Policy, Research, and External Affairs

WORKING PAPERS

Urban Development

Infrastructure and Urban Development
Department
The World Bank
April 1990
WPS 405

Investments in Solid Waste Management

Opportunities for Environmental Improvement

Carl Bartone
Janis Bernstein
and
Frederick Wright

Despite heavy municipal spending on solid waste management, most cities fail to provide efficient, reliable, universal collection services or environmentally safe disposal — at high costs to public health and the environment. Bank lending should emphasize strategic service planning, better institutional arrangements, more efficient management and finances, and environmental protection.

Policy, Research, and External Affairs

WORKING PAPERS

Urban Development

This paper — a product of the Urban Development Division, Infrastructure and Urban Development Department — is part of a larger effort in PRE to develop a policy framework for the urban environment. Please contact Sriyani Cumine, room S10-141, extension 33735 (84 pages with tables).

Municipal solid waste management (MSWM) should protect the environment, safeguard health, and improve productivity. In most developing countries, however, solid waste services consume between 20 and 50 percent of operating budgets for municipal services yet are unreliable, do not reach everyone, and do not provide safe disposal.

The World Bank has financed MSWM improvements through freestanding solid waste projects and components in broader projects. But the total costs of solid waste components in 71 projects during FY74-88 was about $532 million, or only 0.3 percent of Bank lending. And component design and performance have been largely disappointing.

The low level of borrowing for the MSWM sector — considering high municipal spending on MSWM — is attributable to the sector's labor-intensiveness (and relatively low foreign exchange potential); most cities' failure to appreciate the true cost of MSWM services; the difficulty local governments have getting access to capital; and the failure of many Bank projects to include an MSWM expert.

Early Bank projects provided limited funds to procure collection-related equipment. They had little impact on the quality or efficiency of service delivery. In the past five years, Bank lending for MSWM has increased and broadened — and the potential for its effective expansion is evident.

Bartone, Bernstein, and Wright recommend that:

- The Bank adopt a comprehensive policy framework for designing solid waste components or projects that focus more attention on upgrading institutional arrangements, including private sector delivery of services; the financing of capital investments and recurring costs; pricing for better cost recovery; and environmentally safe disposal (including proper management of hazardous wastes).

- Components finance plans addressing the full range of solid waste services and related management activities.

- The Bank help establish financial intermediaries (such as municipal development banks) to support comprehensive MSWM activities, among other urban investments.

- For publicly-provided services, both primary and secondary collection operations be supported, with special emphasis on vehicle selection and maintenance. For low-income areas, they recommend supporting low-cost community-based technologies.

- Land acquisition — for disposal sites and other facilities — should be a condition of loan effectiveness. So should use of only agreed-upon equipment and vehicles.

- Expansion of collection capacity be balanced by investments in nonpolluting disposal facilities.

- Appropriate regulations be established — few in number, transparent, easily understood, equitable, and economically and physically sensible.

- Costs be recovered through mandatory "benefit taxes" (in residential areas) and variable user charges (higher for better services) for commercial and industrial firms.

Produced at the PRE Dissemination Center

INVESTMENTS IN SOLID WASTE MANAGEMENT: OPPORTUNITIES FOR ENVIRONMENTAL IMPROVEMENT

Table of Contents

TABLES

FIGURES

ANNEXES

Carl Bartone is the Senior Environmental Specialist with the Urban Development Division, Infrastructure and Urban Development Department of the World Bank. Janis Bernstein is a Consultant with the Urban Development Division. Frederick Wright, currently in EMNVP, was an Economist with the Water and Sanitation Division of this Department.

The authors are indebted to a number of persons who contributed to the preparation of this paper. Mr. Riaz Khan assembled and reviewed the various project documents, prepared the corresponding data sheets, and prepared an initial summary. Mr. Steven Maber did the data processing, set up a data base for the project data sheets, and prepared the tables and graphs for this report. Mr. Jonathan Stevens prepared the final versions. Mr. Nadim Khouri reviewed several versions of this paper, and verified the statistics presented. The review and comments of Messrs. Per Ljung, Esra Bennathan, Mike Garn, Arturo Israel, Mike Cohen, Louis Pouliquen, William Dillinger, and Jeff Gutman are also greatly appreciated. Finally, the authors want to thank George Gattoni, Carlo Rietveld, Amir Al-Khafaji, Albert Peltekian, Guillermo Yepes, and Tim Campbell for organizing Regional meetings to review an earlier draft of the paper. For their valuable contributions to the case studies, the authors also want to thank Gerard Tenaille, George Gattoni, Heinz Unger, Braz Menezes, David Jackson, Roy Ramani, and Ned Echeverria.

INVESTMENTS IN SOLID WASTE MANAGEMENT: OPPORTUNITIES FOR ENVIRONMENTAL IMPROVEMENT

EXECUTIVE SUMMARY

i. A review of 71 projects with municipal solid waste management (MSWM) components revealed that the World Bank has supported diverse efforts to improve urban solid waste services in member countries. At one extreme, the Bank financed projects that provide limited funds to support procurement of collection-related equipment with little impact on the quality or efficiency of service provision. In Nigeria, Singapore, and Mexico, by contrast, the Bank invested in well-designed, comprehensive MSWM components covering technological and institutional improvements in solid waste collection, transfer, and disposal. The latter investments ranged between US$47.5 million and US$111.8 million. In some cases, small but well-focused MSWM components covering institutional improvements and equipment procurement have been followed up by larger subsector investments in subsequent projects.

ii. The total cost of the solid waste components in the 71 Bank projects is estimated to be US$532.0 million, or 7.8 percent of total project costs; the average MSWM component cost is about US$8.1 million. Further, the majority of projects with solid waste components are either urban development (75 percent) or water and sanitation (13 percent) projects. In recent years, Bank lending for MSWM activities has increased as the subsector matures in a number of countries. In the few projects for which MSWM component ERRs have been calculated, substantial returns have been reported.

iii. Effective design of MSWM components appears to be related in part to the amount of time and effort government personnel, Bank staff, and consultants allocate to the collection of baseline data and the preparation of specific project proposals. Moreover, when a sanitary or municipal engineer or other technical specialist with experience in refuse management has been involved in the identification and/or appraisal missions, the resulting project designs have tended to provide detailed proposals for meeting solid waste management needs within the broader urban objectives in the project cities. Nonetheless, most of the projects reviewed have small MSWM components for the procurement of collection equipment; only half of the projects provide facilities necessary for environmentally safe disposal and about a third of the projects include technical assistance for strengthening or reorganizing the local institutions responsible for MSWM. The effectiveness of such limited components in achieving urban and environmental management objectives is questionable.

iv. The low level of borrowing for the MSWM sector relative to the magnitude of municipal expenditure for solid waste management can be attributed to several factors. First, solid waste collection operations tend to be labor intensive, and as viewed in several past components, have relatively low foreign exchange potential. A related factor is that the borrowers generally do not recognize that MSWM is a major consumer of scarce municipal resources; the true cost of MSWM services may be hidden due to deficient municipal accounting practices and reliance on central government transfers. Thus, the relative importance of

achieving greater efficiency in service provision is not properly appreciated. An additional factor is that local governments do not have easy access to capital. Lastly, past project identification and appraisal missions did not always include a municipal solid waste expert or sanitary engineer with MSWM expertise. Thus, projects focussed on other problems or simply provided funds for the procurement of vehicles and equipment.

v. Based on a limited review of implementation, many of the MSWM components can be viewed as missed opportunities. Due largely to inadequacies in component design (e.g., lack of or insufficient attention to building institutional capacity, lack of strategic planning, failure to provide for safe disposal facilities), the execution of the components encountered extensive delays and failed to achieve long-term improvement in solid waste management in terms of both efficiency and environmental protection. Specific implementation problems included unclear institutional structure and responsibilities, insufficient technical and managerial expertise, inappropriate vehicle specifications, complicated procurement procedures, failure to maintain vehicles in operating condition, inadequate cost recovery, and difficulties in selecting and acquiring sites for transfer stations and disposal facilities.

vi. To broaden the scope of future investments, the Bank should adopt a comprehensive policy framework for designing solid waste components that takes into account all physical, technical, legal, institutional, financial, environmental, and sociocultural aspects of MSWM in a metropolitan area. To expect significant long-term improvement in solid waste management, the following recommendations should be considered in the design of MSWM components.

(a) Strategic Solid Waste Plans. The components should finance the development of strategic solid waste management plans addressing the full range of solid waste services and related management activities. For large cities, the plan should focus on the requirements of the municipality and the surrounding metropolitan area; a national plan is more appropriate for small and intermediate cities.

(b) Collection. The MSWM components should support improvements in primary as well as secondary collection operations with vehicle selections based on analyses of solid waste, labor, and other local conditions. Special emphasis should be placed on setting up vehicle maintenance garages, training staff, and ensuring availability of spare parts. To provide greater coverage for low-income areas as well as to maximize the sustainability of improved MSWM systems, the solid waste component should support the use or development of low-cost community-based technologies. To achieve efficiency in collection operations, it is essential to match vehicle type and size with local conditions. Due to the complexities of vehicle specifications and procurement, project designers should insist on loan conditions that require only agreed upon equipment to be purchased.

(c) Transfer, Resource Recovery, and Disposal. All investments in expanding collection capacity must be accompanied by corresponding investments in non-polluting disposal facilities. In most developing

country cities, the most appropriate disposal facilities will continue to be sanitary landfills, and where a market for compost can be demonstrated, composting plants. Where incineration and/or resource recovery is planned, facilities for safe disposal of rejects and ash are still needed. Where haul distances are greater than 15 to 20 kilometers or travel times exceed 30 minutes, transfer stations should be considered.

(d) Hazardous Waste Management. To maximize the benefits of a MSWM component, attention should be directed at instituting and improving environmental controls and monitoring to keep hazardous wastes out of the municipal system. If industrial wastes are collected by the municipality, all potential sources of hazardous waste should be identified and targeted for appropriate management. Although laws controlling these wastes are enacted at the national or state level, the municipality should play a key role in monitoring municipal disposal sites for hazardous wastes, monitoring the generation of industrial and hazardous waste in urban areas, identifying suitable hazardous waste sites, and carrying out periodic inspections of industrial and hazardous waste collection and disposal operations. Particular attention attention should be given to small-scale manufacturing and cottage industries.

(e) Regulatory Framework. In planning MSWM improvements, efforts should be directed at establishing appropriate solid waste-related laws, ordinances, regulations, and corresponding inspection and enforcement responsibilities and procedures at the national, state, and local levels. Effective enforcement of national environmental controls will require national and local authority capacity to monitor compliance and apply enforcement procedures, procedural ease in implementing regulations, and broad public acceptance. Moreover, regulations should be few in number, transparent, unambiguous, easily understood, equitable, and considered to have significant positive physical and economic effects.

(f) Institutional Arrangements. To improve the execution of MSWM engineering components, considerable attention is needed in the area of institutional development. In large cities, solid waste institutions need to be upgraded within the overall administrative hierarchy. The responsibility for collecting waste and delivering it to a disposal facility can remain with the municipalities or private companies. Based on available data, private firms can be more productive and efficient in carrying out collection and transport operations than municipalities. In planning MSWM improvements, project designers should evaluate the potential for introducing or expanding private sector involvement through a variety of contractual arrangements. To achieve maximum environmental protection and economies of scale, it may be possible to establish a regional or metropolitan authority responsible for solid waste disposal. In small and intermediate cities, a national solid waste authority should conduct MSWM planning, develop standards, and provide technical and financial assistance. Whatever institutional

arrangements are established, project designers need to ensure that there is a clear organizational structure, an ongoing strategic planning function, and effective budgeting, cost accounting, and management information systems that include monitoring of collection performance.

(g) Financing, Pricing, and Cost Recovery. In planning MSWM components more emphasis should be placed on questions of financing, pricing, and cost recovery. To finance capital investments, municipal governments have three principal options: loans from existing financial intermediaries, special loan or grant programs through the central government, and municipal sinking funds. To finance the substantial recurring costs of MSWM, municipalities can obtain funds from local taxes, intergovernmental transfers, and user charges. Although local conditions will determine the means by which the costs of MSWM should be recovered, project designers should attempt to recover the maximum amount of collection costs through user charges, which include benefit taxes (mandatory solid waste charges) and voluntary fees. Since industrial and commercial enterprises view solid waste as a private good and have much variation in the level of service required, they can be charged voluntary variable fees to cover the full cost of providing the desired level of service. By contrast, municipalities will normally charge benefit taxes to residential beneficiaries to recover all or a portion of their solid waste collection costs. Costs for disposal operations may be recovered largely through local taxes as well as intergovernmental transfers or grants based on broader environmental objectives. In addition to these financial considerations, the Bank should promote the use of financial intermediaries to increase the level of borrowing for this subsector. To expect any significant gains in MSWM, however, solid waste components should accompany broader urban management investments that focus on improving municipal finance, accounting, and budgetary control.

(h) Land Acquisition. Project officers should ensure that there are environmentally safe sites for new solid waste facilities and that these sites will be available for the timely execution of the MSWM improvements. Accordingly, project designers should insist on making land acquisition a condition of loan effectiveness.

(i) Phasing of MSWM Improvements. MSWM investments should be phased to reflect the objectives and constraints of each project city. In most situations, the first phase of Bank lending should finance the development of a strategic solid waste management plan and the execution of key institutional improvements. The second phase of investment would provide financing for collection equipment; transfer, recycling, and disposal facilities; and other program elements such as pilot projects, public education, and further institutional strengthening. Subsequent phases of Bank lending would include support for strategic facilities, expansion of solid waste services to other areas, and the implementation of new MSWM programs.

vii. Based on the analysis of World Bank experience in MSWM, further research is recommended on: (i) the relative magnitude of damages and benefits versus the cost of providing solid waste services to better estimate the economic rate of return for MSWM components as well as to facilitate the ranking of MSWM in comparison to that of other urban investments; (ii) various pricing strategies, separable demand, and intra-urban cross-subsidies to improve cost recovery; (iii) private sector delivery of solid waste services to determine how and under what circumstances the private role in the solid waste sub-sector can be expanded; (iv) the role of APEX institutions in MSWM to improve solid waste service delivery in large, intermediate, and small cities; and (v) strategic planning approaches to improve the full range of solid waste services and related management activities in large, intermediate, and small cities.

INVESTMENTS IN SOLID WASTE MANAGEMENT: OPPORTUNITIES FOR ENVIRONMENTAL IMPROVEMENT

I. INTRODUCTION

1.01 Managing solid wastes is a major challenge for cities in the developing world. In the face of rapid urbanization and industrial growth, effective municipal solid waste management (MSWM) has a critical role in protecting the environment and improving urban productivity. In most developing country cities, however, MSWM is a costly service that consumes between 20 and 50 percent of available operational budgets for municipal services, yet serves no more than 70 percent of the urban inhabitants. Moreover, unsafe solid waste collection and disposal practices in these cities threaten public health as well as surface and ground water resources. To expand or improve solid waste services in urban areas, the World Bank has financed MSWM improvements as part of its overall lending operations in many countries. In response to the Bank's increasing emphasis on integrating environmental concerns into the Bank's lending and policy dialogues, a study was conducted to evaluate the nature and performance of these investments. The resulting paper is one of a series of papers that will form part of the Bank's efforts to develop a policy framework for the urban environment.

A. Purpose and Organization of the Paper

1.02 The purpose of this paper is to present the findings of a brief evaluation of World Bank experience in MSWM and to recommend approaches to improving future Bank performance in this subsector. The review covered free-standing solid waste projects as well as components of broader urban development, pollution control, and water supply and sewerage or sanitation projects approved during the period FY74-88. The findings reveal the extent of Bank lending for domestic and industrial solid waste management and provide information on the design, implementation, and other aspects of MSWM components in Bank projects.

1.03 The paper is presented in four chapters. The remainder of Chapter I describes the methodology by which the MSWM investments were reviewed and presents definitions and brief discussion of the benefits of MSWM to the environment and urban productivity in developing countries. Chapter II presents the overall results relating to the Bank's total lending for solid waste management, including the findings of the Regional evaluation of MSWM lending. Chapter III examines the findings related to the design and implementation of the Bank's MSWM components and discusses such issues as the size and scope of investments, borrowing level, cost recovery, and private sector participation. Lastly, Chapter IV presents recommendations for improving the design and execution of future MSWM projects or components. Annexes to this paper include a series of tables containing summary data on MSWM components in Bank projects and eight individual case studies highlighting specific MSWM projects or components in selected countries.

B. Methodology

1.04 Based on an initial screening of all urban, pollution control, and water supply and sanitation lending activities for the period FY74-88, a subset of 71 solid waste components was identified for analysis. The study was limited to a review of the principal project operational documents: Staff Appraisal Reports (SARs), President's Reports, Project Completion Reports (PCRs), Project Performance Audit Reports (PPARs), and Sector Reports. (The documents reviewed are listed by Region in Tables 1.6 to 1.9 in Annex 1). Upon reviewing these documents, a summary data sheet was prepared for each project containing: information on the design of MSWM components, including sector, institutional, technical (if available) and financial information; a description of the MSWM component by sub-component; and cost distribution by sub-component. Key project information was later entered into an automated data base for storage and future analyses.

1.05 From the diverse set of projects reviewed, eight were selected for further analysis of the MSWM component design, implementation status, and if completed, performance. The projects were chosen on the basis of both the level of investment and the degree of emphasis placed on solid waste management. To provide adequate representation of the breath and scope of Bank-wide MSWM operations, two projects were included from each of the four Bank Regions. For these eight projects, the analysis involved interviews with project officers and reviews of project supervision reports as well as the other principal project documents mentioned above. (Detailed descriptions of these projects are presented in the annexes to this report.)

1.06 Due to a number of methodological limitations, this paper does not provide a complete assessment of the extent and impact of the Bank's involvement in MSWM. First, the project documents for a number of projects include only one or two lines on the type of service provided, often accompanied by unclear cost data. In a number of appraisal and project completion reports, costs for MSWM could not be disaggregated from the overall costs of municipal services, technical assistance, or institutional strengthening components covering solid waste management as well as other urban services. Moreover, reviews of supervision reports and interviews with project officers were undertaken only for the analysis of the eight projects included in the annexes. For various reasons, however, certain project officers and principal consultants who have the most knowledge about certain components could not be reached for interviews. Thus, some of the data in this report may not be completely accurate and a small number of projects that might contain limited MSWM components may not be included. Nonetheless, these possible omissions are unlikely to affect the conclusions and recommendations of this paper.

C. Definitions

1.07 Municipal solid waste can be defined as the wastes arising from domestic, commercial, industrial, and institutional activities in urban areas. The wastes can be solid, semi-solid, and even liquid; generally, they include all those materials that are neither wastewater discharges nor air emissions. Although waste characteristics vary by country and even by city in some

countries, urban refuse in developing countries includes largely vegetable and putrescible matter as well as varying amounts of paper, metals, plastics, and inert matter such as coal ash or sand. Unlike municipal refuse in developed countries, however, municipal waste streams in developing countries may also contain significant amounts of human faecal matter and to various extents, industrial, commercial, and medical wastes, a portion of which may be hazardous.

1.08 Municipal solid waste services encompass refuse storage and collection, street and drain cleaning, solid waste transfer and transport, disposal, and resource recovery. Other MSWM activities include vehicle maintenance and repair, financial management, administrative activities (e.g., routing, scheduling, recordkeeping), staff management and development, and strategic MSWM planning. Generally, these activities fall within the jurisdiction of the municipality; the private sector often manages some domestic refuse and the wastes from large-scale industries, hospitals, and large office complexes. In most developing countries, however, the responsibilities for refuse collection, disposal, and vehicle maintenance are assigned to the lower levels of municipal government or health departments staffed by unqualified managers and unskilled workers. Moreover, the widespread absence of strategic planning and use of inappropriate technology have led to serious inefficiencies in expenditure and effort. Consequently, solid waste services in most developing country cities are unreliable, lack universal coverage, and fail to provide a safe method of disposal. Furthermore, the abundance of improperly disposed waste constrains urban productivity and poses significant threats to public health and the environment.

D. Benefits of Municipal Solid Waste Management

1.09 The impacts of providing effective MSWM services are largely associated with the reduction or elimination of health risks, environmental degradation, and impediments to urban productivity. Although accurate measures of these benefits are not currently available, the following paragraphs highlight some of the most important benefits of investing in MSWM improvements.

1.10 Improvement in Adult Health and Reduction in Child Mortality. In developing country cities, ineffective MSWM systems cause health risks largely from direct and indirect contact with waste containing human faecal matter. Children, refuse collection workers, and scavengers are directly exposed to excreta-related pathogens and intestinal parasites when they handle faecally contaminated refuse. Children are particularly vulnerable; excreta-related diseases are responsible for one quarter to one half of the deaths of children under the age of five.[1/] Important indirect health effects result from the breeding of flies, rats, and other disease vectors at dump sites and open garbage heaps and drains. Additional risks to public health are associated with exposure to toxic substances or hazardous materials that may enter the municipal waste stream.

1/ Sandra J. Cointreau, "Solid Waste Management in Developing Countries," in Proceedings "Resource Mobilization for Drinking Water and Sanitation in Developing Nations," Management Division of the American Society for Civil Engineers, San Juan, Puerto Rico, May 26-29, 1987, p. 546.

1.11 Improvement in Water Quality. Uncontrolled disposal of urban waste into water bodies, open dumps, and poorly designed landfills is a principal cause of surface and ground water contamination. In many developing country cities, where local authorities lack adequate controls over solid waste disposal, toxic industrial or other hazardous wastes can enter the municipal waste stream. Consequently, leachate from open dumps or uncontrolled landfills can cause large-scale, long-term pollution of essential surface and ground water resources, many of which are used for drinking or other economically important activities.

1.12 Improvement in Air Quality. Air pollution occurs largely through inefficient local open air burning of wastes, incineration in plants that lack effective treatment facilities for gaseous emissions, and through spontaneous combustion of refuse at dumps. Spontaneous combustion occurs when methane gas, generated by the anaerobic decomposition of organic waste materials, is ignited; fires can spread underground and continue to burn for years. Landfill gas also constitutes a serious explosion hazard for workers and nearby residents. Other causes of air pollution are the decomposition of urban waste, involving the vaporization and emission of chemical constituents into the atmosphere, and the dispersion of air-borne particulates from open collection points and solid waste transport or transfer activities.

1.13 Increased Urban Productivity. The impacts of inadequate MSWM systems on urban productivity are not well understood, but the signs are evident throughout a city. For example, high rates of worker illness and absenteeism are due to poor hygienic conditions and the proliferation of disease-carrying pests at open dumps. Moreover, poorly located and illegal dumps consume valuable land that could be better used for other purposes. These unsightly facilities also lower the value of land in the surrounding area. Refuse thrown into the drainage system blocks the flow of water which eventually causes flooding and consequent traffic blockages, road deterioration, and property damage. In addition, piles of uncollected garbage and fallen waste storage bins on city streets exacerbate already congested traffic conditions and impede necessary road improvements until the solid waste problem is resolved.

1.14 Economic Development. In some instances, the lack of adequate public or private solid waste services may inhibit industrial development. For example, small manufacturing firms may be forced to locate in alternative locations due to the prohibitive costs of supplying their own garbage trucks and haulers. Large firms, by contrast, may be able to absorb these expenditures, but will suffer losses due to increased production costs. In the absence of effective controls over industrial wastes, further costs may be imposed on the public and the natural environment due to the harmful effects of improperly disposed hazardous materials.

1.15 Given the health and environmental impacts of MSWM systems on urban populations as well as its effects on municipal finance, the World Bank has financed MSWM improvements as part of its lending for urban, water and sanitation, tourism, and pollution control projects. In most of these projects, the components are included to improve and safeguard public health; protect environmental quality; expand access to an acceptable level of service; introduce or increase resource recovery; and build an institutional framework that can

administer and perform acceptable waste management practices, carry out continuous planning, and generate sufficient revenues to meet investment and recurring costs. In some cases, solid waste components were included to support the objectives of other investments. For example, refuse collection will facilitate the cleaning and maintenance of stormwater drainage. MSWM components also were included in the urban upgrading components designed to encourage low-income populations to improve their living conditions through the provision of low-cost loans and basic infrastructure.

1.16 The remainder of this paper examines World Bank experience with solid waste components and recommends ways to improve performance in this subsector. The paper focuses largely on domestic wastes since most of the Bank's MSWM investments have not dealt with industrial or hazardous wastes. Moreover, hazardous waste management is complex and requires special management programs.

II. IBRD/IDA FINANCING FOR SOLID WASTE MANAGEMENT

2.01 In reviewing past World Bank project lending for MSWM, the lack of uniformity in Bank documents (i.e., imprecise definitions and quantification methods and the absence of a systematic approach) made it difficult to undertake rigorous evaluation. Nonetheless, the review of ongoing and completed projects provided an indication of the Bank's overall involvement, achievements, and shortcomings in alleviating MSWM problems in large and medium-sized cities in many developing countries.

