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Action Plan for Urban Waste Water Recycling in Lucknow

Baljeet Singh[1], Dr. J.B Srivastava[2]
[1]*Student, M.Tech Environmental Engineering, Institute of Engineering and Technology, Lucknow U.P, India*
[2] *Professor, Civil Engineering Department, Institute of Engineering and Technology, Lucknow, U.P, India*

Abstract: ***Urban waste water generation per day in Lucknow city is 84 MLD and the treatment capacity of this urban waste water is 446 MLD and 445 MLD urban waste water flows in Gomti River and 339 MLD urban waste water partially treated. Some waste water is recycled by Water treatment plant which are treating 560 MLD urban waste water and remaining are polluted to ground and as well as gomti river.to achieve 100% recycling and treatment we need a action plan for it. The formation of Lucknow municipal board took place in 1882, while as the water supply demand is fulfilled by tube wells, river Gomti, Sharda Sahayak feeder canal, aquifers, and so on, the maximum source of intake is Gomti which is geographically distinguished as Cis and Trans Gomti. The Cis Gomti side is comparatively lower than the area on Trans Gomti side. Since the city is located on alluvial aquifers of Indo-Gangetic plain, where due to easy accessibility, private tube well construction activity is going on unchecked, especially in residential colonies and multi-storeyed buildings, and this is the reason why the private tube wells/borings have almost mushroomed in this capital city. This has led to heavy pumpage/continuous abstraction of groundwater resources, widespread depletion of aquifers and as a result, going down of groundwater levels drastically to almost unsustainable levels, from where it seems very difficult that the depleted conditions of ground water could ever improve (6). The water supply network depends on sources like tube wells, river Gomti and the Sharda Sahayak feeder canal. The distribution of water supply has a very vast network and it is reported to be 2884 km. The rate of water supply is assumed to be 150 LPCD and water demand is calculated accordingly, The availability of water, as reported by Jawaharlal Nehru national urban and rural mission (JNNURM) on November 2016, was 619 MLD from various sources, however, it keeps fluctuating as the city is more vulnerable to migration from other parts of state.***

Keywords: ***urban waste water, waste water recycling, reuse of waste water, sewage treatment plant***

I. INTRODUCTION

According to the 2011 census, the city had a population of 2 815 601 from which about 1 470 133 were men and 1 345 468 were women. More than 36.38% of the aggregate population live in rural areas, leaving scarcely around 63.23% made out of the urban population. These were high figures when contrasted with the state as a whole, where the urban population just constituted around 21.2% of the aggregate population. The sex proportion in the city remained at 915 females to 1000 males in 2011 as contrasted with 2001 evaluation figure of 888. The average national sex proportion in the country is 940 as indicated by the 2011 census. The city, additionally, boasts a literacy level of 84.72% contrasted with 56.3% for the state. The population density of the city is 1815 persons per square kilometer. The total number of inhabitants in Lucknow urban agglomeration exceeded one million in 1981 while the 2001 evaluation assessed it to be ascended to 2.24 million. This included around 60 000 individuals in the Lucknow Cantonment and 2.18 million in Lucknow city and additionally had an increase of 34.53% over the 1991 figure. As reported by the census of India in 2011, the city had a population of 2 815 602 from which around 1 471 133 were men and 1 345 4687 were women. This figure showed an increase about 25.36% contrasted with the 2001 figures. Somewhere around 1991 and 2001 the the 2001 figures. Somewhere around 1991 and 2001 the population enrolled growth of 32.03%, essentially lower than 37.14% which was enlisted somewhere around 1981 and 1991.

