# SOLID WASTE MANAGEMENT: A CASE STUDY OF PATIALA CITY

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**ABSTRACT:**
Solid waste management is the biggest challenge for the both developed and developing countries. Due to rapid growth in population and increase in per capita income there is sudden increase in generation of municipal solid waste. Solid waste management is one of the essential service to protect the environment, safeguard public health service and improve productivity. For clean and sustainable country proper management of solid waste is very essential. Estimation of solid waste generation quantity and composition and its forecasting over the planning period is a successful plan for management of solid waste. Due to generation of huge and excessive volumes of solid waste in Indian cities, municipal solid waste management require more focus and effective mechanism for proper management because improper management can lead to health and environmental hazards. In Indian cities Municipal solid waste management is one of the most neglected service even though a lot of municipality budget is attributed for this purpose. This paper discusses the existing municipal solid waste management practices in Patiala. The various sources of waste generation, amount of waste generated, existing handling and management methods prevalent in Patiala city is discussed in detail. All the information provided in this chapter is as per the interactions with various stakeholders, officials of Patiala municipal corporation (MCP) and site investigations.

## 1. INTRODUCTION

Today town and cities have become the centres of the population growth and require three essential service water supply, sewage treatment and solid waste management. Due to rapid growth in human population and increase in per capita income there is sudden increase in generation of municipal solid waste. Solid waste management is one of the essential service to protect the environment, safeguard public health service and improve productivity. The solid waste poses a major problem today, especially in urban areas. Waste is dumped in haphazard manner in the various part of country which cause serious health hazards.

In India the volume of waste generation has been increasing rapidly over the last few years. According to the swachhata sandesh newsletter by MoHUA, as of January 2020, 1,47,613 metric tonnes (MT) of solid waste is generated per day from 84,745 wards in India. Some of this is recovered by a team of informal recyclers-20% in large cities and less in smaller cities according to chintan environment research. More than 80% reaches open dumpsites where it cause damaging public health, deteriorating the environment and cause the climate change. The uncontrolled and unscientific dumping of such waste has brought a rising number of incidents of hazards of human health. Contamination of surface and ground water effects more serious human health risk.

Municipal solid waste management is associated with the control of generation, storage, collection, transfer and transport, processing and disposal of waste in such a manner which in accord with the best principles of public health and Environmental considerations.

Patiala was founded by Baba Ala Singh with the construction of the Qila Mubarak in the year 1763. It is believed that the word Patiala comes either from Pattan-wala, or from a combination of the word 'Pati' which means “territory” and “Ala” from founder Baba Ala Singh.

Today Patiala Town is the 4th largest city of Punjab, Patiala municipal corporation has a population of 4,06,192 persons and 85,269 household (census 2011), which has grown at a decadal growth rate of 33.99% over 2001 population. Patiala MC has area of 70.18sq.km and the Population density of on average is 5,788 persons per Sq.km. During the last 60 years from 1951 to 2011, the population of the city Patiala has increased from 97869 to 406192. Patiala has experienced from 16% to 27% population growth in the decade from 1951-2011.In the year, 2017 for the Municipal Elections and convenience of administration, the previous 50 Wards were altered and were increased to 60.

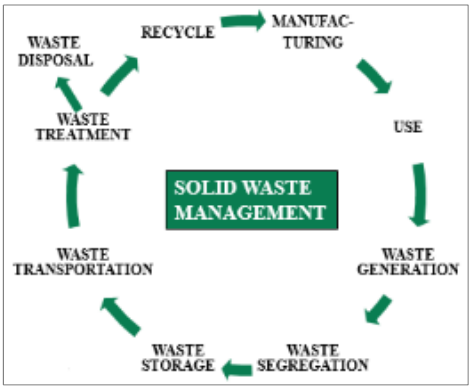
## 2. MUNICIPAL SOLID WASTE

Municipal solid waste (MSW) defined as material that has no value in market, and that is in urban area for which municipalities are responsible for collection, transportation and final disposal.

