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Institutionalizing Household Waste Collection: The Urban Environmental Management Project in Côte d'Ivoire

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ABSTRACT

The efficient disposal of municipal solid waste is critical in maintaining the quality of urban life. Household waste removal is one of the key factors in ensuring the health and safety of the population, but is often neglected in rapidly growing cities of the Third World. This paper presents a case study of the Urban Environmental Management Project in the Côte d'Ivoire in which groups of young entrepreneurs were trained to collect household solid waste in small cities of 20,000–50,000 inhabitants located outside the capital region. The project was a joint collaboration of the US Peace Corps and the Ministries of Interior and Health in the Côte d'Ivoire. It was conceived as a local response to an increasing municipal service burden caused by the national economic crisis of the 1990s and the government's efforts to reduce the size of the national budget by decentralizing services to cities. While community based solid waste strategies have been successful in large cities in other countries, this project demonstrates the potential for innovative arrangements at lower levels of the urban hierarchy. The paper also emphasizes the importance of formalizing public–private institutional arrangements in order to ensure their long term sustainability. © 1997 Elsevier Science Ltd. All rights reserved

HOUSEHOLD WASTE COLLECTION AS A RECURRENT URBAN THEME

Cities throughout history have struggled with how to collect and dispose of the refuse generated by their populations. The world's earliest cities were established in the Middle East, and their locations remain visible to the trained eye even after thousands of years. Throughout this cradle of urban civilization, stretching from Mesopotamia to the Fertile Crescent, there are large free-standing hills known as "tells" which are the remains of ancient cities that never resolved their garbage problems. Archaeologists who have excavated these hills suggest that as trash accumulated over the years, the city dwellers simply built additional stories to literally keep their heads above the garbage (Niemczewski, 1977, p. 11).

In the modern age the efficient disposal of municipal solid waste is recognized as

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critical in maintaining the possibility of urban life. Household waste removal is recognized as one of the key factors in ensuring the health and safety of the population. Accordingly cities have developed complex procedures for handling waste and have established a variety of institutional mechanisms to ensure that those procedures are adhered to. In the United States, for example, many cities have adopted regulations which govern the kinds of materials which can be thrown away by a household or business, the types of containers that they must be placed in, the kind of equipment which must be used to pick up that waste, the exact procedure to be used for disposing of that waste in a sanitary landfill, the specifications for liners, covers, and aeration procedures for those landfills, and the proportion of the cost of this "service" to be paid by the consumer.

In other parts of the world rapid urbanization, a limited income base, and inadequate management capacity at the municipal level have overloaded the ability of cities to provide basic services and caused numerous social ills, requiring spatial policy correctives (Doan, 1995a). Urban growth has been so rapid that city governments are often unable to cope with the most basic issues including municipal solid waste. While "urban" problems have attracted the most attention in the largest cities, the rapid rate of growth in secondary cities has created a growing problem in these places also. Unfortunately most of the resources available for urban infrastructure are absorbed by investments in the largest and most visible cities, leaving little or no resources for critical improvements in cities further down the urban hierarchy. These cities often have few resources of their own and are constrained by low economic multipliers due to the leakage of existing economic resources (Doan and Lewis, 1993).

Secondary cities have a great many needs in the area of basic infrastructure and services, but solid waste collection is a pressing problem which is increasingly demanded by urban residents (Altaf and Deshazo, 1996). Although collection costs in smaller cities may be high, disposal costs are typically low because of the use of uncontrolled dump sites making this a problem that can in fact be addressed by municipalities. Establishing an effective collection system requires an investment of time and a substantial operating budget which may range from 10–40% of the city's operating budget of which 90% may be for the collection and transportation of wastes (Cointreau, 1984, p. 151). The exact amount required is a direct function of the amount of participation and the type of technology used to haul the waste at each of several stages in the waste collection process. Unfortunately the lack of appropriate local institutions to take on this task is a constraint (Table 1).

