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Quantification and characterization of waste in selected wards of Kanpur city, India

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Abstract

Rapid urbanization along with its increasing human activities in metropolitan areas imposes great challenges to urban environmental management. Solid waste management is an important and challenging issue concerning waste generation and disposal. This paper presents the quantification and characterization of waste in selected wards of Kanpur district, India. The analysis of waste composition indicated that non-biodegradable waste consists of 17.06 % plastic waste, 17.51 % polythene followed by 15.89 % glass, 16.62 % metal and 32.90 % under miscellaneous category of waste, biodegradable waste consists of 13.42 % of waste includes Paper whereas 17.31 % Cardboard followed by 20.14 %, food wastes, 11.10 % Clothes and 38.02 % miscellaneous waste.

Keywords: Municipal waste, solid waste, biodegradable, non biodegradable waste

Introduction

Solid waste management is considered to be one of the most serious environmental problems confronting urban areas in developing countries (Pfammatter, 1996). Many cities in developing countries are facing serious problems in managing solid wastes. The annual waste generation increases in proportion with the increase of population and level of urbanization. Issues related to disposal of solid waste have become challenging therefore more land is needed for the ultimate disposal of these solid wastes (Idris, *et. al.*, 2004) [2]. In many modern cities particularly in the metropolises of major developing countries, however, the traditional solid waste disposal practices seen as improper, ineffective and inadequate.

Rapid urbanization along with its increasing human activities in urban areas imposes great challenges to urban environmental management (Buenrostro and Bollo, 2003). One of the most important environmental problem in cities is the production and containment of urban solid waste (Pokhrel and Raghavan, 2005) [7]. The generation of solid waste and its disposal are not new phenomena in human society. The generation of solid waste is directly related with increase of population, industrialization, urbanization, fast changing life style and living pattern, food habits and the culture of over consumerism which gave rise of solid waste problem (Sharma and Chand, 2010) [11].

The problem of municipal solid waste management has acquired alarming dimensions in India during last decade. Solid waste open dumping refers to the act of discharging or otherwise disposing of solid waste in an environment outside of proper pollution management functionalities (Shivayogimath, *et. al.*, 2007) [10]. This word includes cases such as discharging or open-dumping of solid waste into a water body (like a river, lake or sea) or open dumping it at the roadside, in the wilderness or in wetlands or open dumping it together with municipal solid waste. The present system of solid waste management in most of the urban areas are highly unsatisfactory due to limited finance and inadequate services.

Material and Methods

Location and Extent of the Study Area

Kanpur City is situated between the parallels of 25°26'N and 26°58' North latitude and 79°31'E and 80°34' East longitude. It is situated on the most important national highways no. 2 and 25 and state highway. Covering an area of 291.78 Square Kilometers which consist 34, 15, 058 persons (as per 2010 projected population). Kanpur is the biggest city of the state and it is the main centre of commercial and industrial activities formerly known as Manchester of the country is now also called the commercial capital of the State. It is known for its cotton and woolen textile and leather industries. Apart from leather and textile industry, the fertilizer, chemicals, hosiery, two wheelers and engineering industries are also operating prominently in the city. Kanpur city is divided into six zones and further subdivided into 110 wards.