A. Overview of Lending Program

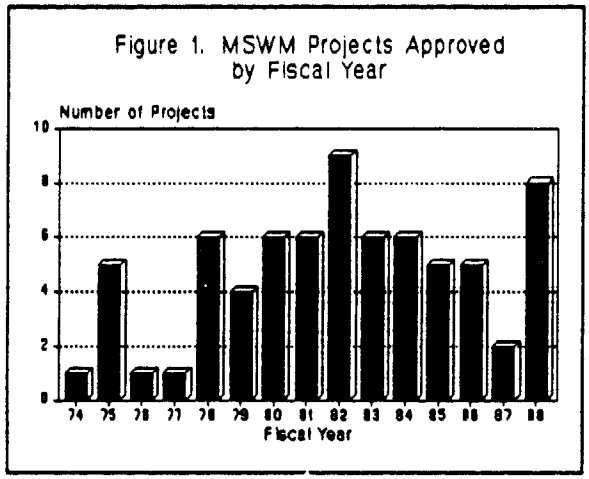
2.02 The FY74-88 lending program for projects with a solid waste management component includes 71 projects with a net commitment in loans and credits of US$3,166.2 million. The appraisal estimate of the projects' total costs reaches US$6,798.1 million. The total cost of the solid waste components is estimated to be US$532.0 million, or 7.8 percent of total project costs. The foreign exchange portion of solid waste component costs, as presented in various appraisal reports, has ranged from 18 percent to as high as 73 percent. Typically, all of the foreign exchange was allocated to equipment and technical assistance. Several projects also received additional financing from other lending sources.

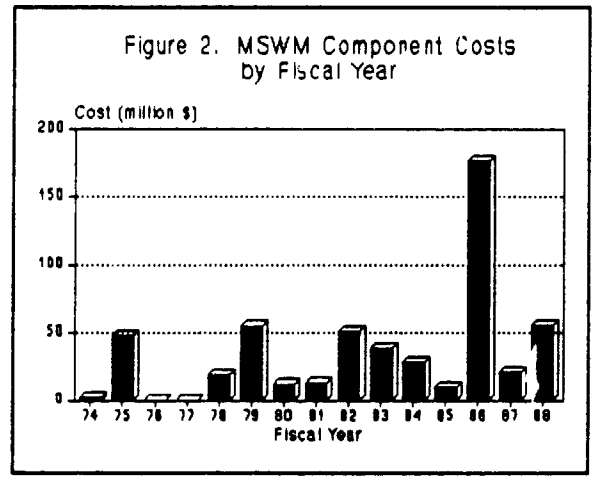
2.03 Among the projects identified as having addressed MSWM, there were two free-standing solid waste projects and a large MSWM component within another project which together accounted for US$209.3 million or 40 percent of all Bank solid waste lending. These were the Lagos Solid Waste Management and Stormdrainage Project in Nigeria (US$111.8 million), the Solid Waste Management Pilot Project in Mexico (US$50.0 million), and the Environmental Control Project in Singapore (US$47.5 million). Another 68 projects had solid waste investments ranging from less than 1 percent to nearly 45 percent of total project costs. The average solid waste operation cost US$8.1 million, but the median was only US$3.5 million. Excluding the three large MSWM projects, the average MSWM component cost dropped to US$5.1 million.

2.04 The majority of projects with MSWM components were either urban development or water and sanitation projects, with 53 projects (75 percent) being urban development projects involving solid waste investments of over US$278.0 million. Water and sanitation projects accounted for 9 projects (13 percent) supporting solid waste activities. Two tourism projects, two drainage projects, three reconstruction projects, and two pollution control projects also have included solid waste components. About 53 percent of the projects can be classified as poverty-oriented, specifically aimed at improving services to low-income urban groups.

2.05 The Bank's first substantial involvement in solid waste operations was in the context of the First Calcutta Urban Development Project approved in August 1973. Since then, from one to eight projects with a MSWM component have been approved annually. Figure 1 shows the number of projects approved by fiscal

year in the period FY74-88. As presented in Figure 2, lending amounts for MSWM components are highly variable.





2.06 During the period FY74-88, there were no clear trends in MSWM lending. For the five-year period FY84-88, however, lending increased significantly over the previous two five-year periods, totalling US$291.2 million (55 percent) of all MSWM project costs (unadjusted for inflation). This is due primarily to the approval in FY86 of the two largest MSWM investments ever financed by the Bank in Nigeria and Mexico.

2.07 In terms of Bank lending for the urban sector during the study period, the solid waste subsector amounts to 3.2 percent of total lending for urban development (including urban transportation prior to FY88) and water supply and sewerage projects. Compared to the water and sanitation subsector only, it represents 6.4 percent of that subsector's lending. Similarly, it represents 6.6 percent of the lending for urban development projects during FY74-88. Overall, solid waste operations accounted for only 0.3 percent of total IBRD/IDA lending for the period. In three of those years, however, MSWM lending ranged from 0.6 percent to 1.1 percent of the total. Bank lending, year-by-year, is summarized in Table 1.1 of Annex 1.

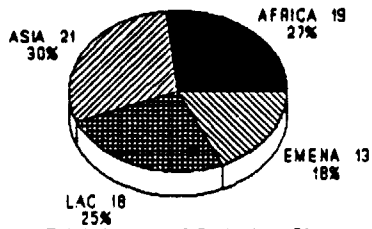
2.08 In recent years, the Bank has made various seed investments in MSWM-related technical assistance and subsector planning efforts in several countries. Thus, there appears to be significant potential for more large free-standing MSWM projects or sizeable MSWM components in urban projects to be included in the lending pipeline. At the time of this writing, large solid waste components were being planned in Nigeria, Indonesia, and Brazil.

B. Regional Lending Programs

2.09 The four Bank Regions have executed a total of 71 projects with modest to large investments for MSWM. The distribution of these projects by Region is shown in Figure 3; the Regional distribution of MSWM component costs is presented in Figure 4. As indicated, the lending program is not characterized by any

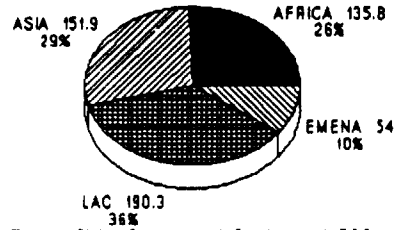
discernible pattern. Further, given the share of urban population in each Region, the projects are more uniformly distributed than might be expected. Although EMENA appears to have invested considerably less in the subsector than the other three Regions, the data is somewhat distorted by the fact that each of the other Regions has one large solid waste project or component. Excluding those three investments, the average cost (US$4.2 million) of MSWM components in EMENA projects is similar to the Bank-wide average of US$5.1 million. The Bank's MSWM investments in each Region are described below.

Figure 3. Number of MSWM Projects by Region



Total Number of Projects = 71

Figure 4. MSWM Component Costs by Region (m$)



Total MSWM Component Costs = m$ 532

AFRICA Region

2.10 Solid waste management was first introduced in the AFRICA lending program in FY75 as a small component of the Lusaka Sites and Service Project. The MSWM component accounted for US$300,000 out of a total project investment of US$41.3 million. To date, the Region has approved 19 projects with MSWM components in 16 countries, involving net loan commitments of US$135.8 million (see Table 1).

2.11 The most striking feature of the solid waste program in AFRICA is the overwhelming share of Nigeria in both the number and size of operations. Currently, Nigeria is executing the largest solid waste component financed by the Bank, the Lagos Solid Waste Management and Stormdrainage Project (described in detail in Annex 3), and is the only country in the Region to undertake more than one project with a MSWM component, having four in total. While other countries in the Region have concentrated their efforts in the larger capital cities, solid waste projects in Nigeria have also addressed the needs of medium-sized cities in several states.

2.12 The project in Lagos State represents over 89 percent of Bank commitments in the subsector for AFRICA. Excluding this project, the average cost of MSWM components drops from US$9.5 million to US$1.6 million per project; the average share of MSWM components falls from 21.3 percent to only 4.2 percent of total project costs.

TABLE 1

Lending for MSWM Projects in AFRICA, FY74-88

COUNTRY	PROJECT TITLE	LOAN AMOUNT	TOTAL PROJECT COST	MSWM COMPONENT COST	MSWM AS PERCENT OF TOTAL PROJECT COST	FY	STATUS AS OF 6/30/89
		(US$ MILLION)					
Benin	Cotonou Water/Sanitary Eng Project	5.0	6.3	0.7	10.9%	81	COMPLETED
B. Faso	Urban Development Project	(8.2)*	(10.8)*	NA	NA	78	COMPLETED
Burundi	Urban Development Project	15.0	16.7	0.4	2.2%	80	COMPLETED
Djibouti	Urban Development Project	5.0	15.2	1.0	6.8%	85	ONGOING
Gambia	Urban Management/Development Project	(11.5)*	(12.4)*	NA	NA	84	ONGOING
Guinea	Conakry Urban Development Project	15.2	16.4	3.3	20.1%	84	ONGOING
Ivory Coast	Second Urban Development Project	(51.0)*	(104.0)*	NA	NA	82	COMPLETED
Kenya	Site and Service Project	(16.0)*	(29.4)*	NA	NA	75	COMPLETED
Lesotho	Urban Development Project	6.0	7.1	0.1	1.4%	80	COMPLETED
Liberia	Monrovia Urban Development Project	10.0	13.4	0.6	4.7%	82	COMPLETED
Madagascar	Antananarivo Water and San Project	20.5	33.7	3.5	10.4%	80	COMPLETED
Mali	Mali Urban Development Project	12.0	15.3	1.4	9.2%	79	COMPLETED
Mauritius	Urban Rehab & Stormdrainage Project	15.0	24.5	0.7	2.7%	81	COMPLETED
Nigeria	Urban Development Project	17.8	36.6	0.03	0.1%	80	COMPLETED
Nigeria	Anambra Water/Sanitation Report	67.0	120.0	5.4	4.5%	82	ONGOING
Nigeria	Lagos SWM and Stormdrainage Project	72.0	164.3	111.8	68.0%	86	ONGOING
Nigeria	Infrastructure Development Fund	69.5	96.8	3.8	3.9%	88	ONGOING
Uganda	Water Supply & Sanitation Rehab	28.0	30.8	2.8	9.1%	85	ONGOING
Zambia	Lusaka Squatter Upgrade/Site Service	20.0	41.3	0.3	0.7%	75	COMPLETED
	TOTAL FOR AFRICA REGION:	378.0	638.4	135.8			
	AVERAGE PER PROJECT:	25.2	42.6	9.1	21.4%		

NOTE: * = Loan and Project Cost quoted but not included in the totals due to non-availability of SWM data.

2.13 The other MSWM activities in the AFRICA Region can be grouped into two categories. One group consists of modest components with varying levels of preparation and investment. These components generally include two or more solid waste sub-components that combine procurement of trucks and equipment with institutional strengthening measures. They typically entail efforts to improve collection services in the project cities, often in low-income areas, and some combination of training, studies, and other technical services. The second group of projects include very small solid waste components as one-shot efforts to tackle critical storage and collection service deficiencies in the country's capital or largest cities.

ASIA Region

2.14 Having approved 21 projects with MSWM components between FY74 and FY88, the ASIA Region has emerged as the most frequent financier of solid waste services in the Bank, with total loan commitments of US$151.9 million. Nonetheless, these solid waste components are largely confined to only seven countries, as shown in Table 2. Among them, India and Indonesia lead the Region with eight and four projects, respectively. Singapore is the beneficiary of the largest solid waste investment in the Region (US$47.5 million). In addition, the Bank financed three solid waste components in the Philippines and two projects with MSWM components in Sri Lanka.

2.15 Approved in FY74, the First Calcutta Urban Development Project was the first project in the Bank to include a solid waste component. This project also marked the beginning of the Bank's long involvement supporting solid waste management in India. MSWM has been a significant component of the eight projects in India, by far the largest number of MSWM-related projects for any single country supported by the Bank. Individual component costs have ranged between US$1.3 million and US$15.0 million. The total lending for MSWM in India during FY74-88 is US$45.6 million.

2.16 The greatest share of resources has been used for meeting the solid waste needs of India's large metropolitan areas. In Calcutta, three successive urban development projects have placed increasing attention to MSWM. The Second Calcutta Urban Development Project included US$11.6 million to support solid waste collection, development of improved methods and facilities for waste disposal, pilot projects, training, and studies. (See Annex 4 for further details.) The solid waste component of the latest project, however, is considered the most successful by the Country Department. Three other large-city urban projects also have contained solid waste components: the Second Madras Urban Development Project, the Kanpur Urban Development Project, and the Bombay Urban Development Project. In addition, two projects have attempted to address state-wide solid waste needs through subsectoral investments in several medium-sized cities in Madhya Pradesh and Uttar Pradesh. The Uttar Pradesh Urban Development Project is the largest and most recent solid waste project underway in India. Approved in April 1987, the project is a follow-up to earlier solid waste investments in the State.

TABLE 2

Lending for MSWM Projects in ASIA, FY74-88

COUNTRY	PROJECT TITLE	LOAN AMOUNT	TOTAL PROJECT COST	MSWM COMPONENT COST	MSWM AS PERCENT OF TOTAL PROJECT COST	FY	STATUS AS OF 6/30/89
		(US$ MILLION)					
Bangladesh	Urban Development Project	47.6	65.6	9.2	14.0%	88	ONGOING
India	Calcutta Urban Development Project	35.0	59.2	2.4	4.0%	74	COMPLETED
India	Second Calcutta Urban Dev Project	87.0	164.4	7.3	4.4%	78	COMPLETED
India	Second Madras Urban Dev Project	42.0	87.9	2.7	3.1%	81	COMPLETED
India	Kanpur Urban Development Project	25.0	51.7	1.3	2.5%	82	COMPLETED
India	Third Calcutta Urban Dev Project	147.0	303.1	15.0	4.9%	83	ONGOING
India	Madhya Pradesh Urban Dev Project	24.1	50.1	4.5	9.0%	83	ONGOING
India	Bombay Urban Development Project	138.0	256.7	2.9	1.1%	85	ONGOING
India	Uttar Pradesh Urban Dev Project	130.0	237.8	9.5	4.0%	87	ONGOING
Indonesia	Jakarta & Urban Development Project	24.2	52.3	0.3	0.6%	75	COMPLETED
Indonesia	Third Urban Development Project	43.6	96.0	20.4	21.3%	79	COMPLETED
Indonesia	Fourth Urban Development Project	43.0	85.9	1.5	1.8%	81	COMPLETED
Indonesia	Fifth Urban Development Project	39.3	64.3	5.7	8.9%	84	ONGOING
Philippines	Third Urban Development Project	72.0	120.0	5.0	4.2%	80	COMPLETED
Philippines	Regional Cities Development Project	67.0	114.6	5.5	4.8%	83	ONGOING
Philippines	Municipal Development Project	40.0	68.8	1.3	1.9%	84	ONGOING
Singapore	Environmental Control Project	25.0	47.5	47.5	100.0%	75	COMPLETED
Sri Lanka	Second Water Supply & Sewerage Project	30.0	94.0	3.3	3.5%	80	COMPLETED
Sri Lanka	Municipal Management Project	13.0	20.4	1.8	8.8%	86	ONGOING
Sri Lanka	Emergency Reconstruction & Rehab. Proj.	78.0	111.4	2.0	1.8%	88	ONGOING
Thailand	Regional Cities Development Project	27.5	50.9	2.7	5.3%	85	ONGOING
	TOTALS FOR ASIA REGION:	1178.2	2202.6	151.9			
	AVERAGE PER PROJECT:	56.1	104.9	7.2	6.9%		

2.17 In Indonesia, there have been four projects that contain a range of MSWM components. For example, the Jakarta Urban Development Project allocated US$320,000 for the procurement of refuse collection vehicles. By contrast, the Third Urban Development Project included US$20.4 million for large-scale MSWM improvements (see Annex 5). Currently, a national MSWM plan is being prepared.

2.18 Within a span of five years (1980-84), the Bank financed three solid waste projects in the Philippines, each having about US$5.0 million for comprehensive MSWM activities. All three projects have directed between 35 and 55 percent of MSWM component costs toward improving services to the urban poor.

2.19 Singapore, Thailand, and Bangladesh have each undertaken one MSWM project. Approved in June 1975, the Singapore Environmental Control Project was the Bank's first free-standing MSWM project. It provided for the collection, incineration, and disposal of solid wastes in Singapore's urban areas as part of a long-term program to improve sanitary standards. The project's main physical component was the construction of an incineration plant with energy recovery capability. To date, this plant is the only municipal solid waste incinerator financed by the Bank. In Thailand, the Regional Cities Development Project allocated US$2.7 million to increase solid waste collection coverage and to provide landfill disposal sites in three cities. The investment in MSWM included collection, disposal, and maintenance equipment as well as technical assistance to improve systems management and operations. More recently, the Bangladesh Urban Development Project provided US$9.2 million to finance institutional strengthening; improvements in solid waste collection and disposal, including landfill operations; and a pilot program involving the sale of solid waste to landowners for private landfilling.

EMENA Region

2.20 Eight countries in the EMENA Region have carried out 13 projects with MSWM components for a total cost of US$54.0 million (see Table 3). The trend over time has been towards increased involvement in solid waste activities through the Region's urban and water and sanitation projects. The share of MSWM activities in total project investments ranges from less than 1 percent in the Greater Cairo Urban Development Project and the Jordan Tourism Project to over 35 percent in the Egypt Urban Development Project. The latter project, along with the Lahore Urban Development Project in Pakistan, constitute the most extensive Regional efforts in the subsector, and are included for further analysis in the annexes to this report. In 1985, a free-standing solid waste project in Egypt was appraised (US$57.2 million) but has not been negotiated. As of 1987, seven solid waste projects have closed in the Region.

2.21 The Egypt Urban Development Project marked a turning point in the Region's solid waste lending (see Annex 6). It was the first in a series of projects in several countries approved between FY78 and FY83 that included significant MSWM investments. Approved in FY79, the Second Tunisia Urban Development Project included a solid waste collection and disposal component at an estimated cost of US$3.5 million. The component was designed to provide low-cost solutions to refuse collection and disposal problems in Greater Tunis.

TABLE 3

Lending for MSWM Projects in EMENA, FY74-88

COUNTRY	PROJECT TITLE	LOAN AMOUNT	TOTAL PROJECT COST	MSWM COMPONENT COST	MSWM AS PERCENT OF TOTAL PROJECT COST	FY	STATUS AS OF 6/30/89
		(US$ MILLION)					
Afghanistan	Kabul Water/Sanitation Project	9.0	11.7	0.2	2.0%	75	COMPLETED
Egypt	Urban Development Project	14.0	22.4	7.9	35.1%	78	COMPLETED
Egypt	Greater Cairo Urban Dev Project	59.0	116.2	0.6	0.5%	82	ONGOING
Jordan	Tourism Prcject	6.0	19.4	0.1	0.3%	76	COMPLETED
Jordan	Amman Transp & Municipal Dev Project	30.0	65.6	9.2	14.0%	84	ONGOING
Lebanon	Reconstruction Project	50.0	83.6	3.0	3.6%	78	COMPLETED
Morocco	Rabat Urban Development Project	18.0	25.6	1.2	4.7%	78	COMPLETED
Morocco	Second Urban Development Project	36.0	81.0	3.1	3.8%	81	COMPLETED
Pakistan	Lahore Urban Development Project	16.0	24.0	4.7	19.6%	83	ONGOING
Pakistan	Karachi Special Development Project	70.0	148.6	8.9	6.0%	86	ONGOING
Tunisia	Second Urban Development Project	19.0	39.4	3.5	8.9%	79	COMPLETED
Turkey	Cukurova Region Urban Eng Project	9.2	10.7	0.2	1.6%	85	ONGOING
Turkey	Cukurova Urban Development Project	120.0	467.4	11.5	2.5%	87	ONGOING
	TOTALS FOR EMENA REGION:	456.2	1115.7	54.0			
	AVERAGE PER PROJECT:	35.1	85.8	4.2	4.8%		

2.22 Earlier project experience under the Jordan Tourism Project, although of limited scale, provided the basis for a significant follow-up solid waste investment. The solid waste component of Jordan's Amman Transport and Municipal Development Project, with an estimated cost of US$9.2 million (14 percent of total project cost), aimed at strengthening services in Amman through investments in collection and disposal equipment and in the development of sound financial and institutional arrangements. Component activities include civil works for four new sanitary landfills, the establishment of a Solid Waste Management Department within the Amman Municipality, implementation of cost recovery mechanisms, and a study of means to improve the productivity of solid waste collection.

2.23 Two solid waste projects each in Pakistan and Turkey account for the remaining subsector investments in the Region. The US$4.7 million solid waste component of the Lahore Urban Development Project is discussed in Annex 7.

2.24 EMENA is the only Region to carry out a major study of the subsector (EMENA Urban Solid Waste Management: Development of Strategies, Green Cover Report No. 4875, June, 1984). The report analyzes previous and ongoing project experience, examines key issues in the Region, and lays out a set of recommended strategies for both the Bank and borrowers. The study provides a good basis for expanding MSWM activities in the Region, and could well be emulated in other Regions.

LAC Region

2.25 Although the LAC Region's first project containing a MSWM component (Baja California Tourism Project, Mexico) was not approved until FY77, subsequent project activities have accounted for the largest share of Bank-wide lending for MSWM (overall 36 percent of total investments). Eighteen projects in eight countries have included MSWM investments ranging from less than 1 percent up to 100 percent of total project costs (see Table 4).

2.26 Several projects in the LAC Region have featured large investments in the subsector. Three projects have each involved MSWM investments of over US$30.0 million, and almost half of the projects in the Region have allocated at least 10 percent of their total project costs to solid waste operations. Brazil and Mexico have received the largest share of LAC's investments in MSWM. Together, they account for half of the solid waste-related projects executed by the Region. Between FY77 and FY86, Mexico has undertaken four solid waste projects, the latest being the ongoing Mexico Solid Waste Management Pilot Project which is national is scope. Aimed at developing investment plans for 26 intermediate cities and establishing a financial intermediary for solid waste lending to municipalities, the project has a total cost of US$50.0 million (see Annex 9). A large follow-up investment is expected to result from this pilot effort.

TABLE 4

Lending for MSWM Projects in LAC, FY74-88

COUNTRY	PROJECT TITLE	LOAN AMOUNT	TOTAL PROJECT COST	MSWM COMPONENT COST	MSWM AS PERCENT OF TOTAL PROJECT COST	FY	STATUS AS OF 6/30/89
		(US$ MILLION)					
Argentina	Municipal Development Project	120.0	240.0	23.6	9.8%	88	ONGOING
Bahamas	Urban Development Project	5.8	24.4	1.5	6.2%	82	COMPLETED
Bolivia	La Paz Municipal Develoomment Project	15.0	21.3	2.2	10.3%	88	ONGOING
Bolivia	Urban Development Project	17.0	22.5	0.1	0.1%	78	COMPLETED
Brazil	Medium-Sized Cities Project	70.0	200.0	30.0	15.0%	79	COMPLETED
Brazil	Metropolitan Development Program	8.9	24.9	1.4	5.6%	83	COMPLETED
Brazil	Water Munic.& Low-income Areas Project	80.0	190.7	2.8	1.5%	88	ONGOING
Brazil	Recife Metropolitan Dev Project	123.9	347.8	38.5	11.1%	82	ONGOING
Brazil	Rio Flood Reconstruction Project	175.0	393.6	6.7	1.7%	88	ONGOING
Colombia	Barranquilla Water Supply Project	24.0	37.2	4.0	10.8%	86	ONGOING
Colombia	Water and Sewerage Sector Project	150.0	435.0	5.0	1.1%	88	ONGOING
Dom. Repub.	Sites and Services Project	25.4	41.7	0.6	1.4%	82	CANCELLED
Dom. Repub.	Santo Domingo Tech Assistance Project	7.1	17.5	7.6	43.4%	83	COMPLETED
Mexico	Second Urban & Regional Dev Project	164.0	468.0	4.4	0.9%	81	ONGOING
Mexico	Solid Waste Management Pilot Project	25.0	50.0	50.0	100.0%	86	ONGOING
Mexico	Pollution Control Project	60.0	190.9	2.5	1.3%	82	ONGOING
Mexico	Baja California Tourism Project	(42.0)*	(122.2)*	NA	NA	77	COMPLETED
Peru	Lima Metropolitan Development Project	82.5	135.9	9.4	6.9%	84	SUSPENDED
	TOTALS FOR LAC REGION:	1153.6	2841.4	190.3			
	AVERAGE PER PROJECT:	64.1	157.9	11.2	7.1%		

NOTE: * = Loan and Project Cost quoted but not included in the totals due to non-availability of SWM data.

2.27 Three of the five urban projects executed in Brazil between FY78 and FY83 have included significant investments for solid waste activities. The Brazil Medium-Sized Cities Project included US$30.0 million (15 percent of total project cost) to upgrade municipal refuse collection services and to expand these services to poor, unserved areas. The Recife Metropolitan Region Development Project, discussed in Annex 8, includes a US$38.5 million solid waste component to meet subsector needs. Approved in FY88, both the Rio Flood Reconstruction Project and the Water Project for Municipalities and Low-Income Areas contain significantly smaller MSWM components.

2.28 Bolivia, the Dominican Republic, and Colombia have each executed two solid waste projects. In Bolivia and the Dominican Republic, small investments for MSWM in initial urban projects were followed-up by comprehensive solid waste components in a second project. In Colombia, however, a US$4.0 million component to upgrade collection services in the City of Baranquilla preceded a similar level of investment (US$5.0 million) to carry out studies and establish a line of credit for MSWM improvements in about ten cities. Finally, Argentina, the Bahamas, and Peru have each executed a single project with modest to large solid waste components that range between 6 and 11 percent of total project costs. The latter project supports the development of a solid waste parastatal for Metropolitan Lima as well as a comprehensive approach to solid waste management for the city (although Bank disbursements for the project have been suspended, it continues with GTZ cofinancing).

