

Review and Status of Solid Waste Management Practices in Multan, Pakistan

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Basic urban services, such as municipal refuse disposal, have largely been neglected in Pakistani towns and cities. Multan is also one of those cities where a larger portion of population lacks basic urban facilities. This study specifically deals with the problems related to solid waste management in Multan City. Presently, the population is producing and facing different types of problems associated with solid wastes in the city. As population and environment are closely related, the population's response towards managing their environment can reduce environmental risks like those associated with inefficient systems of solid waste management. The solutions lie within reach but a missing element is participatory approaches for development. Expediting the process of participatory development approaches can help local governments in the provision of better service delivery and managing environment at the local level. This paper reviews the policy relevance at the operational level – how the population can contribute to the solutions of growing environmental risks such as solid wastes.

Introduction

Waste and waste management have seen many breakthroughs in the ages from the generation of simple organic wastes to hazardous and nuclear wastes and respective solutions as well at local to global level. Solid waste management has been considered a basic urban service throughout the world and the efforts involved in managing waste have been a great hallmark of human endeavour for the betterment of the environment. The waste management psychology has been relying for a long time on simple solutions of throwing waste in water bodies, burning it as an alternative or burying it unconsciously as land-filling. Now with the inception of high-tech incineration technologies and concerted efforts in some parts of the world to drive communities towards zero waste societies, the world is just beginning to move towards making its urban centers more environmentally friendly.

The problems and solutions scenario changes as the globe moves from

developed to developing world. Unfortunately, solid waste management has remained a neglected urban service in Pakistan. The federal and provincial governments have adopted a hands-off policy declaring it a local problem rather than a national one. As a result, the load on municipalities to manage solid waste is greater than their meagre resources. Hence system failure starts, which is a matter of paramount importance.

This article presents the picture of municipal solid waste management practices in Multan City and draws some conclusions at the end, along with suggesting measures as to what can be done towards managing wastes in a better way.

The City

Multan is the fifth largest city in Pakistan after Karachi, Lahore, Faisalabad and Rawalpindi, with a population of nearly 1.2 million according to 1998 census (Federal Bureau of Statistics, 2004) . Currently its population is estimated as 1.8 million that is expected to rise to 3.3 million in the next 20 years (Burgéap et al, 2003) . Multan Division lies between north latitude 29°22' and 30°45' and east longitude 71°4' and 72°4'55" at about 215 meters above sea level (Aleph Inc., 2000) . It is believed to be the oldest city in the world, still under inhabitation, with an extensive history. It has witnessed many invasions and is famous for having been visited by Alexander the Great and a succession of foreign armies. At one time in antiquity, it was the national capital of the Punjab Province, but now it is simply regarded as a major city of Southern Punjab. It contains many historical sites and religious shrines. The center was once a walled city, which still exists, but is now surrounded by later suburban development. The inner city is very congested with narrow streets and a high population of mixed houses, shops and businesses. The outer areas are developed and there is still land available for further expansion. There are new areas being developed as "satellite towns" and there is a military area known as the cantonment.

Multan gets very little annual rainfall and the occasions of daily rainfall are perhaps five times a year. Despite this the area has rich agricultural lands, and with access to a large irrigation system, produces many crops, being most famous for mangoes, which are exported all over the world. The geography of the town area is very different to other cities, possibly unique, as it lies in a bowl-shaped geographic depression and so all natural drainage is into the center of the city. Electrical pumping is required for drainage of wastewater, and in the event of an electricity failure, localized flooding occurs in the city.

The existing infrastructure dates back to the time of the British, and despite some later works in the 1970's is in an advanced state of disrepair (Burgéap et al., 2003) . Some residents have no access to clean drinking water, drainage and sanitation is poor, solid waste blocks the sewers and many areas are permanently flooded with sewage water. Incidents of water related diseases are high and major improvements are necessary.

The following four tehsils make up the district:

1. Multan City
2. Multan Saddar
3. Shujabad
4. Jalalpur Pirwala

Research Methodology

The research is based on interviews and observational study within the administrative boundary of Tehsil Municipal Administration (TMA) Multan City. Primary data collected included interviews with the concerned persons in the Department of Solid Waste Management (SWM) TMA Multan City. Scavengers and junk dealers were also interviewed to get an idea about what is scavenged as recyclables from the municipal waste. The secondary data on solid waste and its management aspects was also collected from the concerned department of the TMA Multan City. Field surveys on waste reclamation and its disposal practices were also carried out in different localities of the city. Special attention was given to any environmental hazards which have potentiality of association with the solid wastes in low-income populations living close to the dumping sites.

