

## Solid Waste and Waste Water Management of Maha Kumbha 2016 at Ujjain, M.P., India

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**Abstract**— Water and waste management is mainly a topic of global concern. For every city development plan (CDP) we have to make a good strategy for strong water. An action plan is required with initiative in protecting this areas. Anyways the technology support is essential for solid waste management (SWM). Rapidly growing population of most cities in India has contributed to solve the problems of waste management. Dumping the Solid Waste into river is one of the secondary product of human activities which become the obstacle for the river to provide raw drinking water or to run the function as drainage system and flood control. We are finely known as Kshipra is most Holy River of the state. Simhasth Kumbh Mahaparv” is one of the four “Kumbh Melas” celebrated by largest spiritual mass gathering on the Earth. In Simhasth Kumbh Mahaparv it is fulfilled by holy bath in the sacred river Kshipra in ancient and religious city Ujjain (Madhya Pradesh). Simhasth Kumbh Maha Parva is based on the the Zodiac Signs and lining-up of Planets, which occurs every 12 years. “Kumbh” in its literal English translation means “Pot”, which emerged from”Samudra Manthan” fight between Gods and Devils. The term ‘Mela’ signifies ‘Fair’. In city like Ujjain the main source of waste generation is from households, hotels, temples and market. Solid waste generated in civil area is not segregated into biodegradable and non-biodegradable category. Waste is collected daily in the morning hours in open trolleys tractors. It is dumped together and burnt immediately along with Bio Medical Waste from hospitals. After burning ash remains as it is at the disposal site. Only three stages of any waste management system are used in Ujjain i.e. collection, transportation and disposal. It should be very necessary to make a special Environmental Management Plan for Simhasth. This study is very helpful in analyzing data & information related to ongoing Solid Waste Management system. To suggest suitable technology and methods for safe disposal of Municipal Solid Waste & minimize the risk of environmental threats of the poor Solid Waste Management. Solid Waste Management is one of the important components of Mela Plan. To applicable 4R concept, method and equipment for managing Municipal Solid Waste during Simhasth 2016. It will be help full for make a plan of Simhastha for Ujjain Municipal Corporation authority.

**Keywords**- *City Development Plan (CDP), Bio Medical Waste (BMO), Environmental Management Plan (EMP), Municipal Solid Waste (MSW), Solid Waste Management (SWM), (4R) - Refuse, Recycle, Reuse, Reduce, Ujjain Municipal Corporation (UMC)*

### I. INTRODUCTION

Ujjain is an ancient city of Madhya Pradesh State. Situated on the eastern bank of the Kshipra River, the city was called Ujjayini in ancient times. It is one of the seven important religious centers in India, the others being Badrinath, Kedarnath, Gangotri, and Yamunotri. Kashi, Prayag, Haridwar, Rishikesh, Mathura, and Ayodhya. The religious importance of Ujjain city has been due to the presence of lord Mahakaleshwar on the banks of holy river Kshipra. Mahakaleshwar is considered as one of the twelve Jyotirlingas in India and the Kumbh Mela religious festival is held here every twelve years. Ujjain is located at 23°10' latitude north and 75°46' longitude east at an average elevation of

491 meters (1610 ft.) above mean sea level. Ujjain city, as a municipal entity, spans an area of 92.68 sq. Km. For lidding to severe environmental degradation that undermines the environmental resource has the rapid increase in industrial and economic development. The economics of environmental pollution, depletion and degradation of resources has in fact been neglected as compared to the issues of growth and expansion. Historically health and safety have been the major concern in the field of environment management.

The exponential growth together with rapid urbanization and tourist pressure in Ujjain over the years has substantial impact on the environment management of this city. Ujjain is a place of great sanctity and hence attracts devotees for

almost all the major festivals like Amavasya, Shivaratri, Panchakroshi, Nagpanchami etc. Thus, there is always a great pressure on the environment of the city.

### Area of Study

#### Focus Areas

- Development of Heritage Areas
- Preservation of Water Bodies
- Water Supply and Sanitation
- Drainage and Sewerage and Solid Waste Management
- Improvement and construction of Drains with Storm Water Drains.

Ujjain is one of the twelve holy cities of the Hindus with high religious and cultural importance. Considering its significant religious image it has been included in the list of selected cities under JNNURM scheme.

The primary objective underlying the CDP of Ujjain is protection of site heritage center, which includes its religious, sacred, historical character, and renovation of the city through heritage preservation.



Figure- 1

## II. POLLUTION STATUS

The ongoing population and various human activities have led to the concentration of pollutants in our natural resources. Pollution of air and water is detrimental to our health since these two elements are vital for our survival.