III. MSWM COMPONENTS IN BANK PROJECTS

3.01 World Bank investments in MSWM range from small components to finance the procurement of collection vehicles and equipment to free-standing comprehensive solid waste projects covering technical and institutional improvements in all aspects of solid waste management in large cities or groups of secondary cities. Most projects, however, include two or three of the usual "engineering" subcomponents: (i) storage and collection, (ii) transport/transfer, (iii) disposal, and (iv) resource recovery. More than half of the projects also contain a technical assistance or institutional development subcomponent to improve the operations and/or institutional capabilities of local municipal authorities. Some of the more comprehensive components incorporated pilot projects to test improved methodologies prior to full-scale implementation. Finally, about half of the projects have included a specific subcomponent aimed at resolving solid waste collection problems in low-income neighborhoods. Table 5 presents a global summary of the occurrence of these subcomponents in Bank projects; Tables 1.2 to 1.5 in Annex 1 provide a further breakdown by Region. The remainder of this chapter discusses the broad range of MSWM investments in terms of component design and implementation and other key project issues.

TABLE 5

Distribution of MSWM Subcomponents by Region

REGION	NUMBER OF PROJECTS	SUBCOMPONENTS								TOTAL No. OF SUBCOM-PONENTS	AVERAGE No. OF SUBCOM-PONENTS PER PROJECT
		TECH ASST	INST STRN	SYST /OPS IMPV	STOR CLCT	TSPT TRSF	LAND FILL	PRCS RSRC RCVY	LOW-INCM FCUS		
AFRICA	19	11	6	5	18	3	5	1	7	56	2.9
ASIA	21	11	5	6	17	7	8	6	9	69	3.3
EMENA	13	9	5	5	10	4	6	5	6	50	3.8
LAC	18	9	7	7	13	4	10	4	10	64	3.6
TOTALS	71	40	23	23	58	18	29	16	32	239	3.4

KEY: TECH ASST = Technical Assistance; INST STRN = Institutional Strengthening; SYST/OPS IMPV = Systems/Operations Improvements; STOR CLCT = Storage/Collection; TSPT TRSF = Transport/Transfer; LAND FILL = Landfill Operations; PRCS RESC RCVY = Processing/Resource Recovery; LOW-INCM FCUS = Low-income Focus

A. Component Design and Implementation

3.02 The MSWM components in most Bank projects have not been systematically designed and have a limited focus. The majority of the components supported the purchase of collection and transport equipment; only about half of these components provided facilities necessary for environmentally

safe disposal. Moreover, many of the components failed to include sufficient attention to the broader institutional and financial requirements for effective solid waste management. Consequently, many of the MSWM components can be viewed as missed opportunities. A limited review of project experience revealed that the deficiencies in design resulted in extensive delays and failure to achieve significant long-term improvement in solid waste management. The following sections describe in more detail the nature of the Bank's investments in solid waste storage and collection, transfer and transport, disposal, resource recovery, industrial waste management, and institutional strengthening.

Storage and Collection

3.03 The most frequent feature of the Bank's MSWM investments is the provision of collection vehicles; 66 out of the 71 projects have collection-related components. Bank support for collection services has ranged from a one-time injection of funds for vehicles (e.g., Kenya, Gambia, Sri Lanka, Afghanistan, Lesotho) to comprehensive efforts addressing city-wide refuse collection needs (e.g., India, Indonesia, Egypt, Nigeria, Brazil, Mexico). Thirty-six projects are aimed at improving primary collection services for low-income groups in project cities. In these areas, collection techniques typically include both traditional methods (using human or animal-powered carts) as well as motorized vehicles. In several Bank projects in India, Indonesia, Egypt, and the Philippines, handcarts are being used as the principal mode of house-to-house refuse collection within low-income neighborhoods.

3.04 The means by which primary collection in low-income areas are linked to the overall secondary collection network vary, but often is accomplished by establishing neighborhood bins or transfer points (i.e., mini-transfer stations) in contrast to conventional transfer stations discussed in the following section. Here, as in many other MSWM issues, there is no universal policy regarding institutional responsibilities. In the planning of the Third Urban Project in Indonesia, for example, household collection responsibilities were expected to be shifted from local neighborhood organizations to the central municipal authorities. By contrast, the recommended MSWM scheme in the Egypt Urban Development Project was to encourage private refuse collectors and assign a limited role to the municipality in door-to-door collection. Both projects are considered in greater detail in Annexes 5 and 6, respectively.

3.05 To maximize efficiency in collection operations, it is essential to match truck type and size with local conditions. Given the predominance of truck procurement in the projects analyzed, however, there was disturbingly little attention given to questions of truck selection criteria or vehicle specifications in the project appraisal reports. Consequently, the process of selecting the most appropriate solid waste technology presented a significant constraint to the implementation of a number of MSWM components. In the Third Urban Project in Indonesia, for example, difficulties on the part of Jakarta's Cleansing Department in determining the appropriate technology for solid waste transport posed costly delays in Jakarta. Although a Bank consultant had recommended an appropriate technical approach during project preparation, the local institution, upon project execution, experimented with more highly mechanized equipment (e.g., balers, compactors). After testing these

technologies, the local agency discovered that they were indeed inappropriate (i.e., the high moisture content of the waste made the compactors inoperable and scavengers undermined the effectiveness of the balers) and subsequently accepted the original Bank recommendations.

3.06 In the execution of other MSWM components, the complexities of equipment and vehicle specification and procurement caused further delays. Under the Lagos project, internal and external controversy over vehicle specifications and the design and award of a US$40.0 million procurement package delayed the acquisition of garbage trucks by almost four years. In other projects, failure to include spare parts in the initial package meant that the project-financed vehicles, during later stages of implementation, would have to remain idle for considerable periods of time while the municipality procured replacement parts. Further, many of the Bank-financed trucks that eventually broke down often remained out of commission due to the lack of adequate facilities and skills for maintenance and repair. In Calcutta, vehicles financed under one loan had to be replaced by new vehicles funded under a subsequent loan five years later.

Transfer/Transport

3.07 Waste collected by conventional trucks from individual dwellings or community transfer points may be hauled either directly to the disposal site or to a transfer station. In large, crowded cities such as Calcutta, Manila, Jakarta, Cairo, Lahore, and Karachi, the transfer of solid waste is emerging as an important issue in Bank projects. Overall, transfer stations or depots have been incorporated into the design of 18 solid waste components. They were generally included because of the distance and travel time constraints on solid waste collection. In large, spread-out cities, the distance between collection areas and the disposal site is often greater than the economical range of collection trucks. In crowded cities, where distance may not be excessive, road congestion on main arteries may also tie up many collection trucks for too long a time when the first priority of these vehicles is to remove refuse within collection areas as efficiently as possible. In these situations, the projects included transfer stations to optimize the use of collection equipment. In one case where cost savings were calculated (Lima), the economic rate of return for transfer operations was 156 percent.

Disposal

3.08 Open dumping remains the prevalent form of disposal practiced in developing countries, and was identified as a serious environmental problem in numerous project cities. Further, it is generally recognized that efforts to increase collection efficiency without consideration of appropriate disposal facilities tend to aggravate the disposal problem as well as ensuing environmental problems. Nonetheless, investments in disposal (i.e., landfills) are only included in about half of the Bank's MSWM projects, indicating a low priority for disposal operations on the part of municipal governments. The AFRICA and EMENA Regions have six projects each with disposal subcomponents; these are generally concentrated in the larger cities (e.g., Amman, Cairo, Lagos, Lahore, Karachi). The LAC Region has made extensive efforts to address disposal issues in 11 of its 18 Regional projects, the majority in Brazil and Mexico.

In the Asia Region, disposal services have accompanied collection operations in nine projects, primarily those in India, Indonesia, and the Philippines.

3.09 In the course of implementation, difficulties surrounding the selection and acquisition of land for landfills as well as transfer stations were a major cause of delay. The problems encompassed lack of institutional capacity to identify environmentally acceptable sites, resistance from surrounding residential areas, delays in obtaining legal land rights, and lack of vacant land. In Calcutta, difficulties in locating and acquiring land for solid waste transfer depots reduced the component's construction program from 80 to 28 ward depots. In Nigeria, the process of identifying, conducting environmental investigations, surveying, and obtaining certificates of occupancy for transfer station and sanitary landfill sites posed lengthy delays in the implementation of the Lagos project. Although some of the land acquisition problems experienced in these and other MSWM components impede Bank projects in almost all sectors, the complexities of identifying, evaluating, and acquiring environmentally suitable sites that will be tolerated by adjacent neighborhoods compounded the land problem for MSWM.

Resource Recovery

3.10 Resource recovery options can be employed to (i) reduce refuse volume in cities that lack adequate disposal or landfill space, and (ii) utilize resources in the refuse (reusable material, energy value) when it is economically and environmentally feasible. In Singapore, the scarcity of land for disposal sites was recognized as a particularly urgent problem. Consequently, the Singapore Environmental Control Project financed the construction of an incineration plant capable of receiving and incinerating 1,200 tons of refuse per day to generate a net of 7.0 MW of electricity currently being sold. Scrap recovery at the plant also was included, but it only achieved about one-third of the expected amounts, due largely to the lower-than-expected scrap content in the refuse. On average, however, the sale of electricity and scrap reduces the disposal cost per ton by 25 percent.

3.11 Besides the Singapore project, 17 other projects include provisions for resource recovery. In most of these projects, such as the ones in Mexico, Brazil, India, Tunisia, Madagascar, Lebanon, Egypt, and the Philippines, the resource recovery subcomponents involve the establishment or improvement of composting facilities. One project in Mexico includes resources for the construction of a materials recovery and recycling facility. The Bangladesh project includes land reclamation through the filling of low-lying lands. Another project in Recife, Brazil provided financing for two sanitary landfills equipped with facilities for recovering landfill gas for use in adjacent industries. Due to political reasons, however, these facilities were never built (see Annex 8).

3.12 With respect to the implementation of Bank-financed composting facilities, deficient institutional and technical capacities posed significant constraints to effective facility management and operations. As illustrated by the implementation of the composting plant financed under the Antananarivo Water and Sanitation Project, lack of local expertise in compost marketing, sales, and

quality control undermined the financial and agricultural benefits of resource recovery. In Egypt, by contrast, the composting plant in Alexandria, financed under the First Urban Development Project, was effectively managed by an agronomic engineer with assistance from a technical expert who ensured that the plant was efficiently operated and the compost properly marketed, tested, and sold. Currently, the plant is producing compost of regular consistency, with high organic content, suitable for soil conditioning. It also is recovering substantial quantities of metals, plastics, leather, paper, and textiles that are sold and recycled. Notwithstanding this experience, most composting operations are better carried out by the private sector or linked to agricultural agencies.

3.13 Apart from project lending, the Bank also is executing a UNDP-financed global research and demonstration project on waste management and resource recovery. The project is evaluating many resource recovery and recycling technologies and promoting the incorporation of promising options in future investment projects.

Industrial Waste Management

3.14 Unsafe handling and disposal of industrial waste is a growing problem for developing countries. Nonetheless, only four of the projects reviewed addressed the management of industrial or hazardous solid wastes. Each project allocated relatively little attention to this problem. In the Lagos Solid Waste and Stormdrainage Project, for example, the solid waste component includes equipment and vehicles for upgrading industrial waste collection; the SAR provides no data on their costs and very little information on how this service will be upgraded. The incineration plant financed by the Singapore Environmental Control Project was designed to incinerate a certain amount of waste oil and other suitable industrial solid wastes of high calorific value in addition to domestic waste. Although the municipal government normally is not responsible for the collection and disposal of industrial waste, local agencies have expanded their operations to include these wastes in order to recover additional revenues. Lastly, two projects in Mexico include financing for industrial waste management. The Mexico Pollution Control Project allocates US$2.5 million for studies related to industrial solid waste control. The studies encompass a comprehensive study for characterization and quantification of chemical and hazardous industrial wastes as well as feasibility studies for industrial waste treatment plants and disposal sites. As part of the project's other components, which provides loans to industrial enterprises for undertaking air or water pollution control, the project includes support for a limited number of industrial solid waste disposal investments. To support the development of industrial waste confinement sites in three Mexican cities, the Mexico Solid Waste Management Pilot Project finances studies and assistance for preparation works, monitoring, evaluation, documentation, and training. This project also includes the development of an industrial waste information system.

Institutional Strengthening

3.15 In most developing country cities, the solid waste service is the largest employer of municipal labor and transport and spends the largest portion

of the city's revenues for operations, yet few cities have a qualified senior officer employed exclusively in solid waste management operations. Further, MSWM institutions in most developing countries are fragmented and have little or no capacity in sanitary engineering and municipal waste management. Despite these conditions, however, only about one third of the projects reviewed addressed the need to strengthen or reorganize the local institutions responsible for solid waste services. In these projects, MSWM or technical assistance components provided for studies, expert assistance, and training of municipal staff. A few projects dealt with creating or strengthening a metropolitan area solid waste agency (e.g., Amman, Lagos, La Paz, Lima, Monterrey). With regard to component implementation in most cities, both intermediate and large, MSWM responsibilities were delegated to a multi-service municipal department. In three cases, they were delegated to health or sanitation departments. Only seven components incorporated specific solid waste or urban cleansing departments.

3.16 Inadequate attention to institutional issues in the design of solid waste components resulted in poor component performance. Moreover, deficient institutional organization and capacity was cited as the principal impediment to effective MSWM component execution. For example, insufficient and unskilled staff, inadequate project management, and unclear organizational structure and responsibilities undermined the execution of MSWM improvements in the Lagos Solid Waste and Stormdrainage Project. In this project, a three-year delay in preparing and formally adopting a management organization and staffing plan posed a significant constraint to executing long-term solid waste improvements. Although the delay was due primarily to the fact that four different governors exerted their influence on the plan in the course of project preparation, appraisal, and execution, the continuing uncertainties regarding organization, management, staffing, and training severely impeded critical planning and coordination tasks associated with the project.

3.17 In a number of projects, insufficient technical and managerial expertise impeded the introduction of more advanced levels of technology and service. During the implementation of the Third Urban Project in Calcutta, for example, the Calcutta Municipal Corporation changed its methods of solid waste management more frequently than could be readily absorbed by the solid waste workers; the project did not provide adequate training to complement the changes in technology. As discussed earlier, weak institutional capacity also undermined the efficiency of Bank-financed composting facilities.

3.18 With respect to institutional development, there were some notable accomplishments in the projects reviewed. Under the Mexico Solid Waste Management Project, for example, the Monterrey subloan supported the development of a state level public company responsible for the disposal of the solid wastes of eight municipalities within the Monterrey metropolitan area in the State of Nuevo Leon. Controlled by a Board of Directors, the company (SIMEPRODE) will operate four transfer stations, a fleet of 24 transfer trailers, and a sanitary landfill. Collection remains the responsibility of each municipality, but the company provides technical assistance. Operations are expected to start in September 1989.

3.19 In Asia, urban projects in Indonesia and India triggered additional institutional improvements. As a result of the Third Urban Project in Indonesia, the city of Surabaya established a separate Cleansing Department within the municipality, thus increasing the status and subsequent resources assigned to solid waste management. In Calcutta, implementation of the second urban project resulted in the reorganiz ion of the solid waste structure within the municipality, designation of a qualified senior engineer to direct solid waste operations, and establishment of a hierarchy of positions and responsibilities. The project also supported the improvement of employee working conditions and the design of a management system for operations and maintenance. Despite these accomplishments, however, one project officer noted that the failure to sustain local commitment to solid waste management was an important factor inhibiting long-term improvement. Solid waste institutions have remained weak and local governments have continued to assign higher priority to other urban expenditures.

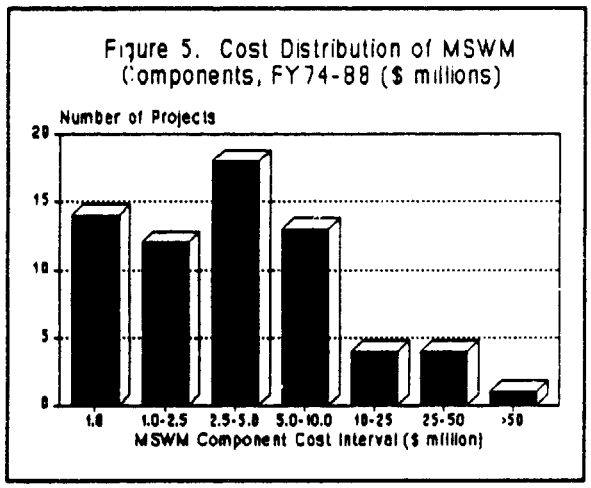
B. Project Issues

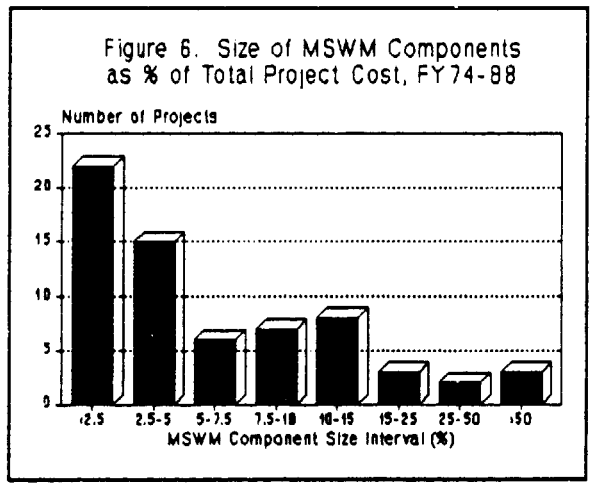
3.20 To complement the evaluation of component design and implementation, the review of World Bank MSWM investments focused on the size and scope of the solid waste investments, level of borrowing, financial considerations, and private sector participation in municipal solid waste services. The following sections consider key findings related to these issues and highlight pertinent questions raised in the course of reviewing MSWM projects and components.

Size and Scope of Investments

3.21 Notwithstanding some of the large, focused MSWM projects or components, the majority of components had very limited scope to provide vehicles and equipment to municipal departments. Little attention was given to specific improvements in the MSWM subsector. Furthermore, this approach raises serious questions about the usefulness of vehicle procurement as the main project subsector objective when rudimentary maintenance capacity is generally lacking. For Bank lending to have real impact on subsector performance, the project design must incorporate a broader, more comprehensive approach as illustrated by projects in Nigeria, Indonesia, and Mexico (See Annexes 3, 5 and 9).

3.22 Based on an analysis of MSWM component size, many of the projects appear to have included solid wastes as an afterthought - even though MSWM is a major budget item for cities. One fifth of the components had a component cost of less than US$1.0 million, and represented less than two percent of the respective total project cost. Moreover, this group of components was included largely for procuring collection equipment. The median value of the MSWM components was US$3.4 million; the median share was 4.5 percent of total project costs. By contrast, about one third of the projects had sizeable solid waste components costing in excess of US$5.0 million and accounting for more than 10 percent of project costs. The cost and size distribution of 66 projects for which MSWM component cost data were available is shown in Figures 5 and 6.





3.23 In addition to the relatively low level of investment in MSWM, the Bank has carried out very few sector studies on solid waste management. In 1982, the Bank published Environmental Management of Urban Solid Wastes in Developing Countries: A Project Guide by Sandra Cointreau (World Bank Urban Development Technical Paper Number 5). The document provides information and procedures for planning and implementing solid waste management improvements but is not known to a surprising number of project officers questioned. In searching through the Bank's information systems, only two Regional sector studies were found that dealt with solid wastes. The EMENA Urban Solid Waste Management: Development of Strategies report, prepared in 1984, provides an in-depth review of regional lending and proposes a number of strategies to expand and improve program and project development. A 1982 LAC Water Supply and Wastes Sector Strategy Paper devotes a brief section to MSWM, indicating the growing importance of this subsector in the Region. The paper emphasizes the need to strengthen Bank and country capacity for dealing with this urban problem and identifies proposed activities in Brazil, Colombia, and Mexico. Also in LAC, country water and wastes sector studies for Brazil (1983) and Columbia (1986) include substantial analyses and discussions of the solid waste subsector. A LAC sector study to be initiated in FY89 will devote more attention to this topic. Given the potential growth of lending in this subsector, as reflected in experiences in Nigeria, Brazil, Mexico, Egypt, Pakistan, India, and Indonesia, the development of Regional strategies, as carried out in EMENA, is recommended.

Level of Borrowing

3.24 The discussion of MSWM issues to this point raises another important question: why the relatively low borrowing for the subsector? Several explanations can be suggested. First, solid waste collection operations tend to be labor intensive, and as viewed in several of the past small loan components, have a relatively low foreign exchange cost, primarily for vehicles.

The need for more significant borrowing only becomes apparent when there is a comprehensive project or component incorporating technical assistance, operational planning and management, transfer operations, resource recovery, and landfilling.

3.25 Another reason for the low level of borrowing is that past project identification and appraisal missions did not include a municipal solid waste expert or sanitary engineer with MSWM expertise. Thus, project officers usually focussed on other problems or simply provided funds for the procurement of vehicles and equipment. Moreover, MSWM often fell into the cracks between the urban and water and sanitation sectors. Project officers in each sector tended to leave solid waste management to the other sector.

3.26 A third factor accounting for the low level of borrowing is that the borrowers generally do not recognize that MSWM is a major consumer of scarce municipal resources; the true cost of MSWM services may be hidden due to deficient municipal accounting practices and reliance on central government transfers. Thus, the relative importance of achieving greater efficiency in service provision is not properly appreciated. This management information problem, however, is more deeply rooted in overall municipal management capacity, and can only be effectively approached through urban development lending for improvements in land information systems, local tax systems, and municipal budgeting and accounting.

3.27 An additional factor is that local governments do not have easy access to capital. On-lending through national or state financial institutions to local governments can be an important feature of Bank lending to stimulate increased borrowing for comprehensive MSWM projects. The on-lending facilities can be linked to national or state solid waste strategies that include provision of technical assistance to borrowing municipalities. Nonetheless, only five of the projects reviewed (Nigeria, Mexico, Colombia, Argentina, and Brazil) focused on using existing financial intermediaries to support comprehensive MSWM activities.

Financial Considerations

3.28 In the project documents reviewed, there is a scarcity of information on the present or estimated costs of services, cost recovery arrangements, and economic rates of return. With respect to the available information on service costs, illustrative data are: US$5.20 per capita per year for refuse services in Nigeria, US$2 per capita per year in Calcutta, US$15 per ton in Singapore, and US$24 per ton in Amman. These costs, however, are unrelated to levels of service. In many instances, financial analyses of solid wastes operations could not be carried out due to a lack of accounting data; most municipal accounts do not break out MSWM costs from other operating expenditures. Without proper cost data, cost efficiency is not a concern for many municipalities, much less a goal to be achieved.

3.29 Cost recovery is another issue that receives little attention in the project reports. Many SARs do not indicate how the recurring costs for MSWM would be recovered. Where this information was provided, the most common approach was to assume that operating costs would be recovered through municipal

or property taxes. Transfers from central government were planned in several cases. In 17 projects, a refuse fee or tax was established, sometimes as a surcharge on property taxes or on other utility bills. Since solid waste service charges in Lima (based on property values) financed only about 27 percent of the estimated service cost, the Lima project called for a gradual shift from solid waste charges based on property values to a surcharge on electricity. In the case of Merida, householders were expected to pay a weekly collection fee directly to private or municipal haulers. Only one SAR mentions the collection of tipping fees as a source of revenue for disposal operations. The SARs of three projects describe cross subsidies to finance services to the poor through user charges levied on commercial or industrial establishments or high-income households.

3.30 In recovering costs for the Bank-financed MSWM investments, the experience was largely disappointing. Where the municipalities recovered operating costs through municipal or property taxes, collections were inadequate to ensure operations and maintenance, even when the project included a complementary component emphasizing improvement in municipal finance or property tax collections. Where there was a willingness-to-pay for solid waste services, however, more successful financial performance was achieved. Under the Singapore project, for example, recurring costs were recovered through a tariff for domestic wastes and a disposal fee for certain industrial wastes. Under the First Urban Development Project in Egypt, several communities in Cairo are paying for solid waste collection services directly to the Zabbaleen (private refuse collectors). By contrast, the experience in Merida, Mexico was discouraging; reportedly, 60 percent of the population did not subscribe to the paid service and simply dumped their garbage on streets or empty lots.

3.31 The calculation of ERRs for solid waste components is complicated by the fact that this service is generally treated as a public good. Accordingly, most of the project documents reviewed do not report ERRs for the solid waste components, citing methodological difficulties in estimating them. Of the six projects that do report ERRs, most calculated the cost reductions resulting from improved operations as the basis for evaluation or attempted to estimate the benefits of increased service coverage. The few attempted calculations on this basis showed significant returns: Second Calcutta Urban Development (27 percent), Thailand Regional Cities Development (14 percent), Lagos Solid Waste Management and Stormdrainage (25 percent), La Paz Municipal Development (44 percent), Lima Metropolitan Development (transfer station only, 156 percent), and Recife Metropolitan Development (22 percent). Further information regarding the accuracy of these calculations is not currently available in the project documents. Nonetheless, when the calculation is based on improvements in operational efficiency, the ERR on comprehensive solid waste management projects or components can be substantial.