Why has the household waste problem surfaced at this time with such apparent intensity and in such diverse countries? In large part this is due to the fact that the volume of household waste produced is growing larger each year. Engineers who study solid waste issues typically use models based on the unit waste factor (the average amount of solid waste produced per person per day) to estimate the total volume which must be collected. Thus the rapid increase in population in secondary cities (estimated in Côte d'Ivoire to be in excess of 7% per year[1]) is responsible for at least an equivalent increase in the volume of garbage produced. However, in addition to population growth, the nature of the waste itself is also changing because of development-related changes in consumption patterns. For example, in Côte d'Ivoire consumers have begun to use both plastic bags and other plastic packaging which have created a whole new category of waste in this region.

The rate of increase of municipal solid waste can be staggering and the sheer volume which must be handled in larger cities has often been used by engineers to

[1]Various estimates of population growth suggest that urban population is growing at a rapid rate. A recent World Bank staff report placed the rate of growth in secondary cities at 7.6%, while Abidjan continues to grow at a rate of 9% (World Bank, 1989). Other estimates suggest a somewhat lower rate of growth for Abidjan (4.4%), and rates of 7% for the cities adjacent to Abidjan (Serageldin, 1990).

Table 1. Growth of solid waste stream

	Population	Trash generated per day (kg)	#pre-col. teams	#Households	Trash generated per year (tonnes)
Year 1	50000	12500	63	6250	4562.5
Year 2	53500	13375	67	6688	4881.9
Year 3	57245	14311	72	7156	5223.5
Year 4	61252	15313	77	7656	5589.2
Year 5	65540	16385	82	8192	5980.5

Assumptions
Hypothetical city with population of 50,000
Assumed constant population growth rate of 7%
Assumed constant trash generation rate of 0.25 kg per day
Assumed 200 kg per day collection rate of one pre-collect team
Assumed eight people per household
If we use a generation rate of 0.25 kg per person per day which has been suggested based on data from Ghana (Holmes, 1984, p. 15), then we can predict increases in the weight and volume of the waste stream. The table illustrates the hypothetical case of a city with a population of 50,000. If we assume that it is growing at a rate of 7% per yr, then after 1 yr the population will be 53,500 and the daily volume of trash will be 13,375 kg. According to M. Joseph Ngatta (Personal communication to the author, July 1994) using a four-wheeled cart an average pre-collect team can pick up 200 kg of trash per day. Our hypothetical city would therefore require 63 pre-collect teams to cart away all the trash generated in the city during the first year. By year five the city would require 82 pre-collect teams. The estimated number of pre-collect teams required to pick up this trash would increase from 63 to 67.

justify capital-intensive, mechanized solutions to the disposal problems (Haynes and El-Hakim, 1979). However alternative methods of collecting solid waste at the household level which require greater local institutional involvement have been shown to be quite effective (Furedy, 1992), especially in smaller cities where budgets are extremely tight. The *zabbaleen* in Cairo are one example which has attracted attention because of their labor intensive solution to the solid waste problem (Meyer, 1987; Assaad, 1993, 1996). This case illustrates the importance of appropriate institutions to protect the rights of all parties concerned (Table 2).

A further explanation for the increased interest in the collection of municipal solid waste in Africa is that during the past two decades economic conditions in this region have gone from bad to worse with a few notable exceptions.[2] After years of grinding poverty, the public has grown to mistrust governments which are so mired in corruption. Recent reforms which have swept through many African countries in response to this mistrust include decentralization strategies intended to reduce the size of central government as well as increase their efficiency (Doan, 1995b). At the municipal level the residents have taken greater interest in the provision of various public services (including water, sanitation, electricity, and household waste collection), but the visibility of solid waste has made it a symbol of a more responsive public sector.

The paper examines efforts to improve household solid waste collection in the Côte d'Ivoire that illustrate some of these concerns. This paper presents the case of an ongoing project which uses young entrepreneurs and municipal workers to collect household waste in smaller cities around the country. The next section briefly examines economic and political conditions in the Côte d'Ivoire, and then turns to the specifics of the case.

