

IMPLEMENTATION OF NEW TECHNOLOGIES IN SOLID WASTE MANAGEMENT OF PATNA: AN APPRAISAL OF PATNA MUNICIPAL CORPORATION

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ABSTRACT

In Patna the solid waste has become an integral part of man's day-to-day activities. The rapid population growth and urbanization has given rise to the total quantity of waste generation of Patna (M. Corp). According to Patna, City Development Plan (CDP- 2010-31) report about 65% of the total waste generated in Patna Municipal Corporation is collected and rest 35% of waste remains unattended. The report of Patna Master Plan 2031, states that only 60% of total collected waste is transported to primary disposal sites on day to day basis. A major part of waste remains unattended in Patna (Patna Municipal Corporation) due to the inefficient solid waste disposal strategy of PMC, leading to various problems related to human health hazard, environmental pollution and thus un-stabilizing the urban ecosystem of the Patna (Patna Municipal Corporation). This study is an attempt to assess the solid waste management strategies implemented in Patna (Patna Municipal Corporation), Bihar, India. The objectives of the present research work are -to identify the sources and areas of solid waste generation; problems related to solid waste disposal and to assess the awareness among people regarding solid waste management strategy with civic sense. An appraisal of existing solid waste management system of Patna Municipal Corporation (PMC) drives researcher to suggest some measures for a sustainable solid waste management system. The existing management tries its best to sort out the emerging issues related to SWM to some extent, but in some areas present management system has failed to solve the growing environmental threat in the city.

KEY WORDS : Solid waste management (SWM), Patna Municipal Corporation (PMC), Patna Master Plan 2031, Urban Local Body (ULB)

INTRODUCTION

Solid waste management (SWM) is a discipline which is considered as an essential municipal service for protection of environment of city and health of citizens. The strategy for solid waste management is a planned system of effectively controlling the generation, storage, collection, transportation, treatment-procedure and disposal or utilization of solid wastes in a sanitary, aesthetically acceptable and economical manner (Bhanu *et al.*, 2014 and Rai, 1996). The main motive of solid waste management aims at minimizing the adverse environmental

effects caused by the indiscriminate disposal of solid wastes, especially of hazardous wastes (Peay *et al.*, 1988).

Patna high court termed thrice "Patna as to be a garbage city of the country" twice in 2005 and once in 2008 (Verma, 2012). This is the reason which compels the researcher to select Patna Municipal Corporation as the study area. According to various report published in media as well as by government bodies like state pollution control board (SPCB), central pollution control board (CPCB) and Urban Development and Housing Department, approximately rupees 41 crore till 2012 was abruptly

sanctioned to Patna Municipal Corporation (PMC) for garbage disposal and to set up a waste plant. However, nothing came out of these proposals, till date i.e 2019 Patna Municipal Corporation (PMC) only acquired an 80.05 acre of agricultural land to make landfill station on the outskirts of the city (Verma, 2019 and Patna Master Plan, 2013).

The rapid growth of urbanisation results in population growth and rapid growth of urban dwelling units in Patna Municipal Corporation (PMC) which are largely unplanned adding proportion to various problems related to solid waste. Improper planning leads to congestion in streets as a result hindrance occurred in waste collection as the waste vehicles cannot reach the place allowing waste to remain unattended. At present 1000 metric tonnes of waste are generated by PMC per day and “a large chunk of garbage leftover in different parts of the city making the environment unhealthy and unpleasant” (Verma, 2012). The lack of financial resources and inadequate infrastructure of Patna Municipal Corporation (PMC) results in improper waste disposal adding other dimensions to the ever-rising cycle of problems (Jain, 1994 and Zurbrucc, 2003).

Considering the present situation of Patna Municipal Corporation (PMC), the author selected Patna (M. Corp) area. The study has been carried out to find the problems related to solid waste disposal and the different strategies adopted by Patna Municipal Corporation (PMC) for solid waste management within the city.

Solid waste may be defined as organic and inorganic waste materials produced by households, commercial, institutional and industrial activities which have lost their value in the eyes of the first owner, while some other person may find the same useful, if the (original) owner does not want it, it is then called a “waste” (Ramullu and Shoba 2008). Solid waste encompasses both heterogeneous and

homogeneous mass of wastes; heterogeneous wastes generates mainly from urban community while accumulation of agricultural, industrial and mineral wastes accounts for homogeneous wastes.