Private Sector Participation

3.32 The private sector has the potential to increase significantly the efficiency of solid waste service delivery (see paragraphs 4.23 - 4.46). Nonetheless, private sector provision of services was referred to in only a few projects, usually for collection services through municipal contracts (e.g., La

Paz, Lagos) or direct arrangements with householders (e.g., Cairo, Merida,). For example, to improve the industrial waste collection service, the Lagos project incorporates participation by private contractors that demonstrate sound operating practices and have the potential to expand their operations. Under the First Urban Development Project in Egypt, the successful integration of Zabbaleen collection activities into the solid waste component demonstrated the potential for lowering costs and increasing the efficiency and effectiveness of services. This experience also demonstrated the feasibility of mobilizing the informal sector productively. To investigate further the extensive experience with privatization in Latin America, West Africa, and the Middle East, INU has initiated research on this subject.

IV. IMPROVING THE DESIGN AND IMPLEMENTATION OF MSWM COMPONENTS

4.01 MSWM is an integral part of the broad urban and environmental management of a city. To maximize the efficiency and effectiveness of the Bank's investments in this sub-sector, World Bank project designers need to address on a systematic basis the full range of solid waste operations and related environmental, institutional, and financial issues in designing MSWM components or projects. Although project officers generally are not responsible for designing the technical aspects of the specific MSWM improvements, they must ensure that the components prepared by the borrowers or solid waste management consultants provide: collection and disposal of solid wastes generated by all population groups at a level and cost that can be sustained locally; maximum protection of the environment; systems appropriate to local climatic, economic, physical, and social conditions; and high equipment and labor productivity.

4.02 The remainder of this chapter presents general recommendations for improving the design and implementation of MSWM components in World Bank project. The recommendations cover: design of MSWM sub-components, regulatory framework, institutional arrangements, financial arrangements and pricing, land acquisition, and phasing of MSWM improvements. For more detailed guidance in identifying and planning an improved solid waste management system, see Environmental Management of Urban Wastes in Developing Countries: A Project Guide by Sandra Cointreau (World Bank Urban Development Technical Paper Number 5).

A. Component Design

4.03 The design of the MSWM component is a key determinant of the effectiveness of the solid waste investment. Based on the lessons of prior experience, the World Bank should no longer invest in solid waste components that finance only the procurement of collection vehicles and equipment in the absence of a MSWM plan. As discussed earlier, these investments fail to address the broader institutional and financial problems that perpetuate low levels of service and consequent health effects and environmental degradation. Moreover, financing collection vehicles without appropriate provisions for maintenance results after a short time in vehicle breakdown and abandonment. If the World Bank wants to make a more significant impact on solid waste services in developing country cities than it has in the past, Bank-financed projects should incorporate a comprehensive policy framework that takes into account all physical, technical, legal, institutional, financial, environmental, and sociocultural aspects of MSWM in a jurisdiction. Future investments need not be free-standing projects. They do, however, need to be well-focused and integrated components that may incorporate the following MSWM sub-components.

Strategic MSWM Plan

4.04 At a minimum, the MSWM component should include financing to support the development of a strategic solid waste management plan or phased action plan covering the full range of solid waste services and related management activities. For large cities, the plan should focus on the requirements of the municipality as well as the surrounding metropolitan area. A national solid

waste plan is more appropriate for medium-sized and small cities. The investment would cover: comprehensive data collection and analysis of local solid waste conditions; development of MSWM objectives and performance targets; design of the solid waste organizational structure and staffing with designated responsibilities for all categories of municipal wastes; development of a plan for improving waste operations and facilities, vehicle maintenance and repair, staff training, and management practices and systems; identification of sites for new or improved transfer and disposal facilities; development of a financing scheme for capital investments and recurring costs; design of a plan for relocating occupants of sites selected for solid waste facilities; and the development of a plan for managing labor and integrating organized scavenger groups into the municipal solid waste service.

4.05 Since the municipal solid waste service is often the largest employer of municipal labor, almost all planning decisions will require a sensitive and enlightened approach in dealing with labor groups. Solid waste workers are usually well-organized and the unions need to be involved in the planning process. Moreover, a representative of labor groups should be assigned a role on the planning committee. If the new or upgraded solid waste service will include private sector participation, the plan will need to delineate the process of transferring workers from public to private enterprises. The plan also should include measures for improving working conditions and for eliminating the usually large number of unneeded staff on padded labor rolls.

4.06 In addition to labor relations, the plan should address interactions among the municipal government, MSWM agencies, and organized scavenger groups. In developing the plan, authorities should determine: whether there is a way to involve organized scavenger groups into future solid waste activities and the formal MSWM structure, how to mitigate impacts when these groups are displaced, how to continue to recognize the value of their contribution in recycling wastes, and how to improve their living and working conditions.

Storage and Collection

4.07 When planning MSWM system improvements, project designers need to direct more attention to primary as well as secondary collection operations (i.e., from waste storage at the household or communal level through the collection and delivery of these wastes to one or more transfer stations or the final disposal site). Regarding primary collection, the components should encompass appropriate household bins or containers and communal storage bins (e.g., containers or bunkers) as well as vehicles capable of negotiating the narrow, unpaved twisting pathways common to low-income neighborhoods. The collection system should be designed so loose waste is handled only once. To provide greater coverage for low-income areas as well as to maximize the sustainability of improved systems, MSWM components should support the use or development of low-cost indigenous technologies (e.g., handcarts, tricycle rickshaws) for collecting garbage from individual households and then bringing it to collection points where the waste can be transferred to collection trucks.

4.08 With respect to secondary collection, which involves transporting waste from a transfer point or station to the final disposal or processing

facility, the purchase of foreign vehicles usually will be required. To achieve efficiency in collection operations, it is essential to match truck type and size with local conditions, particularly the prevailing solid waste characteristics (density and composition), road conditions, maintenance capacity, availability of spare parts, and labor rates. Due to the complexities of vehicle specifications and procurement, project designers should insist on loan conditions that require only agreed upon vehicles to be purchased for the component. Project designers should also stress appropriate vehicle selection and direct attention to the size and manageability of the procurement packages. Moreover, the initial procurement of collection vehicles should include provisions for spare parts (about 20 percent of vehicle cost) to ensure that the Bank-financed vehicles will be operable beyond the initial period of project implementation. An effective MSWM component also should include workshops and training for vehicle maintenance and repair. For useful information to support vehicle investment decisions, see "Refuse Collection Vehicles for Developing Countries," a recent UNCHS (Habitat) publication. In addition, a simple spreadsheet model for analyzing the unit costs of alternative collection schemes is available from INURD.

Street Sweeping

4.09 The cleaning or sweeping of streets is an important aspect of MSWM. According to Flintoff, many cities spend between a third and a half of their solid waste budgets on this activity. Moreover, the cost of removing wastes which have been scattered on the street is considerably higher than the cost of collecting waste placed in containers.[2/] In planning MSWM components, therefore, project designers should stress the provision of primary collection services, reduction of street litter through public education, as well as the adoption of systems that incorporate the development and use of effective tools and equipment that can achieve high labor productivity. Transfer depots and stations also should be included for the effective management of street sweepers and for the transfer of waste collected. As an alternative to transfer stations, arrangements can be made for collection vehicles to pick up the waste from the sweepers several times a day. Nonetheless, this approach does not obviate the need for transfer depots which provide parking areas for handcarts, tool and equipment storage, and hygiene facilities.

Transfer

4.10 Where haul distances from the collection area to the disposal site are greater than 15-20 kilometers or where vehicle travel times exceed 30 minutes, transfer stations should be considered among the MSWM improvements and included in feasibility studies. Although most municipalities give these facilities low priority, transfer stations can maximize the productivity of collection vehicles and crews and increase the useful life of the collection vehicles. To achieve economies of scale, project designers should ensure that

---

2/ Frank Flintoff, Management of Solid Wastes in Developing Countries. WHO Regional Publications South-East Series no. 1 (New Delhi: World Health Organization, 1984), p.85.

the municipality incorporates a system-wide approach in locating, sizing, and scheduling these facilities, taking into account the location of present and future disposal sites. Moreover, transfer stations should be designed so as to minimize waste handling.

Resource Recovery and Disposal

4.11 All investments in expanding collection capacity must be accompanied by corresponding investments in environmentally safe disposal facilities, which may include resource recovery and recycling plants to reduce the volume of waste and to recover value from the discarded materials. The selection of a disposal system involves a consideration of such factors as environmental impact, costs and revenues from resource recovery, capital and operations and maintenance costs, and the cost and availability of land. In most developing country cities, however, the most appropriate disposal facilities will continue to be sanitary landfills (also referred to as controlled landfills), and where a market for compost can be demonstrated, composting plants. In areas where land is scarce, calorific value of waste is high, and institutional/technical capacity and financial resources are favorable, incineration with energy recovery may be considered. Whatever method is used, however, project designers should explore the possibility of regionalizing the disposal or resource recovery facility to maximize cost efficiency and environmental protection. Moreover, even when resource recovery or incineration is employed, a sanitary landfill also will be needed to accept rejects and ash. For guidance in planning sanitary landfills, see "Landfilling Wastes," Department of the Environment Waste Management Paper No. 26, 1986. In addition, INUWS is preparing a manual on landfill management in developing countries.

Pilot Projects

4.12 To promote new technologies or the development and production of indigenous tools and equipment, MSWM components should include pilot projects to test improved systems of solid waste collection and/or disposal or resource recovery that could be implemented on a larger scale if proven efficient and acceptable. This approach has been effectively carried out in a number of Bank projects (e.g., Cairo, Calcutta, Brazil) and should be incorporated into the design of future MSWM components.

Hazardous Waste Management

4.13 Ineffective management of hazardous wastes threatens public health and the environment worldwide. In most developing countries, the problem is aggravated by the lack of controls over pollution and waste disposal. Consequently, hazardous wastes are entering municipal waste streams, causing surface and ground water contamination and other long-term adverse environmental and health effects. To maximize the benefits of a MSWM component, more attention should be directed at planning safe municipal disposal facilities and instituting or improving environmental controls and monitoring to keep hazardous wastes out of the municipal solid waste system. If industrial wastes are collected by the municipality, project designers should ensure that all potential sources of hazardous wastes are identified and targeted for appropriate waste management.

Where industrial wastes are collected by the private sector, the municipality should ensure that the private companies that collect hazardous waste are licensed to do so and that the waste is safely transported and disposed of at designated disposal sites. Although laws controlling hazardous waste are enacted at the national or state level, the municipality should play a key role in monitoring municipal disposal sites for hazardous wastes; monitoring the generation of urban waste, especially the wastes from small-scale or cottage industry; identifying hazardous waste sites; and carrying out periodic inspections of industrial and hazardous waste collection and disposal operations. Further recommendations regarding hazardous waste management goes beyond the scope of this paper. For guidance on this subject, see "The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries," (World Bank Technical Paper Number 93).

Institutional Strengthening

4.14 Most developing countries have little or no expertise in environmental/sanitary engineering and municipal waste management. Moreover, the solid waste service in most developing country cities lacks planning, human resource development, and financial management and budget control functions. Thus, efforts to improve MSWM should include appropriate levels of technical assistance and training in the operational, financial, and managerial aspects of solid waste management. To support the development of solid waste plans, technical assistance can be provided for: planning collection routes; assessing available or proposed equipment; setting up maintenance shops and depots; scheduling construction of strategic disposal facilities; and designing and siting transfer, resource recovery, and disposal facilities. Assistance is particularly needed in the siting and design of transfer stations and sanitary landfills. If resource recovery or recycling facilities are planned, technical assistance usually will be needed to manage plant operations and to advise on the most suitable means for marketing the recovered or recycled materials, ensuring quality control, and managing sales and delivery of products to consumers. Further assistance can be provided to help organize solid waste departments, supervise project execution and training, design and implement public information programs, design suitable cost recovery schemes, promote private sector (both formal and informal) or non-governmental participation in MSWM services, and advise on the design and evaluation of bid documents.

4.15 With respect to training, the MSWM components should provide on-the-job as well as specialized training in municipal management, municipal finance and accounting, public health, environmental protection, equipment operation and maintenance, and solid waste operations. For middle and top management, training may involve on-the-job or overseas training in some of the subjects covered by technical assistance, as discussed above. For local solid waste staff, the component should include on-the-job or local training in operating, maintaining, and repairing project-financed vehicles and equipment as well as operating a transfer station, sanitary landfill, or recycling plant.

4.16 As part of an institutional strengthening sub-component, a MSWM component could provide further assistance in assessing the existing or potential role of the private sector in municipal waste management. If private firms are

already operating in higher income neighborhoods or serving local industries and institutions, this sub-component should focus on expanding their participation in the solid waste system. To strengthen private sector skills, particularly in the areas of management and environmental protection, project-financed training could be extended to participating firms under certain conditions. (See paragraphs 4.23-4.26 for more information on the private sector.)

Public Education

4.17 To promote or improve public cooperation in solid waste improvement, MSWM components should include funds for educating the public about local solid waste services. For local residents, these education programs should focus on the services provided, the importance of MSWM to health and the community, the real costs of providing solid waste services and how they are paid, and what is expected of each resident in participating in the refuse management system. Basic information to be communicated includes: schedule of collection, storage requirements, arrangements for special collection of bulky wastes, schedule and location of special pick-ups for recyclables, fines and other penalties for non-participation in the system, and means for lodging complaints about the local solid waste service. For commercial and industrial enterprises, education programs should provide further information on disposing of specific materials and any applicable national, state, or local laws, ordinances, and regulations, including penalties for non-compliance. The information can be disseminated though the media, leaflets, pamphlets, billboards, and door-to-door contacts.

B. Regulatory Framework

4.18 In planning MSWM improvements, project designers need to direct more attention to the regulatory framework for solid waste management. In most developing countries, existing laws and enforcement systems provide inadequate protection of the environment and fail to encourage public cooperation with the local solid waste management system. Thus, efforts should be directed at establishing appropriate solid waste-related laws, ordinances, regulations, and corresponding inspection and enforcement responsibilities and procedures at the national, state, and local levels. For example, national or state legislation is needed to control the disposal of hazardous wastes as well as to protect air and water resources from contamination. At the local level, laws and ordinances are needed to control illegal dumping and littering as well as to define citizen responsibilities in household storage, payment of charges, separation of recyclable wastes, and other solid waste-related tasks. Requirements for siting sanitary landfills and other disposal facilities would fall under the jurisdiction of national as well as state and local authorities.

4.19 Enforcement will require special attention since it is always the weakest point in environmental control. Achieving effective enforcement activities will depend on many factors. Among the most important are: the capacity of the responsible local authority to monitor compliance and apply enforcement procedures; simplicity in administration or procedural ease in implementing a regulation; and broad public acceptance, achieved in large part by making information on regulations widely available. Furthermore, regulations should be few in number, transparent, unambiguous, easily understood, equitable

(following polluter pays principle), and considered to have significant positive physical and economic effects.

C. Institutional Arrangements

4.20 The institutional arrangements for service delivery is a critical consideration in designing MSWM components. In planning these arrangements, the size and nature of the cities must be considered. The following addresses institutional considerations in large and intermediate and small cities.

Large Cities

4.21 In large cities, the optimum scheme is to have all refuse management delegated to one agency within the local government hierarchy. The agency should be placed at a level that corresponds to the financial importance and operational difficulties of the service and have a top level administrator, mid-level technical staffing, and its own budget. The designation of such an agency, however, does not preclude some operational functions being delegated to other agencies of local jurisdictions or to the private sector. Nonetheless, one agency should be assigned the principal responsibility for strategic planning, coordinating MSWM operations, contracting services, and overseeing contract performance.

4.22 Collection services in large metropolitan areas (populations greater than 500,000) may continue to be provided by local jurisdictions since there are few economies of scale in collection operations that are labor intensive and require many discrete pieces of equipment. As time and distance for hauling increase, however, the establishment of an area-wide authority with specific responsibilities for transfer, transport, and disposal operations can provide an efficient solution for managing post-collection tasks, which do have significant economies of scale. Further, the siting of one or a few well-managed metropolitan or regional disposal facilities maximizes environmental protection.

4.23 If the public and private sectors will share MSWM responsibilities, there are many possible institutional arrangements. In West Africa, for example, there has been promising experience involving the leasing of government-owned vehicles to private firms who assume responsibility for collection operations and maintenance. Under other public-private sector arrangements in several Latin American cities, a public agency authorizes a contract or grants a franchise to a private firm which provides the service using its own assets. Alternatively, a licensed or unlicensed private firm can operate its own assets and charge service recipients directly. In some cases, the public agency may provide service in some areas of the city while private firms operate in other areas. Public and private sector MSWM roles also may be divided according to collection and disposal functions.[3/]

3/ For a fuller discussion of private solid waste service contractual arrangements, see "Non-Government Delivery of Urban Solid Waste Services," draft framework paper by Roland Schertenleib and Thelma Triche (INUWS, September 1989).

4.24 With regard to solid waste collection, the private sector has been shown to be substantially more efficient than the municipal collection service. Based on detailed nationwide studies carried out in the United States, Canada, Switzerland, and Japan, as well as regional studies undertaken in Connecticut, California, and the midwestern United States, contract collection is about 35 percent less costly than municipal collection for comparable services.[4/] Taking into account taxes paid by the private supplier, which support various local services, the true cost to the resident for contract service can be as much as 58 percent lower than that for the municipal service.[5/] Further, a study in 20 cities with similar urban conditions revealed that the cost of contract street sweeping, with the same frequency and quality of service in each city, was 43 percent less per curb mile than the cost of municipal sweeping.[6/]

4.25 Although there are limited available data on the performance of private sector solid waste services in developing countries, experience in Brazil and Turkey corroborates the findings in the industrialized countries. According to one study,[7/] for a comparable level of service, taxpayers in Rio de Janeiro, where a municipal enterprise provides solid waste services, pay at least twice the amount per metric ton of refuse collected as taxpayers in Sao Paulo, where private firms are contracted to perform solid waste services. The higher productivity and efficiency of the private sector in Sao Paulo can be attributed largely to the higher labor and vehicle use efficiency of the private firms. Contributing factors are the high cost of maintaining the ancient collection fleet in Rio de Janeiro and the difficulty in replacing vehicles due to a government policy restricting access to credit to parastatals for equipment renewal. The three firms that operate the street sweeping and refuse collection service in Sao Paulo report to the Regional Administrations (bodies that administer the city's districts), which are responsible for authorizing payments and monitoring contract performance in accordance with measurable variables. The city's waste management department is responsible for overseeing competitive bidding, hiring contractors, and supervising the private services. A key factor in the success of this arrangement is the ability of the waste management department to negociate contract conditions with private firms on the basis of its broad knowledge of unit costs and performance standards.

4.26 In Adana, Turkey, the municipality hires two private firms to collect 75 percent of the city's wastes. The municipality works in one part of the city while the private contractors operate in a different area. Despite the reported

---

4/ Emanuel S. Savas, Privatization. (Chatham, New Jersey: Chatham House Publishers, Inc., 1987), p. 124.

5/ Ibid., p. 125.

6/ Ibid., p. 131.

7/ Luiz Costa Leite, "Private and Public Services: Different Approaches to Solid Waste Management in Sao Paulo and Rio de Janeiro," unpublished INURD paper, May 1989.

constraints in the private service (i.e., weak interest and consequent lack of adequate competition in the tendering process), the private sector costs for cleansing services are almost three times lower than the costs of service provided by the municipality; productivity of labor in the private firms is up to four times higher than that of the municipal service. To motivate the private sector in Adana, one case study report[8/] highlights the need for clarification in the contracts regarding task descriptions and agreement on appropriate performance levels for meeting sanitation and efficiency requirements. To initiate privatization in general, contracts should be flexible and attractive enough to the private sector to encourage competitive bidding and thus reduce prices. Contracts also should be long enough to allow a contractor to depreciate equipment purchases for the contract's execution. Further research is required to determine the range of conditions under which private sector delivery of services is most feasible. Nonetheless, the objective always should be to avoid monopolistic conditions and create contestable markets.

Small and Intermediate Cities

4.27 For improving service delivery in small and intermediate cities, where there is no private provision of services and weak institutions, an appropriate authority at the national level (e.g., Ministry of Health, Environment, or Public Works) should be assigned responsibility for MSWM planning, developing standards, and providing technical and financial assistance to small and medium-sized municipalities. In some cases, financial intermediaries, such as municipal development banks, also can have an important role in supporting comprehensive MSWM activities in cities that have no other opportunities to obtain credit. The involvement of these national sectoral or financial institutions will promote nationwide coverage of MSWM services and maximum protection of the environment.

4.28 Whatever institutional scheme is adopted for large or small and intermediate cities, project designers should ensure that there is a clear organizational structure with defined responsibilities and staff, an established means for continuous communication and coordination among all solid waste-related agencies, and the ability to secure the necessary resources (budget and qualified staff) to sustain operations and maintenance. The institutional structure also must incorporate an ongoing planning function as well as effective budgeting, cost accounting, and management information systems that include monitoring of collection performance. Lastly, if the implementation of a MSWM component requires institutional changes to effectively execute an improved refuse management system, project designers should insist that these changes occur before any equipment is purchased.

8/ A. Durak and K. Sorgun, "Solid Waste Collection: The Case of Adana," in Management Options for Urban Services: Report on a Seminar held at Cesme, Turkey on November 11-20, 1985, Washington, D.C.: The World Bank, 1986.

D. Financing, Pricing, and Cost Recovery

4.29 As mentioned earlier, MSWM is a costly service that requires specialized equipment and facilities and usually accounts for between 20 and 50 percent of municipal operating budgets. In planning MSWM components, more attention should be directed to the problem of financing capital investment costs (i.e., facilities, equipment, land) and recurring costs (i.e., operations and maintenance, debt service) of solid waste collection and disposal. The following sections discuss arrangements for financing these expenditures as well as pricing and cost recovery implications.

Financing

4.30 In determining appropriate financial mechanisms, project designers should take into account that MSWM activities are recurring cost-intensive. The solid waste service involves large numbers of municipal workers as well as substantial operations and maintenance costs. Moreover, the recurring costs of this service encompass large expenditures for replacing specialized collection equipment every seven to eight years. Thus, the municipal solid waste service needs access to funds on a regular basis to finance operations and maintenance as well as the replacement of essential equipment. In addition to this funding, however, the service also requires financing for the initial capital investments in resource recovery plants, land for transfer and disposal facilites, and a fleet of new collection vehicles.

4.31 To finance the recurring costs of solid waste management, the solid waste service generally obtains funds from the municipality's current revenues, which include local taxes and intergovernmental transfers, and in some situations, user charges. In many developing countries, however, there is limited scope for collecting user charges for MSWM (see section on pricing and cost recovery). Thus, most recurring costs will need to be financed through local taxes and transfers.

4.32 To finance the capital investment costs of MSWM, municipal governments have three principal options: making arrangements with existing financial intermediaries (e.g., municipal development banks) that can extend loans to municipalities for this purpose; establishing a special loan or grant program through the central government budget system; and establishing sinking funds to finance the planned replacement of collection vehicles. In addition, grants or loans from bilateral agencies may be available to finance the purchase of collection vehicles. Based on prior experience in many developing countries, however, there are risks associated with this latter type of assistance. Where there is bilateral support, municipalities often encounter problems with inappropriate imported equipment requiring high maintenance costs. Financing from municipal revenues is rarely an option since this source is already overburdened by the large recurrent costs of MSWM and other urban services.

4.33 In determining the most effective arrangements for financing improved solid waste services, from storage and collection through disposal, project designers or their consultants should analyze the local municipal finance system,

the system of lending for municipal capital investment, and local demand for solid waste services. Where there is limited potential for increasing revenues through user charges and inadequate local revenues to cover the costs of improved MSWM services, most MSWM components will need to be attached to urban management projects that focus on improving local revenue generation, cost accounting, and municipal budgetary planning and control. To successfully estimate and recover the costs of MSWM through local revenues, as well as user charges, these urban management projects should direct special attention to improving the recording of all MSWM costs (i.e., equipment, operations, maintenance, depreciation, and debt service) in the responsible institutions. Moreover, the financial arrangements for MSWM components should provide for continuous funding specifically for solid waste services.

Pricing and Cost Recovery

4.34 In determining how to recover costs for MSWM, project designers must take into account that the solid waste service is a private good as well as a public good. Solid waste collection is a private and public good because it serves the interests of individual householders or enterprises and has positive impacts on public health and the local environment. Thus, in determining cost recovery arrangements for solid waste collection, project designers should plan to recover some portion of the costs from the beneficiaries of the private benefits; the public benefits of solid waste collection can be paid for by the municipality. By contrast, the provision of solid waste transfer and disposal is largely a public good because the principal benefits of these services (i.e., impacts on environmental quality and public health) are external. Thus, in principle, the costs for providing this service should be paid for on a collective basis.

4.35 In determining the most appropriate scheme for recovering the costs of municipal solid waste services, there are two basic financial instruments: (i) general municipal revenues, which include local taxes and intergovernmental transfers, and (ii) user charges, which include benefit taxes (mandatory solid waste charges) and voluntary fees (tariffs) billed directly to the properties receiving the service, added to other urban service billings, or added as a surcharge on property, business, or other local taxes. To recover the costs of MSWM, more than one of these instruments usually will be needed. The selection of each instrument should be based largely on a consideration of the type of service provided - collection or transfer and disposal.

