Research Article

ASSESSMENT AND PHYSICAL CHARACTERIZATION OF SOLID WASTE IN NAGAR PALIKA PARISHAD CHITRAKOOT KARWI

*Indra Prasad Tripathi, Arvind Prasad Dwivedi and Sarika Singh

Department of Physical Sciences, M.G.C.G.V. Chitrakoot, Satna Madhya Pradesh-485780, India

ARTICLE INFO	ABSTRACT
	Present Study on the Quantifying the generation of MSW and physical Characterization of solid waste in Chitrakoot Nagar Palika Parishad includes 25 wards. The total solid waste generated 6164.31 kg/day in Nagar Palika Parishad Chitrakoot. It is mainly divided biodegradable, non-biodegradable and recyclable, which are 3877.37, 1870.01 and 416.93 kg/day respectively. The average per capita solid waste generation rate 0.126kg/day/capita which is less than the Indian standard value

INTRODUCTION

Chitrakoot is a major holy place of Bundelkhand, situated at 24.48" to 25.12" North Latitude and 80.58" to 81.34" East Longitude. It is about 62 km from East to West and 57.5 km from North to South. Chitrakoot is an ancient city, because it is situated at bank of River Mandakani. It has population of about 48892. It is divided into 25 wards shown in Figure1. Municipal solid waste is generated by households, commercial activities and other sources whose activities are similar to those of households and commercial enterprises, for example, wastes from offices, hotels, supermarkets, shops, schools, institutions and from municipal services such as street cleaning and maintenance of recreations areas. Municipal Solid waste management is one of the major environment problems of Indian municipalities (Pathak, 2013). The major types of MSW are food wastes, paper, plastic, rags, metal and glass with some hazardous household wastes such as electric light bulbs, discarded medicines and automotive parts. Environmental problems have globally received more attention in recent years and efforts have been made to decrease environmental problem.

Corresponding author: Indra Prasad Tripathi,
Faculty of Science and Environment, M.G.C.G.V. Chitrakoot, Satna Madhya Pradesh-485780, India.

