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## CREATING A 'ECO CITY' IN INDIA: A CASE OF NAGPUR CITY

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**Abstract:** Nagpur is one of the major cities of central India located in Vidarbha region of Maharashtra state. Nagpur city has a population of 24, 05,421 as per the 2011 Census of India. Nagpur is known for being one of the top five green cities in India. Rapid economic growth, increasing population and change in living standards of city causes a high generation rate of different forms of wastes. Waste management and treatment is a major problem faced by municipal bodies all over the world especially in India. There are no specific centres for the disposal of e-waste and medical waste. Waste management techniques are not up to the mark as far as the increasing population of the city is concerned. In this paper we are presenting an overview about the scientific techniques that can hope to earn Nagpur the status of 'eco city'. We have suggested for the betterment of existing waste management techniques. We can keep river and lakes in the city clean and beautiful for that permanent wall fencing around the lakes and river may lower the quantity of solid wastes deposition and using the treated waste water for other purposes such as irrigation or agriculture etc. Public awareness campaign can also help people to know about the adverse effects of improper waste disposal. Some private organizations and NGO's can also be a helping hand in making the city clean and green. Conservation of water, power, fuel, etc. which play a vital role in conservation of environment and development of eco-friendly city is to be done. Reduction in useless consumption of water, power and fuel will help in sustainable development of eco-friendly city. City may develop in very systematic manner without compromising on greenery if certain steps are properly followed.

**Keywords:** Solid waste, Waste water, reuse and recycle, Waste Management

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## INTRODUCTION

Nagpur is the largest city in central India & the winter capital of the state of Maharashtra. It is a fast-growing metropolis with a population of 24, 05,421 [1]. It is famous for the Nagpur Orange and is known as the "Orange City" [2]. The city has a Zero Mile stone locating the geographical centre of India [3]. Nagpur is known for its greenery and was adjudged the cleanest and second greenest in India after Chandigarh in 2010 [4]. The city generates huge amount of waste that is collected by the Nagpur Municipal Corporation (NMC) and dumped at the Bhandewadi dump yard [5]. Water waste such as human sewage and industrial wastes of every conceivable kind, is dumped in rivers and lakes [6]. Hence to deal with the recent environmental pollution, it is necessary to implement and emphasis on the new waste management techniques. Further we are going to discuss some of the major issues related with the waste management, drawbacks in the Government practices and improvement techniques for sewage management.

## 2. CURRENT SITUATIONS

**2.1 Solid Waste:** In Nagpur about 504 tons/ day of solid waste is generated daily, but the waste collected by NMC is about 300 tons/ day, implying that nearly 204 tons waste remains untreated [5]. These wastes also include Bio-medical wastes and E-wastes. Out of 524982 households in Nagpur city, 510266 (i.e.97%) are served with an individual toilet facility [7]. So it has now become important to provide these households either setting strict rules to build individual toilets at homes or the public toilets which were constructed long back should be restored or reconstructed by the government, so as to avoid the sanitation of wastes in open areas as well as to avoid health hazards. Secondly, the NMC is planning to set up a waste-to-energy (bio-methanation) facility, a pioneering effort designated as a demonstration project by the Ministry of Non-Conventional Energy Sources (MNES). The project will use a technology called "dry anaerobic composting" or "anaerobic digestion in a closed chamber" that will produce biogas. The gas will be utilized in biogas engines to generate electricity. The semi-solids left in the closed reactor are organically rich and can be used as organic compost. This bio-methanation plant will be constructed at Bhandewadi, in Nagpur [5]. Only one dumping site in the city is constructed in which the waste generated within the city and nearby areas is dumped collectively.

**2.2 Water Waste:** There are several natural water bodies within the city limits including 12 lakes, 2 rivers and 5 nallahs, though exact data is not available, it has been observed that all the water bodies are highly polluted. This is mainly due to the free flow of untreated sewage into these rivers and nallahs [7]. NMC urged the builders to ensure that a sewage treatment plant

and rainwater harvesting system is built in apartments and layouts so as to prevent flow of sewage into Nag River and other water bodies in the city. Around 400 MLD (million liters per day) sewage water is generated from the city every day. Presently, NMC is able to treat just 80 MLD water. As a result, rivers like Nag, Kanhan and Waingangā, and ambitious irrigation project Gosikhurd are getting polluted [8].

### **3. EFFORTS FOR IMPROVEMENT IN SOLID WASTE MANAGEMENT TECHNIQUE**

#### **3.1 Solid Waste Management**

Municipal Solid Waste (MSW), also called Urban Solid Waste includes predominantly household waste (domestic waste) including addition of commercial wastes, construction and demolition debris, sanitation residue, and waste from streets collected by a municipality within a given area. [9]. In Nagpur, according to NMC the dumping vans are collecting the household wastes after the interval of every 2 to 3 days but, still people dump waste in nearby rivers and nallah, the reason explained by people is that these vans are very irregular so they are forced to throw the waste in rivers or nallahs. Strict efforts should be taken by NMC to manage the problems faced by people [8].

