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Study of Trapping and Intermixing of Delhi Drains for Rejuvenation of the River Yamuna

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Abstract: This study examines the presence of pollution of Yamuna in the city of Delhi, from two perspectives: (i) understanding the concept of trapping drains and (ii) establishing small scale Sewage Treatment plants at the point of outfall. With events occurring over the last century making river Yamuna polluted, the study focuses on the latest methods and technologies available to avoid intermixing of sewage and storm water drains to reduce pollution. Due to mixing of storm water and sewage, the desired qualities of the river water get degraded and the amount of dissolved oxygen decrease considerably. If this water is allowed to pass through a sewage treatment plant then it will lead to increase in time of treatment due to increase in discharge. The increased discharge can also affect the efficiency of the treatment plant. The study also includes the theory of tributaries of river Yamuna, Major Drainage problems in the region, Quality of River water.

1. Introduction

Yamuna is one of the largest tributary of Ganga and also one of the most important rivers of northern India. It passes through Uttarakhand, Himachal Pradesh, Haryana, Delhi, and Uttar Pradesh. It merges with the Ganga at Allahabad in Uttar Pradesh. At one time, it was the major lifeline for the people of the area, but today it is one of the most polluted rivers of the country which is being degraded day by day. The Yamuna starts getting polluted by pesticides and fertilizers as it enters Haryana, still most of the pollution occurs in Delhi. More than 18 million people live in Delhi. Yet it does not have a proper sewage disposal system. The capital lacks not only in collecting sewage from the residential areas but also in avoiding mixing of industrial and residential waste water.

Nineteen major drains from Delhi open into the Yamuna. At one time, these carried rainwater. But because of the poor sewage disposal system, water carrying sewage is discharged into these drains, from where it finds its way to the river. This leads to increase in the pollutant concentration in the river thereby decreasing its dissolved oxygen capacity considerably.

Delhi, along a stretch, the Yamuna is choked by water hyacinth a weed. This is an example of eutrophication. Dead fishes are also found in the river as soon as the monsoon begins. This is due to the sudden increase in pesticide and other pollutant levels. Industrial wastes also find their way into the river from large industrial units (22 in Haryana, 42 in Delhi and 17 in Uttar Pradesh) and many small industrial units. This industrial waste is harmful to people and the environment. Surprisingly, though Delhi constitutes only 2% of the catchment area, it is responsible for 80% of the pollution of the river.

2. Quality of River Water

Although the Yamuna River flows only for 54 KM from Palla to Badarpur through Delhi, the 22 KM stretch from Wazirabad to Okhla, which is less than 2% of the river length of 1370 Km from Yamnotri to Allahabad, accounts for about 76% of the pollution in the river. During the dry season, spreading over nearly nine month of the year, the river has no fresh water downstream of Wazirabad and the only flow available is sewage, both treated and untreated, flowing through 22 drains that join the river Yamuna all through its journey from end to end within Delhi. The setting up of Sewage Treatment Plants (STPs) and Common Effluent Treatment Plants (CETPs) is done to ensure that the sewage/industrial effluent does not find its way to drains which eventually joins the river, besides several other measures.

3. Measurement Units

The flow of all the drains was measured in MLD (millions of liters per day) and MGD (millions of gallons per day).

Fig. 1: Civil Military Drain

Fig. 2: Tonga Stand Drain

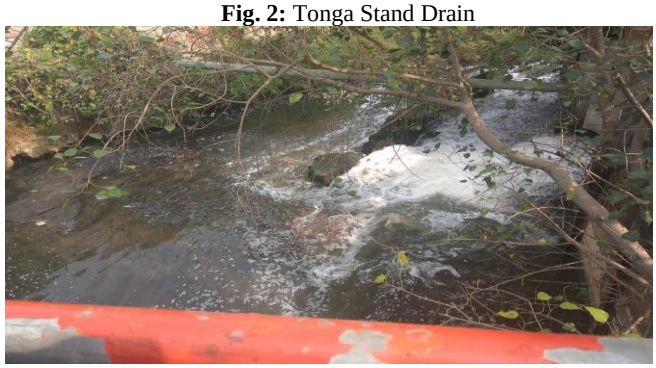

Fig. 3: Delhi Gate Drain

Fig. 4 :Metcalf House Drain(Bela Road)