### Water Quality

- Chloride values are safe within limits from upstream to downstream of the river. Ramghat has the highest chloride value along the river that is due to discharge of domestic waste that contains human excreta (6mg/day/person). Chloride ions are due to dissolutions of salt deposits, discharge of effluents from industries, irrigation drainage.
- High DO levels at u/s and d/s is due to moving water and the availability of more water for dilution of wastes coming into it.
- Decrease in DO levels at Ramghat and Mangalnath is due to slow moving water, discharge of sewage decaying plants and animals and religious waste.
- Total hardness is within the limits and thus safe. The hardness values increases at Gaughat and Mangalnath, which is due to domestic and industrial discharge coming from Khilchipur nallah at Mangalnath.

### Pollution in the River Kshipra

- River Kshipra faces serious problems of pollution and consequent decrease and deterioration of water quality and quantity respectively. The sources of pollution can be classified as follows:-
- Pollution due to Khan River - River Khan joins Kshipra at Triveni. At times, during monsoon season, the discharge in river Khan is more than that of Kshipra. Khan carries industrial waste and domestic sewage of Indore town.
- Religious functions Lakhs of devotees come to take a dip in the sacred river all the year round. The river abluition is also an important factor for various festivals where a large number of devotees throng the river for a dip. Also, Ujjain being a major center for after death rituals large no of people visit Ujjain for post cremation rituals like pinddan in river Kshipra with a belief of attaining moksha to the departed.
- Religious waste is a major contributor to the river pollution with almost all the religious offerings from flowers, hair, ashes to post cremation waste being thrown in the river.
- Discharge of sewage: Earlier a lot of sewage was discharged directly into the river from many nallahs. With NRCP project it was minimized reducing pollution loads on river Kshipra.

### Issues

- Sustainable Riverfront Development: The stress of the city is being felt on the river and development is likely to continue all along the river that would have large scale impact on the river.

- Pollution Due To Religious Activities: This is major issue threatening the survival of the river and is closely linked to the religious nature and functions of the city.
- Water augmentation throughout the year: Low rainfall, lack of flow in the river substantiates the pollution problems and also threatens the religiosity of the city which is closely linked with the river.

#### Other major issues of the city

- No proper collection of solid wastes.
- Direct mixing of untreated sewage.
- Direct disposal of solid waste on streets and drains.
- Solid waste disposal site creating air and land pollution.
- Open defecation on riverbed.
- Continuous honking of rickshaws around hospitals and schools.
- High noise pollution.
- High RSPM.
- Erosion of soil from Kshipra River.
- Intensive agricultural land use along the river and high dependency on river water for irrigation.

#### Prevention of Localized Damage to the River Action

- Manage and control developmental activities at the waterfront.
- Manage and prevent polluting factors and activities on the riverfront with alternatives for disposal methods.
- Religious activities- Many alternatives measures for preventing throwing of ritual waste has been taken by providing kunds for disposal ,it has been not very successful due to lack of awareness and strict enforcement. Strict enforcement and penalty for the polluter should be taken as a measure for prevention of this.
- Dhobighat - Though new structures for it have been built as a part plan of NRCP, water supply and other facilities need to be provided at these points
- Cremation - Awareness to use the electrical crematorium should be done. Practices like dumping of the ashes directly in the river need to be controlled.
- Awareness within the local population
- Awareness programmes and creation of local groups for action against polluting activities can be done.

The overall analysis of problems and issues shows that despite of water adequacy in the city, there is a problem of proper coverage and service. Looking at Ujjain city's future as a pilgrim center and a place with great religious

significance it will be required that the city should have proper infrastructure for its rising population.

#### Objectives

Following are the objectives to achieve the required goal:

- To give access to safe water supply to all communities
- To initiate community involvement for the rational use of water
- To initiate programmes for Rain water harvesting for recharge of ground water
- Action plan
- Roof top Rainwater harvesting can be made mandatory especially in the shallow aquifer zone and against any new boring wells
- Regulations and control of unregistered connections is the need of the day
- The water taxes applied should be at an affordable range for all communities
- Repair of leakages and reduction in stand posts wherever required must be undertaken
- A Distribution network mapping and analysis is required for the entire area Based on the record plans a hydraulic analysis should then be done to allow proper design of any future system expansion
- Educational Programmes for the rational use of water must be propagated. Encouragement for research and training in new techniques of water conservation
- Political will must be mobilized Sufficient levels of investment should be made.

