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## Municipal Solid Waste Management in Srinagar City, Kashmir, India

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**ABSTRACT:** Considering the geo-ecological sensitivity, the Himalayan urban centres are seriously struggling to design useful and economical municipal solid waste (MSW) management systems. The Srinagar is the first metropolis and fastest growing city of Western Himalayas and here the management of MSW is a big challenge for local authorities. The aim of this study was to study the overall scenario of MSW in the city. A comprehensive survey was conducted and data were also collected from local municipal department. The results suggested that in most of cases MSW is being dumped openly along roadsides and open spots in the city. Open dumps are responsible for so many negative environmental impacts in the study area. The study reveals that due to lack of funding and unscientific management the existing solid waste management system is not working successfully in the city. Due to shortage of storage bins, collection efficiency is very low which has severely damaged the environmental condition and also induces to stray dog population phenomenally. The acute absence of waste segregation at the source all types of materials are being disposed along with municipal solid waste which make waste handling very risky especially dumping and disposal points. The lack of governance and inadequate infrastructures for waste collection, transportation and management are the major constrains in designing a suitable MSW management plan for the city. Apart to that unplanned urban settlement and encroachments are also responsible for poor waste collection and disposal system.

**KEYWORDS:** Municipal solid waste, Waste management, Environmental impacts, Himalaya

### I. INTRODUCTION

Human activities create waste, and the ways this waste is handled, stored, collected and disposed off can pose risks to the environment and to the public health. Solid waste management (SWM) includes all activities that seek to minimize health, environment and aesthetic impacts of solid waste. In many cities, MSW contains human and animal excrete as well as hazardous chemical pollutants and sharps. All facilitate disease and injury, especially among children, rag pickers, and employees in the waste management sector. Studies have shown that a high percentage of workers who handle refuse and the individuals who live near the disposal sites are infected with gastrointestinal parasites, worms, and related organisms. Contamination of this kind is likely at all points where the waste is handled. India is also grappling with the negative implications of population growth, urbanization and change in the life style. Increase in the MSW is also one of major negative implications which Indian cities are facing significantly and is expected to increase in the near future as the country strives to attain an industrialized nation status by year 2020 [1].

The disposal of solid waste is become a severe logistic and costly problem in many countries, particularly in high mountain trekking expedition areas. Waste minimization could be the effluent and toxic waste indiscriminately, are the major first step in dealing with waste management either at the household, or community or manufacturing level (such as the food and drink sector), [2], in both trekking [3]. The disposal of solid waste is becoming a severe and costly logistical problem in many Asian countries [4]. In most cities of developing countries solid waste management garbage from the urban community as well as more municipal solid waste management costs consume 20-50% of municipal revenues yet collection service remain low with only 5 to 70% of residents receiving services and most disposal being unsafe [5]. Municipal Solid Waste Management (MSWM) of developing countries have typical problem areas such as

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inadequate service coverage and operational inefficiencies of services, limited utilization recycling activities, inadequate landfill disposal and inadequate management of hazardous and healthcare waste [6]. Solid waste is regarded as one of most adverse forms of pollution it requires environmentally sustainable solutions to reduce overall environmental burdens [7].

According to MSW Rules, 2000, every municipal authority is responsible for setting up a waste processing and disposal facility. The State governments and Union Territory Administrations have the overall responsibility for enforcement of the provisions of these rules in the metropolitan cities and within territorial limits of their jurisdiction [8]. The CPCB, State Boards, and the other committees are required to monitor the compliance of the standards regarding ground water, ambient air, leachate quality, and compost quality including incineration standards, and they are to examine the proposal taking into consideration the views of other agencies. As per implementation rules, setup of waste processing and disposal facilities are to be done first. These facilities must be monitored once every 6 months. Existing landfill sites must be improved, and identification of landfill sites for future use must be carried out. Waste collection by any method (community bin, house-to house collection, etc.) must be conducted by using bell ringing or a musical vehicle to alert citizens without exceeding permissible noise levels. Biomedical and industrial wastes must not be mixed with MSW. Municipal authorities are to establish and maintain MSW storage facilities that do not create unhygienic and unsanitary conditions in the area. Citizens must be encouraged by the municipal authority to segregate wastes.