BACKGROUND ON CÔTE D'IVOIRE

Rapid economic growth and then stagnation

From 1960 to 1975 the rate of economic growth in the Côte d'Ivoire was on average 8.9% per year based largely on revenues from coffee and cocoa production (Penouil,

[2]Ghana's performance in the late 1980s is generally regarded as an "economic miracle", but it is less clear whether its turnaround is due to the validity of the structural adjustment model used or to the depths to which the economy had descended during the previous decade.

Table 2. Composition of the waste stream in several West African neighborhoods

	Components mean by weight			
	Ibadan, Nigeria (Oluwande, 1984)		Accra, Ghana (Holmes, 1984)	
	Local university campus	Lower income area	Cantonment (govt. housing)	Kaneshie
Leaves	28.1%	49.9%	69.0%	90.9%
Garbage	43.2%	4.4%		
Paper	8.1%	0.7%	15.5%	3.0%
Tin	3.7%	0	7.0%	2.2%
Glass	4.3%	0	1.5%	0.7%
Rags	2.0%	0.5%		
Dust	10.6%	44.5%		
Plastic			3.7%	0.5%
Other			1.4%	1.6%

1981). The fall in the price of coffee and cocoa in 1980 sparked a severe economic crisis in which the government had to request assistance from international donors and in 1981 was forced to accept its first Structural Adjustment Program (SAP) containing a package of reforms to encourage competition, and reduce the size and influence of the public sector. The drought of 1983 exacerbated existing conditions in the Côte d'Ivoire which resulted in an even more stringent second SAP. In addition, the country experienced a 30% decline in aggregate consumption between 1987 and 1989, suggesting a widespread decline in the standard of living (Grootaert, 1994). Economic policy measures during this period included a freeze on civil servant salaries, a hefty reduction in government expenditures, and the elimination of price supports for coffee and cocoa (Lambert *et al.*, 1991). However it was not until the devaluation of the CFA, the currency used in most Francophone West African nations, in January 1994 that the economy turned around.[3]

Emphasis on governance and decentralization

Côte d'Ivoire held its first municipal elections in 1980, but it was not until 1990 that President Houphouet-Boigny's call for genuine multi-party elections set the stage for wider political and administrative reforms. During this period democratically elected municipal governments gradually assumed more control of local affairs. In addition, economic adjustment policies forced the central government to shrink the size of the annual budget and in particular to reduce the public sector payroll. Transferring responsibility for a range of basic services to local government agencies was viewed as the best solution because municipal employees were not classified as part of the "civil service." Unfortunately local government budgets were not increased to pay for the increasing array of services for which they were given responsibility, effectively shifting the fiscal crisis to cities.

At the same time municipal officials began to recognize that if they wished to be reelected, they had to demonstrate their effectiveness and find ways to be more responsive to the people who voted for them (Attahi, 1989). In addition a number of donor funded efforts began to provide assistance to local governments seeking to improve the delivery of decentralized services with the aim of strengthening local democracies (Manor, 1995; Doan and Robbins, 1994). In conversations with local officials it is obvious that there is increasing interest in resolving the problem of

[3]A recent article in the *Economist* ("CFA-franc zone: out of Africa", January 14, 1995) suggests that Côte d'Ivoire, Mali, and Burkina Faso are the three countries that have received the greatest benefit from the devaluation because their exports have increased dramatically and domestic inflation has been kept in check.

municipal solid waste.[4] These local leaders perceive that the household waste problem is a relatively inexpensive one[5], with a large potential pay-off in terms of visible benefits to communities, and hence will be likely to enhance the leader's re-election chances. The problem they face is how to develop local institutional mechanisms to resolve this problem.

The next section of this paper examines a household waste management intervention undertaken by the US Peace Corps in the Côte d'Ivoire. This example illustrates both the potential for donor assistance at the local level, but also the complexity of providing technical assistance to smaller municipalities in which local planning capacity is either limited or virtually non-existent. The paper then examines the usefulness of a strategy to create local groups of private sector entrepreneurs to function as garbage collectors in a number of cities.

