



## An Assessment of Solid waste generation during the Religious occasions at Haridwar city

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**Abstract:** The urban centers of India produce 120,000 ton of solid waste per day. The unscientific disposal of solid waste creates many environmental and pollution problems. This communication reveals the problems of solid waste generation in Haridwar city due to religio-touristic activities during the selected festive occasions. In this study eight festivals were selected for the study and solid waste categorized in to two category viz. Bio-degradable and non-biodegradable. The maximum amount of total solid waste (3307.250kg) found at Har Ki Pauri during the Kanwar festival and lowest amount of total solid waste (537.550kg) on the occasion of Makar Sakranti at Sapta Rishi Ashram Ghat.

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**Key words:** Religio-touristic activities, Festive days, Solid waste generation

### Introduction

The municipal refuse is referred as any waste that is generated by the domestic and industrial sectors in municipality. The municipal solid waste (MSW) is heterogeneous in nature and contains paper, plastic, rag, metal, glass piece, ash and compostable matter. In addition, other substances like scrap materials, waste papers, dead animals, discarded chemicals, paints, hazardous hospital waste and agricultural residue are also categorized under MSW. In Indian cities solid waste generation rate is on the increase. Urban solid waste management is considered as one of the most immediate and serious environmental problem confronting municipal authorities in developing countries like India. It is now a major global concern that is increasing every day. The rapid growth of population and urbanization is making the nonrenewable resources to be in shortage and dispose of effluent and toxic waste indiscriminately. They are some of the major environmental issues posing threats to the existence of human being. The most common problems associated with improper management of solid waste include diseases transmission, fire hazards, odor nuisance, atmospheric and water pollution, aesthetic nuisance and economic losses.

Haridwar, which literally means “Gateway (Dwar) to God (Hari)” and is also known by the names of **Mayapuri, Kapila and Gangadwar**. It is believed that taking bath here purifies the soul and opens the way for the ultimate freedom, **Moksha**. The Ganga is a major river of the Indian subcontinent rising in the

Himalaya Mountains and flowing about 2,550 km generally eastward, through a vast plain, to the Bay of Bengal. The Ganga river alone drains an area of over a million square km with a population of over 451 million people living in its basin are directly and indirectly dependent upon the Ganga River. Millions of devotees and visitors take a dip in the holiest river Ganga during a number of festive occasions round the year like **Makar Sakranti, Maha Shivratri, Basant Panchami, Ganga Dussehra, Guru Purnima, Kartik Purnima, Kanwar Mela** besides **Ardh-Kumbh and Maha Kumbh** and other festive occasions.

The pilgrims bring a lot of offering in the form of flowers, cloths, old icons of Gods and Goddess, last remains (ashes) of their loved ones, to dispose in and around the river Ganga, at Haridwar. Most of the times such offerings are brought in polythene bags. These polythene bags and other biodegradable and non-biodegradable materials remain either floating on the water surface or bathing sites. In this way, pilgrimage exerts a heavy burden not only on the total sanitary and health-hygiene, infra-structure and life supporting systems of the city but on the riverine ecosystem of holy river Ganga. Therefore, it is necessary to monitor the impact of pilgrimage through scientific study, especially on festive occasions round the year on the environmental condition of city and river. Municipal sewage constitutes 80 per cent by volume of the total waste dumped into the Ganga, and industries

contribute about 15 percent. Naturally, as a consequence of rise in massive number of these pilgrims and tourists, the consumption of all commodities also rises. This leads various types of pollution i.e. water, noise, solid waste, air of varying physico-chemical nature. It was being experienced for many years that the Haridwar city is experiencing a growing pressure of pilgrims and tourists to meet out their various types of routine as well as special needs. In the present study an attempt has made to find the generation of solid waste during auspicious occasions.

### Materials And Methods

**Study Area:** Haridwar is situated on the bank of river Ganga at the foot hills of Shivalik range of

mountain that constitute the outer Himalaya. Haridwar city lies at an elevation of 965ft from the sea level and between the latitude  $20^{\circ}, 58' N$  and Longitude at  $78^{\circ}, 13' E$ . According to Hindu mythology, Haridwar is one of the four sites where drops of elixir of immortality (AMRITA) accidentally spilled over from the pitcher in which it was being carried (KUMBHA) away by the celestial bird Garuda, after the **Samudra Manthan** (Churning of sea). These four places are Haridwar, Allahabad, Ujjain and Nasik where famous “**Kumbh Mela**” is held. It is believed that taking bath here purifies the soul and opens the way for the ultimate freedom, Moksha.