The generation of solid waste contributes to environmental problems when treating and disposing solid waste. Many problems are involved in collection and treatment of municipal solid waste (Singh, 2005; Tripathi, 2014). The impacts we are facing due to environmental degradation are global warming, ozone layer depletion, soil erosion, loss of biodiversity. So it is the responsibility of us to take actions to preserve our environment (TERI, 2013). Improper waste disposal and waste management may lead to negative impacts on health leading to various health problems (Harith, 2014; Sathya prabha, 2012; Agarwal, 2012). Total waste refers to the sum of industrial solid waste, MSW, construction and demolition waste, HM and agricultural solid waste. MSW is defined as household waste, road cleaning waste, similar commercial, industrial and institutional waste. HW is defined as infections, toxic and other hazardous waste generated in healthcare facilities (Zho, 2011). aste includes all items that people or companies no longer have any for, which either to get rid of or have already discarded. However, waste can also be a resource if it is put in the right place. Many items can be considered as waste, for instance household rubbish, sewage sludge, waste from manufacturing activities, packaging items, discarded cars, discarded electronic devices, garden waste, old paint containers, etc.
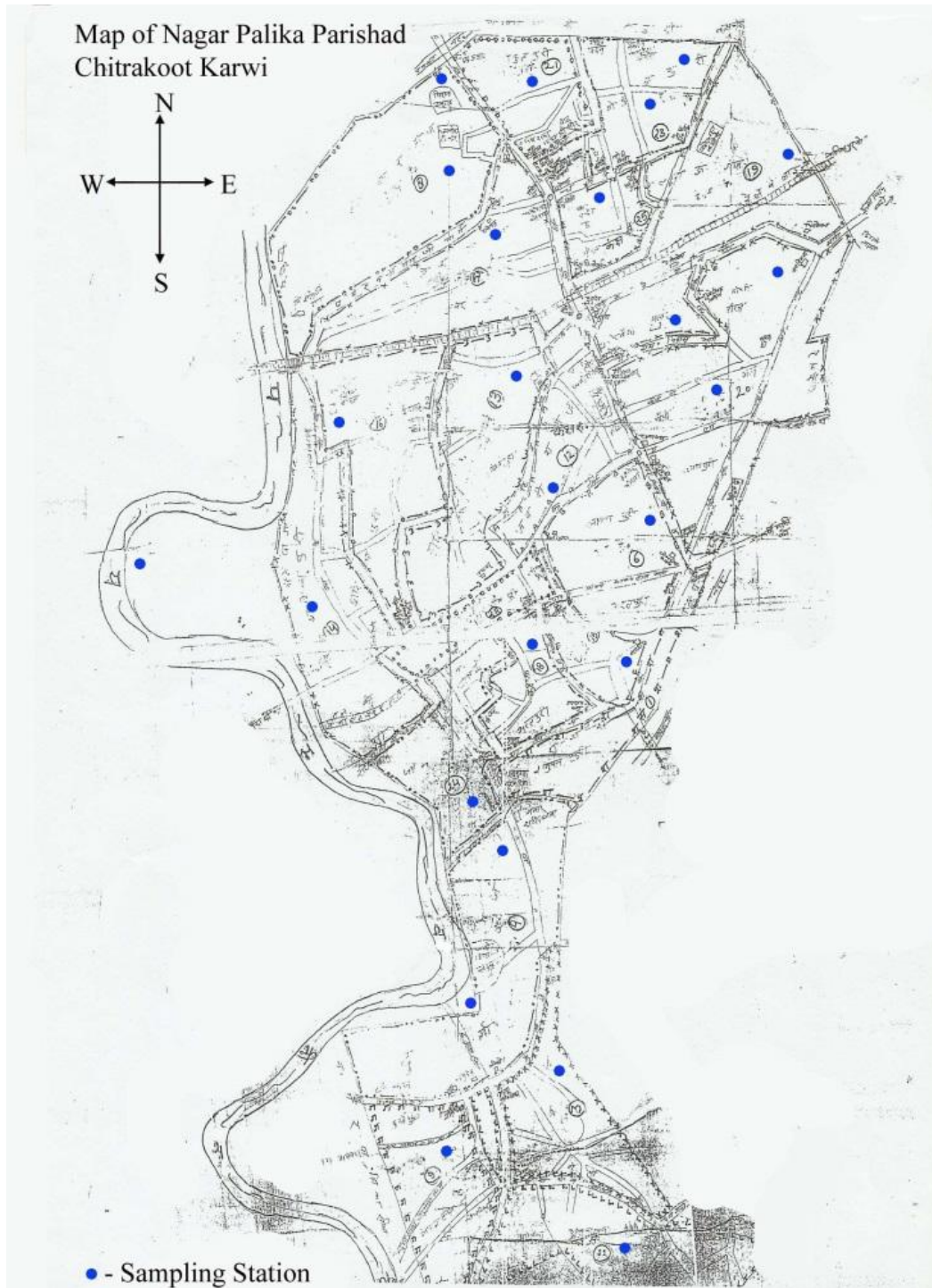
Fig.1. Map of Nagar Palika Parishad Chitrakoot Karwi

Thus all our daily activities can give rise to a large variety of different wastes arising from different sources. Waste generation rates are affected by socio-economic development, degree of industrialization and climate. Generally, the greater the economic prosperity and the higher the percentage of urban population, the greater the amount of solid waste production (Jin, 2011). Municipal solid waste (MSW) has become a great concern due to increasing volumes from expanding industrial capacity and activities the world over. The cost of sweeping away solid waste pollution is a primary issue for management agencies. Thus, an effective planning method of waste management activities is desired (Nguyen, 2009).

