Original Research Article

Sewage disposal system of patna city: Bihar

Reena Kumari

Research Scholar, University Department of Chemistry, Magadh University, Bodh-Gaya, Bihar, INDIA.
Email: reenakumari3103@gmail.com

Abstract

There has been significant improvement in the standards of urban civic amenities over the years since independence on account of upgradation of socioeconomic conditions along with concerted efforts in expanding the health infrastructure have given up results we can feel proud of. In spite of this achievement, the urban areas in India are plagued with inefficient and inadequate civic amenities due to rapid population growth and rural-urban migration increasing tremendous pressure on limited urban infrastructures. Proper disposal of sewage has been a challenging task before concerned authority because it is a basic requirement to keep people safe from different diseases. But, the condition of sewage disposal system in most of the Indian cities are not up to the mark. Not a single city of India has proper sewage disposal mechanism and Patna city is not exception of it. The condition becomes more pathetic in rainy season because sewage overflows and spread onto streets presenting a dingy view, promoting unhygienic condition and causing numerous diseases. The reason for this is the unauthorized construction in and around the city lying outside the purview of the main sewerage systems. Furthermore, water pipes which run in close proximity of sewer lines often experienced serious leakage leading to contamination of drinking water which results in spread of water-borne diseases. The sewage treatment plants which were installed in the city are not functioning well frequent power failure. About seventy percent of sewage is being discharged into rivers without any treatment causing damage to the Ganga water and its aquatic lives. The present study analyses problems of waste water disposal in one of the most water-logging affected city of the middle Ganga plan, Patna city.

Key Words: Drainage System, Sewage Disposal System, Pumping Station, Sewage Treatment.

***Address for Correspondence:**
Dr. Reena Kumari, Research Scholar, University Department of Chemistry, Magadh University, Bodh-Gaya, Bihar, INDIA.
Email: reenakumari3103@gmail.com

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INTRODUCTION

The urban areas in India are lacked with proper civic amenities. The condition of sewage disposal system is bad and not a single city of India is fully sewered. In many cities, no care has been taken to improve, modernize, or replace the old sewerage systems. The treatment and disposal of sewage is carried out by crude and out –dated methods (Siddhartha and Mukherjee, 2001). According to latest estimates, only 35-40 percent of the urban population had the privileged of sewage systems. Furthermore, in most Indian cities, water pipelines run next to sewer lines causing contamination of water and resultant diseases. The local governments and concerned authorities are lacking with financial, technical and managerial experience to tackle this burning problems (Khullar, 2006). The case of Patna City is not different. The situation becomes worse in the eastern part of the city which remains water- logged throughout the monsoon period.

AIMS AND OBJECTIVE

The major objectives of the study are:

- Assessment of the generation of waste water,
- Assessment of the condition and coverage of sewerage system,
- Assessment of service level and coverage efficiency,
- Assessment of status of sewage treatment plants (STP)
- Suggestions for the proper disposal of sewage.

Study Area: Patna, the capital city of Bihar, is situated on the banks of river Ganga, between – $85^0$2'E to $85^0$16'E longitudes and $25^0$35'N to $25^0$39'N latitudes. It extends from Danapur in the West of Malsalami in the East and from Kankarbagh in the South to river Ganga in the North

with a river bank stretch of about 20 kms. The terrain within the city limit is generally flat with a mild southward slope. The altitude from Lohanipur to kankarbagh is about 47.5 m along the Railway line but it is about 52.1 m along the bank of the rive Ganga and the areal expansion of Patna city is about 105 sq. km. with a population of 15.35 lakh (2011). Patna has a glorious past with name of Patliputra which was founded by Azatshatru, a king of Magadh Empire in six century B.C. Patna City receives rainfall both from the Southern monsoon and Western disturbances during winter seasons but former contributes most of the rainfall. It receives medium to heavy rainfall in the monsoon. The normal rainfalls in the month of May, june, july, and August are 44 mm, 168.4 mm, 311.7 mm, and 303.8 mm respectively. The mean humidity goes up to 100 percent with wind speed of 5 to 9 km/hr. The maximum and minimum temperature in the summer is 430 c and 210c respectively and those in winter are 200 c and 60 c (BSPCB).

Sewerage System and Sanitation: Wastewater collection, treatment and disposal are a major problem in most of Indian Cities. Disposal of untreated wastewater into low lying areas or various water bodies causes several aquatic po0rpbles. For management of sewage disposal, the sewerage system of the Patna city has been divided into seven distinct zones which are follows: (PRDA, 2011)

ZONE 1: This zone covers newly developed outer areas like Khajpura, Rajapur, Samanpura, Shastri Nagar, Patel Nagar, Rajbanshi Nagar, etc. Though, these areas are thinly populated but it is developing very fast. Because this is newly developing areas, there is no planned sewerage system in this zone.

Zone 2: The old and new Patliputra colonies mainly come in this zone. It is and industrial area and has better provision of sewerage system with respect to other parts of the city.

