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STUDY OF NAGPUR RAILWAY STATION FOR CONSUMPTION OF PET WATER BOTTLES AND PLASTIC WASTE DURING RAILWAY TRAVEL

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ABSTRACT

Recently, plastic waste has attracted widespread attention in India, particularly in the last five years, due to widespread littering on the landscape. The enormous increase in waste generation will have impacts in terms of the land required for waste disposal. It is estimated that if the waste is not disposed off in a more systematic manner, more than 1400 sq. km of land would be required in the country by the year 2047 for its disposal .As plastic is non biodegradable in nature, it remains in environment for several years and disposing plastic wastes at landfill are unsafe since toxic chemicals leach out into the soil, and under-ground water and pollute the water bodies. Due to littering habits of Indian Railway passengers, inadequate waste management system / infrastructure, plastic waste disposal continue to be a major problem for the railway authorities, especially in the major stations like Nagpur. Collection and recycling of product returns is gaining interest in business and research worldwide. Growing green concerns concepts and practices make it all the more relevant. This paper covers the study of Nagpur Railway station for consumption of PET water bottles and plastic waste during railway travel and the amount of plastic bottle waste generated due to the throw away culture of thepassengers.

Keyword: Plastic Waste Management, Plastic Waste, Waste at Railway Station

INTRODUCTION

The Nagpur railway station constitutes a very significant part of the transport and communication system in the city of Nagpur in Maharashtra. Many people from the rest of the country and abroad, visit the city of Nagpur to spend a vacation or on a work-related tour. For these frequent visitors to the city, the railways of Nagpur along with the airways and the roadways are of immense importance. The railways at Nagpur were established a long time back well before the independence of India, as Nagpur used to be an important city of India even in those days. 1867 marks the beginning of the Nagpur railways. In the year 1881, the city of Nagpur was linked up. The railways in Nagpur are important not only because the city is one of the tourist destinations of the country and the second capital of the significant state of Maharashtra, but also because of its prime location. The railway station has a central location in the entire country and hence is strategically very important not only in the state but in the entire subcontinent of India.

Nagpur is well connected with network other parts of the country through Rajdhani, Shatabdi and Express trains. Due to the wide of trains, the stations Experiences the huge quantity of waste andit

mostly depends upon the numbers of trains originating and passing through the station and numbers of passengers handled.

The details of the numbers of trains originating and passing through the station and numbers of passengers at three stations are summarized in Table 1. In all about 13 trains are originating from Nagpur station and about 156 trains passing through. The total number of passenger served at station are 1,50,000 perday.

Table 1: Number of Trains in Nagpur

Total Of Train	Originatin Trains	Terminati Trains	Passing Trains	Passenger Day
182	13	13	156	1,50,000

STUDY AREA

The plastic wastes generated from the railway station are lacking proper collection, segregation, transportation, treatment, reuse and disposal of plastic waste. Considering the vast daily passengers at Nagpur, it becomes essential to generate the huge plastic waste at station The various segments of study are decided depending upon the channel of waste processing from source to disposal. The source, packaging materials, formal and informal collection system of plastic waste are important components/ segments. The important stakeholders of this study of waste generation at railway stations are: Platform & Vendors • Offices at station • Pantry cars• Waiting / Retiring Rooms • Dustbins • Rag-pickers • Kabadis.

i. **Platform & Vendors:** Platform vendors are the major users for the plastic packaging containers for supply of feed materials to the passengers at platform. Passengers purchase the needful items from vendors in plastic containers. On consumption/ utilization of needful items, the plastic containers in the form of plastic waste are thrown either in the designated dustbins or on platforms/ rails. The survey was carried out at each platform of the station with the objective to know the type and average quantity of plastic packing materials in use. The survey was conducted at Nagpur railway station. There are 7 platforms and 16 vendors available in Nagpur railway stations. The distribution of platforms and vendors are summarized in Table2.

Table 2. Numbers of Platforms and Vendors

Station	**Platform**	**Vendors**
Nagpur	7	16

ii. **Offices at station:** Offices located at platform or station building also contributes in the system for generation of plastic waste. The study was carried out to know the exact locations of dustbin and quantity ofplasticwastegeneratedfromoffices.Itwasobservedthatatpresentthenumbersofdustbinare

negligible at all the stations, hence it could be concluded that no plastic waste is being generated from offices. Therefore plastic waste from offices is not considered as a part of plastic waste generating source in the report.

