

# Municipal Solid Waste Management in Gwalior Region: A Case Study

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**Abstract—** This paper is about one of the most critical problem of solid waste management in urban planning and implementation process. Urban planning is an activity which takes place to guide the socioeconomic and management of an area. In this paper we are focusing on the solid waste management. Solid waste management is not only a big problem in developing countries but it is also a challenge for developed countries. Millions of tons of garbage are produced annually throughout the world. The same problem is a big issue in the Gwalior city. There is no proper management for solid waste disposal. Street corners are full of garbage which spread diseases and destroy the aesthetic of nature. In order to understand the issue, we selected Gwalior city and did a case study about solid waste materials. We observed the some sites of Gwalior city, took interviews form solid waste management authority of Gwalior municipal corporation to better understand this critical problem. We analyze and discussed this problem by comparing with other countries through literature review. We find many problems in the site. On the basis of the literature review and analyzing of site we recommended different solutions to overcome on this problem. We can overcome on this problem by reduce use, reuse of materials and recycling of materials. If the Gwalior municipality researched more and follow the recommendations given in the paper they can overcome on the issue. Finally, if residents of the area cooperate with the Gwalior Municipality, we can provide a sustainable solution for this critical problem.

**IndexTerms—** Solid Waste Management, Urban planning and implementation, Analyze, Reduce, Reuse, Recycle, Sustainable Solution.

## I. INTRODUCTION

Rapid modernization, industrialization, globalization and population of India these are the main factor of solid waste issue .Since India is 2<sup>nd</sup> most populated country in world and developing nation. People generate millions of tons solid waste every day. Generation of waste pattern varies from metro cities to small cities in India .actually India has various geographical and demographical pattern so the waste pattern of generation also varies from one state to another state or one region to another region that why waste generation pattern are different in Gwalior as compare to others cities of India and also varies the waste content of Gwalior as compare to others cities. Solid waste generation based on the living standard of people, financial condition, literacy rate of population and religious value of places. Municipal solid waste in Gwalior comprise a big portion of biomass material such as paper, food, wood waste, clothes rage, plastics, vegetable, rubbers, polythene, Tires , and others daily used discarded materials. Improper management of municipal solid waste (MSW) and practice of dumping waste on land in hygienic way causes hazards to inhabitants. Municipal Solid Waste has to be managed by various technologies and methods that are able to keep our cities clean, protect the environment and minimize the cost at the same time through recovery of energy and resources. There is a need to reduce the waste generation and increase in material and energy recovery, which are considered as the essential steps for sustainable waste management system. Landfill is not the first option for disposal of waste as compare to other methods such as recycling, composting and Incineration, but it is the last step after all possible material and energy recovery in integrated solid waste management system. Municipal solid waste is the result of human daily activities whether ineffective and inappropriate management system is used. So it may cause the environmental pollution and endangers the mankind's health, wealth and other living and non living component of eco system. municipal solid waste can be a potential source of energy for power generation that can fulfill our energy demands or can be utilized properly in industries and agriculture sectors .To satisfying the energy demands through the use of renewable energy sources is a main agenda of government of India as well as state government, because it is directly concerned to the environmental issue, climate change and achieve the objective of sustainable developments. At present, to handle the solid waste properly in efficient way is a big challenge for municipal corporation Gwalior and government of Madhya Pradesh.

## 2. OBJECTIVE

First of all, we should define what Solid Waste Management is. Solid waste management is a term which refers to the process of collecting and treating solid wastes. This is not only limited to the collecting and treating but it also offers the solution for recycling materials and items that are not related to garbage or trashes and Solid waste material is one of the critical issue of Gwalior city. There is no proper solution for the garbage and trashes. Inside a neighborhood or even though if we talk on a larger scale on the level of a district, we don't have a single proper place or solution for garbage and other useless Materials. These solid waste materials create many hygienic and health related problems especially in children. These waste materials contaminate air, water and this also cause the closing of water drainage channels along the street Water stops in them and gives bad odor. The

solid waste material problem is one of the critical problems throughout the world in the urban planning of a city. If this problem has solved than the inhabitants of that neighborhood will have a healthy, pleasurable and joyful life:

## 2.1 Situation before the Initiative

### 2.1.1 Location

Gwalior is a historic city of Madhya Pradesh and its coordinates: 26° 13' 25 N, 78° 10' 45 E and having 646 RL, according to Indian census 2011, the population of Gwalior is noted 2,032,036. The gross population density of the city is 6,292/km<sup>2</sup>. The region which is located 319 kilometers south of Delhi a capital city of India. The maximum temperature recorded 53°C and -10°C recorded as the minimum temp of Gwalior city. Summers comes in last March-May and June having the max temp of summer) monsoon comes in late Jun. Extremely winter comes in January having temp under in the 5-7°C range (40-45°F). Gwalior's main landfill area is situated at Shivpuri link road where all waste accumulation takes place. The samples are being collected from Shivpuri Link road, whereas the total waste accumulation is 4210 kg.

