Requirement of Solid Waste Management for Water Conservation and Environment Upgradation at Jamshedpur

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Abstract: People are obtaining many problems along with many facilities through the industrial and urban development from a century. Always seen the facts that issue of water and environmental has also included in the development plans. Till now only, drainage system, coastal barrier, rainwater harvesting, wastewater treatment and recycle, plantation, gardening and preserving dump area etc. field has developed for this. The Jamshedpur lies between latitude 21°58' to 22°48' N and longitude 85°04' to 86°54'E. Total geographical area is 149.225 km². It population is 13,39,438 which are holding in 2,57,584 houses. It is located at the confluence of Kharkai and Subarnarekha Rivers. The rivers and groundwater are the major sources of drinking water. It is a major industrial centre of East India. To evaluate the effects of solid waste, related data were collected from at JNAC, ANAC, MNAC, Jugsalai Municipality and others (Bagbera, Kitadih, Haludbani, Parsudih, Sarjamda, Gadra, Chhota Govindpur and Ghorabanda). The data were collected in session 2011-15. Attempt to the development of water resources and clean and hygienic environment; and to encouragement to safe reuse and disposal of the waste for reduce the problems are main objectives.

Keywords: Source of solid waste, effects of solid waste, efforts to resolve the problem, water conservation and environment upgradation

1. Introduction

In the first sight display that, needs to focus on the solid waste management to get achievement in water management projects; because, waste transportation, solution and reaction has happen through or along with air, water, soil, elements of active and alive. Presently the solid waste treatment system in the city is lacking that means waste related job like collection, dustbin, storage, separating, transportation and execution etc. arrangements are not sufficient.

Industrial discharge, urban-settlement discharge, illegal mining discharge & stuffing, illegal cattle and poultry farm, medical discharge and faith-cultural activities are main source of solid waste.

Plastic, cement, asbestos, glass, silt, slag, vehicle's parts, cable, mantles (Iron, steel, copper, brass, oil and grease, cloth, paper, wood, bamboo, chaff, coal, chemicals (relating to industrial, agricultural and domestic use), construction items, food, biological discharge, organic relic also included in the solid waste.

Solid wastes are affecting on water resources along with environment. Due to health of people, animals and vegetations of the neighbourhood are being affected. Now, the city is getting ugly & illness regularly by the causes. It is harming effects of building a substantial city.

In the present time, solid waste production capacity in the city is found in between of 258.77–305.92 metric ton per day. In the organization of waste possibility of compost and reproduction amount is respectively 43.36% and 15.7%; while useless things are 40.95%. ^[1] Contribution in the waste production of Industrial, residential, commercial and market are respectively 60%, 25%, 10% and 5%. ^[2] Now, solid waste is becoming a major problem for the city. Accordingly

we all feel that, it should be increasing the solid waste management related plans to water conservation and environment upgradation. My research study is related to the efforts to help in this task.

2. Study Area

The Jamshedpur (**Map–1.1**) lies between latitude 21°58' to 22°48'N and longitude 85°04' to 86°54'E. Total geographical area is 149.225 km². ^[3] It population is 13,39,438 which are holding in 2,57,584 houses. It is located at the confluence of Kharkai and Subarnarekha Rivers. The rivers and groundwater are the major sources of drinking water.

It is a major industrial centre of East India. It houses companies like Tata Steel, Tata Motors, Tata Power, Lafarge Cement, Telcon, BOC Gases, Tata Technologies Ltd., Praxair, TCE, TCS, Timken India, Tinplate and many more. It is home to one of the largest industrial zones of India known as Adityapur Industrial Area Development Authority (AIADA) which houses more than 1,200 small and medium scale industries. Total numbers of industries are 1,895 and total number of leading industries 32 in Jamshedpur. These industries are discharge their effluents (treated & untreated) into the ground and the river. This polluted water leaches down the soil and contaminate the groundwater.

3. Data and Research Methods

To evaluate the volume and effects of the solid waste in the Jamshedpur urban agglomeration, solid waste were collected from the Jamshedpur Notified Area Committee, Adityapur Notified Area Committee, Mango Notified Area Committee, Jugsalai Municipality and others (Bagbera, Kitadih, Haludbani, Parsudih, Sarjamda, Gadra, Chhota Govindpur, Ghorabanda).

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The data were collected in session 2011-15. Research is found the facts after collection of data from different sources. These data may be primary and secondary in nature, other resources of information from of map, charts and articles relevant to volume and effects of the solid waste various also consulted. Some data are relating to water resources. Finally an account based on charts and diagrams will be presented.



