

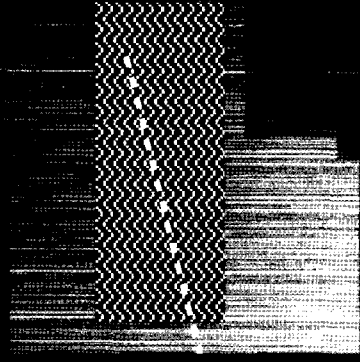


Urban  
Management  
Programme

Private Sector  
Participation in Municipal  
Solid Waste Services  
in Developing Countries

Volume 1. The Formal Sector

*Sandra Cointreau-Levine*



13

URBAN MANAGEMENT PROGRAMME DISCUSSION PAPER

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Urban Management Programme

**Urban Management and the Environment**

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**Private Sector Participation  
in Municipal Solid Waste Services  
in Developing Countries**

**Volume 1. The Formal Sector**

Sandra Cointreau-Levine

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The Urban Management Programme (UMP) represents a major approach by the United Nations family of organizations, together with external support agencies (ESAs), to strengthen the contribution that cities and towns in developing countries make toward economic growth, social development, and the alleviation of poverty. The program seeks to develop and promote appropriate policies and tools for municipal finance and administration, land management, infrastructure management, environmental management, and poverty alleviation. Through a capacity building component, the UMP plans to establish an effective partnership with national, regional, and global networks and ESAs in applied research, dissemination of information, and experiences of best practices and promising options.

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## FOREWORD

This discussion paper has been prepared for the urban environment and the municipal finance and administration components of the joint UNDP/UNCHS/World Bank—Urban Management Programme (UMP). It analyzes the participation of the formal private sector in the delivery of municipal solid waste services in developing countries and recommends a decisionmaking framework. Future case study and tool papers are planned on the topics of private sector participation, including informal sector collection and recycling, and model contracts for provision of collection, cleansing, disposal, and transfer services.

The UMP represents a major approach by the UN family of organizations, together with external support agencies (ESAs), to strengthen the contribution that cities and towns in developing countries make toward economic growth, social development, and the alleviation of poverty. The program seeks to develop and promote appropriate policies and tools for municipal finance and administration, land management, infrastructure management, environmental management, and poverty alleviation. Through a capacity building component, the UMP plans to establish an effective partnership with national, regional, and global networks and ESAs in applied research, dissemination of information, and experiences of best practices and promising options.

This paper is one in a series of discussion papers that has been used, in combination with case studies and research, to develop an overall report on formulating environmental strategies for cities. Other papers in the series cover regulatory and economic instruments for waste management and pollution control, land use considerations in urban environmental management, energy/environmental linkages in the urban sector, and rapid urban environmental assessment. Each paper provides background information on key urban development and environment linkages and/or suggest elements of an environmental management strategy for cities in the developing world. In addition, research reports have been prepared on the following topics: health impacts of urban environmental problems, economic spillover effects of urban environmental problems, the application of remote sensing and geographic information systems to urban environmental planning, privatization of municipal solid waste services, and local management of wastes from small-scale and cottage industries. Finally, case studies on priority urban environmental problems have been prepared for Accra, Curitiba, Jakarta, Katowice, Sao Paulo, the Singrauli region of India, Tianjin, and Tunis.

This paper is also part of the municipal finance and administration component which is intended to address three questions: 1) how to mobilize resources to finance the delivery of urban services; 2) how to improve the financial management of those resources; and 3) how to organize municipal institutions to promote greater efficiency and responsiveness in urban service delivery. Work during the initial phase of the Urban Management Programme has focused on the first of these questions—focusing specifically on local tax reform, intergovernmental transfers, and local access to long-term credit. Case studies and background papers on the latter questions—documenting issues in local financial management and the organization of municipal government—have also been prepared.

Phase 2 of the UMP (1992-96) is concerned with capacity building at both the country and regional levels and with facilitating national and municipal dialogues on policy and program options. It emphasizes a participatory structure that draws on the strengths of developing country experts and expedites the dissemination of that expertise at the local, national, regional, and global levels.

Through its regional offices in Africa, the Arab States, Asia and the Pacific, and Latin America and the Caribbean, the UMP seeks to strengthen urban management by harnessing the skills and strategies of regional experts, communities, and organizations in the private sector.

Regional coordinators use these networks to address the five program themes in two ways:

- **City and country consultations.** The UMP brings together national and local authorities, private-sector networks, community representatives, and other actors to discuss specific problems within the UMP's subject areas and to propose reasoned solutions. Consultations are held at the request of a country or city, and often provide a forum for discussion of a cross-section of issues.
- **Technical cooperation.** To sustain follow-up to the consultations, the UMP uses its regional networks of expertise to provide technical advice and cooperation.

Through its nucleus team in Nairobi and Washington, D.C., the UMP supports its regional programs and networks by synthesizing lessons learned, conducting state-of-the-art research, and supporting dissemination of program related materials.

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## ABSTRACT

Municipal solid waste management is an essential public service which benefits all urban residents. It is not feasible to exclude from service those who do not pay, because public cleanliness and the safe disposal of wastes are essential to public health and environmental protection. As a result of these characteristics, solid waste management is a public good for which local or metropolitan governments are typically responsible. This does not, however, mean that local government has to accomplish the task of solid waste service delivery entirely with its own staff, equipment, and monies. In fact, this is where the role of the private sector comes into play.

This paper discusses the reduction of government activity through the participation of the private sector in service delivery. The paper poses the questions of whether and how to involve the formal private sector in the provision of municipal solid waste services. Private sector participation is a possible opportunity—not a panacea. In situations in which existing service delivery is either too costly or inadequate, private sector participation should be examined as a means of enhancing efficiency (and thus lowering costs) and mobilizing private investment (and thus expanding the resources available for urban infrastructure and equipment).

To decide whether to have private sector participation, many factors need to be analyzed, such as cost recovery, efficiency, public accountability, management, finance, economies of scale, legislation, institutions, and cost. Cost factors in particular should be analyzed separately for the different components of solid waste service—collection, cleansing, disposal, and transfer.

Methods of private sector participation most common to solid waste management are contracting, concession, franchise, and open competition. These options are discussed with particular emphasis given to the roles and responsibilities of local government in each case. The suitability of each of these methods may also vary for collection, cleansing, disposal and transfer services.

The paper summarizes decisionmaking criteria for whether to have private sector participation in delivery of solid waste management services. Furthermore, it recommends steps for proceeding beyond the discussion of issues and privatization approaches and moving toward field studies that will support decisionmaking in a specific city and, where justified, lead to phased involvement of the private sector.



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For his meticulous attention to issues of scholarship and his many patient readings of this paper as it was developed, the author thanks her husband Joel Levine.



## EXECUTIVE SUMMARY

i. **Solid waste management as a public good.** Solid waste management is a service for which local government is responsible.<sup>1</sup> This service is *nonexclusive*, meaning that once it is provided to some portion of a community it benefits the overall public welfare, not only the resident that specifically receives service (20).<sup>2</sup> The service is also *nonrivalled*, meaning that any resident can enjoy the benefit of the service without diminishing the benefit to anyone else (20). Beyond this, it is not feasible to exclude from service those who do not pay, because public cleanliness and the safe disposal of waste are *essential* to public health and environmental protection (47).

ii. These qualities of being nonexclusive, nonrivalled, and essential place responsibility for solid waste management squarely within the public domain as a public good. Because solid waste management is an urban issue, the level of government responsible is typically local or metropolitan government. This does not, however, mean that local government has to accomplish the task of solid waste service delivery entirely with its own staff, equipment, and monies. In fact, this is where the role of the private sector comes into play.

iii. **What is privatization?** Generally stated, privatization is a reduction in government activity or ownership within a given service or industry, as follows:

- Government *activity* is reduced when the private sector participates in service delivery.
- Government *ownership* is reduced when a) government enterprises are divested to unregulated private ownership and b) government agencies are commercialized (reorganized into accountable and financially autonomous semiprivate enterprises).

iv. This paper discusses only reduction of government activity through private sector participation. It does not address the reduction of government ownership.

v. **Context within which the decision for private sector participation should be made.** This paper poses the question of whether to involve the private sector in the provision of municipal solid waste services. The aim of government and of the private sector in providing this public good is based on two entirely different perspectives: for the private sector, the fundamental concern is whether the delivery of service will *make* money. For government, one of many considerations is whether it will *save* money through private sector participation. Moreover, government must consider known public values and address macroeconomic issues beyond the price of service as discussed in the context section.

---

1. For the purposes of this discussion, solid waste management refers to the collection, transfer, recycling, resource recovery, and disposal of municipal solid wastes. Municipal solid wastes are defined to include: refuse from households, nonhazardous solid (not sludge or semisolid) wastes from industrial and commercial establishments, refuse from institutions (including nonpathogenic waste from hospitals), market waste, yard waste, and street sweepings. For purposes of this paper, construction and demolition debris is not included within the definition of municipal solid waste, because it dramatically skews waste generation rates and waste composition.

2. The numbers in parenthesis refer to references that begin on page 47.

vi. Private sector participation is a possible opportunity—not a panacea. In situations in which existing service delivery is either too costly or inadequate, private sector participation should be examined as a means of enhancing *efficiency* (and thus lowering costs) and mobilizing *private investment* (and thus expanding the resources available for urban infrastructure and equipment).

vii. Chapter one discusses the context for deciding whether to have private sector participation, in terms of cost recovery, efficiency, public accountability, management, finance, economies of scale, legislation, institutions, and cost. The Annex elaborates on the contextual issue of cost; and provides an analysis of the costs of solid waste collection, cleansing, disposal, and transfer.

viii. Chapter two discusses methods of private sector participation and provides case examples. The types of private sector participation most common to solid waste management are contracting, concession, franchise, and open competition.

- **Contracting.** The government awards a finite-term contract to a private firm for the delivery of solid waste collection service, street sweeping service, the collection of recyclables, transfer station operation, disposal site operation, or fleet maintenance. The contract award is made after a competitive procurement process. The private firm is paid for service delivery by the government under the terms of the contract.
- **Concession.** The government awards a concession to a private firm to set up a facility that utilizes the government-owned resource—refuse. This concession may enable the private firm to recycle materials (paper, plastic, metal, glass) from refuse; to recover resources (compost, heat, electricity) from refuse; or to transfer or dispose of refuse. The concession is in the form of a long-term contractual agreement, whereby the private firm builds the facility. In some cases, the private firm may maintain indefinitely the ownership and operation of the facility. In others, the private firm may transfer ownership of the facility to the government after a specified period of private ownership and operation.
- **Franchise.** The government awards a finite-term zonal monopoly (a franchise) to a private firm for the delivery of solid waste collection service. The franchise award is made after a competitive qualification process. The private firm deposits a performance bond with the government and pays a license fee to cover the government's costs of monitoring. The private firm recovers its cost and profit through direct charges to the households and establishments that are served. Government provides control over the tariff charged to the consumer through: a) development of adequate competition and control of price collusion, or b) price regulation.
- **Open Competition.** The government freely allows qualified private firms to compete for refuse collection, recycling, or disposal services. In open competition, individual households and establishments make private arrangements with individual firms for refuse collection and/or recycling. No firm holds a zonal monopoly, and any number of firms may compete within the same zone.

Similarly, in open competition, the government grants a license to qualified individual firms for the private provision of disposal services. One city may be served by several disposal sites competing for business from the area's local governments and private haulers, as well as for business from remote governments and haulers. The government's role in open competition is to license, monitor, and, as needed, sanction private firms. Under open competition, costs are directly billed by the private firms to their customers.

ix. Chapter three summarizes the decisionmaking criteria for whether to have private sector participation in delivery of solid waste management services.

x. Chapter four recommends steps for proceeding beyond the evaluation of contextual issues and private sector methods available to a given country and city, toward incremental involvement of the private sector in service delivery.





## **I. CONTEXTUAL ISSUES OF PRIVATE SECTOR PARTICIPATION IN MUNICIPAL SOLID WASTE SERVICES**

1.1 In developing policies and strategic plans for private sector participation in solid waste services, a number of contextual issues need to be addressed. These issues, discussed below, include those of cost recovery, efficiency, accountability, management, finance, economics of scale, legislation, institutional management, and cost.

### **The Cost Recovery Context**

1.2 There is a simplistic argument that public goods should be paid for by public funds and delivered by public agencies, while private goods should be paid for by private individuals (through user charges) and delivered by the private sector. Issues of private sector participation in solid waste management services should not be confused with those of cost recovery. One premise of this paper is that there are sometimes reasons for involving the private sector in solid waste management activities, regardless of whether these activities are public goods or private goods.

1.3 Many activities within the overall purview of solid waste management vary in the extent to which they are public goods. Taking into consideration only the factor of the degree to which a solid waste activity is exclusive or rivalled, Figure 1 illustrates that most solid waste activities are public goods. For example, public cleansing, which involves sweeping of public streets and cleaning of public parks and lands, is clearly a public good because it benefits the public at large and not any specific individual. As a public good, the cost of these services is expected to be covered through general revenues of local government. This includes the cost for public education regarding the individual's civic duties in maintaining a clean community.

1.4 The safe disposal of all collected solid waste within a sanitary landfill is also a public good; it benefits no specific individual but is required for environmental protection purposes that benefit the public at large. The use of a sanitary landfill is usually the lowest cost method of safe disposal. All other methods of disposal also involve the sanitary landfill of residuals (ash from incineration) or of wastes that are incompatible with the disposal method (noncompostables from composting).

1.5 It is theoretically appropriate for the cost of sanitary landfill to be covered through general revenues. Nevertheless, tipping fees (user charges on a per tonne basis) can be readily collected from private refuse haulers and from individual industrial and commercial establishments that bring their solid waste to the landfill. For tipping fees to be levied in a manner that does not encourage clandestine dumping, relevant local government laws and sanctions need to be comprehensive, and inspection and enforcement systems need to be consistently vigilant in their monitoring of such.

1.6 In developing countries, resource recovery (composting, waste-to-energy incineration) can provide safe disposal of solid waste which is comparable environmentally to sanitary landfill. The cost of resource recovery, however, is usually significantly higher than the cost of sanitary landfill. Resource recovery should not be implemented unless a) the recovered resources (compost, secondary materials, steam) can be counted as public goods worthy of subvention from government, or b) the

cost difference between sanitary landfill and resource recovery can be covered by revenue from marketing the recovered resources.

1.7 In low-income communities characterized by limited access to refuse collection trucks or carts, door-to-door collection service is not economically feasible, and only a communal container or bell system is viable. Collection by communal systems a) inherently involves collection from a *public area* not from a private establishment or household, and b) requires the participation of residents who bring their refuse to a communal container or to an attending refuse collection vehicle (upon bell ringing). Such participation represents a significant, voluntary contribution by the community residents. Also, it is not feasible to make an accurate accounting of which residents bring refuse to the communal collection point. Communal systems of solid waste collection are considered a public good, and direct charges are difficult to implement unless a strong community organization exists to enable cost recovery.

