

CHAPTER XVII. POLICY ALTERNATIVES FOR IMPROVING SOLID WASTE MANAGEMENT

A. Introduction

Characteristically, in most developing nations, solid waste management and the provision of associated services are entrusted to a municipal agency. Associated services include all aspects of solid waste management, ranging from collection through final disposal. Another feature of solid waste management in developing countries has been the basing of important decisions upon findings made in a search for the least burdensome course of action. Not surprisingly, the almost inevitable outcome of such a limited course was the adoption of a solid waste management program that was unsatisfactory.

B. Decision-making

The proper approach to decision-making and program development is to take into account the combination of increasing demands and limited resources that usually prevail in developing nations. This combination necessitates the adoption of waste management systems that are based on practical and systematic methods. A further requirement is that program selection should essentially be a local activity, and should be a response to local needs. Consequently, no single formula is to be found that can provide a solution for every situation [1].

A serious problem that besets most developing countries is the high cost of solid waste management. Evidence of this difficulty is the fact that the expenses associated with providing solid waste services account for 10% to 50% of the revenue taken in by a typical municipality. Furthermore, deficiencies resulting from inadequate management cannot be remedied merely by resorting to increasing the already high expenditures. On the contrary, the attainment of high levels of efficiency in the overall system is one of the more effective means of expanding the coverage and improving the quality of the solid waste service.

Efficiency in solid waste management is a function of several fundamental factors. Factors of particular importance in a developing country setting may be classified as follows: 1) financial (e.g., budget, access to financing); 2) human resources (e.g., professional competence at the management and implementation levels, provisions for training personnel); and 3) pertinent political issues [2].

C. Financial aspects

C1. BUDGETARY issues

In comparison with those in industrialised countries, unit expenditures on solid waste management typically are larger in developing countries. The disparity arises in large part from the inefficiency and inadequacy characteristic of waste collection and transport in developing countries. The costs for collection services in a developing country generally range from US\$2 to US\$5/Mg. In a large metropolitan area, however, collection costs may be on the order of US\$10/Mg. This cost is high despite the fact that expenditure on disposal in developing countries is very low because the usual method of disposal is the open dump, unencumbered by environmental constraints.

The budgetary problem is aggravated by the failure of the public to appreciate the significance of the disproportionately high cost of solid waste management. This failure originates in the absence

of an understanding of the real costs associated with waste management, which is an outgrowth of a lack of awareness of the service charge, or of an erroneous belief that the charge only equals about 10% to 20% of the real cost.

A practice unfortunately typical of developing countries during periods of financial stress is the tendency to reduce funds allocated to maintenance of equipment and to the acquisition of supplies and replacement parts. This tendency has many unfavourable consequences, one of which is a sharp drop in the number of vehicles available for collection. Vehicle downtime may be as much as 40% to 60%. To maximise the number of functioning vehicles during times of financial stress, solid waste managers usually resort to cannibalising disabled vehicles to obtain parts for the repair of other vehicles. Another desperate measure is to keep vehicles in operation long past their useful lifespan [3].

C2. BUDGETARY reform

The objective of budgetary reform is the continuing assurance of an adequate solid waste management budget. A measure that would go far to the attainment of such an assurance is to give local governments the authority to defray solid waste management costs through the establishment of the necessary revenue base. Establishment of the revenue base can be facilitated through an updating of the cadastral. This can also be facilitated by amplifying the collection of taxes, fees, and licenses. Moreover, local governments should be empowered to levy and collect taxes from residents, including the imposition of user fees for solid waste services.

A serious problem arises from the three- to six-month delay that often intervenes between the drafting, approval, and appropriation of a budget for provision of solid waste management services and the actual receipt of the funds by the entity that provides the service. The problem is further aggravated by the fact that the amount eventually received almost inevitably is only a fraction of the original appropriation. Consequently, proper planning for the utilisation of the funds becomes extremely difficult. Another result is the unfavourable impact exerted upon the financial rating imposed by vendors and suppliers of equipment, replacement parts, and other items upon the solid waste service sector. The unfavourable rating has an inflationary effect upon charges for purchasing replacement parts and supplies. The inflation is an accommodation for the long delays in payment. Adding to the difficulties of the situation is the ineffectiveness of the budget cycle and an incorrect interpretation of the cycle.