CASE STUDY—URBAN ENVIRONMENTAL MANAGEMENT PROGRAM

The Urban Environmental Management Project (UEM) in Côte d'Ivoire was initially developed by the US Peace Corps to address a range of environmental and sanitation issues in smaller cities (Hughes, 1992). While the system of basic infrastructure in Côte d'Ivoire is comparatively well developed with respect to other African countries, the level of investment in intermediate cities is still far from sufficient to meet the needs of its growing population especially in many smaller cities in the interior. As a result municipalities have been operating on shoestring budgets with virtually no funds for operation and maintenance.

In late 1990 representatives from the Peace Corps Office for Training and Program Support (OTAPS), the Ministry of the Interior, and USAID's Regional Housing and Urban Development Office (RHUDO) came together to design a project to control urban waste, manage urban infrastructure, and find ways to improve the urban environment. The project objectives included: (1) developing locally based waste and sewage management systems and other environmental activities (2) establishing community organizations to initiate or strengthen cooperation between neighborhoods and municipal technical services staff, and (3) strengthening relationships among municipalities and other public/private organizations (Peace Corps, 1992).

Volunteers assigned to the UEM project were placed initially in six small cities ranging in size from 15,000 to 50,000 inhabitants. Subsequently additional volunteers have been placed in a number of other cities of similar size and distance from Abidjan. Typically two volunteers are assigned to each site, where one volunteer fills a technical position (with an engineering or urban planning background) and the other fills a community development/environmental education position. The volunteers are formally affiliated with the Ministry of the Interior, but have an informal partnership with the Ministry of Health. The Interior affiliation is through the Department of Local Government which is charged with the oversight of Municipal Affairs and has a variety of technical staff working in

[4]In the summer of 1994 in the context of an evaluation of a USAID-funded Urban Development Project (the Municipal Management Training Project), the author had the opportunity to visit a number of secondary cities in Côte d'Ivoire, Burkina Faso, and Mali. One of the common themes that surfaced in cities in conversations with mayors and elected officials in smaller cities in each of these countries was the preoccupation with the problem of municipal solid waste. The elected mayors and municipal councilors all expressed concerns about finding some way to deal with their mounting problem with municipal solid waste. These officials were all concerned about the prospects of upcoming elections and felt that this problem could be resolved with a modest amount of effort.

[5]Costs are extremely low for municipal solid waste collection because typical disposal methods are little more than open dumps or at best a dump with a thin coating of soil. The long range costs of problems such as groundwater contamination are obviously not being factored into local decision-making. However given the extremely adverse conditions, these long-term issues would still be discounted due to the short-term benefits of getting the trash off the streets.

the municipal offices. The Health linkage is through the Department of Social Development which oversees a Social Center in each of the cities.

In principle the technical volunteer works more closely with the technical services staff of the municipality and the community development volunteer works more closely with community groups and the social center. However, there is fluidity in these affiliations and the volunteers end up working with whomever is most interested in a particular environmental project at a given point in time. Teamwork and flexibility are key ingredients in the overall success of the project. By pooling volunteer skills and knowledge in this way the project assures that the volunteers are reasonably well prepared for the range of problems which may need to be addressed in a given locale.

The solid waste activity is only one of various projects with which UEM volunteers are concerned, but its high visibility has stimulated a good deal of interest. At first glance it might appear that the technical problem of collecting solid waste would fall squarely within the domain of the municipal technical services division. All households with electricity are assessed a small fee on their monthly electric bill which is collected by the centralized tax department, the Direction Générale des Impôts, which is designated for municipal trash collection. Unfortunately because of the highly centralized fee collection system the municipalities actually receive only a small proportion of this revenue. The lack of adequate funding constrains municipal solid waste collection. Although most cities do have a single, aging, multi-purpose dump truck, it is used frequently for myriad other small tasks as well as for garbage collection. When it is not needed for other uses or is not broken down, it is nominally available to pick up garbage. However in most cities it is simply not feasible to collect household solid waste with a single truck available on a part-time basis only.

