

# **Constraints to Effective Management of Municipal Solid Waste – A Case Study of Srinagar City, Kashmir, India**

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## **ABSTRACT**

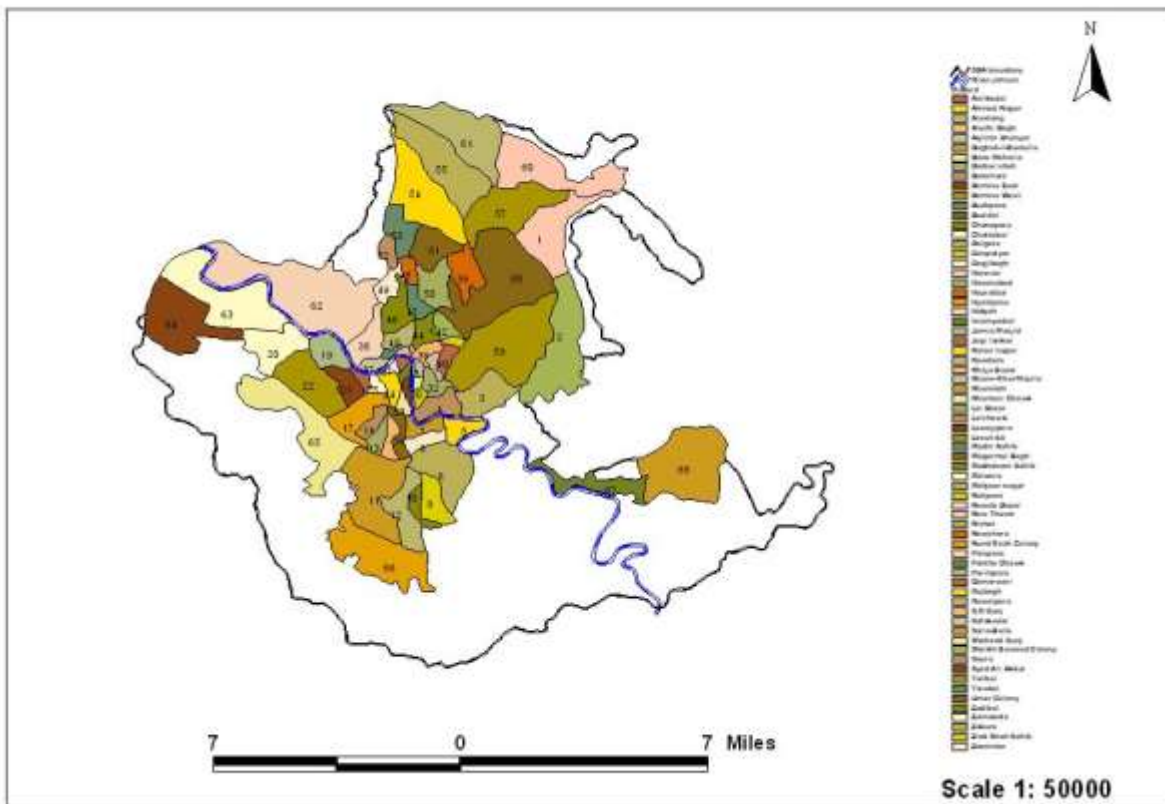
Solid waste management is emerging to be a big problem for the waste managers throughout the world and one of the most problematic issues in developing countries. Though the per capita municipal solid waste (MSW) generation in India in general and Srinagar city in particular is quite low, however, its disposal is poor and inappropriate. The primary responsibility to manage the solid waste generated in the cities is of urban local bodies (ULBs) or Municipal Corporations. In Srinagar city, this responsibility lies with Srinagar Municipal Corporation (SMC). But SMC does not have any MSW management plan in place. Currently a portion of MSW is being collected from different parts of Srinagar city in a haphazard manner and unscientifically dumped at an open dumping ground. This paper examines the potential constraints associated with MSW management in the city. The identified constraints include: absence of waste management planning; lack of people's awareness; absence of public private participation and non-compliance of waste management legislation. The paper further examines the impacts associated with the identified constraints.

