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# WASTE DISPOSAL MANAGEMENT: A CASE STUDY OF KOLHAPUR CITY (MAHARASHTRA)

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**ABSTRACT**

The present paper based on secondary source ofdata mainly collected from the Kolhapur Municipal Corporation and Environmental Status Reports, looks into the waste management and its disposal in Kolhapur city in 2013-14. It is found that near about 175 tons solid waste is being generated daily in the city. The highest quantity is generated from the residential area (60 tons) and closely followed by vegetable markets (28 tons). The waste produced in the Kattalkhana(slaughter house) is comparatively lessbut it causes huge pollution along with other polluting agents to the Panchganga river water. It needs to be disposed ofvery systematically so that it should not cause pollution to air as well as water the basis on which human health very much depends. Due to delay or improper way of waste disposal causes different health problems to people living in its proximity. Therefore, waste should be disposed ofcarefully. It should be systematically and usefully handled to generate fertilizer, electricity, etc. for further development and having neat and clean city environment for making it as a smart city.

**KEYWORDS :**Solid waste, Liquid waste, Waste disposal.


## INTRODUCTION :

Unscientificallyand improper ways of solid waste disposal has been generally noticed in many urban areas of the country. Urban local bodies have the massive challenges of managing municipal solid waste. It is being dumped anywhere and that causes health problems to the people inhabiting nearby such places. To stop this sort of open dumping of waste outside of the city limits the Municipality Solid Waste (MSW) rules have been laid down a strict timetable for compliance. It is clearly mentioned that improvement of existing landfill sites for long term future use and making them ready by the end of 2002and setting up of waste processing and disposal facilities by the end 2003 and making of provision of buffer zone around such sites. This policy was framed in Sep. 2000 based on the March 1999 report (Sharholy et al,2008). But so

far 90% of the solid waste is disposed of unscientificallyin open dumps and landfills,which is causing problem to public health and environment (ibid). It is found that every day, urban India generates 188,500 tonnes of MSW (or 68.8 million tonnes per year) and the waste generation increases by 50% every decade. Some of this waste will be recovered by an army of informal recyclers (20%) in large cities, lesser in smaller cities leaving more than 80% to reach open dumpsites where it causes damaging public health, deteriorating the environment, and causes climate change (swmindia.blogspots.in). Maharashtra generates over 26,820 tonne solid waste per day, more than any other state in the country, as per Central Pollution Control Board (CPCB) report compiled after the National Green Tribunal (NGT). .

The report said that cities like Pune, Mumbai, Ahmedabad, Agra, Bangalore, Bhopal, Chennai, Delhi, Hyderabad, Jaipur, Kanpur, Kolkata, Lucknow, Nagpur and Surat, among others, have an estimated waste generation of more than 500 tonne per day (TOI, April4, 2015).

The waste generated in Kolhapur city per day is 150-165MT. The contract was done by Kolhapur Municipal Corporation (KMC) with Zoom Bio fertilizer Pvt. Ltd. in 2000 and since 2003-04 it used to segregate biodegradable solid waste and for making bio fertilizers. But as the company went into liquidation, this project was closed in July 2011(Patil, 2014).

Solid wastes are defined as any discarded or abandoned materials. Solid wastes can be solid, liquid, semi-solid or containerized gaseous material. For instance,waste tires,scrap metal, latex paints, furniture and toys, garbage, appliances and vehicles, oil and anti-freeze, empty aerosol cans, paint cans and compressed gas cylinders, construction and demolition debris, asbestos (www.dec.ny.govt.)

Solid waste is the material that no longer has any value to the person who is responsible for it and is not intended to be discharged through a pipe(Biraje, Patil & Raut 2010). It can be further defined and refined that solid waste is such a material, which cannot be further used in the present form but can be made for further use to the people after having done its conversion into fertilizer, electricity or some other useful material. In the age of modern technology any waste material may be wasteful for an individual but may not the same for another. It means that if anything, which is out of use for an individual, for example, clothes, shoes, kitchen waste water, etc. but still useful to another person, should be used or re-used.It should be practised till it becomes absolutely wasteful, it will reduce the waste and thereafter the waste generated should be disposed of systematically. Most of our attention in waste management focuses on recycling. Slowing the consumption of waste products is by far the most effective way to save energy, materials and money. In this concern, one should remember3R waste hierarchy: reduce, reuse, recycle-lists the most important strategy first (Cunningham & Cunningham, 2010). One can add one more thing to it as cited above, that is prevention of wastebe prioritised. It should be kept in mind that as far as possible,prevent or avoid waste or minimize it by reusing, recycling thereafter, dispose of the material when absolutely of no use. It will save money, energy, raw materials,land space and reduce pollution also. Any material which is not recyclable is permissible for landfill. For that there should be one principle of ‘waste producer or polluter pays’.Regions and persons producing waste or causing pollution should pay for its disposal. Higher the level of pollution or waste production higher should be charges to be paid by the concern individual.