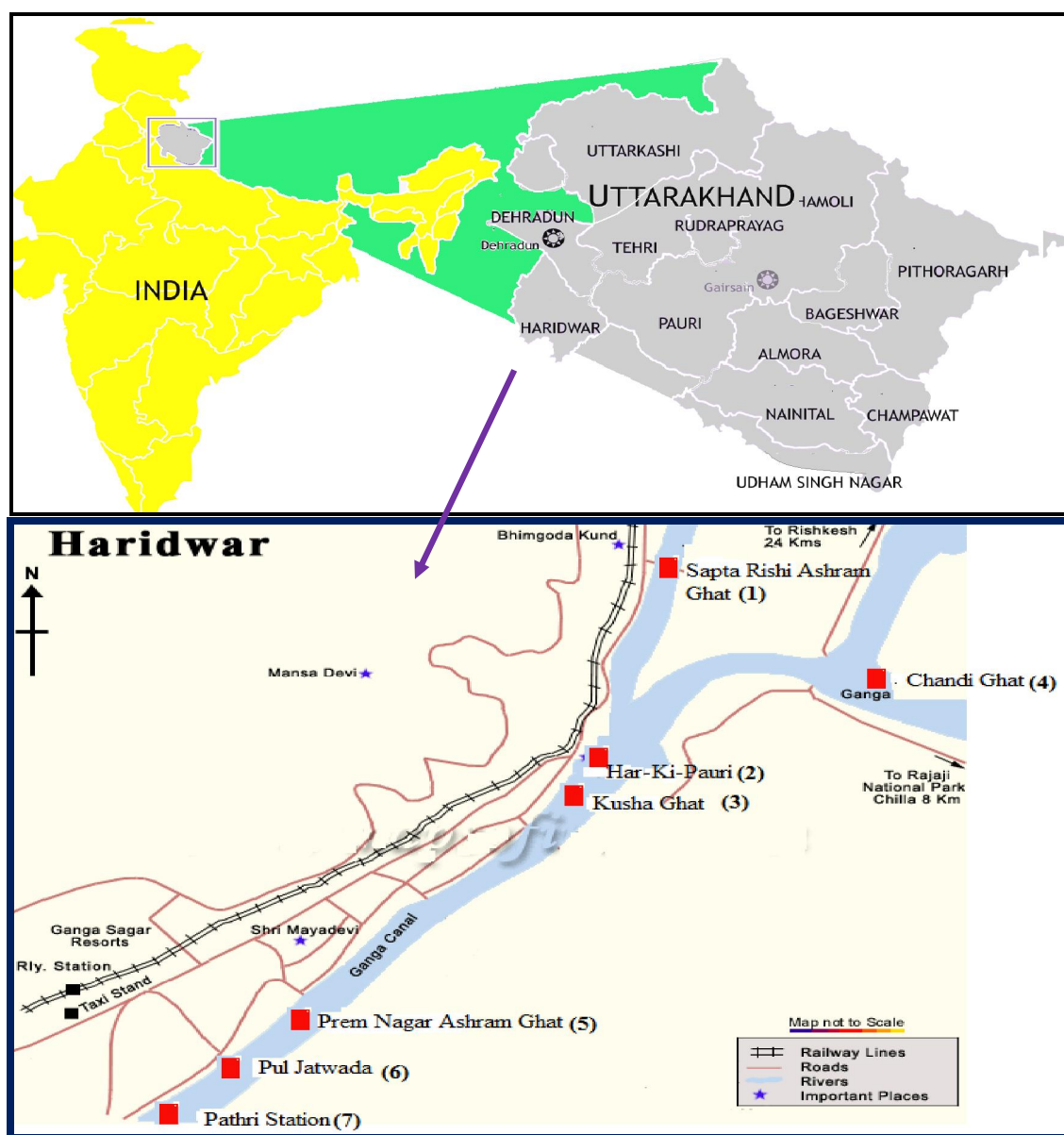


Fig-1: Map of Haridwar city showing location the of study sites

**Table -1:- Schedule For the Study**

S. No.	Festive Occasions	Date and Month (2010)	Date and Month (2011)
1.	Makar Sakranti	14 January	14 January
2.	Maha Shivaratri	14 February	3 March
3.	Baishakhi	14 April	14 April
4.	Ganga Dussehra	21 June	11 June
5.	Kanwar Mela	16 July to 30 July	16 July to 29 July
6.	Somvati Amavasya	9 August	29 August
7.	Kartik Poornima	6 November	26 October
8.	Pitra Visarjini Amavasya	7 October	27 September

**Solid waste:** During the study period solid waste was also assessed in the pre festive, festive and post festive occasions at each sampling sites. The solid wastes were also categorized into two categories, based on its gross composition biodegradable and non-biodegradable.

