Nature Environment and Pollution Technology
An International Quarterly Scientific Journal

ISSN: 0972-6268	Vol. 13	No. 3	pp. 637-640	2014

Original Research Paper

Integrated Wastewater Management in Jaipur City, Rajasthan, India

Amit Dass, A. S. Jethoo* and M. P. Poonia**
Sri Balaji College of Engineering and Technology, Jaipur, Rajasthan, India
*Department of Civil Engineering, Malaviya National Institute of Technology, Jaipur, Rajasthan, India
**National Institute of Technical Teachers Training and Research, Chandigarh, India
Corresponding Author: Amit Dass

Nat. Env. & Poll. Tech.
Website: www.neptjournal.com
Received: 28-1-2014
Accepted: 20-3-2014

Key Words:
Integrated wastewater management
Jaipur city
Sewage treatment plants

ABSTRACT

Unfortunately, there are globally various examples of poor wastewater planning and management of poorly targeted government investments that targeted low priority problems ineffectively. Integrated wastewater management is essential for responsible use of the environment and affordable provision of services within an overall water resources management system. About 7.5 % of all deaths in India are due to deficiencies in safety of water sanitation or hygiene. The effective use of treated effluent for gardening, industries can save the potable water which can be sufficiently utilised in draughts in States like Rajasthan where underground water is the main source of water supply. During present work, a study has been undertaken for integrated wastewater management system for Jaipur city. The city has sufficient sewage treatment plants (STPs) to meet the wastewater generated. An attempt has been made through this article to understand the present available system to handle the water scarcity issues effectively and to suggest that no sustainable solution is likely to come up until an integrated approach including socio-political reasons behind wastewater pollution is achieved.

INTRODUCTION

Wastewater is the water generated from domestic and commercial activities including toilets, urinals, bathrooms, wash hand basins, cloth washing and kitchen cleaning activities (Smith 2006). Wastewater contains high levels of microorganisms, chemicals (nutrients), solids and other contaminants causing adverse impacts on human health and local environment. Generally, wastewater is either transported away from the locality for treatment by a centralised sewerage system, or treated on-site by a septic tank system which consists of an effluent disposal like soak pit.

One of the key objectives of any Domestic Wastewater Management Plan (DWMP) is the coordinated planning and action by Local Urban Bodies (LUBs) as well as stakeholders. The necessity of taking this regional approach is to provide a mechanism for developing strategies which will support domestic wastewater service coordination and standardisation between the local bodies and stakeholders. These strategies are useful for achieving the goals of LUBs in providing a safe, healthy and sustainable water supply for their respective societies (Smith 2006).

Water quality protection and proper wastewater management are two essential items in an integrated wastewater management scheme. The overall goal of water quality management is to protect the resources, environment and stake holders. The management generally becomes necessary when demands on the consumption side is increasing and available resources are unacceptable due to human or natural activities. The development of a realistic and practical management plan requires involvement of all sectors including local public, NGOs, agriculture sector and transport representatives. Generally, the plan should be regarded as a process rather than a single document or an agreement (World Bank Group 1998).

In general practice, the failure of such projects to achieve the design goals is often blamed on lack of institutional capacity and/or on financial problems. However, the general cause may be an adoption of inappropriate technologies as well as failure to take into consideration the socio-economic characteristics in which the plant must operate (World Bank Group 1998).

In the present paper, the wastewater management plan has been outlined to meet future demands for wastewater treatment maintaining water quality standards for waterbodies within the Jaipur city. It includes specific tasks and requirements for implementing these recommendations for LUBs and local governments as well as regional and State agencies. The Integrated Water Management Plan (IWMP) for the Jaipur city aims to provide sustainable management of all water resources; preservation of the ecological function of the region's watercourses; protecting health and wellbeing of people; water use that is fit for the

Table 1: Water production in Jaipur city.

1	From tube wells (1897 Nos.)	290 M Litres
2	From Bisalpur system	72 M Litres
3	Single point tube wells (117 Nos.)	1.5 M Litres
	Total	**363.5 M Litres**

Table 2: Present scenario of water demand in Jaipur city.

1	Population of city as per 2001	23.74 lakhs
2	Present population (2011)	31.12 lakhs
3	Population connected	27.98 lakhs
4	Water production	363.5 M Litres
5	Water demand	419.7 M Litres
6	Water supply	340 M Litres
7	Wastewater generated	272 M Litres

Source: S.E., PHED City Office, 2011.

Table 3: STPs in Jaipur city.