The growth of solid waste has now outpaced population growth in recent years as a result of changing lifestyle, food habits raising living standards. Another estimate points out that about48 million tonnes of solid waste are generated in the urban areas every day, an eight-fold increase since independence. The increase in non-degradable waste is alarming phenomenon. Surprisingly, the production and consumption of plastic have increased more than 70 times since 1960. Transportation of solid waste for disposal is also an important challenge for urban management. Seventy percent of

Indian cities have inadequate waste transportation facilities resulting in littering during collection and transportation. In next two to three decades per capita generation of solid waste and waste water will increase more than two times. The present requirement of land for solid waste disposal will increase five to six times. But due to the scarce land resources and the mounting population, there will be a severe crisis in solid waste management (Khanna et al 2010).

Rapid industrialization in India has resulted in the magnifying the need for removal of industrial wastes. There is significant increase in industries such as pesticides, drugs. The problem of waste and garbage is serious in slum areas, where it gets piledup for several days. Pharmaceuticals, textiles, fertilizers, paint, etc. which are major generator of hazardous waste. Domestic garbage dumped in variety of places along roads, nullahs, parks, schools, etc.

Waste disposal is very necessary to keep city environment healthy and sound. Many municipalities in India have taken various steps for systematic disposal of waste.

## OBJECTIVES

Present study endeavours to analysethe waste disposal management in Kolhapur City.

## STUDY AREA

The area under taken for the present study is Kolhapur city located in the southern part of the state of Maharashtra between $16^0$ 39'' 30' to $16^0$ 45'' 50' North latitude and $74^0$ 11" 20' to $74^0$ 16" 10' East longitude. It is 11th largest city in the state located on the right bank of the Panchganga River, which is a tributary of the river Krishna. The elevation of Kolhapur city is 650 m above sea level. The city has moderate climate with temperature ranging from a minimum of $15^oC$ to maximum of $40^oC$ and on an average it receives rainfall of 1043 mm. In the beginning of last century particularly in 1901, the population of Kolhapur City was 54,373, and it amplified to 5,49,236in 2011. The city has unique physiographic setup with gentle slope decreases from south to north. The famous Rankala tank is located to the Western side of the city. The Pune- Bengaluru national highway No 4 (NH-4) is on the eastern side of the city. Kolhapur is known as 'Dakshin Kashi' due to famous Mahalaxmi temple.

## DATABASE AND METHODOLOGY

The present paper is mainly based on secondary sources of data which have been collected from various reports of the government, besides this, books, journals and internet were also used. The researcher has used recent data from various studies on this issue.

## SOLID WASTE

Rapid urbanization, increasing commercial and industrial activities and changing lifestyle of the people, the city Kolhapur has observed to be leading to increase in the generation of solid waste. The primary sources of solid waste in Kolhapur are local households, markets, commercial establishments, hotels, restaurants and hospitals. The total quantity of waste generated is 175 tons per day at per capita generation of 342 grams per day.

In Kolhapur city, the generation of solid waste is in high percent. It is affecting on city's environment. The solid waste can be classified as follows:

1) Household waste – Plastic carry bags, Kitchen waste, packing material, material from cleanness.

2)Urban waste – Waste from hawkers, waste from offices, waste from road construction, building construction waste etc.

3)Commercial waste – waste from hotels, shops, bazaar, and vegetable market, saw mills, etc.

4) Industrial waste – waste from small scale and heavy industry after processing.