### Results And Discussion

India is known for its spiritual revels and this has far more occurrences of solid waste generation than in any other country, during different religious festivals celebrated round the year. The results obtained for the studies made during eight festive occasions, occurring round the year as mentioned in Table-2 and described below:

**Biodegradable Waste:** In the festive occasions highest mean value of biodegradable waste was recorded 2560.850 Kg on the festive occasion of Kanwar Mela at site-II Har-ki-Pauri and lowest mean value of biodegradable was found 307.650Kg on the festive occasion of Makar Sakranti at Sapta Rishi Ashram Ghat.

**Non- Biodegradable Waste:** In the festive occasions highest mean value of non-biodegradable waste was recorded 768.700 Kg on the festive occasion of Kanwar Mela at Pathri Station and lowest value of non-biodegradable waste was recorded as 229.000kg on the occasion of Makar Sakranti at Sapta Rishi Ghat.

### Discussion

During the study period it was also found that, most of the offerings are carried in polythene bags, envelopes and in paper or cloth bags, beside the bamboo baskets of various sizes to the Deities. All these offering are left at the bathing site, which are normally collected from the extra staff members of the city municipality as litter around the bathing ghats. This waste is rarely collected systematically and brought to the solid waste dumping ground of the city about 5-6 Km. away to minimize the service cost related to its transportation, collection and disposal, by the management of the municipality. These types of

solid waste have various negative impacts to the concern area. In this series, **Gangwar and Joshi (2008)** studied the quantity of solid waste during the Ardh Kumbh period of 2004. They reported that 62.20% biodegradable, 17.14% Non Biodegradable and 13.61% miscellaneous during the different festivals of Ardh Kumbh. **Sharma et. al. (2010)** surveyed different type of colonies in Haridwar city and observed that the financially better people generate roughly twice as much garbage as people from slum areas.

The Haridwar municipality takes lot of preventive measure to keep the city and the bathing ghats/ platforms sanitarilly and hygienically clean and high-quality condition, but for the flow of massive congregation during the festive days and the pressure of work on the sanitary staff, the garbage still finds pockets of accumulation all around. The solid waste disposal site of Haridwar city is situated about 2.5km away from generation site (Har Ki Pauri) on the bank of river Ganga. The open vehicles normally used for transporting garbage from its generation site to dumping site spill the garbage in way, which again originates foul smell and traffic congestion due to slow speed as also reported by **Mazumdar (1996)** from the cities of his study.

To manage the congregation the Haridwar municipality almost routinely reschedules its civic services related to waste collection and transportation, during the festive occasions. In addition to its regular scavenging staff of 567 workers, the municipality employs additional staff of around 175-200 persons, on contract basis to carry out extra cleaning of these places, during the festive days. Routinely there are about 15 tractor trolley, 5 container, 7 tipper truck, 2 sewer jetting machine, 5 sewer cleaning machine, and about 270 container for the daily collection and transportation to open dumping site for single trips but during the festive days, number of solid waste disposal transportation trip of vehicle is increased more than three to four times. In the present study, out of eight selected festivals and at seven selected sites, viz. Sapta Rishi Ashram Ghat, Har Ki Pauri, Kusha Ghat, Chandi

Ghat, Prem Nagar Ghat, Pul Jatwada and Pathri Station. In the Sapta Rishi Ashram Ghat selected as reference site the lowest total gross amount of solid waste was observed during the 507 kg during the festive occasion of Makar Sakranti during the year of 2011 and the highest value of total gross amount of solid waste was 3429.4kg at Har Ki Pauri during the festive occasion of Kanwar Mela. This solid waste may lead to communicable disease in the concern areas.

The chances of the spread of communicable diseases in the bathing sites area due to the lack of efficient municipal services, as has been reported earlier by **Saini et. al. 2009** in Hardwar city during

Kanwar Mela and described the number of patients significantly rise during the festive occasions and these patients mainly suffering from water borne disease.

In the present study the huge amount of solid waste was found during the Kanwar Mela and the gross total amount of solid waste was 16777.9Kg during said festival at all the sampling site. It may due to number of tourists/pilgrims visited the spot. According to data of tourism department approximately **1932326** numbers of people visited the Haridwar city during the month of July in which the Kanwar Mela was held.