**Key Words:** Srinagar city, waste management, constraints, impacts

## **INTRODUCTION**

The valley of Kashmir is situated in the midst of the Himalayan Mountains system and is world famous for its natural beauty. The historical Srinagar city which is the summer capital of Jammu and Kashmir State has great cultural, aesthetic, socio-economic and ecological values. It is surrounded by hills on east and northeastern side located between the geographical coordinates 34° 05' N latitude and 75° 50' E longitude. The area of Srinagar city has increased from 83 Km<sup>2</sup> in 1971 to 103.81 Km<sup>2</sup> in 1987. It further expanded to 177 Km<sup>2</sup> in later years. With further expansion of the city, the area increased to 300 Km<sup>2</sup>. The Master Plan (2000-2021) has termed the Srinagar city as Greater Srinagar and placed the area measurement to 416.25 Km<sup>2</sup>. At present the Srinagar city has been divided into 68 electoral wards and 34 administrative wards (Figure 1). Being the capital and largest urban settlement of Jammu and Kashmir State, Srinagar city has become a hub of major administrative, political, economic, commercial and other specialized activities. The city has recorded uninterrupted and accelerated population growth from 1971 onwards. Srinagar city is also famous for its lakes with house boats floating over them attracting thousands of tourists every year. The population of Srinagar city according to 2001 census was estimated 9.71 lakhs, excluding population of about 2 lakhs of 138.15 km<sup>2</sup> recently added master plan area, tourists flow numbers, office move employees, floating population, large number of migratory labourers from Bihar and Uttar Pradesh and the size of security forces located in

Srinagar city. The projected population of Srinagar Municipal area at the end of year 2006 within coverage area of 278.1 km<sup>2</sup> was estimated about 11.37 lakhs whereas in entire SDA area, it was estimated to be 12.83 lakhs in coverage area of 416.25 km<sup>2</sup>. The metro area population of Srinagar city was projected to 15.50 lacs by the end of year 2020.



**Fig. 1:** Map of Srinagar city showing municipal wards and SDA boundary

There condition of MSW management in Srinagar city is pathetic. Solid waste collection and disposal efficiency is only about 50% due to absence of waste management planning, people’s involvement/awareness, and non-implementation of waste management legislation, public private participation besides lack of manpower, appropriate equipments and transportation fleet. Because of unregulated municipal collection, the solid waste generated daily is simply disposed off on streets, by-lanes, open spaces, drains, and water bodies, especially in River Jhelum and Dal Lake. The pollution thereby created is objectionable, damaging and possibly hazardous to public health and ecological and aesthetic attributes of lakes and the river. About 351.54 metric tons (MT) of MSW is generated daily of which approximately 64.48 % remains unattended due to poor waste collection and disposal services in the city. In this paper characteristics and generation of MSW in the city have been worked out as well as the main constraints affecting proper MSW management have been examined with a focus on spin-off effects.

## **Methodology and approach of study**

The data was obtained through actual field surveys, collection of MSW samples from households and collection points for the estimation of per capita solid waste generation and physical characterization. The study also involved a desk study of documents and records available with Srinagar Municipal Corporation related to MSW management in Srinagar and information obtained from the some officials of SMC through personal communication.

## **Results and Discussion**

### ***Generation of Solid Waste***

Per capita per day solid waste generation was determined in two stages. In first stage, household per capita solid waste generation was determined by collecting samples from selected households belonging to different income groups like high income, medium income and low income groups. The practice was carried out for one year on monthly basis. It was observed that on an average 149.13 grams of household solid waste was generated per person per day. Component composition was also determined instantly. The results revealed that 85 – 90% of waste was biodegradable food wastes followed by polythene, paper, cardboard and dust sweeping. In second stage solid waste samples were collected from the community collection points. On comparing the physical composition of these samples with that of household waste samples, an increase of about 45.5 % in the composite waste was observed. The major contributor was found to be the inert material followed by polythene, plastic/rubber, cardboard, and clothe rags, etc. On the basis of these analyses, the per capita per day MSW generations in Srinagar city was estimated to be 273.66 grams, say 274 grams. Therefore, the total quantity of MSW generated per day for a projected population at the end of 2006 in municipal limits turns out to 311.53 MT and for whole coverage area of 416.25 km<sup>2</sup> it is 351.54 MT. at present the solid waste is expected to be more than 500 MT per day. The figures do not include the quantity of waste generated by tourists, office move employees, floating population and the strength of security forces located in Srinagar city.

