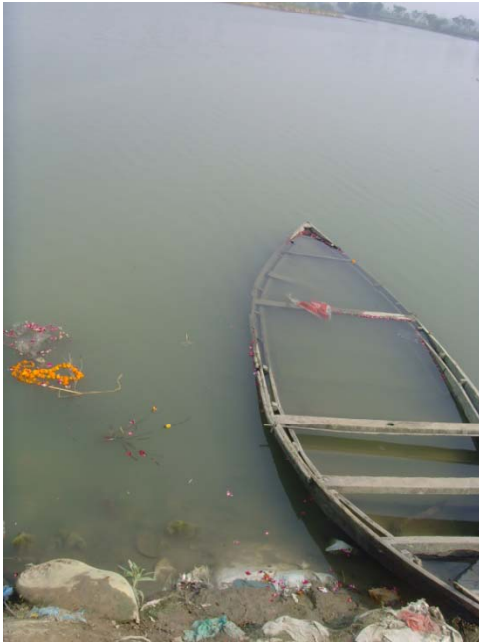
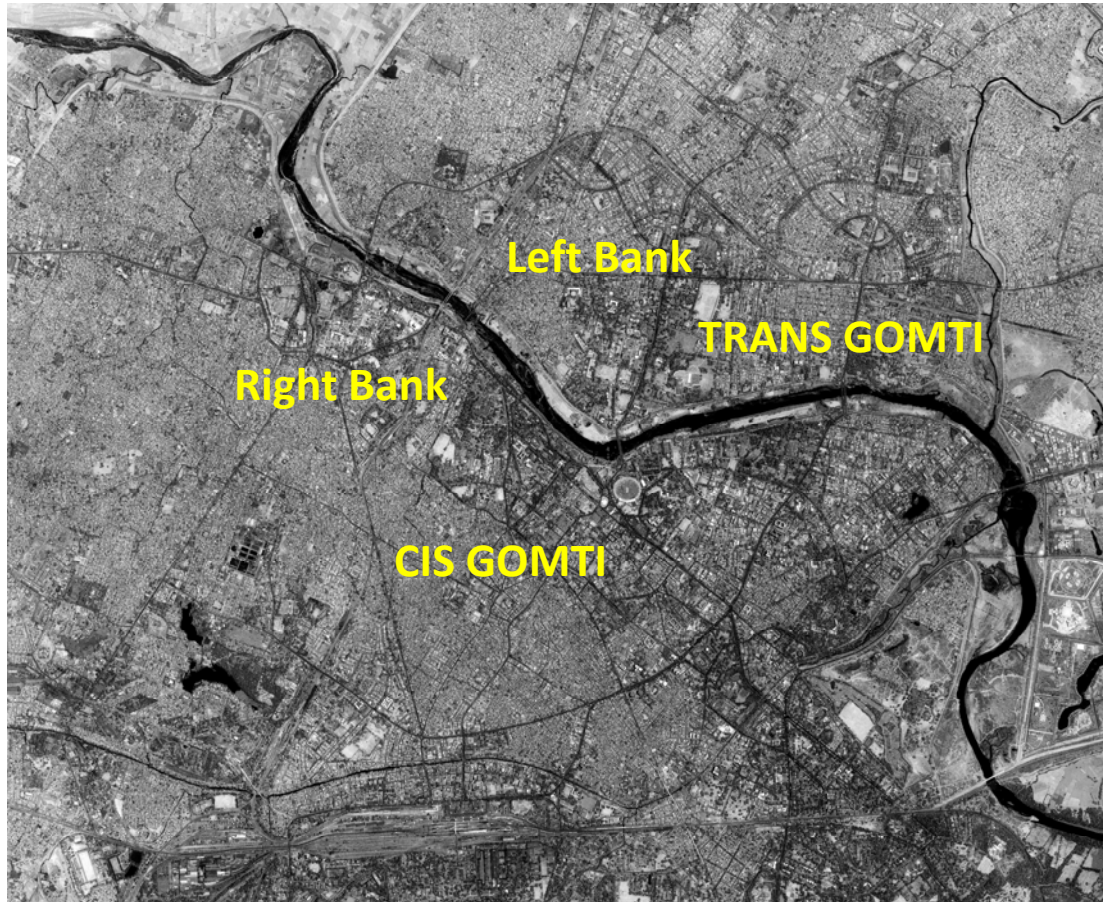


Study on performance evaluation of STPs in Lucknow and Issue of wastewater sustainability



REGIONAL WORKSHOP
**‘Sustainable Water and Sanitation: Best management
Practices –
Potential and Challenges’**
May 1, 2013

Dr. Venkatesh Dutta
School for Environmental Science (SES)
Babasaheb Bhimrao Ambedkar (Central) University
Lucknow (UP)



Around 85% of the land-area of Lucknow City is situated on the Central Ganga alluvial plain, and stretches across both banks of the Gomti River

- Gomti River flows from **NW to SE** through the heart of the city.
- Cis-Gomti side are comparatively **lower** than the areas on Trans- Gomti side.
- 26 drains join the river, 14 drains from cis-Gomti and 12 drains from trans-Gomti side.
- Out of 14 cis-Gomti side drains, **12 drains are located in the upstream** and 2 are located into downstream of Barrage.
- All of the 12 Trans-Gomti drains merge into river Gomti in the upstream of Barrage.

Gross available water supply of about 490 MLD – of which around 240 MLD is derived from up to 500 tube wells and 250 MLD from river Gomti.