4.36 Solid Waste Collection. To recover the costs of solid waste collection operations, the most commonly used instruments are local taxes, user charges, or some combination of local taxes and user charges. The type and level of user charges to be applied will depend on the beneficiary. For example, industrial and commercial enterprises generally view solid waste collection as a private good and have much variation in the level of service required; thus, they can be charged variable tariffs to cover the full cost of providing the desired level of service. The charge for this service can be based on: actual or estimated quantity and type of waste collected, frequency of collection, kind of business, and/or area of buildings or property.

4.37 In residential areas, municipalities should attempt to recover all or a portion of their solid waste costs through mandatory user charges or benefit taxes. In establishing an equitable basis for setting charges, the municipality has two general options. One alternative is to charge a mandatory fixed user charge based on one or more measures of service level, i.e., number of waste containers, frequency of collection, distance from containers to collection vehicles, and type and quantity of waste. This scheme would be applied to homogeneous neighborhoods; higher income neighborhoods would be charged a fixed fee for a higher service level than lower income neighborhoods, which would receive a lower level of service for a lower price. In low-income areas, the municipality should provide a basic level of service that is adapted to local needs and traditions and allows for some degree of payment, either in cash or in kind. The remainder of the costs for collection in these areas can be subsidized by local revenues. In some cases, user charges from commercial and industrial enterprises that pay for high quality individualized service can be set high enough to allow a municipality to extend service to low-income areas.

4.38 Where neighborhoods are not homogeneous, users can be charged variable fees based on one or more measures of household income (e.g., number of rooms, floor space of buildings, and property values). In establishing the rate structure based on income, however, project designers will need to consider the reliability, availability, and accessibility of property data. Where there are inadequate data, as is the case in most developing countries, the charge for solid waste collection should be based largely on service level.

4.39 As an alternative to charging benefit taxes to recover solid waste collection costs, municipalities or private solid waste services can collect residential user charges only from those willing to pay. Where there is a perceived need to have garbage removed and a consequent fine if the refuse remains on or near the property, residents can be expected to pay for the collection service or haul their wastes to designated transfer/disposal sites. The generation of significant revenues from these beneficiaries, however, will be largely dependent on the system's capacity to provide a high level of service and to enforce anti-dumping regulations. In some cases, it may be possible to collect user charges only from those willing to pay for high quality individualized service; the costs of providing a basic level of service in other areas could be financed by local revenues. Where there is an inelastic demand for solid waste services, user charges for high quality services can be set high enough to subsidize collection services in other parts of the city. Although the collection of voluntary user charges has proven effective in many cities in the United States, there is limited experience in developing countries. A few examples in Guatamala and Mexico shows that there is a problem of illegal dumping by those who choose not to pay or cart their wastes to municipal disposal sites.

4.40 Although project designers should attempt to recover the recurring costs of solid waste collection to the maximum extent possible, there will be situations where the application of user charges will not be feasible. In these situations, municipalities will need to continue to pay for solid waste collection entirely out of local taxes. Normally, the cost will be recovered through the property tax.

4.41 The mode of billing for solid waste collection services (i.e., separate charge, addition to other urban service bills, or surcharge on local taxes) will have an effect on the cost of collection as well as the ease of enforcement. For example, a separate charge billed directly to the consumer is the most expensive approach. The administrative cost of billing and collecting charges will increase significantly the overall cost of MSWM. In the United States, for example, this increase has been estimated to be as high as 10 to 15 percent of the cost of refuse collection.[9/] Moreover, separate user charges are the most difficult to collect. In the absence of a legal basis for imposing fines or other penalties for non-payment, or if the enforcement of these penalties is deficient, some service recipients will have no incentive to pay. In most cases, the municipality will continue to collect refuse from non-paying beneficiaries to prevent unsanitary neighborhood conditions.

4.42 The more effective approach to billing for solid waste services is attaching solid waste fees to existing water, electricity, or other urban service bills. This system is less costly to administer (generally, three to five percent of collection costs based on experience in the United States),[10/] and easier to enforce. If the solid waste charges are not paid, the water or electricity service can be withheld. The effectiveness of this approach, however, will depend on the cooperation of the corresponding service agency as well as the coverage and collection performance of the billing system. In some situations, a private collection agent can be contracted to perform joint billing operations for several municipal services.

4.43 Incorporating solid waste charges into the property tax or other local tax bill, either as a separate line item or combined within the entire property tax bill, is the least expensive mode of billing for solid waste collection. Since the tax will be collected whether or not it finances solid waste services, there is no additional cost for collecting the solid waste charge. Tax collection performance, however, will depend on the coverage and effectiveness of the local tax system.

4.44 Solid Waste Transfer and Disposal. Since solid waste transfer and disposal impart only public benefits, the recurring costs of these operations should be recovered largely through local taxes and intergovernmental transfers. If solid waste collection is privately financed or executed by an entity other than the one carrying out transfer and disposal operations, however, the costs for transfer and disposal may be recovered through tipping fees, a direct charge for recovering the costs of operating a transfer or disposal facility.

4.45 Tipping fees are based on volume, weight, and sometimes type of waste; they can be used most successfully where there is a shortage of landfill sites, public and government concern for protecting the environment, and

---

9/ E.S. Savas, Daniel Baumol and William A. Wells, "Financing Solid Waste Collection," in The Organization and Efficiency of Solid Waste Collection, E.S. Savas (Lexington: Lexington Books, 1977), p.87.

10/ Ibid.

effective enforcement of anti-dumping regulations. Nonetheless, in most developing countries, where these conditions do not exist, the charging of separate disposal fees may encourage uncontrolled dumping. Where there is broad-based local public concern for environmental protection, however, all or a portion of the costs for safe disposal facilities could be financed through the user fees normally charged for collection services.

4.46 Based on the review of World Bank lending for MSWM, there is little experience in charging fees for disposal. Moreover, most residents and local governments are concerned only about having their wastes removed and assign low priority to how the wastes are disposed of. Thus, a substantial portion of costs for transfer and environmentally safe disposal may need to be recovered through special intergovernmental transfers. In planning the financial arrangements for regional disposal facilities, project designers should make a realistic assessment of how much the participating municipalities can and will share in the costs of safe disposal and then estimate transfer needs. The use of these transfers in financing regional disposal facilities may be justified on the basis of meeting national environmental objectives.

E. Land Acquisition

4.47 The availability and accessibility of environmentally acceptable sites for transfer stations, landfills, recycling facilities, and other solid waste-related facilities is another aspect of MSWM that requires priority attention. To improve the implementation of MSWM components, project designers should ensure that there are appropriate sites for the planned facilities and that these sites will be available for the timely execution of the solid waste management improvements. (For information on selecting suitable sites for landfills, see "Landfilling Wastes: A Technical Memorandum for the Disposal of Waste," Department of the Environment Waste Management Paper no. 26.) Accordingly, project designers should insist on making land acquisition a condition of loan effectiveness. To meet this requirement, the process of selecting and acquiring sites could take place as part of an earlier project in the same country, financed by project preparation funds.

F. Phasing of MSWM Improvements

4.48 Future Bank investments in MSWM should be phased so as to reflect the objectives and constraints of each project city or larger planning area. Unless there is an existing solid waste plan, however, the first phase of Bank involvement will consist of financing for the preparation of the strategic solid waste plan and execution of key institutional improvements. If there are critical collection equipment shortages in a city, the first phase also may include financing for a limited number of replacement vehicles, including spare parts. The second stage of investment would occur after the solid waste plan is formally adopted and important institutional adjustments are accomplished. At this time, the Bank could finance foreign equipment and construction of maintenance shops, transfer stations, and non-polluting disposal facilities to expand citywide solid waste services. Other program elements may include pilot projects, public educational activities, and further institutional strengthening. Subsequent phases of World Bank investment could finance solid waste services

in other jurisdictions; finance construction of strategic facilities; or support the implementation of new solid waste programs.

G. Research Needs

4.49 Several areas for research on MSWM can be identified based on the above analysis and discussion. In order of priority, the following items summarize the recommended topics for investigation:

(a) Relative Magnitude of Damages and Benefits Versus Cost of Providing Service. If improvements are to be achieved in MSWM, particularly in providing safer disposal, it is essential that the environmental and public health benefits be better quantified. Although it may not be possible to obtain sufficient information for detailed cost-benefit evaluations, a broader understanding of the relative magnitude of the costs and benefits of upgraded services would permit a better approximation of the economic rate of return of MSWM projects. It also would facilitate the ranking of solid waste projects in comparison to that of other investments in urban services.

(b) Pricing Strategies for Improved Cost Recovery. As discussed in the section on pricing and cost recovery, the objective in setting prices for solid waste services should be to recover as much of the cost of providing the service as possible given local demand characteristics. To better evaluate pricing strategies, research should focus on discriminatory pricing approaches (e.g., charges based on quantity and type of wastes collected for commercial or industrial consumers; charges based on the quality of services provided in upper-income neighborhoods); separable demand approaches (e.g., charge for collection services where there is relatively inelastic demand, use local taxes or intergovernmental transfers to pay for disposal); and intra-urban cross-subsidies (e.g., charge commercial and upper income residential customers sufficiently for high quality services so that minimum acceptable collection services can be extended to low-income peri-urban areas).

(c) Private Sector Delivery of Solid Waste Services. Given the poor track record of public solid waste services, there is a need to look to the private sector to achieve efficiency gains. Since an examination of Bank experience to date revealed few concrete examples, further investigation of private solid waste service arrangements in developing countries should be carried out to develop guidelines for determining how, where, and under what circumstances the role of the private sector in this sub-sector can be expanded.

(d) APEX Institutions for MSWM. Institutional strengthening is a prerequisite to improved solid waste service delivery. Even if the private sector assumes a larger role, there still will be a need for a metropolitan area-wide institution to conduct comprehensive planning and to contract and oversee services. At the country level, a national solid waste authority may be needed to plan, develop standards, and provide technical and financial assistance to municipalities. To determine the effectiveness of different approaches in centralizing normative, planning, and technical assistance responsibilities while decentralizing investment decisions and operations, an evaluation of the various approaches (e.g., national solid waste authority, municipal development banks) supported by Bank projects should be performed.

(e) Strategic Planning Approaches. A strategic MSWM plan should be a prerequisite to all significant investments in solid waste management. To improve the planning of solid waste services and related management activities in large as well as small and intermediate cities, research is needed on the framework and methodologies for developing strategic MSWM plans (as described in paragraph 4.04). The use of interactive microcomputer models to assist in the planning process also should be investigated.

The INU research plan currently includes studies on health impacts of inadequate waste disposal, private sector service delivery, and strategic planning.

ANNEX I

ADDITIONAL TABLES

TABLE 1.1

LENDING FOR SOLID WASTES COMPARED TO URBAN AND TOTAL LENDING, FY74-88

URBAN SUBSECTORS	FISCAL YEAR															TOTALS
	FY74	FY75	FY76	FY77	FY78	FY79	FY80	FY81	FY82	FY83	FY84	FY85	FY86	FY87	FY88	
Urban Development (million US$)	113	93	80	158	369	310	349	501	375	554	500	385	1,118	1,469	1,716	8,088
Water Supply & Sewerage (million US$)	174	145	335	301	375	1,019	631	535	441	811	641	781	605	969	535	8,297
Urban Subtotal (million US$)	287	238	414	459	744	1,328	980	1,036	816	1,365	1,141	1,165	1,722	2,439	2,252	16,385
MSWM Subcomponents (million US$)	2	48	0	0	19	55	12	13	51	39	29	10	177	21	55	532
MSWM as Percent of Urban (%)	0.8	20.3	0.0	0.0	2.6	4.2	1.3	1.3	6.3	2.8	2.5	0.8	10.2	0.9	2.5	3.2
Total Bank Lending (billion US$)	4.3	5.9	6.6	7.1	8.4	10.0	11.5	12.3	13.0	14.5	15.5	14.4	16.3	17.7	19.2	176.7
Urban as Percent of Total (%)	6.6	4.0	6.2	6.5	8.8	13.3	8.5	8.4	6.3	9.4	7.3	8.1	10.6	13.8	11.7	9.3
MSWM as Percent of Total (%)	0.06	0.82	0.00	0.00	0.23	0.55	0.11	0.11	0.39	0.27	0.16	0.07	1.08	0.12	0.29	0.30

TABLE 1.2

SOLID WASTE MANAGEMENT SUBCOMPONENTS FOR PROJECTS IN AFRICA

COUNTRY	PROJECT TITLE	TECH ASST	INST STRN	SYST /OPS IMPV	STOR CLCT	TSPT TRSF	LAND FILL	PRCS RSRC RCVY	LOW-INCM FCUS	No. OF SUBCOM-PONENTS	COMPONENT DESCRIPTION
Benin	Cotonou Water/Sanitary Eng Project	(X)			X	X				3	SOLID AND SLUDGE TRUCKS, STUDIES
Burk.Faso	Urban Development Project		X		X					2	TRUCKS, TRAINING, AND OPERATIONS START-UP
Burundi	Urban Development Project	(X)			X	X	X		X	5	TRUCKS/EQUIPMENT/DISCHARGE PNT IMPROVEMENT
Djibouti	Urban Development Project	X		X	X					3	TRUCKS/EQUIPMENT AND TRAINING
Gambia	Urban Management/Development Project				X					1	COLLECTION POINTS
Guinea	Conakry Urban Development Project	X	X	X	X					4	TRUCKS/EQUIPMENT, MAINT, TECH ASST, TRAINING
Ivory Coast	Second Urban Project				X					1	TRUCKS
Kenya	Site and Service Project				X					1	HARDSTANDINGS PROVIDED
Lesotho	Urban Development Project				X				X	2	COLLECTION EQUIPMENT
Liberia	Monrovia Urban Development Project	(X)	X		X					3	COLLECTION POINTS, VEHICLES, EQMNT, STUDY
Madagascar	Antananarivo Water and San Project				X		X	X	X	4	COLLECTION BINS, EQUIPMENT AND COMPOSTING
Mali	Mali Urban Development Project	X	X		X		X			4	TRUCKS AND ASSISTANCE
Mauritius	Urban Rehab & Stormdrainage Project	X		X	X				X	4	EQUIPMENT AND TRAINING
Nigeria	Urban Development Project	X			X					2	TRUCKS AND BINS
Nigeria	Anambra Water/Sanitation Report	X	X	X	X		X			5	TRUCKS, COLLECTION, CIVILS, TECH ASSISTANCE
Nigeria	Lagos SWM and Stormdrainage Project	X	X	X	X	X	X		X	7	EQMNT, TRANSFERS, BINS, DEMO, TECH ASSISTANCE
Nigeria	Infrastructure Development Fund	X	X	X	X		X			5	MSWM IMPROVEMENTS AND EQUIPMENT FOR 3 STATES
Uganda	Water Supply & Sanitation Rehab	(X)			X				X	3	EQUIPMENT ,TECHNICAL ASSISTANCE
Zambia	Lusaka Squatter Upgrade/Site Service				X				X	2	TRUCKS AND EQUIPMENT
	TOTAL FOR AFRICA REGION:	12	7	6	19	3	6	1	7	61	
	SUBCOMPONENT INCLUSION (%):	63	37	32	100	19	38	6	44		

KEY:
- TECH ASST = Technical Assistance
- INST STRN = Institutional Strengthening
- SYST/OPS IMPV = Systems/Operations Improvement
- STOR CLCT = Storage/Collection
- TSPT TRSF = Transport/Transfer
- LAND FILL = Land Fill Operations
- PRCS RESC RCVY = Processing/Resource Recovery
- LOW-INCM FCUS = Low-Income Focus
- X = Significant Component
- (X) = Minor Component (eg. Study Only)

TABLE 1.3

SOLID WASTE MANAGEMENT SUBCOMPONENTS FOR PROJECTS IN ASIA

COUNTRY	PROJECT TITLE	TECH ASST	INST STRN	SYST /OPS IMPV	STOR CLCT	TSPT TRSF	LAND FILL	PRCS RSRC RCVY	LOW-INCM FCUS	No. OF SUBCOM-PONENTS	COMPONENT DESCRIPTION
Bangladesh	Urban Development Project		X	X	X		X	X		5	COLLECTION, LANDFILLING, PILOT LAND RECLAMATION
India	Calcutta Urban Development Project				X	X				2	SUPPORT OPERATIONS
India	Second Calcutta Urban Dev Project	X	X	X	X	X	X	X	X	8	COMPREHENSIVE IMPROVEMENT SCHEMES AND PILOT
India	Second Madras Urban Dev Project				(X)	(X)				2	COLLECTION AND TRANSPORT PLANNING
India	Kanpur Urban Development Project	X	X	X	X			X		5	EQUIPMENT, WORKSHOP AND DEPOT
India	Third Calcutta Urban Dev Project	X			X	X	X	X	X	6	COLLECTION, TRANSFER, DISPOSAL, PROCESSING
India	Madhya Pradesh Urban Dev Project	X			X					2	TECHNICAL SUPPORT
India	Bombay Urban Development Project				X				X	2	COLLECTION EQUIPMENT, BINS, WORKSHOPS
India	Uttar Pradesh Urban Dev Project				X		X	X		3	GENERAL IMPROVEMENTS ON EXISTING COMPOST
Indonesia	Jakarta & Urban Development Project				X				X	2	IMPROVEMENT OF SWM IN LOW INCOME AREAS
Indonesia	Third Urban Development Project	X	X	X	X	X	X		X	7	HANDCARTS, EQUIPMENT, TRANSFER STN, PILOT
Indonesia	Fourth Urban Development Project	X			X				X	3	TECHNICAL SUPPORT
Indonesia	Fifth Urban Development Project	X	X	X	X	X	X			6	COMPREHENSIVE EXPANSION
Philippines	Third Urban Development Project	X	X	X	X	X		X	X	7	TRUCKS, CARTS, TRANSFERS AND SORTING YARDS
Philippines	Regional Cities Development Project	X			X		X		X	4	EQUIPMENT AND TECHNICAL ASSISTANCE
Philippines	Municipal Development Project				X		X		X	3	DUMP SITES AND EQUIPMENT
Singapore	Environmental Control Project			X	X			X		3	INCINERATOR AND VEHICLES
Sri Lanka	Second Water Sply & Sew Project	(X)								1	SOLID WASTE MANAGEMENT STUDY FOR COLOMBO
Sri Lanka	Municipal Management Project				(X)					1	INITIAL SOLID WASTE MANAGEMENT IMPROVEMENTS
Sri Lanka	Emergency Recons. & Rehab. Project				X				X	2	VEHICLES FOR 7 TOWNS (56 TRUCKS, 400 HANDCARTS)
Thailand	Regional Cities Development Project	X			X		X		X	4	EQUIPMENT AND TECHNICAL ASSISTANCE
	TOTALS FOR ASIA REGION:	11	6	7	20	7	9	7	11	78	
	SUBCOMPONENT INCLUSION (%):	53	29	33	95	33	43	33	53		

KEY:
- TECH ASST = Technical Assistance
- INST STRN = Institutional Strengthening
- SYST/OPS IMPV = Systems/Operations Improvement
- STOR CLCT = Storage/Collection
- TSPT TRSF = Transport/Transfer
- LAND FILL = Land Fill Operations
- PRCS RESC RCVY = Processing/Resource Recovery
- LOW-INCM FCUS = Low-Income Focus
- X = Significant Component
- (X) = Minor Component (eg. Study Only)

TABLE 1.4

SOLID WASTE MANAGEMENT SUBCOMPONENTS FOR PROJECTS IN EMENA

COUNTRY	PROJECT TITLE	TECH ASST	INST STRN	SYST /OPS IMPV	STOR CLCT	TSPT TRSF	LAND FILL	PRCS RSRC RCVY	LOW-INCM FCUS	No. OF SUBCOM-PONENTS	COMPONENT DESCRIPTION
Afghanistan	Kabul Water/Sanitation Project				X			(X)		2	LATRINES AND NIGHT SOIL COLLECTION
Egypt	Urban Development Project	X	X	X	X	X		X	X	7	COMPOST, WORKSHOPS, DEPOTS, VEHICLES, TECH ASST
Egypt	Greater Cairo Urban Dev Project	X							X	2	CONSULTANT SERVICES AND PILOT PROJECT
Jordan	Tourism Project				X		X			2	EQUIPMENT FOR SANITARY LANDFILL, VEHICLES
Jordan	Amman Transp & Municipal Dev Project	X	X	X	X		X			5	VEHICLES, EQUIPMENT FOR 4 LANDFILLS, STUDY
Lebanon	Reconstruction Project							X		1	REHAB OF SOLID WASTE TREATMENT PLANT (BILAT)
Morocco	Rabat Urban Development Project	X			X				X	3	LOW INCOME INFRASTRUCTURE
Morocco	Second Urban Development Project	X			X					2	COLLECTION EQUIPMENT AND VEHICLE DEPOT
Pakistan	Lahore Urban Development Project	(X)	X	X	X	X	X		X	7	BINS, EQPMNT, WORKSHOPS, TRANSFERS, TECH ASST
Pakistan	Karachi Special Development Project		X	X	X		X			4	VEHICLES, EQUIPMENT, WORKSHOPS, LANDFILL SITES
Tunisia	Second Urban Development Project	X	X	X	X	X	X	(X)	X	8	LOW COST SWM, TRANSFER STNS, PILOT COMPOST
Turkey	Cukurova Region Urban Eng Project	(X)								1	STUDIES
Turkey	Cukurova Urban Development Project	X			X	X	X	X	X	6	COLLECTION, DISPOSAL WITH COMPOSTING PLANT
	TOTALS FOR EMENA REGION:	9	5	5	10	4	6	5	6	50	
	SUBCOMPONENT INCLUSION (%):	69	38	38	77	31	46	38	46		

KEY:
- TECH ASST = Technical Assistance
- INST STRN = Institutional Strengthening
- SYST/OPS IMPV = Systems/Operations Improvement
- STOR CLCT = Storage/Collection
- TSPT TRSF = Transport/Transfer
- LAND FILL = Land Fill Operations
- PRCS RESC RCVY = Processing/Resource Recovery
- LOW-INCM FCUS = Low-Income Focus
- X = Significant Component
- (X) = Minor Component (eg. Study Only)

TABLE 1.5

SOLID WASTE MANAGEMENT SUBCOMPONENTS FOR PROJECTS IN LAC

COUNTRY	PROJECT TITLE	TECH ASST	INST STRN	SYST /OPS IMPV	STOR CLCT	TSPT TRSF	LAND FILL	PRCS RSRC RCVY	LOW-INCM FCUS	No. OF SUBCOM-PONENTS	COMPONENT DESCRIPTION
Argentina	Municipal Development Project				X		X			2	EQUIPMENT
Bahamas	Urban Development Project				X		X	X		3	EQUIPMENT, SHREDDERS, DISPOSAL SITES
Bolivia	Urban Development Project			X	X				X	3	FLEET MANAGEMENT, NON-CONVENTIONAL COLLECTION
Brazil	La Paz Municipal Development Project	X	X		X			X	X	5	COMPREHENSIVE COMPONENT, PRIVATIZATION
Brazil	Medium-Sized Cities Project	X	X		X		X		X	5	COMPREHENSIVE SWM UPGRADING FOR 3 CITIES
Brazil	Recife Metropolitan Dev. Project	X	X	X	X	X	X	X	X	8	ESTABLISHMENT OF COMPREHENSIVE SWM AGENCY
Brazil	Metropolitan Development Program			X	X		X		X	4	PILOT STUDY
Brazil	Rio Flood Reconstruction Project				X			X	X	3	TRUCKS, COMPOST PLANTS
Brazil	Water for Mun. & Low-income Areas				X				X	2	UPGRADING COLLECTION IN LOW-INCOME AREAS
Colombia	Barrangquilla Water Supply Project	X	X	X	X				X	5	UPGRADING COLLECTION SERVICE
Colombia	Water & Sewerage Sector Project	X	X							2	STUDIES, LINE OF CREDIT
Dom. Repub.	Sites and Services Project				X					1	TRASH COLLECTION ASSISTANCE
Dom. Repub.	Santo Domingo Tech Assce Project	X	X	X	X	X	X		X	7	COMPREHENSIVE ASSISTANCE PACKAGE AND PILOT
Mexico	Baja California Tourism Project				X		X		X	3	TRUCKS AND LANDFILL EQUIPMENT
Mexico	Second Urban & Regional Dev Project	X			X		X			3	LANDFILL SITES, EQUIPMENT, TECH ASSISTANCE
Mexico	Pollution Control Project	X					X			2	LANDFILL FOR INDUSTRIAL SWM, STUDIES
Mexico	Solid Waste Management Pilot Project	X	X	X	X	X	X	X	X	8	STUDIES, LINE OF CREDIT, PILOT PROJECTS
Peru	Lima Metropolitan Dev. Project	X	X	X	X	X	X		X	7	COMPREHENSIVE SWM COMPONENT AND PILOT
	TOTALS FOR LAC REGION :	10	8	7	16	4	11	5	12	73	
	SUBCOMPONENT INCLUSION (%) :	56	44	39	89	22	61	28	67		