The overall rate of water supply is about 230 lpcd in Lucknow City as per the CA& FS reports of WAPCOS (appointed by NMCG for feasibility study). However, the distribution is highly uneven and ranges between 70 lpcd to 330 lpcd. The high rate of water supply is due to higher availability of water from surface source and as well as matching availability from ground source. However, the ground water resources are declining day by day and it is expected to contribute little towards the future water availability. This shall lead to decrease in rate of water supply and the overall rate is expected to be 150 lpcd by the year 2037 for Lucknow City which will be attained by projects proposed for reorganization of water supply under AMRUT and decrease in contribution from ground water. From the above tables it is evident that the waste. The anticipated rate of water supply of 150 lpcd and interception factor of 0.80 is considered for waste water generation. The projected population and sewage generation is tabulated below:

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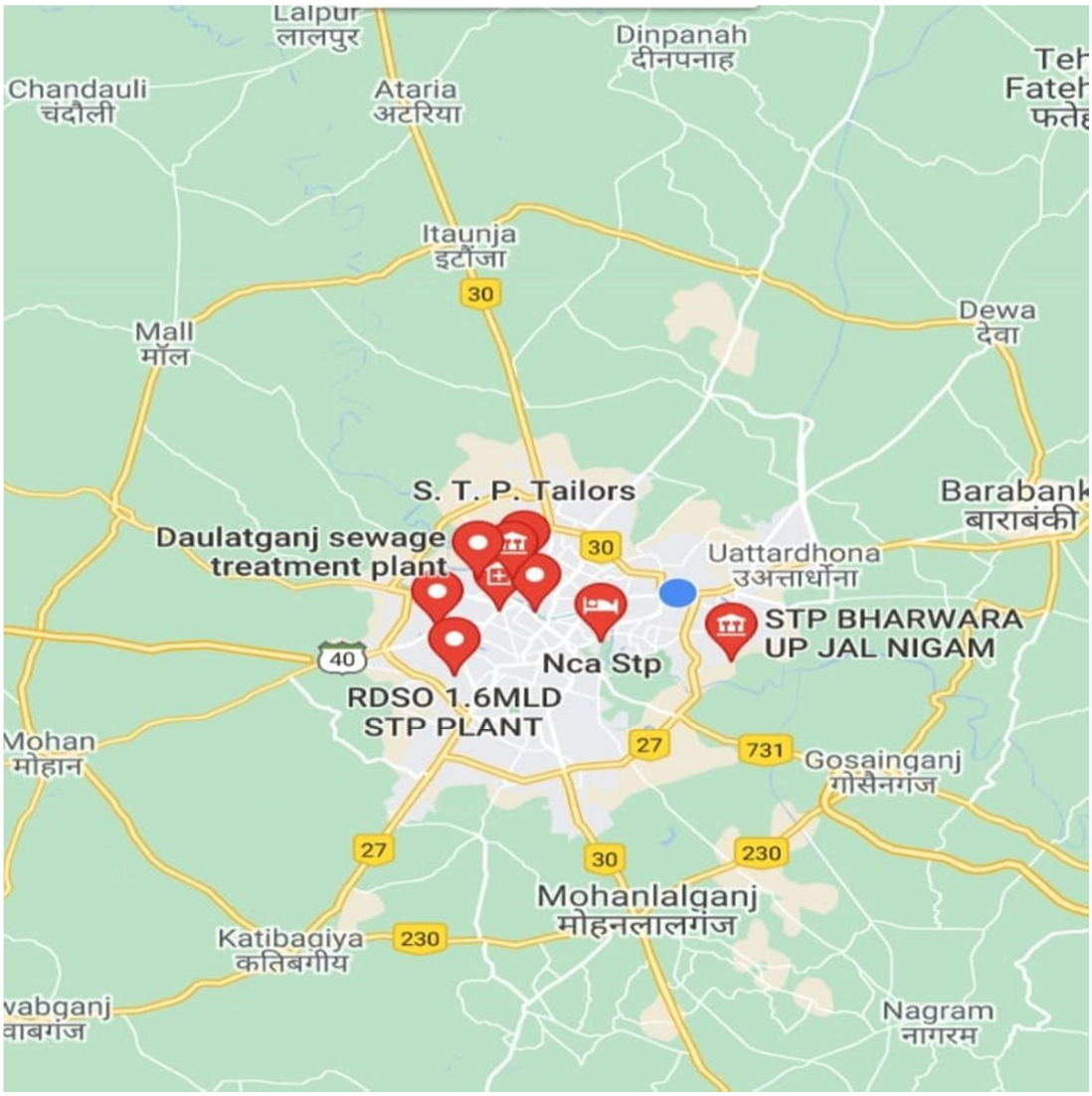