PRE-COLLECTION SYSTEM ELEMENTS

Because of these severe resource constraints UEM volunteers responded by organizing groups of unemployed (or under-employed) young entrepreneurs from the community to collect solid waste from participating households and transport it to a transfer station located centrally in each neighborhood. Such community based efforts are not new, but most such experiences occur in the largest metropolitan areas in a country. For example Furedy (1992) describes community-based solid waste options in Bangalore, Madras, Manilla, and Jakarta, all cities of over a million inhabitants. The innovative nature of this project was the demonstration that such strategies could be widely replicated in small cities where the population density, income levels, and access to technical assistance were much more limited.

The collection technology used in this system is quite basic: the collection agents gather household trash in small buckets or baskets which they carry from each subscribed household compound using either a wheel-barrow or a simple push-cart. When these human-powered carts are filled, the collectors push them to the designated intermediate collection point (*abri poubelle*) built by the city for each neighborhood. The municipal truck can then pick up the trash from the transfer point in a much more efficient fashion and transport the trash from this point to the dump, usually located outside the city limits. This particular system is called a pre-collection system.

In every household waste collection system, the participation of the population is an essential component (Ohnesgoren, 1993). They may be required to store waste within the household until it can be collected or may have been convinced by mass education programs to empty their own trash directly into the trash collection vehicles (Oluwande, 1984). In contrast, in more developed countries municipal solid waste workers are responsible for collecting the trash at the household level and

moving it to a local collection point. This collection process can involve vastly different levels of transportation technology, ranging from human-powered wheelbarrows and hand carts to animal-powered donkey carts to motorized tractors and expensive trash collection vehicles (Holmes, 1984). The number of intermediate collection points is largely a function of the level of technology in use and the density of the population. There are large variations in the number of workers required to provide trash collection services in a given city. For instance relatively poor countries may require as many as 10–50 workers for every 10,000 people, whereas middle-income countries may substitute some capital for labor and use 5–30 workers per 10,000 people, while more developed countries like the US might use just five workers per 10,000 people (Cointreau, 1984, p. 174).

In the UEM case there are some inefficiencies in the current system because not all households are required to participate. In addition the service is provided by essentially informal and unregulated pre-collection groups working in each neighborhood. Each group must do its own marketing and collect its own fees, but there is no municipal sanction for households that do not participate. At the same time if the pre-collectors do not provide careful and timely service, the households have no ability to appeal to higher authorities for assistance.

There are three main components to the UEM solid waste collection project. First there are the activities at the neighborhood level including a public awareness campaign. Next there is the selection and training of teams of young entrepreneurs, and finally there is the critical liaison role between the entrepreneurs and the municipality.

Creating environmental awareness at the neighborhood level

Most of the initial work on this project focused on the community development end of the project. Studies have shown that there is little awareness of the public health consequences of urban waste (Mensah and Whitney, 1991). Accordingly volunteers worked with each city's Social Center staff or other interested groups to set up a public awareness campaign about the environmental and health problems which result from improper garbage disposal at the neighborhood level. While the accumulation of trash in the streets was highly visible and considered by some to be an eyesore, there was less understanding of the public health implications of this problem.

In some areas related issues such as storm-water drainage were also discussed because storm-water run-off gullies are common informal "dumping" places for household trash. The ultimate objective of the campaign was to discourage households from simply throwing garbage into the streets and to encourage each household to pay a small weekly or monthly fee for house to house garbage collection. In some areas neighborhood work days to clean up particular problem areas were organized as a means of raising local consciousness and empowering the local population to resolve basic issues on their own.

Developing local entrepreneurs

Organizing young men and women into viable enterprises was a critical component of the project. First, these young people needed specialized training in several areas including how to handle the technical details of solid waste collection. They learned the proper method of handling the waste generated by each household using protective gear (buckets, baskets, gloves) and appropriate equipment for transporting the waste to the nearest transfer station (push carts, wheel barrows, other transport mechanisms). In some cities donors provided special equipment (USAID and the French embassy), but the entrepreneurs who benefitted from these benefactors failed to maintain their basic equipment in good working order. The lack of basic

maintenance procedures caused general problems due to frequent equipment breakdowns and the need for time-consuming and costly repairs.

