ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 12, pp.44197-44200, December, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

TO DEVELOP "*Zinipol area*" AS A MODEL AREA FOR MUNICIPAL SOLID WASTE MANAGEMENT IN PATAN

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ARTICLE INFO

Article History:
Received 11th September, 2016
Received in revised form
08th October, 2016
Accepted 07th November, 2016
Published online 30th December, 2016

Key words:

Municipal Solid Waste Management,
Swachhata Abhiyan,
Patan,
Gujarat.

ABSTRACT

Problems of Municipal Solid Waste Management are increasing day by day with the increase of population, urbanization and industrialization. Our Indian Prime minister declared the *Swachha Bharat Abhiyan* to reduce the waste management problems in India. All the states of India are participating it to success it. Patan was also participated in to reduce the problems in Patan but due to some reasons, problems are not reducing. The present study was carried out in Zinipol area of Patan by being a mediator of Patan Nagar Palika and Public. Zinopol is a residential area having more than 120 households. During the study, Specific Municipal Solid Waste Management System from waste generation to disposal of the Zinipol area was developed as per the draft Solid Waste Management Rules, 2015 and implemented successfully with the support of Patan Nagar Palika and Public Participation of Zinipol area. The Swachhata Plan for the area was also developed with this. According to the Specific Municipal Solid Waste Management system and Plan of Zinipol, the entire household was segregating and storing dry waste and wet waste in separate dustbins at their home which was directly transferred to the processing site. At the site, the dry waste and wet waste was weighted and segregated in categories like compostable, recyclable, reusable and landfill. After segregation, compostable materials were used in composting, recyclable send for recycling, reusable given to stakeholders. The waste of Zinipol area was reduced up to 98 % by implementing the plan and system. Only 2 % waste was remain which has no solution with us so it was transferred to the dumping site because of no landfill sites in Patan and in its surrounding area. It was the first system and plan implemented in Patan which reduced the quantity of waste and supported to draft Solid Waste Management Rules, 2015.

Citation: Patel Hardik and Solanki Hitesh, 2016. "To develop "*Zinipol area*" as a Model area for Municipal Solid Waste Management in Patan", *International Journal of Current Research*, 8, (12), 44197-44200.

INTRODUCTION

Now a day, Industrialization and Urbanization is spreading in all over the India with increase of Population so India has led to the migration of people from villages to cities, which generate thousands of tons of Municipal Solid Waste daily by different sources and this generated waste is producing the some environmental problems due to lack of treatment and awareness of public. Waste is a burning issue for entire world. The waste quantity is increasing at an alarming rate in India due to rapid urbanization and high population growth. The growth rate of population for India in the last decade was 17.6% (census of India 2011) (Srivastava *et al.,* 2004). Domestic, Commercial, Biomedical and variety of toxic and domestic hazardous wastes are generally disposed of by the citizens on the streets, drains, open spaces, water bodies, etc., causing serious problems of health and environment (Abbasi *et al.,* 2012).

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A Planning Commission report, prepared in May 2014, has said that while Gujarat's urban development authorities may be collecting most of the MSW – 7,378 out of 8,336 tonnes per day (TPD), they are able to treat just 118 TPD, which comes to a mere 1.57 per cent of the total collection and Gujarat fails to treat nearly 98 % of the municipal solid waste it generates in the urban areas. According to an estimate, residential waste (including waste from apartment houses) accounts to 55 to 65 % of the total municipal solid waste generation. Waste from schools and commercial locations such as hospitals and businesses, amounted to 35 to 45% (EPA, 2006). The MSW amount is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020 (Sharma and Shah, 2005). Poor collection and inadequate transportation are responsible for the accumulation of MSW at every nook and corner. The management of MSW is going through a critical phase, due to the unavailability of suitable facilities to treat and dispose of the larger amount of MSW generated daily in metropolitan cities. Unscientific disposal causes an adverse impact on all components of the

