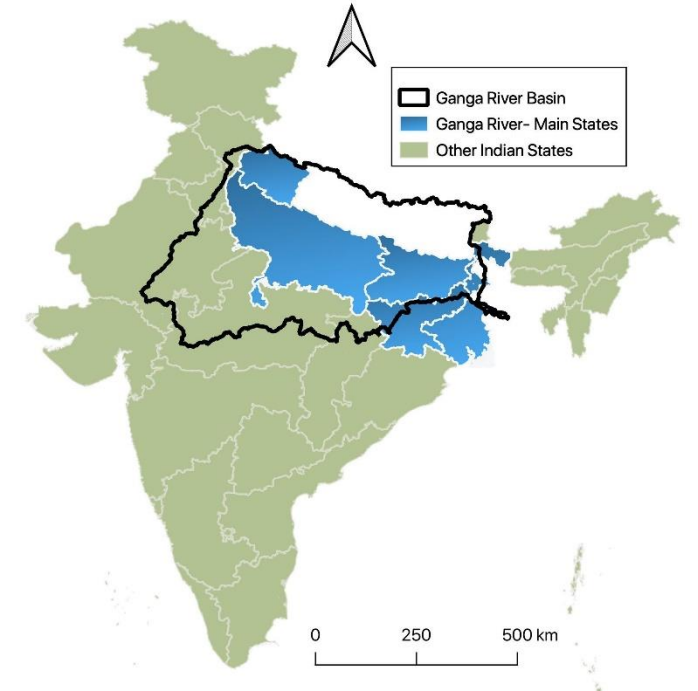


# MAKING WATER SENSITIVE CITIES IN GANGA BASIN AIMED AT IMPROVING RIVER HEALTH/FLOWS

**Co-treatment of septage and sewage**

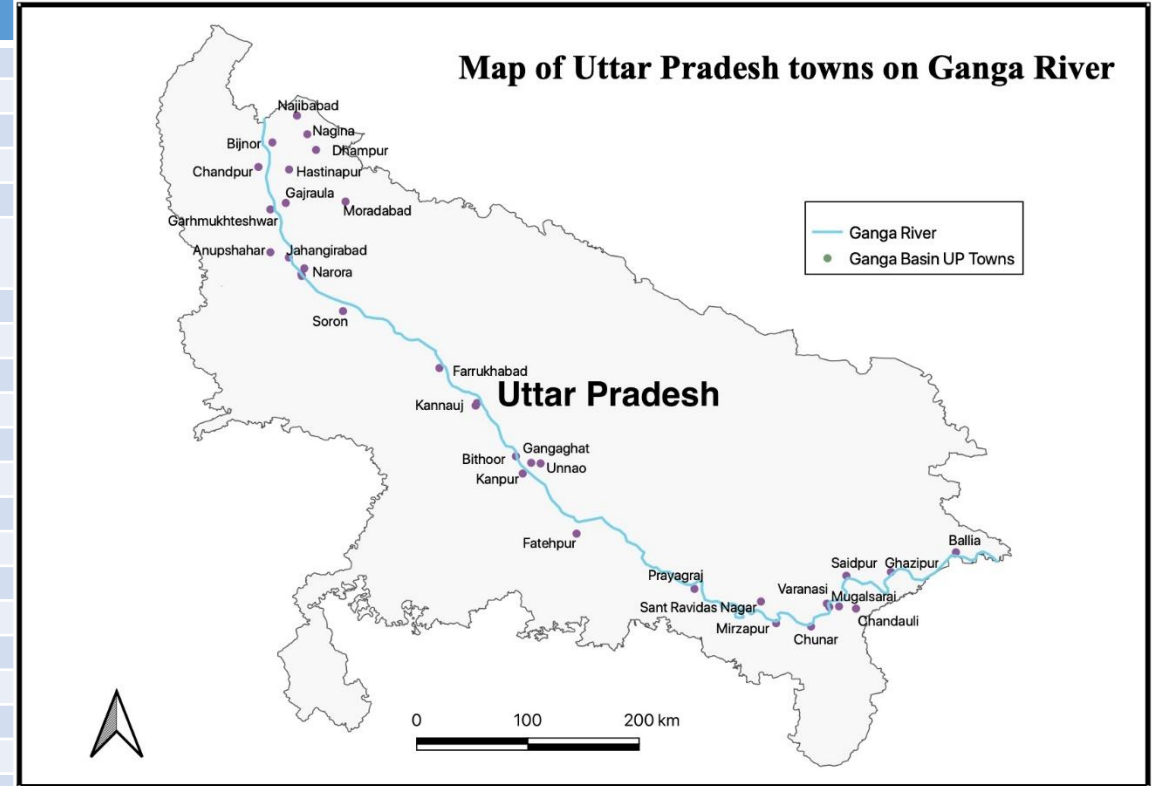
**A research report on feasibility of co-treatment in 31 Ganga Basin priority towns in  
Uttar Pradesh**