S. No.	Location	Capacity MLD	Remark
1	STP at Delawas	125	62.5, 2Nos. RUDIP
2	STP at Brahmpuri	27	JNN
3	STP Jaisinghpura Khor	50	JNN
4	STP Gajadharpura	30	JNN
5	STP Ralawata	30	JDA, Under construction
6	STP Jawahar Circle	1	JDA
7	STP Ram Niwas Garden	1	JDA
8	STP Sawarn Jayanti Park, Vidhyadharnagar	1	JDA
	Total	**265**	

Source: Jaipur Development Authority

Table 4: Water requirement for the gardens comes under JDA and Nagar Nigam.

S.No	No. of Gardens, Zonewise/Areawise	Total area in ha.	Area in sq.m	Water required @per turn/sq.m = 30L/sq.m	Total water required per day in litres
			JDA		
1	Zone I to Zone IV	101.71	1017100	30 L/sq.m	30513000
			Nagar Nigam		
2	Vidhyadhar Nagar Zone A	13.88	138800	30 L/sq.m	4164000
3	Vidhyadhar Nagar Zone B	14.85	148500	30 L/sq.m	4455000
4	Vidhyadhar Nagar Zone D	9.87	98700	30 L/sq.m	2961000
5	Vidhyadhar Nagar Zone C	15.33	153300	30 L/sq.m	4599000
6	Civil Lines Zone A	17.28	172800	30 L/sq.m	5184000
7	Civil Lines Zone B	14.59	145900	30 L/sq.m	4377000
8	Motidungri Zone A	10.34	103400	30 L/sq.m	3102000
9	Motidungri Zone C	12.31	123100	30 L/sq.m	3693000
10	Motidungri Zone B	16.46	164600	30 L/sq.m	4938000
11	Sanganer Zone A	11.95	119500	30 L/sq.m	3585000
12	Sanganer Zone B	9.46	94600	30 L/sq.m	2838000
13	Mansarover Zone A	13.69	136900	30 L/sq.m	4107000
14	Mansarover Zone B	15.59	155900	30 L/sq.m	4677000
15	Mansarover Zone C	10.82	108200	30 L/sq.m	3246000
16	Mansarover Zone D	12.37	123700	30 L/sq.m	3711000
17	Mansarover Zone E	12.48	124800	30 L/sq.m	3744000
18	Mansarover Zone F	13.72	137200	30 L/sq.m	4116000
19	HawaMahal (E-W) Zone	13.03	130300	30 L/sq.m	3909000
				Total	71406000
		Water required per watering		G Total	101919000
		Water required per watering		Say	102MLD
				Total in month	1020ML

Source: JDA & Nagar Nigam Horticulture Department

purpose; and responsibility within the community and clear direction as to how water will be managed within growth areas of the townships subject to the plan (Renmark Paringa Council 2011).

MATERIALS AND METHODS

Study area: Jaipur is the capital city of Rajasthan State having its population within the city 23.74 lakhs as per the 2001 census. This has been estimated to have risen to about 27.70 lakhs in 2005. Out of this, population within the walled city is estimated to be around 6.50 lakhs and the rest resides in the colonies outside the walled city (JMC 2006). The sources of water supply to the Jaipur city are tube wells and Bislapur dam which is about 150 km away from the city.

Table 5: Treated waste water demand at Jaipur.

S.No.	Location	Demand	Unit
1	JDA	13.00	MLD
2	RHB	2.30	MLD
3	Mahindra SEZ	7.50	MLD
4	Sitpura Industrial area	2.00	MLD
5	Pratap Nagar	3.85	MLD
6	Jawahar Circle	0.55	MLD
7	Mansarover Industrial area	1.20	MLD
8	Mansarover	2.45	MLD
9	Malviya Nagar Sec 9	0.70	MLD
10	Malviyanagar Sec 1	0.70	MLD
11	Malviya Nagar Ind area	0.95	MLD
12	MNIT	0.70	MLD
13	OTS &ShikshaSankul	0.60	MLD
14	Smrity Van	0.30	MLD
15	RamniwasBagh	1.20	MLD
16	Central Park	1.45	MLD
17	SMS Stadium	0.60	MLD
18	Jawahar Nagar	1.56	MLD
19	University Campus	1.00	MLD
20	Jagatpura	3.00	MLD
21	Amrita Devi Udhayan	3.00	MLD
22	Army area Hasanpura	6.00	MLD
23	Railway Station(Coach Washing)	3.00	MLD
24	Forest area Jawaharnagar area	5.00	MLD
	Total	**62.61**	**MLD**

Source: Jaipur Development Authority

About 80 % of water supplied to the city comes from underground sources as given in Table 1. The continuous drawing out of underground water affects the availability of water in draught prone situation.