According to Central pollution control board municipal solid waste includes commercial and residential waste generated in municipal area or notified committees in either solid or semi solid from excluding industrial, hazardous but include treated bio-medical waste.

Solid waste quantity and composition depends upon Socio -economic, population, cultural traditions, consumption behaviour, and degree of industrialization and climate of the city.

Fig.1: MUNICIPAL SOLID WASTE MANAGEMEMT CYCLE:




*Source: by author*

**3. SOLID WASTE GENERATION:**

Patiala city generates 230MT solid waste per day. The gross per capita generation from the city is 0.56kg/day.

Fig.2: PATIALA WARD MAP

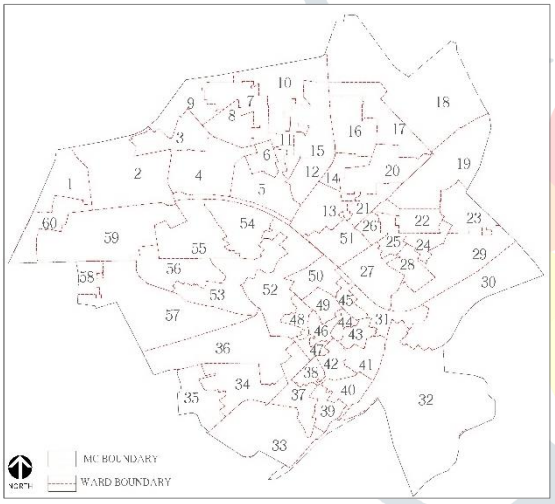



Table.1: WARD WISE MSW GENERATION IN PATIALA

| Solid waste generation mt/day | Ward | No. Of wards |
|---|---|---|
| 4.00 -4.20 | 2,8,10,12,13,15,18,21,31,38,39,44,49 | 13 |
| 4.21-4.40 | 7,14,16,17,20,28,30, 32,34, 40,45,48,50,51 | 14 |
| 4.41-4.60 | 1,4,11,19,22,35,36,41,42,47 | 10 |
| 4.61-4.80 | 3,6,26,37,43,46,55 | 7 |
| 4.81-5.0 | 5,9,23,24,25,27,29,33,52,53,54,56,57,58, 59,60 | 16 |

Wards no. 54 and 60 produce the maximum amount of solid MSW (4.9mt/day) followed by the ward no. 29 and 56 (4.89mt/day) and ward no. 23 and 48 (4.88mt/day). While ward no. 13 generate less amount of MSW (4.01mt/day), followed by the ward no 31 (4.05mt/day) and ward no. 44 (4.08mt/day).

## 4. PRIMARY COLLECTION

Municipal Corporation Patiala provide 100% door to door collection in all 60 wards. Informal waste pickers are involved in door to door collection in the city. 250 push carts, 100 tricycle rickshaw &2 mini tippers are engaged in city for primary collection of waste at household level & commercial waste. It is observed during the field studies that each pushcart covers around 200 households with an average of 2-3 trips a day depending on the need. There are of about 38 secondary bins and 29 open dumping point in the entire city.

PROBLEMS IN CURRENT PRIMARY COLLECTION SYSTEM:

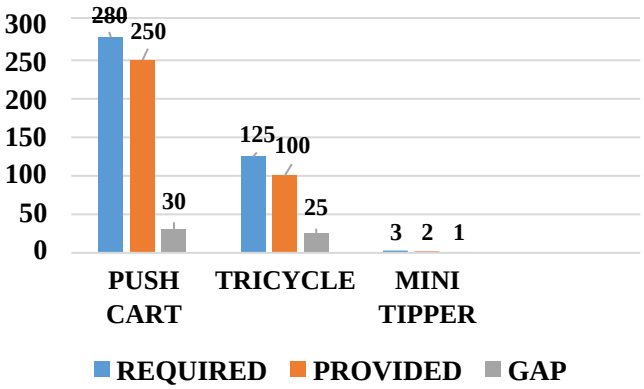
MCP provides 100% door to door collection. But waste pickers do not visit daily for primary collection. They visit alternate days, after two or three days according to their timings. Informal waste pickers which are paid monthly by households to collect waste from door to door but municipal corporation waste pickers comes in street, people have to come out from houses and have to throw waste in push cart and tricycle.