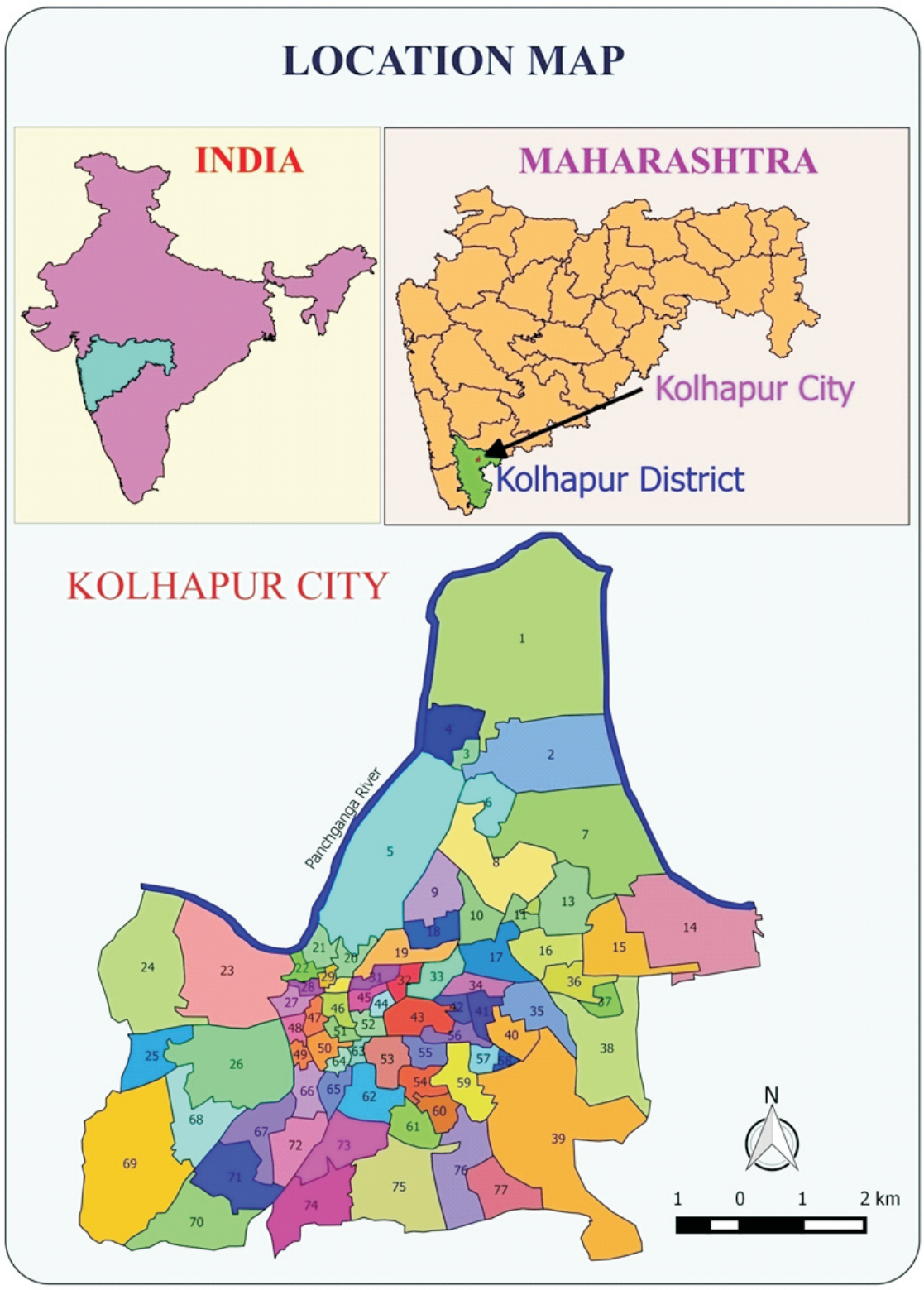


**Fig. 1. Note- Numbers in the maps showing ward numbers.**

5) Ash – Ash thrown by industry, ash from household industry, ash from human funeral, etc.
6) Heavy waste – useful vehicles, destroyed electric material, furniture, etc.
7) Waste from building rejuvenation – parts of bricks, mixer of concrete material, sanitary waste, stile waste etc.
8) E waste – old and unusable computer, thermacol, scorch, TV sets, etc.
9) Biomedical waste – waste from hospitals, laboratories, blood banks, parts of human body, various bottles, etc (Environmental Status Report, 2013-14).