Fig. 1. Location of Sites

Fig. 2. Sewage Treatment Plants in Lucknow

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TABLE 1
Waste Water generation per capita projection

S.No	Sewerage District	Population/WW generation (in mld)							
		2011		2022		2037		2052	
		Pop	W/W	Pop	W/W	Pop	W/W	Pop	W/W
1	I	300849	36	422519	51	709442	85	979953	118
2	II	328865	39	428031	51	782824	94	1124749	135
3	III	1079614	130	1409311	169	2318525	278	3212232	385
4	IV	110777	133	1389113	167	1825160	219	2207667	265
	G Total	2817105	338	3648974	438	5635952	676	7524600	903

So total Sewage generation for whole of the Lucknow city in year 2037 is 676 mld while in year 2052 is 903 mld. This is considered for W/S rate @ 150 lpcd and no infiltration and unaccounted for water. From the above tables it is evident that the waste water generation (as per measured discharge) in year 2015 and year 2019 for Lucknow city is 674.73 and 784.20 mld respectively, however discharge based on population projection for year 2022 is 438 mld as seen in previous table. This high variation is owing to the fact that currently average water supply rate in Lucknow city is around 230 lpcd. However, the design discharge for STP has been kept considering the water supply rate @ 150 lpcd as per the norms laid in the CPHEEO Manual/NMCG Guideline which is in line with the proposed water supply reorganization projects under AMRUT with an aim to distribute the water supply at even rate. Coupled with reorganization water supply projects, as ground water source is exhausted, this will bring down the high-water supply rate as per the norms. Total treatment capacity proposed for Lucknow city in year 2037 is 793 MLD (446 existing+120 MLD G.H. Canal under construction + 1 MLD Barikala, sanctioned + 39 MLD Daulatganj, sanctioned + 22 MLD Ghaila + 85 MLD Bharwara + 80 MLD Bijnor) which seems realistic with expected population growth and targeted decrease in rate of water supply of 150 lpcd. Capacity of STP is determined on higher of current measured discharge (June, 2019) or discharge based on projected population of Year 2037 and in this case measured discharge is higher and is adopted for capacity calculations.

II. EXISTING WASTE WATER TREATMENT PLANT AND RECYCLING STATUS AT LUCKNOW

As per discharge measurement of 33 no.'s drains falling in River Gomti and predicted discharge of 1 drain falling in River Sai, a total of 784 mld capacity of STP has to be installed in Lucknow city for the next 15 years. The Discharge of all the drains falling in River Gomti and River Sai is tabulated as below:

TABLE 2
Existing waste water treatment facility at Lucknow

Details of Data Requirement	Present Status
No of Class-II towns and above	NA
No of Class-I towns and above	1
No of Town STPs installed	1
No of Towns needing STPs	1
No of ULBs having partial underground sewerage network.	1
No of towns not having sewerage network.	NA
Total quantity of sewage generated in Districtfrom Class II cities and above.	NA
Quantity of treated sewage flowing into Rivers(directly or indirectly)	445 MLD
Quantity of untreated or partially treated sewage (directly or indirectly)	339 MLD
Quantity of sewage flowing into lakes	NA
Total available Treatment capacity	446 mld

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TABLE 3
Existing and Proposed STPs in Lucknow