Private groundwater use

There is no inventory or systematic assessment of the scale of private residential groundwater use –

It has been estimated that around 1500 tube wells are in operational across Lucknow District by commercial, industrial and institutional water users (although only a few extract more than 10 MLD).

Wastewater generation:

- The combined discharge of the 26 drains was estimated for the year 2004 as **390 MLD**
- Currently it is estimated to be in the range of **425 - 450 MLD.**
- This does not include areas which are not connected by sewerage systems.

Approach in the past

- 1930s – 1980s: collect the sullage / sewage through branch and trunk sewers and carry it through pumping mains to a sewage farm outskirts of Trans-Gomti Area in D/S of the town.
- Sewage farm has been converted into housing colonies (Gomti Nagar)

2001 – 2010: 1:10

- The river is hardly able to dilute the incoming sewage/sullage of the city by 10 times resulting in a steep rise in bacterial count (about 2.5×10^7 / 100 ml against the maximum prescribed limits of 5000 counts per 100 ml). 250000000

GENERAL LAYOUT ARRANGEMENT FOR GOMTI POLLUTION ABATEMENT OF RIVER GOMTI AT LUCKNOW

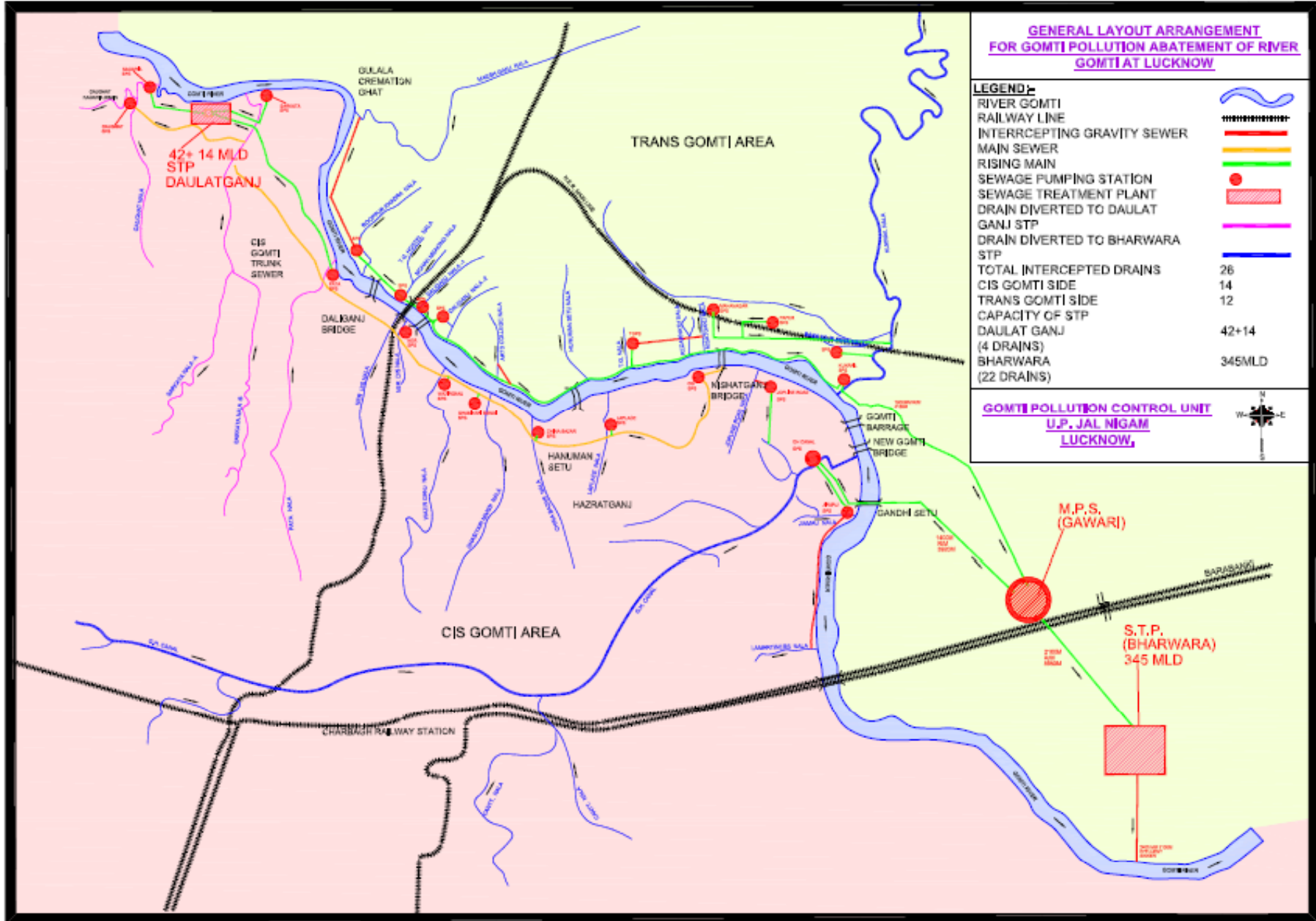
LEGEND:-

- RIVER GOMTI
- RAILWAY LINE
- INTERCEPTING GRAVITY SEWER
- MAIN SEWER
- RISING MAIN
- SEWAGE PUMPING STATION
- SEWAGE TREATMENT PLANT
- DRAIN DIVERTED TO DAULAT GANJ STP
- DRAIN DIVERTED TO BHARWARA STP
- TOTAL INTERCEPTED DRAINS
- CIS GOMTI SIDE
- TRANS GOMTI SIDE
- CAPACITY OF STP
- DAULAT GANJ
- BHARWARA



