

Current Evaluation on Generation, Storage, And Disposal of Solid Waste from Tourist Lodging Places in Mokokchung Town : A Case Study of Metsuben, Whispering Wind and Marvel Guest House

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ABSTRACT

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Rapid urbanization, population growth and changing consumption patterns in Mokokchung Town contribute significantly to the growing volumes of solid waste. The rate of tourist inflow in Mokokchung Town increases especially during the festive season owing to its culture, religion, history and aesthetic character of the town. Growth in the tourism industry along with ineffective solid waste management practises in the accommodation places and the town has resulted in increasing rates of solid waste production. The present study aims to analyse the inflow rate of tourists and to evaluate the current rate of generation, storage, and disposal of solid waste through empirical study. The study finds out that Mokokchung Town generates 14600 metric tons per year out of this, solid waste generated from tourist accommodation in town accounted for 4088 kg per year i.e., 4.08 Metric tons per year. The study suggests alternative storage and disposal options for tourist accommodation places.

Keywords: Growth, Tourist accommodation, Solid waste, Mokokchung, Management

I. INTRODUCTION

Solid waste has become a major problem in urban areas this is mainly due to rapid urbanization, growth of population, ineffective solid waste management practises, and lack of awareness among the people. The urban centre whose economy is dependent mostly on tourism generates solid waste at much higher rates in a short span of time [9]. Whatever the nature and magnitude of solid waste, these have to be managed in a sustainable way to reduce the overall

burden on the environment [5]. The ever-increasing quantity of solid waste along with changing quality of the solid waste material and primitive system for storage and disposal of solid waste poses a great danger to the health and environment of the town. As such the fast urban growth in many developing countries cannot cope with the huge volumes of wastes being generated over the years [3,10]. ULBs in India including the study area spend INR 500-INR 1,500/Mt on SWM, 60-70 per cent of which is spend on collection, 20-30 per cent of which is spent on

distributed for each hotel to segregate the waste in green, blue and red dustbins. The dustbins were kept for three days because compostable material tends to decompose very fast releasing a foul smell which creates an unhygienic environment. Green bins were allotted to collect compostable material like kitchen waste, green waste, etc. Blue bins were allotted to collect recyclable material like plastic, paper, cardboard etc., and red dustbins were allotted to collect inert material like fine earth, ashes, Silt, pebbles etc. The sorting, segregation and estimation of solid waste were done manually by the researcher to determine the composition of the waste and the data for the quantity of solid waste were acquired by weighing the solid waste material. The data regarding tourist inflow has been collected through questionnaires and documents. As per Directorate of tourism (2017) records, 7 tourists' accommodation hotels are available in the town.

IV. RESULTS AND DISCUSSION

The most important urban hub centre in all of Nagaland after Dimapur and Kohima is Mokokchung. Some of the factors which lead to the attraction of tourists in the town are its aesthetic environment,

unique culture and tradition, history and religion. In the whole district of Mokokchung, there are eight tourist villages viz. Changtongya, Chuchuyimlang, Mopungchukit, Longjang, Longsa, Sungratsu, Pilgrimage village Molungyimsen, and Ungma. Two important tourist spots include Longkhum and Latuleba Lakhuni. The present study shows that the highest number of tourists arrives during autumn, spring, and winter seasons with an estimation of 884 tourists. The lowest numbers of tourists arrive during summer seasons with an estimation of 156 tourists. Table 1 shows the inflow rate of tourists per season divided into International, National, and Local tourists for the study areas (2019).

From table 2 we can find out that the average inflow rate for the three hotels is 347 persons per year. Metsuben and Whispering wind have the highest tourist inflow with 360 persons per year for each hotel. Marvel guest house has the lowest tourist inflow rate with 320 persons per year. This difference is because of the factors like location of the hotel from the main town, rating of the hotels, information about hotels among the people, and the number of tourist inflow among the hotels.