1.8 Whether refuse collection from private establishments or individual households can be *treated like a private good* (even though it is a public good) depends on the education and culture of the residents. In communities wherein residents have been sensitized to the need for public cleanliness and to the problem of limited resources (or efficiencies) of government, the door-to-door collection service to households, institutions and to industrial and commercial establishments can be treated as a private good for which those being serviced would be willing to pay. In communities wherein the residents have not been similarly sensitized, there will be resistance, however, to direct user charges and a tendency toward clandestine dumping. Service to all customers, whether paying or nonpaying, is in the public interest. Unlike water supply or electricity, which can be readily cut off for nonpayment of user charges, solid waste collection can not be discontinued without jeopardizing the public welfare.

1.9 Recycling has historically been treated as a private good in most countries, except during war time when governments have conducted recycling in the interest of national security. China has been an exception, and state-operated recycling systems are perceived as an important element of self-sustainable development. In the last decade, industrialized countries have slowly changed their perspective on environmental awareness, thus recognizing that everyone benefits from recycling as a public good. Through recycling, foreign exchange is saved, natural resources are conserved, industrialization is promoted, and waste disposal cost is minimized.

1.10 While it is true that industries save on their materials and energy costs through the use of recovered waste materials as feedstock and that they are willing to buy recyclables, recycling is seldom achieved at an optimal level when left purely to market forces. Thus, recycling can be labeled a *merit good* (20,47). Even in the poorest of developing countries, many recyclable materials that could have been effectively recycled remain in disposal sites. In recognition of recycling as a public good, the governments of industrialized countries are beginning to sponsor education about recycling, to facilitate recovery and purchasing networks, and to provide financial incentives to buy-back (redemption) centers and industries that recycle.

1.11 Figure 1 provides a framework for categorizing various activities of solid waste management as pure public goods (also called *collective goods*) or as pure private goods. Public goods (national defense) are consumed jointly and are nonexclusive. Private goods (store-bought items) are consumed individually, and the producer can deny the good to the consumer until payment

has been made. Figure 1 also categorizes these activities that fall somewhere in between these two categories, such as toll goods and common-pool goods. To be economically viable, toll goods (cable television) are like private goods, in that some people can be excluded from benefiting, and like public goods, in that they need to be provided to a collective group of beneficiaries. Common-pool goods (air) are those for which consumption is not joint and to which access is nonexcludable.

1.12 Figure 2 links activities of solid waste management to the methods of private sector arrangement. For example, for pure public goods (collective goods), which can not exclude any potential user within the service area, contracting and concession are the most appropriate methods of private sector participation. On the other hand, toll goods can be exclusive, thus franchise and open competition are also appropriate methods. For activities that fall between pure public goods and toll goods, contracting, concession, and franchise are appropriate methods. For activities that fall between private goods and toll goods, contract, franchise, and open competition are appropriate methods. For pure private goods, open competition is the most appropriate method of private sector participation.

1.13 In developing countries, most local governments experience a serious shortfall in meeting their revenue needs from their tax base (60). User charges, as one means to cover solid waste cost, should not be neglected, even though most solid waste management services are public goods. User charges give the solid waste agency some autonomy by eliminating the need to compete with all other government agencies for their share of general revenue. User charges also may render the solid waste agency more directly accountable to residents for the cost and value of services that they provide.

1.14 Whether to involve the private sector in solid waste management services is an issue that is separate from cost recovery. Instead, the question of whether to involve the private sector in solid waste management activities is to be examined from the perspective of service coverage, efficiency, reliability, cost, economies of scale, equitability, and accountability, as discussed below.

### **The Efficiency Context**

1.15 According to the World Bank's *World Development Report, 1991*, public spending in developing countries is relatively high for their level of development and provides very low returns. Total government expenditure is roughly 20 percent of GNP in low-income countries and 30 percent of GNP in middle-income countries. This report asserts a "need for smaller, more efficient public sectors and a more dynamic private sector." Furthermore, it states that private sector participation "is not to be undertaken as end in itself, but as a means to an end: to use resources more efficiently" (64).

1.16 Within local governments of developing countries, expenditure for municipal solid waste service is usually from 20 percent to 50 percent of total municipal expenditure. Even at such a high level of expenditure, the level of solid waste service is low, and only 50 percent to 70 percent of the solid waste is collected. In response to this high level of expenditure and low level of service, the main argument raised for private sector participation is that the private sector might be more *efficient* than the public sector in providing services. Private sector efficiency is said to derive from management flexibility, freedom of action, greater financial discipline, and accountability to market forces (12). Presumably, in a competitive environment, private firms must perform efficiently to make a profit and to maintain their position in the market place. Optimum efficiency does not occur when there are no opposing competitive forces. It doesn't occur when there is a public monopoly or

**Figure 1. Public versus private goods in solid waste management**

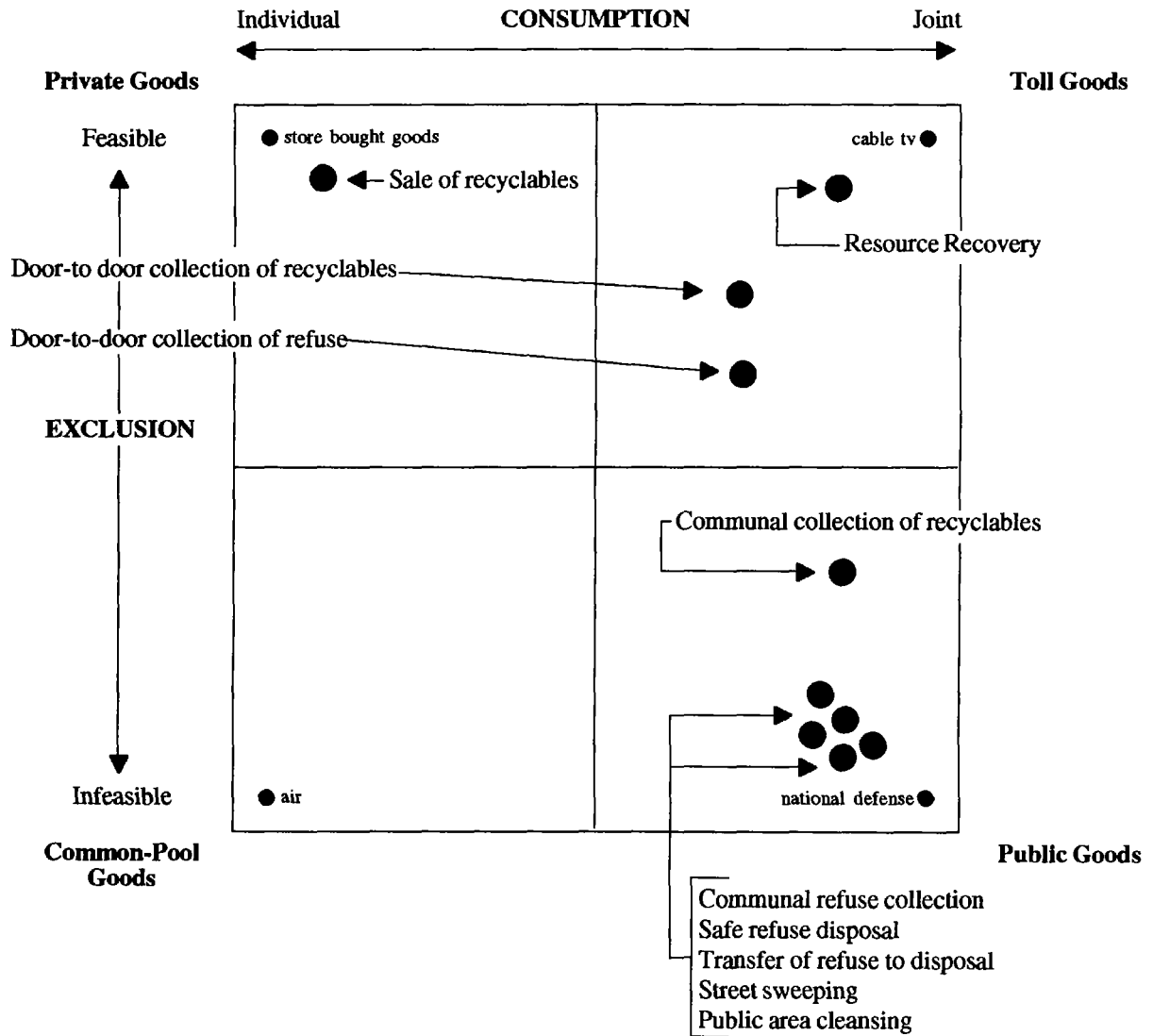
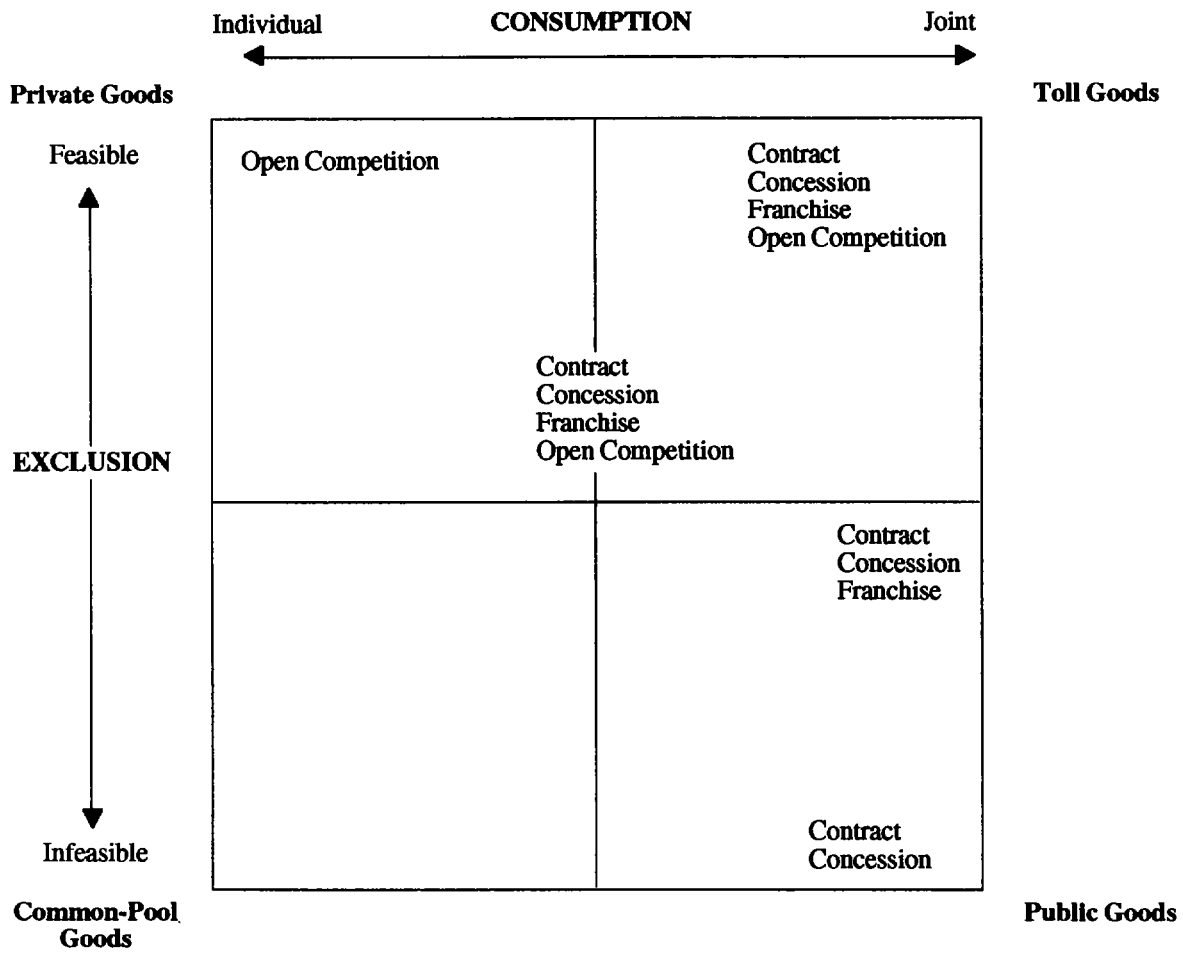


Figure 2. Private sector arrangements in solid waste management



a private monopoly. Even when there are many private companies, efficiency will not be optimized if they are in collusion over prices or work practices.

1.17 This argument certainly holds in countries where the competitive environment is well-developed. In the United States, a) more than 10,000 private firms are engaged in municipal solid waste service, and b) more than 80 percent of this type of waste is collected by private firms (43). Of American publicly owned solid waste facilities, 7 percent of the landfills and 73 percent of the resource recovery facilities are operated by private contractors (52). These numbers indicate a highly competitive environment which is close to the reality. However, in many developing countries, the number of firms participating in service delivery may not be a true indicator of competition. Complexities in the qualification, registration, and procurement process of some countries (i.e., Indonesia and Malaysia) has lead to indigenous private companies registering and bidding under different company names, even though ownership and staffing were essentially the same.

1.18 Conditions leading to efficiency captured by the private sector in the United States, Canada, and Great Britain include smaller, younger crews; lower absenteeism, wages, and benefit costs; more flexible scheduling; efficient vehicle routing; better designed vehicles; managerial incentives; faster vehicle repairs; vehicle standardization; and competition (20, 32, 39, 43, 56, 58). In such high income countries, optimization of labor productivity has priority because labor costs are high relative to equipment costs; the converse is true for low income countries.

1.19 These same conditions of efficiency sometimes are reported by developing countries that have involved the private sector in municipal solid waste services. In Bogota (Colombia) the average age of the private sector work force is about twenty-five years old, while the average age of the government work force is about forty years old. In this case, the younger work force is considered more productive because it is stronger and also more cooperative with new management requirements (11).

1.20 In Lagos (Nigeria) the average age of the private sector's work force also is about twenty-five years old, while the government work force is about forty-five years old. In Lagos the younger workers, however, are considered to be less motivated to work, while the older workers are considered to be more conscientious and reliable. This reason is that the younger workers are a) better educated than the older workers and b) view their job in sanitation as temporary employment, whereas the older workers view it as a life-long career (11).

1.21 Among developing countries, there are as many dissimilarities as similarities. Each city is unique. For example, substantially lower wage and benefit costs have been reported for private sector collection workers in Seoul (Korea) and Bogota—cities where a portion of the municipal solid waste collection service is conducted by private contractors. Seoul reports that government collection workers earn 50 percent more than private sector collection workers (11, 29). On the other hand, in Lagos, government workers are paid substantially less than private sector workers (11).