- Introduction of the Study area: Ganga Basin Priority Towns
- Objective and Research Methodology
- Why co-treatment of Faecal Sludge with Wastewater?
- Status of sewage and sanitation infrastructure in the towns
- Assessment of Co-treatment potential in the cities having STPs
- Septage treatment in the cities with existing or proposed FSTPs and Co-treatment – Viability check
- Septage treatment in the cities with no existing or proposed STP, FSTP and Co-treatment
- Conclusion and way forward



# Introduction of the Study area: Ganga Basin Priority Towns

S.N o.	Priority Towns	Type of Town	Class of town	District
1	Mughal Sarai	NPP	I	Chandauli
2	Fatehpur	NPP	I	Fatehpur
3	Kannauj	NPP	II	Kannauj
4	Gangaghat	NPP	II	Unnao
5	Najibabad	NPP	II	Bijnor
6	Gajraula	NP	II	Jyotiba Phule Nagar
7	Nagina	NPP	II	Bijnor
8	Chandpur	NPP	II	Bijnor
9	Dhampur	NPP	II	Bijnor
10	Jahangirabad	NPP	II	Bulandshahar
11	Bhadohi	NPP	II	Sant Ravidas Nagar
12	Saidpur	NP	III	Ghazipur
13	Soron	NPP	III	Kanshiram Nagar
14	Hastinapur	NP	III	Meerut
15	Bithoor	NP	IV	Kanpur Nagar
16	Babralla	NP	IV	Budaun
17	Chunar	NPP	III	Mirzapur
18	Farrukhabad	NPP	I	Farrukhabad
19	Ghazipur	NPP + OG	I	Ghazipur
20	Ballia	NPP	I	Ballia
21	Bijnor	NPP	II	Bijnor
22	Ramnagar	NPP	III	Varanasi
23	Unnao	NPP	I	Unnao
24	Garhmukhteshwar	NPP	III	Ghaziabad
25	Narora	NP	III	Bulandshahar
26	Moradabad (Ramganga)	M Corp	I	Moradabad
27	Anupshahar	NPP	III	Bulandshahr
28	Mirzapur	NPP	I	Mirzapur
29	Varanasi	M Corp.	I	Varanasi
30	Allahabad	M Corp. + OG + CB	I	Allahabad
31	Kanpur	M Corp. + OG + CB	I	Kanpur Nagar



# Introduction of the Study area: Ganga Basin Priority Towns

Category of town	No of towns	Total population	Estimated septage KLD
Class 1 (Population above 1 lakh)	10	8575779	923.4
Class II (50,000 to 100,000 population)	11	1110828	230.4
Class III (20-50,000 population)	8	315271	48.8
Class IV (10-20,000 population)	2	35497	7.5
<b>TOTAL</b>	<b>31</b>	<b>10037375</b>	<b>1210.1</b>

**Total population-** 84,57,577 (increase by 51% since 2011)

**Wastewater generation-** 1084 MLD (2021)

**Septage generation-** 1200 KLD (2021) Conservative figures calculated by using the back calculation of population not connected to sewerage network.

FS generation = Population \* Sludge Accumulation rate;

Sludge Accumulation Rate=0.00021/capita/day for Septic tanks.