Second, these groups also needed rudimentary small business skills including how to: maintain accurate records, use and maintain their equipment, estimate regular expenditures, calculate typical monthly incomes, and analyze the market potential for expanding their service to more households. Many of the beginning entrepreneurs had left school early which complicated the training in basic record-keeping and accountability. Several groups had problems of inaccurate collection records which caused dissension among the members of the group about the fair allocation of returns to each of the group members.

Third, part of the training included exercises to encourage entrepreneurs' willingness to explore spin-off activities to diversify their incomes. Because the potential remuneration from collection activities is low, spin-off activities are an important means to supplement incomes. Peace Corps volunteers explored a variety of income generating projects including recycling, composting, biogas, and using some of the wastes for livestock projects. Unfortunately in many of the smaller cities the volume of recyclable material in the waste stream is low so that this activity is not yet highly remunerative except in larger cities like Abidjan. Although competition over recyclables from existing scavengers has been cited as a problem in other regions (Huysman, 1994), the volume of recyclable materials in the UEM cities is considerably lower than in larger and higher income metropolitan areas. In addition in small cities households are likely to retain more rural consumption habits in which all usable materials are sorted and saved by the household rather than discarded reducing the return to potential scavengers. Composting has been quite successful elsewhere in West Africa (Lewcock, 1995) and livestock projects also show some promise.

Establishing linkages with the municipality

This role is the least developed, but is potentially the most critical for the long term sustainability of the project. In general the UEM volunteers had reasonably good ties with the Mayor and other municipal employees and provide a quasi-official linkage between the entrepreneurs and the Mayor's office. However in general there are no clear-cut linkages or channels of communication between the municipality and these workers which poses a potential problem in the longer term. As the system is expanded throughout the city, the municipality will need to communicate directly and have at least some minimal oversight of these private service providers. In Cairo formalizing the informal dimensions of the municipality–zabbaleen institutional linkage was quite a challenge (Assaad, 1996).

While solid waste collection is a traditional area of concern for municipalities because of the public health dangers of poor collection practices, it is a public service which is often provided by one of four main forms of service provision: complete municipal involvement (public provision), management contracts, franchises, full private sector operations (Savas, 1977; Roth, 1987). In UEM project cities the service provision mechanism is not formally specified, but the relationship is somewhere between a management contract and a franchise. The groups of collection agents receive mostly verbal support from the city, if at all. Though arrangements vary from city to city, in general there is little direct interaction between the collection teams and the municipality. Ownership of the basic tools and equipment such as gloves, boots, wheel barrows, and/or push carts varies by city, but in all cases the city is responsible for collecting waste from each of the intermediate neighborhood collection bins, so the overall system is a mix of public and private service provision.

Project successes

A key benefit of this program is the demonstration to policy-makers that even in small secondary cities private entrepreneurs are capable of providing basic municipal services in sufficient quantity and with adequate service quality. In other sectors in Côte d'Ivoire the private sector has successfully provided municipal services to large metropolitan areas, generally through large scale. capital intensive companies such as the Societé des Eaux de Côte d'Ivoire, SODECI (see Attahi, 1989). However, the UEM project demonstrated that young school leavers in smaller cities were capable of providing basic services with only limited external assistance (other than supervision by Peace Corps volunteers). As noted earlier several groups did receive initial technical assistance and basic equipment from a USAID funded Municipal Development Support Project and several others received basic equipment from the French embassy (Doan and Robbins, 1994). These donations were not essential to project success and in some cases led to poorer maintenance than in other cities where groups had to raise their own funds for equipment.

The ability of some entrepreneurs to develop alternative revenue streams was also notable. The lack of recyclable material (metals, glass, paper) meant that the waste stream contains a high percentage of organic material which makes the garbage very suitable for composting and livestock projects. In Issia, Côte d'Ivoire, several pilot composting projects have been established. Because the costs of inorganic fertilizer are high, there is a reasonable prospect for expansion of "urban agricultural" projects here, although more detailed analysis of the impacts of price changes in fertilizer needs to be explored. Some neighborhood groups have experimented with alternative uses for organic wastes such as livestock-raising (primarily pigs), but they have not yet confirmed its economic viability.