A chronic shortage of funds in many municipalities intensifies the competition between the various departments within the municipalities for access to the limited funds that are available. This competition interferes with the proper balancing of the funds. Moreover, it encourages the absence of order and planning in the disbursement of available funds.

In summary, several measures can be taken whereby the required cash flow can be facilitated and maintained. Chief among them are the following two: 1) amplify and strengthen the self-sufficiency of local governments, endowing them with the authority to levy and collect taxes from constituents; and 2) empower solid waste service organisations to directly invoice and collect user fees from residents.

C3. DEVELOPMENT of a financial base

As is true in other governmental divisions, decision-making in the solid waste management sector is, or should be, strongly influenced by the magnitude of the available funding, i.e., the level of its monetary reservoir. The dependence originates in the obvious fact that the feasibility of implementing any given decision is a function of the existence and magnitude of the sector's financial resources. Unfortunately, all too frequently, decisions are made and their execution is

attempted without regard to available financial resources. These unfounded decisions may rest upon erroneous assumptions regarding available financial resources, or the matter of financial resources simply may be ignored.

C4. EFFECTS of financial resources

The effect of financial resources upon the feasibility of implementing decisions has many ramifications, some of which are discussed in the paragraphs that follow.

One ramification is the fact that funding availability can act as a constraint upon process and facility improvement, or upon facility expansion.

A particularly significant effect of access to adequate financial resources is that it enables the inauguration of systems or processes that markedly improve the service. For example, the financial resource could serve as a source of funding for the construction of a needed transfer station. The acquisition of land depends upon access to funding, i.e., access to a financial reserve. In addition, access to such a reserve is needed to finance the construction of a transfer facility complex, and for the purchase of rolling stock.

Not all shortcomings in the solid waste management sector are entirely traceable to financial difficulties. Thus, a serious shortcoming can be the unawareness of the savings that accrue from the substitution of a more efficient system for a less efficient one. Unfortunately, funding for such substitutions usually fails to materialise. The customarily poor financial climate with respect to certain systems in the solid waste management sector can be explained by the modest political appeal of the systems. Moreover, the foreign funding component of the system may be too small to be of interest to international financing institutions.

Instead of adopting an appropriately simple (low) technology, many developing countries tend to select a technology that is more suited for an industrialised country. Obviously, adoption of an inappropriately high technology will generate an unfavourable financial climate in a developing country. Nevertheless, securing financial backing for appropriately low-cost, low technology is far more difficult than obtaining financial backing for high-cost, inappropriate, complex (high) technology. Thus, it is not unduly difficult to arrange for the loans and credits involved in financing expensive, and frequently ill-suited, processing options such as incineration and highly mechanised materials recovery schemes. On the other hand, arranging a local loan and financing for the acquisition of land for a low-cost sanitary landfill and for construction and operation of the facility is a far more difficult task.

C5. DATABASE needs

A failing that is common in developing countries (as well as in industrialised countries) is the virtual neglect of an attempt to precede a solid waste management undertaking with the implementation of a database. The database should include: 1) the raw data, 2) an analysis of the data (discussed in another chapter), and 3) the planning arising from the data analysis.

An adequate database is particularly essential in the design and implementation of the waste collection service. A satisfactory database makes it possible to improve the quality and coverage of the service at a lower cost, because the collection process usually is the most expensive of the management processes. Maximum lowering of collection costs involves the gathering of accurate current information on parameters such as: number of stops per route, amounts of waste collected per stop per route, time requirements, and productivities per worker and per vehicle in terms of crew size. These data should influence the design of collection routes and the rationale for assigning crew size and number of vehicles per given route.