26
14
12
42+14
(4 DRAINS)
345MLD

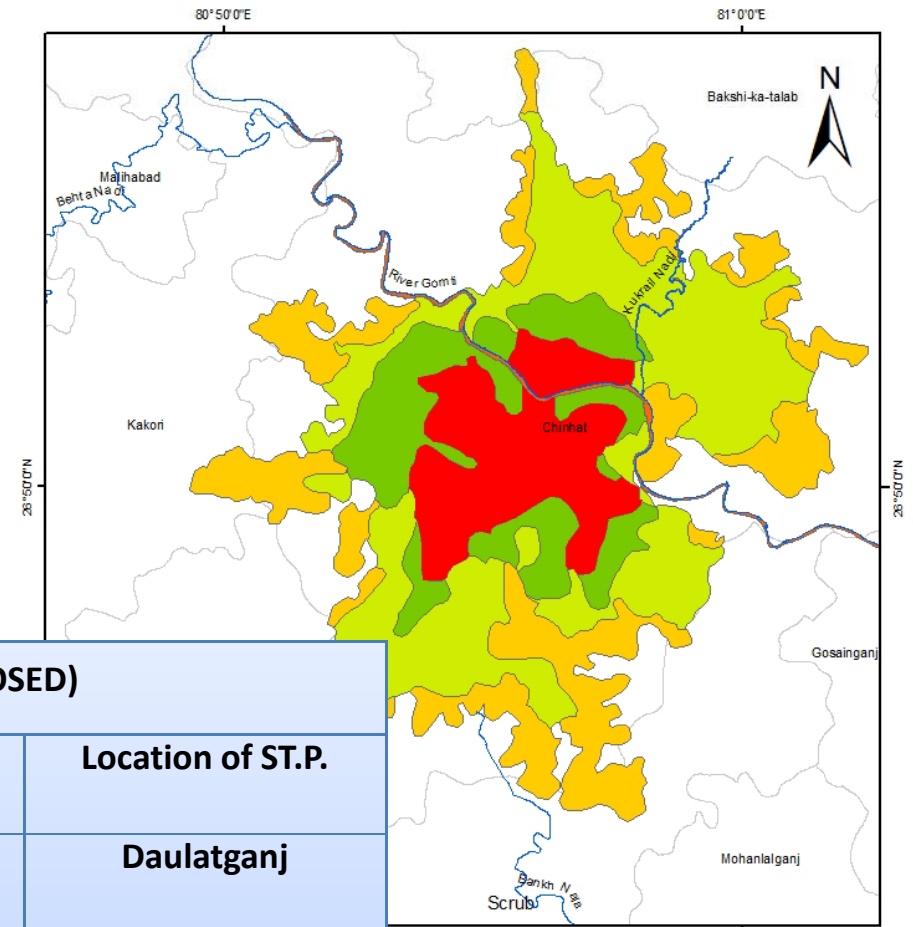
**GOMTI POLLUTION CONTROL UNIT
U.P. JAL NIGAM
LUCKNOW,**



Existing Sewerage Status

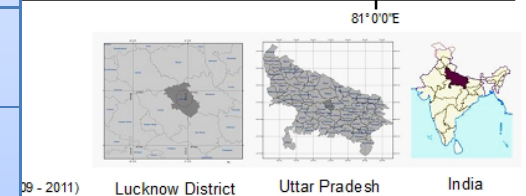
Population	Lucknow City	
Census 2001	21.86	Lacs
Census 2011	28.13	Lacs
Design Population (2025/2040)	42.43/64.22	Lacs
Area of the ULB	340	Sq. Km
Sewerage Generation (Yr. 2010 /2040)	344/787	MLD
Existing Sewerage System		
Length of Sewer	1950	Km
SPS (Nos)	30	Nos.
STP (Nos/Cap)	2/401	MLD
Status of STP	Working	

Map showing Urban Sprawl for Lucknow City : Year 1972 to 1992



DISTRICT	POPULATION		
	2010	2025	2040
I	2,87,335	4,48,634	5,65,069
II	2,25,975	4,42,125	8,84,500
III	11,75,418	18,46,926	28,24,286
IV	11,14,272	15,05,315	21,48,145
TOTAL	28,03,000	42,43,000	64,22,000

DISTRICT	WORKS (EXISTING & PROPOSED)			
	Sewer	SPS	STP	Location of ST.P.
I	Complete Network	1	42+ 14 MLD	Daulatganj
II	Complete Network	1	108 MLD	Khwajapur
III	Complete Network	3	345 MLD	Bharwara
IV	Complete Network	2	270 MLD	Mastemau
		Total	779 MLD	



DISTRICT	WORKS (EXISTING & PROPOSED)			
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III	Complete Network	3	345 MLD	Bharwara
IV	Complete Network	2	270 MLD	Mastemau
		Total	779 MLD	

<p>Estimated Cost as per C.D.P. (Rs. Crore)</p> <p>Capital cost: About 4 million Rs per MLD of treatment capacity</p>	:	District – I	222.86
		District – II	475.71
		District – III	428.80
		District – IV	927.26
		Sub Total	2054.63
		Contingency @ 3%	61.64
		Total	2116.27