### 2.2 Accumulation of solid waste:-

S.NO.	TYPE OF WASTE	TOTAL WT. (Kg)	PERCENTAGE (%)
1.	Wooden Piece	2	0.04
2.	Paper	0	0
3.	Textile	42	0.99
4.	Thermocol	0	0
5.	Coconut shell/ Straw/hay/Stalk	1	0.02
6.	Plastic bag	427	10.14
7.	School bag	2	0.04
8.	Plastic	0.5	0.01
9.	Green matter(tree garden leaves cutting)	0	0
10.	Vegetable & Fruit chhilka	0	0
11.	Raw meat	0	0
12.	Kitchen waste (Restaurant food)	0	0
13.	Bones	0	0
14.	Stone/ Brick/ Concrete	404	9.59
15.	Ceramic	0	0
16.	Sand/ soil/Earth	3329	79.07
17.	Metals	0	0
18.	Battery	0	0
19.	Glass	1	0.02
20.	Rubber leather	0	0
21.	Human hair	0	0
22.	Hazardous waste	0	0



Municipal Waste Processing Plant, Gwalior.

## 3. Research Methodology

This study is based on research and non-experimental studies. The topic was theoretical and we had to find the solution for one of the existing problem related to the urban planning and theory. We only rely on research, observation, interviews and questionnaire. We did not perform any practical experiment. The variable in this study is solid waste which has created a crucial problem to the residents of the Gwalior city. During this study we tried to observe this critical problem in the area. After the observation, interviews with people and the research about the solid waste materials, we come to know that how can we get rid of this problem.

Some recommendations to control over the problem have given in the recommendation section of this paper. First of all, we observed the site area. We searched for the places where the people put garbage and trashes. We visited and observed about few garbage places. Most of them were at the corner of streets. We observed and studied the residents who were putting garbage in these waste products stocks. We also did interviews with the occupants of the area. According to them, they don't have a proper place for solid waste management. During the interview they shared with us the problem created by solid wastes. We took interview from different age of people. But we mostly concerned to the residents of houses near to these waste materials. We took a brief interview from one of the attorney of the site. We also fill up the questionnaires from solid waste management authority of Gwalior Municipal Corporation.

### 3.1. Analysis/Discussion

Solid waste disposal management is a challenge for almost every country. This is not only a critical issue in the developing countries but most of the advanced countries like United States are also facing this problem. In the Australia, millions of cubic tons of solid wastes produced such a big amount of garbage needs to provide a planning to manage and control these solid waste materials. These solid waste materials are impossible to stop but the government and other authorities should make a good and applicable plan to control on this critical problem. This is because with the passage of time, human being need more facilities and new products. This is clear when demands increase, the production rate and consumption rate also increases and this ultimately increase the solid waste materials.

#### 3.1.1 Effect of poor solid waste management

Whenever in the urban planning process, the designer and planner did not consider this important issue or fails to provide a proper solution for solid waste materials, it creates many problems. People use materials and products. The consumption rate is increasing day by day which automatically increase the solid waste materials. If the municipality fails to provide a Specific proper place for garbage and trash in a neighbourhood or a city and there is lack of management of solid waste materials, then the waste materials heap up in that area and create many problems for the inhabitants of that area. In such an uncontrolled situation the biodegradable insects and other organisms produced which decompose the materials and after a few days of decomposition, the bad odour and smell produced. This condition also provides a good inhabitant for much kind of diseases. An interviewer whose house was near the waste

Materials told us that her all family members are sick and ill due to these waste materials. This also spoils the aesthetic and natural beauty of that area. These all are produced just due to residential, institutional and commercial building's waste products, the most dangerous and critical waste products are from the industrial buildings. This part of waste product needs a standard and appropriate solution for the waste products. These waste materials have high toxic chemicals and components. Even this kind of waste materials should not be mixed with ordinary street waste products. This is because industrial waste materials are heavy hazardous wastes and when they mix with ordinary garbage and other flammable wastes, this makes the disposal method tough and risky and cause various diseases including cancer. As this area is a residential area, so this area is free of industrial wastes.