iii. **Pantry cars:** The Indian Railway Catering and Tourism Corporation (IRCTC) are responsible for managing and supplying the entire catering services for the railways. The IRCTC has been using various types of plastic for packaging food items to the passengers. Trains like Rajdhani and Shatabdi have well maintained pantry and waste collection system within the trains. However, other trains (express trains) do not have proper collection system. This is because of non AC coaches, which results in the throw away culture of refuse from the open windows. The remaining plastic waste is found lying scattered all over the floor of train and lifted by rag-pickers as train reaches the final destination station. These trains stand at stations for passengers de-boarding and leave the station to washing line for cleaning purpose. At washing line, the collected plastic waste in dustbins from pantry cars gets collected and cleaned by the railway employees. Wastes collected from the washing line are disposed at the collection yard located within the washing line area. The Survey was conducted at washing line of each station to understand the process of waste collection and disposal. In all there are 15 trains with pantry car and proper waste collectionsystem.

iv. **Waiting/Retiring Rooms:** Nagpur railway station is having waiting rooms and retiring rooms for passenger and officers refreshment. Two types of waiting rooms are provided for passenger services, in which one is AC type and another is Non-AC type. During field study it is observed that, dustbins are provided in each waiting and retiring rooms but the generation of plastic wastes found to be practically negligible and cannot be considered as thesource.

v. **Dustbins:** The primary collection points are the dustbins. There are two types ofdustbins
i) Railway departmental dustbins located at some specified distance on the platform and cleaned by the railway employee at the designated interval ii) the second type of dustbins are placed close to the vendor shops and cleaned by vendors only. The Railway departmental dustbins are of fixed size and open whereas vendor's dustbins are of varying size and shape. The waste from these dustbins is emptied/ disposed at the railway collection centre located within the station area about 18 dustbins are available on Nagpur station.

vi. **Rag-pickers:** It has been observed that rag-pickers are involved in collection, transportation and disposal of plastic waste from railway stations. The rag-pickers found all over the rail/track in search of plastic bottles in railway station area. The majority of rag pickers are child labor and in the age group 10 to 18. The rag-pickers collect drinking and soft drinks bottles from tracks and platform for their daily earnings. These rag-pickers sold their daily collected plastic bottles to the nearby Kabadis. About 20 % of the rag-pickers from each station have been selected for survey to assess/ calculate an average quantity of plastic waste (Bottles) being collected by them. It has been reported that rag-pickers collect onlyvalue

added products like drinking water and soft drink bottles. About 25 to 30 rag pickers are reported to work on different platforms.

Figure 1: Unauthorized Rag-pickers at Nagpur Railway Station

vii. **Kabadis:** Each railway station has specific and well established Kabadis and they deals in post consumer collection of plastic waste. Hence, Kabadis are the important link between collection and disposal of plastic waste from railway stations. Sometimes the sorting of plastic material is done at the location of Kabadis itself. Kabadis sale sorted/ crushed plastic material (bottles) to the bulk buyers or recycled units. There are 4 Kabadis near railwaystation.

Figure 3: Collection of Plastic Waste Bottles at Kabadiwala near Nagpur Station

viii. **Recyclers:** The recycling sector in India is dispersed between the formal and informal sector. Formal recycling units are registered, pay taxes and municipality has an account of them. However informal units are characterized as those who are not registered with municipality. The PET recycling unit is the part of formal sector and receives most of the plastic waste (water and soft drink bottles) collected by kabadis from railway stations. The interviews with recyclers help to understand the complexity of problem associated with plastic waste management in India. A site visit was also undertaken to recycling unit to understand the procurement of raw materials for recycling, process techniques and quality of finish product.

QUANTIFICATION OF PLASTIC WASTE AT NAGPUR RAILWAY STATION

During survey, it has been observed that plastic waste generated at source is picked up by Rag-pickers. About 25-30 rag-pickers have been actively involved at Nagpur Railway Station for plastic waste collection. About of 20% of rag-pickers were randomly selected for survey. Questionnaire used in the survey for rag-pickers.

Table 3: Value Added Plastic Waste Generation At Nagpur Station

Sr. No	Plastic Waste Source	Quantity	Percentage (%)
1	Platform Vendors	387.04	81.49%
2.	Passengers/Unauthorized Vendors/Passing Trains	226.76	18.51%
Total		613.8	100%

The survey conducted at station reveal the fact that the value added plastic wastes (water and soft drink bottles) are not generated at platforms and track because as soon as it generates, it is lifted by the informal sectors i.e. rag-pickers. Survey has indicated that about out of the total waste generated about 460 kg of plastic waste is collected and sold to kabadis by the r. However, the kabadis pays Rs. 22/- per kg to the rag-pickers. The distribution of plastic waste is presented in Table3.