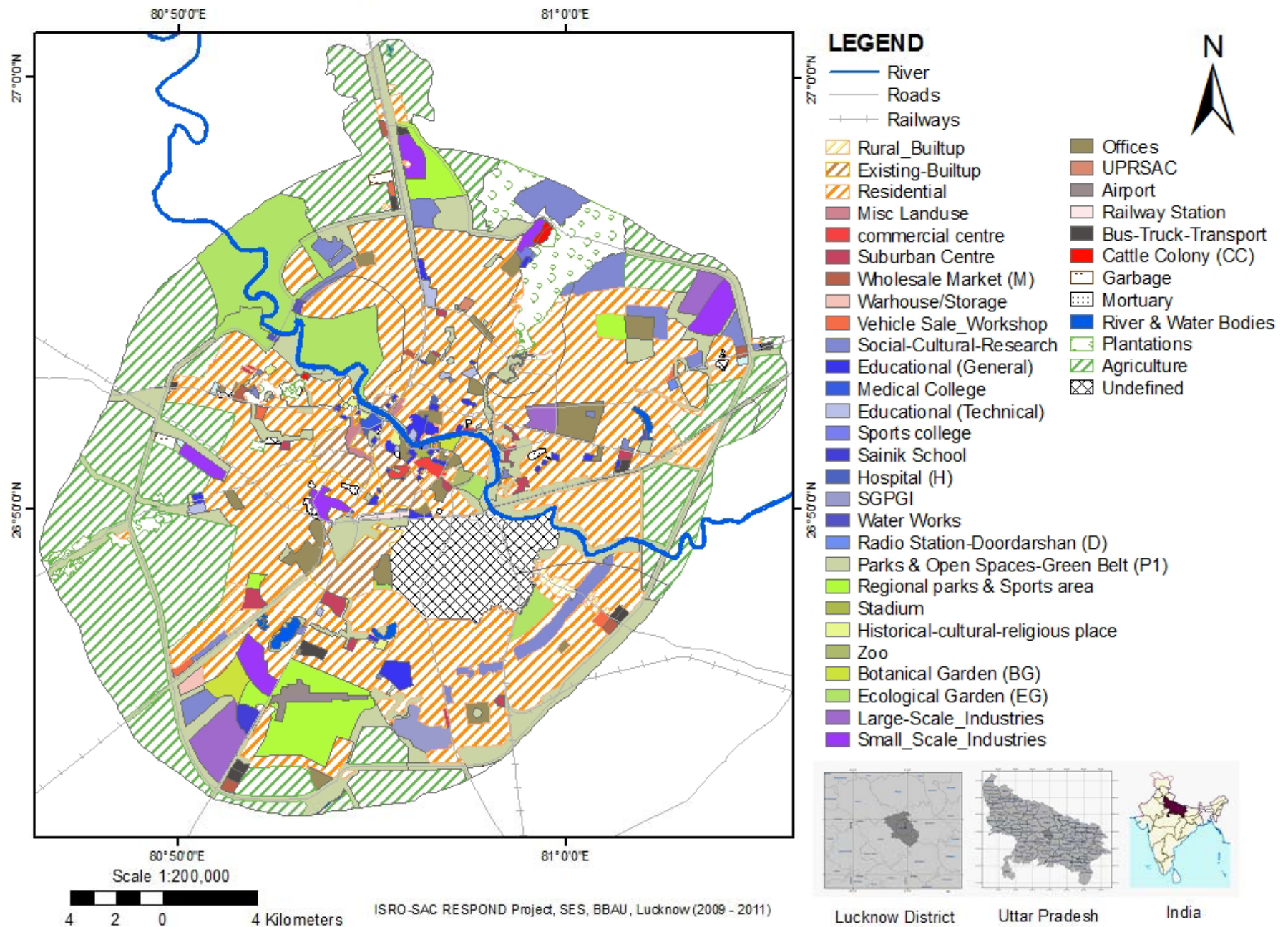
Operational STPs

STP	Capacity	Technology	Drains	Length of trunk and branch sewer lines
Daulatganj STP	42+14 = 56 MLD	FAB	Wastewater from Gaughat, Sarkata, Pata, Nagaria - treated wastewater is discharged in Gomti river through Sarkata Nala	339 km
Bharwara STP	345 MLD	UASB		860 km
	401 MLD			