1.22 In Bogota, the private sector has a new standardized fleet, while the city is operating with an old and highly diversified fleet—factors that significantly complicate vehicle productivity. On the other hand, in Lagos, the government fleet is relatively new, standardized, and appropriately designed, while the private sector fleet is old and inappropriately designed. Lagos is somewhat unique among Nigerian cities because of equipment financing provided by the World Bank.

Nevertheless, even in those Nigerian cities wherein the World Bank has not financed collection equipment, the fleet owned by the government is appreciably better than those owned by the private sector.

1.23 Restrictive labor practices, such as those prevalent in seaports and on railways, are not a major issue in the solid waste sector (7, 24). Tenured government workers, however, have traditional patterns of behavior that may limit their productivity and that government may find difficult to curtail. These patterns include several breaks for meals and snacks, performing special service at households for tips, and sorting through the refuse for recyclables.

1.24 For example, Bangkok (Thailand), Bogota, Lagos, and Mexico City (Mexico), have reported a traditional practice of government refuse collection workers sorting out recyclable materials from the solid waste while working within their assigned collection areas. Of the time available in the collection zone, the time taken for sorting activity has been observed as 10 percent in Mexico City, to 30 percent in Bogota, and 40 percent in Bangkok (11).

1.25 In metropolitan Manila (the Philippines), government workers have devised a creative solution to their desire to recycle. In this case, many collection trucks transport nongovernment, informal sector workers who perform the sorting, while government workers perform refuse collection; income is shared equitably among all (11).

1.26 Not only government workers are prone to spend their time sorting out recyclable materials. In Lagos, private workers also spend a significant portion of their work day in recycling. The only difference between government workers and private workers is that private workers are not allowed to use recycling as an excuse for not completing their daily routes. Overtime is regularly authorized to private workers for the extra time they require to finish routes; conversely, overtime is the exception for government workers, not the rule (11).

1.27 In dealing with inefficiencies in government, the first response should be to determine if they can be corrected within the purview of public service. In other words, to build on what exists and is working and to fix *only* what is not working. If the government does not have the political will to make necessary changes to improve efficiency or if workers will not accept change, one may create a competitive environment by contracting out a *portion* of the public service. Introducing some private sector service will produce the desired result *only* if a) monitoring is carried out of public versus private service delivery, and b) feedback is provided to ongoing negotiations between management and labor on increasing efficiency.

1.28 Involvement of the private sector in municipal solid waste service is not the only way of introducing competition as a means of stimulating greater efficiency. Since 1985, Indonesia promotes efficiency with local government in this area by sponsoring an annual city cleanliness competition—the ADIPURA Awards. This competition stimulates political commitment to placing a priority on municipal solid waste services.

### **The Public Accountability Context**

1.29 According to Donahue in his book *The Privatization Decision*, “But efficiency, at base, is merely one aspect of a more fundamental quality—accountability—. The term suggests the idea of taking ‘into account’ the consequences of one’s actions for the welfare of others” (20). Government, which represents the public at large, has a special obligation to be accountable to public

values. In this capacity, each government needs to carefully weigh the decision to privatize “by the yardstick of *fidelity to the public’s values*, whatever they may be. If the citizenry cares about *how* goods and services are produced, about how equitably they are distributed, about the pay, benefits, and working conditions of those who produce them, then any legitimate measure of efficiency must incorporate these concerns” (20).

1.30 In most developing countries, municipal solid waste service involves labor-intensive street sweeping and waste collection techniques. Because labor costs are relatively low, labor-intensive techniques are appropriate. There are roughly 2,000 solid waste workers for every 1 million urban residents in developing countries, with labor intensity ranging between a high of about 5,000 per million residents in some Central Asian cities and a low of 1,000 per million residents in some Latin American cities (10, 73).

1.31 Local governments in developing countries have typically provided patronage through jobs in the municipal solid waste agency. As a result, the solid waste employment roles are bulging with extra employees, many who are scarcely productive and others who do not produce at all. In addition to the problem of patronage, technological changes have led to labor redundancy. As urban areas become densely populated and travel time to disposal sites increases, local governments tend to change from labor-intensive refuse collection systems, which use pushcarts and open trucks, to capital-intensive systems, which use compaction trucks. Few cities, however, take any parallel steps toward reducing labor redundancy in their refuse collection work force.

1.32 One expected outcome of privatizing solid waste services is that government employment roles would be reduced. This, however, is not necessarily the case. Excess employees are commonly clerical staff and refuse collectors and sweepers with a long tenure (ten to twenty-five years) of government service rather than refuse collection truck drivers and laborers (11). Moreover, in many developing countries, government employees cannot be terminated without cause. The discontinued need for the employee, limited performance by the employee, or even excessive absenteeism, is commonly not considered adequate justification for laying off a government employee (11, 23, 62). Where layoffs are permitted as local governments’ needs change, governments typically are to pay solid waste employees a severance pay of one to two months salary for every year of government service (11). After privatization of solid waste service, there is seldom the money or political will to do more than to shift government solid waste workers to another department and to retain most of the office employees in place.

1.33 Over the short term, the role of government as employer needs to be weighed as part of the private sector participation decision, given the recognition that the direct and indirect costs of high unemployment are significantly borne by government. Nevertheless, for the long term, it generally makes more economic sense to reduce the roles and to pay appropriate severance pay to the government workers who are asked to leave their jobs.

1.34 In many developing countries, solid waste workers in the private sector are paid much less than government workers, enjoy fewer vacation days, and receive fewer benefits (11, 20, 29, 58). Because the jobs in the private sector are less secure, the private sector workers may also work much harder. The extent to which government may wish to exploit these disparities between public and private sector workers is one of the social issues involved in deciding whether to privatize.



1.35 Because government solid waste workers typically have job security, the average age of the government worker is higher than the average age of the private sector worker. Solid waste collection is an arduous job. In developing countries, an average collection worker will lift and load daily from 1 to 3 tonnes of solid waste. In industrialized countries, an average collection worker will lift and load two to three times this quantity, because the loading process is facilitated by better designed equipment. Studies in the United States have shown that an older work force is less productive than a younger work force. Comments from solid waste managers in developing countries also indicate that the same is generally true (11, 56). This raises a social issue, especially in labor-surplus countries wherein these essentially older, unskilled workers might not have other work opportunities available to them if they are removed from the municipal solid waste service.

1.36 After the turn of the twentieth century, labor unions came into being in industrialized countries. The impetus for their creation was a response to an unrestrained free market economy that rested heavily on the exploitation of an unskilled labor force that included child labor. Through this self-organization of labor into a collective bargaining power, working conditions and wages were upgraded. In turn, labor unions contributed to the development in industrialized countries of a dominant middle class, which includes skilled and unskilled laborers.

1.37 Much of the thrust of private sector participation, both in major cities of industrialized countries as well as in Latin America, is in reaction to the negotiated wages, benefits, labor restrictions, and job security obtained by union labor. While it is sometimes true that unions' requirements might limit productivity and escalate costs in the solid waste management sector, it is doubtful whether "union busting" through complete privatization is the solution. Nevertheless, introducing private sector involvement in a portion of solid waste service area might be enough to advance negotiations with labor unions and to obtain a reasonable level of cooperation. Given that the primary objective of most developing countries is to promote the evolution of a middle class, governments need to examine how to conduct private sector participation in a manner that does not widen the gap between the rich and the poor.

1.38 Most of the earlier discussion centered on government's need to be accountable for fair, safe labor practices. In this light, some local governments are anxious to turn solid waste collection over to the private sector to avoid accountability. Municipal solid waste service is highly visible and uncollected waste generates strong sentiment among constituents. After privatizing, government is prone to blame the private sector whenever citizens are unhappy with the service being received. Because solid waste management is a complex service that involves optimizing the productivity of vehicles and workers, politicians may long to escape dealing with it and take an arm's-length approach.

### **The Management Context**

1.39 One of the most frequently cited advantages of the private sector over government is its management flexibility. Private sector management has greater ease in firing personnel for nonperformance and in providing upward mobility for workers with good performance. Also, the private sector is not constrained to government hours and overtime constraints. This has been an important factor in the private sector participation case of Bogota. There, government solid waste collection workers have a union contract for a six and one-half hour workday, with overtime at double salary. Because of the difficulty in obtaining authorization for overtime pay, the city is constrained with being able to collect only one full load for each daily shift. On the other hand, the private sector

operates on an eight-hour daily shift basis. Bogota is privatizing municipal solid waste collection—one zone at a time—and is trying to obtain enough cooperation from the government union to be able to provide efficient service in the remaining publicly served zones (11).

1.40 In Malaysia, all municipalities are formally obliged to follow government hours. However, one city, Petaling Jaya, reached an informal agreement with its refuse collection workers to implement the “task” system of work, wherein workers may leave work whenever they finish their assigned route (11).

1.41 Constraining government hours have been a motivating factor to increase private sector participation in Indonesia. To have around-the-clock street cleaning and refuse collection of central commercial and tourist areas, the cities of Jakarta and Semarang have hired private companies (11).

1.42 Studies on optimal municipal solid waste management have shown that cost is reduced in cities where the span of management between the manager or supervisor and the worker is appropriate. When the span of management is too high, the supervision of workers is inadequate, and worker productivity is low. When the span of management is too low, the supervision of workers is adequate, but supervisor productivity is low. Both extremes lead unnecessarily to high costs. Ideally, to obtain low-cost service, the span of management for solid waste collection systems should be about one supervisor for every four vehicle crews required for solid waste collection (56). In developing countries, most municipal solid waste agencies have a span of management of about one supervisor to every twenty to fifty solid waste collection crews. Also, government often provides inadequate salaries for supervisory positions, which makes it difficult to obtain qualified supervisors (49, 54). If the private sector has a greater ability to implement more appropriate management practices than government, there is opportunity for cost reduction through private sector participation.

1.43 Staffing ratios are important in maintenance as well as in supervision. Ideally, there should be one mechanic for every four to five solid waste collection vehicles (56). In developing countries, most municipal solid waste agencies commonly have one mechanic for every ten to fifteen vehicles. In addition, repair operations are bogged down with burdensome bureaucratic procedures that dramatically increase the downtime of solid waste collection vehicles. For a spare part to be purchased it typically takes two to four days to obtain the necessary supplier quotations and to submit the lowest quote for the approval of upper management. Most vehicles are down for three to six days just for relatively minor repairs. If the part has to be ordered from a foreign supplier, the vehicle is down for three to six months (11). For efficient solid waste management service, at any given time, no more than 20 percent of the equipment should be out of service (56). In most developing countries, however, typically 25 percent to 50 percent of the operable fleet is down (11). Maintenance and repair service is one area where in which the private sector has typically been able to perform very effectively. Vehicles used in private sector solid waste collection fleets are seldom down for repair service for more than a half day.

1.44 Private sector participation in solid waste service is not the only way to introduce management flexibility into the system. This goal can be effectively accomplished by commercializing the solid waste management entity. In Bandung (Indonesia), Medan (Indonesia), Ho Chi Minh City (Viet Nam), and Lagos, effective steps toward this goal are well underway. In these cities, commercialization has involved: a) the restructuring of the solid waste service entity into a semiprivate enterprise, and b) the granting of authority to the new enterprise to hire and fire personnel freely and to collect appropriate tariffs to cover costs. It has also included the payment by government of costs related to service of public properties and the removal of government subsidy (11).

## The Finance Context

1.45 In developing countries, cities are hard pressed to obtain enough capital to finance their solid waste systems and are burdened with political constraints limiting their ability to generate revenues. This problem is related to years of inadequate efforts toward cost accounting for cost recovery in solid waste management, as well as to competing political agendas.

1.46 In response, private sector participation is viewed as one way to secure investment finance from private companies for solid waste equipment and facilities in return for contracts to provide service. In reality, in many developing countries, the private sector has expressed an unwillingness to provide solid waste service under contract with local governments. The private sector queries how local governments in developing countries, which do not obtain the funds to provide for the renewal and expansion of existing equipment, can be expected to reliably meet their payments to suppliers and contractors. The track record is not good.

1.47 In countries where the private sector is unwilling to work with government under contract, this sector is sometimes willing to work independently (through zonal monopoly or open competition) and to collect its own user charges. Some problems are: How does government deal with those generators of refuse that are not willing to enter into individual agreements with private haulers and pay for service? How does government regulate the tariffs charged? How does government limit collusion and price-setting?

1.48 In countries in which the private sector is willing to invest in solid waste management, the apparent and hidden costs of private versus government service need to be carefully analyzed. This needs to be put into comparable and equitable terms, showing any hidden subsidies and costs that might exist in either service.

1.49 For example, in many developing countries, local governments can borrow at substantially lower interest rates than private firms. These governments are exempt from paying property tax on their facilities and equipment; often can import machinery, spare parts, and even technical assistance without paying custom duties; and can provide a service without paying value added taxes on their services (2, 12, 57). These can be viewed as hidden subsidies to government. When comparing private with government service, these hidden subsidies need to be included in a comprehensive accounting of costs.

1.50 Beyond these subsidies to government (which require analysis), there are hidden costs incurred by the private sector. For example, in many developing countries in which the private sector collects refuse or provides landfill operations, the operators are small (often with only one or two trucks) and the equipment used (open tipper trucks and bulldozers) have already been fully depreciated (during ten to fifteen years of construction use). In such cases, the prices charged by the private sector seldom include monies for renewal. While government may save money in the short term by hiring small operators with old equipment, eventually, the cost of renewal will have to be borne.

1.51 When solid waste management service is rendered by public means, there are costs related to political exploitation. These involve the hidden cost of patronage and the political manipulation of the purchase of equipment and facilities. On the other hand, awarding and administering contracts with private firms also provides "numerous opportunities for political manipulation" (57). This issue is particularly true in developing countries wherein governmental procurement regulations typically limit the term of contracts to one year because of a reluctance to

commit funding beyond the current budget. Every year, the need for contract renewal is revisited and the opportunities for exploitation reappear. Costs to the economy at large in the form of directly unproductive profit-seeking, include not only the transfers made to bureaucrats but also the cost of lobbying (51).

1.52 In some developing countries, the government's reputation for corruption is founded on a long-standing reality—one which contractors to government understand better than anyone. The costs of working under contract (in terms of bribes to get contract payments, delays in payments, and risks of nonpayment) can be substantial. While there are many reasons given in each case of delayed payment or nonpayment (lack of budget, change of government, inadequate invoicing, poor performance), the instances occur far too frequently to always be justified.

1.53 Private refuse collection companies take advantage of the fact that government must work toward the overall cleanliness of the city. In many countries, including Colombia, Mexico, and Nigeria, private sector collectors have been responsible for much of the clandestine dumping of wastes. These collectors have serviced their paying customers and dumped on open land, leaving the resulting mess for government to clear at a great expense (11).

1.54 When developing countries involve the private sector, it is typically for service of areas with predominantly upper income households and large industrial and commercial establishments. If private service costs are covered directly by and matched to user charges within the service area, the opportunity is lost for government to source these wealthier residents for the cross-subsidy of service to poorer residents. In the worst case scenario, the government contracts for this service and the cost recovery paid to government is less than the cost of the service—leading to a hidden cross-subsidy from poorer residents to cover the service for wealthier residents (53, 29).