MATERIALS AND METHODS

In the first phase of the study, sample of MSW from different wards were collected randomly one sample from each ward. Physical characterizations of MSW were carried out on segregation site. Further, the per capita generation rate was calculated. All the Parameters procedure was followed as per standard methods (APHA AWWA WPCF, 1987; Indian Standard, 1982)

RESULTS AND DISCUSSION

Total MSW was classified in the nine categories paper, plastic, rags, rubber, leather, glass, metal, total compostable matter and non-biodegradable waste; details are given in Table 1. The annual collection of these waste paper (3.08), plastic (2.7), rags (2.2), rubber (0.46), leather (0.15), glass (0.20), metal (0.25), TCM (60.53) and non-biodegradable (30.3) percent of total waste 2051.42 tons/year. The maximum weight of paper (3.2), plastic (2.8), rags (2.5), rubber (0.72), leather (0.22), glass (0.24), metal (0.34), TCM (64.07), and non-biodegradable waste (32.80) was found in rubber (0.24), leather (0.07), glass (0.11), metal (0.12), TCM (37.09)

ward number 19, 20, 02, 20, 20, 19, 20, 02 and 02 respectively. The minimum weight of paper (2.0), plastic (1.7), rags (1.4), and non-biodegradable (19.89) was found in ward number 15, 15, 09, 24, 17, 01, 15, 15 and 17 respectively. The maximum percentage of paper (3.4), plastic (2.8), rags (2.3), rubber (0.68), leather (0.20), glass 0.14), metal (0.34), TCM (61.23) and non-biodegradable (30.78) was found in ward number 10, 09, 02, 20, 12, 01, 20, 13 and 02. The minimum percentage of paper (2.7), plastic (2.4), rags(1.9), rubber(0.33), leather (0.10), glass(0.49), metals (0.18), TCM (59.6) and non-biodegradable (29.57) was found in ward number 12, 02, 25, 01, 01, 20, 01, 10 and 24 respectively.

Table 1. Annual Solid Waste Generation in different ward of Nagar Palika Parishad Chitrakoot (Tons/year)