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Table 1: Status of Drains out falling into River Yamuna in Delhi

Drain	Observations	Recommendations
Arunanagar Drain / Magazine Road Drain (4.5MLD)	Sewerage system from Arunanagar, old Chandrawal have a sewage outfall. Maintenance of point of interception is poor. Leakage/overflow of sewage into river. Solid waste accumulation at interception point.	Proper maintenance of outfall system of drain so that entire sewage is diverted into Arunanagar Sewage Pumping Station Providing proper outfall of sewage system of Arunanagar Provision for measurement of flow shall be made available.
Colony Drain (4MLD)	village/ J.J. Cluster. Leakage from interceptor sewer (Gate open). Freshwater outfall from Chandrawal WTP (Backwash). Solid waste accumulation at interception point. Poor maintenance of tapping point.	Proper maintenance of tapping point so that entire sewage diverts to Arunanagar SPS. Interception/collection of sewage from Provision for measurement of flow shall be made available.
Khyber Pass Drain (1MLD)	Sewage from Arunanagar, old Chandrawal Village, Chandrawal JJ cluster, and Tibetan Camp unauthorized occupants on Army land at Khyber pass etc. Maintenance of point of interception is poor. Leakage/overflow of sewage. Leakage of freshwater. Silting up of drain. Solid waste accumulation at interception point.	Proper maintenance Providing sewage system and outfall for JJ cluster Setting up constructed wetland system for treatment of sewage at source i.e. Chandrawal water works itself Provision for measurement of flow shall be made available.
Metcalf House Drain (Bela Road) (5MLD)	There is no outfall sewer line to cater to the sewage of Civil lines (Shamnath Marg/ Rajniwas etc.). Hence, sewage outfalls into this S.W. drain. Solid Waste accumulation. Leakage of waste freshwater. Faulty gate	Proper operation and maintenance Providing proper baffle for overflow Provision for measurement of flow shall be made available.
Mori Gate Drain (9.5MLD)	Leakage/overflow of Sewage from sewered area of Kashmiri gate, Old Delhi and Mori Gate area (Leakage from sewered area). Leakage from ISBT and area around. Solid waste accumulation at interception point.	Diversion of sewage to sewer line at source in the respective areas Providing root zone treatment before outfall to treat waste water Provision for measurement of flow shall be made available.
Tonga Stand Drain (1.5MLD)	Solid Waste accumulation. Leakage of sewage from Old Delhi Railway station area. Sewage and solid waste from unauthorised colony immediately before outfall. Open defecation near the point of outfall. No action plan by DJB to trap this drain.	Proper operation and maintenance of existing sewers Interception of sewage before outfall Provision for measurement of flow shall be made available.
Civil Military Drain (2.5MLD)	Leakage and overflow of sewage from sewered area of Chandni Chowk etc. area. Leakage of sewage from the gate of regulator. Open defecation near the point of outfall.	Proper operation and maintenance of existing sewers Providing root zone treatment before outfall or trap this sewage into trunk sewer line near Red fort Provision for measurement of flow shall be made available.
Delhi Gate Drain (15-17MGD)	Sewage from old Delhi i.e. Hauz Khas, Chawri Bazaar, Ballimaran and Darya Ganj area etc. Leakage Overflow of surplus sewage. Accumulation of some solid waste. Proper management of sewage. Entire discharge is being treated at two STPs of 17.2 MGD capacity.	Proper cleaning of drain operation and maintenance of existing treatment systems Provision for measurement of flow shall be made available.
Dr. Sen Nursing Home Drain (2.2MGD)	Sewage from railway colony area. Leakage of sewage from NDMC sewered area. Accumulation of solid waste. Overflow from the regulator gate. Inadequate treatment capacity of STP.	NDMC must divert sewage to sewer lines at source. Railway department must trap sewage into DJB sewer line near Tilak Marg or Deen Dayal Upadhyay Marg. Proper operation and maintenance of existing treatment system at STP Providing root zone treatment before outfall Provision for measurement of flow shall be made available.
Drain No. 14 Drain **(**1MLD)	Accumulation of solid waste Overflow of sub-soil water (freshwater) from construction activity at Pragati Maidan.	Sewage is being trapped into Ring Road Trunk sewer Provision for measurement of flow shall be made available.