In simple words, solid waste can be defined as any unwanted and discarded materials arise due to different human activities. Solid wastes are not pollutants, but it is having the potentiality to become pollutant if handled improperly and disposed at wrong place (Boojh, 1996). It is also not possible to avoid waste. Thus, the only way is to properly manage the solid waste from collection of waste, transportation by waste vehicles and finally the disposal of waste in a planned way to keep environment and human healthy (Majumdar, 2001).

Solid Waste Generation in Patna (M.Corp)

The population size plays a significant role in cities with respect to the quantity and quality of garbage generated (Singh *et al.*, 1988). It also varies according to the nature of residential, commercial and industrial areas, occupational structure, income level, food habit, and nutritional intake, level of education, living conditions and lifestyle of inhabitants.

Status of Patna on National Level

A survey in 46 cities of India was conducted during 2016-17 by Central Pollution Control Board (CPCB). The quantity of waste is continuously increasing year after year as clearly visible in Table 1. It shows that in big cities the quantity of solid waste is much higher compared to smaller cities according to population strength. The city ranks no.1 Mumbai (population wise) generates maximum waste of 11000 tonnes per day, followed by Delhi 8700 tonnes per day, Bangalore 3700 tonnes per day, Chennai 5000 tonnes per day, and Hyderabad 4000 tonnes per day. Whereas Patna also comes in category of high population as it ranks 19th most populous city

Table 1. Solid Waste Generation in Top 5 Metro Cities, (Population Wise) and Patna

Rank of Cities	Name of City	Population (2011)	Waste Generation in Tonnes Per Day(TPD)			
			1999-2000	2004-05	2010-11	2015-16
1	Mumbai	12442373	5355	5320	6500	11000
2	Delhi	11034555	400	5922	6800	8700
3	Bangalore	8443675	200	4669	3700	3700
4	Chennai	7088000	3124	3036	4500	5000
5	Hyderabad	6731790	1566	2187	4200	4000
19	Patna	1683200	330	511	220	450

Source: CPCB 2017, Solid Waste Generation in 46 Metro Cities of India

of India generates 450 tonnes of waste per day which is very less compared to other populous metro cities like Delhi, Mumbai, Bangalore, Chennai and Hyderabad.

Status of Patna on State Level

There is no such formal study conducted in the state to identify the quantity and quality of waste generated in different cities of the state. However, data on waste generation per capita per day is available from Central Pollution Control Board (CPCB) and Urban Development and Housing Department of Government of Bihar.

From the analysis of Table 2 it can be summed up that on an average 0.4 kg/capita/day waste is generated in Patna Municipal Corporation, 0.3 kg/capita/day by different Municipal Corporations and 0.2 and 0.15 kg/capita/day by Municipal Councils and Nagar Panchayats respectively of Bihar. The share of per capita waste generation of Municipal Solid Waste of Patna Municipal Corporation in the state of Bihar is highest.

Patna Municipal Corporation: A Brief Background

Patna Municipal Corporation (PMC) is the Urban Local Body (ULB) as per 74th amendment of the Indian constitution and was established on 15th

august 1952 by the Government of Bihar. Solid waste management is an overall responsibility and duty of the PMC as per Bihar Municipal Act 2007 and Municipal Solid Waste Management and Handling Rules 2000.

According to Urban Development Ministry of Bihar Patna Municipal Corporation (PMC), surrounds an area of 99.45sq kms, (Patna Master Plan, 2013). The city is divided into 72 wards which is grouped under these four circles- New Capital Circle (Western Zone), Kankarbagh Circle (Sothern Zone), Bankipur Circle (Central Zone) and Patna City Circle (Eastern Zone) which accommodates about 1.7 million (16, 83,200) population as per Census 2011. This civic administrative body administers and well managed through four circles. Each circle is administered by an executive officer who is deputed by the State Government of Bihar. The administrative functions of the municipalities are exercised through mayor-in-councils. It comprises of a Mayor, a Deputy Mayor and other elected members of the PMC. In PMC, Municipal Commissioner and Additional Municipal Commissioner, Sanitation Department is responsible for overall Solid Waste Management (SWM) of Patna.