### **The Economies of Scale Context**

1.55 One reason that solid waste management is viewed as a possible arena for private sector participation is that the economies of scale are not pronounced. This is in contrast to the case of water, electricity, and telecommunications that have such significant economies of scale that they are often regarded as natural monopolies (56). In solid waste management, there are economies of scale to a limited extent, as follows:

- **Collection in low-income areas.** Low-income areas are commonly characterized by narrow or steeply graded roads (or both) that are accessible only by relatively small vehicles of about 2-tonne payload capacity that are able to make 2 trips for each daily shift (4 tonnes per day), or by communal container vehicles of about 3-tonne payload capacity able to make 5 trips for each daily shift (15 tonnes per day). Assuming a daily neighborhood waste generation rate of about 0.35 kilograms per capita in low-income residential areas, 1 vehicle can serve about 10,000 to 40,000 residents, respectively.
- **Collection in high-income areas.** High-income areas are commonly characterized by roads of moderate width and grade that are readily accessed by compaction vehicles of about 6-tonne payload capacity able to make 2 trips for each daily shift (12 tonnes per day). Assuming a daily neighborhood waste generation rate of about 0.60 kilograms per capita in high-income residential areas, 1 vehicle can serve about 20,000 residents.

- **Transfer systems.** Transfer station design is based on the use of large-capacity hauling vehicles (tractor trucks with trailers) that have a payload capacity of about 20 tonnes and are able to make at least 4 trips for each daily shift (80 tonnes per day). Assuming a citywide waste generation rate of about 0.70 kilograms per capita per day, 1 vehicle can serve about 115,000 residents. In systems that use compaction devices to fill the trailer trucks, one stationary compactor moves about 60 tonnes per hour, or 480 tonnes per day. Using this same analysis, 1 stationary compactor can serve about 685,000 residents.
- **Sanitary landfill.** Sanitary landfills rely on bulldozers as their main piece of equipment for spreading and grading refuse and for daily soil cover. One bulldozer of 200 horsepower can handle about 400 tonnes per day. Assuming a daily, citywide waste generation rate of about 0.70 kilograms per capita, 1 bulldozer can serve about 570,000 residents.
- **Composting.** Composting systems need be no more complicated than the manual sorting of noncompostables from incoming waste, followed by the mechanized turning of windrow piles with a wheeled loader or windrow turning machine and the screening of compost product with a portable trommel screen. If the composting operation is performed at a site adjacent to the sanitary landfill operation, the wheeled loader used for the excavation of soil cover at the landfill can be shared with the compost operation. If the composting operation is at a separate location, thus requiring dedicated equipment, 1 wheeled loader of about 170 horsepower would handle about 200 tonnes per day. Assuming each windrow pile is turned once weekly over a 7-week period, 1 wheeled loader would handle an incoming waste load of 200 tonnes per day, or serve about 285,000 residents.
- **Waste-to-energy.** Waste-to-energy incineration systems are not technically viable for most developing countries, because the refuse, on an as received basis (wet basis), is not sufficiently high in calorific value to sustain incineration. Refuse of least 1,300 kilocalorie per kilogram of “lower heating value” needs to exist on a year-round basis for incineration without supplemental fuel. If waste-to-energy incineration is viable, the frequency and duration of downtime for maintenance require 100 percent standby capacity. A waste-to-energy incinerator needs to operate continuously, on a 24-hour basis, at no less than 5 tonnes per hour per unit. As a result, the smallest viable waste-to-energy incineration system would consist of one 120 tonnes per unit per day, plus one standby, which would serve about 170,000 residents.

1.56 Based on studies of costs for refuse collection in the United States, *no* economies of scale are thought to exist for communities greater than 50,000 people (56). Only for transfer, disposal, and resource recovery systems are there economies of scale to handle more than 200 tonnes per day, or 150,000 residents based on the United States’ higher waste generation rate.

### **The Legislative Context**

1.57 Laws influence the private sector significantly in its assessment of whether to become involved in the provision of municipal solid waste management services. Reputable private

companies want to have “a level playing field,” in which they can compete equitably, fairly and with minimal risk. For example, before private companies will invest in building, owning, and operating a sanitary landfill for public use, they will want environmentally sound, safe disposal practices to be required by law and enforced by penalty. Before spending money on the development of bid documents in response to government procurements, companies will want assurance that government will follow procurement regulations governing fair competition.

1.58 Countries that have experienced colonial influence may have old laws from colonial powers that have little relevance to today’s needs but which take precedent legally. Indonesia has recognized this as an obstacle to its privatization program and has been aggressively redrafting its regulatory framework in recent years. To complicate matters, only about 20 percent of Indonesia’s procurement staff have full sets of the laws that guide them. Because they rely on verbal communications for their understanding, there is a high degree of variability in how the laws are applied. Current training programs on procurement are directed at correcting this problem.

1.59 Few developing countries have domestic, private companies with expertise in municipal solid waste management. For foreign firms to take an interest in participating in municipal solid waste service in such a country, an attractive environment for foreign investment needs to be created. This would necessarily include the local recognition of the value of and need for expertise that foreign firms could contribute.

1.60 Although developing countries legally restrict foreign ownership in the joint venture to only a minority share, these countries do not protect against liability for nonperformance of a local partner. Laws in many developing countries restrict the ownership of indigenous land or other property, limit the immigration of foreign professionals needed for technology transfer to the local counterparts, prohibit repatriation of profit and repayment on investment capital, and demand high compensation to be paid to workers that are fired for nonperformance or at the end of a contract period (2, 11). At the same time, there are few, if any, laws that protect a private firm from nonpayment by government for services rendered.

### **The Institutional Context**

1.61 Privatizing some aspects of municipal solid waste service delivery does not *in any way* take away the need for local government (or metropolitan government, if appropriate) to be fully responsible for solid waste management service. Local government needs to have adequate autonomy to enter into multi-year agreements that capture economies-of-scale, as well as efficiencies. Many Asian countries have procurement laws that place low monetary ceilings on the sizes of contracts before provincial and central reviews and approvals are required, and do not allow contracts to extend beyond one fiscal year (11).

1.62 For some of these services to be effectively privatized, government would need to be strengthened (5). Only a governmental organization with a competent professional staff and an adequately designated authority with commensurate responsibility would be fully able to develop, negotiate, manage, monitor, and enforce a competent contract instrument. If government does not have political leadership with the will to upgrade and professionalize the staffing of the solid waste agency as part of a decision to privatize solid waste management services, it is doubtful if the private sector will be obliged to deliver service at a low cost.

1.63 Beyond the strengthening of local (or metropolitan) government, there are obvious needs to strengthen central government to deal with the contextual parameters raised above. According to the World Bank's *Urban Policy and Economic Development—An Agenda for the 1990s*, central government needs to “establish expectations of local performance” and to “retain some degree of oversight to ensure accountability over some areas of local decision-making” (8).

1.64 Some issues that are directly related to enabling private sector participation to realize low costs can be dealt with only at the central level. These issues include the minimization of risks related to environmental regulatory changes, national inflation, currency convertibility, fuel prices, pricing policies, import bans or quotas, and taxes. These also include the provision of appropriate incentives, such as guarantees for any borrowings, assumption of foreign exchange risk, tax incentives, customs duty exemption, and special lines of credit (2, 3, 12, 52).

1.65 Which level of government is most appropriate to conduct solid waste collection and street sweeping activities? When the *technology* for a given service is readily known and available, the decentralization of an activity from metropolitan government to local government and private markets may be advisable (72). Many unfamiliar with solid waste management view refuse collection and street sweeping as simple services that do not require much knowledge or specialized equipment. This is far from true. While it is possible to collect and dispose of refuse without knowledge and with only limited equipment, to do it efficiently and effectively requires substantial planning ability, appropriate equipment, and continuous managerial optimization of vehicle and worker productivity. While it is viable to decentralize refuse collection and sweeping from metropolitan government to local government after the appropriate equipment has been procured and the optimal crew size and routing has been determined, it would be ill-advised to decentralize the equipment procurement or optimization planning activities without the significant development of the technological base within local government and the private sector.

1.66 Which level of government is most appropriate to conduct solid waste transfer and disposal activities? When goods and services have significant *spillovers* (or externalities), the institutional arrangement must have sufficient authority to deal equitably with the entire area of impact (73). Some solid waste activities, such as refuse collection, have no significant spillovers. That is, all the costs, benefits, and impacts are confined to the area of service. Other solid waste activities, such as refuse disposal, can have significant spillovers, that is, water and air pollution can migrate from the area of service to surrounding areas. Because of the spillovers that typically characterize refuse disposal, it is not advisable to decentralize disposal to local governments within a metropolitan area or to private markets unless the regulatory framework and sanctions are adequate.

### **The Cost Context**

1.67 What is a *low cost* for solid waste management? At first glance, a low cost for service delivery by the private sector would be one that is lower than the cost for government service. After the cost for government to monitor the performance of the private sector is added, a low cost for service delivery by the private sector would be still lower than the cost of government service.

1.68 But what are the costs for government service? In most developing countries, accounting systems show cash flows rather than accruals, with no clear delineation between recurrent and capital expenditures. There is no attempt to aggregate municipal solid waste management costs incurred by all the various agencies that participate in the system. Moreover, there is typically no attempt to keep

track of depreciation, debt service, personnel benefits, land acquisition, and human resettlement costs within the solid waste management accounting system. The result is that most developing countries estimate their costs for municipal solid waste management service to be less than 50 percent of actual cost (11).

1.69 While waste generation rates and labor rates in developing countries are significantly lower than those in industrialized countries, the costs of solid waste collection, sweeping, and disposal in developing countries require a much higher percentage of individual income than those in industrialized countries. That is because income levels are much lower, while costs attributable to equipment purchase, debt service, spare parts, fuel, and oil are typically much higher. Total solid waste management costs in a low income country might consume two to three percent of individual income while total costs in a high income industrialized country might consume only one percent of individual income.

1.70 Because costs are so little understood in developing countries, the annex presents a cost analysis. This discussion will provide a framework to determine which parts of the municipal solid waste management service incur the highest cost. Because most of the municipal solid waste management expenditure is for collection, this should be the first service to examine for private sector participation arrangements that would reduce costs through increasing efficiency. This analyses will also provide a framework to determine which parts of the municipal solid waste service require the greatest capital investment. Because solid waste disposal and transfer systems are more capital-intensive than the collection and sweeping systems, these should be examined for private sector participation arrangements that would provide investment.



## II. PRIVATE SECTOR PARTICIPATION METHODS

2.1 This chapter presents case examples and experiences for each method of private sector participation most common to solid waste management—namely, contracting, franchise, concession, and open competition.

### **Contracting**

#### *Solid waste collection contracts*

2.2 The greatest opportunity to involve the private sector lies in having private firms provide collection service under contract with the local government. As noted by John D. Donahue in his comprehensive book on privatization in industrialized countries, which includes private sector participation: “One key is the absence of barriers to entry. The service involves low economies of scale, technological simplicity, and moderate investment costs” (20). It is feasible for local firms with modest financial resources to enter into the business of solid waste collection. Study of private sector participation in Latin America showed that most of the firms were small- to medium-sized, indicating that there were virtually no barriers to entry (5). In Seoul (Korea), approximately 35 percent of the solid waste is collected by 85 private contractors, each of which is a relatively small firm with an average of 6 vehicles (11). In Lagos, there are nearly 100 private contractors, most with only 1 or 2 vehicles and less than 10 with more than 5 vehicles (11).

2.3 Among the various options for private sector participation, contracting for solid waste service holds the greatest promise to developing countries as a way of lowering cost. Even when only a small portion of the city is served under private contract, significant efficiencies may be achieved because of contestability of market principles, wherein the government monopoly over service delivery is contested.

2.4 Based on studies conducted in 317 cities in England and Wales and in 126 cities in Canada, contracting of solid waste collection service was 22 percent to 41 percent—less costly, respectively—than public service. In those cities in which a private contractor provided refuse collection and thus eliminated public monopoly, costs were lower (20).

2.5 The two principal studies on costs in the United States (one covering 1,378 cities, and the other, 340) showed contracting was 10 percent to 30 percent less costly as compared with those for a public monopoly (20, 56). These studies included government’s cost to monitor its contractors, estimated to average roughly 25 percent of overall costs (government plus contractors) (20).

2.6 No comparable study has been conducted in developing countries to document whether contracting versus a public monopoly leads to lower costs in these countries. The World Bank conducted case studies in Latin America that examined contract systems in cities of different countries—namely Caracas (Venezuela), Santiago (Chile), Buenos Aires (Argentina), and Sao Paulo (Brazil). Only in the case of Brazil was data also obtained from a city wherein the service was provided by the government of Rio de Janeiro (Brazil). As observed by the World Bank’s report, the country-to-country cost and productivity data are not comparable (5). Not only are the working conditions unique, but there is a wide difference in costing factors, including salaries, benefits, fuel cost, duties on imported equipment, taxes, inflation, interest on loans, and currency exchange.

2.7 In the case of Brazil, data from similar neighborhoods in Sao Paulo and Rio de Janeiro indicate that refuse collection cost is lower and productivity is higher in Sao Paulo, where the service is provided by private contractor (5). However, this city-to-city comparison of cost and productivity differences is not definitive because record-keeping of quantities is inadequate and weighbridges are not used. Sao Paulo operated several well-designed treatment facilities and sanitary landfills whereby an accurate measure could be made of quantities of waste being delivered by its contractors, Rio de Janeiro had most of its government trucks discharging loads into several open dumps (5).

2.8 Since 1989 in Bogota, there has been a mix of public and private refuse collection which enables a zone-to-zone comparison. A private consulting firm monitors the performance of both the government and contractors, including the weighing of all loads collected. Based on September 1991 data, the difference in the cost of service is insignificant between one specific contractor and the government; however, it must be noted that this contractor requires a longer travel time for disposal than the government. The other contractor, however, has provided service at a lower cost and with higher productivity than the government; although in this case, the contractor and the government are traveling comparable distances to disposal. The daily worker productivity is comparable, i.e., 2.3 tonnes/worker versus 2.4 tonnes/worker, respectively. The key determinant of the lower cost obtained by this contractor is that 1.9 trips/collection vehicle are being made daily during the contractor's eight-hour workday, whereas the government can make only 1.3 trips/collection vehicle each day in its union-restricted six and one-half hour workday (11).

2.9 Bangkok has been experimenting with the private contracting of collection service. In 1987, Bangkok contracted for service for three districts. The cost for the contract service appears to have been lower for each tonne than the costs for public service, and the private service was considered to be of adequate quality. In one district, residents were initially not happy with the change to private service, because their neighborhoods were not as clean compared with public service. Actually, the residents were accustomed to government refuse collection trucks passing through their neighborhoods several times a day to pick up waste, rather than be required to place waste at the curbside at a specific time each day before collection, which was scheduled only once a day (11).