In Kolhapur city daily 175 tons solid waste is being generated. The important places of solid waste in city are commercial market where 18 tons solid waste generated. Vegetable markets are 31 in numbers in city and generate 28 tons of waste and residential area generates daily 60 tons of waste. Hotel and restaurants,and industrial area each generate daily 10 tons of waste in the city (Table 1).

**Table 1**
**Places of Generating Solid Waste in Kolhapur City**

| Sr. No. | Places | numbers | tons |
|---|---|---|---|
| 1 | Commercial malls | 11286 | 18 |
| 2 | Vegetable market | 31 | 28 |
| 3 | Kattalkhana (Slaughter House) | 1 | 3 |
| 4 | Hotels and Restaurants | 1053 | 10 |
| 5 | Industrial area | 292 | 10 |
| 6 | Residential area | 1100 blocks | 60 |
| 7 | Slums | 54 | 16 |
| 8 | Animals Gotha | 7082 | 10 |
| 9 | Gardens | 54 | 5 |
| 10 | Roads cleanness | | 15 |
| | Total | | 175 |

Source – Environmental Status Report, KMC, 2013-14

## SOLID WASTE MANAGEMENT IN KOLHAPUR CITY

Solid waste comprises unwanted and discarded materials from houses, street sweeping, commercial and industrial operations. The primary sources of solid waste in Kolhapur are local households, markets, commercial establishments, hotels, restaurants and hospitals. The estimated quantity of waste collected and disposed is about 175 tons per day, which translates into a collection performance of about 86%. About 1050 conservancy workers are engaged by KMC and the waste is collected on a day to day basis through sweeping and door to door collection. 12,130 community bins have been placed in the city for primary collection of waste at a spacing of 300 meters. The handcarts and wheelbarrows have two containers, each of which has a carrying capacity of 25 kg. (E S Report ,2013-14).

Daily sweeping is carried out only at few locations, while in most places; it is done in alternate days. A total number of 90,000 houses are covered under the collection. The system of door to door collection is prevalent in approximately 30% of the city. Currently, there is no segregation of waste and

the mixed waste is directly picked up from the collection points. The collection of waste from dustbin is done by manually and with the help of ladders. For this purpose, refuse collectors and dumper placers with containers are used. City solid waste includes refuse from domestic colonies, commercial establishments, biomedical or hospital waste and rubble construction activities. Bio-medical waste is separately disposed off.

### Transportation of solid waste

Currently, three types of curb-side bins are being used in Kolhapur city from where the waste is collected. These are RCC square type, RCC open bottom and steel containers. The collection of garbage is normally carried out manually. This is done either with the help of collection trucks, which collect the waste from various bins and take it to the disposal site. Two refuse collectors and 20 trucks have been allocated for the transportation of waste to the final disposal site. 175 tons of waste is collected and transported in this manner. Of these, 120 tons of waste is collected daily and 55 tons is collected twice a week. The details regarding the different type of vehicles used for carrying waste is given below;

**Table 2**
**Fleet of Conservancy Vehicles for Waste**

| Type of Vehicles | Numbers | Capacity (tons) | Number of trips per day | Distance (km) | Waste carries (tons) |
|---|---|---|---|---|---|
| Truck | 11 | 4.5 | 22 | 361 | 77 |
| Truck Tripper | 6 | 3 | 18 | 214 | 45 |
| Refuse Compactor | 2 | 5 | 4 | 54 | 16 |
| Dumper placer | 2 | 2.5 | 20 | 140 | 20 |

Source- KMC Report, 2013-14

Of the total waste generated, 120 tons waste handled manually creating hazardous conditions. Almost 40-50 trips are undertaken by the vehicles to transport the garbage from the city to the disposal point.

### Disposal of solid waste

KMC has undertaken some measures for disposal waste. Daily 175 tons of solid waste has been collected from various places in the city. For this purpose KMC has purchased some resources (Table 3).

All types of solid waste has been collected with the help of the above resources by door to door and deposited in steel container. Then with the help of modern Refuse Compactor the solid waste is being sent to the processing plant of KMC.