Organizational Profile of Solid Waste Management Department TMA Multan City

It is evident that an efficient solid waste management system needs organizational capacity and integrated cooperation between communities, private enterprises and municipal authorities, as it is responsible for the selection and adoption of appropriate technical and local solutions for waste collection, transfer, recycling and disposal. Here is a detailed discussion about the organizational capacity of Department of Solid Waste Management (SWM), TMA Multan City (Fig. 1) and various activities of SWM including generation, storage, collection, disposal of municipal and hazardous waste (Fig. 2). Scavenging and recycling in Multan are also discussed later in this article.

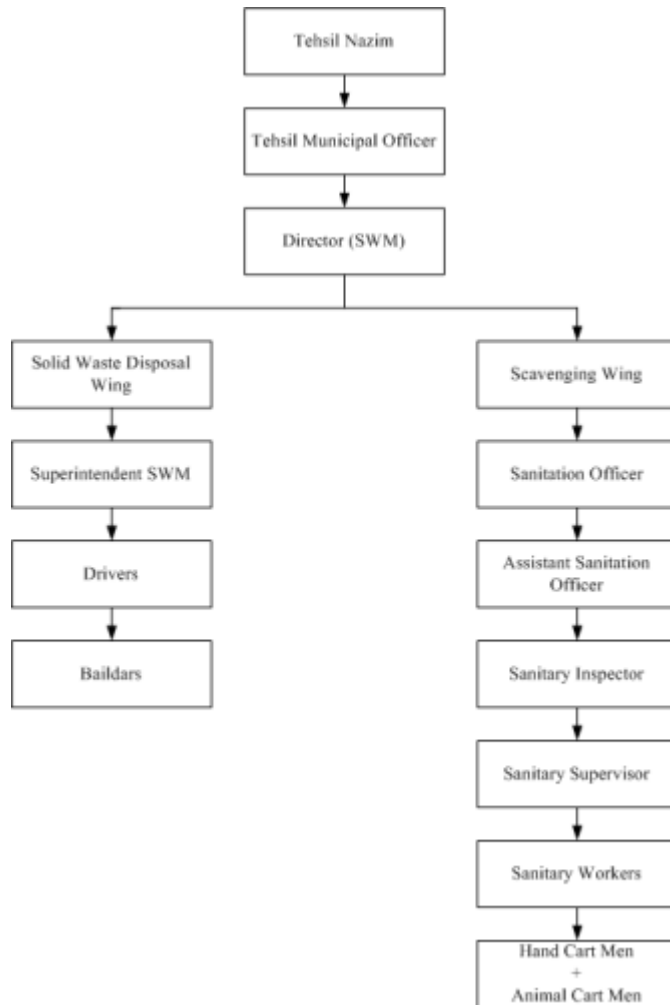


Figure 1: Solid Waste Management Department, Tehsil Municipal Administration, Multan City.
 [Source: Superintendent SWM, TMA, Multan City]