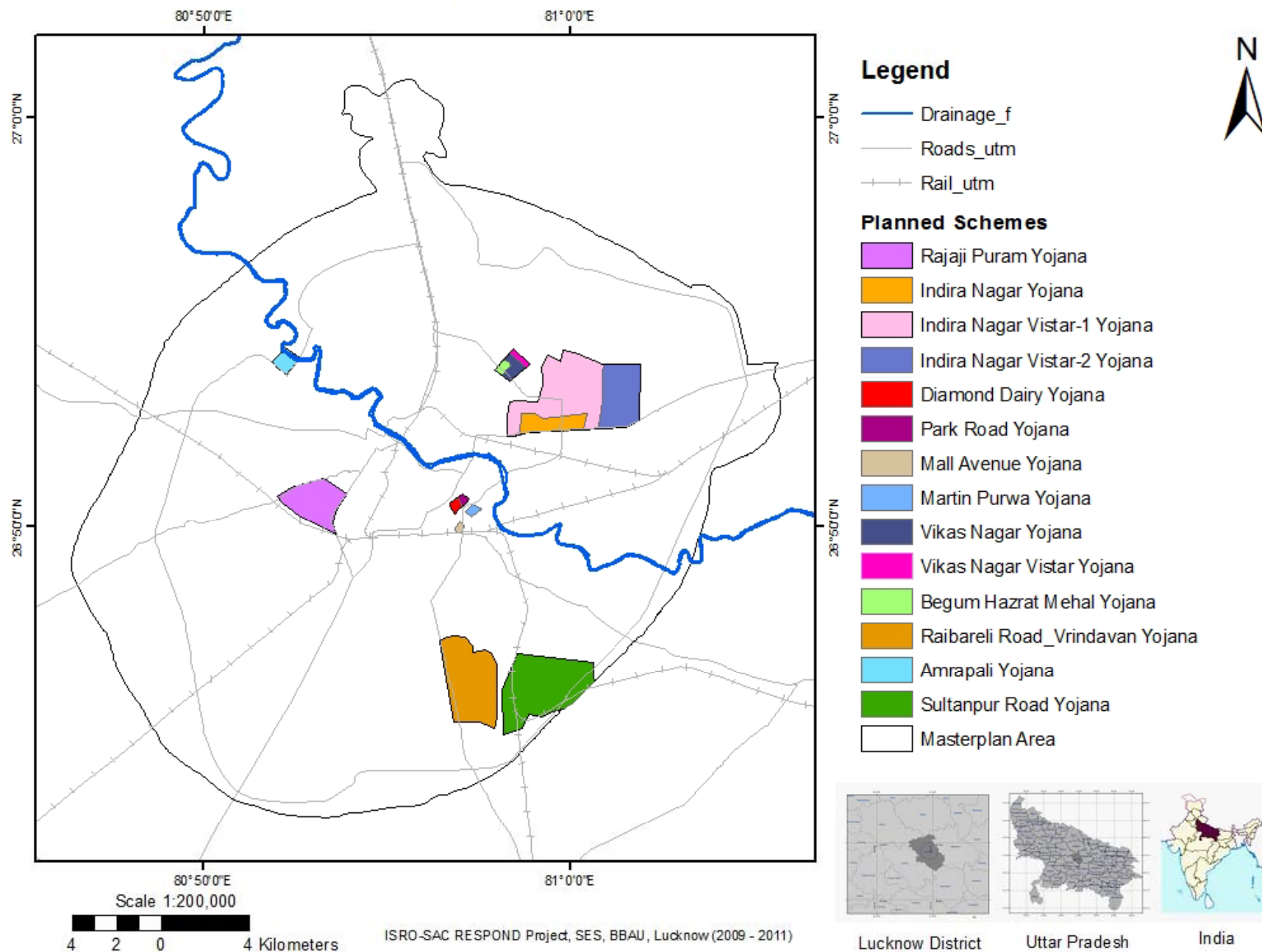


Aerial View of 345 MLD STP (UASB) at Bharwara

Map showing the Proposed Lucknow City Master Plan 2021



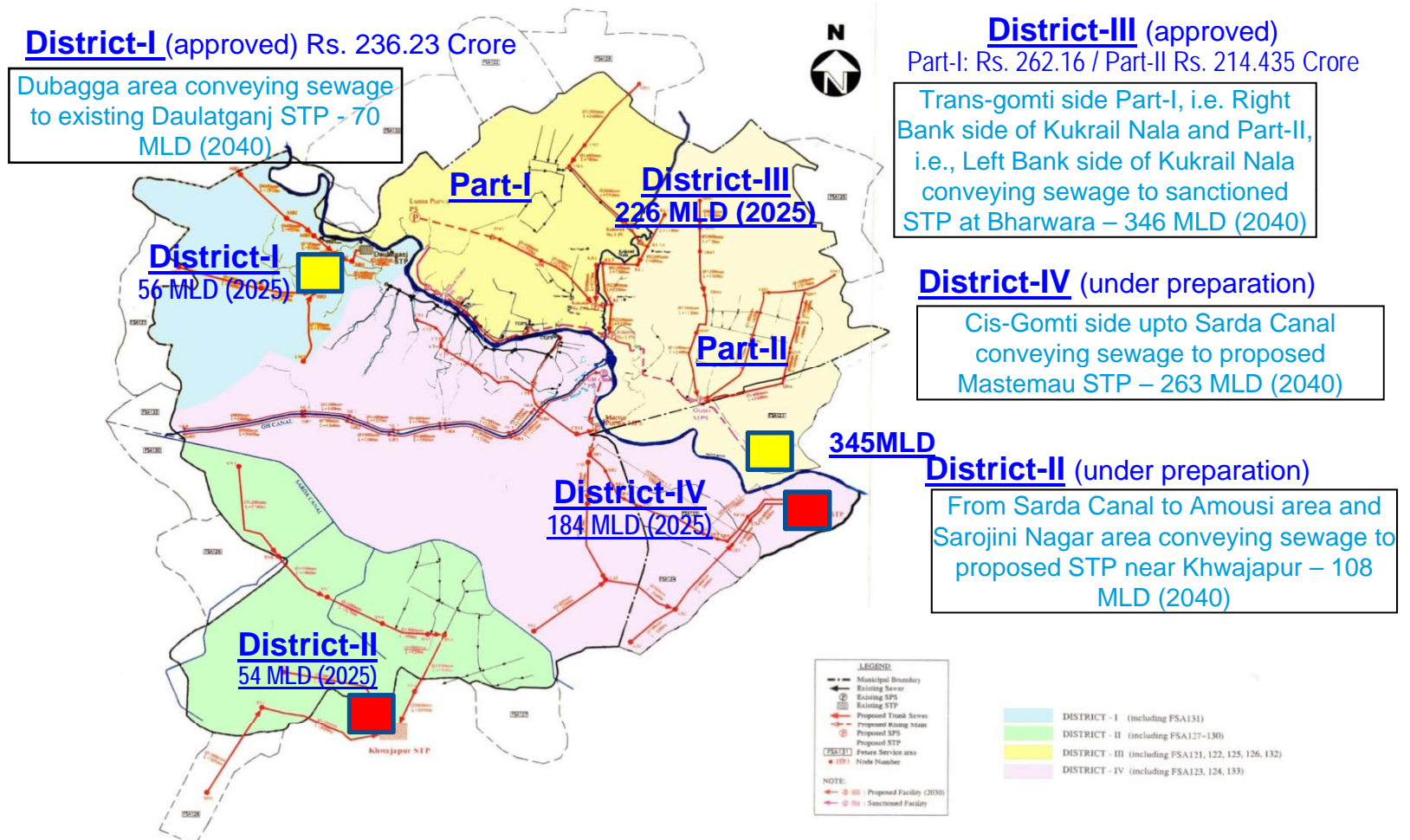
Map showing the Avas-vikas planned Schemes for Lucknow City Master Plan 2021