Sr. No.	Ward Name	Paper	Plastic	Rags	Rubber	Leather	Glass	Metal	Total Como stable Matter	Non-Biodegradable Waste
1	Shatrughan puri	2.2 (2.9)	2.0 (2.6)	1.7 (2.2)	0.25 (0.33)	0.08 (0.10)	0.11 (0.14)	0.15 (0.18)	45.62 (61.02)	22.59 (22.59)
2	Raghav Puri-1	3.0 (2.8)	2.6 (2.4)	2.5 (2.3)	0.6 (0.56)	0.2 (0.18)	0.26 (0.24)	0.3 (0.28)	64.07 (60.13)	32.8 (30.78)
3	Manikunj	2.1 (2.8)	2.0 (2.6)	1.6 (2.1)	0.27 (0.37)	0.1 (0.13)	0.14 (0.17)	0.18 (0.24)	45.16 (60.41)	23.01 (30.78)
4	Durga Kunj	2.2 (2.9)	2.0 (2.7)	1.6 (2.1)	0.25 (0.33)	0.09 (0.12)	0.13 (0.17)	0.17 (0.22)	44.95 (60.69)	22.49 (30.36)
5	Teerthraj Puri-1	2.3 (2.9)	2.0 (2.5)	1.6 (2.0)	0.31 (0.38)	0.1 (0.12)	0.13 (0.16)	0.17 (0.21)	47.23 (60.56)	23.91 (30.66)
6	Lakahman puri-1	2.9 (3.0)	2.5 (2.6)	2.1 (2.2)	0.57 (0.61)	0.18 (0.18)	0.2 (0.21)	0.27 (0.28)	57.2 (60.30)	28.74 (30.30)
7	Teerthraj puri-2	2.3 (2.8)	2.2 (2.7)	1.7 (2.1)	0.35 (0.42)	0.11 (0.13)	0.16 (0.19)	0.2 (0.24)	48.77 (60.93)	24.08 (30.08)
8	Shankar ganj	2.7 (3.0)	2.3 (2.5)	1.9 (2.1)	0.39 (0.43)	0.14 (0.15)	0.18 (0.18)	0.22 (0.24)	54.46 (60.61)	27.36 (30.45)
9	Gopal puri-1	2.3 (3.4)	1.9 (2.8)	1.4 (2.0)	0.26 (0.37)	0.08 (0.11)	0.12 (0.17)	0.17 (0.25)	40.65 (60.48)	20.11 (29.92)
10	Raghav puri-2	3.1 (3.0)	2.6 (2.5)	2.3 (2.2)	0.65 (0.63)	0.2 (0.19)	0.25 (0.24)	0.31 (0.30)	61.48 (59.67)	29.92 (30.97)
11	Ambika Kunj	2.1 (3.0)	1.8 (2.6)	1.4 (2.0)	0.26 (0.38)	0.09 (0.13)	0.12 (0.17)	0.15 (0.22)	41.14 (60.45)	20.84 (30.62)
12	Jagdeesh ganj	2.7 (2.7)	2.5 (2.5)	2.1 (2.1)	0.57 (0.57)	0.2 (0.20)	0.23 (0.23)	0.26 (0.26)	59.36 (60.67)	29.7 (30.35)
13	Dwarika puri-1	2.5 (2.8)	2.2 (2.5)	1.9 (2.1)	0.39 (0.44)	0.14 (0.16)	0.17 (0.19)	0.21 (0.24)	53.1 (61.23)	25.93 (29.90)
14	Janki puri	2.4 (2.9)	2.1 (2.5)	1.7 (2.0)	0.34 (0.41)	0.11 (0.13)	0.15 (0.18)	0.19 (0.23)	49.48 (60.37)	25.51 (30.93)
15	Bhart puri-1	2.0 (3.2)	1.7 (2.7)	1.4 (2.2)	2.3 (0.37)	0.08 (0.13)	0.10 (0.16)	0.12 (0.19)	37.09 (60.69)	18.29 (29.92)
16	Dwarika puri-2	2.1 (3.0)	1.9 (2.7)	1.5 (2.1)	0.26 (0.37)	0.08 (0.11)	0.12 (0.17)	0.14 (0.20)	42.01 (60.22)	21.47 (30.78)
17	Kuber ganj	2.0 (3.0)	1.8 (2.6)	1.4 (2.1)	0.26 (0.39)	0.08 (0.10)	0.12 (0.18)	0.14 (0.21)	39.65 (60.46)	19.89 (30.33)
18	Barat puri-2	2.3 (3.3)	1.9 (2.7)	1.4 (2.0)	0.24 (3.5)	0.08 (0.11)	0.13 (0.19)	0.15 (0.22)	41.25 (60.71)	20.35 (29.95)
19	Baldau ganj	3.2 (3.1)	2.8 (2.7)	2.3 (2.2)	0.67 (0.66)	0.21 (0.20)	0.24 (0.23)	0.33 (0.32)	60.75 (60.42)	29.81 (29.64)
20	Gandhi ganj	3.2 (3.0)	2.8 (2.6)	2.5 (2.3)	0.72 (0.68)	0.22 (0.20)	0.25 (0.49)	0.34 (0.34)	63.41 (60.51)	31.2 (29.77)
21	Gopal puri-2	2.5 (2.9)	2.3 (2.7)	1.7 (2.0)	0.35 (0.41)	0.13 (0.15)	0.16 (0.19)	0.2 (0.23)	50.75 (60.43)	25.66 (30.55)
22	Lakahman puri-2	2.6 (3.0)	2.3 (2.6)	1.8 (2.1)	0.33 (0.38)	0.12 (0.14)	0.16 (0.18)	0.18 (0.21)	51.41 (60.22)	26.22 (30.71)
23	Gopal puri-3	2.6 (2.8)	2.4 (2.6)	1.9 (2.1)	0.33 (0.36)	0.12 (0.13)	0.15 (0.16)	0.2 (0.21)	54.61 (60.68)	27.56 (30.62)
24	Ram puri	2.4 (3.4)	2.0 (2.8)	1.4 (2.0)	0.24 (0.34)	0.08 (0.11)	0.11 (0.15)	0.15 (0.21)	42.3 (60.98)	20.55 (29.57)
25	Baldau ganj	2.3 (3.0)	2.0 (2.6)	1.5 (1.9)	0.27 (0.36)	0.09 (0.11)	0.12 (0.15)	0.21 (0.19)	60.98 (60.91)	22.62 (30.09)
	Total (Tons)	63.37	55.9	45.7	9.46	3.23	4.12	5.16	1241.85	622.58