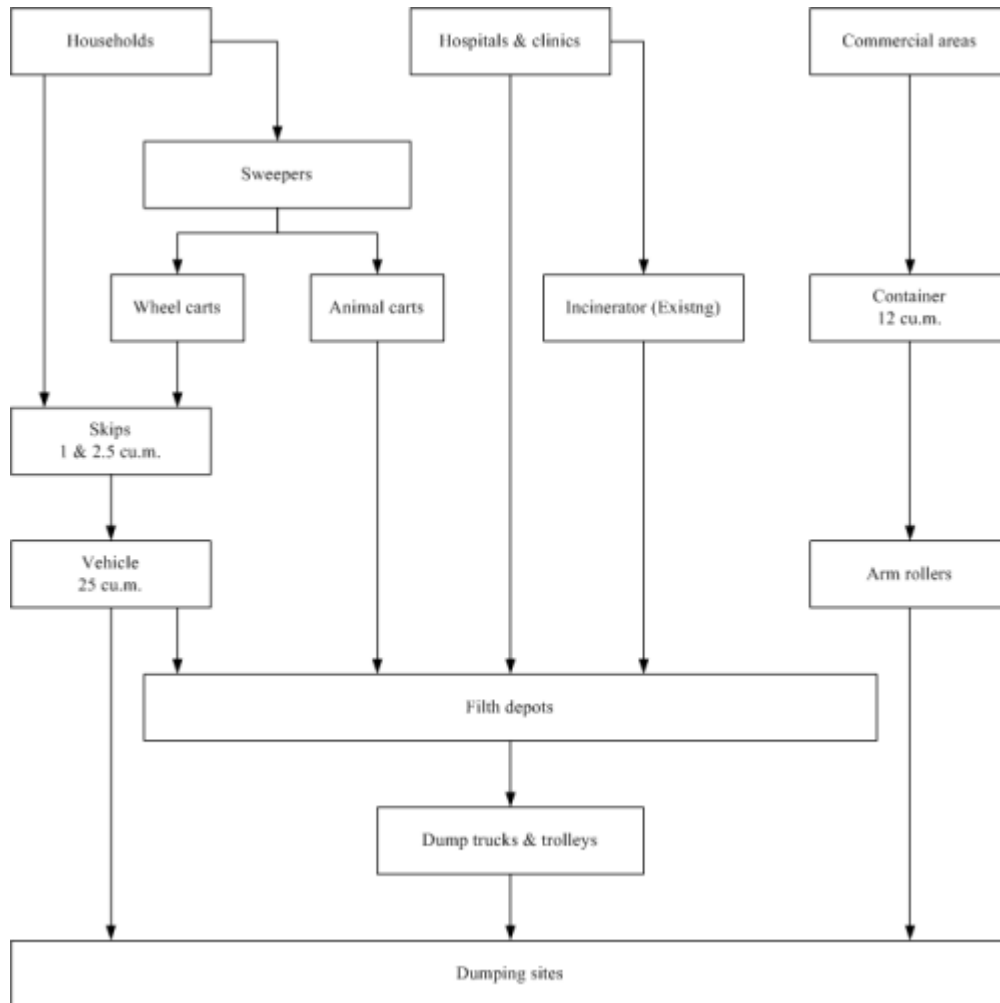


Figure 2: Activities involved in solid waste management in Multan City.

Organization

The Department of Solid Waste Management was established in 1991 initially to address the growing problem of waste management in the Tehsil Municipal Corporation (TMC), Multan (now Tehsil Municipal Corporations are regarded as Tehsil Municipal Administrations (TMAs)). Principally the SWM Department is responsible for the collection, transfer, transportation and final disposal of the waste within the administrative jurisdiction of TMA Multan City excluding the Multan Cantonment. The Director of Solid Waste Management reporting to the Tehsil Municipal Officer and the Nazim. TMA Multan City, as shown in Fig. 1, heads the department.

Multan is divided into 58 Union Councils (UC) and at each UC level, the Union Council Nazim is supposed to manage the sanitary workers with the help of the sanitary supervisors (Office of the Tehsil Nazim, 2004). The present organization has been established after an effort of more than a

decade. The regular employees who serve in different sections of the SWM Department of the TMA Multan City are 231 whereas the labor force is about 1775 and about 200 of them are women sanitary workers (Director SWM, 2004) . As per specifications, one sanitary worker is required for a population of 500; hence there is a shortage of 1825 workers in the city. Unfortunately, most of the sanitary workers available within SWM Department are above age of 40 and some of them are patients of TB and other respiratory ailments due to the non-availability of proper precautionary measures during street sweeping and other waste treatment steps. Perhaps no study or data is available but significant correlations were found during the field investigations.

Seemingly, the present organization is lacking the right people at the right place. For instance, there is no environmental engineer or professional solid waste manager in the organization. The absence of this basic principle of management has resulted in the inclusion of non-professionals in the Department that surely affects the organizational capacity.

Solid Waste Generation in Multan

With an area of about 208 sq km and a currently estimated population of about 1.8 million, the city of Multan generates a waste of about 1000 metric tons per day, with a generation rate of 0.45 kg/capita/day (Office of the TMO, 2002). It produces a number of waste components, details of which are given in Table 1.

Table 1: Solid Waste Generation in Multan City, Source: Office of the TMO (2002)

Current estimated population	1.8 million
Domestic waste generated @ 0.45 kg/c/day	810 tons
Total animal/livestock population in the city	45000
Total animal/livestock waste generated @ 3 kg/day	135 tons
Industrial/commercial waste generated per day	35 tons
Hospital waste generated/day	20 tons
Total solid waste generated in the City	1000 tons/day

As local living styles and income levels increase the waste stream of any community significantly changes. Waste of Multan city is found comparatively rich in organic components. The physical composition of waste is described in Table 2 (CDRC, 2004).