environment and human health (Rathi, 2006). There are many categories of MSW such as food waste, rubbish, commercial waste, institutional waste, street sweeping waste, industrial waste, construction and demolition waste, and sanitation waste. MSW contains recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), compostable organic matter (fruit and vegetable peels, food waste) and soiled waste (blood stained cotton, sanitary napkins, disposable syringes) (Jha *et al.,* 2003; Reddy and Galab, 1998; Khan, 1994). To reduce the problems of municipal solid waste in Gujarat, the government of Gujarat expectedly went in massively into *"Swachh Bharat Abhiyan" launched by* our Indian Prime Minister. Ministry of Environment, Forest and Climate change drafted the Solid Waste Management Rules, 2015 to reduce the problems of Municipal Solid Waste and improve the waste management in India. Patan is also participated in to *Swachha Bharat Abhiyan* to reduce the problems of MSW in Patan. Though, they efforting for clean Patan but they are going to fail in it mainly due to the lack of the Public Participation, communication gap between Patan Municipality and Public etc. The study was carried out to support and implementation of the drafted Solid Waste Management Rules, 2015 in Patan.

MATERIALS AND METHODS

Study Area

Patan city is situated at the Northern part of Gujarat Region of India and geographically located between 23° 51' 5.81796" North and 72° 6' 53.49096" East. It is one of the fastest growing cities in Gujarat. With a population of 1, 25, 027 in 2011, indicating a development of 741 Sq.km areas. Patan has an average literacy rate of 72%, higher than the national average (Census of India, 2011). Zinipol area is selected for the study which is one of the popular residential areas of Patan covering more than 120 households.

Preparation of MSWM System and Plan

Specific Municipal Solid Waste Management system and Plan including Solid Waste generation, collection of segregated waste from source, transportation, process and disposal was prepared for Zinipol area to implement and reduce the municipal solid waste management problems with the public and municipality involvement.

Mediator

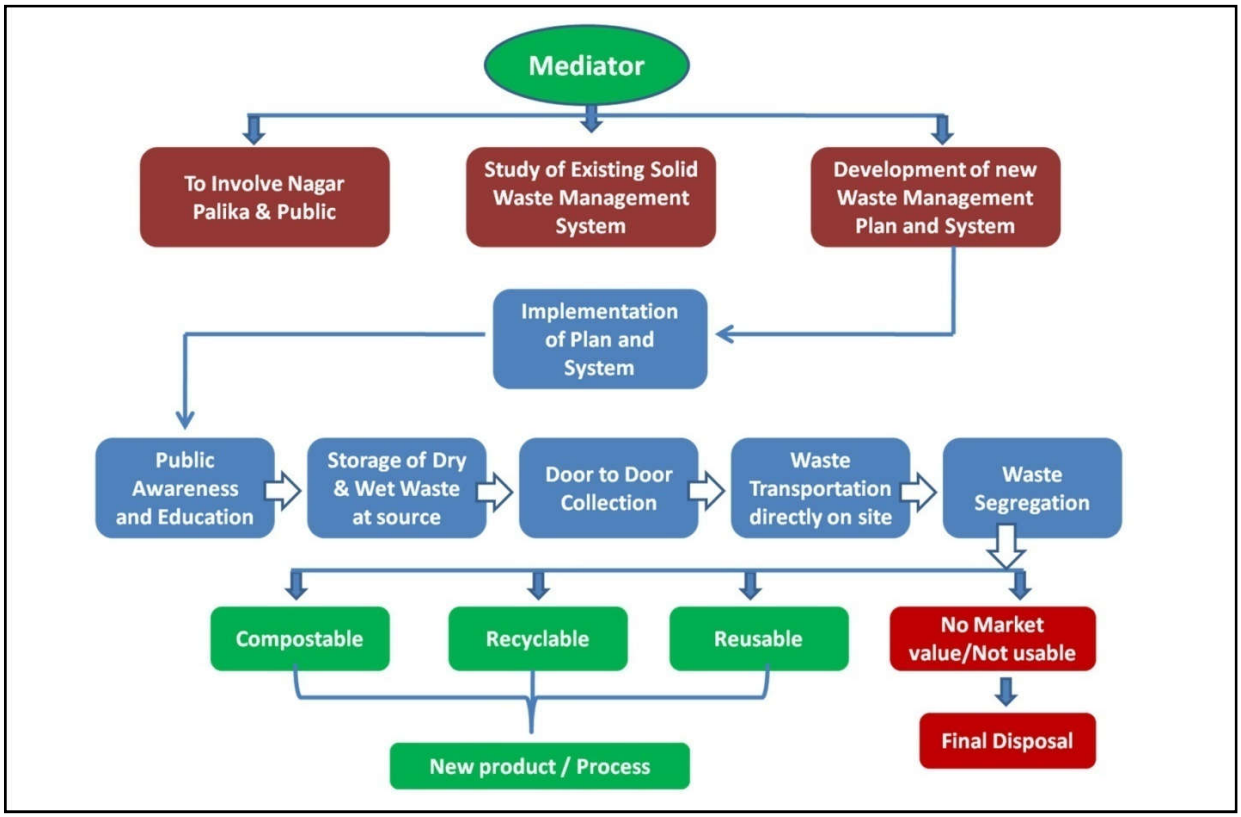
Mediator will connect the municipality and public for the better solid waste management.