In a developing country setting, reliance upon a management information system can bring about a 25% to 50% reduction of per unit cost of solid waste management service. Although the futility of not analysing amassed data should be readily apparent, neglect of the analysis is not infrequent. Often, the accuracy of data is unfavourably compromised because of failure to adhere to prescribed protocols. Ultimately, effectiveness of cost reduction measures is a function of quality of the professional skill with which they are formulated and applied.

C6. COST containment via design of collection service

The following is a list of steps and considerations that are conducive to the designing of a collection service that is commensurate with cost containment.

1. Adjust the number of loads per shift of work such that the practical loading potential per worker is maximised.
2. Select the type and size of vehicle that best befits the roads and loading conditions of the neighbourhoods to be served.
3. Adjust crew size per collection vehicle such that the utility of the vehicle is maximised. Crew size should be based upon time and motion studies of worker productivity under different sets of working conditions.
4. Keep collection vehicle “downtime” to a minimum. This can be done by scheduling adequate preventive maintenance. An essential element of preventive maintenance is the continued availability of spare parts and of the tools needed for repairs.
5. Ensure compliance by local residents with ordinances enacted in support of the solid waste service.
6. Secure the collaboration of the public in the waste collection activity. This can be accomplished by resorting to a suitable public education effort. For example, aspects of proper storage of waste at the site of generation constitute a useful subject for public education. Among the aspects would be durability and capacity.
7. Properly design the storage area, as well as the positioning of the receptacles on the day of collection.

C7. PROCUREMENT

The success or failure of a solid waste management activity largely depends upon the degree of access to required equipment. The reason for the dependence lies in the extensive technological orientation of the activity. Hence, equipment procurement becomes a critical feature. Because collection and processing constitute a major share of solid waste management, especially in a developing country setting, procurement of collection equipment assumes a significant importance.

Procurement involves the preparation of specifications and tender documents. In the procurement of collection vehicles or processing equipment, it is essential that recourse be had to the expertise needed to select the most appropriate types of equipment at the lowest cost. The extent of the spread between highest and lowest vehicle costs is exemplified by the spread between the current highest and lowest costs of a new, modern collection vehicle. The current lowest cost is US\$50,000 and the highest is US\$190,000. The foreign exchange component of the purchase price for a particular vehicle may vary between 60% and 95%. In most situations, the initial

purchase price is not used as an indicator to determine whether or not the particular vehicle will result in a low total cost for ownership and operation.

Regarding the number of vehicles to be procured, obviously, number is a function of the capacity and degree of productive use of particular vehicles. Thus, one collection vehicle is required for every 1,500 to 10,000 residents. Practically speaking, the economic lifespans of waste collection vehicles range from 5 to 10 years.

C8. EQUIPMENT bid document: preparation and precautions

Ideally, responsibility for equipment acquisition is entrusted to a task force. Accordingly, members of the task force must work together to develop a detailed set of specification requirements.

The task of delineating the basic aspects of the bid documents should be assigned by the task force to a technically qualified individual. In making the delineation, the individual usually relies upon general specifications gleaned from brochures of one or two known equipment suppliers. Ideally, the decisive criterion for final acceptance of a bid is based upon the lowest qualified bid. Far less desirably, acceptance may rest upon political acceptability. An important, but often overlooked, criterion is lowest total ownership and operating cost. Comparative evaluations of vehicle ownership and operating costs should be made by knowledgeable mechanical engineers and by experienced supervisors from the fleet garage.

It is essential that decisions made by the task force concerning vehicle selection be based on actual vehicle operational experiences in the country, road conditions, driver skills, mechanic skills, available workshop equipment, local availability of spare parts, and opportunities for standardisation of components. In addition to the technical aspects, the specifications should include financial and legal conditions required for the particular acquisition.