- **Stage- 1-** Assessment of sewage and septage treatment capacity in the town: Primary survey, secondary research, literature review.
- **Stage-2-** Post analysis of gaps and opportunities, pre-feasibility study for co-treatment of faecal sludge
- **Stage-3-** The cities which already have co-treatment / FSTP proposed or present were analyzed further whether the proposed or existing FSTP/ co-treatment infrastructure is sufficient to treat the septage of the city and is the STP has enough gap to accommodate the proposed co-treatment.
- **Stage -4-** Assessment of solution for the towns without any sewage and septage treatment facility in the existing or proposed phase.
  - i. To understand the cities profile; Demography; water supply, Wastewater (WW) & Faecal Sludge generation highlighted the need for FSM.
  - ii. Data was collected by SLBs and sanitation profile of cities. Also Key informant Interviews(KIIs), Focused Group Discussions (FGD) & field observations were conducted
  - iii. A detailed checklist, to evaluate STPs by collecting technical and operational data used to collate necessary information on existing infrastructure.
  - iv. STPs analyzed for operational, non –operational, complying and non-complying.
  - v. Designed and operational hydraulic, solids and organic loads were calculated to find out the gap loading for septage management.
  - vi. Calculation of co-treatment potential based on hydraulic loading and organic loading.
  - vii. Post analysis feasibility study to find out the cities where co-treatment can be done in the existing STPs.
  - viii. Viability check for the proposed FSTPs and co-treatment
  - ix. Solution for the towns having no sewage- septage treatment infrastructure.



# Why co-treatment of Faecal Sludge with Wastewater?

AAETI

- Co-treatment is a treatment process where Sewage Treatment Plant (STP) having idle hydraulic, organic and solids capacity, also treats the faecal sludge and septage emptied through onsite sanitation systems in addition to treating the domestic sewage transported through a sewerage network of the city.
- It is also an important treatment method to achieve the SDG 6.2 target to access of adequate and equitable sanitation and hygiene for all.
- Co-treatment is an essential component to achieve the goal of citywide sanitation.
- SBM 2.0 mandates for the towns/ those parts of town not covered with sewer network to have in place adequate mechanism for faecal sludge treatment.
- Co-treatment can be done by utilizing existing STPs, with or without retrofits, or in the new STPs being designed to co treat sludge.



# How sewage and septage/fecal sludge are different and how the addition of septage in a STP can affect the performance of STP?

Item	Type 'A' (Fresh FSS)	Type 'B' (Partially Digested FSS)	Sewage
Example	Public toilet or bucket latrine sludge	Septage	Tropical sewage
COD (mg/l)	20,000–50,000	<15,000	500–2,500
COD/BOD	2:1–5:1	5:1–10:1	2:1
NH <sub>4</sub> -N (mg/l)	2,000–5,000	<1,000	30–70
TS (mg/l) (%)	≥ 3.5	< 3	< 1
SS (mg/l)	≥ 30,000	≈ 7,000	200–700
Helm. eggs, (no./l)	20,000–60,000	≈ 4,000	300–2,000

(adapted from Heinss et al., 1998)

In comparison to sewage, faecal sludge and septage is generally much more concentrated than sewage which is around 10–100 times higher in solids content, Bio Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrogen, Pathogens, particularly helminths, Fats, oils and grease, inorganic content (silt, sand and grit), garbage/ solid waste etc.



# Data requirement to assess the co-treatment feasibility

## a. Characteristics of the STP

- Designed and operational hydraulic loading of the STP
- Designed and operational COD loading of the STP
- Designed and operational solids loading of the STP
- Gap hydraulic, COD and solids loading available to treat septage
- Current STP performance in terms of influent sewage parameters and effluent sewage parameters The STP should be meeting the effluent standards.
- Technology of the STP

## b. Characteristics and future prospect of the catchment of the STP

- Current sewage flows (daily, peak)
- Projection of sewage flows over planning period
- Characteristics of sewage

## c. Characteristics and future prospect of the sludge catchment for sludge to be co-treated at the STP

- Total estimated sludge to be treated (annual, daily, hourly)
- Quantity of septage/ faecal sludge
- Quality of septage/ faecal sludge





# Status of sewage and sanitation infrastructure in the towns

S.No.	Description	Name of towns	Nos of towns
1	No of towns without any treatment facility	Mughal Sarai, Gangaghat, Nazibabad, Gajraula, Nagina, Chandpur, Dhampur, Jahangirabad, Bhadohi, Saidpur, Soron, Hastinapur, Babrala	13
2	No of towns with treatment facility (FSTP/STP) proposed/existing	Chunar, Farrukkabad, Ghazipur, Ballia, Bijnor, Ramnagar, Unnao, Garhmukhteshwar, Narora, Moradabad (Ramganga), Anupshahar, Mirzapur, Varanasi, Allahabad, Kanpur, Bithoor	18