### III. ANALYSIS OF CHEMICAL CHARACTERISTICS OF MUNICIPAL SOLID WASTE

These chemical parameters of Wastewater disposed off in the river and ponds of entire Ujjain city were analyzed. In the present study sample of river water were collected during the year. The chemical parameters mainly were pH, turbidity, TS, TDS, TSS, SO<sub>4</sub>, BOD, COD were analyzed by using standards of American Physical Health Association (APHA)

#### Sampling Procedure:

Municipal wastewater was collected during March 2015 to February 2016, which cover entire Ujjain city. The Table shows the physical and chemical parameters from the river in different months.

Samples were collected during the first week of each month, between 8.45 am to 10.45 am in clean plastic bottles, labeled properly and brought to the laboratory for analysis.

**Methods of Sampling:**

Waste water sample is collected from about 30-40 cm below the surface water level, to avoid the collection of impurities from surface. Before sampling, 2Lit. plastic bottles were rinsed with 0.1N chromic acid, than washed twice with distilled water. A separate sample was collected in bottle to measure the Dissolved oxygen.

**Results and Discussion**

On the same day a comparative analysis of physical and chemical characteristics of Kshipra river water based on physical characteristics like pH, Temperature, turbidity, conductivity and total dissolved solids in conjunction with chemical Characteristics such as DO, BOD, COD etc., the water quality has been analyzed.

Observed Values of the parameters of all the sampling areas 1-10 during March 2015-February 2016

Para.	Unit	March	April	May	June	July	August	Sep	Oct	Nov.	Dec.	Jan.	Feb.
Tem.	OC	23.07	26.38	31.98	31.76	22.85	24.95	25.45	23.89	22.27	24.54	18.09	20.14
pH	NTU	8.39	8.02	8.23	8.21	8.11	7.89	7.66	7.98	8.14	7.36	8.36	8.40
<b>Turbidity</b>	Mg/l	54.25	55.72	56.26	53.87	55.45	56.76	51.24	65.12	61.56	64.88	60.45	62.23
<b>T.S.</b>	Mg/l	1038	1028	1051	1027	1047	1062	1056	1045	1037	1046	1036	1055
<b>TDS</b>	Mg/l	734.21	754.12	786.34	784.09	784.02	762.52	776.30	798.34	735.22	745.21	764.43	765.37
<b>TSS</b>	Mg/l	232.20	221.10	226.24	218.22	221.10	239.15	235.20	231.19	218.22	225.16	242.23	218.88
<b>SO4</b>	Mg/l	234.83	243.5	282.52	249.28	231.21	254.10	243.7	275.15	243.5	264.29	245.84	234.57
<b>BOD</b>	Ppm	135.64	138.59	139.89	142.12	143.6	147.58	135.64	146.67	124.55	154.1	135.64	135.78
<b>COD</b>	Ppm	319.5	298.89	315.2	326.9	321	278.18	326.9	337.9	360.27	387.2	348.34	376.28

**IV. SEWERAGE AND SANITATION**

Of many things that can make for healthy cities, clean living conditions are very important. 'Sanitation is a main component for development of life of city and country .It is not only the problem of keeping clean , it is also an economic for good life.

At present, Ujjain city lacks the Sewerage network. Under the predominant system of sewage disposal, therefore, the untreated effluent over flowing from soak-pits and draining into the city's drainage system tends to pollute the water considerably apart from emanating foul smell into the atmosphere. All the sewage thus generated in the city flows through the open drains and discharged to nallahs and ultimately to the river Kshipra. In the old areas of the city an attempt was made for laying some sewers about 60 years back, but is only about 7 km in length.

**Detail of Sewerage system in the city**

Septic tank is the most common mode of disposal of sanitary waste disposal in Ujjain. The other modes of disposal and household distribution are shown in Table below. It is evident that about 85% of households have an access to Safe mode of sanitary disposal i.e. by the means of Septic tanks, Dug latrines. However, about 15% of households do not have an access to safe mode of sanitation.

**Sanitation facilities**

S.No.	Sanitation Facilities	Population covered	(no. of units)
A	Septic Tanks	397000	65000.00
B	Public Conveniences	21000	850.00
C	Low Cost Sanitation units	12000	7554.00
D	Dry Latrines		0.00
E	e Others		0.00
	<b>TOTAL</b>	<b>430000</b>	<b>73,404</b>

**Present status of sewage generation**

The present status of sewage generation is as follows:

Total population of Ujjain = 4.65 lakh

Water supply= 64.53 MLD

Considering 80% of water supply as disposed sewage, total sewage generated = 52.75 Mld/day.

**Future Requirement**

It is estimated that around 57.24 MLD sewage would be generated in 2011. To have a good sewerage system, it would require to lay a complete sewer network for the entire city which comes out to be 139.5 kms. For fulfilling the future sewage treatment demand an additional sewage treatment plant of 22 MLD is proposed.

