN THIRD WORLD CITIES: LESSONS LEARNED AND A PROPOSAL FOR IMPROVEMENT

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Summary

Municipal solid waste management (MSWM) constitutes a serious problem in many Third World cities. Most cities do not collect the totality of wastes generated, and, of the wastes collected, only a fraction receives proper disposal. The insufficient collection and inappropriate disposal of solid wastes represent a source of water, land and air pollution, and pose risks to human health and the environment. Over the next several decades, the rapid urbanization in the developing world will tend to further deteriorate this situation.

Cities spend increasing resources attempting to improve their MSWM. Conventional approaches usually involve solutions that are centralized, bureaucratic, and ignore the potential contribution of the informal sector, with little public participation in the decision process, and often use imported technology. Conventional approaches often fail. The socioeconomic conditions in the Third World are so different from the developed world that a different approach is needed. This article argues that a decentralized model for MSWM may be more appropriate to the conditions prevalent in the developing world. In the proposed model, the specific needs of low-income areas would be considered; it would promote community participation and incorporate informal refuse collectors and scavengers into public-private partnerships, micro-enterprises, or scavenger cooperatives. The proposed approach could help solve the problem of solid wastes in a socially desirable, economically viable, and environmentally sound manner.

1. Introduction

Third World cities have undergone a rapid urbanization during the past fifty years. The number of urban dwellers is expected to double between 1987 and 2015. Nearly 90% of this increase will take place in the Third World, where growth rates exceed 3% a year, three times that of the industrialized countries.

Urbanization in the Third World implies the expansion of slum areas and the creation of new ones. Population growth intensifies the pressure on urban infrastructure in many cities already overburdened with the provision of urban services. Most Third World cities lack the resources to meet the demand for services such as water, sanitation, and solid waste management. The insufficiency of services results in a deterioration of the urban environment in the form of air, water and land pollution that poses risks to human health and the environment. In Manila, a city of over 10 million people, only 10% of the population is served by sewers. Raw sewage generated by Manila residents regularly pollutes water supplies, canals, lagoons, the Pasig River (which runs through the city), and Manila Bay. Worldwide, over two-thirds of human wastes (excrement) are released to the environment as sewage, often polluting surface waters.

Solid waste management in developing countries receives less attention from policy makers and academics than that paid to other urban environmental problems, such as air

pollution and wastewater treatment. Nevertheless, the improper handling and disposal of solid wastes constitute a serious problem. This article examines the current situation in the management of solid wastes in Third World cities, discusses some lessons learned, and proposes a decentralized system for the collection, recycling and disposal of municipal solid wastes.

2. Municipal Solid Waste Management in Third World Cities: An Overview

2.1. Definition of Municipal Solid Waste

Municipal solid waste (MSW) refers to the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport, and final disposal. MSW encompasses household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris. In developing countries, MSW also contains varying amounts of industrial wastes from small industries.

2.2. Current Problems

Collecting, transporting, and disposing of MSW represents a large expenditure for Third World cities: waste management usually accounts for 30-50% of municipal operational budgets. Despite these high expenses, many cities collect less than half of the refuse generated. In India, for instance, less than 50% of the refuse generated is collected, 33% in Karachi, 40% in Yangoon (formerly Rangoon), and 50% in Cairo. Waste disposal receives even less attention: as much as 90% of the MSW collected in Asian cities end up in open dumps.

In areas that lack refuse collection—usually low-income communities—residents tend either to dump their garbage at the nearest vacant lot, public space, creek, or river, or simply to burn it in their backyards. Uncollected waste may accumulate on the streets and clog drains when it rains, which may cause flooding. Wastes can also be carried away by runoff water to rivers, lakes, and seas, affecting those ecosystems. Alternatively, wastes may end up in open dumps, legal and illegal—the most common disposal method in the Third World.

Open dumping of solid wastes generates various environmental and health hazards. The decomposition of organic materials produces methane, which can cause fire and explosions, and contributes to global warming. The biological and chemical processes that occur in open dumps produce strong leachates, which pollute surface and groundwater. Fires periodically break out in open dumps, generating smoke and contributing to air pollution. In the Mexican city of Tampico, on the Gulf of Mexico coast, for instance, a fire burned for over six months at the local open dump. Fires at open dumps often start spontaneously by the methane and heat generated by biological decomposition. Dump managers in some cities deliberately set periodic fires at the dumps in order to reduce the volume of the wastes, which allows more wastes to be disposed there and thus extends the life of the dumps. Human scavengers may also cause intentional fires, since metals are easier to spot and recover among the ashes after the fires than among piles of mixed wastes. Food leftovers and kitchen wastes attract

birds, rats, flies and other animals to the dumps. Animals feeding at the dumps may transmit diseases to humans living in the vicinity. Biodegradation of organic materials may take decades, which may limit the future use of the land on which open dumps are located.