Sewerage Districts

- The overall sewerage scheme consists of 4 separate Sewerage Districts each with its own (planned) treatment plant:
- **District I** : Chowk, Hardoi Road, Cambell Road and Dubagga etc. area conveying sewage to existing **Daulatganj STP**
- **District II** : Amausi area and Sarojini Nagar area conveying sewage to proposed **Khwajapur STP**
- **District III** : Total Trans-Gomti side including Indira Nagar, Gomti Nagar and Sitapur road areas conveying sewage to **Bharwara STP** which is sanctioned under Gomti Action Plan Phase-II and in process of construction.
- **District IV** : Cis Gomti side conveying sewage to proposed **Mastema STP**

Lucknow Sewerage Master Plan



Districts	Location	STP	Waste Water Generation/Proposed Capacity of STP in MLD		
			Base year 2010	Middle year 2025	Design year 2040
District I	East	Daulatganj STP	36	55/56	70/70
District II	South	Khwajapur STP: near south/east of the Airport	28	54/54	108/108
District III		Bharwara STP: left bank of the Gomti River (Trans side)	144	226/230	346/345
District IV		Mastemau STP: right bank of Gomti River (Cis-Side)	136	184/180	263/270
Total			344	519/520	787/793

Bharwara STP

Parameters	Inlet	Outlet	% Removal
pH	7.5	7.8	---
EC	1.07	1.05	1.86
TS	970	750	22
TDS	566	502	11.30
TSS	360	66	81.66
Alkalinity	490	447.5	8.67
Nitrate	105.56	33.07	68.67
Nitrite	0.2174	0.09212	57.63
Total Hardness	72	57.6	24.21
Chloride	77.97	76.97	1.28
Phosphate	2.7	1.4	48.14
DO	---	3.65	---
BOD	180	42	76.6
COD	320	122	61.87
Sulfate	78.72	64.41	18.17



Daulatganj STP

Parameters	Inlet	Outlet	% Removal
pH	7.4	7.7	---
EC	1.10	1.06	3.63
TS	980	796	18.77
TDS	680	495	27.20
TSS	318	47	85.22
Alkalinity	467.5	415	11.22
Nitrate	38	35	7.89
Nitrite	0.1380	0.0323	76.59
Total Hardness	76	54	28.94
Chloride	111.65	110.46	1.063
Phosphate	2.9	1.5	48.27
DO	1.8	6.43	---
BOD	94	20	78.72
COD	240	72	70
Sulfate	68.34	63.72	6.76



	May 2012		
	Inlet	Outlet	Std. Uncertainty (±)
DO	0.00	6.4	---
BOD	90.0	16.0	20.4
COD	204.7	27.6	4.06
TSS	100.0	48.0	0.345

	June 2012		
	Inlet	Outlet	Std. Uncertainty(±)
DO	0.00	6.5	---
BOD	90	23.0	20.4
COD	148.8	64.0	4.06
TSS	56.0	40.0	0.345

	August 2012		
	Inlet	Outlet	Std. Uncertainty(±)
DO	0.8	6.2	---
BOD	85	29	20.4
COD	196	82.3	4.06
TSS	126.0	48.0	0.345

	September 2012		
	Inlet	Outlet	Std. Uncertainty(±)
DO	0.00	6.0	---
BOD	87.5	28	20.4
COD	189.9	89.15	4.06
TSS	146.0	62.0	0.345

Some issues....