Public Involvement

It is very essential to educate the public regarding segregation of wet and dry waste separately before any project is implemented, a public participation meeting be held to make the public aware of impacts of mixed waste dumping and the problems associated with it (Ramachar *et al.,* 2012). Public of Zinipol area was educated and aware about the storage of dry waste and wet waste at their home; current solid waste management problems and their effect on environment and human health; benefits to involve in solid waste management; and motivated to initiate "Swachha Zinipol Abhiyan" with the support of Patan Municipality to develop Zinipol area as a model area for the better municipal solid waste management system in Patan.

Solid Waste Storage at Source

According to drafted Solid Waste Management Rules, 2015, the municipal solid waste should be stored Dry Waste and Wet Waste separately. For the collection of the Solid Waste in Zinipol area, two dustbins were distributed in each and every home. In two dustbins, yellow color's dustbin for dry waste storage and green color's dustbin for wet waste storage was distributed with their own coats.



Waste Collection

For the Collection of dry waste and wet waste separately of Zinipol area, door to door collection arranged in Patan Municipality's vehicle.

Transportation

Collected dry and wet waste directly transported with the separation to varmi compost plant (in non working condition) of Patan Municipality in same vehicle.

Waste Segregation

From the dry waste, waste was segregated at the site like kitchen/ vegetable waste, bio degradable waste, plastic, paper, polythene, glass, card board, inert material etc.

Waste Processing

All the segregated waste was weighted and categorized for the further processes like composting, recycling, reuse and landfill.

Waste Disposal

Remaining not managed waste was send to the dumping site due to no working landfill site in Patan and in its surrounding area for final disposal.

RESULTS AND DISCUSSION

Solid Waste Storage at Source

Storage of dry waste and wet waste separately at source of generation is essential for the better municipal solid waste management. Zinipol area's people were educated and awared about the storage of dry waste in yellow dustbin and wet waste in green dustbin. They were also awared about the categories of dry waste and wet waste.

Waste Collection

Door to door collection of segregated wet solid waste and dry solid wastes on a daily basis at pre informed timings from all residential premises organized and settled in motorized vehicles with the collection facility of segregated dry and wet waste without mixing of waste.

Table 1. Average quantity of waste collected from Zinipol Area

	Dry Waste (Kg)	Wetm Waste (Kg)	Total Waste (Kg)
Total Waste/month	1091.37	654.18	1745.55
Total Waste/day	36.38	21.81	58.19
Total Waste/household/day	0.30	0.18	0.48

According to households waste collection, Table :1 shows that the each house of Zinipol area generated 0.30 Kg Dry Waste/day, 0.18 Kg Wet Waste/day and 0.48 Kg total solid waste/day at the collection time but it was having slight variation in their type and quantity due to some mixture of the waste.

Waste Transportation

Collected segregated dry and wet waste directly transported to the processing site without sending it on secondary collection sites. As per the recommendation in draft Solid Waste Management Rules, 2015, the step of the secondary waste collection or transferred sites removed from the waste management steps.

Waste Processing

The collected dry and wet waste was brings at the varmi compost plant of Patan Nagar Palika which was not in working condition. There were no facilities available at the site and not in good condition for varmi composting or any other composting. After the bringing of solid waste at site, the dry and wet waste was weighed by the portable weigh balance every day.