In developing countries, the most likely sources of investment capital for the procurement of solid waste management equipment are entities such as the traditional international and bilateral development agencies (e.g., The World Bank). Certain funding agencies may insist upon international competitive bidding. On the other hand, a donor country may insist that the funds be used for the purchase of equipment manufactured within its domain. As far as developing countries are concerned, reliance upon funding sources currently available to them renders it very difficult to attain standardisation in the solid waste fleet. This in turn complicates the ability to stock the tools and replacement parts needed to keep the fleet in operation.

C9. COSTS apportionment

Information on actual costs is a precondition for the attainment of cost efficiency in a system. Although a manager may be given information on total costs of department salaries, fuel costs for the entire fleet, total costs for replacement parts, and debt service; he or she usually is not given detailed information. Moreover, the manager does not have the means of analysing existing data into meaningful information that could be used to improve the efficiency of the service. Information that could be used advantageously by the manager would be the unit cost of utilising a vehicle that has been used beyond its economic life, as compared to a new vehicle. Also useful would be a comparison of the cost of providing the service with a non-compactor collection vehicle and with a compactor, as well as an analysis of the cost advantages to be gained from the use of standardised containers. In addition, it would be useful to calculate the cost advantages of operating the fleet for two 6-hr shifts/day instead of one 8-hr shift.

Monitoring a solid waste management system demands access to data that are both reliable and applicable to the situation. The only fully satisfactory approach to the acquisition of such data is by way of an evaluation of the impact of the service upon the community's sanitary status.

In terms of percentage of average personal income, attainment of a comparable level of sanitation is more costly in developing countries than in industrialised countries. Although the cost of refuse collection in many developing countries is only about one-half that in industrialised nations; the magnitude of the average income is only a small fraction of the income of residents in industrialised countries. The consequence, therefore, is that a disproportionate amount of available revenues is spent on solid waste services in developing countries.

D. Human resources

D1. PERSONNEL requirements

The intricacies of solid waste management demand the services of highly qualified personnel that represent a broad array of professional disciplines. Illustrative of the breadth of the disciplinary array is the need for the input of professionals versed in mechanical engineering who would be responsible for the management and maintenance, repair, and deployment of the collection fleet. On the other hand, the input of professionals versed in civil engineering is essential to the design and operation of a sanitary landfill [5].

Regarding the design of optimal collection routes and the determination of appropriate collection methods and crew sizes, it is sufficient for the personnel assigned to this task to have had proper training and experience. However, a formal education in the principles of systems analysis would be helpful.

D2. FIELD supervision of collection service personnel

The importance of field supervision derives from the fact that the quality of the collection service is, to a great extent, a function of the quality of the performance exhibited by the staff, inasmuch as collection is a labour-intensive operation. Regarding the size of the supervisory staff, one field supervisor per five to eight collection vehicles is recommended. The difficulty in meeting this recommendation is intensified in many regions by a chronic shortage of competent professionals specifically trained in solid waste management. This deficiency is an outcome of the substantial dearth of formal education and of poor hiring practices. The unfortunate combination of circumstances compels numerous public and private sector institutions entrusted with solid waste management to employ untrained candidates, some of whom are unable to perform the tasks pertinent to routine operations.

The unfavourable consequences of the situation engendered by the shortage of qualified professionals are intensified by the practice of overburdening professionals with the responsibility of managing an overly large workforce. The lot of the professional in the solid waste management sector is rendered less attractive by the fact that the salary base in the solid waste sector usually is lower than that for comparable professional training and experience in other services in the public sector.

D3. ATTITUDE, morale, and motivation of personnel

The major significance of "attitude" arises from its effectiveness in minimising absenteeism. Absenteeism becomes a seriously deleterious factor in activities that require a given amount of human input. For example, an incomplete complement of workers almost invariably leads to an inadequate utilisation of equipment and/or overburdening of the remaining staff and crew.