Table 2. Bihar: Waste Generation in different ULBs of Bihar TPD & TPA (Tonnes per Day and Tonnes Per Annum)

Sl. No	Type of ULBs	Total No. of Households	Waste Generation in Kg/Capita/Day	Waste Generation In TPD	Waste Generation In TPA
1	Municipal Corporation	537550	0.3kg	806	294309
2	Patna Municipal Corporation	223088	0.4kg	446	162854
3	Municipal Council	648111	0.2kg	648	236561
4	Nagar Panchayat	495168	0.15kg	371	135552
	Total	1903917		2272	829276

Source: i) Central Pollution Control Board 2000 (CPCB), ii) *Comprehensive Solid Waste Management Policy and Strategy for Urban Local Bodies of Bihar (ULBs) 2018 draft copy*, Urban Development and Housing Department, Government of Bihar

Table 3. Patna (M. Corp.): Organizational Body Setup of Waste Management

Members	Operational Level
Municipal Commissioner	Chief Executive
Additional Municipal Commissioner, Sanitation	Over-All in Charge of SWM Operations
Deputy Municipal Commissioner, Sanitation	Assist Additional Municipal Commissioner, Sanitation
Executive Officers	Circle Head
City Managers	Assist Executive Officers at Circle Level
Assistant Health Officers	Circle Wise
Sanitary Inspectors	Circle Wise/Ward Wise
Sanitary Supervisors	Ward Level
Sanitary Workers	Primary Level at Different Wards

Source: i) information collected from PMC by researcher; ii) Budget Report of PMC

As per Table 3 city managers are responsible for the proper functioning of Solid Waste Management at circle level who are assisted by Assistant Health Officers and Sanitation Inspectors, Supervisors and Workers. All of the three the sanitary inspector, supervisor and workers are responsible to monitor the works related to waste management.

Different Techniques Adopted by PMC for Solid Waste Management

The people of Patna are in habit of dumping their waste indiscriminately along the sides of streets, lanes or in open spaces/plot or nearby vats/bins. These waste or garbage are collected by PMC *safaikarmachari* (sanitation workers) and transferred into the roadside bins or collection points. Afterwards these wastes with the help of next troop of *safaikarmachari* (sanitation workers) are transported to dumping sites in open trucks or through tractor and trailers.

Steps of Collection and Disposal of solid waste Adopted by PMC

Waste Segregation – Segregation is the process of sorting wastes into biodegradable and non-biodegradable or into recyclable or reusable items. Unfortunately, this system of segregation of waste is not in practise here in PMC.

Bin Waste Segregation System: The Government of India along with State Government’s and Local Bodies launched a massive campaign on 05th of June 2017(world environment day) termed as 2 Bin Waste Segregation System. Patna Municipal Corporation has also launched 2 bin system in the city. Two colourful dustbins green and blue were installed by the local bodies all over the city of Patna. These are installed with a motive to implement the practise of segregation at source point only. For this purpose 100 secondary bins were purchased and installed across the city (PMC Budget 2016-17-98). Practically this concept is far from the reality of this aforesaid concept. In the lack of awareness and proper knowledge among the city dwellers this 2 bin system concept is almost a failure in the city of Patna.

Storage and Collection : The collection of solid waste and its storage at the source are substantially lacking in most of the areas of Patna (M.Corp). Before 05th June 2017(campaign of segregation of waste) dustbins are common for decomposable and non- decomposable waste because no segregation is

performed and waste is disposed at a common disposal centre.

Storage

On an account of the overall study of all areas the researcher noticed that 48 percent of total households use polythene /plastic bags for collection of their waste. Only 15 percent of total households prefer normal dustbins to collect waste. It’s very common sight of throwing waste in open spaces/plot/drains (14 percent) of total households. 12 percent use empty cardboard or boxes to collect waste while 11 percent of total households throw their waste at open spaces/plot or drain.