KEY:
- TECH ASST = Technical Assistance
- INST STRN = Institutional Strengthening
- SYST/OPS IMPV = Systems/Operations Improvement
- STOR CLCT = Storage/Collection
- TSPT TRSF = Transport/Transfer
- LAND FILL = Land Fill Operations
- PRCS RESC RCVY = Processing/Resource Recovery
- LOW-INCM FCUS = Low-Income Focus
- X = Significant Component
- (X) = Minor Component (eg. Study Only)

TABLE 1.6

DOCUMENTATION FOR SOLID WASTE MANAGEMENT PROJECTS IN AFRICA

PROJECT INFORMATION:		FINANCE INFORMATION:			SOURCE DOCUMENTS:				
COUNTRY	PROJECT TITLE	CREDIT/LOAN NUMBER	APPROVAL DATE	CLOSING DATE	APPRAISAL REPORT NUMBER	APPRAISAL REPORT DATE	PROJECT COMPLETION REPORT NUMBER	PROJECT COMPLETION REPORT DATE	SWM WORKING PAPERS?
Benin	Cotonou Water/Sanitary Eng Project	CR 1171-BEN	JUN 25 81	JUN 30 87	3083-BEN	JUN 05 81			NO
Burkina Faso	Urban Development Project	CR 766-BUR	JAN 03 78	DEC 31 85	1660a-UV	JAN 03 78	7032	DEC 01 87	NO
Burundi	Urban Development Project	CR 1049-BU	JUN 24 80	DEC 31 87	2854-BU	JUN 02 80			NO
Djibouti	Urban Development Project	CR 1518-DJI	SEP 11 84	JUN 30 91	5005-DJI	AUG 20 84			YES
Gambia	Urban Management/Development Project	CR 1443-GM	MAR 06 84	DEC 03 91	4628-GM	FEB 07 84			NO
Guinea	Conakry Urban Development Project	CR 1466-GUI	MAY 01 84	DEC 31 90	4777-GUI	APR 12 84			YES
Ivory Coast	Second Urban Project	LN 2048-IVC	AUG 25 81	DEC 31 87	3236a-IVC	JUL 07 81			NO
Kenya	Site and Service Project	LN 1105-KE	APR 29 75	DEC 31 82	607A-KE	APR 14 75			NO
Lesotho	Urban Development Project	CR 1036-LSO	JUN 30 80	JUN 30 87	2640-LSO	APR 28 80			YES
Liberia	Monrovia Urban Development Project	CR 1223-LR	APR 01 82	JUN 30 87	3384-LBR	NOV 30 81			NO
Madagascar	Antananarivo Water and San Project	CR 1002-MAG	APR 01 80	JUN 30 86	2266A-MAG	JAN 25 80			YES
Mali	Mali Urban Development Project	CR 943-MLI	JUN 26 79	DEC 31 80	2444-MLI	MAY 29 79			YES
Mauritius	Urban Rehab & Stormdrainage Project	LN 1926-MAS	DEC 09 80	DEC 31 86	3100-MAS	NOV 10 80			YES
Nigeria	Urban Development Project	LN 1767-UNI	NOV 13 79	JUN 30 86	2412-UNI	SEP 10 79			NO
Nigeria	Anambra Water/Sanitation Report	LN 2036-UNI	JUL 07 81	SEP 30 88	3036-UNI	APR 28 81			YES
Nigeria	Lagos SWM and Stormdrainage Project	LN 2620-UNI	SEP 19 85	DEC 31 90	4452-UNI	AUG 26 85			YES
Nigeria	Infrastructure Development Fund	LN 2925-UNT	MAR 29 88	DEC 31 94	6391-UNI	NOV 20 87			NO
Uganda	Water Supply & Sanitation Rehab	CR 1510-UG	JUL 19 84	SEP 30 89	4968-UG	JUN 25 84			YES
Zambia	Lusaka Squatter Upgrade/Site Service	LN 1057-ZA	JUL 05 74	DEC 31 81	420a-ZA	JUN 24 74			YES

TABLE 1.7

DOCUMENTATION FOR SOLID WASTE MANAGEMENT PROJECTS IN ASIA

PROJECT INFORMATION:		FINANCE INFORMATION:			SOURCE DOCUMENTS:				
COUNTRY	PROJECT TITLE	CREDIT/LOAN NUMBER	APPROVAL DATE	CLOSING DATE	APPRAISAL REPORT NUMBER	APPRAISAL REPORT DATE	PROJECT COMPLETION REPORT NUMBER	PROJECT COMPLETION REPORT DATE	SWM WORKING PAPERS?
Bangladesh	Urban Development Project	CR 1930-BD	JUN 21 88	JUN 30 97	6287-BD	JUN 1 88			YES
India	Calcutta Urban Development Project	CR 427-IN	AUG 14 73	DEC 31 79	159a-IN	JUL 27 73	4023	JUN 30 82	YES
India	Second Calcutta Urban Dev Project	CR 756-IN	DEC 13 77	AUG 08 84	1662a-IN	SEP 23 77	6970	SEP 30 87	NO
India	Second Madras Urban Dev Project	CR 1082-IN	DEC 16 80	MAR 31 88	2893A-IN	NOV 26 80			NO
India	Kanpur Urban Development Project	CR 1185-IN	OCT 27 81	JUN 30 87	3504-IN	SEP 25 81			YES
India	Third Calcutta Urban Dev Project	CR 1369-IN	MAY 19 83	MAR 31 89	4310-IN	MAR 30 83			YES
India	Madhya Pradesh Urban Dev Project	LN 2329-IN	JUN 28 83	JUN 30 89	4359-IN	JUN 08 83			YES
India	Bombay Urban Development Project	CR 1544-IN	JAN 29 85	SEP 30 90	4794-IN	JAN 04 85			YES
India	Uttar Pradesh Urban Dev Project	LN 2797-IN	APR 21 87	MAR 03 96	6458-IN	APR 02 87			YES
Indonesia	Jakarta & Urban Development Project	LN 1040-IND	SEP 17 74	DEC 31 80	475a-IND	AUG 30 74	4620	JUN 30 83	NO
Indonesia	Third Urban Development Project	LN 1653-IND	JAN 16 79	DEC 31 86	2211a-IND	DEC 12 78			YES
Indonesia	Fourth Urban Development Project	LN 1972-IND	APR 21 81	SEP 30 87	3132a-IND	MAR 16 81			YES
Indonesia	Fifth Urban Development Project	LN 2408-IND	MAY 08 84	DEC 31 90	4887-IND	APR 12 84			YES
Philippines	Third Urban Development Project	LN 1821-PH	MAR 25 80	DEC 31 87	2703-PH	FEB 26 80			NO
Philippines	Regional Cities Development Project	LN 2257-PH	MAR 31 83	DEC 31 89	4094-PH	OCT 03 83			YES
Philippines	Municipal Development Project	LN 2435-PH	JUN 05 84	JUN 30 91	5027-PH	MAY 10 84			YES
Singapore	Environmental Control Project	LN 1137-SI	JUN 19 75	SEP 30 79	772-SI	MAY 29 75	3235	DEC 16 80	YES
Sri Lanka	Second Water Sply & Sewerage Project	CR 1041-CE	JUN 10 80	SEP 30 86	2904b-CE	MAY 15 80			YES
Sri Lanka	Municipal Management Project	CR 1697-CE	MAY 13 86	JUN 30 94	P-4224-CE	APR 24 86			YES
Sri Lanka	Emergency Reconst. & Rehab. Proj	CR 1883-CE	MAR 15 88	DEC 31 91	P-4705-CE	FEB 24 88			NO
Thailand	Regional Cities Development Project	LN 2520-TH	APR 23 85	MAR 31 91	4673-TH	MAR 08 85			YES

TABLE 1.8

DOCUMENTATION FOR SOLID WASTE MANAGEMENT PROJECTS IN EMENA

PROJECT INFORMATION:		FINANCE INFORMATION:			SOURCE DOCUMENTS:				
COUNTRY	PROJECT TITLE	CREDIT/LOAN NUMBER	APPROVAL DATE	CLOSING DATE	APPRAISAL REPORT NUMBER	APPRAISAL REPORT DATE	PROJECT COMPLETION REPORT NUMBER	PROJECT COMPLETION REPORT DATE	SWM WORKING PAPERS?
Afghanistan	Kabul Water/Sanitation Project	CR 563-AF	JUN 05 75	DEC 31 82	746-AF	MAY 22 75			YES
Egypt	Urban Development Project	CR 831-EGT	JUN 23 78	DEC 31 84	1976-EGT	JUN 06 78	6561	DEC 19 86	YES
Egypt	Greater Cairo Urban Dev Project	LN 2176-EGT	JUN 10 82	DEC 31 89	3327-EGT	MAY 14 82			YES
Jordan	Tourism Project	CR 639-JO	JUN 08 76	MAR 31 83	1069A-JO	MAY 10 76	5729	JUN 21 85	NO
Jordan	Amman Transp & Municipal Dev Project	LN 2334-JO	JUL 07 83	JUN 30 89	4413-JO	MAY 17 83			YES
Lebanon	Reconstruction Project	LN 1476-LE	JUL 05 77	JUN 30 85	2113-LE	JUN 15 77			NO
Morocco	Rabat Urban Development Project	LN 1528-MOR	FEB 28 78	MAR 31 84	1800-MOR	FEB 03 78	6184	MAY 12 86	YES
Morocco	Second Urban Development Project	LN 1944-MOR	JAN 22 81	JUL 31 88	3118-MOR	DEC 15 80			YES
Pakistan	Lahore Urban Development Project	CR 1348-PAK	APR 19 83	JUN 30 88	3584-PAK	MAR 25 83			YES
Pakistan	Karachi Special Development Project	CR 1652-PAK	JAN 14 86	SEP 30 92	5772-PAK	NOV 27 85			YES
Tunisia	Second Urban Development Project	LN 1705-TUN	MAY 22 79	DEC 31 85	2372a-TUN	MAY 08 79	6750	APR 22 87	YES
Turkey	Cukurova Region Urban Eng Project	LN 2537-TU	MAY 09 85	JUN 30 89	P-3935	APR 18 85			NO
Turkey	Cukurova Urban Development Project	LN 2819-TU	MAY 21 87	JUN 30 85	6657-TU	APR 17 87			YES

Table 1.9

DOCUMENTATION FOR SOLID WASTE MANAGEMENT PROJECTS IN LAC

PROJECT INFORMATION:		FINANCE INFORMATION:			SOURCE DOCUMENTS:				
COUNTRY	PROJECT TITLE	CREDIT/LOAN NUMBER	APPROVAL DATE	CLOSING DATE	APPRAISAL NUMBER	REPORT DATE	PROJECT COMPLETION NUMBER	REPORT DATE	SWM WORKING PAPERS?
Argentina	Municipal Development Project	LN 2920-AR	MAR 22 88	JUN 30 95	7093-AR	FEB 26 88			NO
Bahamas	Urban Development Project	LN 2089-BM	FEB 16 82	DEC 31 87	3498b-BM	DEC 20 81			YES
Bolivia	Urban Development Project	LN 1489-BO	OCT 04 77	JUN 30 86	1625a-BO	SEP 09 77			NO
Bolivia	La Paz Municipal Development Project	CR 1842-BO	AUG 04 87	JUN 30 95	6769-BO	JUL 08 87			NO
Brazil	Medium-Sized Cities Project	LN 1720-BR	JUN 07 79	DEC 31 86	2361-BR	MAY 21 79			YES
Brazil	Recife Metropolitan Dev Project	LN 2170-BR	JUN 03 82	DEC 31 88	3863b-BR	MAY 12 82			YES
Brazil	Metropolitan Development Program	LN 2196-BR	AUG 03 82	JUN 30 85	3291-BR	JUL 22 82			NO
Brazil	Rio Flood Reconstruction Project	LN 2975-BR	JUN 24 88	MAR 31 91	P-4833-BR	JUN 10 88			NO
Brazil	Water for Munic. & Low-income Areas	LN 2983-BR	JUN 29 88	JUN 30 94	7083-BR	JUN 10 88			NO
Colombia	Barranquilla Water Supply Project	LN 2637-CO	NOV 26 85	DEC 31 81	5613-CO	NOV 8 85			NO
Colombia	Water and Sewerage Sector Project	LN 2961-CO	JUN 16 88	DEC 31 94	7120-CO	MAY 26 88			NO
Dom. Repub.	Sites and Services Project	LN 2104-DO	MAR 23 82	JUN 30 87	3639c-DO	MAR 01 82			NO
Dom. Repub.	Santo Domingo Tech Assistnce Project	LN 2292-DO	MAY 26 83	JAN 01 86	P-3496	MAY 09 83			NO
Mexico	Baja California Tourism Project	LN 1420-ME	MAY 10 77	JUN 30 81	1483-ME	APR 18 77	5848	SEP 12 85	NO
Mexico	Second Urban & Regional Dev Project	LN 1990-ME	MAY 12 81	DEC 31 88	2937-ME	APR 04 81			YES
Mexico	Pollution Control Project	LN 2154-ME	MAY 25 82	DEC 31 88	3186b-ME	APR 28 82			YES
Mexico	Solid Waste Management Pilot Project	LN 2669-ME	MAR 25 86	JUN 30 94	5952-ME	MAR 05 86			YES
Peru	Lima Metropolitan Development Project	LN 2451-PE	JUN 21 84	DEC 31 91	4781b-PE	MAY 29 84			YES

ANNEX 2

ANTANANARIVO WATER AND SANITATION PROJECT, MADAGASCAR
(CR 1002-MAG)

2.1 Project Background/Objectives

During the years 1971 to 1975, UNDP (with WHO as executing agency) financed a master plan and feasibility studies for the water supply and sewerage sector in Antananarivo, Madagascar. In 1971, the Bank expressed "special interest" in the UNDP-financed studies and a number of missions to Antananarivo assisted in their implementation. In December 1976, the Government formally requested the Bank to include the Antananarivo water supply and sanitation project in its lending program. Due to the time required to reorganize the local authorities and to complete the project preparation, however, the Bank delayed field appraisal of the project until July 1978.

The Antananarivo Water and Sanitation Project (Cr 1002-MAG) was approved in April 1980 for a credit of US$20.5 million. The project was designed to: (i) improve and develop the existing water supply, sewerage, drainage and solid waste facilities in the Antananarivo area; (ii) strengthen the institutions, especially in the sanitation subsector, in order to attain proper standards of operation and maintenance; (iii) assist the Government in developing appropriate cost recovery policies; and (iv) help the Government prepare a long-term development program for urban water supply. The project contained six components: water supply (new production facilities, transmission lines, supply to suburban communities, and extension and strengthening of existing distribution facilities), sewerage, solid waste, training of water supply staff, and training of sanitation staff. At appraisal, the solid waste component consisted of the construction of collective dumping containers, supply of collection trucks and heavy equipment for the existing dumping site, and the improvement of an existing composting facility. The total project cost was estimated at US$33.7 million, of which US$3.5 million (10.4 percent) was allocated to the solid waste component.

2.2 Solid Waste Conditions

At the time of project appraisal, the World Bank mission judged the existing system of collection and disposal to be adequate in terms of quantity collected, but inadequate in terms of collection conditions and disposal. With respect to collections, households used three types of solid wastes containers: private bins, collective bins, and fixed concrete containers. The collective bins were often stolen, however, and the concrete containers were poorly designed. Consequently, wastes often were dumped carelessly outside collective bins, drainage canals, and other uncontrolled or illegal dumping areas.

The Municipality collected solid wastes at 820 locations spread over 14 districts. Each district, which included two collection routes, was served by one vehicle (standard 6 to 8 ton truck running about 50 to 70 kilometers per

day and manned by 2 teams in shifts). At the end of each route, the collection truck was full. In total, there were only about 16 operating trucks that collected waste at night and used during the day for maintaining the sewerage system. Maintenance workshops were poorly equipped, however, and the maintenance budget was inadequate. Nonetheless, a total of about 160 tons of solid waste were collected each day, about 38,000 tons per year. This service met about 90 percent of the city's needs. All urban areas with a population density over 25 inhabitants per hectare were served.

After collection, the trucks dumped the solid wastes 9 kilometers from the city on an area covering 15 hectares. The landfilling process was not carried out properly since wastes were frequently left uncovered. On a regular basis, however, burning, disinfestation, grading, and compaction were performed. In addition, small quantities of waste were composted. The composting facilities included handling equipment, a hammermill, and a composting area where refuse stacked in heaps was periodically turned over until the putrescibles were degraded. Although, theoretically, the hammermill had a capacity of 10 tons per day, lack of pre-sorting, screening, and handling equipment limited production to 600-800 tons per year instead of a possible 10,000 tons per year. Moreover, the quality of the compost was poor due to the lack of pre-sorting equipment and resulting presence of dangerous debris in the compost.

2.3 Solid Waste Component

In designing the solid waste component, the project team estimated that by 1984 the city would need to collect 180 tons of solid waste per day, implying a total capacity of garbage containers of 400 cubic meters. Accordingly, the project provided the following: (i) construction of additional containers for the city (80 containers of 600 liter capacity and 480 containers of 300 liter capacity); (ii) supply of 19 collection trucks of 6 to 8 ton capacity to reinforce and partially renew the fleet of vehicles used to collect the city's solid waste; (iii) supply of heavy equipment (2 bulldozers, 3 loaders, 1 weigh bridge, and 4 trucks) to transform and maintain the existing dump site as a "controlled" sanitary landfill; and (iv) improvement of the existing composting facility so as to produce 10,000 tons/year of good quality compost that could be purchased for fertilizer.[1/]

The appraisal team selected sanitary controlled dumping as the basic method of solid waste disposal because it was considered the least-cost solution. The project included upgrading of a small composting facility for processing part of the wastes in order to acquire practical information (e.g., investment costs, operating and maintenance costs, customer willingness-to-pay) about the composting method in the Antananarivo context.

1/ Compost is generally considered to be an excellent soil conditioner with low, but significant, fertilizer value.

By increasing the number of collective bins and by improving collections, the solid waste component was expected to benefit the whole population, especially the poor since these improvements were provided mainly in the poor areas of the city. The Antananarivo Municipality (Fivondronana) was directly responsible for implementing the solid waste component.

2.4 Implementation

Despite delays in procurement, the implementation of the solid waste component was carried out largely as planned. One exception related to the upgrading of the composting plant. After consultation with the supplier of the original composting plant and the project consultant, it was agreed that the plant could not be upgraded; a new composting plant would be constructed. The Municipality would finance the civil works; the Bank would finance the new equipment (from the same supplier). Implementation was slow, however, due to long delays in preparing bid documents, tender evaluation reports, and the final award of contracts. For example, after one year of indecision, the Municipality selected a consultant (SOMEAH) to carry out a detailed design of the composting plant. After another two years, the contract design study was finalized.

Currently, the plant is operating, but poorly managed. The municipal employees who operate the plant process the solid waste, but pay no attention to the quality of the compost. They are unconcerned about how to ensure that the compost is acceptable for agricultural use. Moreover, they store the compost on vacant land on the plant premises. Farmers from the surrounding areas may take the compost free of charge if they are able to get to the plant and haul the compost away. To improve this operation and maximize the benefits of composting, technical assistance is needed to determine the appropriate means for compost quality control, sales, and delivery. According to one project officer, private firms should take over plant operations and compost management. Under one contract, one firm would be responsible for operating the plant; another firm would manage and market the compost.

Another implementation problem concerned the supply and maintenance of garbage trucks, the number of which was increased to 23 collection vehicles (19 garbage collection trucks and 4 trucks for the sanitary landfill). The Bank financed the equipment, but the Government never agreed to import the trucks without duties and taxes. Consequently, the supplier absorbed this added expense and delivered the trucks in 1984. During the next several years, however, the company refused to supply spare parts for truck maintenance until it was reimbursed for the taxes and duties. The project closed on June 30, 1986 (one year after the original appraisal closing date), and in 1987, a supervision mission reported that 11 out of the 23 domestic waste collection trucks financed under the credit were out of service due to a lack of spare parts. In 1988, when the Municipality was finally able to pay the company, it received its spare parts. Reportedly, the trucks are now in full operation.

ANNEX 3

LAGOS SOLID WASTE AND STORMDRAINAGE PROJECT, NIGERIA (LN 2620-UNI)

3.1 Project Background/Objectives

In 1982, the Federal Government of Nigeria and the Lagos State Government (LSG) requested Bank assistance in financing a five-year solid waste management and stormdrainage project for Lagos Metropolitan Area. The project was identified by LSG and a Bank urban sector mission in March 1982; it was prepared by the Lagos State Waste Disposal Board (LSWDB) and the then Lagos State Ministry of Works and Housing (MOW), with the assistance of consultancy services financed in part by project preparation funds available from the Bank's first urban project in Nigeria (Bauchi). The project was appraised in November/December 1982 and revised in 1984 to reflect discussions with the new Military Government of Lagos State. In September 1985, the Bank approved the US$72.0 million loan (Loan 2620-UNI), which is the largest Bank loan approved for a solid waste management project to date.

The Lagos Solid Waste and Stormdrainage Project is the third project in Nigeria to include a MSWM component and the first urban development project in Nigeria focusing on citywide infrastructure services and management. The project's overall objectives are to:

(a) strengthen the administrative, technical, and financial capacity of key Lagos State institutions and reorient their existing programs toward larger scale provision of infrastructure and maintenance;

(b) support the ongoing solid waste operations of LSWDB and stormwater drainage of the Drainage Division by expanding and improving services rendered by both agencies, which would in turn lead to better functioning of the city and increased productivity; and

(c) assist LSG in mobilizing the additional resources needed to provide future infrastructure, services, and maintenance to Metropolitan Lagos by revising and reactivating the rating system for property valuation.

Aimed at these objectives, the project includes three major components: (i) improvement and expansion of solid waste collection and disposal services (ii) expansion and rehabilitation of the primary stormdrainage network; and (iii) assistance to LSG in the establishment of a Lagos State Valuation Office (LSVO). The project also includes institutional support for project coordination; future project preparation; and improvement in local government administration, financial management, and maintenance operations.

With base costs calculated in January 1983 and updated in March 1984, the total cost of the project was estimated at US$164.3 million (including taxes and contingencies).

The solid waste component, estimated to cost approximately US$111.8 million, accounts for 68 percent of total project costs. The component encompasses equipment, new maintenance and depot facilities, and related civil works to enable LSWDB to improve all aspects of its operations (domestic and industrial waste collections, disposal, abandoned vehicle management, and secondary and tertiary stormdrainage network cleaning and maintenance).

3.2 Solid Waste Conditions

In Metropolitan Lagos, inefficient collection of solid wastes has had a direct affect on the functioning of other urban services, infrastructure, and productive activities. Uncollected garbage and abandoned vehicles on streets impeded traffic; refuse thrown in stormwater drains (also used as a rudimentary sewerage system for vast parts of the city) caused flooding by blocking the flow of water. To compound these problems, extremely dense population, traffic congestion, poor road conditions, and heavy rainfall, as well as the accelerating population growth and urban sprawl in Metropolitan Lagos, made it impossible for local authorities to provide adequate waste collection and disposal services.

In 1977, the Lagos State Refuse Disposal Board (later renamed the Lagos State Solid Waste Disposal Board) was established to deal with the mounting accumulation of garbage and abandoned vehicles on the streets. It was given broad powers to plan and operate a citywide refuse collection system which includes a workshop, depots, tip sites, and refuse vehicle operations. After the Board was established, it procured new vehicles and engaged expatriate technical assistance to manage LSWDB operations. As a result of LSWDB's initial success in street cleaning, LSG pressured the new Board to broaden its activities. By 1981, the Board expanded its responsibilities to commercial and industrial waste management, stormdrain cleaning, and collection and disposal of abandoned vehicles. LSWDB's solid waste removal and drain maintenance services were successful in reducing flooding in parts of the city, particularly in the central business district, but the Board was not equipped to sustain this effort on a citywide basis due to its erratic and limited budget, based largely on grants from LSG.

In December 1984, the contract with the foreign expert assistance was not renewed and Nigerians took over the full management of the LSWDB. They had limited capacity in civil engineering; moreover, there were very few engineers in Nigeria who had any expertise in designing and managing solid waste facilities. Due to limited funding, staffing, and equipment, the Board's operations consisted largely of crisis management on a day-to-day basis; there was no long-term planning for development and expanded and improved operations.

Further, the Board's overall ability to carry out its full responsibilities declined.

At appraisal, it was estimated that only one-half of the domestic refuse generated daily in Metropolitan Lagos was being collected. Large areas within the city and almost one third of the population had no refuse collection service. Even within the serviced areas, only a portion of the generated refuse was being collected. The most pressing problems of solid waste management in the Lagos Metropolitan Area included:

(a) lack of adequate street storage containers for refuse;

(b) inadequate disposal sites and management of landfill operations;

(c) shortage of refuse collection equipment and vehicle maintenance facilities;

(d) inefficiencies caused by physical and climatic conditions; and

(e) staffing and funding shortages and weak administrative procedures of LSWDB.