Table 2: Physical Composition of Solid Waste in Multan City, Source: CDRC (2004)

Waste Type	Percentage	Tons/day
Plastics and rubber	4.39	43.9
Metals	0.3	3
Paper (all types of paper)	2.4	24
Rags	6.98	69.8
Glass	0.8	8
Food waste	32.35	323.5
Animal waste	2.65	26.5
Leaves, grass, etc.	20.22	202.2
Wood	1.3	13
Bones	1.03	10.3
Stones (construction waste)	27.51	275.1
Unclassified	0.07	0.7
Total	100.00	1000

Budget

The present annual budget is Rs. 9,585,000 (US\$ 160,000) annually for contingency expenditures. It also includes the machinery maintenance and other related expenditures with the solid waste transportation. However, the department generates money from its own resources like selling of waste trolleys for landfilling purpose. Salary given to sanitary staff is about Rs. 12,700,000 (US\$ 212000) per annum (TMA Multan City, 2004).

Waste Storage

The following five types of units are in use in the city:

1. Plastic bins
2. Masonry dust bins
3. Filth depots
4. Metallic skips of 1 and 2.5 m³
5. Metallic containers 12 m³

Storage on the Premises

Normally, in some parts of the city, the refuse generated in the households as well as that from the commercial areas partly is indiscriminately thrown on the roadsides. TMA has recently installed 1 m³ capacity plastic bins in the communities throughout the city that are occasionally used. This practice makes difficulties for the sweepers to collect, transfer and transport to the nearest collection points. However, the above mentioned practice obviously needs some civic interventions to mend the people psychology. While in other case makeshift type of containers are used for storage of waste at the

premises. This is mainly practiced in the inner city of Multan.

Communal Storage on the Streets

Communal storage is made in different ways based on the nature of the area. There are 26 filth depots (non-sanitary) in the city to collect waste and act as a transfer station to load the waste for final disposal (Director SWM, 2004). TMA provided skips of 2.1 m³ in different parts of the city, but with the passage of time they were vandalized. Some of them are still there but do not present a good picture. As a result of this crises most of the refuse generated is openly dumped along the roads and in open or vacant plots. Animals scatter the refuse in open dumps. Rats have access for food and fly larvae can migrate from these open dumps, causing serious health hazards.

In developed areas, mostly planned metallic containers/skips are used for communal storage. Waste is brought to the container through door-to-door collection, which is then lifted by Solid Waste Management Department for hauling to the final disposal sites. In the inner city, the TMA has franchised the solid waste collection system four union councils to a contractor at the rate of Rs. 0.24 million per union council (Director SWM, 2004). The contractor is responsible for the collection and hauling of the waste to the filth depots around the walled city of Multan and some part of the waste is also transported to landfill site near Shah Rukn-e-Alam Colony. The contractor's income is based on sanitation fee imposed by the TMA Multan City.

Equipment and Machinery Availability

Details of equipment/machinery presently available with TMA Multan City are provided in Table 3 (Superintendent SWM, 2004).

Table 3: Equipment/Machinery Available with TMA Multan City, Source: Superintendent SWM (2004)

Equipment/Machinery	Total No.	In-order	Out of Order
Tractor Trolleys	40	35	5
Tractor with Blades	2	1	1
Tractor with Buckets	6	4	2
Dumper Trucks	8	2	6
Suzuki Vans	10	6	4
Truck Compost	1	1	0
Water Sprinkling Vehicles	3	2	1
Bull Carts	65	65	0
Hand Carts	400	400	0

Street Sweeping

Due to indiscriminate throwing of solid waste, sweepers often have a tough task, thus many streets are rarely cleaned. The tools provided to the sweepers are of poor design and quality. The sweepers use short hand-held brooms for sweeping and wheel barrows for collecting the sweepings. They create large or small heaps on the street side, which are then collected by tractor trolleys, bullock carts or Mazda trucks. Recently TMA Multan City has purchased 2 mechanical sweepers to clean the main roads of the city.