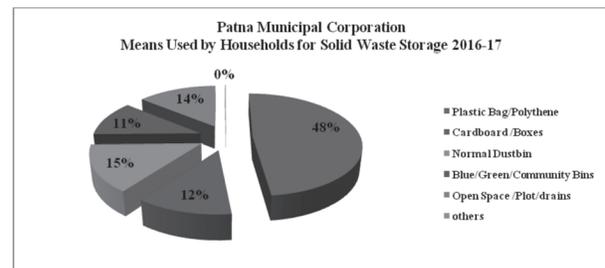


Fig. 1. Source – based on field survey by researcher

Primary Collection - Before 2nd October 2018 the door to door collection system was not in practise in Patna. As shown in Fig. 2 people use to dispose their waste in nearby containers or dustbins or vats or collection points if available, or if not available they simply dump their waste on roadside or corner of streets or low lying areas or simply on the open land/plot of their locality which can be easily found anywhere.

Door to door collection was initiated by PMC in April 2017 with the help of two private agencies named Patna based-Nishka Security and Intelligence Services and Delhi based- People’s Association for Total Help and Youth Applause (PATHEYA). Unfortunately their services were terminated after few months only because they failed to execute the programme properly (Patna

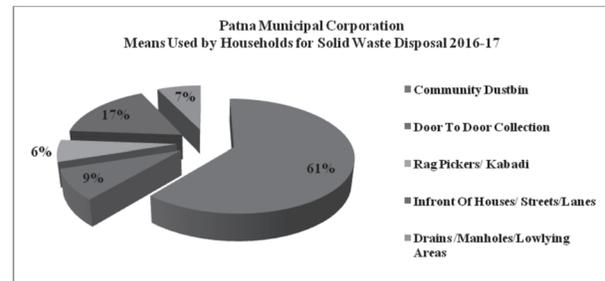


Fig. 2. Source – based on field survey by researcher

Master Plan, 2031).

Secondary Collection - The waste or garbage dumped by the residents are then picked up by the municipal workers designated as sanitation workers with the help of hand trolleys, handcarts etc and dumped in an unorganised manner into the roadside vats/ dustbins.

Door to Door Collection Service- 2nd October 2018 on the eve of 150th birth anniversary of father of our nation Mahatma Gandhi; Chief Minister Mr. Nitish Kumar launched the Door to Door Collection Service in Patna once again but without the help of private agencies under direct supervision of PMC. This service is not chargeable. This new system is known as *Chalant Kachra Sangrah* (mobile garbage collection). For the proper functioning of this new system of waste collection 375 auto trippers, 10 sweeping machines, 100 large bins and 106 small bins has been deployed for door to door collection (information given by PMC). The auto trippers and handcarts were collecting the garbage from households by playing music so that people come to know that the vehicle has arrived at their doorsteps. They are playing audio songs with lyrics such as: *Gariwala aaya ghar se Kachra le ao, Gariwala aaya ghar se Kachra le ao* (bring garbage, bring garbage out of your homes). Now residents of Patna heaved a sigh of relief as the corporation started door to door garbage collection, it becomes very helpful for people to dispose their waste directly to PMC mobile garbage vehicle.

Table 4 shows that total 392 vehicles are engaged to serve in four different circles for door to door garbage collection in Patna. They usually take two trips per day to the designated wards of circle assigned by the sanitation supervisor of PMC. The timing varies according to the locality, though two standard time generally followed that is between 7 A.M. to 10 A.M. and 2 P.M. to 5 P.M.

Table 4. Patna (M. Corp): Door to Door Tipper Details functioning in Patna

Type of Vehicles	Total Number
Door To Door Close Tipper	201
Door To Door Open Tipper	102
Mini Tipper	61
Auto Tipper	28
Total	392

Source: information given by City Manager of four circles of PMC

Transportation of Waste

In Patna vehicles used to transport wastes from source to collection point and finally to dumping ground are open trucks, dumpers and tractors. There are no advanced vehicles in PMC for timely collection and transportation of waste. Largely the transportation of waste depends on manual loading. Although mechanised loading with the help of large compactors is also in practise but to some areas only. It is due to the inadequacy in number of compactors in PMC. For waste transportation a temporary intermediate point was formed within all the four circles by PMC. Thus, all the waste collected is transported to these points.

Waste Disposal Process of PMC

Patna (M. Corp) has been divided in four circles, for the disposal of the solid waste of the city. The officials informed that the solid waste is not weighed rather it is calculated on the basis of number of vehicles used for collection of solid waste, their carrying capacity and number of trips per day. Hence solid waste generation from each ward of Patna (M. Corp) has been calculated on this basis.