**Table 3**
**Resources Purchased by KMC for Disposal of Waste**

| SR.NO. | Name | Quantity |
|---|---|---|
| 1 | Refused Compactor | 10 |
| 2 | Steel Container of 3.5 Cu.Metre | 550 |
| 3 | Three wheeler cycle rickshaw (*Ghanatagadi*) | 310 |
| 4 | Plastic Container ( Drum) | 1860 |
| 5 | Hauda Dumper | 2 |
| 6 | Cargo Dumper | 3 |

Source – KMC Record, 2013-14

Currently, M/s Zoom Engineering has put up a composite plant of 100 tons daily capacity, based on Municipal Solid Waste (MSW). KMC has signed the agreement with Zoom Bio Fertilizer, Mumbai on BOT (Build, Operate, and Transfer) basis. For this purpose land near sugar mill (Kasaba Bawada) has been provided by KMC to concern company. The Kasaba Bawada dumping site is located above five km from the city with an area of one hectare (ha). The dumpsites are not having landfill facility. KMC has tried to develop landfill facility in the area of Top village of Hatkanangaletahsil of Kolhapur district but Grampanchayat(village assembly)of Top village registered a case against KMC in court for denying the land.

## BIOMEDICAL WASTE

There are about 750 medical institutions in the city including private hospitals, nursing homes, blood banks, etc. In order to manage the biomedical waste, the Kolhapur Medical Association (KMA) has formed a separate firm with the help of a private operator. KMC has made available a 10,000 sq. ft. area to a private operator for setting up a biomedical waste disposal and processing facility at Kasaba Bawada.

KMC has engaged a Nasik based firm called “Adarsh Ghantagadi” to privatize the collection for the entire city of Kolhapur. The scheme covers door to door waste collection as dry and wet waste. KMC hasbeen paying Rs. 425 /ton of waste.

## LIQUID WASTE

In Kolhapur city, 137 million litres of water has been daily used. Used water flows into the various nullahs of the city. Due to Sewage water all nullahs in the city are polluted.Water pollution is any chemical, physical or biological that changes the quality of water and has harmful effects on any living organism that use it (Kamble,2014). Particularly the Jayantinullah (49 MLD), Dudhali nullah (17MLD), Bapat camp nullah (10MLD) and Line Bazaar nullah (6MLD) are heavily polluted. Sewage water from all these nullahs mixed in the Panchganga River. The Dudhali nullah and its sub nullahs cover 1727.73 ha of the total city area. The Jayanti nullah and its sub nullahs covers 2493.74 ha area of the city (Table 4). Jayanti nullah’s watershedarea is Dasara Chowk, Mahapalica, Shivaji Chowk, Bhawani Mandap,

Mirajkar Tikti, Shahu Bank, Racecourse Naka, Sambhaji Nagar, ITI, Girgaon Hill, Chitranagari, Vaibhav Hill, Shivaji University, T A Batalian, Sangam Theater, Kawala Naka, Collector Office, etc., Dudhali nullah covers the area of western part of Rankala tank, Sane Guruji, Puikhadi, Katyayani, Panyacha Khajina, Papachi Tikti, Khokhandoba, Brahmpuri, Dudhali, etc. Laxtirth nullah covers the area of Phulewadi, Chambu Khadi, Dattanagar etc. CPR nullah covers area of Dasara Chowk, Ghisad Galli, Maratha Bank, Sonya Maruti Chowk, Town Hall, CPR Hospital, etc. Line Bazar nullah covers DCP Bungalow, Police ground, Gokul Dudha Sangh, Himmat Bahaddar Parisar, Police Line, Line Bazaar, etc. Bapat Camp nullah covers the area of Kasaba Bawada to Kawala Naka and Market Yard area.

It is observed that most of the city area of Kolhapur is covered by main and small nullahs. It is the responsibility of KMC to keep all nullahs in clean position so that it will help to develop the healthy environment of the city.