Map-1.1: Jamshedpur urban agglomeration

4. Expected Findings

1. Production of solid waste from the City (1991–2021): Presently the solid waste treatment plant system in the city is lacking that means waste related job like collection, dustbin, storage, separating, transportation and execution etc. arrangements are not sufficient. Waste of public trunk and put out silt-waste of water resources and drains are taken out from the city through the team of labourer, handcart, tempo and dumper of government. At now, only JUSCO is arranged to solid waste management in the JNAC; it's not enough for the city. According to the CPHEEO and UDPFI, **Table- 1.1** and **Diagram-1.1** are respectively showing per day solid waste discharge in 1991–202. Contribution in the waste production of Industrial, residential, commercial and market are respectively 60%, 25%, 10% and 5%; while the industrial-commercial and residential-settlement contribution is respectively 67.33% and 32.67%. In 1991, 2001 and 2011 solid waste is goes up to respectively 189.37 mt, 252.30 mt and 305.92 mt. In the present time, solid waste production capacity in the city is 258.77-305.92 mt per day. If, it is going on continuous then it will be up to 304.11-359.52 mt per day in 2021. ^[4]

Table 1.1. Solid waste discharge in 1991–2021									
Year	Population		According to CPHEEO (in mt)			According to UDPFI (in mt)			Increment
	88 %	12 %	88 %	12 %	Total	88 %	12 %	Total	(%)
1991	7,29,670	99,501	153.23	6.96	160.19	182.41	6.96	189.37	-
2001	9,72,147	13,25,66	204.15	9.27	213.42	243.03	9.27	252.30	24.94
2011	11,78,705	1,60,733	247.52	11.25	258.77	294.67	11.25	305.92	17.52
2021	13,85,215	1,88,893	290.89	13.22	304.11	346.30	13.22	359.52	14.90

Table 1.1: Solid waste discharge in 1991-2021

Source- 2006: JNURM final report, pp. 63, 64.

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2. According to C.P.C.B. (2000):- Solid waste had being discharged 387.98 mt per day (1,41,612.7 mt per year). In the organization of waste, possibility of compost amount were 43.36% and reproduction possibility were 15.7%, while useless things are 40.95%. In here pH value is found in between of 6.20-8.26; carbon Nitrogen ratio and highest caloric value are respectively 19.29 and 1,008.84 kcal per kg. ^[5] Chemical organization and mixture of solid waste are shown in **Table–1.2** and **Diagram-1.2**.

3. According to C.P.C.B. (2009):- Waste was increased 32.18% (572.09 per day and 2,08,813 mt per year). It was 45.82% of industrial waste. 3.10 mt (1,132 mt per year) wastes has been thrown or filled on the open grounds.^[6] Jamshedpur has a total area of 4.10 hectares of area under landfill site. Filingable, reusable and incinerable wastes are respectively 0.52%, 95.06% and 4.39% in the organization of waste. 40% (228.834 mt) part of waste is being discharge in drainage system. According to the report, required solid waste management system capacity is 575 mt in the city.

4. The impact of solid wastes on the water resources and human health:-

- 1. Solid waste are being dump on open or reserve place; but at last, spread over land waste are being arrived on water resource through the wind, rain, runoff water, animal and human beings.
- 2. Surface and ground water resources (rivers, reservoir, lakes, ponds, wells and tanks) are polluted.
- 3. Drainage area and system is affected. Examples- 1. Silt has being set on the base of rivers, lakes and ponds. 2. Water runoff is being affected. 3. Space of drainage and water area are being overstepped and narrowed. 4. Flood problems are being increased.
- 4. Groundwater recharge and organization has been affected.
- 5. Stable water has being polluted rapidly; plastic, rubber, construction items, vehicle waste, eichhornia, medical waste, statue immersion, leather, tatter of cloth and wood Items are much responsible for these.
- 6. Germs and bacteria are expanding and increasing rapidly through the medical waste and infected items; these are doings encourage through illegal cattle, poultry farm, carcass immersion and carcass burning.
- Due to density of microparticles has been increased in water. Now, surface and ground water have danger for life of creatures; if it is taken directly or without treatment. Ahead **Table- 1.3** is showing effects of water dissolved elements upon human hygiene.^[7]

Due to environmental problems are being increased. Diagram-1.2: Organization of solid

waste



Chemical organization	%	Possible Use	%	Things	%
Moisture	47.61	Compost	43.36		
Steam / flying Ash	24.43			Paper	10.24
Carbon (C)	13.59	Capable to reuse and recycle	15.7 40.95	Plastic	5.27
Nitrogen (N)	0.69			Glass	0.06
				Metal	0.13
Phosphorus/Phosphorus Pentoxide $(P(P_2O_5))$	0.54			Rubber, Leather	2.51
Potassium/Potassium Oxide	0.51			Tatter of cloth	2.99
$(K(K_2O))$	12.63	0501055		Wood Items	4.29
				Coconut	0.22
Others				Bone	0.13
				Others	30.93
Total	100		100		100

Table 1.2: Chemical organization and mixture of solid waste (in kg)

8.