#### **3.2 Proper Collection and Disposal of Wastes**

As mentioned above, NMC should improve the techniques of waste collection and its management. The waste generated should be properly collected on the daily basis from every locality. Communal dust bins should be set up at road sides, market places, complexes and other appropriate places for public use which should be checked and emptied frequently to avoid garbage pile up and other problems such as foul smell, health issues etc. Another point is that, at public places such as parks, gardens and lakes, visible dustbins should be placed at regular intervals, so that the visitors use them wisely and properly, to avoid pollution and littering of these places. Volunteers or authorities should be hired specially to look after and to take care of these places. Small vehicles should transfer all the waste collected from different localities to the larger vehicles which can then carry the waste from the collection points to the disposal sites.

#### **3.3 Selecting Technology & Trained Man-force**

Disposal is the final & most important step of the Solid waste management. Selection of proper disposal technology is an important aspect to be focused on. Technology transfer in MSW is not as simple as it is in case of another sector. Use of indigenous technology & machinery on the basis of the analysis of garbage should be adopted & promoted for waste disposal. Availability

of adequate trained man-force to implement the procedures of the adopted technology in a correct manner is another important aspect. Staff deployed by Local Administration to carry out waste disposal is most of the times not trained, motivated & efficient [10].

### **3.4 Awareness Building**

Cleanliness of city can only be achieved with the participation of all concerned so; people should be encouraged and motivated to keep their surroundings clean. They should be provided education regarding sanitation and garbage disposal through various means of communication such as: Posters, folders, booklets or leaflets, exhibitions, wall paintings, living society meetings, debates and painting competitions in schools and regular talks with citizens can be done [9].

## **4. WASTE WATER MANAGEMENT**

The problem of management, treatment and disposal of waste especially liquid waste is critical, since this waste water will find its way into the groundwater or surface water directly polluting it. A solution to this problem not only requires bridging the ever widening gap between sewage generation and treatment capacity, but also calls for development of facilities to divert the treated sewage for use in irrigation to prevent pollution of water bodies, utilize the nutrient value of sewage in irrigation and bring down fresh water to use in irrigation [11].

### **4.1 Improvement of Sewage Facility in the City**

The current sewage system covers 70% of the city. The system is divided into three zones – North, South and Central. The situation is worse in the north zone. Less than 50% of the sewage is collected, which is disposed into the rivers without any treatment. The drainage function of an urban local body is related to the disposal of wastewater and storm water. This is carried out either through underground piped drains (sewers) or surface drains, which may be covered or open. In the case of Nagpur, only 66% of the city has underground sewers. In the case of the rest of the city, the sewage flows in open drains, which often get choked causing unhygienic conditions [12]. Proper drainage system should be maintained and sewers should be cleaned regularly.

### **4.2 Recycle and Reuse the Water**

The water draining out from household use or any other place can be recycled or reused for other than drinking processes. In Nagpur, when NMC has drawn a plan to recycle waste water to reclaim historic Nag River, the Nagpur division of Central Railway is perhaps the first

institution to do so and is already recycling 5 lakh liters per day. The Central Railway is making good use of waste water flowing from Chamar Nallah near its premises. The plant was set up in 2003, but it is being used to its full potential after revival a couple of years ago. Here they treat this water and use it for washing trains, passenger coaches, platforms etc. The Central Railway is being charged commercial rate of Rs5 per liter by the civic body. At this rate, they are saving at least Rs 25,000 per day by recycling 5 lakh liter waste water daily [13]. The water from other reservoirs can be treated and remaining untreated water can be used in irrigation and agriculture purposes.

#### 4.3 Efforts for Water Pollution Control

1. In Nagpur, during the *Ganesh* and *Durga Puja* the idols are immersed in either *Futala*, or *Gandhisagar* Lake leading to the pollution in these water bodies. Proper arrangements should be made at these places during the festive season. Artificial water tanks can be made for idol immersion and residues generated during these festivals such as dried flowers, leaves, garlands, plastic bags etc. should not be dumped in these reservoirs to reduce pollution.
2. Permanent wall fencing should be constructed at all the lakes so that dumping of residue plastic, glass etc. can be avoided. These fencing should also be constructed at nallahs so that people should not dump excess waste in spite of its high pollution.