### ***Physical Characteristics of MSW***

The data on physical characterization of MSW in Srinagar city are depicted in **Table** Biodegradable waste that included food waste, vegetable and fruit waste, grass clippings, and other fine organic matter was found to be the major component of waste stream except at commercial site where inert material dominated other components. Biodegradable waste ranged between average value of 58.69 % to 33.62 % for residential and commercial areas respectively. Higher proportion of biodegradable waste in the waste stream is mainly due to maximum usage green vegetables, cuttings of gardens and lawns and due to high moisture content. Proportion of paper, cardboard, polythene, and inert material was found higher at commercial site due to the usage of polythene and paper as packaging material. Patil *et al.* (1985) have also reported higher proportion of paper in commercial areas mainly due to packaging, etc. Comparatively higher proportion of inert material at commercial site was chiefly due to street sweeping of paved interior streets, and construction and demolition waste. Plastic waste that included mineral water and cold drink bottles was found higher at the tourist cum commercial site at Nehru Park – the front side/fore yard of world famous Dal Lake. This is mainly due to the larger usage of these

utility items which are otherwise less used in residential areas. On the other hand clothe rags' proportion was less at the tourist site as compared to other sites. Other minor contributions into MSW stream were from wooden chips, glass and metal scraps. During the course of study it was observed that paper, cardboard, plastic, selected polythene, and metal scraps were collected by rag pickers to earn their livelihood by selling these items to the scrap dealers.

**Table:** Average physical characteristics of MSW at different locations in Srinagar city

S.No	% MSW components	Sampling Locations				
		Residential	Commercial	Mixed (Residential cum Commercial)	Tourist cum commercial	Composite (dumping site)
1	Biodegradable	58.69	33.62	49.58	51.24	56.31
2	Paper	1.54	2.68	1.93	1.44	1.38
3	Cardboard	2.33	9.58	3.79	4.29	2.92
4	Clothen Rags	2.28	2.64	2.72	1.88	2.25
5	Wooden Chips	0.87	1.73	1.17	0.5	0.86
6	Polythene	3.48	8.29	5.2	5.37	4.33
7	Plastic/Rubber	1.9	4.46	2.57	4.89	2.29
8	Glass	0.56	0.9	1.47	1.21	0.76
9	Metal Scraps	0.11	0.39	0.41	0.16	0.17
10	Inert Material	28.24	35.71	31.16	29.02	28.73

***Existing System of MSW Management***

SMC do not have solid waste records i.e., quality and quantity of solid waste generation, quantity collected and transported daily, recycled, etc., as well as the origin and type of solid waste produced and in different areas of the city. Therefore, it seems that the SMC can not be in a position to predict infrastructure and equipment required to produce an efficient service. This results in decisions being made on assumptions, suppositions and inferences (Buenrostro and Bocco, 2003) and to the purchasing of unsuitable solid waste collection equipments and incorrect design of the collection route.

Most of MSW generated in Srinagar is putrescible and should be removed before it starts decomposing in the storage bins or at the open collection points. In a statement of SMC (Anonymous, 2006) it was reported that the corporation collected, transported and disposed off about 235 MT of MSW daily. However, present investigation revealed that SMC collects and dispose only about 50% of the MSW generated in the city. This is a general observation that official statistics often report a higher rate of solid waste generation than those reported by non-official sources, whose results, for the most part, tend to agree with each other (Restrepo *et al.*, 1991; Bernache *et al.*, 1998; Buenrostro *et al.*, 2001a. This was also true in case of SMC as the reported figures of 235 MT was found contradictory with SMCs own calculations of 258 MT (Anonymous, 2006).