Municipal Solid Waste (MSW) quantity disposed per day is calculated with the help of following formula: -

$$\text{Number of vehicles} \times \text{vehicle carrying capacity (kg/trip)} = \text{MSW quantity disposed per day}$$

(Close Tipper vehicles 1000 kg/trips, Open Tipper vehicles 1500 kg/trips, Mini Tipper vehicles 500 kg/trips, Auto Tipper vehicles 500kg/ trips, E-Cart vehicles 400 kg/trips).

Treatment of Waste : The PMC body dump the entire waste collected from the 72 wards of the city without any treatment or any scientific methods in low lying areas as well as the outskirts of the city, besides the dumping grounds. PMC as per its convenience regarding municipal solid waste disposal followed a two step strategy of dumping of waste. First step is carried out in morning time at secondary landfill site while the second one happens during night at primary landfill site.

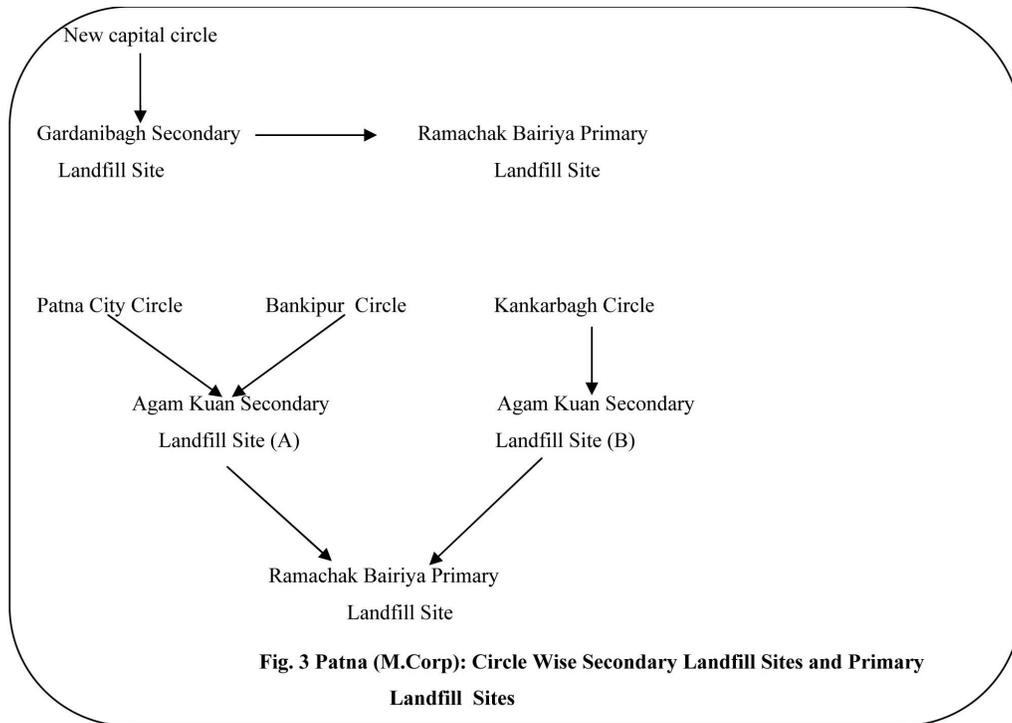
Agam Kuan Secondary Landfill Site A and B

The garbage collected from the localities of Kankarbagh Circle through Door to Door collection services are dumped here at Agam Kuan Secondary Landfill Site (A). The localities of Patna City and Bankipur circle's garbage vehicles dumped their

Table 5. Patna (M. Corp): Machinery and Vehicles Used for Waste Loading and Transportation in Patna

Type of Machines	Total Number	Type of Vehicles	Total Number
Bobcat	25	Compactor	12
Wheelbarrows	600	Hiwa	15
Handcarts	386	Mini Hiwa	23
		Tractor	122
		Trucks	27
		Dumpers	7

Source: Report of City Manager and Patna Master Plan 2031 pg 109



Source: Information Collected from PMC office and Report of City Manager.

waste at Agam Kuan Secondary Landfill Site (B).