% Value given in Parenthesis

On the basis of broad nature of solid waste, it is classified in three categories i.e. bio-degradable, non-biodegradable and recyclable waste, which found 3877.37, 1870.01 and 416.93 kg/day respectively. The population of Chitrakoot Nagar Palika Parishad is 48892 and per capita generation rate of solid waste are 0.126 kg/day/capita which is given in Table 2. The maximum solid waste generation was found in ward number 2 (106.54 tons/year) and minimum solid waste generation rate

manufactures. The composition of MSW shows mostly organic matter, so composting is a good method for the treatment and production of soil amendment. The MSW generation rate in small towns are lower than those of metro cities and the per capita generation rate of MSW in India ranges from 0.2 to 0.5 kg/day (CPCB, 2004). In Chitrakoot Nagar Palika Parishad per capita MSW generation rate 0.126 kg/person/day.

Table 2. Major Classified Municipal Solid Waste Generation (kg/day)

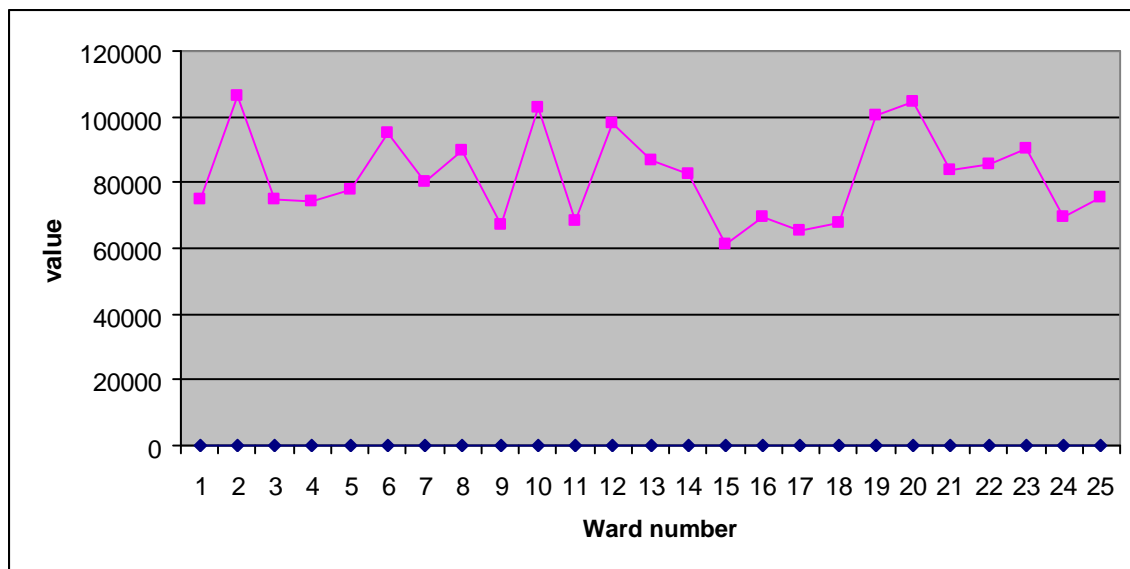| Sr. No.	Waste Category	Per day Generated Waste (kg/day)	Population	Per Capita Generated Waste in kg/day
1	Bio-degradable Waste	3877.37		
2	Non-biodegradable Waste	1870.01	48892	0.126 kg
3	Recyclable Waste	416.93		
Total		6164.31kg/day		

Figure 2. Graphical Representation of Annual Solid Waste Generation in different ward of Nagar Palika Parishad Chitrakoot

was found in ward number 15 (61.11 tons/year), which is shown in Figure 2. Refuse characteristics vary not only from city to city but even within the same city, as it depends on factors as the nature of local activities, food habits, cultural traditions, socio-economic factors, climatic conditions, and seasons.