The aim of this study was to investigate the overall situation of MSW management in Srinagar city, J&K, India. The comprehensive survey was conducted in different wards of the city and data were also collected from local municipality office. The data were compiled in terms of waste quantity and quality and appropriate statistical tool was used to draw the conclusion.

## II. MATERIALS AND METHODS

**Study Area:** The study area is located in Srinagar city of Jammu and Kashmir State with the GPS location as  $33^{\circ}53'49''$  -  $34^{\circ}17'14''$  N latitudes and  $74^{\circ}36'16''$  -  $75^{\circ}01'26''$  E longitudes. Srinagar is situated in the centre of Kashmir valley. The total area of the city at present is 278.kms<sup>2</sup> excluding cantonment area under defence use. Non developed area of the city is mainly occupied by rice fields, orchards, vegetables, wetlands and lakes etc.

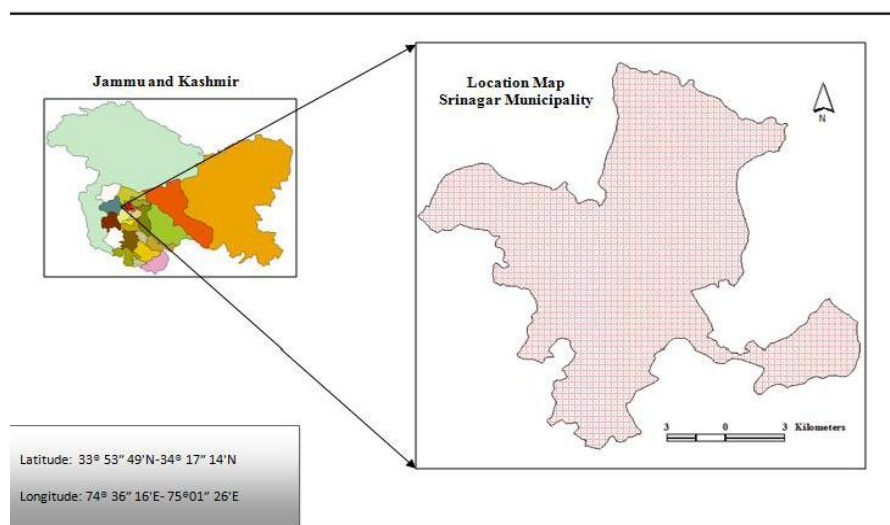


Fig.1: Map of Study Area

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

**Survey and sampling areas:** A field work of the entire Srinagar city was started from January, 2013 to June, 2013 to visualize the existing scenario of solid waste collection and disposal by the Srinagar Municipal Corporation. A number of 15 wards of Srinagar city were randomly selected. 15 wards were selected in consultation with the help of secondary data and suggestions provided by our project guide. Based on the references, I selected the wards within the city namely *Lal Chowk, Parimpora, Buchpora, Jawahir Nagar, Shalteng, Batmaloo, Hazratbal, Hari Singh High Street, Hawal, Nagbal, HMT, Nowshera, Brein* and *Khumani Chowk*. A questionnaire was prepared covering all aspects of solid waste management and conducted survey of 15 wards, covering a major portion of the Srinagar city. For the determination of nature and magnitude of solid waste, several places were visited along with the SMC workers (Safai-karamcharies). The total quantum of household waste collected by the workers of Srinagar Municipal Corporation was categorized into specific fractions, lying almost emphasis on the possibilities of utilization and providing scope for recycle, reuse of these fractions of wastes and therefore, aiming at the maximum reduction of the volume of waste eventually left for the final disposal. Hence, the entire amount of waste generated was fractioned into the following categories as mentioned in [Table 1](#).