Table 1. Number of International, National, and Local tourists per season for the three hotels (2019)

	International	National	Local	Total
Metsuben	30	30	30	90
Whispering wind	30	30	30	90
Marvel Guest House	25	25	30	80
			Total	260

Source: Field Study

Table 2. Tourist inflow rate per year for the three hotels

	Per seasons (Persons)	Per Year (Persons)
Metsuben	90	360
Whispering wind	90	360
Marvel Guest House	80	320
Total	260	1040
	Average	347 Persons per year

Source: Field study, 2019

Solid Waste: Generation and Composition

Major sources of solid waste generation in the three hotels were: Kitchen and restaurant, office and guest rooms, and yard waste. The source of waste determines the characteristics and quality of solid waste. Compostable are those materials that can be decomposed naturally without any scientific intervention, for example, Kitchen waste, green waste etc. recyclable waste is those wastes that can be recycled and reused through scientific intervention for example plastic, paper, cardboard metal etc. and inert waste include material like fine earth, dust, ashes, silt, pebbles etc. which are also decomposable. Different type of solid waste is generated from tourists accommodation places and based on this requirement solid waste can be divided into three categories: compostable, recyclable, and inert waste.

The survey reveals that annual solid waste generated from the three hotels is about 4,088 kg i.e., 4.08 metric tons. Out of the total 2,290 kg (56 per cent) contains compostable while 858 kg (21 per cent) are recyclable and 940 kg (23 per cent) under inert waste. The highest quantity of compostable items i.e.,

leftover food occupied the top position with 1,603 kg, followed by vegetable waste 459 kg and 228 kg from garden clipping. Under recyclable waste, plastic occupied the highest items with 601 kg followed by paper waste 258 kg. Under inert fine earth occupied the highest items with 846 kg of waste and other mixed material 94 kg of waste. Table 3 shows the quantity and quality of solid waste. From the study we found out that 56 per cent of the wastes from the hotels are compostable waste, 21 per cent of wastes are recyclables, and 23 per cent of waste falls under inert waste. So, this indicates that if the compostable matter constitutes 56 per cent of the waste, if they are properly decomposed, this will help in reducing the pollution arising out of solid waste upto some limit.

Table 3 clearly shows that a huge quantity of the wastes from tourist accommodation places can be put for recycling and composting. Solid waste becomes hazardous when dry waste i.e., recyclable and wet waste i.e., compostable are mixed. If this waste is dumped without segregation, it causes environmental pollution which poses a great threat to human health.

Table 3. Annual waste generations from tourist accommodation places, 2019

	Waste in %	Material Category	Waste in Kg	Total in kg
Compostable	56	Leftover food	1603	2290
		Vegetable waste	459	
		Garden	228	
Recyclable	21	Plastics	610	858
		Paper	258	
Inert	23	Fine earth	846	940
		Mixed material	94	
Total	100			4088

Source: Field survey, 2019

Table 4. Storage of waste at the source in per cent

	Percentage of waste stored (%)	Average storage for the three hotels
Metsuben	45	45 per cent
Whispering wind	75	
Marvel guest house	15	
Total	135	Average: 45 per cent

Source: Field study

Storage and Disposal

The survey reveals that there is poor management of solid waste in the three-study areas. Only 45 per cent of wastes are well stored at the source level. Table 4 reveals the percentage of waste stored at the source level. The above table reveals that whispering wind stores 75 per cent of the waste they use dustbin for segregation and storage of solid waste. Finally for disposal they use a community dustbin to dump the waste. Marvel guest house stores only 15 per cent of the waste and has the lowest percentage of waste storage among the three hotels. Even though the waste is managed daily for marvel guest house there is poor management of the solid waste as 85 per cent of the waste is just thrown in the streams or nulla. The survey reveals that all the three hotels practice some form of segregation but without any knowledge on how to segregate the waste in green, blue and red bins. During the analysis of the bins distributed to the hotels, the researcher found mixed waste i.e., a mixture of wet and dry waste, which indicates that they use only one bin to collect and store all the categories of solid waste. It should be noted that Solid waste became hazardous when wet and dry waste is mixed together as it releases harmful gases like methane gas, toxic fumes and releases a foul smell. For disposal, the solid waste is either dumped in the community dustbin or thrown in the stream or nulla which is a concerning way of disposal. Overall, even if the hotel management are aware of the impact of poor management of solid waste on the environment and health there is poor implementation of action plan toward proper waste management.