Main problem in primary collection system is solid waste is not collected in segregated way- dry waste, wet waste, recyclable and non-recyclable all type of waste collected in one container.

Patiala Municipal Corporation includes 250 informal waste pickers for door to door collection. They charge 20 to 100 rupee per month per household. Also they collect waste in unhygienic and unsystematic way. In some areas informal pickers collect waste on daily basis and in some areas they collect after one day or two days which depends on the rupee how much they charge. Generally waste pickers charge 100 rupee per month for daily collection and 20 to 80 rupee for collection on alternative days.

In some area such as Ragho Majra waste is collected through trolley tractor, which pass through the street and people have to come and throw garbage in the trolley which is totally wrong. People are not able to throw garbage because they are unable to match timing with tractor trolley, so they prefer informal waste pickers for primary collection on monthly charge basis. Tractor trolley is used for both primary and secondary collection at same time, tractor have to stop on every open dumping point in the streets and waste pickers throw the garbage in trolley from streets through manually loading. This system cause traffic congestion on the roads.

Fig.3: ANALYSIS OF VEHICLES FOR PRIMARY COLLECTION:




In primary survey it is observed that MCP collect solid waste only from 54.5% of household, 36.4% collected by private waste pickers and 9.15% people have to go to and throw the waste.

In 50% household solid waste is collected daily,18.2% alternate days, 4.5% after two days, 13.6% after two days, 4.5% after four days and in 13.6% household waste is never collected they have to go and throw the waste.

Informal waste pickers charge 20 to 100 rupee from household for primary collection based on the efficiency of collection.

## 5. MAN POWER INVOLVED IN SOLID WASTE MANAGEMENT SYSTEM:

60 wards of the city are divided into 7 sanitary ZONES according to sanitary inspector for effective monitoring. To manage entire city sanitation, 1 chief sanitary inspector is deployed along with 7 sanitary inspectors and 32 sanitary supervisors. Sanitary Inspectors are responsible for managing entire sanitation related activities in their assigned sanitary divisions and reports to the Chief Sanitary Inspectors, who then reports it to the Health Officer.

Sanitary Inspectors have engaged 793 sanitary workers who are responsible for collection, transportation and disposal, street sweeping and drain cleaning activities. Among the 793 workers, 532 are permanent workers, 223 are Outsource workers and remaining 38 are daily wages workers that are hired by Patiala Municipal Corporation for a certain period.

GAP ANALYSIS OF MAN POWER

In manpower requirement, chief sanitary inspector, sanitary officer, sub sanitary inspector, sanitary inspector and junior engineer, jamadar is not sufficient so municipal corporation Patiala cannot handle all the wards without manpower infrastructure.

Table.2: GAP ANALYSIS OF MAN POWER

| S. n. | Types | Standard | Requ-ired | Prov-ided | Gap |
|---|---|---|---|---|---|
| 1 | Health Officer | 1For SWM Departme-nt | 1 | 1 | - |
| 2 | Chief Sanitary Inspector | 1 Per 1Lakh Population | 4 | 1 | 3 |
| 3 | Sanitary Officer | 1 Per 1Lakh Population | 4 | 1 | 3 |
| 4 | Sub Sanitary Inspector | 1 Per 40 Sweepers | 17 | 12 | 5 |
| 5 | Sanitary Inspector | 1 Per 80 Sweepers | 9 | 7 | 2 |
| 6 | Sanitary Supervisors | 1 Per 20 Sweepers, | 33 | 32 | 1 |
| 7 | Junior Engineer | 1 Per 2.5 Lakh Population | 2 | 0 | 2 |
| 8 | Jamadar | 1 Per 25 Sweeper | 26 | 13 | 13 |
| 9 | Sweeper | 1 For 625 Population | 650 | 648 | 2 |