### Objectives of proposing sewerage and sanitation facilities

- The sanitation systems should not lead to water or land degradation.
- The systems should be designed to recycle to the maximum extent the renewable resources, such as water and nutrients present in human excreta, as well as nonrenewable resources.
- A city can grow better only if has healthy citizens. With a vision to bring Ujjain on the world map as a city with great religious image it is must to develop it as a clean and hygienic city first. Following will be the objectives for sanitation provision in the city
- The provision of infrastructure will be sensitive to the heritage image of the city.
- Genuine community involvement must take place in both planning and management of systems.

## V. SOLID WASTE MANAGEMENT

Historically health and safety have been the major concern in waste management. Today, society demands more than this as well as being safe, waste management must also be sustainable. Sustainable Development as defined by Brundtland Commission emphasis the synergy between economic development, social equity and environment.

Sustainable waste management should be economically affordable, socially acceptable and environmentally effective.

Solid waste management is an urban service that requires a lot of attention and is one of the very important obligatory functions of any urban local body. The Ujjain municipal Corporation estimates that 160 T/day of solid waste is generated in the urban area, which includes the impact of the floating population drawn to Ujjain as a city of great religious significance. Most waste seems to end up on open land or outside the containers. Waste generation estimates suggest that about 83% of generated waste is actually removed. There is a strong decline in the standard of services with respect to collection, transportation and disposal. Presently municipal waste is simply dumped at MR-V Agar Road trenching ground, at about 4 km from the city.

### Waste generation

The above table shows that the major contributors of solid waste are domestic and commercial places, which combinable account for more than 70 % of solid waste. The city has adequate dustbins covering nearly 85% of the city area. The average dustbin spacing is nearly 500mts the expenditure per capita on conservancy comes out to be Rs.2.5 for every meter.

### Present status

In Ujjain the main source of waste generation is from households, hotels and market. Waste generated from hospital and clinics, which could be toxic/hazardous in nature, is currently not separated from domestic waste. There are no industries in the area hence the problem of industrial waste is non-existent. Solid waste generated in civil area is not segregated into biodegradable and non-biodegradable category. Waste is collected in open trolleys/tractors daily in the morning hours. It is dumped together and burnt intermittently along with biomedical waste. After burning ash remains as it is at the disposal site. People including hoteliers dump the waste near or outside the community stand posts but rarely inside it. After collecting the waste from community stand post in the cantonment area waste is disposed in the final dumping site. Basic three stages of any waste management system in Ujjain comprise collection, transportation and disposal that is discussed in the following paragraph.

### Collection

Household waste is disposed of either via door-to-door collection, which is quite uncommon, or in the primary collection points or dustbins provided by Municipal Corporation. Excluding posh residential colonies most of the households, shops and other commercial establishment like hotels, waste is generally thrown on streets, open spaces and drains as and when it is generated. At some places where primary collection bins, (concrete/plastic) have been provided they are either placed at a distance or their size is too small. According to the authorities it was found that a large number of community bins are either dilapidated or managed poorly. In some of the bins garbage was found to be spilling over. During the visit it was also observed that unhygienic condition compelled people to throw waste from a distance. Stray animals like cows, buffaloes, pigs and dogs spread the waste from the bins. As small number of people have to cover large area for cleaning and sweeping certain important roads and market area, are swept daily and some are swept on alternate days depending on "importance", concentration of population and type of activity. Rag picker cum waste material merchant of Ujjain picks material from waste having recyclable value.

## VI. CONCLUSION

Many people feel that solid waste management in a simple way of putting waste into a vehicle and unloading a waste to the dump. If this is true, then why so many cities getting problem from uncollected refuse blocking streets and Successful solid waste management is rarely achieved without thought effort and much learning from mistake.

The present changes in the political and administrative reforms have helped UMC in strengthening of the Functions, Finances for the Functions and Functionaries to a greater extent. This is reflected in the impact of

institutional development, services and finances of UMC. Although examined with an increasing trend, the activities under institutional development still have not achieved the satisfactory levels.

The preparation and management of a good solid waste management system needs input from a range of discipline, and careful consideration of local conditions.

Generally, the average application rate of municipal wastewater per unit area is in excess of normally permissible application rates in any properly managed irrigation system. Therefore municipal wastewater, if treated properly to reduce BOD, salt load and other properties judiciously, one can provide an alternate source of water for irrigation. It may be concluded that the municipal wastewater of Ujjain city is not fit for industrial, domestic and irrigation purpose, without treatment.

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