**Table 1 Major components of the household waste.**

S.No	Components	Items
1.	Biodegradable	Vegetables, Kitchen wastes, garden sweeping etc.
2.	Plastics	Including carry bags, vessels, containers, wrappers and other plastic items.
3.	Paper	Newspaper, Trash paper, Cardboard, wrappers etc.
4.	Solids	Metals, leather, textile, battery, earthenware, rubber, sponge etc.
5.	Glass	Glass bottles, utensils, etc.
6.	Sanitary	Incontinences pads, sanitary towels, etc.
7.	Medical	Surgical wastes, syringes, soiled bandages etc.
8.	Inert material	Comprises mainly of construction and demolishing debris, dirt, ashes etc.

### III. RESULT AND DISCUSSION

The survey was conducted with a view to have an insight of the actual condition of the wards and thereafter the method of collection and storage adopted/followed. There were 68 electoral wards in the Srinagar city. Some wards of the Srinagar city were randomly selected and surveyed for the estimation of waste generation and associated issues with the waste management. [Table 2](#) enlists the locations and quantity of waste generated in the study area. A highest waste generation of 60% tons was registered by the ward *Jawahir Nagar* which has an inhabiting population of 28033, followed by *Parimpora* and *Hazratbal* wards each of which registered 50 tons of MSW generation. The waste generation in other wards followed the pattern: *Buchpora* (45 tons), *Lal Bazar* (40Tons), *Brein* (38 tons), *Batmaloo* (32 tons), *Hawal* (30 tons), *Nowshera* (20 tons), *Hari Singh High Street* (13 tons), *Pandch* (10 tons), *HMT* (10 tons), *Shalteng* (10 tons), *Lal chowk* (8 tons) and *Khumani Chowk* (8 tons). The mean waste generation in different wards was calculated to be 31.11 tons.

The solid waste generation sources are mainly residential, commercial slaughterhouses, institutions, organization like hospitals, hotels and restaurants, small scale industries, construction and demolition waste (debris) etc.

Waste collected from the wards are of mixed kind i.e. it consists of both biodegradable and nonbiodegradable waste and temporarily stored in open collection spots, waste sheds or waste dumpers before being lifted for final disposal. Stray animal feed on the waste at open spots resulting in littering of waste. At times it was observed that the areas are not attended for days together resulting in un-hygienic conditions, unpleasant look and appear tension of an epidemic as the use of disinfectant at the storage sites is not followed.

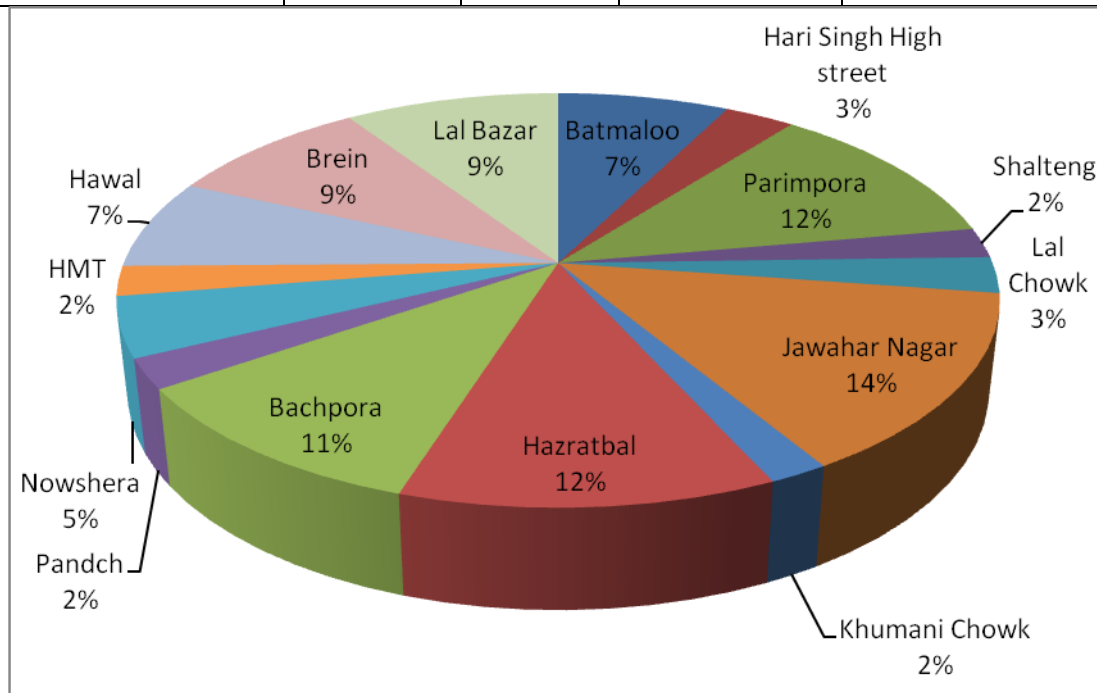
## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