2.3. Conventional Waste Management Systems

In order to extend refuse collection, upgrade disposal facilities, and diminish the risks to human health and the environment associated with inadequate waste management, various measures have been implemented. The solutions that are commonly proposed to the problems in municipal solid waste management (MSWM) in Third World cities often have the following features:

1. Centralized and undiversified: solutions that do not distinguish the different needs and heterogeneity of neighborhoods within each city, and between cities
2. Bureaucratic: top-down solutions, usually reached without or with little community participation
3. Capital-intensive approaches: involving advanced technology and equipment, frequently imported from industrialized countries
4. Formal: conventional solutions only consider the formal sector, neglecting the existence and possible contributions of the informal sector that has developed around waste collection and recycling in many Third World cities.

It can be argued that Third World cities require a fundamentally different approach to the solutions that are currently proposed.

3. MSWM in the First and Third World: A Comparison

Profound differences exist between industrialized and developing countries in terms of income, standard of living, consumption patterns, institutional capacity, and capital available for urban investments. Conventional solutions often do not take into account these differences, resulting in less than optimum outcomes.

3.1. Differences between First and Third World Cities that Affect MSWM

The following represent the major differences between industrialized and developing countries relevant to the design of MSWM solutions in the latter:

1. Industrialized countries enjoy a relative abundance of capital and have high labor costs, while developing countries have a relative scarcity of capital and an abundance of unskilled and inexpensive labor. It makes sense for the former to devise waste management systems intensive in capital and that save in labor costs, but it often does not make sense for the latter to follow the same approach. Developing countries need low-cost, labor-intensive solutions that reduce poverty, particularly among the most underprivileged segments of society. Socially desirable MSWM solutions in developing countries are those that create income opportunities for unskilled workers, particularly the poor.

2. The physical characteristics of cities in developing and industrialized countries differ markedly. Third World cities have extensive areas with substandard conditions—slums—with narrow, hilly, and unpaved streets. Many immigrants can not afford to purchase land on which to build their homes. As a result, some migrants occupy vacant land and become squatters. Most of the areas that lack refuse collection service are slum and squatter settlements. Some local authorities decline to provide refuse collection to squatters because they do not pay taxes. This refusal to provide waste collection has a deleterious effect on the urban environment.

   Given the conditions of hilly, unpaved, or narrow streets common in Third World settlements, it may not be possible for collection trucks to enter those areas. Alternatively, if they do enter those neighborhoods, collection vehicles tend to break down often due to the harsh conditions of streets and roads. Further, faulty or nonexistent maintenance, and lack of spare parts contribute to that high percentage of idleness. A common practice that seeks to increase waste collection in Third World cities is the use of compactor trucks (collection vehicles equipped with a compacting mechanism). The section below on technology transfer discusses this and other technologies.

3. An important difference between industrialized and developing countries refers to the dissimilar amount and characteristics of wastes generated. The waste generated tends to go up as income increases. First World cities have higher waste generation rates than Third World cities. In the US, cities can have waste generation rates of over 1.2 kg/person/day (kilogram per person per day), while the residents of some African cities generate less than 200 gm/person/day (gram per person per day). A positive relationship also tends to exist between income and waste generation rates within each city: in Mexico City, for example, low-income households generate 2.6 kg (kilogram) a day, middle-income households produce 2.7 kg a day, and upper-income households, 3.7 kg a day.

   Further, in addition to less refuse being generated in low-income communities, waste composition also tends to be different. Waste generated in developing countries contains a large percentage of organic materials, usually three times higher than that of industrialized countries. Waste is also more dense and humid, due to the prevalent consumption of fresh fruits and vegetables, as well as unpackaged food. First World residents consume more processed food and food packaged in cans, bottles, jars, and plastic containers than in the developing world. As a result, waste generated in the former contains more packaging materials than in that of the latter.

4. Many Third World cities have a dynamic informal sector that has evolved around wastes, which provides income opportunities for recent migrants, unemployed, children, women, elderly and handicapped individuals. The most common occupations are informal refuse collection and scavenging. Due to their importance, sections 4.5 and 6 below presents a more detailed discussion of these occupations.

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Biographical Sketch

Martin Medina received his Ph.D. in Environmental Studies from Yale University and his Master's of Science from the University of North Carolina. He has collaborated with non-governmental organizations, governments, and private, academic, and international organizations in Asia, Africa, and Latin America. His areas of interest are waste management, sanitation, and industrial ecology. He has received numerous grants and awards, such as a finalist award in the Bremen Partnership Award, a finalist award in the

Global Development Research Medal Award, and second place in the Global Development Outstanding Research Award in 2002. He has published widely on community-based solid waste management systems in the developing world. He is currently professor at El Colegio de la Frontera Norte, in Tijuana, Mexico.