Collection

The waste has to be picked up from the ground manually with the help of rakes and baskets and most of small heaps disperse, as they are not lifted. At present, there are about 200 open heaps in Multan. Irregular and uncontrolled sweeping, particularly in rush hours, creates problems for the general public. Average amount of sweeping collected in commercial areas is 20 kg/sweeper/day. In non-commercial areas, however, the average collection is 41 kg/sweeper/day (Superintendent SWM, 2004).

With the equipment and machinery available with the Solid Waste Management Department, TMA Multan City, a maximum collection capacity of 600 tons/day can be achieved. The balance uncollected waste is 400 tons/day. This shows that there is a shortfall in lifting capacity of solid waste from jurisdiction of TMA Multan City. Only about 60% of solid waste is collected and transported to dumping sites. The remaining waste is either burnt in the city or remains on streets or in residential areas most of which is thrown in drains and sewerage system of the city hence creating another environmental health problem in the city. This increases the susceptibility to environmental pollution and causes many diseases associated with solid wastes in the city.

Waste Transportation

The vehicles and equipments available with SWM for collection and transport of waste are discussed in the following lines.

Presently 40 open body tractor trolleys and 8 dumper trucks are being used to collect and to dispose off the waste from different sites in the city with the help of labor allocated on each vehicle in 4-6 numbers (Superintendent SWM, 2004). These vehicles make 2-4 trips per working day. In congested areas of the city, bullock carts are used for collection of waste in transit to filth depots for disposal. SWM Department is responsible for emptying the

skips and containers, and transportation of waste to landfill sites. For direct haul of metallic containers deployed at different areas of the city, arm rollers are used to dispose off the waste at landfill site. Trolleys and dumpers are also used to lift bigger open piles. Normally it is the practice that the construction waste and the debris collected in various parts of the city are sold to the interested parties for land filling purposes or dumped with the municipal waste.

Transfer Stations

Proper transfer stations do not exist in the city. However, 26 transit filth depots act as the transfer stations. The waste is transferred from small transport units to these locations. They create unsafe working environments in the city, as most of them are located along Alang (fortification of the old city) and in the past many times this wall was damaged due to certain environmental and weather conditions and caused many accidental deaths.

The current practice of scavenging at the filth depots is unsanitary and dangerous method of resource recovery. Child scavengers are commonly found sorting different valuable recyclable items from the waste at these filth depots.

Dumping Sites

There are a number of illegal dumps within and outside the city. The only legal sanitary landfill site is proposed along the Matti-Tal Road where a parcel 6 acre of land has been acquired with the funding of Asian Development Bank's Southern Punjab Basic Urban Services Project (SPBUSP) (Director SWM, 2004). An interesting fact is that SWM Department fills the private land with the consent of the owner. It is also noted that the SWM department sells the waste on a payment of Rs. 200 per trolley to the landowners who need the waste to fill the depressions.

Solid Waste Management Department dumps the waste at five landfill sites. All of these sites are not being operated on scientific basis due to lack of technical know-how. The open dumping permits serious environmental threats to the nearby communities. Moreover, these landfill sites are within the populated colonies of the city creating ugly scenes.

Hospital Waste

At present there is no proper system for the disposal of hospital waste in Multan. The clinical and other infectious wastes are mixed with the municipal solid waste and being dumped in the landfills. The Solid Waste Management

Department is held responsible for the collection, transfer and final transportation to the landfills. Recently, Nishtar Hospital in City purchased two incinerators to burn the hospital waste of its own and other government hospitals and some of the private clinics. But this facility is not functional yet due to some administrative and technical reasons. Normally, private clinics and other health facilities mix up the waste with municipal waste and the municipality is supposed to get it out of sight. The most unfortunate aspect of hospital waste management in Multan City is the scavenging and recycling of hospital waste, which might contain germs of infectious diseases. It is also found during the field visits that many of the hospitals' waste-dumps are routinely scavenged for material used in medical procedures, which is then recycled to be sold as brand new.

During the field study, it was discovered that these dumps are allegedly being contracted off on an annual basis. There have been instances of hospital staff conducting open auctions of hospital waste including syringes, urine bags, blood bags, dextrose/saline bottles, bandages, canulas, IVs, catheters, glass slides and vials. Bringing back the used hospital items can cause serious health risks to naive patients.