#### 3.1.2 Problems created by solid waste management

In the studied area, the garbage is on an open terrain so when a fast wind blows the garbage goes into the inside of the yard and rooms of the houses around these garbage areas. There is no planning system for this garbage. According to the residents of that area, the people of municipality comes twice a month to collect these garbage and waste materials but unfortunately, this is not enough to control the solid waste materials. In Gwalior city, due to unplanned area and lacking of specific garbage place and some other facilities, people put the garbage even in the water drainage channel. The water drainage channels get close by putting trashes and garbage in these channels so this create another problem of storm water and houses waste water running in the street surface instead of running of in the water drainage channels. This garbage and stopping of water drainage channel brings hygienic problems in inhabitants of that area. The children play in these areas so they are affected by this garbage and the complain of many serious and crucial diseases. These trashes and solid waste materials are also serve as dining area to animals. The sheep and other animals browse here but by eating these waste and hazardous materials, the animals get many kinds of disease and when human being use the meat of these animals as food, these diseases also effect the human health and health defensive system. Along many of health related problems, these solid waste materials also contaminate the water and put bad impact on the surrounding environment.

No one wants to live in such areas. When there is lack of proper urban planning then you cannot blame the people unawareness. This is because they don't have facilities and alternatives where to put the garbage other solid waste materials. But if government and other related authorities provide proper and standard urban planning according to the area requirements and contents, then even the unaware and illiterate people use these places for the disposal of waste products.

### 3.2. Findings

By the literature review of books, manuals and observation of the site, the solid waste management system is very poor in the studied area. There are no proper and suitable spaces for the collection of solid waste materials. The main findings of the study are as follow:

#### 3.2.1 Improper Location

In the studied area there is no place allotted for solid waste materials. People were putting their garbage in the corner of the street. In some part of the Gwalior city the people were putting their garbage in the middle of streets too. This is all due to unavailability of specific place.

### 3.2.2 Inadequate Size

In some part of the Gwalior municipality has provided the bins for garbage. As the population is dense and people consume to much products, so these bins are small According to the residents, the municipality workers come twice a month but the bins fill in a week.

### 3.2.3 No attention of Gwalior Municipality

Municipality of a city play an important role in the waste management of the city. Unfortunately, Gwalior municipality has failed badly in solid waste management. Due to the short number of workers and lack of control the solid waste management has become a critical problem.

### 3.2.4 Diseases generated from solid wastes

The garbage and trashes are the sources of viruses and germs. The solid waste materials should be on a distance from the residential areas. But unfortunately in the studied area the waste materials are in the streets. The kids and children play near these trashes and garbage. These germs cause diseases in the children. Due to these waste products the adults are also effected. The residents near to these waste materials are more effected and facing different kind of diseases.

### 3.2.5 Blocking of water drainage channels

In the studied area, the water drainage channels have blocked due to poor waste management system. As the waste bins are of small size and they are not clean by municipality workers at time, the people put garbage near the bins. With the passage of time this garbage changes into a trashes mountain. These solid waste materials especially the plastic bags block the water channels .In the studied site the water was flowing in the street instead of water drainage channels.

### 3.2.6 Discrimination

During the study of the area we found that in some areas the problem of the waste management is due to discrimination. The attorneys or the streets of some powerful people are neat and clean. The municipality peoples come regularly and dispose the waist materials. But unfortunately, the local people's areas are full of waste materials.

## 4. CONCLUSIONS

Without doubt, solid waste management is one of the important topic. The solid waste materials frequently contain many components that have the potential to cause serious infectious diseases. Unfortunately, in the studied area the solid waste management is very poor. There is no adequate attention toward the solid waste management by the Gwalior Municipality. The residents of studied area were affected by many diseases caused by solid waste management. The Tighra River along the studied area is also contaminated by the solid waste materials. These solid waste materials in the river affect the purity of underground water. The Gwalior Municipality should be serious for solid waste management system. There should be a suitable plan and schedule for emptying of dustbins. The residents of the studied area should not only blame the Gwalior Municipality authority but they should also participate in the management of the solid waste. If the residents of the area put their garbage in the dustbins this problem can be solved. The residents should also contribute in the emptying and cleaning of waste collected areas if they feel that government cannot manage these all. The government should work on the awareness of the people about solid waste management.