As shown in the table above on an average the garbage vehicles takes two trips per day from collection source point to secondary garbage point. First trip is between 8 A.M. to 12 P.M. while second trip occurs generally after 12 P.M. and before 3 P.M. On the other hand big garbage vehicle like Haiwa usually takes singlr trip per day.

Gardanibagh Secondary Landfill Site

The garbage collected from the localities of New Capital Circle through Door to Door collection services are dumped here at Gardanibagh Secondary Landfill Site. As shown in the table below on an average the garbage vehicles takes two trips per day from collection source point to secondary garbage point. First trip is between 7 A.M. to 11 P.M.

while second trip occurs generally after 2 P.M. and before 5 P.M

Primary Landfill Site Raman Chak – Bairiya

Presently Raman Chak-Bairiya is the primary waste landfill site acquired by the state government. On an average about 1000 MT/day waste is disposed here from the secondary lanfill sites of the city. After the complains of city dwellers timing was changed, especially the people residing nearby the landfill sites about the problems faced by them due to continuous to and fro of garbage vehicles in their day to day activities. The dumping activities are carried out in night after 10p.m. and stopped befor 4 a.m. like the other Indian cities wastes are dumped without any treatment by the crude method of dumping.

In the above table details were given about the different machinery available at PMC for day to day functioning of solid waste disposal of all the four circles from garbage collection point to secondary landfill site and finally to primary landfill site.

Deficiencies in SWM Techniques of PMC

Absence of segregation- Instead of introduction of modern techniques likes 2 bin systems, door to door collection through 2 bins residents of PMC dispose waste indiscriminately. In Door to Door Collection Service vehicles like Open and Close Tipper, Mini and Auto Tipper are designed for collection of wet and dry waste separately, but no segregation of waste is in practise. All types of waste are intermingled and collectively dumped to landfill sites without any treatment.

Waste collection : These indiscriminate disposed wastes are picked up by the street sanitation

workers manually and brought to the designated point of collection. The researcher in the present study found that Patna Municipal Corporation is facing the problem of shortage of standard tools and equipment to carry out the garbage collection process. Manual loading is the only option with the help of equipment like handcrafts, *shovels, kudal and belcha* which makes the waste disposal process slow and irregular or even waste remains unattended for several days.

Waste transportation- The machinery, vehicles and manpower are not adequate for waste collection and transportation of the city. Due to the inadequacy in number of compactors in PMC; mechanised loading with the help of large compactors is done but to some areas only. Most of the waste transportation vehicles or machines used by PMC are either hired or over a decade old which is worn out and is in urgent need of complete replacement. New vehicles

Table 6. Patna (M. Corp): Waste Disposal Per Day in Patna

Circle of PMC	Total No. of wards	Waste Generation From Wards	Vehicles Used	Number of Vehicles	Disposal In Kg/Day/Trip
New Capital	29	340430 Kg/Day	Door to Door Close Tipper	80	80000
			Door to Door Open Tipper	26	39000
			Door to Door Mini Tipper	61	30500
Patna city	20	233459 Kg/Day	Door to Door Close Tipper	90	90000
			Door to Door Open Tipper	30	45000
Bankipore	12	127052 Kg/Day	Door to Door Close Tipper	60	60000
kankarbagh	20	141164 Kg/Day	Door to Door Open Tipper	20	30000
			Door to Door Close Tipper	50	50000
			Door to Door Open Tipper	5	7500
			Auto Tipper	28	14000
Total	72	842105	e-cart	22	8800
				472	454800

Source: Information Collected from PMC office and Report of City Manager.

Table 7. Patna (M. Corp): Timing and per day vehicles trip for waste disposal of three Circles

Landfill Site	Circle	Garbage Vehicles	Number of Vehicles	Timing First trip	Timing Second trip	Number of Trips
Agam Kuan (A)	Kankarbagh	Door to Door Close & Open Tipper	55	08:00-10:00	11:00-2:00	2
		Auto Tipper & e-cart	50	08:00-10:00	11:00-2:00	2
Agam Kuan (B)	Patna City	Haiwa	34	11:00-04:00		1
		Door to Door Close & Open Tipper	120	08:00-11:00	11:30-3:00	2
	Bankipur	Door to Door Close & Open Tipper	80	09:00-11:00	12:00-3:30	2
		Haiwa	2	11:00-03:00		1

Source: Information Collected from PMC office and Report of City Manager

like door to door collection open and close Tipper were launched but unfortunately 15% vehicles (46 out of 303) are non-functional, 26% Hiwa vehicles are hired by PMC for waste transportaion and 16% tractors of PMC are in damaged conditions.