Integrated Solid Waste Management for Tourist Accommodation in Mokokchung Town

Based on the nature and composition of solid waste generated from the three hotels the research recommends introducing integrated solid waste

management (ISWM) for tourist accommodation places in Mokokchung town. Integrated solid waste management is an approach in which stages have been included to reduce and reuse the solid waste as much as possible. The ISWM involve evaluating the local needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions and requirement [9]. Base on the present study we would recommend the method of composting and recycling for the three hotels.

Compostable waste

Composting is an effective practice for the disposal of organic wastes which act as nutrients for crops and plants. On average, the three hotels generate 4,088 kg of solid waste annually out of which 2,289 kg are compostable and constitute 56 per cent of the total waste in terms of weight. So from table 3, it is clear that solid waste generated from the hotels has a great perspective of composting. Not only will it reduce the waste entering into the mainstream but the hotels can also use it as fertilizer to maintain organic gardening in the hotel premises given that there is space. It will not only reduce the expense of the hotels in food products but also help in maintaining the health of the guests and customers. We can also notice that 23 per cent of the waste is inert i.e., fine earth, dust and ashes if segregated probably this kind of waste are also decomposable. So, if done probably 79 per cent of the waste can be decomposed thereby reducing the effect of solid waste on the environment upto some limit. This is what the researcher has done to the organic waste that was have collected from the three hotels. The researcher made a compost bin and used a compost maker to make compost out of the organic waste. It will approximately take between one to two months for the material to become fertilized. Fig 1 presents the compost bin and the compost fertilizer.



Fig 1. Presents Compost bin, Organic waste and Compost fertilizer.

Recyclable waste

Here we can practice two ways of managing solid waste one is recycling and the other is incineration. Recycling is an environmentally friendly and cost-effective method of waste disposal. Table 3 shows that 21 per cent of the waste is recyclable waste which is 858 Kg of total waste. For example, paper can be recycled if we collect and sell it to the paper industry, they can make items like toilet paper and tissues, paper towels and napkins, greeting cards, magazines and newspapers from the recycled paper. Incineration is another option for waste reduction and disposal for integrated solid waste management. Here incineration means controlled burning of waste or scientific burning of waste without causing any pollution from the burning. Waste to energy is what we are talking about and should not be confused with open burning. In waste-to-energy incineration, the heat generated

by the process is captured and turned into usable energy. The energy produced can be used either in the form of steam or in the form of electricity. Pyrolysis is an example of waste to energy incineration where the waste is burned in the absence of oxygen in a closed chamber.

V. CONCLUSION

This study has shown that on average 4,088 kg of solid waste is generated annually from the three hotels. The composition of the total waste mainly consists of compostable waste like leftover food, vegetable and garden clipping waste which occupies 56 per cent of the waste along with inert waste which occupies 23 per cent of waste. It is highly recommended that composting should be introduced in these three hotels. If successfully introduced this would help to reduce 2,289 Kg of waste from the waste stream and also this can be used as organic fertilizers for gardening and agriculture. This will enable saving costs on chemical fertilizers and also contribute to environmental sustainability by replacing chemical farming with organic farming [5]. The study also shows that there is poor management of solid waste in the three hotels as only 45 per cent of waste is stored with some sort of segregation. Proper segregation of waste should be done before disposing of it in a community or municipal bins. Solid waste should be stored in the segregated form in green, blue and red bins. Disposing of waste in streams and nulla should be stopped as it causes water pollution, threatening the well-being of local people. The study has successfully generated a data set showing potential of “Going green” tourist accommodation in Mokokchung town. The tourist accommodation sector should aim for proper management of solid waste by efficient use of energy; reducing solid waste generation, proper storage and disposal of waste and recycling that material that can be recycled. This can be achieved by co-operating

with each other, staff training, educating the people and developing strategies and plans for proper management of solid waste according to local needs and conditions.

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