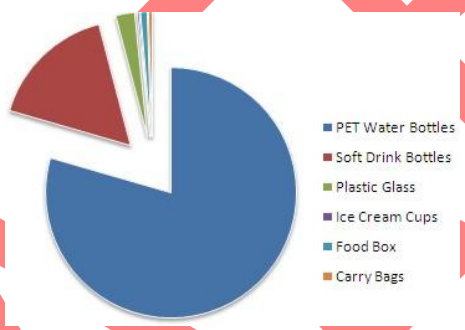

Figure 4: Graphical Representation of Plastic Waste at Nagpur Station

The following sources are fluctuating time to time; therefore, exact quantification of plastic waste by these sources could not be done. These sourcesare;

i. Unauthorized illegalvendors;

ii. Passengers;and

iii. Passingtrains.

i. Unauthorized vendors: The movement of unauthorized vendors at station is a common scene. These vendors are selling variety of plastic packaging materials. The movements of these vendors are not limited to platforms but also in halted trains (passing trains). Entry for unauthorized vendors is possible because boundary of station is notsealed.

ii. Passengers: Passengers or visitors brings plastic packaging materials from home or outside vendors and discard at platform or at tracks. The plastic waste generated from passengers and visitors are impossible to quantify due to unidentifiedsource.

iii. Passing trains: Passing trains which halt at station for a moment could discard the waste. Also passengers throw unwanted waste at halted station and it could be possible that the plastic materials purchased on some other station are discarded at haltedstation.

PLASTIC WASTE GENERATION AT NAGPUR RAILWAY STATION

During the survey it has been observed that plastic waste is following the route of solid waste or kabadis for reuse or disposal. The quantity of plastic waste generated at railway stations are summarized in Table 4. The quantities at stations vary from 600 kg to 950 kg per day. The plastic waste generation per capita is calculated based on the ratio of the total quantity of plastic waste generated to total number of passengers per day. The details of per capita plastic waste generation from railway stations are summarizedgraphicallyinFigure4.Thepercapitaplasticwastesatrailwaystationsvaryfrom 4gmto 7.5 gms per person per day. The analysis of data has concluded that the average plastic waste generation at Nagpur railway stations is about 4.092 gm per person per day.

Table 4: Per Capita Plastic Waste Generation

Location	Number Passengers	Total Quantity of Pla Waste(Kg)	Plastic waste per Capita (gms)
Nagpur	1,50,000	613.8	4.092

CONCLUSION

Due to rapid pace of urbanization there is an increasing demand of transport especially in railways. In this sector passengers are handled at Railway station. There are several environmental challenges; one of these is waste management specifically plastic waste management. Environment issues regarding plastic waste arise predominately due to the throwaway culture and lack of waste management system. Inadequate resources, in-appropriate technologies, management apathy and low efficiency of system are unable to give fruitful results. Undoubtedly, it is the habit of people and lack of infrastructure for management of solid waste. Problems have been identified in the collection, transportation and disposal system along with the quantified plastic waste at railway stations. The existing policies have not been able to provide any respite solution for associatedproblems.

This study has identified various sources along with assessed quantities of plastic waste at Nagpur Railway Station and can draw the following conclusion, The sources of plastic waste generation at Nagpur railway station are identified and these are: Platform Vendors, Offices at station, Pantry cars, waiting/ retiring rooms, Dustbins, Rag-pickers/ Kabadis. The existing waste management system at railway station has several shortcomings; hence the waste management system needs complete reorganization, with clear definition of roles and responsibilities. Some of the conclusion drawn from experienced gain and lesson learned are as follows for railways.

• Nagpur Railway Station served about 5, 47, 50,000 passengers every year. There are 7 platforms and 16 vendors at this station to meet the passenger's requirements. 36 trains on this station have pantry cars. The solid waste generation at Nagpur station is 224037 kg per year. There are only 18 dustbins to store the waste atstations.

• The per capita plastic waste generation is 4.092gm.

• The plastics waste has been collected by both formal and informal system but an informal system (rag-pickers) is also collecting illegally the value added plastic waste i.e., water bottles and soft drink bottles. However plastic carry bags and multilayered metalized plastic pouches are not collected bythem.

• No separate dustbins for biodegradable and recyclable waste have been provided, therefore non value added plastic waste like packaging materials and multilayered metalized plastics finds their way to landfill along with garbage without getting segregated at any point up todisposal.

• The percentage of plastic in solid waste is ranging between 20%-30% with respective locations as compared to 5-9% in Municipal Solid Waste, in general. This variation in percentage is due to present social culture of the people and increasing use of plastic packaging products atstations.

• Mail and Express trains do not have proper collection system. This is because of non AC coaches, which results in the throw away culture of refuse from the open windows. The remaining plastic waste is found lying scattered all over the floor of train and lifted by rag-pickers as train reaches the final destinationstation.

• The unauthorized rag-pickers playing an important role in collection, transportation of plastic waste from railway stations. The rag-pickers collect only value added products like drinking and soft drink bottles (PET Bottles) from tracks and platform for their daily earnings. There are about 25 to 30 rag-pickers which are actively involved in the collection of PET bottles at Nagpur Railway station. The rag-pickers sale the collected plastic wastes to the Kabadis. There are 4 kabadis near railway stations. About 460 kg of plastic waste is collected by unauthorized rag-pickers and sold to kabadis. The kabadis pays Rs. 22/- per kg to therag-pickers.

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