2.10 In 1988, Jakarta began to experiment with the private contracting for collection in 261 subdistricts (10 percent of the city's waste generating area), which were comprised of middle- to high-income residents in relatively laid out developments (41). Jakarta has been unable to determine the true cost of public service and whether private sector participation has brought about savings (11). Thus, comparative cost information is not available. When surveyed, residents in the neighborhoods served by the private sector—as well as those served by government—expressed satisfaction with the quality of service and the price they were paying.

2.11 In 1985 in Nigeria, after a five-year period of open competition among private refuse collection companies, the Lagos State Waste Disposal Board (LSWDB) divided the city of Lagos into zones and awarded contracts to selected contractors to collect industrial and commercial waste from large generators in these zones. The LSWDB collected user charges from the industrial and commercial establishments serviced, paid 60 percent of the monies collected to the private contractors, and kept 40 percent for covering its own administration, billing, and disposal costs (as well as for providing a cross-subsidy for residential collection).

2.12 In the same zones, the LSWDB operated with its own trucks to service all small generators and government establishments. Unfortunately, some contractors reportedly were able to

manipulate the system by paying money to some of the LSWDB's refuse collection crews that were to serve customers designated for private service. Also, some contractors reportedly were able to obtain spare parts from the LSWDB's inventory for the repair of their privately owned trucks. Complaints of clandestine dumping by the private contractors also were made. Partly in response to these problems and partly to ease the commercialization of its own operations, in 1991, the LSWDB revoked the licenses of private refuse haulers and declared its monopoly over service delivery.

2.13 The LSWDB is now considering how to adequately regulate and control the private sector, given the extent of corruption that is locally prevalent. The LSWDB has already taken a bold step toward control by commercializing its own operation. By this measure, the LSWDB is making each section manager accountable for costs and now has the management flexibility to hire and fire freely and to provide incentives to its staff.

### ***Competition***

2.14 Competition is a key factor to getting low-cost solid waste service from private contractors. This was recently demonstrated in San Jose, California (United States). San Jose has had for many years private collection and disposal of wastes. In 1984, the city reexamined the prices they were paying and decided that they might lower their waste management costs by actively increasing competition. They focused attention on helping a competitive waste management firm develop a new landfill site, so that there would then be two private landfills owned by competing firms in the San Jose area. They also separated the procurement of disposal services from collection services. Furthermore, they contracted for disposal and collection by zone, so that it would be possible for the city to have more than one disposal contractor and more than one collection contractor. In 1986, the disposal contract cost was 33 percent lower than what had been paid in the previous year, and the collection contract cost was 23 percent lower. Over a six-year contract period, this amounted to savings of US \$25 to US \$31 million (32).

2.15 In cities where there is not a public monopoly, but where the public sector competes with the private, there is no evidence that contracting costs less than public service. In fact, data from several cities suggest that competition encourages the public sector to significantly improve its efficiency and lower costs, as discussed below.

### ***Public and private competition***

2.16 Because public solid waste systems in developing countries are commonly plagued by excessive staff, obsolescent equipment, cumbersome procurement procedures for spare parts, inflexible work schedules, limitations on management changes, inadequate supervision, and strong worker unions, it is difficult for the public service to implement the changes necessary to match the efficiency of the private sector. Nevertheless, it has been shown that when the public service agency is a) placed in competition with private contractors, and b) is allowed to make the necessary adjustments to become competitive, the public agency has been able to attain costs comparable to those of the contractor (20).

2.17 For this reason, the ideal arrangement may be a mix of public and private service—for example, contracting for the collection of solid waste from some zones of the city, while retaining public service to the remaining zones. This is the way that Bangkok has approached private contract

service of solid waste collection in some districts. In this way, Bogota has also recently contracted for solid waste collection in two zones covering 40 percent of its service area. The competition between the private and public systems has led this city to streamline its roles by 30 percent, largely through the attrition of unproductive office employees. It is also the basis for continued negotiations with the government labor union over work schedules, overtime pay, and worker performance requirements for collection workers (11).

2.18 When a mixed public and private system was implemented in 1970 in Minneapolis, Minnesota (United States), the city's costs were higher than those of private contractors. After five years, however, the city's costs dropped toward the level of the private contractors', whereas the quality of service provided by the private contractors raised toward the standard set by the city crews (20). With a mix of public and private service, the natural tendency is to make both types of providers more accountable. As a result, the public organization is motivated to become more efficient, and the contractors recognize that the city cannot be held hostage to cartels, monopolies, or collusion.

2.19 The city of Phoenix, Arizona (United States), maintains a balance of public and private solid waste collection service, which it believes is the foundation of preserving cost effectiveness. The city is divided into zones for solid waste collection. The city's department of public works (DPW) always keeps jurisdiction over two of the zones to maintain its ability to provide service in case of private sector failure. The remaining zones are tendered for contracts of seven-year duration. At the time of tendering, the DPW competes on a level basis with private companies. Using cost accounting data available on current DPW operations and any changes it proposes in technical systems, the city auditor independently and confidentially prepares the bid. Not until the bids are opened does the DPW know the bid price that the city auditor has submitted. The contract award goes to the lowest bidder. To date, the city has successfully been awarded about half of the contracts. As of 1988, Phoenix estimated that *cost savings* amounted to about \$US 11 million in one decade of competitive bidding. In addition, in the same time frame, *cost avoidance* (from lower costs of contracts won back by city employees) amounted to another \$US 9 million (26).

2.20 In Great Britain, a number of local governments allowed the public sector service to challenge the private sector in bid competitions. In those cities where the public sector won the competition, as compared with public monopoly, the city saved about 17 percent in service cost (20).

2.21 South Korea has a successful blend of public and private sector activity for hazardous waste disposal. A public corporation established under the ministry of the environment built and operated two state-of-the-art hazardous waste treatment and disposal facilities. Using the knowledge and practical experience gained from this activity, the Ministry has been able to license and monitor the development of at least six privately owned and operated hazardous waste treatment and disposal facilities (11).

### ***Contracting for transfer and disposal***

2.22 Contracting is a viable means of securing service so long as it is possible to adequately describe outputs anticipated from the contract. Thus, contracting is well-suited for discreet activities within the solid waste system, such as the operation of a transfer station or sanitary landfill. In Caracas, a private firm operates the city's transfer station under contract with the solid waste organization (73). Similarly, in Buenos Aires and in Bogota, private firms operate the sanitary landfills under contract with the solid waste organization (5, 11).

### ***Cost recovery***

2.23 In many countries, local governments have successfully contracted their billing and collection of solid waste user fees to regional water and electric utilities. For example, Surabaya contracts with the water authority and allows it to keep 10 percent of the collections as payment. In areas not served by the water authority, Surabaya has an agreement with elected neighborhood leaders for them to collect the fees in return for payment in a similar manner.

### ***Leasing***

2.24 Contracting to lease equipment, rather than to obtain service, is one way of obtaining equipment when the opportunity to borrow money for a capital investment is limited. In Santa Cruz, Bolivia, 70 percent of the solid waste collection fleet is leased from private firms. The firms provide the vehicles, as well as the drivers, fuel, and maintenance (73).

2.25 In developing countries, the available equipment for solid waste service leasing typically has been fully depreciated during private sector use in construction or haulage. Most leasing involves open tipper trucks or bulldozers that are readily available from construction contractors, especially in recent years when construction activity has declined in most developing countries. Until this year, metropolitan Manila has been heavily dependent on leased trucks for use in solid waste collection. In 1989, private contracts provided, through leasing agreements, 76 percent of the solid waste collection fleet (432 open tipper trucks). Because the trucks were more than fifteen years old, it was typical for 30 percent of the fleet to be down for repairs on any given day (11).

2.26 During the 1980s, the city of Onitsha (Nigeria) relied heavily on leased equipment until a new fleet was purchased through a World Bank project. The cost for leasing old open tippers was roughly equivalent to the estimated costs for owning and operating newly purchased open tippers. Because the market demand for bulldozers and wheeled loaders was greater, the leasing cost was roughly 100 percent greater than the estimated costs for owning and operating newly purchased dozers and loaders (11).

### ***Contract specifications***

2.27 To foster competition, a key factor is a good tender document—one that recognizes the capabilities and limitations of the local private sector and enables it to bid competitively toward providing an acceptable standard of service.

2.28 Because contracting has been used extensively as the primary mode of privatizing in the United States, substantial guidance is available in the literature issued by various American associations. For instance, contracting issues are discussed and a model contract is provided in the excellent book entitled *Solid Waste Collection Practice*, which was written by the American Public Works Association (1975). Model contracts are also available in the United States from the National Solid Waste Management Association, whose members are predominantly private contractors, and from the Solid Waste Association of North America, whose members are largely from municipal government (34, 35). In addition, the city of Phoenix has a well-conceived document entitled “Management Procedure for Preparing Cost Estimate for City Services under Consideration to be Performed by Private Industry on a Contractual Basis,” which provides a framework for how to establish public-private competition to optimize cost-effectiveness (26).

### ***Monitoring***

2.29 It would be a mistake to assume in the absence of well-defined contract performance measures, enforceable contract sanctions, vigilant contract monitoring, and cost accountability that private contractors would deliver a lower cost than that of public service. The monitoring of the performance of the private sector is very important. A good contract clearly defines measurable outputs of service required of the contractor and thus enables performance monitoring. A good contract also clearly defines the sanctions that are to be imposed for nonperformance.

2.30 Complaints from residents about solid waste service should be received by the local government, even when solid waste service is being provided by private firms (56). Singapore has set up its complaint bureau for the receipt of complaints about *all* public services. The central complaint bureau processes each complaint with the appropriate government agency and follows up on whether the problem resulting in the complaint has been adequately addressed, a process that they feel increases the accountability of each government agency (11).

2.31 In Kuala Lumpur, monitoring includes comparing the efficiency of the public service with that of the private contractor. It was reported that the private firms made more daily trips for each vehicle and collected more waste on each trip. The result was that the private firms collected daily 8.5 tonnes per vehicle, whereas the public service collected daily 5.7 tonnes per vehicle (11).

2.32 In Hong Kong, at privately run transfer stations, monitoring includes six full-time inspectors from the local government. Operations are continuously observed and regular readings of pollution levels (noise, dust, odor) are made. In addition, the weigh-bridges at the transfer station are computerized and linked to the central computer in local government, so that all data on incoming and outgoing loads are immediately available to the local government for performance monitoring (11).

2.33 In 1991 in Bogota, two private contractors serviced about 40 percent of the city's households and establishments, while the local government serviced about 55 percent. The city hired a private company of consulting engineers to monitor both the public and private service delivery and to provide a monthly report on performance by each. The cost of the monitoring contract amounted to 2.5 percent of the total cost for contracting with the two private firms (11).

### ***Length of contract***

2.34 For low cost to be achieved by contracting, it is generally agreed that the contract should have a long enough duration to enable the private sector to depreciate capital expenditures for appropriate equipment. Given that collection vehicles have an economic life of six to eight years under single-shift use and a life of four to five years under intense use, in solid waste collection contracts the length of contract should be at least 4 years. In a well-developed market in which substantial competition and private sector participation already exists, the issue of the length of contract is less important, because a private firm can sell its collection vehicles to other contractors if their contract is not renewed. Few developing countries, however, are at this stage, and thus length of contract is an issue to consider.

2.35 Many developing countries have limits on whether local government can contract beyond its current fiscal year and commit funds beyond its current budget allocation. As a result, the

contracts for collection in Seoul are solely for one year. For political reasons, some cities have contracts of less than one year duration (11). For example, the solid waste collection contracts in Surabaya (Indonesia), and truck leasing contracts in Manila, are for three and six month periods, respectively (11, 41).

## **Franchise**

2.36 By national law in most countries, local governments own all waste within their boundaries, once it has been discharged for collection and disposal. A local government has the authority to give exclusive franchise to a qualified private firm for the right and responsibility to provide service to customers within a zone. In return for such an exclusive franchise, the private firm pays a license fee to the government. The firm subsequently charges their customers appropriate fees to cover the cost of service.

2.37 The fees charged may be regulated by ceilings fixed by municipal ordinance (57). Local government retains responsibility to monitor the performance of private firms having franchise agreements, and to regulate user charges. It also retains the right to renew or revoke licenses in accordance with preestablished criteria.

### ***Solid waste collection by franchise***

2.38 Franchise is applicable to solid waste systems because economies of service are attainable only when waste is collected along a contiguous route or within an exclusive zone (20).

2.39 In contracting, the private firms are paid by the local government from general revenues or through monies raised by direct user charges. The costs to local government for cost recovery are insignificant when general revenues are used. When local governments bill for service, this is typically part of a combined bill for a number of services (water, sewerage, parks), and the portion of the billing costs attributable to solid waste is estimated to amount to only about 3 percent (56).

2.40 By the franchise system, private firms collect user charges from each household and establishment that receives private service. Thus, private firms must individually bear the cost of billing and collecting user charges. The cost of billing (including costs of nonpayment and late payment) is estimated to amount to 10 percent of the total cost to the consumer of service. It is one of the reasons why franchise does not usually result in the same low cost as contracting (20, 56).

2.41 In 1985, private franchise of residential collection in high-income laid-out areas was implemented in Ibadan (Nigeria). These areas were divided into ten zones for private sector participation purposes. Based on availability of equipment and business credentials, six firms were selected to collect refuse from the zones. Each firm paid a license fee of 5,000 Naira (then equivalent to about \$US 1000). Significant improvements in city cleanliness resulted. Many Ibadan residents, however, complained that they were not given free choice to select their designated company. And indeed, some of the companies turned out not to be reliable performers (10).

2.42 Franchise is popular in large cities in the United States, particularly with regard to collection of waste from large generators, such as large commercial establishments (hotels, department stores) and large industries.

2.43 Franchise is also popular in small towns in the United States, where residents have the option of hauling their own waste to the local landfill or of reaching a service agreement with the firm obtaining the franchise. In the case of small towns, there is limited political clout for obtaining low-cost service, and, as a result, residents can carry a high cost burden.

2.44 For developing countries, franchise is applicable only in the areas of the city wherein *all* of the households and establishments can be readily educated to be concerned about public cleanliness. Only in such areas would it possible for the private company holding the franchise to obtain full cooperation and cost recovery.

### ***Informal sector solid waste collection***

2.45 It is possible for government to work with community groups, nongovernmental organizations, and cooperatives for conduct of solid waste services. This is particularly true with regard to service of low-income neighborhoods and the recycling of secondary materials.<sup>1</sup>

2.46 In many developing countries, the informal sector provides waste collection services to low-income neighborhoods, especially in Latin America where government solid waste collection service has not been able to keep pace with the huge influx of rural immigrants to the cities' marginal zones. It is common to see these areas served by individuals with donkey carts or old dump trucks. Unfortunately, because the collectors in the informal sector do not have equipment to travel far to the official landfill and are also outside of the officially sanctioned system, the collectors are prone to dump solid waste illegally. In 1988 in Barranquilla (Colombia), there were more than 600 clandestine dumps, many of which were created in the informal sector by collectors using donkey carts (11). For this reason, it is worthwhile for government to explore organizing these collectors into a cooperative and developing a franchise arrangement whereby the rights *and* responsibilities of the informal sector collectors are defined.