The physical and chemical characteristics aid in deciding the desired frequency of collection, precautions to be taken during transportation and methods of processing and disposal (Chattopadhyay, 2009). In Chitrakoot Table 1 shows an increasing trend for the biodegradable fraction, and also shows an increase in the day- to day use of plastic and paper. The amount of paper and plastics, including materials such as food containers and wrapping materials, is noted to be much lower than in developing countries such as the USA (65%) and Western Europe (48%). Waste in developing cities generally has a high organic content more than 50%) and a low energy value (CPHEEO, 2000).

Conclusion

The segregation of waste at source and promotion of recycling or reuse of segregation materials reduces the quantity of waste and the burden on landfills, and provides raw materials for

This is lesser than the standard; therefore MSW management is a no problem in Chitrakoot Nagar Palika Parishad.

Acknowledgment

REFERENCES

Agarwal, S.P. Samdani K.L. Singhvi, B.S. Shekhawat, R.S. and Arora, R.P.2012. Plastic Waste Management an Indian Perspective. *IJEP*, 32: 478-485.

APHA AWWA WPCF, 1987. Standard Methods for Examination of Water, Waste Water and Sludge (*APHA*).

Central Pollution Control Board (*CPCB*). 2004. Management of Municipal Solid Waste. Ministry of Environment and Forests, New Delhi, India.

Chattopadhyay, Subhasish, Dutta, Amit. , Ray, Subhabrata. 2009. Municipal Solid Waste Management in Kolkata, India- A review, *Waste Management,* 29: 1449-1458.

CPHEEO (*Central Public Heath and Environmental Engineering Organization*). 2000. Manual on Municipal

Solid Waste Management Ministry of Urban Development, Govt. of India, New Delhi.

Haritha, B. iiakiya, M., Swetha, M. and Vinitha S.2014. Environmental Degradation of Resources and Waste Management in Chennai City. *IJEP,* 34:844-847.

IS,9325. 1982. Methods for Physical Analysis and Determination of moisture in Solid Waste, (*Indian Standard Institution, and New Delhi*)

Jin, Lei. 2011. A Type-Fuzzy Optimization Model for Municipal Solid Waste Management, Eighth *International Conference* on Fuzzy System and Knowledge Discovery (FSKD), 55-59.

Ngoc, Nguyen, Uyen. , Schnitzer, Hans. 2009. Sustainable Solutions for Solid Waste Management in Southwest Asian Countries. *Waste Management,* 29:1982-1995**.**

Pathak, Vandana and Kushwaha B.P. 2013. Assessment of Municipal Solid Waste Management in Satna. *IJEP*, 33:321-328.

Sathya Prabha, K .Ravindraan, P. and iiavarasan N. 2012. Sustainable Waste Management Using Waste Materials in Concrete, *IJEP* 32:147-151.

Singh, Akhilesh and Awashthi, Ajay. 2005. A study on Municipal Solid Waste and its Disposal and Management Strategy of Rewa Town. Ph.D Thysis. APS University, Rewa,

TERI. 2013. TERI. Environmental Survey. www.teriin.org.

Tripathi, I.P. Singh, Sarika, Dwivedi, Arvind Prasad, Singh, Kiran and Singh, Ravindra. 2014. Assessment and Physical Characterization of Solid Waste in Nagar Panchayat Chitrakoot, Satna. *Journal of Applicable Chemistry,* 3: 1713-1718.

Zho, Wei and Zhang, Qun. 2011. Solid Waste Management in Tianjin City: Status and Challenges, Eighth *International Conference* on Fuzzy System and Knowledge Discovery (FSKD) 978-1-4244-5089-3/11.

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