The main deficiency of the existing LSWDB program was its limited scope of service. It was estimated that within the serviced areas, with existing LSWDB capacity and resources, the percentage of waste collected as a proportion of waste generated would decline from 55 percent in 1984 to 38 percent in 1988. With respect to the total metropolitan area, the percentages would be about 46 percent and 33 percent, respectively. Further, only about 18 percent of the industrial and commercial premises were being served. In addition, LSWDB provided inadequate removal of abandoned vehicles. In 1983, there were an estimated 15,000 abandoned vehicles on vacant land, footpaths, road shoulders, and medians. The existing landfills, badly located within densely built-up areas, were reaching capacity. Moreover, they contained industrial as well as municipal waste, which sometimes burned uncontrollably, and were unsanitary as well as inefficient because funds for the purchase of ash, lime, and topsoil for cover were not available. Thus, the appraisal mission identified an urgent need for corrective action to prevent the total collapse of solid waste services.

3.3 Solid Waste Component

According to the SAR, the solid waste component was designed to provide:

(a) more efficient removal of solid waste from currently served areas, increased service levels in these areas, and extension of this service to unserved areas;

(b) control of flooding caused by blockage of drains with solid waste;

(c) strengthening of institutional capacity for solid waste management, including financial management and revenue generation; and

(d) assistance in strengthening local governments'capabilities.

To meet these objectives. the component includes: (i) specialized equipment for refuse collection and disposal (US$63.7 million); (ii) construction of transfer stations (US$7.8 million); (iii) civil works for new and existing controlled sanitary landfill sites and new vehicle depots and maintenance workshops (US$22.5 million); (iv) bulk bin hardstandings for refuse containers throughout the city (US$2.3 million); and (v) funds to support implementation of small demonstration projects, a study to facilitate the transfer of secondary stormdrain maintenance to local governments, advisory services for training LSWDB staff, improvement of the LSWDB financial complex, establishment of proper financial accounting systems and a comprehensive specialized staff training program, and the establishment of a research and development group for long-term programming of its operations (US$15.5 million).

The project includes collection of industrial wastes by providing the equipment and vehicles required to extend the existing coverage of 369 premises to an additional 1,500 premises over a four-year period. By expanding the service level, it was anticipated that revenues from the existing industrial waste collection service would increase from N 3.4 million (approximately US$4.5 million, at then current exchange rates) to N 12.4 million (US$16.2 million). As part of the industrial waste collection service, the project incorporates participation by private contractors that demonstrate sound and satisfactory operating practices and have the potential to efficiently expand their operations. Based on a detailed analysis of private sector capability, only about two or three private contractors could be considered. Most of the private firms lack the satisfactory management capacity to increase operations and have been involved in improper operating practices and disposal at unauthorized sites.

In addition to the above sub-components, the project includes loan conditions requiring LSWDB to formally adopt a management staffing plan satisfactory to the Bank; assign sufficient staff; reorganize and strengthen its project execution capabilities; and meet other financial obligations.

Given the city-wide scope of the project, it was not possible to quantify the direct benefits to the poor. Nonetheless, it is the poorest areas which suffer most from lack of drainage and inadequate or non-existent solid waste services. A conservative estimate indicates that some two and one-half million people were expected to benefit directly from the solid waste and stormdrainage components which together account for 90 percent of the total project costs.

3.4 Implementation

In the course of project implementation, progress in the solid waste component has been impeded by a number of difficulties, among them: repeated changes in LSG staff, delays in preparing and adopting the LSWDB management organization and staffing plan, delays in tendering and awarding LSWDB civil works and equipment contracts, delays in selecting and acquiring sites for transfer stations and landfills as well as completing preliminary designs for those sites, problems maintaining appropriate insurance for newly acquired equipment and vehicles financed under this project, and problems ensuring proper maintenance of equipment and facilities.

The three-year delay in adopting an acceptable management, organization, and staffing plan was due to the complex political environment surrounding the project. In the course of project preparation, appraisal, and implementation, four different governors of Lagos State meant that a new strategy had to be prepared with each new administration. LSG was never fully committed to using external technical assistance to administer the LSWDB or the project. The LSWDB was to do the job if operations could be improved and expanded just by acquiring more equipment. Elements of the now completed plan include recommendations for the Board's organization and staffing, training strategy and methods, waste management master plan covering three phases of system development and operation, and management systems including those for management information and preventive maintenance. Although it was finally approved in May 1989, the long delay in completing and adopting the plan impeded the execution of key management, planning, and coordinating tasks associated with the project. According to one project officer, the completion and formal adoption of the plan should have been a condition of loan effectiveness.

The procurement of 600 collection vehicles in one package (approximately $40.0 million) presented another serious implementation problem, delaying some key elements of the project by almost four years. The difficulties centered on the technical aspects of equipment specifications, preparing tender documents, and evaluating bids. Complicated local procurement procedures further impeded the process. By June 1989, the contracts for the garbage trucks were finally approved. Due to devaluation, however, the actual local currency cost of the vehicles is eight to nine times higher than originally estimated.

Problems surrounding the selection and acquisition of sites for transfer stations and landfills posed further impediments to the execution of the solid waste component. The major causes were the Board's inability to carry out appropriate environmental investigations and secure Certificates of Occupancy for sites that would not be resisted by the surrounding community or refused by the Planning Department. To facilitate this process, the World Bank hired a solid waste management consultant to review sites and advise on the selection process. At the time of this writing, the sites had been identified and were undergoing analyses of soil and hydrogeological conditions.

The project was scheduled to be executed over a five-year period (FY86-FY91) and is currently ongoing. To complete substantial implementation of the major components, it is expected that at least a two-year extension will be required. According to the draft SAR for a new project in Oyo State, the lessons of the Lagos project already have been incorporated into the design of another solid waste management investment (US$11.6 million) in Nigeria. One condition of effectiveness requires completion of land acquisition for the sanitary landfill as well as other solid waste facilities (transfer station, central offices, and workshop).

ANNEX 4

SECOND CALCUTTA URBAN DEVELOPMENT PROJECT, INDIA
(CR 756-IN)

4.1 Project Background/Objectives

The Bank first became actively involved in Calcutta's development in 1973 with the approval of a US$35 million loan (CR 427-IN) to support the Calcutta Metropolitan Development Authority (CMDA) and its program of urban reconstruction and development. In 1977, the Bank followed up with a second loan of US$87.0 million (CR 756-IN) for a larger and more ambitious project. This was followed by a third, still larger project in 1983 (CR 1369-IN, US$147.0 million). This annex deals with the second project of this series.

As indicated in the PCR, the Bank and CMDA invested a great deal of effort into preparing the Second Calcutta Urban Development Project (CUDP II). During project preparation and appraisal (July 1976 - August 1977), the Bank sent six missions to Calcutta. The resulting project was large, ambitious, and complex. CUDP II consisted of 54 sub-projects in 11 sectors, plus consultant services, technical assistance, and training, all drawn from a five-year rolling investment program. At the investment program level, the allocations for water supply, sewerage/drainage, and transport accounted for a much smaller proportion of the total than in CUDP I. By contrast, the proportion of CUDP II funds allocated to area development and solid waste management was greater than in the previous project. In CUDP I, the solid waste component included two sub-projects in Calcutta involving small-scale works procurement of related equipment. The MSWM component of CUDP II consisted of the rehabilitation of the existing systems of solid waste collection, street cleansing, and night soil collection, as well as pilot projects and studies to develop long-term solutions to solid waste management. This US$11.63 million component accounted for about 6 percent of the estimated total project cost of US$183.71 million, including taxes and contingencies (1977 prices).

4.2 Solid Waste Conditions

In 1985, the total population in Calcutta (about 10 million) produced between 4,000 and 6,000 tons of solid waste per day and large quantities of sludge from nightsoil collection, open drains, and sewer cleaning. None of the wastes, however, were disposed of efficiently. Except in the case of nightsoil collection, there was no system for the collection of wastes directly from the source. Most wastes were thrown into the street, picked up, transported to vats by hand carts, loaded in lorries, and off loaded (mainly by hand) at the tipping sites. Serious health hazards arose from deficiencies in handling night soil; the practice of open dumping polluted the surrounding areas and reduced property values as well.

At the time of appraisal, the rate of expenditure on solid waste management by Calcutta Corporation (CC) was over Rs 6 crores annually (equivalent to almost US$2 per inhabitant per year in 1977 dollars) which is adequate to finance a first class service. Nonetheless, lack of adequate physical infrastructure, shortage of key equipment items, failure to effectively control the labor force of over 14,500 untrained employees, insufficient vehicles and inadequate vehicle maintenance, lack of a vehicle renewal fund, and an unsuitable management structure resulted in a wasteful and inefficient system. Expenditures in the remainder of the CMD approached US$.70 per person per year, less than half the amount required to provide a basic level of service.

4.3 Solid Waste Component

The solid waste management component was designed to achieve reliable operation of the existing systems within CC in the short term and to develop a solid waste management system with metropolitan area-wide application. The specific objectives of the component were to: (i) overcome the shortcomings of services by increasing the number of equipment; (ii) improve the facilities for maintenance of vehicles plant and equipment; (iii) construct a network of depots throughout the city for future control of services; (iv) introduce better solid waste systems through development of indigenous technology; and (v) improve management structure, quality, and training facilities.

In physical terms, the component provided for construction of 80 ward depots, 400 masonry vats, and 10 trailer sites; purchase of 8,000 handcarts, 81 tipping trucks, 12 tractors and trailers, 2 cesspool emptiers, and 26 tanker lorries; renovation of existing nightsoil disposal areas and construction of additional discharge points; improvement of existing vehicle maintenance facilities including purchase of vehicles and equipment; repair of garages; construction of access roads; and purchase of bulldozers and equipment to organize additional landfill sites. In addition, the component provided funds for training, studies, and pilot projects to test alternative methods of storage, collection, and disposal of solid wastes.

4.4 Implementation

At the start of project implementation, the solid waste component supported the purchase of collection vehicles to remove the mounting piles of garbage in Calcutta. The component also set in motion fundamental solid waste institutional changes which included: reorganizing the structure of solid waste service within the municipality of Calcutta, designating a qualified senior engineer to take charge of CMC's solid waste services, establishing a hierarchy of jobs and responsibilities, improving the working conditions of the solid waste staff, and designing a management system for operations and maintenance. From the perspective of one project officer, these actions represented a dramatic change in the manner in which CMC operated its solid waste collection services

and the first critical step in implementing a solid waste strategy that covered collection, transport/transfer, and disposal in sanitary landfills.

At the end of the project period, the procurement of equipment was practically complete. According to the PPAR, the component also accomplished significant improvements in the system's repair of vehicles. Moreover, these improvements helped CMC eliminate the need to hire trucks from private contractors.

Despite the above accomplishments in institutional strengthening and equipment procurement and maintenance, several factors constrained the longer term effectiveness of the solid waste component. First, the delay in land acquisition was a significant problem that impeded the progress of the civil works, particularly in the construction of the ward depots. Due largely to difficulties in locating available vacant land in each ward. the number of ward depots to be constructed was reduced from 80 to 28. Moreover, the acquisition of sites for those 28 ward deports was not completed by the end of the project period.

Other implementation constraints were institutional. According to the PPAR, the Calcutta Municipal Corporation had changed its solid waste methodologies more frequently than could be readily absorbed by its staff, who were ill-prepared to deal with increasing levels of technology. Additional institutional constraints were the lack of continuity among middle management solid waste staff and the problem of sustaining the momentum of solid waste improvements among competing urban service needs.

Lastly, the expenditures for the improved solid waste services were not recovered and the costs for operations and maintenance rose steadily. In 1977/78, the costs for operations and maintenance was Rs 7 crores; in 1982/83, the cost soared to Rs 9.5 crores (excluding the bustees). At the end of the project period, about 50 percent of the total component expenditure remained unspent. The actual cost of the component came to US$7.31 million.

The remainder of the component works was carried out under the Third Calcutta Urban Development Project (CUDP III, CR 1369-IN), approved in May 1983. Based on the recommendations of a pilot study carried out under the second urban project, CUDP III was intended to continue and consolidate the efforts set in motion during the two previous projects. The project also was directed at improving urban management in the Calcutta Metropolitan Area through a comprehensive approach that combined institutional and financial reforms with physical improvements. The total project cost was estimated at US$303.0 million. The IDA credit of US$147.0 million financed 50 percent of total project costs. The solid waste component, with an estimated cost of US$15.0 million (including contingencies) consisted of provisions for collection equipment, transfer stations for primary collection, equipment for final disposal, and pilot composting plants.

ANNEX 5

THIRD URBAN DEVELOPMENT PROJECT, INDONESIA
(LN 1653-IND)

5.1 Project Background/Objectives

Indonesia's urban areas are characterized by severe deficiencies in housing and essential infrastructure. In tackling its urban problems through national and local policies, the Government of Indonesia was supported by a series of Bank-assisted urban development projects. The Jakarta Urban Development Project (LN 1040-IND) was the first slum upgrading project financed by the Bank. The project provided for minimum basic services, including refuse collection, to about 2,000 hectares of densely populated "kampungs" in Jakarta. The Second Urban Development Project (LN 1336-IND) was approved in 1976 to finance a three-year extension of the Kampung Improvement Program (KIP) in Jakarta, an additional 3,000 hectares of unserviced kampungs, and the extension of the program to Surabaya. In 1979, the World Bank approved a US$43.6 million loan to support the Third Urban Development Project (LN 1653-IND), which continued the Government's initiative in kampung improvement.

The project had two principal objectives: first, to provide further support to the Government's efforts to supply essential services to low-income neighborhoods (kampungs) in Jakarta and Surabaya and to extend the program to three additional secondary cities (Ujung Pandang, Semarang, and Surakarta); and second, to expand the scope of the project to include investments aimed at improving general public health. To meet the second objective, the project financed improvements in solid waste management (in Jakarta and Surabaya), drainage, and community health services. Other project components included: Kampung Improvement Program, land registration, and technical assistance. At appraisal, the total project cost was estimated at US$96.0 million (1978 dollars) with a foreign exchange component of US$32.0 million. According to the PCR, cost estimates for the solid waste component amounted to US$22.8 million (24 percent of total project cost). The actual cost of the component was US$11.2 million or 12 percent of the total (US$90.5 million),[2/] due to a high rupiah devaluation during project implementation.

5.2 Solid Waste Conditions

The absence of adequate physical and planning facilities, coupled with fragmentation of management responsibilities among several agencies, has been a deterrent to the formulation of a city-wide comprehensive solid waste management program in both Jakarta and Surabaya. At appraisal, only about 40 to 50 percent of the wastes generated (about 3,600 tons/day in Jakarta and 1,000

2/ These costs do not coincide with those in Table 2 of the main report because the PCR was not received by the authors by the end of FY89.

tons/day in Surabaya) was collected; the remainder was disposed of by partial burning or dumping at random locations in canals or drains or along roads, with consequent health, pollution, and drainage problems.

The responsibility for solid waste management in both cities was split between the Cleansing Department and a number of neighborhood organizations. The function of the Cleansing Department was limited to the transfer, transport, and disposal of wastes from the local neighborhood (keluharan) dumps and the cleansing of main streets. Each keluharan was responsible for organizing household collection of wastes at central collection points. Poor coordination between the neighborhood collection system and the Cleansing Department hindered timely collection of wastes and thus caused substantial over-spilling of storage facilities. This fragmentation of responsibility was identified at appraisal as the principal cause for the worst subsector problem in the two cities. Other key problems included the lack of adequate transfer depots and transport vehicles and unsatisfactory landfill operations.

5.3 Solid Waste Component

The proposed solid waste management program for Jakarta and Surabaya was aimed at improving waste collection, street/drain cleaning, and transport and disposal of wastes, as well as unifying control of all solid waste-related operations under a central agency (Cleansing Department) in each city. The project would provide the required infrastructure and transport and disposal facilities for the first phase of a long-term program in the two cities. A pilot program covering two or three kampungs was included to test and assess improved methods or facilities for collection, storage, transfer, route planning, transport and sanitary disposal. The emphasis of the program was to collect wastes on a door-to-door basis, especially in low-income areas which have the most serious collection and transfer problems. Infrastructure provisions included depots, offices, workshops, and related transfer facilities. The results of the pilot study would be extended to the actual service areas over the three-year project period.

The key element of the proposed program consisted of decentralized control of physical operations at the then existing three levels of political structure. The basic operating unit would be at the kelurahan (ward) level. Each kelurahan would have a depot consisting of an office, toilet, and transfer facility (trailer and cart parking). Control of transportation, time tables, and supervision of kelurahan depots would be the responsibility of kecamatan (district) offices Garage and servicing facilities would be provided at the Wilayah (region) level. At appraisal, the project's provisions included: 108 kelurahan depots, 16 kelurahan offices and three garages for Jakarta; and 27 kelurahan depots and one garage for Surabaya. In both cities, the program included a phased replacement of existing vehicles and additional vehicles; about 93 vehicles for Jakarta and 60 tractors with 180 trailers for Surabaya.

In addition, the project would provide handcarts for household collection and street-sweeping. Finally, the project would establish sanitary landfills as the primary means of solid waste disposal in the two cities.

Under the technical assistance and training component, the project financed one advisor to assist Jakarta and Surabaya in the design and implementation of the pilot solid waste program and its evaluation and extension to other areas of the city; supervision of sanitary landfill projects, and development of an appropriate organizational structure for the Cleansing Departments in both cities. In addition, the project financed six man-months of engineering services to assist in the design of the sanitary landfills.

Under the project, the Cleansing Department in each city would be organized to assume responsibility for all solid waste services down to individual dwellings and for the cleansing of all roads, footpaths, and open drains. Initially, this arrangement would be attempted on a pilot scale; over time, it would be extended to the entire city through a phased program. In Jakarta, there was a separate Cleansing Department that provided decentralized control of operations at three levels based on the political structure. In Surabaya, however, where there was the same general structure for waste collection and disposal as Jakarta, cleansing services were controlled by a third-tier section in the Public Works Department and received very low status. Thus, during negotiations, assurances were given by the Government that a Cleansing Department would be established in Surabaya.

At the time of appraisal, the municipal governments did not levy any direct charges for residential solid waste collection, since municipal services were limited to the transportation of wastes from collection points to disposal sites. With the primary collection responsibility shifting under the project to the municipalities, a study was also included to assess the most appropriate mechanism of charging for solid waste services.

5.4 Implementation

In the course of implementation, the solid waste component encountered a number of impediments. According to one project officer, one of the main problems related to difficulties on the part of Jakarta's Cleansing Department in determining the proper mix of vehicles and equipment. Although a World Bank solid waste consultant made recommendations regarding appropriate technology, the Cleansing Department favored more mechanized systems. When approached by a number of manufacturers and representatives of bilateral agencies, each stressing a different kind of equipment, the Cleansing Department, with its lack of technical expertise, responded to this pressure. Before making a decision, the Department experimented unsuccessfully with different types of vehicles. For example, the compactor trucks proved to be infeasible because of the high water content (40 to 50 percent) of the waste. The baling machines also were not feasible because scavengers pulled apart the waste. Moreover, the

Department wanted incinerators and mechanical compactors, also technically and financially inappropriate. Ultimately, the Cleansing Department bought the tipping trucks and constructed sanitary landfills, as originally planned.

Institutional deficiencies presented further constraints to project implementation. They included lack of adequate project management and supervision, insufficient staff resources (employees involved in solid waste services held concurrent jobs in other agencies), need to replace the technical advisor three times in the course of project execution, and delays in designing and evaluating the pilot study so that the results could be applied to the rest of Jakarta in a timely fashion. The Cleansing Department's lack of familiarity with ICB procurement procedures caused further delays.

Difficulties in acquiring suitable sites for the transfer depots posed additional constraints to successful project implementation. The difficulties were due to high land prices, lack of vacant land, and neighborhood resistance. Consequently, in many kelurahans, the transfer depot was replaced by a transito, an area at the edge of the road where a six to eight cubic meter arm roll container could be placed.

Insufficient financing for solid waste services was another impediment to project success. To cover the costs for transport and disposal, the Bank suggested that every neighborhood pay a monthly charge to the Cleansing Department. As customary in the kampungs, each neighborhood unit would be responsible for collecting a fee from each household. Nonetheless, all of the revenues were not passed on to the municipality. Consequently, the municipality received insufficient revenues to cover the costs of transport and disposal. Moreover, the municipality lacked a separate accounting system identifying costs and revenues attributed to the solid waste operations. Unless the cost recovery mechanisms are rationalized and improved, the PCR indicates that significant subsidies from general revenues will be required to sustain, improve, and expand solid waste services in Jakarta.

Despite the various difficulties encountered in the course of implementation, the project accomplished the reorganization of the Cleansing Department in Jakarta. It also strengthened the Department in terms of its technical and operational capacities. Solid waste service levels in Jakarta rose from 48 percent to 86 percent of the total population. The actual population served (1,812,275) exceeded the target of 1.5 million. Moreover, the project introduced a cost recovery system for the residential neighborhoods to meet at least a portion of the municipality's solid waste transport and disposal costs. In addition to these achievements, the project also demonstrated the effectiveness of community involvement in primary solid waste collection. During implementation, it became obvious that the responsibility for primary collection should remain with the local neighborhood groups, rather than be taken over by

existing neighborhood arrangements for household collections would have undermined community spirit.

In Surabaya, the solid waste component was implemented as planned. A notable achievement was the establishment of a separate Cleansing Department within the municipality which increased its status and resulting budgetary and manpower resources. Moreover, the Surabaya Cleansing Department accepted the Bank's strategy of using simple technology, thus avoiding the costly and lengthy delays encountered in Jakarta. Nonetheless, a report on the results of follow-up investments in Surabaya's solid waste services supported by the Fifth Urban Development Project (Loan 2408) indicate problems in the areas of operations and maintenance, staff resources, financing, and disposal.

ANNEX 6

FIRST URBAN DEVELOPMENT PROJECT, EGYPT
(CR 831-EGT)

6.1 Project Background/Objectives

The Egypt Urban Development Project was the first urban sector operation assisted by the Bank in Egypt. The project was intended to introduce low-cost technological innovations for the provision of shelter and urban services on a pilot scale. It was appraised in November 1977 and approved in June 1978. The IDA credit for US$14.0 million to the Arab Republic of Egypt was to finance 67 percent of total project cost estimated at US$21.0 million.

The project was designed to meet Egypt's urban problems by demonstrating the viability of: (i) providing non-subsidized services to existing settlements in Cairo; (ii) introducing sites and services development in Alexandria and Assiut; (iii) experimenting with low-cost solutions to solid waste problems in Cairo and Alexandria; and (iv) expanding employment opportunities. General institution building in the sector was to be provided through technical assistance. The project's components included shelter provision, employment promotion services, rehabilitation of water supply and sewerage systems in Assiut, technical assistance and project management, and solid waste services.

The objectives of the solid waste collection and disposal component were to: (i) introduce low-cost intermediate technology waste disposal systems, and (ii) improve waste collection, particularly in low-income areas, by expanding the role of small private contractors. In addition, the consultant and advisory services component of the project allocated US$0.17 million for the preparation and implementation of schemes to improve solid waste collection and disposal systems in Cairo and Alexandria. At appraisal, the total cost of the solid waste component was estimated to be about US$3.3 million, or 16 percent of the total project cost. Due to changes in the project design during implementation, the actual expenditure rose to approximately US$7.9 million or 35 percent of the total project cost.

6.2 Solid Waste Conditions

At appraisal, solid waste collection in Egypt was not considered a public service. When provided, it was normally concentrated in high-income areas where private collectors could realize higher salvage values. In Cairo, accumulation of refuse on the streets had become a serious health hazard and was ranked by residents as the most pressing neighborhood problem.

The Governorates' responsibility for refuse collection was limited to street cleansing. House to house collection was left to small private contractors, called Zabbaleen, who pay fees to middlemen for the right to collect wastes from designated buildings. Zabbaleen are usually squatters earning their

living by sorting the refuse at their settlements and selling all reusable matter. The Zabbaleen also feed organic waste to the pigs which they raise and then sell to supplement their income. In addition, part of this waste is composted and sold to farmers as fertilizer.

Since it is more profitable for the Zabbaleen to collect refuse from the wealthy neighborhoods, poor neighborhoods were neglected. In Cairo, for instance, the Zabbaleen collect by donkey cart about 45 percent of all household waste (1,800 tons per day) at no cost to the Governorate. This comprises most of the waste from the high and middle-income areas, about half the waste from lower middle income areas, and none from the low-income districts. In Alexandria, the Zabbaleen collect about 50 percent of the city's domestic waste. In both cities, uncollected waste is thrown onto the streets, where a portion is subsequently removed by the Governorates' street cleansing departments. The appraisal mission identified the accumulation of waste on the streets as a serious health hazard, particularly in the poorer areas.

6.3 Solid Waste Component

The solid waste management component was designed to improve collection and disposal services through the construction of composting plants and improved collection arrangements. In Cairo, a pilot composting plant with a capacity of about ten tons/day was planned at the Shoubra disposal site to test the composition of wastes being collected and the quality and marketability of the resulting compost. The plant also was to provide a basis for developing the appropriate design and operating procedures for a larger plant. After a test period of about one year, a larger plant with increased capacity would be designed and implemented. To assist in the design, testing, and operation of the plants, the component also provided consultant services.

For the city of Alexandria, the component included: a pilot "windrow-type" composting plant with a 10-ton per hour capacity, 300 donkey carts for waste collection, 600 hand carts and 40 depots for street cleaning, 2 sorting depots for disposal, 2 workshops for repairing refuse collection vehicles, equipment for 4 garages, and 4 jeeps for supervision. Consultant services to help implement this scheme also were included.