Waste Segregation

The collected waste was segregated as per the market demand and materials required for composting. One rag picker was hired for the segregation of solid waste of Zinipol area for the further process of waste.

Table 2. Composition of Municipal Solid Waste of Zinipol Area

Type of Waste	Quantity of Waste (Kg/Month)
Kitchen/Vegetable Waste	714.178
Silt and other miscellaneous organic waste	620.118
Cloths	79.9
Coconut	70.5
Bricks and other concrete waste	56.97
Paper	43.71
Polythene	42.35
Not usable materials	40.81
Plastic	22.12
Rubber	17.525
Milk pouch	11.255
Paper board, box etc.	10.045
Glass	6.42
Cement bags	6.385
Wood	3.26
Total	1745.546

Table 2 shows the composition of solid waste of Zinipol area which was highly contain kitchen/Vegetable (714.178 Kg/Month) waste due to the residential area and Slit and other miscellaneous organic waste (620 Kg/Month). 40.81 Kg was the not usable material which has no market demand and useless materials for composting which includes namkeen pouch, shoes' not usable material etc.

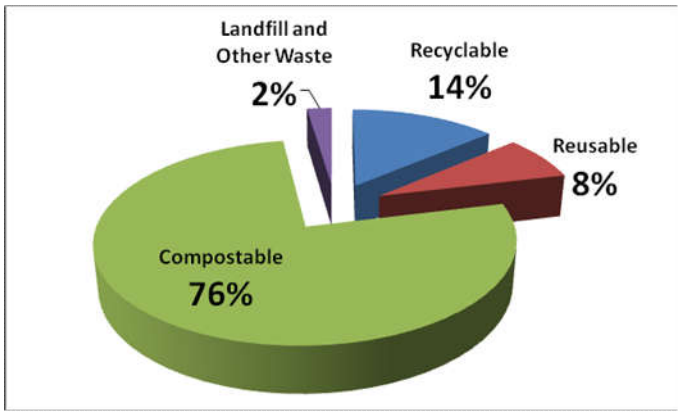


Figure 2. Categories of solid waste generated in study area

Figure 2 showed that the 76 % was a compostable material which can be used for the composting; 14 % was Recyclable

material; 8 % was Reusable material and only 2 % was landfill and other materials which were not used for the further process.

Other actions were implemented for better solid waste management

Development of Monitoring Committee

For the quick solution of solid waste management regarding issues of the areas, the monitoring committees were developed. They were monitored the each and every steps of the Project.

Keep the area clean

People were educated and awared to use the dust bin and not to litter the waste on road or other places in area.

No burning of Waste

Before the implementation of project, the solid waste was burnt in the area. After declaration of *Swachha Zinipol Abhiyan*, we have prohibited the open burning of solid waste as per the compliance criteria of draft Solid Waste Management Rules, 2015. No persons were burning the solid waste during study.

Reduction in use of Polythene bag

To support *Swachha Zinipol Abhiyan*, people were keeping the reusable bag with them when they were going for shopping. The shop keeper of this area was also supported it with not providing polythene beg to consumers as much as possible.

Reduction in use of disposable materials

People are motivated to use of steel glass and other metal's materials instead of disposable materials. After declaration, the use of disposable glasses and other materials were reduced in events, religious or other festivals organized by Zinipol Youth Club.

Conclusion

In Patan, whole the solid waste generated from household and other area's sent directly to the dumping site. There was no process carried out to reduce the solid waste quantity. The study was clearly showed that the developed and implemented Municipal Solid Waste Management System and Plan of Zinipol area reduced the quantity of solid waste for landfill up to 98 % and just 2 % waste remained for the landfill. It also helps to generate the economy and employment in this sector. People were not littering the waste on road; not burning waste in area; reduced the use of polythene bag and disposable materials. It worked successfully because of the public and Patan Nagar Palika worked together technically and scientifically with the systematic planning. The study also revealed that the municipal solid waste management problems of zinipol area reduced because of the public and municipal authority worked together with the systematic planning and mediator's involvement. This system and plan was suggested to Nagar Palika for implementation in Patan.

Acknowledgement

Author would like to thanks Zinipol Youth Club, Patan Nagar Palika, Earth Protectors, Patan and local media.

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