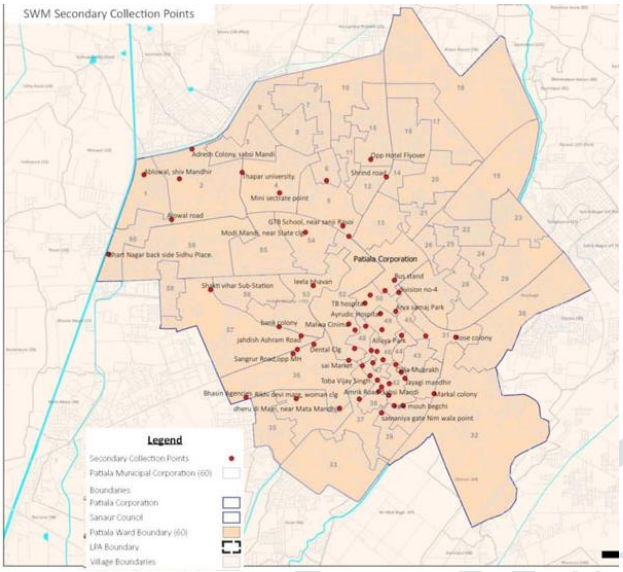
## 6. SECONDARY COLLECTION:

The collection of waste is done in the morning with no specific time. Usually the collection is done 2 to 4 days a week and different in different wards. The amount of dustbins is less than the required but the major problem is the scattering of waste. The community bins are always overfilled and they are never emptied on time.

### 6.1:SECONDARY COLLECTION POINTS IN PATIALA CITY:

The waste collected from households and commercial areas, is dumped either in community bins or at open areas. There are 38 secondary collection points and 29 open dumping points are available with the Patiala municipal corporation. Waste is transported through pushcarts, autos, tractors to the secondary collection. Approximately, 230 tons of waste is transported daily from HHs and secondary points to the dump site, or in other words 80% of the entire city waste generated is being transported to dumping site. The waste collected at secondary points is again collected and transported to the final dumping point "Sanour road" which is located at a distance of 03 km from the Patiala City by means of Tractor trolly, Compactors and Tippers. The city has 5 Tippers and 2 Compactor 11 tractors to transfer the waste from transfer station to the final dumping point at Sanour Road.