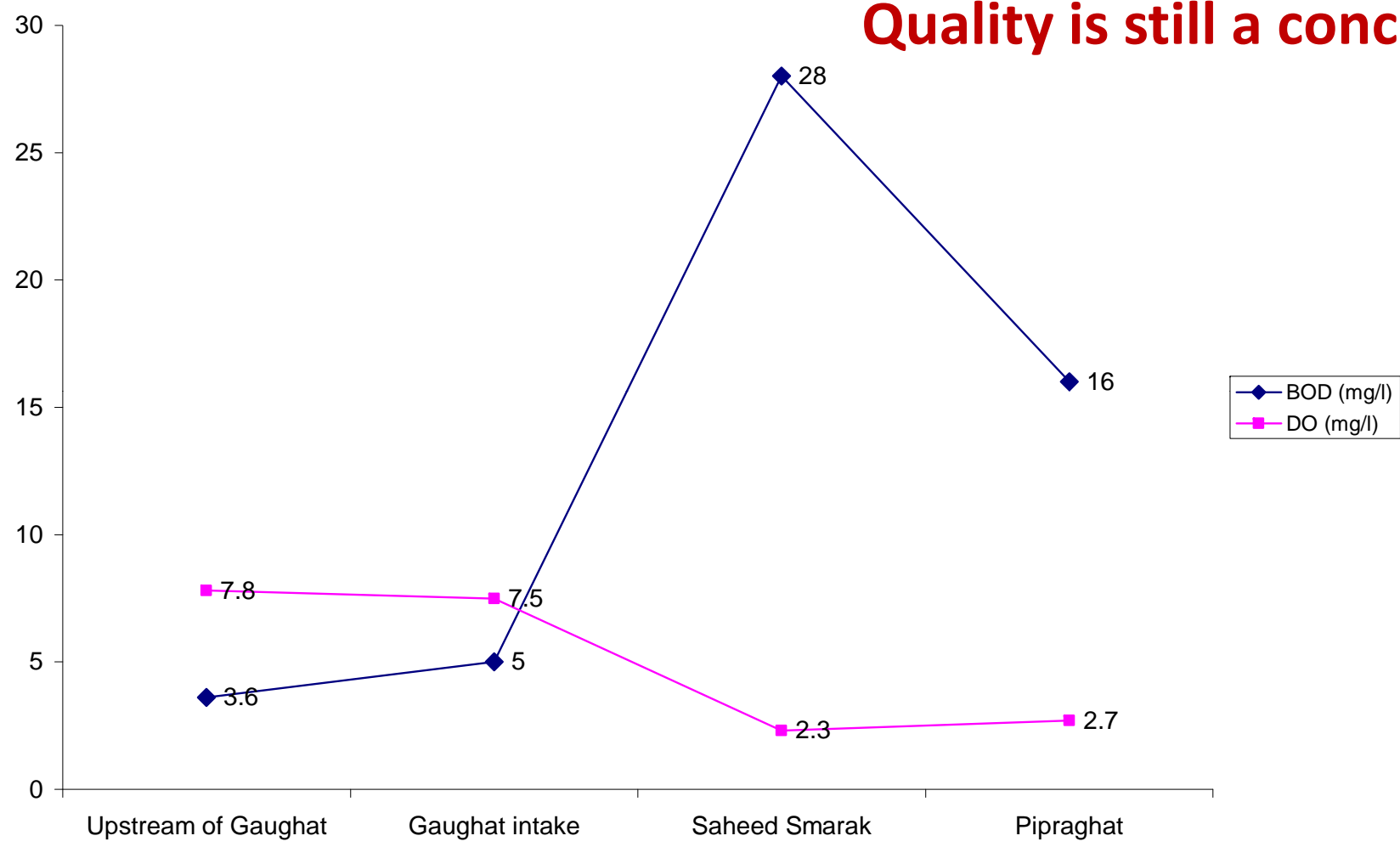
Location of the barrage

- The Gomti barrage constructed at downstream end of the town impounds most of the sewage entering the river. This also stops the river from flowing.



BOD-DO Profile in Lucknow

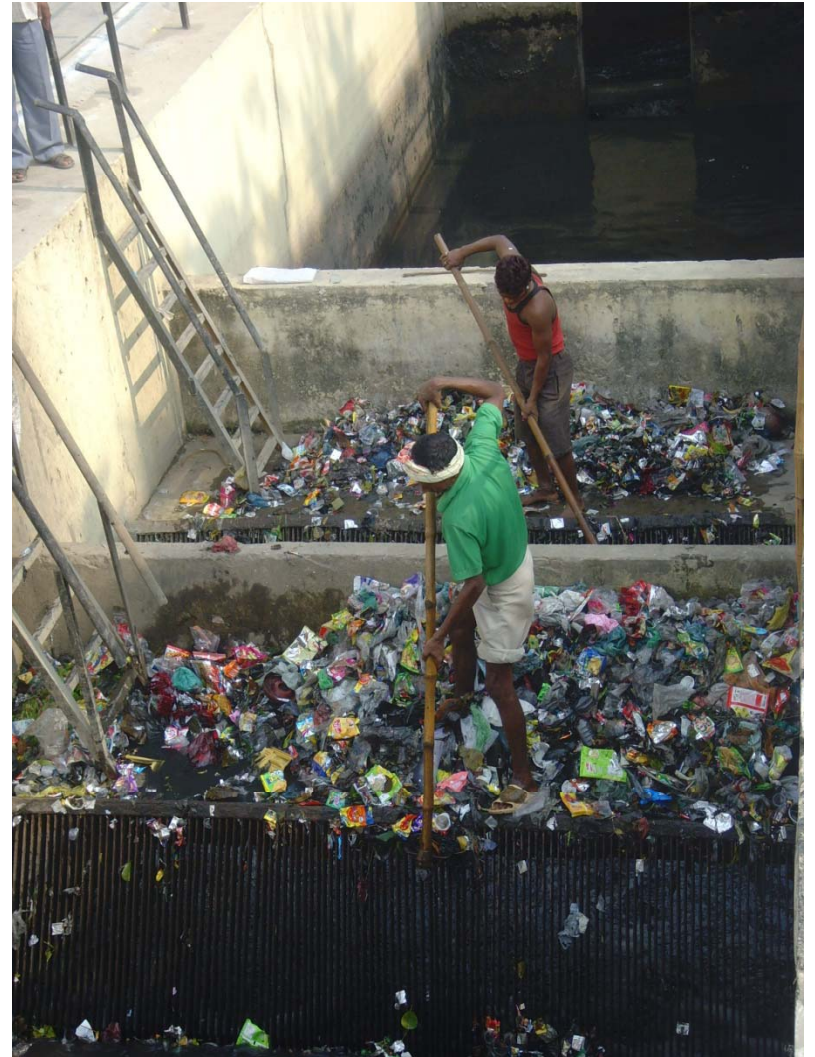
Quality is still a concern



DO-BOD profile in Lucknow stretch of the Gomti River



- No feasible mechanism of stopping wastes going to the drains
- A lot of silt and debris go into the sewer system which is detrimental to its life and proper function.