S.NO	Name Of STP	Name of Drain	Measured Average Discharge Yr 2020	Tapped (Y/N)	Remarks
1	Barikala STP (Sanctioned 1 MLD)	BAIRIKALAA	0.65	N	
2	Daulatganj STP (56 mld existingand 39 mld Sanctioned)	NAGARIA GAUGHAT MOHINIPURWA SARKATA PATA	0.65 16.8 1.64 28.8 15.5	Y Y N Y Y	
3	Bharwara (existing 345 Mld and 85 mld proposed)	NER U / S NER D / S WAZIRGANJ GHASIARIMANDI CHINA BAZAR LAPLACE BY TRUNK SEWER AT CGPS	3.6 41.41 17.86 0.32 8.90 55.0	Y Y Y Y Y Y	
4	GH Canal(sanctioned 120 mld)	JOPLING ROAD G H CANAL LAMARTINIER JIAMAU	0.58 207.7 2.05 6.50	Y Y Y Y	
5	Bijnor STP (80mld proposed)	Sec N Ashiyana SPS (District 2) Sec M Ashiyana SPS (District 2) SPS Vidhi Sansthaan (District 2) SPS Ambedkar University (District 2)	10.20 10.20 10.20 20.20		

III. GAPS IN RECYCLING OF WASTE WATER TREATMENT AND RECYCLING

From preceding paragraphs following gaps is identified in Sewage Treatment Plant Capacity:

1) Total Capacity Required - 784 mld

2) Existing Capacity - 446 mld

3) Under Construction - 120 mld

4) Sanctioned - 40 mld

5) Balance Requirement - 178 mld

6) Proposals Sent against S No e - 187 mld

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IV. LONG TERM ACTION PLAN

Detailed Project Report for the 7 new drains and required STP's were forwarded to NMCG, NewDelhi. Current status of the DPR's is as follows:-

TABLE 4
Drains in Lucknow

S. No	Particular	Proposed Works
1	Phase I part 1	• 1 No I& D at Barikala • 1 mld STP at Barikala • 39 mld STP & MPS at Daulatganj • 3 No SPS Strengthening
2	Phase 2	• 2 No.'s I& D (Faizullaganj U/S and Faizullaganj D/S) • 22 mld STP at Ghaila • 80 mld STP and MPS atBijnor • 3.2 kms Gravity Mains • 15 years O&M
3	Phase 3	• 3 No.'s I& D (Sahara, Gomti Nagar, Gomti Nagar Extension) • 85 mld STP at Bharwara • 15 years O&M

V. GAPS AND ACTION PLAN FOR SEWERAGE NETWORK FOR RECYCLING GAPS

a.	Total Required	-	6500 kms
b.	Existing	-	2100 kms
c.	Under Construction	-	345 kms
d.	Sanctioned	-	NA
e.	Balance Requirement	-	4055 kms

As per Service Level improvement plan under AMRUT a total of Rs 5950 cr was required for allSTP's and sewer network work. However only Rs 585 cr was sanctioned for Lucknow city underdifferent State Annual Action Plan. DPR amounting to Rs 1432.64 cr is sanctioned for the Lucknow city and works are under progress.

VI. ACTION PLAN

A. Short Term Action Plan

Septage management works were sanctioned for Lucknow city as a short-term measure tocollect the septage from the septic tank and dispose it at specified location for treatment purpose.The works shall be completed by December 2021. No further action is required.

VII. CONCLUSIONS

In the present study Total urban waste water generation in Lucknow is 784 MLD in which only 446 MLD urban waste water is treated by sewage treatment plant and remaining is half treated and fully untreated goes into Gomti rivers about 45 % waste water is recycling by Water treatment plant situated in Ashbaugh, balaganj and kathuta jheel water treatment plant. For fully treatment of this urban waste water, we need 446 MLD capacity treatment plant and for recycling these waste water we have to more increased the proper channeling of this treated water. For maximum reach of these urban waste water, we have built sewar lines at all the drains of the city and must connected to every household.