Proper waste collection was found to be inadequate in the core city area and almost absent in the peripheral areas. One important reason for poor waste collection from core city area was that most of the residential houses in the core city area were mainly located along narrow lanes having less than 4 meter width. Therefore the collection by using community collection points can not work effectively because due to narrow roads and lanes, collection vehicles reach only selected accessible points. Although the Municipal Corporation has recently introduced smaller vehicles for door to door collection of solid wastes in some areas, the residents were found usually throwing waste in the lanes itself or pack the waste in plastic carry bags to throw it in the waste bins or open collection points. Even when the bins are available, sometimes waste material is thrown outside the bins anyway and since the wastes are always thrown lose, the problem becomes unmanageable very quickly (Hassan, 1998). Solid waste collection and transportation was also found to be irregular and was no collection and transportation on Sundays and public holidays. Moreover people dump their waste at any location that suits them as there is no defined and adequate waste collection point throughout the city creating lot of collection and environmental problems. The openly dumped waste defaces roads, choke the drains, pollute water bodies and air, and obstruct roads. Animals and scavengers dig into the piles made up of swept wastes and scatter it. Moving vehicles scatter overflowing garbage from the piles which then flows into the roadside drains. It is in this context the identification of appropriate collection points becomes important for the effective and successful implementation of any waste management programmes and policies (Kofoworola, 2006).

Source separation is not in practice in the city however, some people do retain newspapers, plastic waste and metal scraps for selling it to kabariwallas (itinerant waste buyers). Paper, cardboard, plastic, polythene, metal scraps, and glass are collected by rag-pickers to earn their livelihood from the commercial areas, collection points, and from the dumping ground and sold to waste buyers for recycling. A large number of people, mostly from outside state, subsist on collecting and selling recyclable items. These rag-pickers contribute significantly reducing the volume of solid waste to be collected for disposal.

### **Constraints**

The main constraints encountering effective MSW management in Srinagar city can be categorized as: (a) absence of proper waste management planning, (b) lack of people's awareness, (c) absence of public private participation, and (d) non-compliance of MSW (Management and Handling) Rules, 2016.

#### ***Absence of proper waste management planning***

The primary responsibility to manage the solid waste so generated in the city is on Srinagar Municipal Corporation (SMC). However, SMC does not have any updated MSW management plan in place. The idea of MSW management in the city has been reduced to street sweeping and collection of some solid waste material from residential and commercial areas for disposal at an uncontrolled landfill site. Currently solid waste is being collected from different parts of Srinagar city in a haphazard and crude manner and dumped at a landfill site which used to be an open dumping ground till 2010. To carry out this type of MSW management affairs, SMC has to appoint adequate number of sweepers. However, there are 1360 sweepers on regular basis and about same number of sweepers on consolidate basis which is about 40% deficient as

per present requirements. Primary solid waste collection was generally carried out through road and street sweeping and waste was found to be collected through traditional handcarts and wheel barrows that can carry small quantity of waste for temporary storage mostly on ground in open at collection points. At some places some concrete community bins and dumper bins also stand installed.

### ***Lack of people's awareness***

There is lack of public awareness among general masses and SMC has not contributed appropriately and significantly in increasing the level of people's awareness. Though people generally retain news papers, metal scraps and plastic material for selling it to the itinerant waste buyers, the segregation of waste material at source is not practiced. This is mainly because of the fact that door to door collection of segregated material has never been implemented or even thought of. Waste collection and transportation is irregular and not done on Sundays and public holidays. There is no proof available with SMC to suggest that it has thought of any change of improvement in waste collection and transportation programmes. Moreover, there is rampant use of cheap polythene bags that user throwaway anywhere after use. Even solid waste generated in households is packed and disposed of at any place as there are no designated collection points in many areas of the city. Though it seems that people have some pro-environmental sense, still most of the residents do not restrain to discard solid wastes on public areas, roads, streets and water bodies. It is high time the SMC should involve the residents in waste management practices, making them aware of waste management benefits including enforcement.