2.47 In Indonesia, cities commonly work with the local leader of low-income neighborhoods to organize community efforts for the self-delivery of waste to a communal depot or to hire and manage the neighborhoods workers who provide door-to-door collection by push cart. The local leader collects fees from residents to fully cover the neighborhood costs (salaries, supplies, and equipment replacement) and to keep the neighborhood system self-sustaining. The cities participate by sending trucks to pick up the portable roll-on containers and to transport them to landfills to be discharged (11, 33, 68).

2.48 In Cairo (Egypt), an informal sector solid waste collection system involving 12,000 workers has existed for the past century. The private collectors are part of a single community, known traditionally as the Zabbaleen. The private collectors worked closely with another community, known as the Wahis, which originally had purchased the long-term rights to the refuse from various buildings. Over the past century, the Zabbaleen provided collection free-of-charge to residents of upper income neighborhoods, in return for the opportunity to recover and recycle the materials present in the wastes. For their livelihood, the Zabbaleen sold recovered paper, plastic, glass, and metal to manufacturing plants for recycling, and they raised pigs on the recovered organic wastes. Fees were paid to the Wahis for access to the wastes from these upper income neighborhoods.

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1. A detailed discussion of informal sector participation is beyond the scope of this paper. A second volume under preparation will document case studies of informal sector arrangements for collection and recycling, and provide corresponding policy recommendations.



2.49 Unfortunately, there was no incentive for the private collectors to provide collection from lower income neighborhoods, because the waste from these neighborhoods did not have much recyclable material content. In 1987, the Wahis and the Zabbaleen were assisted in setting up a private company (called the Environmental Protection Company) for purposes of providing solid waste collection under contract. So that private collection service arrangements could be developed, technical and financial assistance was provided by volunteer organizations and international agencies for the upgrading of collection equipment and the routing of vehicles for networking with the residents of the lower income neighborhoods. The outcome was the extension of private service to lower income neighborhoods in return for payment of user charges by the residents. The basis of the charges was established so that the system could be self-sustaining (21).

### ***Recycling and resource recovery***

2.50 Several Indonesian cities have awarded cooperatives and private companies the exclusive rights to recycle and recover resources from municipal refuse. For example, Surabaya gives the official cooperative of registered waste pickers the franchise to recover secondary materials at the city's communal transfer depots. Medan gives two private companies the franchise to mine compost from the city's two disposal sites, respectively. In Medan, the private firms share their profits with the city (11).

### **Concession**

2.51 Under concession arrangements, the private sector finances and owns (for period of time sufficient to depreciate investments and to provide a reasonable return to the equity investors) solid waste management facilities (3). In return, the government typically grants and enables access to a specified quantity and quality of solid waste and provides some form of tipping fee. In cases in which the government is the only purchaser of the product or output service of the concession, the government will normally be required to enter into a binding long term agreement to purchase on a "take or pay" basis (3). The concession agreement might specify performance standards, methods of judging performance, penalties for delay or nonperformance, risk assignment, insurance requirements, dispute resolution, and standards for worker safety and health protection and for environmental protection (52).

2.52 In developing countries, governments need to be wary of unsolicited proposals from a single vendor with unsupported exaggerated claims that its technology would lead to substantial revenues from sales of recovered resources (compost, steam, electricity). When politically motivated decisions are made to buy equipment or facilities from such vendors, the customary procedure of citywide master planning and feasibility study to determine the most viable waste disposal option is often bypassed—as are those of competitive procurement. Unfortunately, some of these facilities are unwittingly financed by grants or soft loans from bilateral donor agencies, which gives the appearance of minimal risk.

2.53 Once built, these costly facilities serve as little more than urban sculpture—impressive structures that cannot and do not function, because they are technically inappropriate, too energy-intensive to operate, or both. The examples of such in developing countries are numerous. A partial list includes a refuse-derived fuel plant in Seoul, a composting plant and incinerators in Lagos, and an incinerator in Delhi (India).

2.54 Long-term *ownership* by the private sector is one way to avoid the problems caused by hasty "build and sell" arrangements. Concession arrangements involve building, owning, and operating facilities through long-term contractual agreements, as discussed in the next paragraph.

***Build, own, operate, and transfer (BOOT)***

2.55 BOOT involves private sector participation in building, owning, operating, and, after a prespecified number of years, transferring infrastructure. It provides a means of having the private sector finance facilities whose ownership will eventually be transferred over to government. While governments, especially those of developing countries, favor the concept of BOOT, very few have been able to implement these arrangements. In many developing countries, the private sector is not willing to risk its investment money in such long-term and large-scale projects. As a result, one of the few BOOT examples within the solid waste sector is for a transfer station in Hong Kong (notably a city where the investment risk is considered minimal relative to what would typically be found within a city of a developing country).

2.56 The city of Hong Kong and a private firm reached a BOOT agreement several years ago for the construction and operation of solid waste transfer facilities (a transfer station and fleet of transfer trucks). Several firms were prequalified, based on their past experience in designing and operating transfer stations. The government's bidding document specified technical performance requirements (on-site storage, vehicle washing, compaction, and through-put requirements), environmental performance requirements (noise and odor detection at the station's perimeter, wastewater treatment, bird and rodent control, and air emission standards), equipment and building maintenance requirements, and equipment replacement schedules. The station is now built and operating. The government makes regular inspections to determine whether all of the contract performance specifications are being met (11).

2.57 In this example, ownership was transferred to government after only one year because government wanted to feel free to fire the contractor if there were inadequate performance. Thus, the objective of the BOOT agreement was *not* that of obtaining private sector investment but that of obtaining private sector design and construction expertise. Also, by having the private sector design and build the facility this sector will eventually operate, the contractor has fewer excuses available for nonperformance.

2.58 BOOT agreements require meticulously developed specifications. Most important, these agreements outline the regular maintenance requirements that the private sector must provide to the facilities, as well as the final condition in which the facilities must be presented to the local government at the time of ownership transfer. Without such specifications, one could well anticipate that the facility would have a planned obsolescence matching the schedule for transfer (3, 12).

***Build, own, and operate (BOO)***

2.59 A private firm, through turnkey contracting, may build, own, and operate (BOO) a facility that provides solid waste service, such as transfer, disposal, or resource recovery. Such turnkey contracts became a popular means of financing major resource recovery projects in the United States, where about half of the waste-to-energy plants are privately owned (25). In this country, private ownership was encouraged by financial incentives established by the federal government, including tax benefits and opportunities for accelerated depreciation (18).

2.60 BOO is not as popular with developing countries, because the private sector does not eventually transfer ownership of facilities to government. For many reasons, however, this is a much

better arrangement to pursue for the following simple reason: If the private sector is willing to build, own, and operate a solid waste facility, it indicates that the fundamental risks and economic benefits have been satisfactorily managed to create a real-world market opportunity.

2.61 From 1976 to 1986 Surabaya operated under a variation of a BOO arrangement with a private company for the implementation of a composting facility. Unfortunately, there was not an adequate quality control of the solid waste quality delivered to the facility by the local government nor an adequate development of markets by the private sector. Also, the private firm did not choose the most appropriate technology for the local conditions. Given Indonesia's low labor cost, a labor-intensive composting technique should have been built, rather than a mechanized technique. Finally, under more favorable BOO arrangements, the firm would have received a tipping fee from the city that would have been priced to cover costs that might have otherwise been incurred for comparably safe disposal. The firm struggled along for many years but is presently not operating. For BOO arrangements to succeed, they need to be as carefully developed as BOOT arrangements.

2.62 In Buenos Aires, a cooperative operates a composting operation on a site provided by the government. The government pays a small tipping fee for the waste that the cooperative receives. To assist the cooperative with marketing, government encouraged privately owned trucking companies that haul fresh produce into the city to return to the agricultural area through the compost plant and thus to return to the farms with compost (12).

### ***Solid waste recycling concessions***

2.63 For the self-serving reason of reducing its work load and cutting its costs, if not for humanitarian and environmental reasons, local governments should do everything possible to encourage recycling from the source by private sector initiatives. The best way to encourage recycling is to provide financial incentives (low-cost loans, loan guarantees, tax exemptions) and to set up concession arrangements with the private sector, including the informal sector waste pickers.

2.64 At the heart of recycling is the buy-back center. The buy-back center purchases recyclables from individuals, processes them to meet industrial requirements, and sells them to industry. Because buy-back activity could lead to significant reductions in the quantity of waste that the government has to collect, the government should be willing to provide buy-back centers with financial support. For example, in New York City (United States), buy-back centers are given a payment for every tonne of waste that they can demonstrate is recycled back to industry and, hence, saved from land disposal.

2.65 In most developing countries, buy-back centers are purely market driven and receive no government support. Their profits are solely based on the difference in price received from industry versus that paid to individuals (dump-site waste pickers and door-to-door waste collectors). Unfortunately, until governments in developing countries stop open dumping and recognize the cost associated with disposal, it is unlikely that they will give buy-back centers the equivalent of a tipping fee for every tonne recycled and thus diverted from disposal. In recognition of the savings in solid waste collection costs that buy-back centers cause when they recover wastes directly from the source, local governments ought to provide some form of financial incentive.

2.66 In some cities of developing countries, limited competition exists among buy-back centers, because there is limited competition among industries or because access to the waste is

politically manipulated by local government officials. In these cities, the price paid for recyclables is both controlled and nominal (11). As a result, the waste pickers enter into a patronal relationship with and become highly dependent on one buyer (11, 55). During times of hardship, the waste pickers may need to borrow money from their patronal buyer and may remain forever indebted owing to the subsistence levels at which they are working.

2.67 In other cities, where there is extensive competition among the buy-back centers and free access to the waste, the waste pickers can make a viable income. In 1988 in Bangkok, for example, where the free market is relatively well-developed, there were about 1,000 licensed buy-back centers. Competition in Bangkok is significant, and earnings achieved by waste pickers and government solid waste collection workers who recycle are substantial (11).

2.68 In many cities of the developing world, a large work force is informally employed in waste picking at city dumps. There are, notably, about 8,000 waste pickers at the dumps of Jakarta, 10,000 in Mexico City (Mexico), and about 7,000 in metropolitan Manila (11). On the surface, friction exists between local governments and dump-site waste pickers. To resolve the problem in Ciudad Juarez (Mexico), dump-site waste pickers were organized into a recycling cooperative and the cooperative was given a concession to operate the city landfill (5). In Ecatepec (Mexico), dump-site waste pickers were granted the concession to recycle at a city-operated landfill (11).

2.69 As with all private sector arrangements, it is important that such a concession arrangement clearly specify the rights and responsibilities of each party—namely a) the cooperative's right to recover and sell the recyclables found in the waste brought to the landfill and responsibility to operate the landfill to meet specified environmental standards, and b) the city's right to monitor the environmental conditions of the landfill and the responsibility to bring a guaranteed quantity of municipal solid waste, exclusive of hazardous wastes, to the landfill.

### **Open Competition**

2.70 In open competition (often termed *private subscription*) of solid waste collection services, each household and commercial establishment hires a private collection firm and pays the solid waste removal fee that the firm charges (43). Generally, this form of privatizing of solid waste collection a) leads to substantially higher costs than those incurred by government contracting with private firms and b) is often more costly than public service. When a number of competing firms operate in the same area, along the same streets, each loses the "economies of contiguity" that would be received if one firm served the area and in turn picked up the waste from each establishment (20).

2.71 Collusion is an issue of concern when open competition is allowed. In developing countries that do not have true competition at a significant level, collusion is a common practice. Price setting occurs and is viewed in some cultures to be an accepted practice. In Nigeria, there are associations of private refuse companies in the states of Lagos and Oyo, and agreements on prices are made among companies (11). In countries where private companies can be relied on to not be excessively greedy, such price setting might be tolerable. But in other countries, where the hardship imposed by unreasonable prices does not affect the drive of private companies toward disproportionately high profits, such price setting is clearly unacceptable.

### ***Solid waste collection***

2.72 Private subscription has been found to be the most costly method of solid waste

collection service for urban areas. Private subscription among solid waste collection firms takes away the opportunities to achieve economies of contiguity, as illustrated by the case of Ibadan, noted below. In addition, competitive firms must bear the cost of billing and collecting user charges from customers. Billing has been estimated in the United States to comprise about 15 percent of the total cost of service (56). Studies done in the United States, Canada, and England differ in their assessment of the extent to which costs are elevated by private subscription, reporting private subscription costs from 26 percent to 63 percent more than contracting (20).

2.73 As discussed earlier, in 1985, private franchise of residential collection in high-income, laid-out areas was implemented in Ibadan. In 1987, Ibadan switched to an open competition system for the high-income households and establishments, wherein licensed private firms were allowed to compete for clients throughout the city. Later that year, local officials found that “it was cheaper for the firms to operate the same number of clients within a zone than to hop from Bodija to Manatan to Apata to Felele, etc., for the same number of customers” (59). Nevertheless, because most customers of private haulers are wealthy, they prefer their “freedom-to-choose” system and open competition is still practiced in Ibadan. (11).

2.74 From 1987 to 1992, the local currency, Naira, became significantly devalued. Yet, the price that customers are willing to pay for service has not increased over time. The result is that the private firms no longer generate enough revenue to purchase the imported spare parts necessary to keep their vehicles in operation. The number of licensed private firms in Ibadan has dwindled. Also, the fleet that each firm has available has deteriorated in condition and decreased in number. As illustrated by the Ibadan example, open competition can only work in areas where customers are able and willing to pay enough to fully cover the costs and enable private firms to renew their fleet as well as make a profit (11).

2.75 Despite conditions of open competition and unrestricted entry into the refuse collection business in various cities within Nigeria, the private sector has waxed and waned in response to general economic conditions, providing service when the economy is good and retreating from service delivery when bad. Only a handful of the private firms operating in Nigeria (no more than 10 out of more than 100 firms) have made an investment in appropriately designed refuse vehicles. The remainder use depreciated equipment from construction (open tipper trucks), which they can readily use for other business activity when the profit potential of refuse collection business is down (11). At this juncture, it is interesting to observe that the one argument most often used for privatizing refuse collection (no barriers to *entry*) is essentially the same as one reason for private sector failure in Nigeria (no barriers to *exit*).

### ***Solid waste recycling***

2.76 Recycling of secondary materials (cans, bottles, paper, textiles) is commonly conducted under open competition arrangements. Various redemption centers, junk yards, or buy-back centers compete with each other to obtain recyclable materials and to process them for sale to industry.