**Table 2 : Showing MSW generation and proportion composition of different waste types in different wards of Srinagar city**

Name of the ward	Quantity of MSW generated (Tons)	Population	Proportion of different waste types (%)	
			Biodegradable	Non-Biodegradable
Batmaloo	32	22350	60	40
Hari Singh High street	13	24242	60	40
Parimpora	50	30915	50	50
Shalteng	10	33793	55	45
LalChowk	12	26501	60	40
Jawahar Nagar	60	28033	65	35
KhumaniChowk	8	12000	70	30
Hazratbal	50	36902	65	35
Bachpora	45	34448	50	50
Pandch	10	22240	57	43
Nowshera	20	24459	60	40
HMT	10	38087	65	35
Hawal	30	40524	60	40
Brein	38	42534	55	45
Lal Bazar	40	48894	50	50
<b>Mean</b>	28.53		58.8	41.2



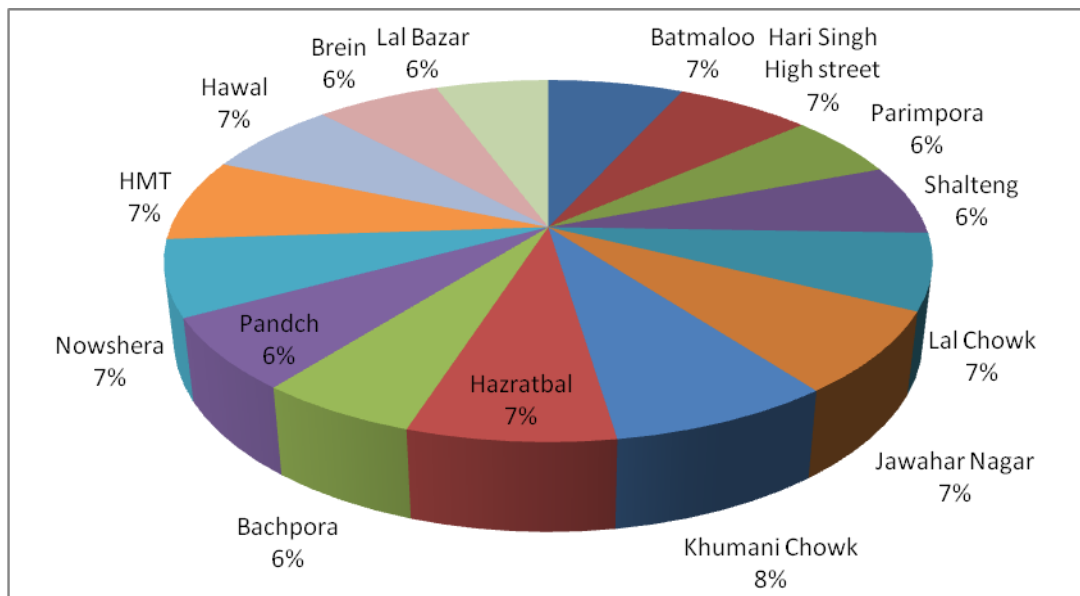
**Fig.2: Showing MSW generation of different waste types in different wards of Srinagar city**