Motivation is a factor because it is a positive force that impels an individual to participate in a given endeavour. One of the sources of motivation is a strong awareness of the utility of, and need for, the task being performed or to be performed. Judging from common experience, workers involved in a solid waste management activity generally have this awareness and, hence, possess the desired motivation. The community can foster and strengthen this motivation by initiating training programs and clarifying job descriptions. Monitoring and evaluating work performance, accompanied by assurance of job security, are excellent reinforcements of motivation. Finally, a program of motivation should be capped by the provision of basic benefits such as medical coverage and guarantee of a retirement pension.

Because motivation is a function of incentives and disincentives linked to performance evaluation, solid waste managers should be empowered to acknowledge superior performance by way of incentives such as formal recognition, further training, accelerated promotion, salary enhancement, and bonuses. Conversely, managers should be able to penalise inferior performance. This can be done through the imposition of disincentives such as fines, demotions, and dismissal.

D4. PUBLIC health inspectors

In accordance with the level of labour intensity, in developing countries, the size of the refuse collection workforce ranges from 5 to 50 labourers per 10,000 residents. Typically, the public health inspector assignment is one inspector per 100 to 300 collection workers. However, only from 5% to 40% of an inspector's time is devoted to solid waste related activities. Time over and above the 5% to 40% is reserved for the inspections of medical clinics, restaurants, food markets, public toilets, and other facilities and installations. In terms of time equivalents, this division of effort translates into approximately one full-time inspector for every 1,000 or more collection workers, or one inspector for every 200,000 residents. Generally, a public health inspector is entrusted with the enforcement of local health-related ordinances, definition of proper storage and disposal of waste, and the restricting of littering. Finally, the entire responsibility for providing public education on sanitation and improvement of the quality of the environment usually devolves upon the health inspector.

The preceding exposition of the labour situation demonstrates that the investments being made on public health inspection in developing countries are not sufficient to produce an educated and cooperative citizenry. Consequently, it is necessary to establish policies that will lead to a change in this situation.

E. Political issues

E1. AUTHORITY

Individuals charged with the management of an organisation must be authorised to make day-to-day operational decisions. In fact, the satisfactory functioning of an organisation depends upon the organisation being endowed with an authority commensurate with its responsibility. A serious difficulty in many developing countries arises from the fact that although the expenditure on solid waste management is relatively high, the position of the service in the municipal hierarchy is quite low. Frequently, the solid waste service has a divisional status within a public works or public health department. Another setup is as a section within a municipal semi-private authority established for water, wastewater, and solid waste.

Because of its comparatively low status, the authority is severely constricted. As a result, the manager of a solid waste group has little latitude in terms of hiring and appropriately paying the professional staff needed to plan and supervise the service. An additional and serious problem is

the practice of burdening the manager's budget with the costs of low-level staff, some of whom may be on the payroll but not actually working.

The difficulties described in the preceding paragraphs can be avoided by broadening the autonomy of the solid waste sector and reorganising it either as a separate solid waste department within the municipal structure or as a semi-autonomous public enterprise. Establishing a separate municipal department enables greater accountability and also allows the employment of high-level professionals in the service. Setting up a completely separate entity would allow the authority to institute pay scales, which would be outside of the municipal salary scales and enable staff hiring and firing with limited interference from politicians. This type of organisation could enable the entity to generate financial resources so that it could be self-financing. There is the possibility that the establishment of such an independent entity might be interpreted as being a weakening of the municipality because it apparently would usurp one of its fundamental services. Consequently, the advantages and disadvantages of such a move must be carefully analysed and weighed before its implementation.

E2. PUBLIC education

Collaboration of the public is essential to the successful attainment of the objectives of the solid waste management service. Collaboration is best obtained by convincing the public that its cooperation is the key to the successful conduct of the service and, furthermore, that success of the service redounds in an improvement in the welfare of the public. One of the most effective means of securing such a conviction is through education [6].