Fig4: SECONDARY COLLECTION POINTS IN PATIALA CITY

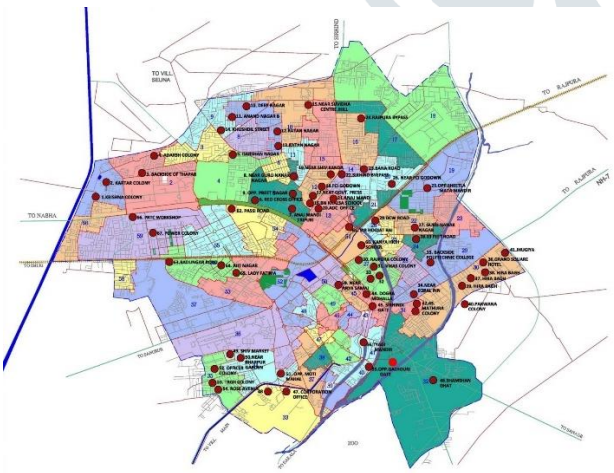



## 6.2: GARBAGE VULNERABLE POINTS:

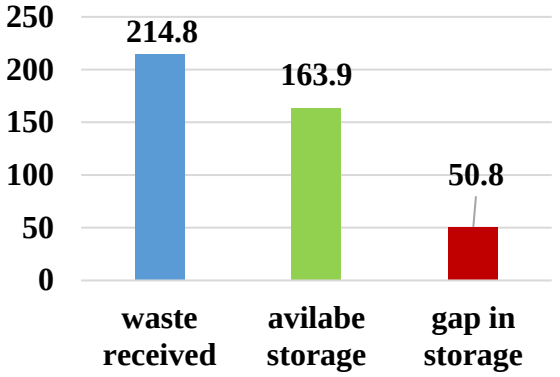
Garbage vulnerable points (GVP) are those areas where the garbage gets piled up because of the constant dropping of garbage by the local residents, travellers, or passer-by, or these spots must have had dustbins earlier.

There are 67 garbage vulnerable point in Patiala city. Public unawareness about solid waste management is a main reason of this garbage vulnerable points, people throw garbage in streets, open areas, public spaces. Another main reason is proper dustbins are not provided by Mc Patiala in the city.

Fig.5: GARBAGE VULNERABLE POINTS IN PATIALA CITY



6.3:AN ANALYSIS OF WASTE RECEIVED, STORAGE CAPACITY AND ATORAGE GAP IN SECONDARY COLLECTION POINTS(MT/DAY)




There are 38 secondary collection points and 29 open dumping points in MCP. Total 95 secondary bins and 6 compactors are available in Patiala city with storage capacity $5m^3$ and $10m^3$ each respectively. At secondary collection point total 214.8mt solid waste is received per day, but the storage capacity of secondary bins is only 163.9mt, 50.8 MT of waste is stored openly or scattered at secondary collection point. MC Patiala requires more 55 secondary bins (capacity $5m^{3)}$ to avoid open dumping and scattering of waste.

As per the CPHEEO norms, ULBs should provide for the storage capacity which is 20% more than the expected daily in flow of waste.

## 7. PROCESSING AND DISPOSAL OF WASTE

Total transported waste that is collected is dumped at Sanour road site. This is located at a distance of 3 km from the Patiala City. Presently, there is no waste processing plant existing in the city. Only soil capping and spray of herbal sanitizer used in the dump site and site of waste processing plant also identified near village Dhudhar approximately 20 km from municipal corporation Patiala.

There is no scientific solid waste processing and disposal facility in Patiala city. Waste collected from the city is disposed at the dumping the site located at Sanour road at distance of 3km from Patiala city. There is no segregation of waste at the site and it's dumped openly. The method is very unhealthy and environmentally unsafe. Total area of site is 17 acres. In the absence of a solid waste management plant, the city's garbage was being dumped at this site on Sanaur road for the last 50 years, turning the lives of nearby residents into a nightmare. Many have been complaining of foul smell and health issues due to the dump.

As per 2020 report of Hindustan times times175 lakh metric tonne of waste spread over eight acres at dump site. It was a landfill site but now its getting overflow and waste is dumped and open left exposing to atmosphere. Due to overflow landfill site is visible from nearby villages.

MATERIAL RECOVERY FACILITIES

MCP started material recovery facilities in city to reduce the waste at dumping site. At current material recovery is done at a very small scale. MCP Patiala has only 8 MRF plants.

## 8. LANFILL SITE:

The method adopted by the Patiala Municipal Corporation for disposal of the solid waste is through the mechanism of landfills. At present Patiala Corporation uses one site for dumping of the solid waste. The site is located at Sanauri adda. The area under this site is 17 acre approximately. The solid waste collected atthe community level is transported to dump site at Sanauri adda. The landfill site is not lined and properly defined. Moreover land filling is being done in an unscientific manner. The waste is directly dumped, without any segregation. There is no compaction of the waste undertaken to compress it since there is no road rollers are available. In the absence of scientific disposal of the waste lot of valuable waste is lost due to absence of recycling. Further, in the absence of defined boundaries, animals like pigs etc. vegetate on the waste. In addition, due to unscientific disposal of the waste, lot of foul smell is generated due to the presence of organic waste polluting the environment in the process. No treatment of the solid waste is undertaken during the dumping process as required in the system of sanitary landfills. This dump site is very close to Tej Bagh residential colony, the occupants of which have to face this ugly scene.