Zone 3: The Secretariat building, Government offices, High court, Ministerial and official residences, Aerodrome, etc. important government undertakings fall under this zone has satisfactory condition of drainage system.

Zone 4: This zone comprises of a mixture of old and new habitation wherein western area of this zone is fully sewered, but the eastern part has no sewerage system at all due to growth of slums. Laying of sewerage lines in this narrow settled area is difficult, hence drainage condition of this zone is not satisfactory.

Zone 5: This zone consists of old settled outermost boundary on north- eastern side of the Patna city. This area is characterized by dense settlement and heavy network of very narrow streets and lanes which does not allow laying down sewerage lines. Hence domestic and storm sewerage condition is poor.

Zone 6: This zone mainly comprises Kankarbagh co-operative colony which has grown fast in recent years. It has developed in low lying marshy lands and is one of the biggest colonies of the city. This area **has no provision of sewerage system. Besides, Bahadurpur, Housing colony, Chirayatand, Ashok nagar,** Defence colony, etc. also fall in this zone which is also inadequately served with sewerage system.

Zone 7: It covers south- eastern portion of the Patna city which is thinly populated but developing very fast. This zone is also deficit of sewerage system.

Service Level and Coverage Efficiency: Level of service is essential to know the condition of sanitary facility. Household having access to Under Ground Sewerage facility or Septic Tank are considered to have access to a safe disposal facility. The indicator is represented as percentage of assessments having access to safe disposal. Table 1 shows the level of sanitary facility in Patna city. According to which only 9.2 percent p0opulation has under -ground sewerage is around 25 percent. In the absence of full sewerage facility, the major mode of disposal is through individual septic tanks and low cost sanitation. One-third population is dependent on the septic tanks and low cost sanitation for sanitation in Patna City.

Status of Sewage Treatment Plan (STPs): The purpose of waste water treatment is to remove or reduce organic and inorganic substances, nutrients, toxic substances, kill pathogenic organisms, etc. so that the quality of discharged water is improved to meet permissible level of water to discharged in some water body, on land or agricultural field (Kaushic and Kaushic, 2008). The liquid waste is sewage and sullage which flows through a network of open and Under ground sewer line.

Table 1: Sanitation Service Level Indicators

Components	Sanitation level
Availability of Under Ground Sewerage System	Yes
Percentage of Population with Under Ground Sewerage Network	9.2
Number of connections	21884
Road Cove red by Under Ground Sewerage Network in Percent	**25**
Quantity of Generated Sewage in MLD	143
Total treatment capacity of Sewage in MLD	**109**
Total treatment capacity of Sewage in MLD	**49**
Number of Septic Tanks	58305

Source: City Development Plan for Patna, JNNURM, (2012) and NEERI.

And ultimately dispose waste water in the rivers. Before to 1936 the liquid waste of the city used to flow directly

into the Ganga river through open drains at Kurjee, Rajapur, Mandiri, Antaghat, Krishnaghat, and city moatnala. But in 1936 a sewage treatment plant at Saidpur in the central zone was installed with a treatment capacity of 2 MLD sewage and a small STP at Beur was established in 1975 to treat the liquid waste before releasing it into the Ganga River. With the growth of the urban area and consequent activities there was a need to strengthen the existing STPs, increase the network of soiled sewerage line and storm water drains. By late 80s, three STEPs came into existence to treat the sewage and use of treated sewage in irrigation (SPCB and DE and F, 2007). The following information is available about various STEPs.

1. **Saidpur Sewage Treatment Plant**: The designed capacity of Saidpur STP is 45 MLD and is treating Sewage by activated sludge process. The actual flow to the plant is about 33 MLD. One unit of this plant having the capacity of 4.55 MLD is not functioning since November 1997 and all the mechanical components are badly damaged. The Unit require special repair, in case it has to be made operational. Besides, two digesters are put out of order and needs overall repair and replacement of screw pumps. The treated sewage flows through Rampur drain into Barmutta Nala and finally leads to the Punpun jalla.
2. **Beur Sewage Treatment plant** : The designed capacity of Beur STP is 35 MLD, out of which, 15 MLD capacities is only for primary treatment and 20 MLD can be treated through activated sludge process. However, the actual flow to the plant is about 16 MLD and it remained under utilized. There are two digesters in this plant which are in operation but the gas produced in them is not utilized for power generation and flared up. The collection system of wastewater through intermediate pumping stations is not properly managed and as a result the sufficient volume of wastewater is not reaching to STP. The capacity of drying beds is also inadequate. The treated Sewage from this plant is disposed through channel starting from effluent lifting station situated at Beur village and meeting Badshahi pan. The treated sewage is utilized for irrigation otherwise reaching to the Pun pun river.
3. **Pahari Sewage Treatment Plant** : The designed capacity of this plant is 25 MLD use to treat the sewage by aeration in the lagoon. The plant is not in operation due to technical as well as electrical as well as electric fault. It was viewed during observations that the fish pond of this plant was full of algae, which reflects that the aerated lagoon is not in operation for a considerable period of time. Furthermore, there are serious problems occurred with the pump receiving sewage from Kankarbagh outfall. Besides these, eh power supply is also a major problem has been reported by concerned authority.