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

The waste generated in all of the wards was a mixed type, composed of biodegradable and non-biodegradable parts, although the different wards contributed different waste types in variable proportions (Fig.2). *Khumani Chowk* was found to contribute a highest proportion of 70% biodegradable waste followed by *Hazratbal*, *HMT* and *Jawahar Nagar* (65%) and a least contribution of biodegradable was contributed by *Parimpora*, *Lal Bazar* and *Buchpora* wards (50%). The mean percent contribution of all the wards was found to be 59.44%.



**Fig.3: Showing proportion contribution of biodegradable waste in different wards of Srinagar city**

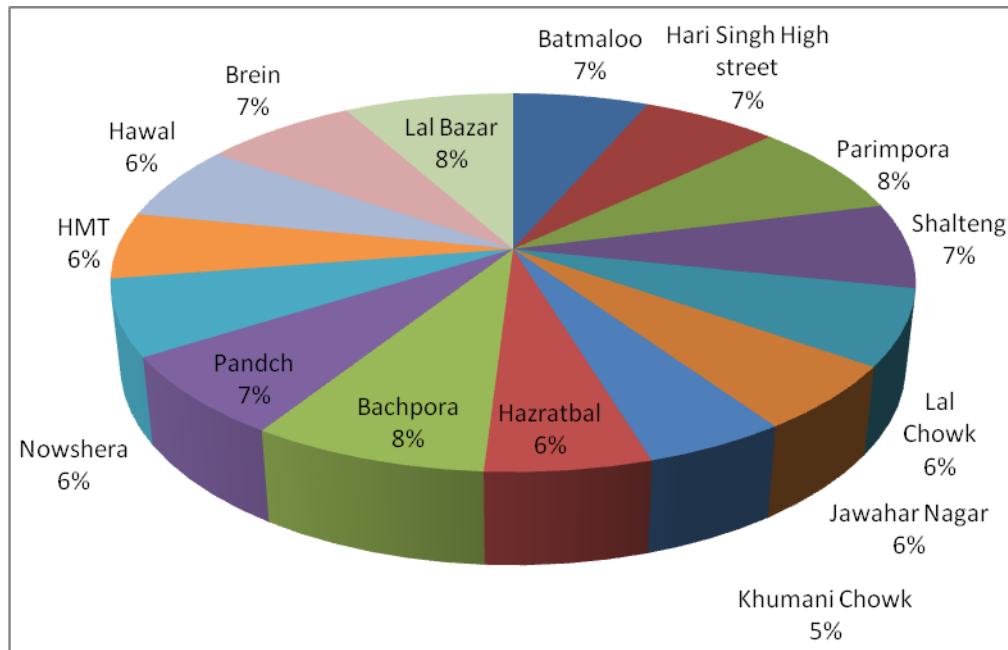
As far as non-biodegradable waste generation as shown in Fig. 4, from different wards is concerned, a highest proportion of non-biodegradable waste was generated by *Parimpora*, *Lal Bazar* and *Buchpora* (50% each) and least was generated by *Khumani Chowk* (30%). 41.2% was the mean of the non biodegradable waste generation.

The location of existing dumpsite is in the middle of settlements. The residents of nine villages comprising of *Saidapora*, *Shonglipora*, *Waganpora*, *Sangam*, *Braywar*, *Danmar*, *Guzerbal*, *Noorshah Colony* and *Bagh-i-LalPandith* compliant that they have been affected with dumping of solid waste and demand closure of the dump site. The present method of operation of the sanitary landfill is also very crude and unscientific. Condition of internal roads is very poor, due to which there is a tendency to dump at wrong places which either create obstruction or helps in deposition of waste in heaps at certain disposed points. There is high frequency of waste burning at the dump site. It has been noticed that visitors and local population throw plastic bottles, canes, wrappers and other non-biodegradable material in the interior areas of the Dal Lake which has resulted in the choking of various interlinking channels. The channel passing through *Naidyar* and *Jogilankar* has turned into a foul smelling drain/cesspool. Decaying biodegradable solid waste emanates stinking smell and generated hydrogen sulphide gas bubbles from the bottom of the channel.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015