In other cases backward economic linkages have been developed. For example, in Soubre, Côte d'Ivoire local artisans with the help of volunteers developed an innovative system for turning used tires into trash collection receptacles which are then sold to participating households. There is clearly scope for expanding this activity to other sites as long as the competition for used tires is not prohibitive (tires are also used to make sandals in some areas).

Finally another positive spin-off is the recognition of the importance of different gender roles on the project. Several groups implicitly recognized the importance of women in project decision-making since many urban management issues are tied to household management decisions made by women acting in their triple functions of production, reproduction, and community management (Moser, 1993). Several groups employed young women to take primary responsibility for collecting fees and ensuring household satisfaction with the service because they realized that women are likely to be the key decision-makers about participation in the household garbage collection effort, especially with regard to making the weekly payments for the trash collection services. These groups realized that young women could establish a better liaison with the women from the subscribing households. The implicit recognition that these women's concerns must be included in decision-making on these issues was a different kind of breakthrough. However, further consideration should be given to including women from the start in the discussion and decision-making about these issues.

Project limitations

There are a variety of problems which have resulted from poor communication and coordination. First, the relationship between the entrepreneurial groups and the municipal authorities needs to be more formally specified. Issues such as whether the city should provide financing for initial equipment or directly provide the equipment itself must be clarified. The entrepreneurs should know in advance whether

they will be expected to take this on by themselves and what oversight the municipality will provide to ensure the health and safety of the population. If the level of service provided by these entrepreneurs deteriorates the municipality must have some recourse for ensuring adequate performance of the task at hand. At the same time the entrepreneurs must have some recourse if the city fails to pick up trash from the central bins for several days/weeks effectively shutting down the system.

Second, there are some key equipment constraints at the municipal level which cause problems. The poor overall condition of the municipal truck results in frequent break-downs and causes large accumulations of garbage at transfer stations. In addition the budgetary crisis frequently means that funds for gasoline are in short supply which reduces the frequency of collection. When garbage piles up for days or weeks in a central location the whole effort to change household behavior vis-a-vis garbage is undermined, not to mention the health risks posed to the community. This is the most critical problem for the entire system. Some volunteers have tried to provide assistance to the head of municipal technical services with truck scheduling, but this is often a politically delicate subject.

Third, ensuring that household garbage is picked up as scheduled by the entrepreneurs should be a concern of the municipality requiring some form of general oversight or at least household level feedback on the quality of service provided by the entrepreneurs. In the US context there are a variety of institutional mechanisms for supervising the private collection of garbage (management contracts, franchises, etc.) which might be explored in the future or in other countries to create a clearer institutional link between the public and private sectors.

Fourth, since the UEM collection efforts in most cities are operating in a kind of pilot phase at this point, there are a variety of critical issues which have not been addressed about the expansion of coverage to other neighborhoods. Requiring households to participate in the process would be an excellent start. In addition if garbage collectors must expand their coverage to the whole urban population, decisions must be made about what groups should provide services to these new areas. It is extremely important to assess the ability of neighborhood organizations to take on some of the tasks involved in selecting additional entrepreneurs, monitoring their performance, and providing feedback to the municipal authorities. The allocation of additional groups of entrepreneurs to particular neighborhoods may require some degree of municipal supervision to ensure that poorer areas are not neglected. In fact in some countries groups are encouraged to develop routes in richer neighborhoods first which can then be used to cross-subsidize routes in poorer areas. For long term sustainability, it is important to involve neighborhood leaders in decision-making about their areas, especially to assist with selecting locations for transfer stations because few households are eager to have a garbage collection point in their vicinity.

REPLICABILITY OF THE UEM PROJECT

Economic viability of the project

Garbage collection schemes in other countries often involve additional means of generating revenue to supplement the modest fees which can be supported by low and moderate income populations. This additional income stream is often critical to making this occupation one which is capable of supporting a worker for more than just a year or two as short term employment. It is essential that the entrepreneurial groups explore alternative income sources related to solid waste collection.