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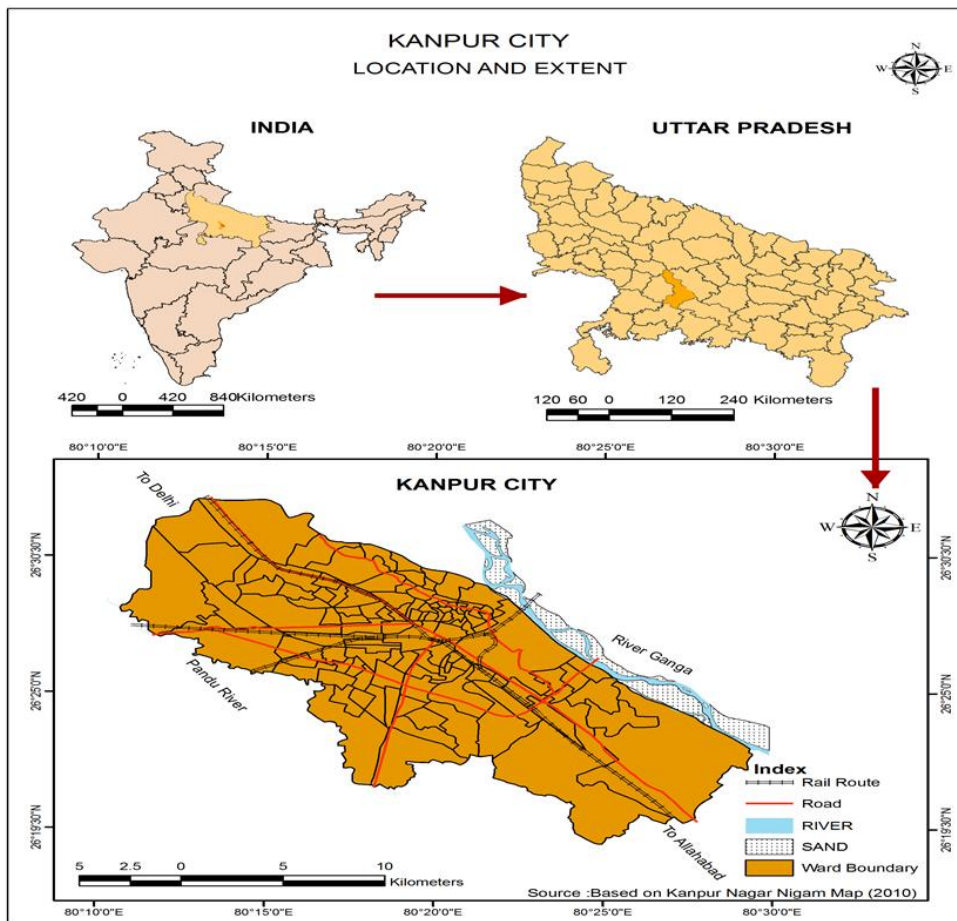


Fig 1: Map of Study area

Study Site

Present research was conducted in selected wards of Kanpur city in zone 1 during the period of January to April, 2010. Zone no.1 situated on the southern bank of river Ganga in the Northern Central part of the Kanpur City. It covers an area of 10.29 Square Kilometers and consist 4, 76, 562 persons. It has 18 wards namely Laxmipurwa, Raipurwa, Anwarganj, Sisamau South, Civil lines, Dalelpurwa,

Coperganj, Chataimohal, Harbansmohal, Chamanganj, Patkapur, Maheshwarimohal, Generalganj, Parade, Nazirbagh, Danakhori, Chowk sarafa and Collectorganj. This zone is the hub of all commercial, social and political activities of Kanpur since british era. Total population, ward, and total number of households presented in Table 1.

Table 1: Number of ward, population and households in Zone 1

S. No.	Zone No.	No. of Wards	Total Population of Zone	Total Area of Zone in Sq. k.m	Total Number of Households	Name of Ward's
1	1	18	476562	10.27	51250	1. Laxmipurwa, 2. Raipurwa, 3. Anwarganj, 4. Sisamau South, 5. Civil lines, 6. Dalelpurwa, 7. Coperganj, 8. Chataimohal, 9. Harbansmohal, 10. Chamanganj, 11. Patkapur, 12. Maheshwarimohal, 13. Generalganj, 14. Parade, 15. Nazirbagh, 16. Danakhori, 17. Chowk sarafa 18. Collectorganj

Sampling Period: Sampling analysis was performed in selected wards of zone 1 in Kanpur city (Table 1). The randomized sampling was performed at interval of one month (January-April, 2010) in selected wards.

Sample analysis

Representative samples were collected for characterization and quantification of biodegradable, non-biodegradable and moisture content in collected solid waste sample. The following formula were used for determine the moisture

content in the biodegradable and non biodegradable waste materials

$$Mc = (Ww - Wd) / Ww \times 100$$

Where, Mc = moisture content (%),
 Ww = wet weight of the sample, and
 Wd = dry weight of the sample.