## 5. Recommendations

Solid waste materials are one of the challenging and more critical issues in almost all countries. These waste materials have bad impact on the environment and on the human health. This also takes the aesthetic values from the surrounding environment. Now the main question is that how can we find a good solution for this problem in urban planning and then how can we implement it practically. This is clear that solid waste materials are a critical problem but our goal is to eliminate it and provide a suitable solution in the urban planning and implementation process. Our major goal is to convert the solid waste materials from harmful and hazardous state to an income source. The achievement of this goal is very easy but need a very good urban plan. If we consider, different sustainable and easy management methods, we can control and manage this critical issue. The most preferred and meaningful method of management is the waste reduction, waste reuse and recycling of materials. These methods can reduce pollution, conserve resources, greenhouse gasses and the most important thing is that it minimized the treatment of solid waste

materials. In short these are cheap and environment friendly methods. Some of the strategies to overcome on the solid waste materials are recommended as follow:

### 5.1 Recycling

Recycling means the removal of materials or items from the waste products and to use it as a raw material in the manufacture of a new product. During this procedure three steps take place. Wastes are sorted and those wastes which can be recyclable are collected, the recyclable are used to create raw materials and then these raw materials are used in a new product.

### 5.2 Reuse of materials

One of the best strategies to overcome on waste materials is the reuse of materials. This is beneficial from both point of view of economics and environment. The best example of for reuse is the cans of cooking oils and water plastic bottles. After their use, we can grow flowers in these cans and bottles. We can fetch water etc.

### 5.3 Sanitary Landfill

For this method of waste material management, an adequate area and volume should be provided which should fulfill the planning period of waste materials. The site in such a method should be selected that are found on an economic distance. They should not be far more than 2 kilometers from the suitable main road (Urban Planning and Implementation Manual). The selected area should not have bad impact on the residential environment. The areas where water table is high, should not reserve land for sanitary landfill as it contaminates the soil. This site should be 5 km far from the airport in the direction of approach and takeoff. But this method requires proper planning, design and implementation.

### 5.4 Incineration

In this method we burn the solid wastes at high temperature until it has turned into ash. Incinerations are made in such a way that they don't give off extreme amount of heat while burning the solid wastes. The positive point of this method is that it reduces the volume of waste up to 20% or 30% of the original volume (Google Search/Wikipedia). This method requires less land and can be operated in any condition.

### 5.5 Open Dumping

This method is very simple and inexpensive but these open dumping areas are unhygienic and damage to air pollution these areas should be far from water and run off. This is because by air the garbage and trashes can fly and contaminate the water and air.

### 5.6 Proper municipality dust bins

Another very simple solution is that there should be standard designed dustbins where the inhabitants put their garbage and waste materials. First of all, these dustbins should have standard design which can be used by everyone. The present dustbins in Gwalior city can't be used by children and even by teenagers this is because they are huge and children can't put the trashes inside of these trashes. Secondly the related authorities should empty these dustbins regularly and must clean the surrounding area of these dustbins. The residents should also try to put the garbage inside of these dustbins.

### 5.7 Awareness

Awareness can be a good solution for a problem. When someone knows about the positive and negative point of a thing then he or she always avoids the negative points. The government authorities should manage awareness programs in the districts. The schools and universities can play a key role in this part.

## 6. REFERENCES

- [1] Brijesh Kumar Pandey ,Savita Vyas, Mukesh Pandey and Anurag Gaur. "Characterisation OF MUNICIPAL SOLID WASTE GENERATED FROM BHOPAL , India" Current Science Perspectives 2(3) (2016) 52-56
- [2] Vaishali Sahu & Naveen.B.P "MUNICIPAL SOLID WASTE MANAGEMENT IN GWALIOR CITY, INDIA" International Conference on Waste Management for Sustainable Development, 21-23 March, 2014, N.S.S.College of Engineering(NSSCE), Palakkad, Kerala, India, organized by Dept. of Civil Engg., NSSCE: LaBISHaS, Govt. of Kerala & IEI
- [3] Vijay Kumar, Dr R.K.Pandit "Problems of Solid Waste Management in Indian Cities" International Journal of Scientific and Research Publications, Volume 3, Issue 3, March 2013 1 ISSN 2250-3153
- [4] "REPORT ON STATUS OF MUNICIPAL SOLID WASTE MANAGEMENT IN GWALIOR CITY"
- [5] "SWACHH BHARAT MISSION MUNICIPAL SOLID WASTE MANAGEMENT MANUAL Part II: the manual"

- [6] Rakesh Giri, D. Rastogi, Sanjay Tiwari “THROUGH MANAGING MUNICIPAL WASTE PUBLIC –PRIVATE PARTNERSHIP IN GWALIOR, M.P. (A CASE STUDY)” IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308
- [7] Shyamveer Singh Chauhan , Prof. Deepak Rastogi “ UTILIZATION OF MUNICIPAL SOLID WASTE OF GWALIOR CITY FOR ENERGY GENERATION (A CASE STUDY)” International Research Journal of Engineering and Technology (IRJET)e-ISSN: 2395 -0056 Volume: 03 Issue: 07 | July-2016