### ***Solid waste disposal***

2.77 Once environmental regulations clearly specify minimum standards of safe disposal, open competition between private owners of disposal sites can occur. If environmental protection is well-regulated, private firms can assume the risk of investing in safe disposal systems. As sites that

do not meet environmental criteria are phased out of operation, there is increasing competition for clients among firms owning proper disposal sites. In the United States, it is not uncommon for a local government to have to transport its waste from 100 kilometers to 300 kilometers to a privately owned sanitary landfill.

### ***Maintenance and repair***

2.78 One of the most typical services for which governments turn to open competition is maintenance and repair service. For minor repairs of solid waste collection trucks, several quotations from private workshops are obtained within a matter of hours, and the repair job is given to the lowest qualified bidder. For example, even though Bangkok operates a central garage for major repair and overhaul of the city's entire fleet of rolling stock, equipment is sent by the districts to private workshops for minor repairs. The same situation occurs in Seoul (11). Both cities have enormous traffic congestion problems, and it can take hours to drive across the city. It is expeditious and generally less expensive to have a minor repair done locally, in the vicinity of each district office, than to send it to the central garage.

### III. PUBLIC OR PRIVATE SERVICE DELIVERY— CRITERIA FOR CHOICE

3.1 The argument is valid that in developing countries the government's solid waste management services often are not as efficient as they could, or perhaps, should be. There are usually too many workers on the roles and too few supervisors and managers. Few incentives exist to encourage high-performance productivity from refuse collection crews. Finances are always limited. And the first priority in government spending is to pay the salaries of tenured workers, even if this means that there are not enough spare parts available to keep all of the fleet operating.

3.2 In theoretical jurisdictions with perfect contestability, there is perfect efficiency and optimal pricing consistent with efficiency (6). Predatory pricing, collusion, cartels, unsafe labor practices, hidden subsidies, unnecessary costs, and excessive risks do not exist in the ideal, perfectly contestable market. These conditions, however, do exist in many developing countries. As a result, the argument is also valid that in developing countries the private sector's solid waste management services often are not as efficient as they could—or should—be.

3.3 How does government resolve the question of whether to privatize a specific aspect or portion of its service? For each situation, government needs to weigh whether the economic risks associated with political manipulation—payment for payment, changing environmental regulations, government tariff regulation, currency devaluation, inflation, and unclear taxation systems—are substantial when compared with the economic benefits of private sector efficiency, which is motivated by market forces. Some criteria that need to be examined in deciding whether to involve the private sector in solid waste management services are:

- **The ease of defining outputs.** Are the outputs definable for privatizing the service under consideration? What is the government's ability to write performance specifications that clearly define outputs that the private sector would have to deliver as part of providing the service? What is the government's ability to define performance measures that can be monitored and enforced?
- **Efficiency.** What are the political realities constraining government from providing efficient service? (These may include cost accountability, labor tenure, government wage scales, restrictive labor practices, personnel benefits, inflexible work arrangements, bureaucratic procurement procedures, and hiring and firing procedures.) Can these constraints be removed? Is the private sector constrained in the same manner? Are there any economies of scale?
- **Capability.** Does the government recognize that expertise is essential for competent and low-cost solid waste management? What are the differences between the government and the private sector in technical and financial resources (such as expertise and skills, ability to raise capital at a reasonable cost) required to build or buy, operate, and maintain solid waste facilities or equipment? Does government have the capability to monitor performance, as well as the will to enforce contractual or license agreements, or both, with the private sector?

- **Competition.** Is the private sector adequately developed to ensure competition between a number of private firms or between the government and a few private firms? Are there significant barriers to entry or economies of scale that might limit competition? Would financial incentives or technical assistance better enable the private sector to participate in public service delivery? Is the government able and committed to conducting a competitive procurement?
- **Duplication.** Does the political will exist to make corresponding cuts in the government roles and assets when services are given to the private sector to conduct? Do the government's monitoring costs offset the savings that might otherwise accrue from private sector participation?
- **Risk.** Does the regulatory framework exist to protect the private sector against risks (such as environmental damage, currency adjustments, inflation, political changes, and force majeure) so that prices for service are not unduly burdened with the hidden costs for risk-protection? Does local government have adequate revenue generating capacity to meet its contractual agreements with the private sector and to protect it from economic conditions that might affect transfers from central government? Does government require a kickback from contractors before it releases payments toward legitimate invoices? Do contractors have to "buy" their contracts through bribes and favors?
- **Accountability.** Has government assessed whether private sector participation will disproportionately benefit an elite, wealthy class with control over private capital, or whether market openings would be available to small- and middle-size business and thus lead to some redistribution of income and power? Has government assessed the social issues of fair and safe working conditions and a guaranteed minimum wage relative to private sector participation? Is government prepared to make provisions for displaced workers including job training and employment networking?
- **Costs.** Are the costs for public service known? Does government have the accounting information to determine whether private sector participation would offer solid waste service delivery at a lower cost? Has there been a sufficient citywide strategic planning and feasibility study conducted to know whether the technology being offered by the private sector would result in low costs?

3.4            These criteria deal with many complex factors that affect the ability of the private and public sector to perform efficiently and effectively. For example, the criteria deal with the extent to which a society is open or closed to competitive market forces, has a procurement process that is straightforward or obtuse, has simple taxation and transparent subsidies or complicated taxation with hidden subsidies, operates freely or is riddled with corruption. From another perspective, these criteria deal with how moral reasoning (also known as *fairness reasoning*) operates in a society.



3.5 One crucial function of moral reasoning is to provide for the distribution of benefits and burdens of social collaboration. Moral rules and principles regulate basic social relationships, practices, and institutions; and social collaboration depends on a stable and reliable system of cooperation. Sociomoral development is based on shared expectations and on some method of securing the support of the participants to maintain cooperation by equilibrating the interests of individuals. To some extent, it is thus reasonable to assume that moral judgment operates differently within different social systems in different developing countries (46). When studying the feasibility of introducing private sector participation to solid waste management, the astute observer needs to be sensitive to these differences.

3.6 In the executive summary, private sector participation was defined as a possible opportunity to *mobilize private investment* and *introduce efficiency* in solid waste management. In some developing countries, however, it is important to note that commercial lenders and private companies may not want to risk their money on long-term or large-scale investments that rely on government payments. Furthermore, efficiency from the private sector will result only in situations in which competition, performance monitoring, and accountability exist.

3.7 Recommendations for private sector participation should not be made in a vacuum separate from a supportive framework. For example, developing cost recovery mechanisms specifically earmarked for solid waste services is one way of enabling government to attract private investors. Creating a reasonable mix of public and private sector service is one way of establishing contestability and competition. Organizational restructuring of the government's solid waste agency is one way of introducing transparency and accountability. This should enable comparative performance monitoring of the public and private sector activities in solid waste management. The possibilities are many—in the view that the goal is not to privatize, but to introduce investment and efficiency to the solid waste management system.



## IV. RECOMMENDATIONS

4.1 This paper has reviewed issues that need to be considered when determining whether to involve the private sector in solid waste management services. It also has provided a review of the privatization approaches that are available.

4.2 To proceed (beyond the purview of this paper) toward private sector participation within a given city and country, field work needs to be accomplished—preferably by a team of two experts with developing country experience, one an expert in solid waste management and the other in municipal finance.

4.3 First, such field work should examine each contextual issue raised in this paper (issues of labor wages and benefits, restrictive labor practices, worker productivity, bureaucratic constraints, costs of private sector capital, risks, regulatory framework, and so forth). The extent to which each issue is relevant in the selected city would need to be assessed; and the corresponding impact it might have on the cost of private sector service delivery in solid waste management would need to be examined.

4.4 Second, if there are cities within the selected country wherein private sector participation in solid waste services already exists, a comparative assessment of costs (broken down into capital, personnel salaries, benefits, administration, operation, maintenance and repair, billing, monitoring) between private sector and public sector service delivery would need to be done. Care would need to be taken to avoid the pitfall of comparing *price* of private sector service, using fully depreciated construction trucks, with the *cost* of public service, using new appropriately designed vehicles.

4.5 Third, after completion of field work and related analysis, definitive technical guidance would need to be developed on where and how to involve the private sector. It is impossible to know in advance whether the potential efficiencies of private sector involvement in solid waste management would outweigh the costs. Nevertheless, there is value in recommending *small, measured steps* to be taken to involve the private sector, if only to introduce contestability to the public monopoly and to provide government with a performance reference point. As part of the technical guidance for involving the private sector, guidance needs to be provided on how best to monitor both private and public sector activities on an equitable and comparable basis.

4.6 Fourth, contextual issues that are identified during the field work to be constraints to cost-effective private sector participation in solid waste services may require changes in the policy and regulatory framework at the national government level. This work might include recommendations on organizational restructuring, legislative revisions, financial incentives, and institutional arrangements.



## ANNEX. COSTS OF MUNICIPAL SOLID WASTE MANAGEMENT

A.1 This annex elaborates on the issue of costs presented in chapter one; and presents an analysis of the costs of solid waste collection, cleansing, disposal, transfer, and recycling. This discussion provides a framework for analysing the costs and advantages of private sector participation arrangements in comparison to existing services.

A.2 There was no specific field research conducted to support the development of this paper. Some information was gleaned from published references. However, most of the information was derived from the author's experience from conducting over 80 field assignments on solid waste management within developing countries during the past 17 years.

A.3 In most cities within developing countries, solid waste management costs consume from 20 percent to 50 percent of local government expenditures. Despite the high level of expenditure made on municipal solid waste management, collection service levels are low. Only 50 percent to 70 percent of urban residents receive service, and most disposal is by unsafe open dumping.

### Waste Generation and Income

A.4 Although the waste generation rates in developing countries are substantially lower than those in industrialized countries, these rates are not proportionally lower relative to income. In fact, these rates are roughly 30 percent to 50 percent as high as those in industrialized countries, while income levels are 2 percent to 10 percent as high, as indicated below.

#### Waste generation rates and income

	Low-income Country	Middle-income Country	Industrialized Country
Solid Waste Quantity (tonne/capita/yr)	0.2/T/c/yr	0.3/T/c/yr	0.6/T/c/yr
Average Income \$US/capita/yr (in 1988 \$US)	\$350/c/yr	\$1,950/c/yr	\$17,500/c/yr

A.5 Solid waste service consumes a higher share of income in developing countries than in industrialized countries. Although labor costs are lower in developing countries, the purchase price of equipment is typically higher, and fuel costs are greater. Because most residents do not discharge their wastes in easy-to-unload containers at convenient curbside locations, more effort is required to perform collection. Because of inadequate public education and political-cultural obstacles to the enforcement of anti-litter and clandestine dumping laws, more effort is also required to perform public cleansing.

## Collection Costs

A.6 In most developing countries, about 95 percent of the solid waste management costs are attributable to collection and public cleansing. On the other hand, in industrialized countries, about 70 percent of the solid waste management costs are attributable to collection and public cleansing.

A.7 For comparative purposes, the following collection costs (including all capital, debt service<sup>1</sup>, operating, and maintenance costs) have been estimated by the author. These are based on municipal solid waste collection conditions observed in a wide range of countries in different regions of the world. See Cointreau (11) for an example of how cost calculations and comparisons can be made of collection options.

### Collection costs

	Low-income Country	Middle-income Country	Industrialized Country
Collection Cost (in \$US/Tonne)	\$15–30/T	\$30–70/T	\$70–120/T
Capital, Labor, and Operating and Maintenance Expense (as percentage of cost)	40% 15	30% 40	10% 70
Collection Cost (in \$US/capita/yr)	\$3–6/c/yr	\$9–21/c/yr	\$42–72/c/yr
Collection Cost (as percentage of income)	0.9–1.7%	0.5–1.1%	0.2–0.4%

## Cleansing Costs

A.8 When citizens litter indiscriminantly and collection services are inadequate, waste accumulates in streets and on open lots. The costs for cleaning up these areas can be very high. The costs/tonne of public cleansing (including general clean up of open areas and street sweeping) are two to three times the costs/tonne of collection. The obvious way to minimize the expenditures required for street sweeping and general cleaning is through a) public education, inspection, and enforcement of laws regulating citizen behavior, and b) adequate provision of collection service to all residents.

1. Capital amortization costs were based on using an interest rate of 10 to 12 percent for on-line lending to local governments on internationally financed projects. It is recognized that private sector capital amortization costs would be substantially higher if borrowing from local commercial banks is necessary.

A.9 For purposes of this estimate of municipal solid waste management costs, it is assumed that a well-run city in a developing country would have no more than 10 percent of its total waste quantity collected through public cleansing, whereas a well-run city in an industrialized country would have no more than 5 percent of its total waste quantity collected through public cleansing. Assuming that the costs/tonne for public cleansing are roughly two times higher than the costs/tonne of collection, the costs for public cleansing are estimated below.

#### Costs for public cleansing

	Low-income Country	Middle-income Country	Industrialized Country
Collection Cost (in \$US/Tonne)	\$30–60/T	\$60–140/T	\$140–240/T
Capital, Labor, and Operating and Maintenance Expense (as percentage of cost)	30% 50	20% 70	25% 65
Collection Cost (in \$US/capita/yr)	\$0.6–1.2/c/yr	\$1.8–4.2/c/yr	\$4.2–7.2/c/yr
Collection Cost (as percentage of income)	0.2–0.3%	0.1–0.2%	0.02–0.04%

#### Disposal Costs

A.10 If environmentally safe disposal were required in developing countries, the most cost-effective technique for most cities would be sanitary landfill. Incineration is rarely technically viable in these countries because the moisture content of refuse (typically between 45 percent and 85 percent moisture) is too high, and because the calorific content is too low (typically between 900 and 1,200 kcal/kilogram lower heating value). Refuse derived fuel technology is not viable because the content of combustibles is too low (paper, plastic, and textile content typically total less than 25 percent). Compost is technically viable because the content of vegetable and putrescible material is high (typically more than 40 percent). The market is commonly poor, however, because most farmers exist at subsistence levels and cannot afford to cover the cost of composting and transporting of the compost product. While specialized markets exist (i.e., pottery, soil, horticultural farms, and intensive vegetable crop farmers) this total demand is usually small.

A.11 In industrialized countries, sanitary-landfill design standards impose strict requirements for environmental protection, resulting in costs that are substantially higher. Yet, these standards do not require a larger fraction of per capita income for cost recovery. Sanitary landfill cost would generally fall within the ranges shown on the next page.