Result and Discussion

Composition of non-biodegradable waste and moisture content

The waste characteristics under the category of non-biodegradable waste an attempt has been made to collect waste from selected wards of Zone 1. There are five wards have been selected as sampling site for Zone-1. These wards are Luxmipurwa, Raipurwa, Anwarganj, Civil Lines and Generalganj.

Table 2 showed that variation of biodegradable waste in four months. The average value of fors non-biodegradable waste reported in table 2, indicated that 17.06 plastic waste, 17.51 percent polythene followed by 15.89 percent glass, 16.62 percent metal and 32.90 percent under miscellaneous category of waste. Moisture content of non-biodegradable waste material varied from (3.28-3.73). The average value of moisture content for four month is 3.54 percent. Less variability was observed in non-biodegradable waste materials during sampling periods. Anwarganj and Civil Lines areas the generation of plastic and polythene is more as compare to other wards like Laxmipurwa, Raipurwa and Generalganj. The amount of plastic and polythene is high in these area only due to high concentration of commercial unit and markets in these areas. (Sharholy *et al.*, 2008; Malviya *et al.*, 2002) ^[9, 4]

Table 2: Monthly composition of non-biodegradable waste and moisture content in zone-1

Non-biodegradable waste in percent						
Months	Plastic	Polythene	Glass	Metal	Miscellaneous	Moisture Content
January	20.94	11.82	16.01	20.28	30.96	3.73
February	18.66	13.90	19.37	14.41	33.66	3.56
March	11.95	23.01	16.53	16.38	32.12	3.61
April	16.72	21.32	11.65	15.41	34.89	3.28
Average	17.06	17.51	15.89	16.62	32.90	3.54

Composition of biodegradable waste and moisture content

The physical characteristics under the category of Bio degradable waste includes Paper, Cardboard, Food wastes, clothes and miscellaneous. Table 3 shows that waste composition under biodegradable gives varying information in selected wards of zone 1. Table shows that 13.42 % of waste includes Paper whereas 17.31 % Cardboard followed by 20.14 %, food wastes, 11.10 % Clothes and 38.02 % under miscellaneous category of waste. The amount of

Paper and Cardboard is high in these area only due to the hub of commercial unit and markets in these areas. The moisture of biodegradable waste varied from 14.55 to 18.35 % and maximum moisture content was observed in solid waste in month of January the possible causes was high moisture in waste material due to minimum atmospheric temperature and less sunshine during day time. Similar study was conducted by other authors (Sharholy, 2008; Nema, A.K., 2004; Rao and Shantaram, 1993) ^[9, 8]

Table 3: Monthly composition of biodegradable waste and moisture content in zone-1

Biodegradable waste in percent						
Months	Paper	Cardboard	Food Wastes	Clothes	Miscellaneous	Moisture Content
January	11.82	18.30	16.52	11.27	42.10	18.35
February	12.73	21.07	19.31	10.23	36.66	14.55
March	14.51	15.31	22.84	11.40	35.95	16.27
April	14.63	14.56	21.89	11.53	37.39	18.03
Average	13.42	17.31	20.14	11.10	38.02	16.8