**Fig.4: Showing proportion contribution of non-biodegradable waste in different wards of Srinagar city**

Proper management and handling of solid waste in Srinagar city has been reduced to mere collection of some portion of the waste generated and its transportation to sites outside the habituated areas. The basic administrative structure at local level, to manage the affairs of the solid waste in Srinagar has remained unaffected due to various inter related administrative, financial, political and managerial problems. In short the management and administrative services rendered by the municipal bodies in Srinagar have remained well below the desired satisfaction level; rather the level of services is highly inadequate and inefficient. The management setup of Municipal Solid Waste is not in position to play its assigned role in providing appropriate solid waste management services. The factors like undefined role, erosion in municipal domain, in adequate resources, weak executive system and indifference towards certain important relevant and innovative provision of 74<sup>th</sup>- Amendment of constitution of India are directly or indirectly affecting the capabilities of Solid Waste Management operations. As per standard norms there should be 2.4 Safai-karamcharies per 1000 population for door-to-door collection of waste and cleaning of interior lanes and bye lanes. Similarly for road sweeping of main 1475.02 running km (which includes both macadamized and other roads) in Srinagar City, there should be 1400 Safai-karamcharies.

As against the requirement of 3700 Safai-karamcharies the Srinagar Municipal Corporation is presently having only 2700 Safai-karamcharies (1400 on regular basis and 1300 on consolidated/casual labour). This includes 600 Sanitary Workers who have been appointed in recent years thus there is still shortage of Safai-karamcharies.

The existing strength is insufficient to cater 100% collection of solid waste on door-to-door basis and to sweep all main city roads regularly. This shortage obviously affects the overall waste collection and road sweeping performance of the Srinagar city. However, to overcome shortage of staff we are encouraging “Sanitation Club Scheme” on Public Private Partnership basis where SMC provides all logistic support to a Mohalla/area and citizens of a particular locality, who pay wages of the labourers being engaged for collection of solid waste. About 250 such Sanitation Clubs have been created and results are encouraging.

Solid waste management is not an isolated phenomenon that can be easily compartmentalized and solved with innovative technology or engineering. It is particularly an urban issue that is closely related, directly or indirectly, to a



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(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2015

number of issues such as urban lifestyles, resource consumption patterns, jobs and income levels, and other socio-economic and cultural issues. All these issues have to be brought together on a common platform in order to ensure a long-term solution to urban waste.

## IV. CONCLUSION

With growing population and economy of the urban regions in the state, there is a need to ensure proper collection, segregation, processing and disposal of solid waste. Segregation of waste needs to be enhanced to improve efficiencies at the processing levels. Construction and demolition wastes should be segregated (collected separately) and recycled. Most of the MSW in Srinagar is dumped on land in an uncontrolled manner. Such inadequate disposal practices lead to problems that will impair human and animal health and result in economic, environmental and biological losses. Comparing the biological, chemical and thermal treatment options in the Indian scenario, perhaps the biological processing options get the priority. Composting and vermicomposting are successful and quite popular now in India instead of incineration. There is a need to review the municipal laws and policies to enable registration of societies of recyclers to operate within the framework of law. Local municipal bodies need to play an important role in proper implementation of the "Recycled Plastics Manufacture and Usage Rules". Municipal bodies will be required to create a general public awareness for reducing, reusing and recycling of the wastes. Finally, the study concluded that the lack of resources such as financing, infrastructure, suitable planning and data, and leadership, are the main barriers in MSWM. The increase of service demands combined with the lack of resources for municipalities are putting a huge strain on the existing MSWM systems.

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