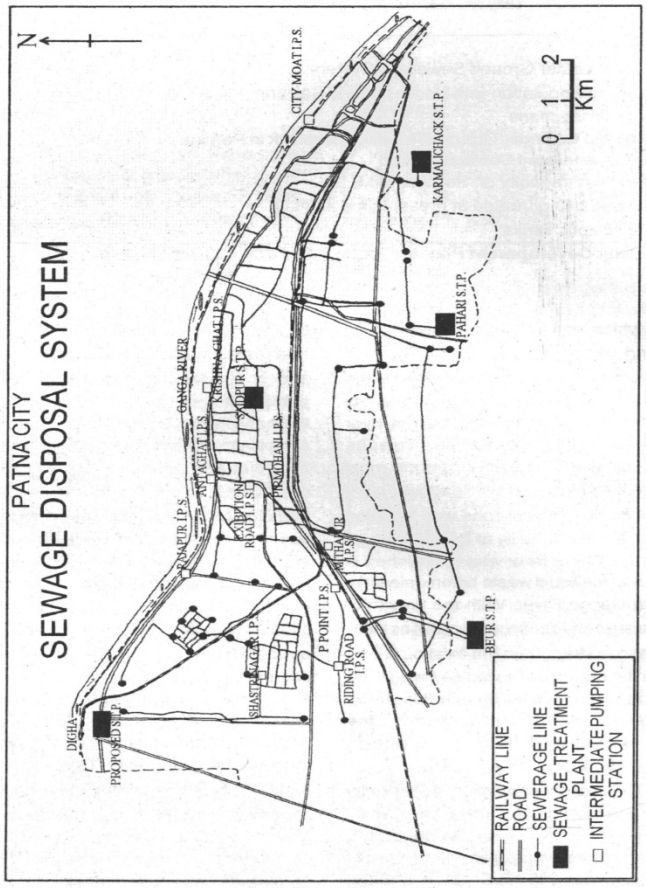

FIG.1.

Figure 1:

Karmalichack Sewage Treatment Plant: This STP was designed for 4MLD and the plant will treat the sewage by natural aeration in the oxidation pond. The construction of plant has not been completed due to the problem of land acquisition. Besides, there is also a problem of cost escalation due to delay in construction (CPCB).

Sewerage system and Sanitation issues: Urban areas are almost invariably plagued with inefficient sewage disposal facility because of crunch of resources faced by municipalities and unauthorized growth of the cities (Khullar, 2008). The underground sewerage system is one of the best methods of waste water conveyance and disposal (Sharma and Priya, 2001). But, on account of high capital and operational cost and topography, urban areas have to depend on other mode of disposals of

sullage. There are some sanitary issues regarding sewerage system of Patna city. These are as follows:

1. There is increasing dependency on septic tank and low cost sanitation because only 20 percent of the total households in urban areas are covered with under sewerage system presenting grief situation.
2. Septic tanks and low cost sanitation may pollute shallow ground water with microbial, which is main sources of drinking water.
3. Infiltration of rain water into sewer line further aggravates the problem in monsoon period.
4. Water pipes run in close proximity to sewer line. Any leakage leads to contamination of water which results in spread of several water borne diseases.
5. About seventy percent of sewage is being discharged into rivers without any treatment causing damage to the Ganga water and its aquatic lives.
6. On account of frequently power shortage, lack of skilled man power and absent of sincerity in operation are great problems faced buy sewage treatment plants.
7. Concerned authority will have to face severe problem in bridging the present gap and estimated future demand for sewage demand for sewage disposal facility.

CONCLUSION AND SUGGESTIONS

After above discussion, it has become clear that there is lack of proper sewage disposal system in Patna city and it has to be adequately sewered as soon as possible to improve the sanitary condition of the city. There is need for proper maintenance and timely renovation of existing sewerage system in the old settled eastern part of the city. Phase-wise expansion of sewerage network should be initiated in newly coming up areas like Khajpura, Rajapur, Samanpur, Shastrinagar, Patel Nagar, Rajbanshinagar, etc. Adequate provision of sewerage system is requested mostly in areas like Knakarbagh Co-operative Colony which has grown up in marshy land. Besides, the sewerage system should also be provided in Bahadurpur Housing Colony, Chirayatand, and Asok Nagar. The open sewer lines within the city must be covered properly and required vent-pipes be provided to control foul odour problem which present pathetic situation. Furthermore, there is need to repair all the three sewage treatment plants which are working under their installed capacity and their strength must also be enhanced to cater the future need of the city. The construction work of Karmalichak sewage treatment plant must be completed as early as possible and its capacity should also be increased to fulfill the requirement of south-east region of the city. Non availability of uninterrupted power supply is another problem faced by almost all sewage treatment plants, which must be checked on the regular basis. There is crying demand of situation to install new STPs at Digha, to meet the requirement of the North West zone.

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