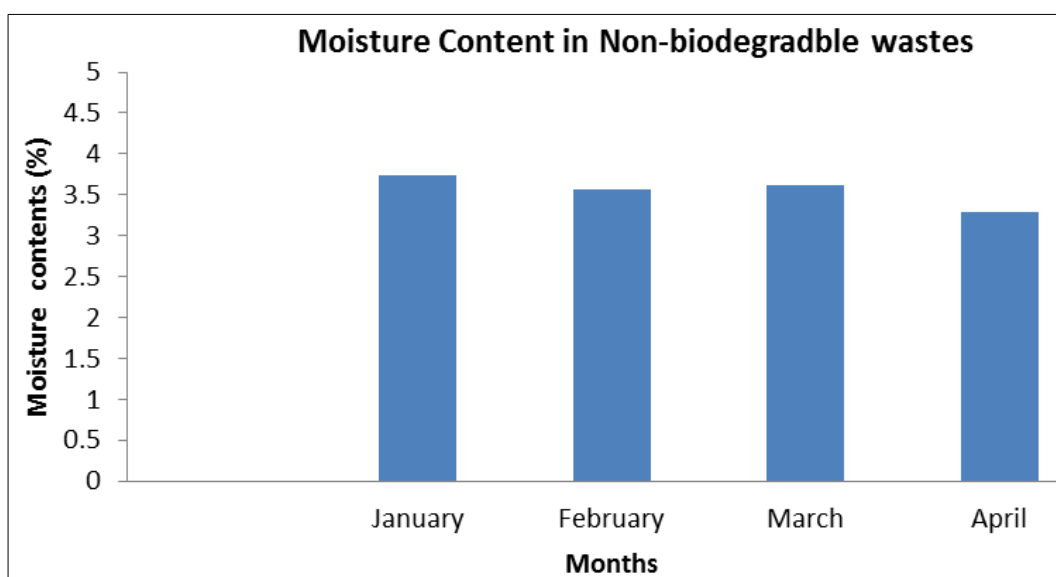


Fig 1: Moisture content in Non-biodegradable components of solid waste in Zone 1

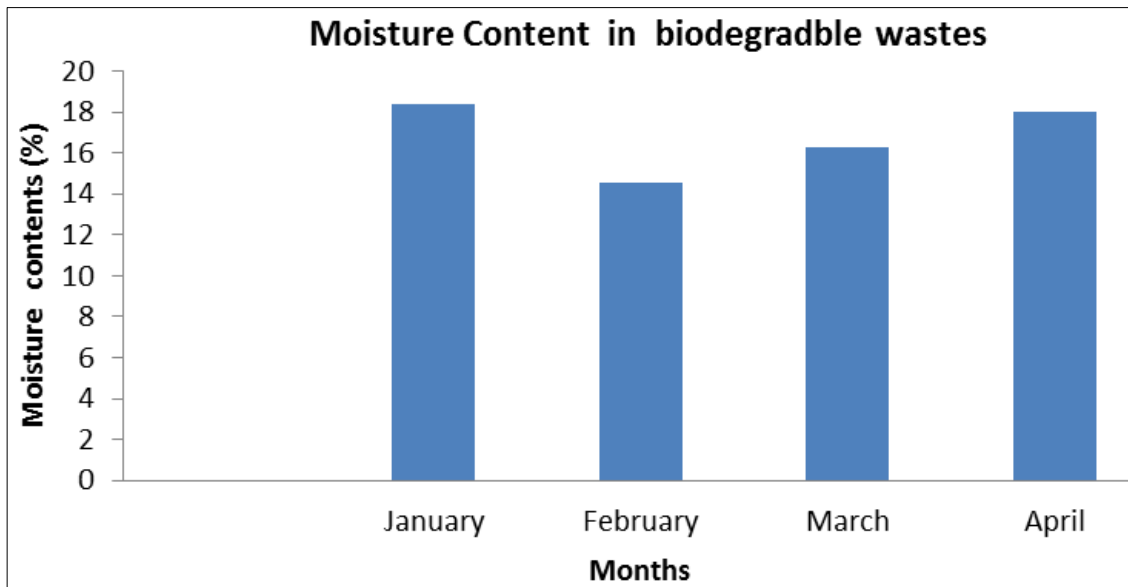


Fig 2: Moisture content in biodegradable components of solid waste in Zone 1

Conclusion

Rapid urbanization and population growth leads to generate huge quantity of municipal solid waste. Present study focused on variation of quantity and quality of biodegradable and non-biodegradable waste material in selected wards of zone 1 in Kanpur district. From the study it was observed that wards Anwarganj and Civil Lines areas generates maximum quantity of paper and cardboard materials as compare to other wards like Laxmipurva, Raipurwa and General ganj. The amount of plastic and polythene is high in these area only due to high concentration of commercial unit and markets. From the present research results indicated that handling of solid waste is very costly affairs now days. They need economic support, human resources, infrastructures facility to smooth handling and proper management and disposal of waste.

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