Source- Asnani P. U., 2006: Solid Waste Management, pp. 160, 185, 187 and C.P.C.B.- 2000.

5. Condition of solid waste management:-

- 1. Presently the solid waste treatment plant system in the city is lacking that means waste related job like collection, dustbin, storage, separating, transportation and execution etc. arrangements are not sufficient.
- 2. Generally we can see that, mounds of waste are found at useless corner and backside of any campus and beside of nearest drain, main footway, roadway and railway, public places (open ground, play ground, garden, transport stop, religious center, river, lake, pond and

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well etc.), ruins and rubbish stores. The large institute is responsible to much waste production like the similar their size. Examples are government and nongovernment offices, training-education and medical institute, industrial plant, residences and colonies, market and market complex. Per day 80 mt solid waste has being dump only in Bagunhatu reserve area by JNAC. Industrial area and MNAC has being waste discharge respectively 100 mt and 40 mt per day.^[8]

- 3. Sufficient arrangements for separation of dangerous items of waste (to classification in high injurious, biological, chemical, fertilizer, reusable items etc.) are not arranged.
- 4. It being seen that, only JUSCO is striving for waste management in Jamshedpur. Proposed JUSCO plant has beside of river bank; therefore, it has not a good situation.
- 5. In the organization of waste, possibility of compost amount was 43.36% and reproduction possibility was 15.7%, while useless things are 40.95%. Contribution in the waste production of Industrial, residential, commercial and market are respectively 60%, 25%, 10% and 5%.
- 6. In here pH value is found in between of 6.20-8.26; carbon Nitrogen ratio and highest caloric value are respectively 19.29 and 1,008.84 kcal per kg.
- 7. According to C.P.C.B. (2009):- industrial-commercial and residential-settlement discharge capacity is respectively 46.52% (266.14 mt) and 53.48% (305.95 mt) per day.
- 8. The government has failed in gaining the confidence of the people for to installation of waste treatment plant. Its latest example, Process of plant installation is being interrupted by local public at Kairbni, since 2009. Proposed plant capacity is 500 ton per day. Elective product and thermal energy production in the plant is proposal.^[9]

6. Projects related to solid waste management:-

1. According to central government guideline, necessarily a bio-waste treatment plant (Command Biomedical waste Treatment Facility) should be established in 150 km2 radius. According to Environment Protection Act, 1986 provide that, defaulter will be punished by five years jail or 1 lac Rs. fine or both. But it's ironic that, whole Jharkhand state has only one biomedical waste management plant at Ramgarh. Its burning and recycling (plastic and glass) capacity is only respectively 100 ton and 200 kg per day. 50 hospitals are running in Jamshedpur, but only 7 hospitals has being provide disposal facility. Accordingly, only 31.10 kg waste is being executed and 265.03 kg waste is being thrown out without treat. ^[10]

- 2. JNNURM- 2006:- Its primary purpose was, provide place and cartage van to deposit and execute of waste. Provide facility of collection, transportation and execution of solid and biomedical waste at modern and scientific way to develop effective and safety waste management system. Three zones have been selected for developing SWMS. Farther Table- 1.4 and Map-1.2 are showing details and location of proposed waste management plant. While locating these sites the following broad issues have been kept into consideration:-
 - (i) The site should not be near any water body (minimum distance of 5 km radius to be maintained between disposal ground and water body).
 - (ii) Disposal Site should be away from human settlement (minimum distance of 3 km radius to be maintained between disposal ground and settlement).
 - (iii) No airstrip (airport) should be located within 5 Km radius of the disposal site.
 - (iv) The site should be barren unfertile land, unsuitable for agriculture.
 - (v) The site should be so located that the waste carriage vehicle (dumper) does not have to pass through dense human settlement areas, but the local dhalaos (neighbourhood garbage bins) are easily accessible by the dumpers.

Zone– 1:- A stretch of approximately 30 Acres of land near Roopamdih and Murudih villages in Adityapur have been identified, which will be catering to the entire area of



Map-1.2: Location of proposed SWMP

Adityapur This site is unsuitable for agriculture, having very low water table, being located at an elevation and is partly rocky in nature. The site being in very close proximity to the AIADA industrial area, ancillary industries (like fertilizer plants, etc) related to the solid waste treatment plants can also be located nearby.