### ***Absence of public private participation***

Private sector involvement in MSW management in Srinagar city is totally absent and so far SMC has not taken any initiative to encourage private for the purpose. Private sector participation has proved to be economical successful / in many cities of India including Bangalore, Chennai, Hyderabad, Ahmadabad and Surat (Asnani, 2004). The private sector face lack of cooperation in the community because it is the general perception that it is the duty of Municipal corporations to pick up the garbage. Hence there is a need to work towards changing the perception of people. The trend of involving the private sector and non-governmental organizations (NGOs) in MSW management in Mumbai has started in the recent past (Rathi, 2005). Also there are number of successful case studies of community and private sector participation in MSW management in developing countries (Anand, 1999; Poerbo, 1991; Ogu, 2000). In absence of adequate financial resources, it is advisable that SMC should outsource certain services to private sector and provide subsidy to entrepreneurs for establishing compost, recycling or biomechanical treatment plants.

### ***Non-compliance with existing legislation***

The basis for actual regulations in MSW management throughout India is "The Municipal Solid Wastes (Management and Handling) Rules, 2016". The rules provided an implementation schedule in a time bound manner that included:

1. Landfill Identification: 1 year
2. Procurement of waste processing facilities: 2 years

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|---|---------|
| 3. Ensure segregation of waste:             | 2 years |
| 4. Cities up to 1 million population:       | 2 years |
| 5. Million plus cities:                     | 3 years |
| 6. Setting up of sanitary landfills:        | 3 years |
| 7. Bioremediation/capping of old landfills: | 5 years |

In light of the above mentioned rules and regulations, it seems that SMC is lagging behind because of wasteful use of sweepers/manpower, shortage of transportation vehicles, inappropriate waste collection equipments, shortage of waste collection bins/containers, lack of their maintenance, inappropriate storage, open collection points exposed to rag-pickers and scavenging animals, non-availability of any recycling and compost plants, inadequate financial resources, wasteful use of available resources, and more importantly lack of public awareness and motivation. Currently SMC is mainly focusing on crude type of waste treatment or disposal resulting in environmental and health problems like contamination of surface and ground water, through release of leachate and direct disposal of wastes into the water bodies, air pollution by open burning of wastes, fly nuisance, release of bad odour and other harmful gases including green house gases. Drivers hauling MSW to the dumping ground and other sanitary staff were found suffering from different respiratory ailments. The rag pickers involved in collection of recyclable materials from open scattered collection points are likely to suffer from various health hazards especially children and women. There are reports of significant increase in diseases contracted by landfill scavengers from hazardous medical waste (Kasseva and Mbuligye, 2000).

However, SMC is not alone and can not be singled out in non-compliance of the waste management legislation. There are so many cities in India which have not initiated any significant measures in this regard. Insignificant compliance in terms of storage at source, segregation, primary collection, storage depot, transportation process and disposal of MSW at sanitary landfill in class I cities in India (Asnani, 2004).

### **Conclusion**

Efficient MSW management systems require professional management, supported by an informed population and appropriate legislation and policies (Wilson et al. (2001). The physical characteristics of MSW generated in Srinagar city showed higher quantities of biodegradable wastes material that can be converted to organic fertilizer by way of composting or vermicomposting. This option should be promoted by SMC however; this will need source separation of MSW. According to “The Municipal Solid Wastes (Management and Handling) Rules, 2016” SMC is obliged to collect biodegradable, recyclable and inert material separately. SMC must identify specific collection points and harness all possible resources to prepare awareness material and make the public aware through radio and TV channels, news papers, posters, pamphlets, hoardings, etc. with help of professional agencies and voluntary organizations to sensitize citizens about the need to keep their environment clean by disposing waste at designated locations. Waste recycling is an interesting approach to achieve an efficient, integrated manner of managing municipal solid waste (Kofoworola, 2006). Rag-pickers collect considerable quantity of recyclable material informally from various parts of the city including commercial/market areas, collection points, and dumping ground. The integration of municipal waste management services and the informal waste