**Table-1:- Quantitative and Quantitative amount of solid waste at seven selected sites during eight selected festivals.**

Sites	Sapta Rishi Ghat		Har-Ki-Pauri		Kusha Ghat		Chandi Ghat		Prem Ashram Nagar Ghat		Pul Jatwada		Pathri Station		
	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	Bio-deg.	Non-Biodeg.	
Fes															
M.S	T. S.W	307.650	229.900	1350.100	361.850	978.450	310.450	471.350	254.450	1288.150	346.700	1343.000	379.950	1693.350	501.900
M. Sh.	T. S.W	344.050	247.200	1435.450	451.250	1080.950	359.950	536.100	280.350	1433.350	485.50	1484.450	416.350	1830.650	582.600
B.K.	T.S.W	450.200	286.050	1813.400	518.600	1144.300	389.650	588.500	318.100	1497.400	548.100	1590.500	443.500	1998.000	620.100
G. D.	T. S.W	373.250	306.950	1749.950	451.850	1125.700	364.400	542.400	294.400	1291.100	370.850	1464.300	416.250	1664.300	580.450
K.M.	T. S.W	553.100	347.150	2560.850	746.400	1918.000	541.500	733.550	418.150	2295.650	647.950	1750.600	614.750	2332.500	768.700
S. A.	T. S.W	335.800	274.950	1563.450	406.900	870.000	341.450	405.700	271.200	896.800	318.650	1192.400	370.850	1535.250	490.750
P.V. A.	T. S.W	373.500	298.450	1893.150	478.150	1260.200	432.800	588.700	328.850	1390.700	413.700	1715.600	441.000	1781.500	624.250
K. A.	T.S.W	431.700	326.100	2024.400	559.850	1486.500	490.100	677.200	411.050	1564.000	455.200	1858.900	490.550	1901.400	722.700

\*(All values are mean of 2010 and 2011 in Kg)

[Non-Biodeg. = Non biodegradable, Bio-deg. = Biodegradable, T.S.W= Total solid waste, M.S= Makar Sankranti, M.Sh=Maha Shivaratri, B.K= Baishakhi, G.D= Ganga Dussehra, K.M. = Kanwar Mela, S.A.= Somvati Amavashya, P.V.A= Pitra Visarjini Amavashya ]

According to **Mishra and Joshi (2002)**, 20,435 Kg solid waste was generated in Hardwar city during the important six festive occasions in 1997. These data give us a bright status of solid waste generation for this holy city, during different festive occasions. **Dhere et. al. (2008)** studied the adverse impact of municipal solid waste on air and ground water due to the improper disposal of waste in Pune city. In this series **Omonmwan and Esiegebe (2009)** reported the ground water contamination due to the lechate contribution of the solid waste in metropolitan city of Nigeria. **Zade and Noori (2008)** also described the adverse impact of solid waste in concerned areas. At Sapta Rishi Ghat the maximum gross total amount 927.2 Kg of solid waste was found during Kanwar Mela which is relatively 82.88% higher than the total gross amount of solid waste during the Makar Sakranti during the year of 2011. It is significantly corelated with the number of tourist/pilgrims visted to the city. According to avilable data from tourism Department during the month of July, 2011 about 1932326 numbers of pilgrims visited the city which is 252% higher in number during the month of January, 2011. In a similar kind of results for festive days, **Mishra and Joshi (2004)** reported 4000.90kg of total solid waste, during the Pitra visarjini amawasya, at Har Ki Pauri, Haridwar. The highest amount reported for the present study at Har Ki Pauri, during festive day of Kanwar Mela. As a result there is extra work on the

local municipality. **Rampal and Sharma (2003)** reported total solid waste generation in the Bhubaneswar city was 162,000 mt. and 180,000mt.k, during the study year of 2001 and 2002 respectively. After the popular Har ki Pauri the Prem Nagar Ashram Ghat is busiest ghat of the city and mostly used by the local people for the bathing but during the festive occasions huge amount of pressure is also observed on this bathing site. Population growth and religio-touristic activities have brought increasing amounts of solid waste to urban areas. Similar kinds of results were made by **Rather et. al. (2010)** in which they described that the urban waste certainly degraded the water quality of river Jhelum in Srinagar. In most developing countries, the ever-increasing quantities have overwhelmed local governments' capabilities to cope efficiently. Every city needs to implement record keeping on the health of its solid waste workers, including the informal waste pickers and recyclers. Rather than having open access of waste pickers to solid waste disposal sites, all solid waste workers should be registered and participate in a regular vaccination and health examination program.

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