Taimoor Nagar Drain (6MGD)	Leakage of sewage from adjoining colonies Sewage from Taimoor Nagar colony (Non-sewered) and sewered area of Defence Colony etc. Accumulation of solid waste.	Taimoor Nagar colony to be sewered Trap out-flowing sewage to CV Raman Trunk sewer should be made functional. Diverting sewage into sewer lines in sewered areas at source. Provision for measurement of flow shall be made available.
Tughlakabad Drain (4-5MGD)	To Sarita Vihar SPS, Flow of drain is partially trapped Operation and Maintenance of drains is improper. Partially trapped 10%, Minimum flow not available. Sewer coming from sewered area. Sewerage system not working properly. Wastewater from Tughlaqabad Govindpur.	O&M to be done properly, sump at zero level Provision for measurement of flow shall be made available. Coffer Dam for diversion of sewage to maintain minimum flow into Sarita Vihar SPS to Okhla STP, Flow meter not present, Weir type dam. Provision for measurement of flow shall be made available.
Tekhand Drain (6MGD)	Sewerage system does not exist. Flow is not trapped. STP of 10 MGD plant proposed. From Tejpur group of unauthorised colonies, Tehkhand Village.	Online or decentralised plant Sewerage system for unauthorised colony to be sent to decentralised plant Provision for measurement of flow shall be made available.
Barapullah Drain (30MGD)	Sewage from unsewered area of Sangam Vihar colony Leakage of sewage from NDMC area and sewered area of South Delhi. Accumulation of some solid waste.	Proposed STP of 20 MGD (as per information from DJB) Trapping of sewage into sewer lines at source to reduce flow of sewage into drains. Proper Maintenance of trapping points at Krishi Vihar, Andrews Ganj and Nizamuddin. Root zone treatment before outfall Provision for measurement of flow shall be made available.

Fig. 5: Khyber Pass Drain

Fig. 6:

Fig. 7: Arunanagar Drain

4. Conclusions

1. It was observed that most of the drains which were reports as plugged, actually, there was sufficient discharge going downstream except at Delhi Gate Drain.
2. It is observed that proper trapping of the sewage is not being done due to improper/poor operation & maintenance.
3. It is observed that most of the places a large amount of the solid waste was found in the drain which was causing obstruction of flow and un-aesthetic view.
4. It is recommended that it will be better to provide decentralized treatment of sewage at the outfall itself.
5. Monitoring of flow has not been done. Discharges given above are approximate and are subjected to verification.

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References

[1]. AK Gosain R Khosa. Department of Irrigation and Flood Control, Government of Delhi Report on Drainage Master Plan for NCT of Delhi, 7, 2018.

[2]. MRJ Doorn, S Towprayoon, S Maria, M Vieira, W Irving, C Palmer, R Pipatti, C Wang. Wastewater treatment and discharge. In 2006 IPCC Guidelines for National Greenhouse Gas Inventories 5, 28, 2006, 1-6.

[3]. WMO, UNEP. Storm Water Audit, Sydney Water, 11, 2017

[4]. An Assessment of Small Scale Sewage Treatment Plant Technologies, India, 5, 2017

[5]. F Ghassemi, AJ Jakeman, HA Nix. Salinisation of land and water resources: Human causes, extent, management and case studies. Sydney, Australia, and CAB International, Wallingford: UNSW Press, 1995.

[6]. G Tchobanoglous, FL Burton, HD Stensel. Metcalf & Eddy, Inc. Wastewater Engineering: Treatment and Reuse (4th ed.). McGraw-Hill, 2003. ISBN 978-0-07-112250-4.

[7]. Metcalf & Eddy, Inc. Wastewater Engineering. New York: McGraw-Hill, 1972. ISBN 978-0-07-041675-8.

[8]. SJ Burrian, et al. The Historical Development of Wet-Weather Flow Management. US Environmental Protection Agency (EPA). National Risk Management Research Laboratory, Cincinnati, OH, Document No. EPA/600/JA-99/275, 1999.