**Table 4**
**Main Nullahs and Sub-Nullahs Area in the Kolhapur City**

| Main Nallah | Sub nullah | Panlot area (hectare) |
|---|---|---|
| Dudhali | Phulewadi and Dudhali | 1447.87 |
| | Laxtirth | 260.23 |
| | Jamadar Club | 19.63 |
| | Total | 1727.73 |
| Jayanti | Jayanti | 2446.62 |
| | CPR | 20.21 |
| | Juna Budhawar | 26.91 |
| | Total | 2493.74 |
| Bapat Camp | Bapat camp | 982.83 |
| | Kawala Naka | 592.83 |
| | Total | 1575.66 |
| Laine Bazar | Rajhauns | 106.82 |
| | Raman Mala | 125.96 |
| | Dreem world | 107.66 |
| | Laine Bazar | 196.01 |
| | Kasaba Bawada | 131.09 |
| | Total | 667.54 |
| VeetBhati | Veet Bhati | 217.33 |
| | Total | 6682.00 |

Source – Environmental Report (KMC), 2013-14.

## Liquid waste management in Kolhapur City

At present, Kolhapur city is generating about 80 million litres per day (MLD). The city has centralized sewage treatment plant (STP) at Kasaba Bawada of 45 MLD. The sewage from Dudhali nullah is pumped to the Jayanti nullah and subsequently to the STP at Kasaba Bawada. The city is divided into four zones – Dudhali nullah zone, Jayanti nullah zone, Bapat camp zone and Line bazaar zone. The current sewerage is 30% coverage, which mainly comprises Gaonthan (settlement) area. The city has 22,000 septic tanks. KMC has also been spending a considerable amount on pumping the sewage generated at three different nullahs to the STP. Sewage generated at the Dudhali nullahbasin is being pumped into the Jayanti nullah pumping station. The Jayanti nullah pumping station then pumps the combined flow of Dudhali nullah and Jayanti nullah to the existing sewage treatment plant at Kasaba Bawada, five km away. There are two pumps of 20 HP capacities each in operation at Dudhali nullah to pump the sewage. KMC has been spending 30,000 per month as electricity charges for the same.

## CONCLUSION

In Kolhapur city about 175 tons solid waste is being generated every day. The important places of solid waste in the city are commercial markets where from 18 tons solid waste is generated, 31 vegetable markets produce 28 tons and residential area in the city generates daily 60 tons of waste.

Hoteland restaurants and industrial area each generates 10 tons of waste daily in the city. The estimated quantity of waste collected and disposed is about 175 tons per day, which translates into a collection performance of about 86%.

KMC has employed 1050 conservancy workers for the collection of waste is collected on a day – to - day basis through sweeping and door to door collection. About 12,130 community bins have been placed in the city for primary collection of waste at a spacing of 300 meters. The handcarts and wheelbarrows have two containers, each of which has a carrying capacity of 25 kg.

KMC has made a 10,000 sq. ft. area available to a private operator for setting up a biomedical waste disposal and processing facility at Kasaba Bawada. As per producer or polluter pays norms, the charge for disposing of this biomedical waste, which is risky to waste collectors/pickers and environment, should be based on the number of beds along with out-patient visitors to a medical unit per day.

The Jayanti nullah, Dudhali nullah, Bapat camp nullah and Line Bazaar nullah are heavily polluted. Sewage water from all these nullahs mixed in the Panchganga river water and it makes the highly polluted river in the state of Maharashtra.

At present, Kolhapur city is generating sewage about 80 million litres per day (MLD). The city has centralized sewage treatment plant (STP) at Kasaba Bawada of 45 MLD. The sewage from Dudhali nullah is pumped to the Jayanti nullah and subsequently to the STP at Kasaba Bawada. The current sewerage is hardly a 30% coverage, which mainly comprisesarea. The city has 22,000 septic tanks. KMC has also been spending a considerable Gaonthan (settlement) amount on pumping the sewage generated at three different nullahs to the sewage treatment plant.

It is found that higher the consumption higher is the waste producer and polluter.

It is suggestedthat modern waste management should emphasise on 3 R's of reduction, reuse, and recycling before ultimately disposing of.

It should be converted to fertilizer through modern technology or converted to electricity or oil etc. That is conversion to energy production.

Recycling of discarded material into new and useful product but enough care should be taken

that it should not be harmful in all respects.

Waste to energy through incineration of refuse and transforming it to heat or electricity. Developed countries like Japan and Western European countries generate much needed energy and reducing nearly 90% amount of garbage that has to be landfilled. Space for dumping the solid waste is very scarce, moreover it causes harm to environment and finally to human beings.It should be handled systematically and scientifically so that city environment should be kept hygienic and healthy.

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