6.4 Implementation

According to the PPAR, the solid waste component was one of the most successful components of the project due to careful preparation by consultants and the fact that the investments responded to a priority. Although the expansion of Zabbaleen collection activities remained limited to only a few low-income areas, the project effectively demonstrated the feasibility of the approach, possibly providing the basis for larger scale development of this service. By contrast, several elements (handcarts, depots, workshops, garage equipment, supervision vehicles) intended to improve refuse collection and street

cleaning operations in Alexandria were cancelled because AID made funds available for the same purpose on a grant basis. In addition, the donkey carts were cancelled because private refuse collectors and the City Council rejected the idea.

In Cairo, most sub-components were implemented as planned. Overall, the cost overruns in the implementation of the solid waste component (actual cost reached nearly US$8.0 million, an estimated 123 percent increase over the appraisal costs) resulted from the inclusion of a 160 ton/day composting plant at Alexandria to substitute for the originally envisaged shelter component. Both composting plants were operational by the project's closing date. In addition, funds were used for the preparation of a free-standing solid waste management project.

As a result of the project, refuse collection in Cairo was extended to approximately 18,500 low-income households on a self-financing, private-service provision basis, thus establishing a model which might be applicable to city-wide expansion. In addition, the administration of street clearsing and solid waste processing services by the Governorates of Cairo and Alexandria was improved by the construction of the two 160 ton/day composting plants and by measures taken to ensure that the plants continue to be properly operated and maintained. Both composting plants were completed on time, and as of 1985, were producing compost of regular consistency with a high organic content suitable for soil conditioning for purposes of land reclamation, agriculture, and landscaping by both the public and private sectors.

The composting plant in Alexandria proved to be the more successful of the two composting facilities because of efficient plant management and effective compost marketing. The plant manager was an agronomic engineer who supervised a staff of committed workers and maintained excellent records on all composting operations and sales. By contrast, the Cairo facility was operated by underpaid, dissatisfied civil servants with no expertise in composting. By 1985, most of the workers left the plant and facility operations were deteriorating.

Overall, the project demonstrated the effectiveness of a least-cost approach to improvement in public sector waste management and provided the basis for larger future projects. To follow-up the First Urban Development Project, for example, a solid waste component was built into the Greater Cairo Urban Development Project (LN 2176-EGT) approved in June 1982. The component included US$600,000 for 40 man-months of consulting services to develop a detailed MSWM program for Cairo. A free-standing solid waste project was appraised in February 1985 to extend the systems established under CR 831-EGT in the cities of Alexandria and Giza. As of this writing, this project has not been negotiated.

ANNEX 7

LAHORE URBAN DEVELOPMENT PROJECT, PAKISTAN
(CR 1348-PAK)

7.1 Project Background/Objectives

The Lahore Urban Development Project (CR 1348-PAK) was approved in April 1983 for a credit of US$16.0 million to support urban sector operations in Lahore, Pakistan. The project resulted from the recognition that Lahore faced a substantial and growing shortage of housing and infrastructure services, particularly for the low-income groups. Some 25 to 30 percent of the total population lived in Katchi Abadis, where insecurity of tenure, overcrowding, and limited access to infrastructure and public services are the main features. A further 25 percent of the population lived in the Walled City and adjacent old parts of the city in conditions of severe overcrowding, decaying houses, and inadequate urban services.

The basic objectives of this first urban development project in Pakistan were to strengthen the capacity of local institutions to prepare and implement integrated urban development programs, improve municipal services, and develop strategies to cope with continuing urban growth, particularly the delivery of services and shelter to the urban poor. To achieve these objectives, the project included: (i) upgrading in Walled City low-income areas (US$4.6 million); (ii) sites-and-services in the Gujjarpura Area (U$14.5 million); (iii) improvements in solid waste collection and municipal management and maintenance (US$4.7 million); and (iv) studies for the preparation of a second urban project (US$0.2 million). The total project cost was estimated at US$24.0 million (including contingencies), of which about 20 percent was allocated to the solid waste management.

7.2 Solid Waste Component

At the time of project appraisal, solid waste collection in Lahore covered nearly 70 percent of the city's area on an intermittent basis, but reached less than half of the population since it mainly served the low density middle and upper income areas. Estimated daily production of solid waste in the city was approximately 2,200 tons. Some 40 percent of the total wastes generated was collected by the Lahore Municipal Corporation (LMC) with an additional 40 percent collected by farmers in the dry season for use as soil conditioner or for land reclamation by dumping. In addition, there were insufficient communal dustbins; wastes were constantly overflowing at collection points and "filth depots" (transfer stations). Disposal was carried out by crude dumping on any available site where the landowner's permission could be obtained. Large amounts of solid waste were also dumped in open drains by residents, causing the drains to block and create additional health hazards from stagnant sewage.

At the time of appraisal, LMC's garbage collection fleet encompassed 160 bullock carts, 43 tractor/trailer units, and 65 trucks, of which 48 were in service at any one time. Vehicles were poorly maintained, insufficient in number, and poorly utilized. Further, productivity of the 6,000 workers employed in the service was low due to inadequate equipment and limited supervision.

The project initially sought to provide solid waste services to those areas of the city not yet served and to improve the level of service to the poorest and most densely populated areas where the level of service was low. Concurrently, small scale demonstrations of improved waste storage and collection systems were to be implemented in pilot areas of the Walled City and in a modern colony. These demonstrations would assist in preparing proposals for the extension of modes found most suitable to cover all of the Walled City and other areas of Lahore. Consultants were appointed to augment the data already in LMC's possession, examine the problems and deficiencies in solid waste management, and propose detailed solutions to these problems.

Provisions were made for the supply of about 50 tipping trucks and eight front-end loaders for the collection, transportation, and disposal of wastes. In addition, the project provided 15 vans/jeeps and 100 bicycles for transporting supervisory staff and 2,000 handcarts, improved brushes, and miscellaneous equipment for sweepers. The project also included civil works for: upgrading vehicle workshops to improve maintenance; three zonal vehicle parks with first line servicing equipment to improve vehicle utilization; six large transfer stations so that wastes collected by sweepers, bullock carts, and other short haul vehicles could be bulk loaded to more distant landfill sites; and control points and access roads at the transfer station sites. Additional storage containers, both fixed and portable, were also provided.

LMC was responsible for the implementation of the solid waste and municipal management components. Consultants were hired to assist LMC in its efforts to improve the organization and management of its solid waste and maintenance operations. The implementation of recommendations arising from this study were to be completed during execution of the project.

It was expected that the quality of the city environment would be significantly improved by the extended and improved garbage collection service envisioned under the project. Although the component would benefit the city population at large by improving health conditions, it would mainly benefit the poorer sections of the community since extensions of service would be located primarily in lower income neighborhoods. The total number of component beneficiaries was estimated to be 1.5 million (about half of the city); of this amount, 65 percent belonged to the urban poverty group.

7.3 Implementation

During project implementation, the execution of the solid waste management component lagged significantly behind the original schedule. Generally, the impediments to the component's progress have included: unclear institutional arrangements; slow procurement of solid waste equipment, collection vehicles, transfer station, and workshop (issues concerned bidders' requirements, need for agreement on specifications, and lack of mobilization bond equipment); time required to determine suitable sites for landfills and long-term tipping sites (issues concerned proximity to city center, need to survey site boundaries and access roads, and lack of information regarding risks of pollution from leachate); and delays in the local manufacture and delivery of refuse skips and containers.

To assist the LMC (presently the Metropolitan Corporation of Lahore) in resolving some of the difficulties encountered in the course of implementing this component, the Credit financed the hiring of an experienced solid waste management advisor for a period of 12 onths. Project completion is expected by the end of December 1989, two years later than planned at appraisal.

ANNEX 8

RECIFE METROPOLITAN REGION DEVELOPMENT PROJECT, BRAZIL
(LN 2170-BR)

8.1 Project Background/Objectives

The Recife Metropolitan Region Development Project (LN 2170-BR) was appraised in May 1982, and a loan commitment of US$123.9 million was approved by the Bank in June 1982. The project is part of an ongoing national program to tackle the severe economic and social problems created by rapid urban growth in Brazil's metropolitan areas. It was recognized by the appraisal mission staff that despite efforts to provide jobs and services, severe deficiencies remained not only in the physical provision of urban infrastructure and services, but also in the planning, management, and financing of such services. Thus, the loan would finance programs and projects designed to alleviate problems of urban growth through more efficient and economic provision of urban infrastructure and services, and the strengthening of metropolitan planning and administrative capabilities. Building on the experience gained under the Brazil Medium-Sized Cities Project (LN 1720-BR), the project focuses on the Recife Metropolitan Region (RMR) which consists of nine municipalities with a total population in 1980 of 2.4 million.

The Recife Metropolitan Region Development Project was designed to support the national policy objectives of strengthening metropolitan regional planning and administration, providing urban infrastructure and services, and consolidating the development of metropolitan regions other than Rio de Janeiro and Sao Paulo. Within the context of these metropolitan-level objectives, the project has four specific objectives: (i) provision of improvements to existing housing and urban infrastructure; (ii) provision of metropolitan-scale infrastructure and services; (iii) generation and enhancement of income, especially for the urban poor; and (iv) strengthening the institutions responsible for the planning, administration, and financial management associated with urban and metropolitan region development. As part of the Metropolitan Infrastructure Subproject, the solid waste component is designed to support the municipalities in their traditional collection activities and to ensure adequate disposal through the creation of a metropolitan agency responsible for garbage disposal. In 1981 prices, the cost of the solid waste component was estimated at US$38.5 million, representing 11 percent of the total project cost of US$347.8 million.

8.2 Solid Waste Conditions

The municipalities that make up the RMR are responsible for the collection and disposal of garbage. At the time of appraisal, only 45 percent of the garbage produced in the region was collected. Most of the waste was disposed of in open dumps, in streams and rivers, and in drainage channels.

Although the lack of primary collection equipment accounted for part of the problem, inadequate disposal facilities presented the major problem. The central municipalities produced the most garbage but had the least amount of land available for disposal. Thus, at appraisal, the regional problem of balancing the production of garbage with safe and efficient disposal had to be resolved.

8.3 Solid Waste Component

The solid waste component was designed to augment the existing fleet of collection vehicles and organize disposal on a metropolitan-wide basis. Accordingly, the project finances the purchase of 280 additional vehicles so as to achieve 100 percent primary and secondary collection. Neighborhood collection stations with containers for depositing refuse are included, particularly for inaccessible low-income areas. Equipment for street, land, and stormdrain cleaning also are included. In addition, garages and maintenance shops are provided in the five major municipalities, as are two transfer stations in Olinda and Recife South. Lastly, two large-scale sanitary landfills would be constructed and put into operation during the life of the project. Using technology already in operation in Sao Paulo, both sites would be equipped to produce bio-gas (methane) that would be transmitted to adjacent industries. According to the appraisal report, 80 percent of the benefits of this component would be directed towards the urban poor.

Cost recovery information in the appraisal report indicates that garbage collection taxes do not cover the costs of operation. Nonetheless, it is expected that the production of gas would generate revenues adequate to cover 100 percent of the cost of sanitary landfills and the gas production plant.

One of the primary objectives of the component is to eliminate a gap in the region's institutional structure through the creation of a responsible agency to manage garbage disposal in the metropolitan region. The feasibility study for the component indicated that the best solution would be the creation of an autonomous company. Therefore, FIDEM [3/] (which prepared the project) would operate the region's disposal system in its initial two-year phase, and then hand over operations to a new company. In the meantime, the project made provisions for hiring a management consulting firm to recommend a detailed structure for the new company.

8.4 Implementation

Due largely to political differences between the Governor of Recife and opposition mayors as well as environmental concerns raised by a prominent environmental group in Sao Paulo, the large-scale landfill facilities with gas recovery were not implemented as planned. The environmental group held a public

---

3/ Foundation for the Development of the Metropolitan Region of Recife.

forum to condemn the project because of the perceived threats to the Matta Grossa Forest and the potential for leachate to enter a nearby river. According to one project officer, however, these concerns were unfounded, particularly since a number of municipalities were dumping their raw sewage into the same river. Moreover, the same environmental group posed no objections to an earlier project that was environmentally unsound. With respect to the North landfill site, other local concerns related to the need for a separate access road and monitoring of stormwater runoff and the underlying aquifer. Objections from neighborhood residents as well as the need to relocate over 120 squatters complicated the acquisition of the South sanitary landfill.

Due to the various problems surrounding project implementation, the 12 affected municipalities adopted a revised metropolitan program that designated strategic locations for sanitary landfills, composting plants, and transfer stations which the municipalities would operate cooperatively. Accordingly, the project financed subsequent construction of three sanitary landfills, six composting plants, and one disposal facility to handle hospital waste. The facilities are now operated by the Metropolitan Solid Waste Sanitary Department, also created under the project. (One of the transfer stations as well as the original North landfill also were constructed but never operated.)

This project demonstrated the effectiveness of municipalities working together to solve metropolitan-wide solid waste problems in a coordinated manner. As a result of the solid waste component, representatives of the twelve municipalities met every week to solve their common solid waste problems (e.g., land needs for transfer stations). This component also showed that substantial savings can be achieved through the use of low-cost primary collection methods (i.e., locally-manufactured donkey carts). According to one project officer, labor costs for primary collection in some areas was reduced by as much as 95 percent. Although the Recife Project was originally scheduled to close on December 31, 1988, the Bank has extended the loan for another year.

ANNEX 9

SOLID WASTE MANAGEMENT PILOT PROJECT, MEXICO (LN 2669-ME)

9.1 Project Background/Objectives

A joint Bank-Mexican sector study, undertaken in late 1983, concluded that the solid waste subsector posed serious problems and recommended assistance for its development. In February 1984, the Government requested Bank assistance to help prepare a first project to develop the subsector. The resulting project was appraised in July-August 1985. In March 1986, the Bank approved a US$25.0 million loan to BANOBRAS (National Bank for Public Works and Services).

The objectives of the Solid Waste Management Pilot Project are to: (i) assist the Government to more clearly define solid waste subsector objectives and policies and to develop national and local institutional capability to improve solid waste management; (ii) improve collection and disposal services through pilot sub-projects; (iii) test and evaluate alternatives for promoting cost savings, providing training, and channelling funds in the subsector; (iv) develop a basis for cost recovery for solid waste services; and (v) provide a basis for preparing full-scale solid waste management improvement projects. In December 1985 prices, the total cost of the project was estimated at US$50.0 million equivalent (including taxes and contingencies).

9.2 Solid Waste Conditions

At the time of project appraisal, solid waste collection, transfer, and final disposal were inadequate in virtually every city. Collection service, often erratic and inconsistent, was available only to 70 percent of the urban population, and generally provided with limited and/or aging facilities, deteriorating equipment, and untrained personnel. Adequate final disposal techniques were applied to only five percent of the total volume of wastes collected. In 90 percent of Mexico's cities, another problem concerned the increasing amounts of industrial and toxic wastes. For example, the electro-mechanical industry generated large amounts of PCBs. These and other toxic substances were being stored, dumped, or discarded in unknown locations around the country.

While the Secretariat of Urban Development and Ecology (SEDUE) is responsible for establishing regulations and norms for the solid waste subsector, municipalities are responsible for the collection and disposal of municipal solid wastes. Responsibility for collection, transport, storage, treatment, and final disposal of toxic and industrial wastes rests with the generating industries, SEDUE, and in some cases, the municipalities. At the municipal level, various arrangements are employed to handle waste management. In many municipalities, one department is responsible for collection, transport, disposal, and fleet management and repair. Other municipalities have a separate department of

transport to handle management, maintenance, and repair of all municipal vehicles. In others, a municipal "empresa" (company) handles all aspects of waste management, including fleet management. Contract and/or private collection is employed in a few municipalities, usually to cover specific zones and institutions (hotels, hospitals, restaurants etc.). At the time of appraisal, there were virtually no inter-municipal cooperative arrangements or organizations to promote and manage shared facilities and equipment.

Poor operational performance has been another problem confronting solid waste services throughout Mexico. Due to a lack of planning and funds to regularly re-stock spare parts, about 25 percent of the most organized municipalities' operative fleet are out of service at any given time. Although solid waste management is estimated to consume up to one third of municipal budgets, there are no systems to record and compile the costs of solid waste operations. There are no data on employees per ton of waste collected or disposed of. As the appraisal report notes, without proper cost data, cost efficiency is not even an issue of concern, much less a goal to be achieved. Further, few (if any) cleaning agencies attempt to minimize raw refuse or provide separate areas for hazardous wastes. Route planning for waste collection and disposal and proper vehicle operation are particularly weak.

9.3 Solid Waste Component

Designed to address the above issues, this free-standing solid waste project consists of two major components. The pilot component finances the development, testing, and evaluation of replicable techniques for the delivery of services in about eight medium-sized municipalities and one metropolitan area. The component includes civil works, equipment and materials, training, and technical assistance to: improve repair and maintenance facilities; establish a metropolitan waste management enterprise in Monterrey; develop low-cost collection systems for markets and marginal zones; construct transfer stations, materials recovery facilities, sanitary landfills, and industrial waste disposal sites/cemeteries; improve institutional, financial, and organizational arrangements; and develop public education campaigns. The total cost of this component was estimated at US$40.09 million.

The national component, which would be executed at the federal level, includes technical assistance, consulting services, studies, and equipment to: (i) define subsector policies and options for effective and efficient delivery of services and to reduce the dependence on the Government budget; (ii) strengthen institutions; (iii) develop plans to address subsector constraints; (iv) undertake plan preparation and pre-feasibility studies in 26 selected cities; and (v) prepare follow-on solid waste management projects. The total cost of the national component was estimated at US$9.09 million.

The project was initially designed to be implemented over a four-year period. The implementation period was subsequently increased to eight years based on experience with water supply projects in the Region.

9.4 Implementation

By the start of project implementation, all of the original cities, except two (Monterrey and Acapulco), withdrew from the project due to a combination of factors: loss of political momentum and lack of interest at the local level; changes in local government administration; inadequate information on start-up procedures by the project coordinating unit; lack of counterpart funds for the pilot and national components; need for better institutional coordination at the state and municipal levels; inadequate preparedness within the project's technical coordinating unit (SEDUE) and within BANOBRAS (National Bank for Public Works and Services), the borrower; and allegedly high interest rates charged under the project. As a result of actions agreed upon by the Bank by the end of the first supervision mission, however, two areas (Puebla and Merida) expressed continued interest in the project. In addition, SEDUE proposed two more cities (Guadalajara and Mexicali) to replace others that dropped out.

As of June 1988, SEDUE's commitment to promoting the Solid Waste Management Pilot Project had not been strong, due primarily to the weak project unit. Only one city (Monterrey) signed a subloan agreement with BANOBRAS. As part of this sub-project, Monterrey developed a public decentralized company at the state level to dispose of the solid wastes of a population of about three million in eight municipalities within the Monterrey metropolitan area in the State of Nuevo Leon. The company, known as SIMEPRODE, has a Board of Directors whose president is the State Governor and members are representatives of the eight municipal mayors, the labor union, the chamber of commerce, and the industrial association. SIMEPRODE will operate four transfer stations, 24 transfer trailers, and a sanitary landfill. Although each municipality will be responsible for collecting and delivering the waste to SIMEPRODE installations, SIMEPRODE will establish a program for one municipality to collect solid wastes in low-income peri-urban zones. The company also will sign technical assistance agreements with the municipalities and advise on such matters as equipment selection and micro-routing. SIMEPRODE will not handle hazardous wastes which will go to a privately owned and operated confinement site.

At the time of this writing, SIMEPRODE's facilities have been constructed and are expected to be operational by September 1989. The cost for establishing SIMEPRODE during the period 1987-1988 was about US$10 million, with 43 percent financed through the World Bank loan, 32 percent through federal grants, and 25 percent through state and municipal sources. Operational revenues are expected to come from tipping fees paid by all municipal and private vehicles delivering waste. (The municipalities will pay the fees out of the portion of property tax revenues earmarked for solid waste services.) The amount of these fees will be determined after the first year of state-funded operations.

In addition to the progress made under the Monterrey sub-loan, there has been further improvement in the project's implementation. The cities of Acapulco, Durango, Merida, and Tampico were included in the pilot component; feasibility studies were contracted for ten cities, and there has been improved coordination within SEDUE and between SEDUE and BANOBRAS. Further, an April 1989 supervision mission reported that the Technical Coordinating Unit had been strengthened with staff and sufficient budget funds; the main factors accounting for the improvement in project execution. In addition, the supervision mission that visited the subprojects in Durango, Acapulco, and Tampico found no major technical or engineering problems; the sites for the proposed sanitary landfills were inspected and found to be satisfactory.

With respect to the national component, progress has been made in carrying out the pre-feasibility studies. The generic studies to define solutions and options for solving fundamental solid waste management problems, however, have not been undertaken. To date, the costs for the project are estimated at US$35.2 million, which leaves about US$14.8 million for implementing the remainder of the project.

BIBLIOGRAPHY

Cointreau, Sandra. "Environmental Management of Urban Solid Wastes in Developing Countries: A Project Guide." World Bank Urban Development Technical Paper, no. 5. Washington, D.C.: World Bank, June 1982.

Department of the Environment. "Landfilling Wastes: A Technical Memorandum for the Disposal of Wastes on Landfill Sites." Paper No. 26. London: Her Majesty's Stationery Office, 1986.

Flintoff, Frank. Management of Solid Wastes in Developing Countries. WHO Regional Publications South-East Asia Series no. 1. 2d ed. New Delhi: World Health Organization, 1984.

Holmes, John R. "Solid Waste Management Decisions in Developing Countries." In Managing Solid Wastes in Developing Countries, Ed. John R. Holmes. Chichester: John Wiley & Sons, 1984.

United Nations Centre for Human Settlements (Habitat). "Refuse Collection Vehicles for Developing Countries." Nairobi: UNCHS, 1989.

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS388	The Distortionary Effects of Tariff Exemptions in Argentina	Faezeh Foroutan	March 1990	S. Fallon 38009
WPS389	Monetary Cooperation in the CFA Zone	Patrick Honohan	March 1990	Wilai Pitayato-nakarn 37666
WPS390	Price and Monetary Convergence in Currency Unions: The Franc and Rand Zones	Patrick Honohan	March 1990	Wilai Pitayato-nakarn 37666
WPS391	Wealth Effects of Voluntary Debt Reduction in Latin America	Daniel Oks	April 1990	S. King-Watson 31047
WPS392	Institutional Development in World Bank Projects: A Cross-Sectional Review	Samuel Paul	April 1990	E. Madrona 37489
WPS393	Debt-for-Nature Swaps	Michael Occhiolini	March 1990	S. King-Watson 31047
WPS394	Threshold Effects in International Lending	Mark M. Spiegel	April 1990	S. King-Watson 31047
WPS395	How Gambians Save — and What Their Strategies Imply for International Aid	Parker Shipton	April 1990	C. Spooner 30464
WPS396	Strategic Trade Policy: How New? How Sensible?	Max Corden		
WPS397	Antidumping Regulations or Procartel Law? The EC Chemical Cases	Patrick A. Messerlin	April 1990	S. Torrijos S8-033
WPS398	Agricultural Extension for Women Farmers in Africa	Katrine A. Saito C. Jean We demann		
WPS399	Macroeconomic Adjustment, Stabilization, and Growth in Reforming Socialist Economies: Analytical and Policy Issues	Andrés Sclimano	April 1990	E. Khine 39361
WPS400	Macroeconomic Constraints for Medium-Term Growth and Distribution: A Model for Chile	Andrés Solimano	April 1990	E. Khine 39361
WPS401	Policing Unfair Imports: The U.S. Example	J. Michael Finger Tracy Murray	March 1990	N. Artis 38010

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS402	The GATT as International Discipline Over Trade Restrictions: A Public Choice Approach	J. Michael Finger	March 1990	N. Artis 38010
WPS403	Innovative Programming for Women in Agricultural Extension: The Case of MIDENO in Cameroon	S. Tjip Walker		
WPS404	Labor Markets in an Era of Adjustment: The Chilean Case	Luis A. Riveros		
WPS405	Investments in Solid Waste Management: Opportunities for Environmental Improvement	Carl Bartone Janis Bernstein Frederick Wright	April 1990	S. Cumine 33735
WPS406	Township, Village, and Private Industry in China's Economic Reform	William Byrd Alan Gelb		
WPS407	Public Enterprise Reform and the World Bank: Approach, Practices, and Challenges	Ahmed Galal		
WPS408	Methodological Issues in Evaluating Debt-Reducing Deals	Stijn Claessens Ishac Diwan		
WPS409	Financial Policy and Corporate Investment in Imperfect Capital Markets: Evidence from Korea	Mansoor Dailami		
WPS410	The Cost of Capital and Investment in Developing Countries	Alan Auerbach		
WPS411	Institutional Dimensions of Poverty Reduction	Lawrence F. Salmen		
WPS412	Exchange Rate Policy in Developing Countries	W. Max Corden		
WPS413	Supporting Safe Motherhood: A Review of Financial Trends	L. M. Howard		
WPS414	Supporting Safe Motherhood: A Review of Financial Trends, Executive Summary	L. M. Howard		
WPS415	How Good (or Bad) are Country Projections?	Norman Hicks Michel Vaugeois	April 1990	M. Berg 31058

END