In Pakistan on average, a hospital bed generates 0.5 to 2 kg per day of medical waste and 0.1 to 0.5 kilogram of this is treated as hazardous and infectious material (Jang Group, et al., 2003). Lack of civic sense among medical practitioners, hospital waste buyers and sellers has caused about 20-25% increase in the rate of infectious diseases in a short time and this practice has caused an increase in reported HIV (AIDS), typhoid, hepatitis, diarrhea, respiratory illnesses, skin disorders and meningitis cases.

Scavenging and Recycling

Multan has a very rich culture of scavenging and recycling practices in the informal sector. Although a number of items are recycled in Multan, this business remained undocumented for years. Recently, the Community Development Resource Center (CDRC), Multan developed a computerized database of Multan City for Tehsil Municipal Administration (TMA City) to increase the tax-base of the TMA (CDRC, et al., 2004). It presented figures of 574 units of scrap dealers in the city who carry out extensive business of recyclable goods. Almost 90% of the inorganic waste is recycled in the informal sector (Shoib, 2004). About 78 recycling units of plastic, rubber, glass, paper, etc. exist which are manufacturing low-quality plastics and other inorganic products. It is important to note that not all of the collected recyclable goods are reused in the city but transported to big recycling industries elsewhere in Pakistan.

Table 4 shows the components that are normally present and extracted from the waste stream of Multan City (Shoaib, 2004). According to classification, as much as 60% of total generated waste is organic in nature. The organic waste comprises kitchen waste, animal refuse, garden waste, etc., while the inorganic waste is a combination of plastic, glass, paper, etc. Statistics show that about 3500 waste scavengers of different ages are working in the city in the informal sector (Shoaib, 2004). The pickers collect valuable and recyclable items from the waste and deliver this to the scrap dealers in different areas of the city for a nominal price. The scrap dealer's shop acts as a transit point from where these items find their way to the main recycling units in the city as well to other recycling industries. These waste pickers work in the most vulnerable, unhealthy environment.

Table 4: Recyclable Items in Municipal Waste Stream of Multan City, Source: Shoaib M. (2004)

Glass	Window glass, crockery glass, mirror, electric bulbs and tube rods, fancy decorations pieces, medicine bottles, beverage bottles, cosmetics residues
Plastics	Crockery, pens and ball points, electric wares, covers of electronic goods, packaging material, plastic syringes, plastic foot wears, straws, bottle lids, food cans, computer waste, cosmetics residues, shopping bags
Papers	Newspapers, papers, cards, cardboard, tissue papers, packaging material (wrappers), sweets wrappers
Bones	Animal bones
Metals	Iron, steel, Aluminum, syringe needles, wires, drink cans, crockery, old battery cells
Textile	Septic pads, bandages, rag clothing
Wood	Garden waste, wood trimmings, furniture works residues, leaves and stems

Composting

Community Development Resource Center (CDRC), Multan and the TMA Multan City, have established a solid waste composting plant as a theme of Multan Environment Conservation Project (MECP). This project was envisaged when the UNDP-funded Programme for the Improvement of Livelihoods in Urban Settlements (UNDP-PLUS) was ending up in mid 2002. To avoid the wastage of the efforts of the PLUS team and links created with the line departments and the community, UNDP proposed to establish a Community Development Resource Center in Multan for the Southern Punjab region. CDRC has come up with its vision to conserve the local environment

for global sustainable development with the idea to manage solid wastes by making compost of the organic content of the waste and sorting inorganic contents into recyclables. CDRC launched Multan Environment Conservation Project (MECP) from January 2003 to conserve the deteriorating urban environment of Multan City (Manager CDRC, 2003). A municipal waste sorting and composting plant, which was manufactured locally and supplied on December 20, 2003, was an integral part of the project. It was scheduled to start operating in October 2004. The project also aimed at community participation and community mobilization and for this purpose social mobilization was started in seven different areas of the city. The project was to be implemented in partnership with the Tehsil Municipal Administration (TMA) Multan City, which provided 7.68 acres (3.11 ha) of land for the plant. Also TMA was responsible for the delivery of 100 tons of municipal waste per day. A Memorandum of Understanding (MoU) was signed between CDRC and TMA for this project, which was to be valid initially for a period of 10 years. CDRC was to manage the project during its life and after the sale of the compost the profit was to be shared between CDRC and TMA at 70% and 30% respectively. The experience has not been successful so far due to problems in management.