Table.3: INFRASTRUCTURE AT LANDFILL SITE:

| S. No. | Components. | Present Scenario |
|---|---|---|
| 1 | Boundary/Fencing | No |
| 2 | Green Belt | No |
| 3 | Entrance Gate. | No |
| 4 | Weight Bridge. | No |
| 5 | Parking Area. | No |
| 6 | Inspection And Sampling. | No |
| 7 | Administrative Buildings | No |
| 8 | Access Roads. | Yes |
| 9 | Workshop And Garage. | No |
| 10 | Washing Facility. | No |
| 11 | Treatment Plant. | No |
| 12 | Surface Water Drains. | No |
| 13 | Sedimentation Tank. | No |
| 14 | Waste Processing Facility | Yes |
| 15 | Lighting | No |
| 16 | Fire Fighting Facility. | No |

Table.4: DISTANCE OF LANDFILL SITE FROM MAIN LOCATIONS

| S. No | Location | Min. Distance | Achieved |
|---|---|---|---|
| 1 | Habitation. | 500 meters | NO |
| 2 | Water Bodies like rivers and lakes | 200 meters | NO |
| 3 | Canals, Drainage Systems | 30 meters | YES |
| 4 | Highways, Railways | 300 meters-from canter line | YES |
| 5 | Coastal Regulation Zoning | No Landfill permitted | NO |
| 6 | Flood-Prone Areas | No Landfill permitted | NO |
| 7 | Airport | 20 kilometres | NO |
| 8 | Earthquake-Prone Ares | 500m from Fault-line fracture | YES |

Landfill site have only 100m distance from habitation, gases like methane and carbon dioxide are creating odour problems, kill vegetation and create skin diseases to the surrounding habitants. Selection of landfill site is comprises of the following steps but landfill site have some major nonc ompliance criteria and not per as MSWM 2016.

## 9. RECOMMENDATIONS

- It is necessary to educate and create awareness among people to change their habits, so the municipal solid waste is handled as per the direction of municipal council and effectively participate in the activities of municipal council.
- Clear guidelines should be given to people related sorting of waste, using of twin bins and offenders should be penalized.

- There should be a segregation of biodegradable and non- biodegradable and recyclable waste at source and at landfill site, so techniques like composting and recycling to be used.
- Separate community bins should be provided for dry and wet waste.
- In case of vegetables markets and weekly markets big container should be provided for a proper collection of waste.
- 100% door to door collection on daily basis should be provided in all 60 wards.
- Gaps in manpower should be covered as soon as possible because without manpower it is impossible to improve the current solid waste management system.
- GPS Based Monitoring of Garbage Vehicles should be installed, through GPS monitoring it's easy to monitor which area is covered with primary and secondary collection.
- Patiala has a strong historical background, the walled city is designed for pedestrians only, and it's a difficult task to collect waste from narrow streets. Pushcart should be used in walled city to avoid traffic congestion.
- A route map should be prepared for primary collection and disposal of waste, which helps to avoid extra trips of vehicles.
- There is need of transfer stations in the whole city, as current each vehicle has to go to landfill site for disposal of waste which cost more to Patiala Municipal Corporation.
- In order to reduce waste at dumping site, Incinerators , composting, bioremediation methods can be used.
- Dumping site should be away (min.500m) from residential area.
- There is a need of awareness programmes about proper solid waste management, without community participations it's difficult to improve the current solid waste management system.
- Private initiative is required in treatment and disposal solid waste.
- There is a need of strictly follow the solid waste management rules 2016.

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