At present in the UEM project cities household waste is being collected only in certain neighborhoods. In order for trash to be collected throughout each city

further investments in equipment will be needed to create a sufficiently large market niche for these entrepreneurs. While the transportation method used in the UEM at the moment is human-powered, other countries have had good success with carts powered by animals or bicycles or even with small tractors or other locally adapted technology (Holmes, 1984). Whether there is sufficient technical skill to support a moderately higher level of technology is not clear, but given the transportation constraint posed by the frequent breakdowns of the municipal truck, alternative transportation using appropriate technologies should be explored. There may also be a possibility for additional small business expansion in the fabrication of locally adapted push carts or other transportation equipment needed to ensure more efficient trash collection and transportation.

Additional analysis must be done in each city to assess the viability of activities such as composting. For example composting may have considerable economic potential in areas where urban agriculture is relatively common (Lewcock, 1995; Furedy, 1989; Asomani-Boateng *et al.*, 1996). Because it is expensive to transport the finished compost, the location of the farms in relation to the city, especially those small producers who supply fruits and vegetables to the urban area is critical to the profitability of this enterprise. In addition an assessment of the proportion of households in an urban area who continue to engage in some form of agricultural production for home consumption will influence the potential size of the market.

Another use of the organic material in the solid waste stream is to feed it to livestock. Local attitudes or experience with livestock, especially pigs, may also affect the ability of collectors to take advantage of this opportunity. If there are sufficient local skills/expertise with pig-raising and local consumers will eat bacon, pork, then there may be a local market for this product.

The volume of recyclable materials found in the waste stream will vary by level of development and consumption patterns in secondary cities. The key question is whether there are enough materials of sufficient value to make it cost effective to collect and sell these items. The size and location of local markets for these products is also a critical factor. In the UEM cities the volume of recyclable material was low, but in other cities with higher incomes or larger population the amount of potentially recyclable material may warrant increased attention. However if there is a reasonable volume of recyclable material, people may already be exploiting this niche, either at the neighborhood level or at the central city dump (Huysman, 1994). In this case decision-makers should incorporate traditional scavengers into the household waste collection groups.

Importance of institutional context

Decision makers need to pay careful attention to the institutional mechanisms for oversight and coordination of the household waste collection system. A more formal public–private partnership would facilitate the establishment of this kind of innovative service delivery arrangement and would ensure the participation of all households. A potential problem with unregulated private collection is the temptation to skim off the wealthiest households (who are most willing to pay and whose trash is likely to contain the most reusable materials) and leave the poorest households with no collection system. The attitude of the central government towards experimentation with local service delivery mechanisms is also important. The authority needed for service provision may in fact have already been decentralized to local governments. A key component of this authority is the local government's right to raise sufficient revenues to pay for their end of the service, i.e. to maintain the vehicles, pay the workers, and ensure adequate final disposal.

CONCLUSIONS

Fiscal pressures on central government budgets and elections at the municipal level have shifted responsibility for service provision to lower levels of government. Although this shift will require improvements in "municipal management", the best method to improve the management of urban systems has been the subject of much debate (Rakodi, 1990; Cohen, 1991; Ramachandran, 1993). The limitations of wholly public sector solutions to urban problems is acknowledged by most observers of the municipal scene in the African context, but the range of alternatives needs further exploration.

Efforts to improve municipal management through exploring alternative service delivery mechanisms, such as the UEM, are likely to be an essential component of the solution. The UEM project demonstrates in small African cities household waste collection strategies using groups of entrepreneurs can be quite effective. The UEM approach requires close cooperation with community members in setting up the program and the full cooperation of the Mayor and municipal council members to ensure that the municipal workers follow through on their part of the agreements. The UEM project provides a model for interventions in other small urban areas which are beset with similar problems throughout the region. The efforts of the Peace Corps volunteers to involve local community members and their ability to provide a range of technical skills when appropriate certainly facilitated this process.

However, in order to replicate this kind of project in other cities and other countries, a more formal institutional linkage between the municipality and the young entrepreneurs needs must be established. This is particularly the case for situations where the assistance of outside agencies is not available and the institutions must be established from scratch. Considerable potential exists for new institutional forms, but care must be taken to ensure their sustainability.

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