Removal of solid wastes from the drain at the pumping station is still manual



Sewage is by-passed to River Gomti when PS doesn't work, or when flow exceeds



Most of the branch and old trunk sewers have become defunct – natural drains are used as carriers of wastewater.



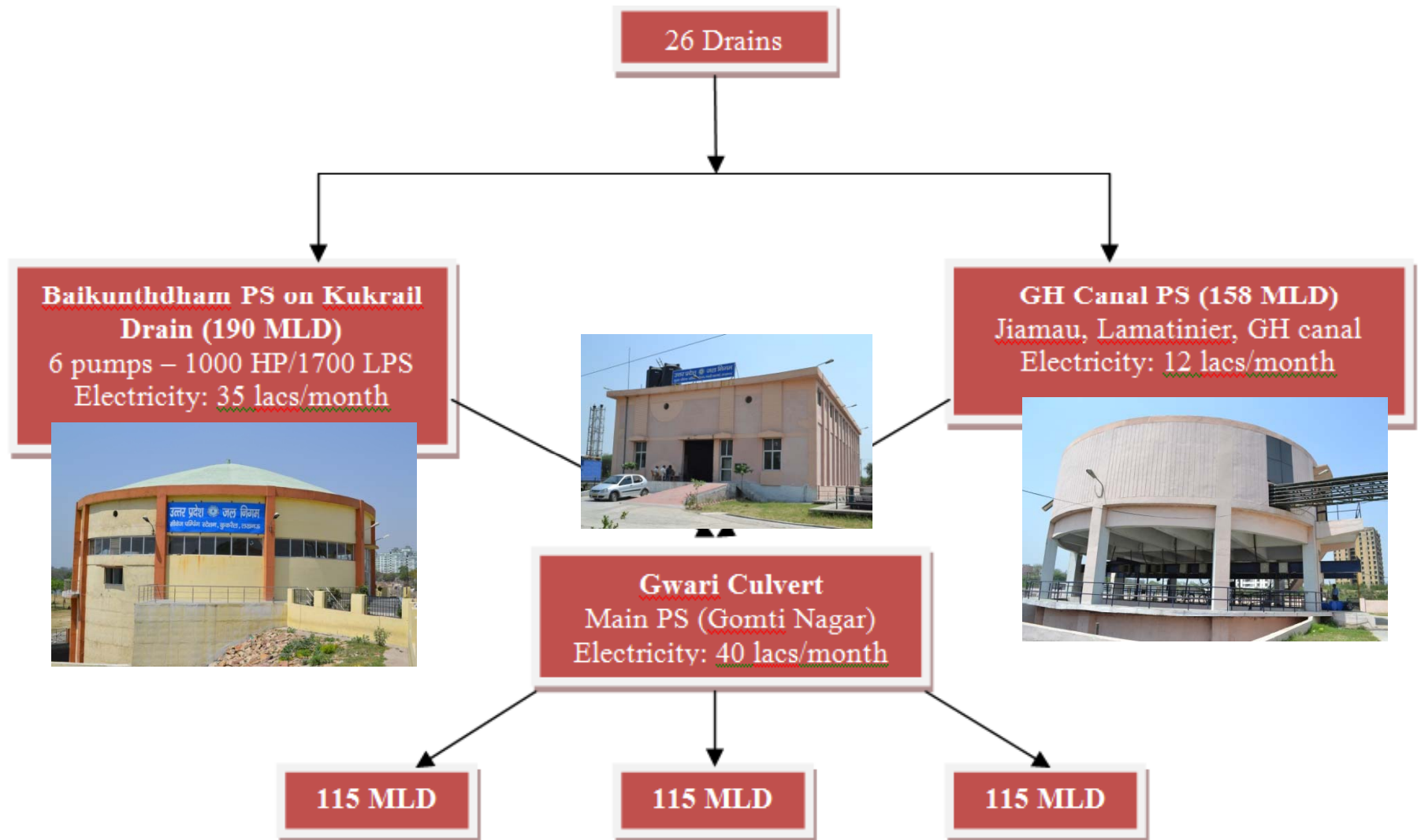
400 m³/hr of methane production at Bharwara STP: still not a reality!



Treated wastewater from Bharwara STP is disposed into river Gomti. It can be disposed into Indira canal for Irrigation.

- Large quantities of storm water causes flooding and hydraulic overloads at treatment plants.

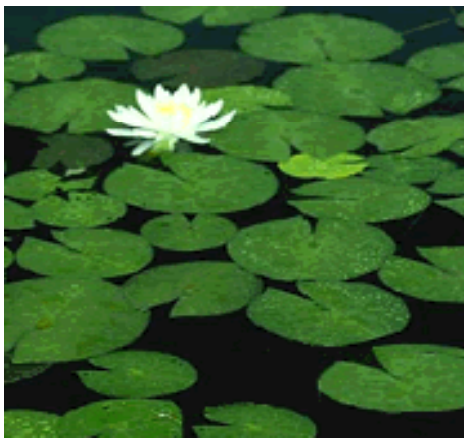




- What about decentralized wastewater treatment systems?
 - STP of less than 5 to 25 MLD at the outfall of the drains
 - At the colony level for the new settlements



Thank you



dvenks@gmail.com

- The total project cost for the overall projects is estimated at Rs. 2054.63 crore with the bulk of investments proposed in Phase 2 of the JNNURM.
- There is a provision of Rs. 625.97 Crores in Phase-I (2006-11) and Rs. 1428.67 Crores in Phase-II (2012-2031) of City Development Plan of Lucknow.