Zone– 2:- A site of approximately 20 Acres has been identified near Palashbani south of NH-33 for catering to the Mango Area.

Zone– 3:- For catering to the entire JNAC area and the other areas of Jamshedpur block, which are being included in the JUA boundary a large site of approximately 150 Acres have been identified in Khairbani, which lies at the extreme eastern part of JUA. This site can also cater to the surrounding industrial areas in Gadhra, Jamshedpur, etc. separate treatment plants should be developed for different types of waste, and recycling industrials should also be located in the vicinity. This site is located in close proximity

The total landfill area should be approximately 15% more than the area required for land filling to accommodate all infrastructure and support facilities as well as allow the formation of a green belt around the landfill. There is no standard method for classifying landfills by their capacity. Landfill heights are reported to vary from less than 5m to well above 30m. ^[11]

3. Jharkhand State government declared 'Notification of Plastic Prevention' on the date of 15 May 2013. But now, it is not running effectively. ^[12] Jharkhand state government has enforced Solid Waste Management

to the southeastern railway line going towards Calcutta, making this a potential site for location of recycling and treated waste related industries in the area.

Table- 1.4: Details of proposed SWMP (along with JUSCO)

Sl. No.	Location of S WM Site	Area (in acres)	Holding Capacity of Site (cum) maximum height = 30m	Area saved	Opening		
1	Grounds of JUSCO	10	9,50,165	JNAC	2010		
2	Zone–1	30	28,50,496	ANAC	2013		
3	Zone–2	20	19,00,330	MNAC	2013		
4	Zone–3	40 (Probable extension up to 150)	38,00,661	JNAC, JM and others area	2013		
	Total	100	95,01,652				
Source- 2006: JNNURM Final Report, pp. 69-70.							

Service Tax- 2015 according to 13th Central Finance Commission. It is also not running effectively.^[13]

4. Tata Steel has proposed management of solid waste transfer station in seven locations. Recently Tata Steel has established a plant at near C. H. Area Petrol Pump; its capacity is 60 mt per day. Waste will be collected from Uliyan, Baradwari, Tube Makers Club, Bara STP etc. Tata Steel is being effort to secure waste collection through mechanism. Modular Biogas Units are proposed along with MSTS. Biogas production may be possible through the waste foods. ^[14]

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Source- 2006: JNNURM, Final Report- 2006, pp. 69-70

5. Measures of Solution

- 1) The following objectives have to be considered in the design of an engineered landfill (Line Drawing-1.1):-
 - (i) Minimization of the possibility of contamination of surface and/or groundwater.
 - (ii) Control over gaseous emissions if any.
 - (iii) Prevention and control of any other possible adverse impact(s) on the environment.
 - (iv) Utilization of excavated soil as cover material.
 - (v) Harvest of upstream rainwater flowing into the landfill.
- 2) Preferred use of clay with plasticity index in between 10-30, which is well graded having at least 30% passing through 75 micron. Clay fraction should be kept at greater than 15% or more whereas gravel fraction should be < 50% of clay lining.
- 3) Clay having clod size less than 50 mm should be compacted to optimum moisture content using a sheep foot roller. ^[15]
- 4) Its needs, law and regulation should be enforced effectively by the state government.
- 5) By government should be trying to enforce Solid Waste Management Service Tax.
- 6) By government should be trying to keep self awareness in citizens for waste management.
- 7) By government should be trying to develop a good running solid waste management system by involve to citizens.
- 8) By government should be trying to provide facility of collection, transportation and execution of solid and biomedical waste at modern and scientific way to develop effective and safety SWMS.
- Separate treatment plants should be developing for different types of waste, and recycling industries should also located in the vicinity.
- 10) Its needs, government try to provide employment to citizens through the SWMS.

6. Conclusions

1) In present time, no capable SWMS in the city; city needs a capable SWMS.

- 2) If early SWMS will not installed here then may be generate a large problems for water and the environment.
- 3) Solid waste, water and environment problems may be create major problems; it can generate major problems for human health, animal and vegetation.
- 4) It can disturb necessary development programs. It will spoil the image of the city.
- 5) Establishment of sufficient SWMS is possible only through the consistent efforts of government and citizens.
- 6) Its needs, law and regulation should be enforced effectively by the state government. Here should be trying to enforce Solid Waste Management Service Tax. Here should be trying to keep self awareness in citizens and should be trying to develop a good running solid waste management system by involve to citizens.
- 7) May be possible that many jobs will be provided for citizen through the SWMS. It may be possible that, city will come back in track of development.

7. Future Scope

Research findings will help us to the efforts in task of water conservation and environment upgradation. It will be help to city in development and management projects. In the future, it may be possible that provide fundamental needs of citizens properly.

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