Waste treatment and disposal : The waste disposal strategy of PMC is very crude. It has been observed that unauthorised segregation of recyclable waste items is undertaken here by rag-pickers in a very inefficient, hazardous, unhygienic and risky way. The PMC body practices open burning of waste, thus posing a health threat especially to people living nearby the landfill site or dumping grounds. It also pollutes the environment and poses risk to the entire area. Rest of the waste without any treatment dumped in a very unscientific manner in low lying areas as well as the outskirts of the city, besides the dumping grounds.

Suggestions for Solid Waste Management

Collection of waste

1. PMC should focus on waste segregation at

source level with the help of making households aware about the segregation process.

2. The frequency of solid waste collection for disposal must be increased and it must be on regular day to day basis

Transportation of Solid Waste –

1. It is suggested by the researcher that the types of vehicles used for transportation and disposal of waste must be selected as per the type and quantity of waste along with the distance, road condition etc
2. There should be route planning map for waste collection and transportation vehicles and each vehicle is under tracking system with GPS installed.

Disposal and Treatment of Solid Waste

1. The researcher has the suggestion that the process Anaerobic Digestion can be adopted for disposal of mixed solid waste of PMC.
2. If the process of segregation becomes successful, then biological composting and recycling of

Table 8. Patna (M. Corp): Timing and per day vehicles trip for waste disposal of Gardanibagh Circle

Landfill site	Circle	Garbage Vehicles	Number of Vehicles	Timing First trip	Timing Second trip	Number of Trips
Gardanibagh	New Capital Area	Door to Door Close & Open Tipper	167	07:00-11:00	2:00-5:00	2
		Haiwa	4	11:00-04:00		1
		Tractor	3	11:00-03:00		1

Source : Information Collected from PMC office and Report of City Manager

Table 9. Patna (M. Corp): Machinery Used for Waste Disposal in Landfill Site

Landfill Site	Circle	Types of Machinery	Number of Machinery
Gardanibagh	New Capital	JCB	17
		Bobcat	17
		Compactor	8
		Dumfer	3
		Poklen	2
		JCB	6
Agam Kuan (A) & (B)	Kankarbagh, Patna City & Bankipur	Bobcat	5
		Compactor	4
		Robot	8
		Poklen-200	1
		JCB	1
Raman Chak- Bairiya	Gardanibagh	Poklen-210	1
		Haiwa	2
		JCB	3
		Haiwa	9
		Tractor	5

Source: Information Collected from PMC office and Report of City Manager

waste can be recommended as the most suitable waste disposal method by researcher.

3. PMC must take steps regarding Waste to compost and waste to energy methods and can be able to handle waste in a better way compared to existing ones.
4. It has been observed that ward level or community level composting opens the scope of recycling of waste also. PMC can deploy the people from economically backward categories or rag pickers which can be a source of employment for economically weaker people, thereby significantly increasing the manpower of PMC as well.

People's Awareness and Participation in Waste Management

For a successful waste management system people's co-operation and participation is necessary. It is the responsibility of PMC to introduce awareness programs in the localities of Patna (M.Corp) to make people aware about the concept of solid waste management especially about segregation of waste into biodegradable, non-biodegradable and recyclable waste, which helps about waste reduction and segregation at source level also.

Proper Monitoring System - There is also need to strengthen the monitoring system of waste management. There is a large gap between policy formulation and its implementation. PMC should focus to bridge this gap for proper SWM.

CONCLUSION

The study of researcher reveals that there are many shortcomings in present solid waste management strategies adopted by PMC for solid waste management. First, the PMC body should strengthen the three aspects the Technological, the Institutional and the financial aspect of PMC. The above-mentioned suggestions recommended by researcher have potentials to make a sustainable solid waste management system in Patna (M.Corp) in the future. The only requirement is to adopt a systematic approach for safe and efficient waste collection, transportation and disposal plan of solid waste management in Patna (M.Corp).

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