#### 5. EFFORTS TO BE TAKEN BY THE CITIZENS

1. Every person should individually participate in cleanliness of the city by at least keeping their surrounding clean.
2. Disposal of household waste should be done such that there is no blockage of drainage system. Every society should clean their common drainage once in a year.
3. During gatherings and events organised in public places for any occasions, organiser should take the responsibility to ensure the cleanliness of that area.
4. Required quantity of water should be used so that less wastewater is generated.
5. Definite point sources of waste generation like Hotels, Restaurant, and Shopping Complexes etc. should contribute space for disposal in their area itself, which ultimately reduces the burden of collection [10].
6. Donating electronics for reuse, to extend the lives of valuable products and keep them out of the waste management system for a long time.

## 6. DISCUSSION

The successful implementation of improved techniques of green city efforts can bring various benefits, such as reduced waste management costs, reduced energy costs, reduced insurance costs, enhanced public awareness, improved public image, total emission reduction, etc. Such a success can contribute to various factors. Hiring trained man-force to implement the procedures of the adopted technology in a correct manner is another important aspect. The uncontrolled human activities along the bank of lakes and rivers polluting the water due to their religious and ethical beliefs should be minimised. Continuous disposals of waste papers and polythene bags are also commonly observed now a day. Deposition of clay and plaster statues, flowers and other organic matter in the water during various occasions is observed during the study period. As the industrial waste water of the city is collected in a common channel called as Nag nallah, which openly runs from the middle of city. Kanhan River is greatly polluted by the waste water drain and water quality is deteriorated, as the water became useless for all human purposes. Moreover, the polluted water of Kanhan River mixes with Wainganga River. Wainganga river water is indirectly contaminated due to waste water drain of Nagpur city. Serious attention of govt. authorities, on the protection of such precious water bodies, is the need of time. Preparation of waste water plant at the distal end of Nag-nallah may reduce the contamination of two rivers. The strict enforcement of pollution laws and preparation of some local rules and regulations for the localities may reduce the deposition of solid wastes in the lakes of Nagpur. They are directed to obtain authorization from the state pollution control boards/committees for setting up waste processing and disposal facilities and furnish annual report of compliance. There is need to modify the collection and transportation vehicles by introducing trucks with compactors as well as to adopt proper segregation of waste at source only as specified above some examples of waste management can be ideal for the development of new similar methods that will prove to be useful for the waste management techniques in Nagpur. These efforts if implanted can result into an improved green and clean Nagpur.

## 7. CONCLUSION

For better management of solid waste, periodic review of each steps involved in waste management like generation, collection, disposal etc. should be conducted & accordingly implementation of "Best Practices" is necessary. Best practices for waste management can be achieved by well known '**3R's principle** (Reduce, Reuse and Recycle). Wet garbage from hotel, resident can be recycled by establishing composting or vermicomposting plant in the vicinity. This will produce good manure that can be used for gardens and lawns. The least technically complex and most cost-effective solution should be chosen. Local Bio-degradable waste

processing units, wherever possible set up small scale processing units (composting or bio-methanation) in public parks, playgrounds, recreation grounds, gardens, markets. Waste should be also seen as a 'resource' and not just a problem. This indeed should be carried out by government and every individual residing in the city to bring Nagpur to the first position as a green city. Preventing a good and clean environment today can lead to a better tomorrow.

## REFERENCES

1. Office of the Registrar General & Census Commissioner, India. Retrieved 26 March 2012.
2. Stamps from the Orange City", The Hindu (Chennai, India). 31 March 2006. Retrieved 19 June 2006.
3. Mandal. D. N., Government Of India Ministry Of Water Resources Central Ground Water Board, 2009.
4. Nagpur. "MSN Green". Retrieved 28 January 2010.
5. Modak. P , Nangare. P, "Quantitative And Qualitative Assessment Of Municipal Solid Waste For Nagpur City". Journal of Engineering Research and Studies Vol.II/ Issue II/April-June, E-ISSN 0976-7916, 55-61, 2011.
6. Sonune M.B. And A.D. Bobdey , "Pollution Studies In Nagpur City With Special Emphasis On The Sources And Possible Control Measures" , Asian Journal Of Contemporary Sciences, Vol.I, ISSN 2319-993, 18-22, 2012.
7. Nagpur Municipal Corporation, "City Sanitation Plan", Submitted to Department of Urban Development, Govt. of Maharashtra, Mumbai, March 2011
8. Garbage dumping in Nag River Continues; NMC fines 100 violators". Times of India May 27, 2013
9. Dr. Agrawal. V, "Sustainable Waste Management; Case study of Nagpur, INDIA", August 28, 2005
10. Shirke. A, "Municipal Solid Waste", December, 2009
11. Dr. Bhattacharya. A, "Water and Waste Water Management in Power Sector Industries" National Head-Technology; Water and Waste Water Management NPTI Seminar, March 23, 2012

12. Nagpur Municipal Corporation, [www.nmcnagpur.gov.in](http://www.nmcnagpur.gov.in)

13. Central Railway shows the way on waste water recycling", Times of India, Apr 21, 2013.