Problems with the Management of Solid Waste in Multan City

From the above discussion we can conclude that the following problems and issues are being faced by the TMA to manage solid wastes in Multan City:

Absence of Waste Management Documentation: The TMA is working without a properly documented waste management plan, which may provide guidelines to the officials for the exact estimation of the generation, collection, transportation and disposal methods, and resource recovery of waste.

Spatial Disparities and Ineffective Resource Management: The equipment, machinery and labor allocated for the SWM are not based on the calculated population characteristics and the area requirements. Hence, collection remains inadequate and consequently further activities of SWM are affected. Mostly waste remains uncollected in the inner city as streets are narrow and it becomes difficult for vehicles to enter there. Further, the vehicles available with the SWM Department of the TMA are open body vehicles, and normally the solid waste gets scattered along the way.

Making Multiple Problems: Waste at one time does not portray one kind of problem but the whole management process sometimes creates other unmanageable problems. For example, as there is no sanitary landfill site available for waste disposal, the SWM Department is forced to dump the

waste in the depressed areas within and outside the city limits making another environmental problem for the nearby residents. Burning of the waste at landfills and in residential areas is a constant source of nuisance for the nearby inhabitants as well a permanent hazard for the urban environment. The stench emanating from the open dumps is another problem that is unbearable for the local communities.

Operation and Maintenance: The SWM Department has no mobile workshop to repair the vehicles if vehicles get punctured or face some other mechanical failures during their operation. The SWM Department has insufficient parking space. So it always becomes a problem for the department to park the vehicles in different places of the city.

Dangerous Work Environment: The lives of the workers of the SWM Department of the TMA face risks in the absence of precautionary measures dealing with the waste. For example, the filth transit depots are the most risky workspaces for the personnel of the department, scavengers, and for the general public. Scavenging is done in an unsafe way. There is no policy restriction or facility to the scavengers for resource recovery.

Waste Mixing: Medical waste is being treated with the municipal solid waste and its resource recovery is done in the most dangerous way. The mixing of some of hazardous wastes such as chemical waste in the MSW is another serious issue, which needs careful attention by the civic agencies.

Wasteful Use of Waste: The city presents a gloomy picture of the deteriorating urban environment of the world's historical city. The willing dumping of waste on private lands is a serious environmental problem as the dumping sites of the TMA are privately owned. These are the remains of land excavation for brick kilns in the city about 30-40 years ago. They are 30-45 ft (9-14 m) deep, spreading over an area up to 100 kanals (12.5 acres or 5 ha) in some cases. It was found that the landowners unconsciously excavated the land to the extent that the silt was discovered and they went for material gains and started selling sand quarries. This quarrying continued until it became difficult to excavate the land further. In Multan, these geographic depressions now serving as burial grounds for municipal solid waste or the liquid waste from nearing communities are unconsciously allowed as alternatives for sewerage disposal stations. The ditches, which remained relatively safe from wastewater invasion, were sold at cheap prices to local people. As they are 30-40 feet below the ground, so people want their houses equal to or above the ground level. For this they buy the waste from the SWM Department on a payment of Rs. 200 per trolley.

As mentioned earlier the SWM Department lacks professional staff such as

environmental planners, environmental engineers, and professional solid waste managers and TMA and Multan Development Authority have no restriction or by-laws in their legal documentation to curb or control this type of activity. Structurally the constructions on such landfill areas are more prone to building collapse incidents. Unfortunately, this common practice of using waste as a filling material for the depressions in the low-lying residential areas in Multan is of serious concern that clearly requires action by all the enforcement agencies regulating waste management and building development control. It is also feared that this type of mass-scale voluntary dumping may cause serious environmental health hazards as once seen in the form of the Love Canal episode in New York. Some investigations into environmental safety have found that the groundwater quality in areas near these landfill sites is far below the safe drinking standards of the World Health Organization (WHO).

Conclusion

The present solid waste management is based on unplanned and haphazard service delivery mechanisms due to the absence of managerial and planning skills in the concerned people and the city government. No professional waste manager is working in the department in order to link various activities from generation to disposal through proper utilization of available sufficient resources.

The SWM Department of TMA Multan City lacks adequate data in order to provide facilities according to the needs of the city. The existing collection is without proper route designing. The present transfer stations and disposal sites are not designed on a scientific basis due to the lack of technical know-how in the officials of the Department. The Department has no plans to keep pace with a modern world. The elements of community participation are missing in the present solid waste management hierarchy of the department. It appears that the officials are lacking adequate training for future vision and insight in the specialized field of solid waste management.

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