The wastewater generated in and around the city is approximately 272 M litres. The consumption of water in the city is indicated in Table 2. The data of wastewater is also indicated in the same table and are collected through sewer network throughout the city. Where sewer line does not exist, the storm water drains are used for conveyance of soil waste and sullage. In unauthorized areas and slums, it is observed that the sewers were used to flow in storm water drains.

Health issues: In unconnected areas and slums, inhabitants face regular overflow of sewage onto streets and partially into houses as well. In monsoon, the situation becomes worse when overall city drainage system touch their design limits. In the year 2012, the same scenario has been experienced in the whole city. This has resulted in major health hazards like diarrhoea, jaundice, dysentery and other waterborne diseases. Unauthorized areas and slum residents spend about 22 % of their monthly income as direct or indirect cost of ill health. Several households cover the drain parts in front of their houses and employ private sweepers for cleaning it and invest time and money in these small scale and temporary solutions.

STPs in Jaipur city: Achieving the aim of a completely sewered capital, Jaipur Municipal Corporation has continuously working to provide better facilities to people by expanding the sewer systems and number of sewage treatment plants in the city. Total eight sewage treatment plants have been installed in the city, which have total capacity of 265 M litres as given in Table 3.

It means that whatever the wastewater generated within the city, has been treated effectively through these treatment plants. The treated effluent is discharged in nearby areas for the irrigation purpose.

Water requirements for gardening: The water requirements for gardening comes under JDA and Jaipur Municipal Corporation, which have been estimated at 1020 M litres in a month i.e., 34 M litres per day as depicted in Table 4. The potable water has been practiced for the gardening under the municipal limits of the city.

Treated wastewater demand: The treated wastewater demand for Jaipur city has been estimated at 62.61 MLD as given in Table 5, which has been provided from domestic water demand. This much domestic water can be saved and the burden on underground storage can be minimized.

RESULTS AND DISCUSSION

The main source of water supply to the city is underground source which is continuously depleted at rapid rate. If the water is withdrawn continuously without recharging the resources, it is very difficult to provide even drinking water to the people in case of draught. It is observed that the wastewater generated within the city, particularly in unauthorized and slum areas, has been conveyed through open drains which are not properly maintained and overflowing of these drains, many times in monsoon season, lead to unhygienic conditions and public hazards. The STPs established in the city meet the demand of wastewater for treatment. It has been noticed that the treated effluent has been discharged at the outskirts of the plant in unscientific manner and then it has been used by the nearby farmers for agricultural purpose only. The remaining effluent overflows on the land which pollute surrounding environment, natural resources as well as threat to public health.

The treated effluent can be effectively utilized for the watering parks and gardens within the JDA and Municipality limits saving 34 MLD water. The industrial demand can be fulfilled up to certain extent by this effluent which saves ample water. The remaining effluent can be used for irrigation purposes. This will not only solve the purpose of reuse of resources but also save the water resources which can be useful in critical conditions.

CONCLUSIONS

The wastewater management in Jaipur city has been extensively studied on the basis of literature available, interviews, and published data and drawn the following conclusions.

1. There is an urgent need of converting open drains into closed ones (especially for the slum areas of Jaipur city).
2. The management of the treated effluent use should be done in centralized way for supplying it to public gardens and parks, industries and farmers.
3. The people should be trained and educated through campaigning about house water audit and utilizing treated effluent for washing clothes, etc. (Awareness program must be run by the Local Govt. Bodies, which are ready to meet the challenge of ethical issues in the society).
4. The migration of people towards city can be minimised through providing competency based training and agriculture based industries in rural areas so that the burden of urbanization should be minimized.
5. Local Govt. Bodies should set the new rules and norms for the public regarding use of effluent STP water at least for limited purposes like gardening, cleaning, cloth washing.
6. Intermittent water supply system must be applied to whole Jaipur city to meet the challenge of water scarcity, especially in drought.
7. Water harvesting system must be implement under local jurisdiction activity to recharge the groundwater.

It is very necessary to wakeup earlier about the water problems which may come in near future by preceding steps. It will help out from scarcity of water problems, especially in dry season.

In addition to above, it is imperative to create forum of inhabitants to local politicians, and NGOs to administrators, who can join hands to work in this area for the improvement of living conditions of the inhabitants.

REFERENCES

Jaipur Municipal Corporation (JMC) 2006. City Development Plan, Chapter 9, pp. 1-38.

Renmark Paringa Council 2011. Integrated Water Management Plan for Renmark and Paringa.

Smith, Jim 2006. Draft wastewater management plan, Mansfildshire Council, Aclyn Huntley, Infocus Management Group, Neil Dunbar, WDMS Pty Ltd.

World Bank Group 1998. Integrated Wastewater Management, Pollution Prevention and Abatement Handbook.