**Sanitary landfill costs**

	Low-income Country	Middle-income Country	Industrialized Country
Disposal Cost (in \$US/Tonne)	\$1–3/T	\$3–10/T	\$15–50/T
Capital, Labor, and Operating and Maintenance Expense (as percentage of cost)	55% 10 35	50% 20 30	40% 35 25
Disposal Cost (in \$US/capita/yr)	\$0.2–0.6/c/yr	\$0.9–3.3/c/yr	\$9.0–30.0/c/yr
Disposal Cost (as percentage of income)	0.05–0.2%	0.05–0.2%	0.05–0.2%

**Transfer Costs**

A.12 To locate a suitable site for sanitary landfill, it may be necessary to look beyond what would be viable transport distances for collection trucks. Generally, sanitary landfill costs are substantially lower than other disposal techniques, even when the cost for the implementation of transfer stations and the long-distance haul in transfer vehicles are added. Transfer system costs tend to fall within the ranges shown below.

**Transfer system costs**

	Low-income Country	Middle-income Country	Industrialized Country
Transfer Cost (in \$US/Tonne)	\$3–5/T	\$5–15/T	\$15–20/T
Capital, Labor, and Operating and Maintenance Expense (as percentage of cost)	65% 10 25	50% 25 25	35% 45 20
Transfer Cost (in \$US/capita/yr)	\$0.62–1.0/c/yr	\$1.5–4.5/c/yr	\$9.0–12.0/c/yr
Transfer Cost (as percentage of income)	0.2–0.3%	0.1–0.2%	0.05–0.07%



## **Recycling Costs**

A.13 In low-income developing countries, recyclable materials comprise about 15 percent of the solid waste stream. As an economy improves, residents are likely to consume more packaged goods and to generate more waste. In middle-income developing countries, recyclable materials comprise about 30 percent of the solid waste stream. In industrialized countries, recyclables comprise about 60 percent of the waste stream.

A.14 The highest recovery of recyclable materials is possible only if source separation is practiced. Source separation of recyclable materials, such as paper, glass, metal, and plastic, can lead to a reduction in the quantity of waste that the local government would have to collect and dispose. The cost of collecting recyclables door to door is typically higher than the cost of collecting solid waste, because although the same number of stops along the collection route is required, the amount of material collected for each stop is less. If the savings in disposal cost would cover the additional collection cost associated with recycling, government support for separate collection for recyclables is justifiable. Without government support, the private sector would bear the cost of recycling only those materials for which the market demand is adequate to enable profit.



## REFERENCES

1. Arif, B., and B. Abiyoga. *Private Sector Participation in the Urban Solid Waste Management in Indonesia*. Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the International Group Seminar on Policy Responses Toward Improving Solid Waste Management. Bandung, Indonesia. February 1991.
2. *A Strategic Framework for Increasing Private Sector Participation in Urban Water Supply in Indonesia*. Prepared for the USAID Mission to Indonesia under the Water and Sanitation for Health Project (Task no. 186) Field Report No. 330. May 1991.
3. Augenblick, M., and B. S. Custer Jr. "The Build, Operate, and Transfer ("BOT") Approach to Infrastructure Projects in Developing Countries." Working Paper. World Bank, Policy, Research, and External Affairs Department. Washington, D.C. August 1990.
4. Bartone, C. R., J. Bernstein, and F. Wright. "Investments in Solid Waste Management—Opportunities for Environmental Improvement." Working Paper No. 405. World Bank, Policy, Research, and External Affairs Department. Washington, D.C. April 1990.
5. Bartone, C. R., L. Leite, T. Triche, and R. Schertenleib. "Private Sector Participation in Municipal Solid Waste Service: Experiences in Latin America." *Waste Management & Research* 9(6): 495–509 (December, 1991).
6. Berg, E., et al. "Private Provision of Public Services: A Literature Review." (Unpublished report.) World Bank, Public Sector Management and Private Sector Development Division, Country Economics Department, Washington, D.C. April 1989.
7. Beshers, E. W. *Restrictive Labor Practices on Railways in Developing Countries*. World Bank Report INU 78. Washington, D.C. January 1991.
8. Cohen, M. A., et. al. *Urban Policy and Economic Development..An Agenda for the 1990s*. World Bank Policy Paper. Washington, D.C. April 1991.
9. Cointreau, S. J. *Environmental Management of Urban Solid Wastes in Developing Countries: A Project Guide*. World Bank Urban Development Technical Paper 5. Washington, D.C. June 1982.
10. Cointreau, S. J. "Solid Waste Collection Practice and Planning in Developing Countries." In *Managing Solid Wastes in Developing Countries*. John R. Holmes, ed., John Wiley & Sons. 1984.
11. Cointreau, S.J. "Provision of Solid Waste Services in Developing Countries." Paper sponsored by United Nations for the international seminar on the provision of municipal public services in developing countries. Assenovgrad, Bulgaria. August 1989.

12. Cointreau-Levine, S. J. Conversations with solid waste managers from developing country local and central governments and with solid waste specialists and private refuse haulers from developing countries, 1978 to 1992.
13. Cointreau-Levine, S. J. Conversations with World Bank and USAID infrastructure project staff and consultants, 1991 and 1992.
14. Contract for Secondary Collection of Solid Waste under Cleansing Development Project JUDP–III. Dinas Kebersihan DKI Jakarta. IBRD Loan no. 3246-IND. (circa) 1991.
15. Contract for Leasing of Vehicles for Solid Waste Secondary Collection under Cleansing Development Project JUDP - III. Dinas Kebersihan DKI Jakarta. IBRD Loan no. 3246-IND. (circa) 1991.
16. Coyaud, D.P. *Private and Public Alternatives for Providing Water Supply and Sewerage Services*. World Bank INU Report No. 31. Washington, D.C. October 1988.
17. Danoedjo, S. “Case Study Report on Policy Responses Towards Improving Solid Waste Management in the Metropolitan City of Jakarta, Indonesia.” Paper sponsored by the United Nations Centre for Regional Development and Kitakyushu City Government for the international expert group seminar on policy responses towards improving solid waste management. Kitakyushu, Japan. October 1989.
18. Davey, K. *Strengthening Municipal Government*. World Bank INU report no. 47. Washington, D.C. June 1989.
19. Dawson, R. A. “Tax Benefits for Waste Plants Pay Off.” *Solid Waste Management*. 25(1); 22–24. 1982.
20. Dillinger, W. “Urban Property Taxation in Developing Countries.” Working Paper #1. World Bank, Policy, Planning and Research Complex, Washington, D.C. August 1988.
21. Donahue, J. D. *The Privatization Decision: Public Ends, Private Means*. New York: Basic Books. 1989.
22. *Extension of Technical and Advisory Services to the Zabbaleen, Gameya—Phase II*. Report for The Ford Foundation. Environmental Quality International, Cairo, Egypt. December 1988.
23. Furedy, C. “Social Aspects of Solid Waste Recovery in Asian Cities.” *Environmental Sanitation Reviews* 30: pp 1–52. December 1990.
24. Galenson, A. “Labor Redundancy in the Transport Sector.” Working Paper 158. World Bank, Washington, D.C. 1989.
25. Harding, A. S. “Restrictive Labor Practices in Seaports.” Working Paper 514. World Bank, Washington, D.C. 1990.

26. Hilgendorff, C. C. "Emerging Trends in Solid Waste Finance" *Solid Waste and Power* 3(2): 12-17. April 1989.
27. Jensen, R. W. "The Phoenix Approach to Privatization". Testimony in June 1987 before the Subcommittee on Small Business Anti-Trust Impact of Deregulation and Privatization, together with transcripts of various talk show interviews and newspaper articles from 1984 to 1988. Provided by the Public Works Department, City of Phoenix, Arizona, USA.
28. Johnson, J. E. "Private Sector Participation in Solid Waste Management, Surabaya (Indonesia)." Master's thesis, Massachusetts Institute of Technology, Cambridge. October 1991.
29. Jones, D. C. *Costing and Cost Recovery for Waste Disposal and Recycling*. Report UDD-37a. World Bank. Washington, D.C. December 1986.
30. Kim, J. W. "Strategies for Developing Responsive Solid Waste Management in Seoul: Institutional Arrangements." Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the international group seminar on policy responses towards improving solid waste management, Bandung, Indonesia. February 1991.
31. Lee, K. S., and A. Anas. *Manufacturer's Responses to Infrastructure Deficiencies in Nigeria—Private Alternatives and Policy Options*. Report INU 50. World Bank, Washington, D.C. July 1989.
32. Leite, L. E. C. "Government and Non-government Provision of Solid Waste Management." Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the international group seminar on policy responses towards improving solid waste management, February, Bandung, Indonesia. February 1991.
33. Liss, G. B., B.J. Stevens. "How San Jose Did It." *Waste Age*. October 1986.
34. Listyanwan, B., and E. Damanhuri. "Public Participation as a Variable in the Metropolitan Solid Waste Management System of Surabaya, Indonesia." Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the international group seminar on policy responses towards improving solid waste management, Bandung, Indonesia. February 1991.
35. *Model Contract Documents and Specifications for Solid Waste Collection*. Solid Waste Association of North America. August 1987.
36. *Model Contract Documents for Residential Waste Collection and Disposal*. Technical Bulletin 85-7. National Solid Waste Management Association, Washington, D.C. November 1985.
37. National Consumer Council. *In the Absence of Competition—A Consumer View of Public Utilities Regulation*. Her Majesty's Stationery Office. London, Great Britain. 1989.

38. *National Solid Waste Management Strategy*. Consultants' report developed for the Indonesian Ministry of Public Works, Jakarta. (lead by Pt. Bumi Prasidi). March 1989.
39. *Ownership of Municipal Solid Waste Systems*. Technical Policy Position Paper. Solid Waste Association of North America, Washington, D.C. April 1991.
40. Peters, D. M. "Private Sector Seeks MSW—Can Cities Afford It?" *MSW Management*. March/April 1991.
41. Powell, J. "Keeping it Separate or Commingling it: The Latest Numbers" *Resource Recycling*. March 1991.
42. "Private Participation in Power and Urban Services (PURSE)—Urban Services Component." Paper prepared by Research Triangle Institute for U. S. Agency for International Development. August 1991.
43. *Private Participation in Urban Services (PURSE). Project Paper*. Project paper 497-0373. U.S. Agency for International Development, Jakarta, Indonesia. August 1991.
44. *Privatizing Municipal Waste Services: Saving Dollars and Making Sense*. Position paper by the National Solid Wastes Management Association, Washington, D.C. September 1991.
45. *Public-Private Partnership Case Studies—Profiles of Success In Providing Environmental Services*. Agency Report 20M-2005. U.S. Environmental Protection Agency, Washington, D.C. September 1991.
46. *Public-Private Partnerships for Environmental Facilities—A Self Help Guide for Local Governments*. Agency Report 20M-2003. U.S. Environmental Protection Agency, Washington, D.C. July 1991.
47. Rest, J. R. *Development in Judging Moral Issues*. Minneapolis: University of Minnesota Press. 1979.
48. Roth, G. J. *The Private Provision of Public Services in Developing Countries*. World Bank EDI Series in Economic Development. Oxford University Press. 1987.
49. Saleh, D., B. Arif, and B. Listyawan. "Partnership and Non-Conventional Arrangement in Solid Waste Management (in Indonesia)." Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the international group seminar on policy responses towards improving solid waste management, Bandung, Indonesia. February 1991.
50. Savas, E. S. *Privatizing the Public Sector: How to Shrink Governments*. Chatham, New Jersey, U.S.: Chatham House Publishers. 1982.
51. Schertenleib, R., and T. Triche. *Non-Government Delivery of Urban Solid Waste Services*. Unpublished draft. World Bank, INUWS Division, Washington, D.C. August 1989.

52. "Schools Brief" (On rent-seeking, the use of resources to make profits without creating any useful output). *The Economist*. February 9, 1991.
53. Seader, D. "Privatization moves to the Forefront." *Solid Waste Power* 3(2): 59–62. April 1989.
54. *Semarang Solid Waste Management Plan*. Prepared for the city of Semarang by local consultants. 1991.
55. Shirley, M., and J. Nellis. *Public Enterprise Reform—The Lessons of Experience*. World Bank EDI Development Studies Paper. Economic Development Institute, Washington, D.C. June 1991.
56. Sicular, D. T. "Pockets of Peasants in Indonesian Cities: The Case of Scavengers." *World Development* 19 (2/3). 1991.
57. Stevens, B. J. *Handbook of Municipal Waste Management System: Planning and Practice*. New York: Van Nostrand Reinhold. 1980.
58. *Solid Waste Collection Practice*. Institute for Solid Wastes, American Public Works Association. Chicago: Fourth Edition. 1975.
59. Sudol, F. "Contracting Curbs Costs (in Newark, New Jersey)." *MSW Management*. March/April 1991.
60. Sulu, S. A. "Development of Maintenance Strategy for Urban Solid Wastes Collection". Paper presented at the 1987 Nigerian National Workshop on Engineering Maintenance. 1987.
61. Summers, L. H. et al. *Lessons of Tax Reform*. World Bank. Washington, D.C. September 1991.
62. *Surabaya Solid Waste Management Plan*. Prepared for the city of Surabaya by local consultants. 1991.
63. Svejnar, J., and K. Terrel. "Reducing Labor Redundancy in State-Owned Enterprises." Working Paper 792. World Bank, Washington, D.C. October 1991.
64. Thomas, V. et. al. *World Development Report 1991*. New York: Oxford University Press. June 1991.
65. Triche, T. A. "Private Participation in the Delivery of Guinea's Water Supply Services." World Bank, Policy, Research, and External Affairs Complex, Washington, D.C. August 1990.
66. *Urbanization and the Environment in Developing Countries*. USAID, Office of Housing and Urban Programs. Washington, D.C. July 1990.
67. Van Adams, A. et al. *The World Bank's Treatment of Employment and Labor Market Issues*. Technical Paper 177. World Bank, Education and Employment Division, Population and Human Resources Department, Washington, D.C. December 1991.

68. Vickers, J., and G. Yarrow. "Economic Perspectives on Privatization." Manuscript submitted to the *Journal of Economic Perspectives*. August 1990.
69. Whitehead, S., et. al. *Third Jabotabek Urban Development Project, Republic of Indonesia*. Staff Appraisal Report. World Bank. Washington, D.C. June 1990.
70. Whittington, D. et al. "Water Vending Activities in Developing Countries." *Water Resources Development* 5 (3). September 1989.
71. Wilson, D. C. *Waste Management: Planning, Evaluation, Technologies*. Oxford: Clarendon Press. 1981.
72. Wiradisastra, D., and G. M. McManus. "Financial Aspects of solid Waste Management in the Context of Metropolitan Management in Bandung, (Indonesia)." Paper sponsored by the United Nations Centre for Regional Development and Indonesia Ministry of Public Works for the international group seminar on policy responses towards improving solid waste management, February, Bandung, Indonesia. February 1991.
73. Wunsch, J. S. "Institutional Analysis and Decentralization: Developing and Analytical Framework for Effective Third World Administrative Report" In Vol. II of *Public Administration and Development*, 431–451. New York: John Wiley & Sons. 1991.
74. Yepes, G., and T. Campbell. *Assessment of Municipal Solid Waste Services in Latin America*. Report No. 8790- LAC. World Bank, Washington, D.C. June 25, 1990.



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