recycling sector holds the key to existing solid waste management problem. A well organized recycling programme has several advantages over other more conventional disposal technologies because waste is recovered rather than thrown away. Therefore recycling should be promoted by providing financial support/subsidy. The SMC may also encourage NGOs/CBOs or co-operatives of ragpickers and waste buyers to enter this field to organized door to door rag-picking of recyclable materials and provide them an opportunity to improve their working condition and income. There is also a need of setting up of micro-enterprises for the purchase of recyclable materials in each ward to encourage segregation of waste at source. The study concluded that the MSW management plan propounded by Central Pollution Control Board and existing legislation if implemented in letter and spirit would alleviate the problem to a great extent.

**References:**

1. Anonymous, 2006. *Status of solid waste management 2005-2006*. Srinagar Municipal Corporation, Jammu and Kashmir.
2. Anand, P. B. 1999. Waste management in Madras revisited. *Environment and Urbanisation*, **11**(2): 161 – 176.
3. Asnani, P. U. 2004. *United States Asia Environmental Partnership Report*, United States Agency for International Development. Centre for Environmental Planning and Technology, Ahmadabad.
4. Bernache, G., Bazdresch, M., Cuéllar, J. L. and Moreno, F. 1998. *Basura y Metrópoli. Ciesas-Occidente*, Iteso, Col-Jal y U. de G. México. pp 238.
5. Buenrostro, O. and Bocco, G. 2003. Solid waste management in municipalities in Mexico: goals and perspectives. *Resources, Conservation and Recycling*. **39**: 251 – 263.
6. Buenrostro, O., Bocco, G. and Bernache, G. 2001a. Urban solid waste generation and disposal in Mexico. A case study. *Waste Management and Research*. **19**: 169 – 176.
7. Hasan, S. 1998. Problems of municipal waste management in Bangladesh: an inquiry into its nature. *Habitat Intl*. **22** (2): 191 – 202.
8. Kasseva, m. e. Mbuligue, S. E 2000. Ramification of solid waste disposal site relocation in urban areas of developing countries: a case study in Tanzania. *Resources, Conservation and Recycling*, **28**(1-2): 1476 – 161.
9. Kofoworola, O. F. 2006. Recovery and recycling practices in municipal solid waste management in Lagos, Nigeria. *Waste Management*, doi:10.1016/j.wasman.2006.05.006.
10. Master Plan 2001 – 2021. *Srinagar Metropolitan Area*. Srinagar Development Authority. Government Press, Srinagar.



11. Ogu, V. I. 2000. Private sector participation and municipal waste management in Benin City, Nigeria. *Environment and Urbanisation*, **12**(2): 103 – 117.
12. Patil, A. D., Alone, B. Z. and Bhide, A. D. 1985. Characteristics of municipal solid waste and its variation in Pune city. In: R. K. Trivedy and P. K. Goel (Eds.) *Current Pollution Researches in India*. pp 185 – 187.
13. Poerbo, H, 1991. Urban solid waste management in Bandung: towards an integrated resource recovery system. *Environment and Urbanisation*, **3**(1): 60 – 69.
14. Rathi, S. 2005. Alternative approaches for better municipal solid waste management in Mumbai, India. *Waste Management*. doi: 10.1016/j.wasman.2005.09.006.
15. Restrepo, I. Bernache, G. Rathje, W. 1991. *Los Demonios del Consumo*. Basura y Contaminación. Centro de Ecodesarrollo, México. pp 270.
16. Wilson, E. J., McDougall, F. R. and Willmore, J. 2000. Euro-trash: searching Europe for a more sustainable approach to waste management. *Resources, Conservation and Recycling*. **31**: 327 – 346.