Education can be accomplished formally and informally. A formal approach would involve the establishment of conventional educational programs in schools, as well as publicity campaigns. The program and campaigns would elaborate upon the benefits to be expected from proper waste management, and upon the baneful consequences of poor sanitation, while emphasising the high costs associated with inadequate public cooperation.

There are several informal modes of convincing the public that might loosely be termed "education". For example, one such approach is disciplinary in nature and, hence, may be burdened with some political odium. The approach would largely consist of the enactment and enforcement of relevant legislation (e.g., establishment of regulations and delineation of penalties). A much more effective (and far more politically palatable) approach is to initiate a "cleanup" campaign designed to motivate the citizenry and, thereby, elicit its participation. The subject of a cleanup campaign could be a neglected neighbourhood, a littered park or body of water, or any other locality in need of attention. Inasmuch as at least some of the active participants in the cleanup may have contributed to the littering, they will acquire an appreciation of the arduous and thankless nature of the management of solid waste - and in the future may refrain from littering.

E3. STATUS and resulting problems

The lowly status of solid waste management in the municipal officialdom in developing nations is responsible for many of the difficulties that afflict the service. Among the more serious of these obstacles is the prevailing failure of residents to cooperate with the agency that provides the service.

An example of lack of resident participation is the poor management of waste at the point of generation. The poor management consists of the practice of the waste generator of directly discarding waste into the environment; or, at most, of storing waste in randomly selected containers, such as cardboard boxes, rather than in properly designed receptacles. Unfortunately,

the inadequate storage problem is compounded by failure to have filled storage containers readily available for servicing on designated collection days. The improper handling and storage and non-observance of collection day schedules render it exceedingly difficult to maintain cleanliness and order in delinquent neighbourhoods. Additionally, waste in unattended piles or wastes placed in inappropriate receptacles for collection are subject to being picked through by scavengers and dispersed by animals. The cost of emptying a properly designed waste container is only one-third that of collecting and disposing of dispersed refuse.

Few cities in developing countries enforce their littering and dumping laws. This relaxed attitude apparently is not influenced by the fact that littering and illegal dumping can make a well serviced city appear dirty even though residential refuse is properly stored and is collected on a daily basis. Moreover, the attitude apparently is not affected by the high cost of cleaning up after an untidy citizenry.

E4. POLITICAL factor

In developing and in industrialised countries, local and national public commitment is an essential element in the attainment of a solid waste management service that is both effective and efficient. Paradoxically, political commitment to the solid waste service demands that a protective barrier be set up and maintained between politics (political pressures) and the operation of the solid waste management service. In the absence of such a barrier, the work effort remains in danger of being concentrated on short-term, highly visible, publicity-oriented changes at the expense of accomplishing long-term, cost-effective improvements that happen to be less visible to the public.

The reality is that very frequently the ideal barrier either is not set up or is breached so often as to cease being effective. The result is that, in practice, the solid waste manager is a political appointee who often is devoid of experience or expertise in solid waste management. The outcome is that most of the appointee's term in office is consumed in becoming acquainted with the service and in deciding upon a course of action. The appointee's effectiveness is severely constrained by the reluctance or even refusal of staff to cooperate, which is not surprising because the staff is well aware of the appointee's short tenure in office. This is particularly true where the collection workers unions are very strong (e.g., some Latin American countries).

E5. ROLES of the political leadership

E5.1. National level

Ranking high among the roles available to the political leadership regarding the improvement of the solid waste management service is one that consists of enacting and enforcing ordinances that prohibit littering and call for the public to collaborate with the service. Another role is to provide the solid waste service with a reliable and adequate budget. An exceedingly important role is to ensure that corrective measures be rigorously applied in situations in which the quality and effectiveness of the management service are being corroded by internal corruption and theft. The successful implementation of the corrective measures depends in large part upon the willingness of the leadership to make and enforce the difficult decisions that lead to the disciplining of transgressors.

E5.2. Local level

Conscious of the brevity of term of office characteristic of local official positions (e.g., municipality, district), and of the fact that a second term may not be permitted, politicians at the local level tend to concentrate on short-term, preferably potentially newsworthy projects.