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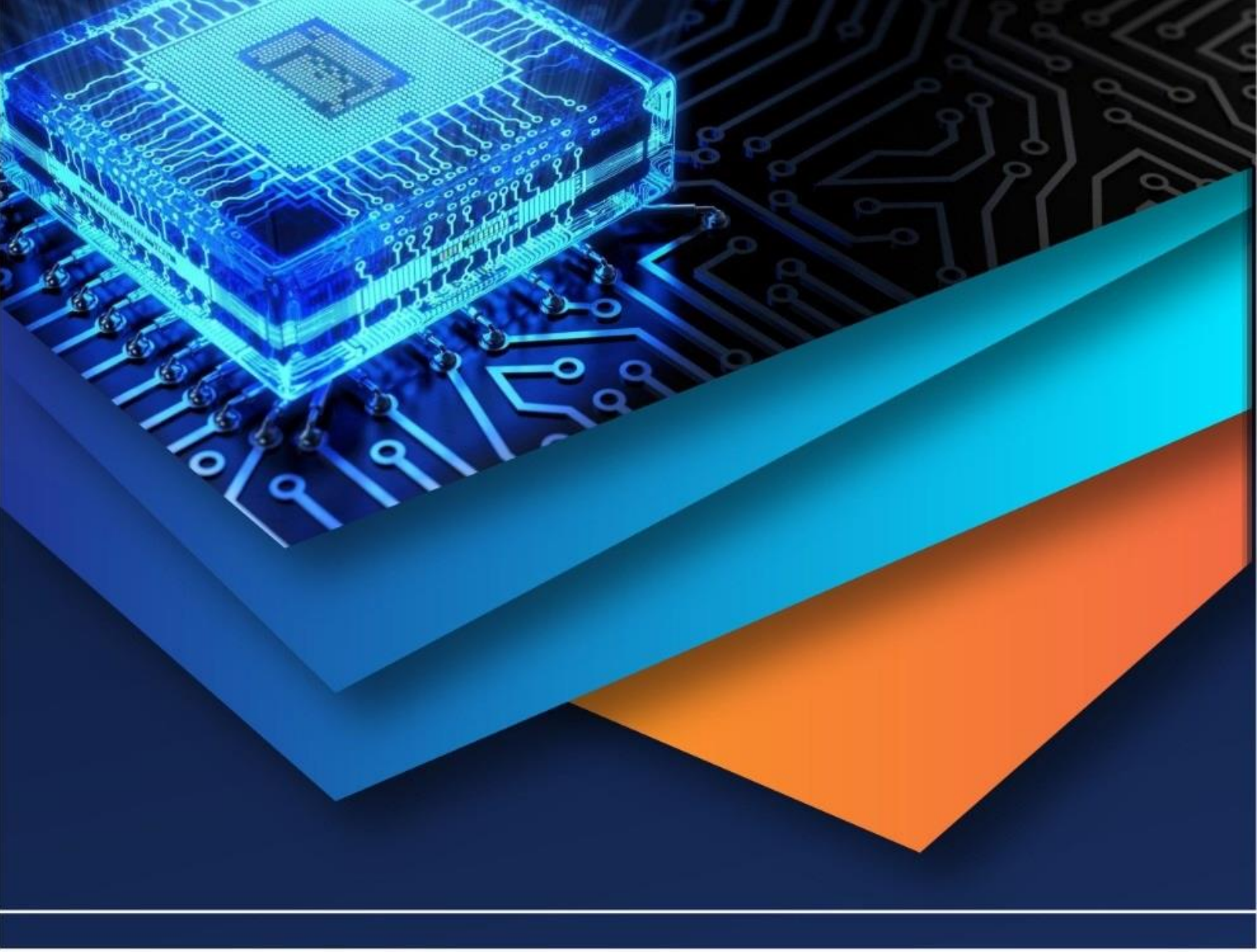

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