Consequently, local office-holders may be vulnerable to promotional overtures made by purveyors of unneeded equipment. Unfortunately, proposals for the acquisition of a fleet of vehicles or for the construction of new facilities are more apt to gain and hold the attention of politicians than would proposals to improve the routine operating and maintenance needs of the solid waste service. In short, local solid waste services are very vulnerable to political pressures.

E6. CENTRALISED policy coordination

It has been found that problems generated by local circumstances and fostered by the local political leadership often can be rectified through the establishment of an interministerial coordinating body at the central government level. The coordinating body would be entrusted with: 1) the development of a national strategy, 2) the evaluation and coordination of major investments, 3) the development of projects, and 4) the making of budgetary allocations from the central government.

It would prove useful to augment the coordinating body with a group of solid waste professionals at the central government level. This group would be charged with: 1) analysing and making comparisons between the systems in the various localities, 2) keeping abreast of the state-of-the-art in other countries, and 3) serving as a clearinghouse of information available to support local solid waste managers.

Policy and program support proffered by the regional or central government serve as a strong platform for local action. Standards for service delivery and performance measures should be established at the national level. Additionally, monitoring, guidance, and regulation of local solid waste services are best accomplished when they are done at the central level. Other activities appropriately delegated to the central government include the acquisition and analysis of data on waste characteristics and quantities, operational norms, service costs, and appropriate technologies. The objective of laws, regulations, and policies promulgated at the central government level should be to provide support for compatible local ordinances and enforcement actions [4].

To avoid needless duplication of effort and expenditures, large-scale research and development work and pilot testing should mostly be confined to the central government level. The reason for the restriction is the fact that the necessarily high degree of expertise and the occasionally relatively expensive financing are not available at the local level.

In general, the implementation of measures designed to reduce the quantities of solid waste generated and to promote recycling is best left to the central government. This is especially true if the primary goal is to protect the quality of the environment. Any increase in the promulgation and stringency of such measures usually triggers an increase in the cost of waste management at the local level. However, the added cost is compensated by an improvement in environmental quality. In turn, the added cost and the improvement in environmental quality serve as incentives. The central government can make a considerable compensation for the costs by way of the establishment of procurement specifications and procedures, import trade policies, and business investment tax incentives such that the market demand for recyclables is markedly enhanced.

F. Conclusions

The burden associated with the management of solid wastes in developing countries is magnified by a chronic shortage of financial and technological resources and a dearth of qualified professionals sufficiently conversant and experienced in solid waste management. The dearth of solid waste management professionals renders the countries vulnerable to the promotional activities of purveyors of equipment that may or may not be needed, or may be ill suited to local

or regional conditions, and that represent an unwise expenditure of funds. In many cases, the burden imposed by the aforementioned purveyors is compounded by pressures exerted by bilateral aid organisations and trade agencies to accept “gifts” of inappropriate equipment and technology. These organisations represent a variety of international agencies. The burden created by purveyors and by bilateral and international aid organisations has yet another facet -- namely, the many misconceptions concocted by the international media as to which techniques would be most effective in coping with the solid waste management problem in developing countries.

Yet another facet of the burden is the urging by certain international development agencies bent upon disbursing loan monies quickly. The catch is that the loan money be appropriated in investments that involve a large foreign exchange component. However, the reality is that such loans, in some cases, are of little use in the solid waste management sector in a developing country; inasmuch as improvements do not necessarily accompany increases in capital investments. The quality of solid waste management service is better served by establishing a program characterised by good management, close supervision, broadened knowledge, superior planning, and strict cost accountability. The successful implementation of such a program demands institutional strengthening, the development of appropriate regulations, and the implementation of a comprehensive and continuous public education program. A final and essential requirement is that the local professionals be trained and assisted regarding improving the efficiency of the present system without recourse to substantial monetary investments.

G. References

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