Typology	No. of ULBs
I	1
II	8
III	3
IV	1

## Summary of the existing/ proposed sewage and/or septage treatment infrastructure

S. No.	Description	Name of towns	No of towns
1	Towns without any treatment facility	Mughal Sarai, Gangaghat, Nazibabad, Gajraula, Nagina, Chandpur, Dhampur, Jahangirabad, Bhadohi, Saidpur, Soron, Hastinapur, Babrala	13
2	Towns with existing STP's	Kannauj, Farrukkabad, Bijnor, Ramnagar, Garhmukhteshwar, Narora, Moradabad (Ramganga), Anupshahar, Mirzapur, Varanasi, Allahabad, Kanpur, Bithoor	13
3	Towns with treatment facility (FSTP/Co-treatment/STP) proposed/existing	Chunar, Farrukkabad, Ghazipur, Ballia, Bijnor, Bithoor, Ramnagar, Unnao, Garhmukhteshwar, Narora, Moradabad (Ramganga), Anupshahar, Mirzapur, Varanasi, Allahabad, Kanpur	18
4	Towns with their first proposed STP's	Ballia, Gazipur, and Unnao	4
5	Towns with FSTP (existing)	Chunar, Farrukhabad, Unnao and Moradabad	4
6	Towns with proposed STPs	Farrukkabad, Ghazipur, Ballia, Unnao, Moradabad (Ramganga), Mirzapur, Varanasi, Allahabad, Kanpur	9
7	Towns with proposed FSTPs	Fatehpur	1
8	No of towns with co-treatment	Bijnor	1
9	No of towns with proposed co-treatment	Ghazipur, Balia, Mirzapur, Kanpur, Varanasi, Prayagraj	6



# Status of sewage and sanitation infrastructure in the towns

Status of STPs	No.
Completed + Under construction	59
Completed	36
Completed but not operational	4
Operational but not complying to CPCB norms	9*
Not considered for the study	2 (Narora and Bithoor)

1. Selected 30 operational STPs were considered for assessing co-treatment potential.
2. Based on the design parameters and actual input parameters, the gap assessment was carried out for hydraulic loading, organic loading and solids loading.

# Assessment of Co-treatment potential in the cities having STPs

AAETI

S. No.	Name of the town	STP	Quantity of FS that can be co-treated	Septage generation	Remarks
1	Bijnor	Khedki	183	23	Co-treatment operational
2.	Moradabad	Hanuman murti ,Gulabbadi, 58 MLD	334	96	Co-treatment possible
3.	Anoopshahar	Zone A, Sevanand Ashram, 0.8 MLD	3	0	Co-treatment possible
4.		Zone B, Sohan Tau Ashram, 1.75 MLD	6		Co-treatment possible
5.		Zone A, Sevanand Ashram, 1.5 MLD	0		Co-treatment not possible
6.		Zone B, Sohan Tau Ashram, 1 MLD	0		Co-treatment not possible
7 .	Narora	Narvar Ghat, 4MLD	16	1.2	Co-treatment possible
8.	Farrukhabad	Farrukhabad, 2.7 MLD	19.5	7.6	Co-treatment possible
9.	Kanpur	Sajari (42 MLD)	281	471	Co-treatment possible
10.		Jajmau (43 MLD)	82		Co-treatment possible
11.		Jajmau (5 MLD)	7		Co-treatment possible
12.		Bingawan (210 MLD)	576		Co-treatment possible
13.		Jajmau (130 MLD)	0		Co-treatment not possible
14.		Jajmau 27 MLD	49		Co-treatment possible



# Assessment of Co-treatment potential in the cities having STPs

AAETI

S. No.	Name of the town	STP	Quantity of FS that can be co-treated	Septage generation	Remarks
15.	Prayagraj	Numayadahi	46	46	Co-treatment possible
16.		Ponghat 7.6 MLD	57		Co-treatment possible
17.		Kodara 25 MLD	132		Co-treatment possible
18.		Rajapur 60 MLD	41		Co-treatment possible
19.		Salori 1 29 MLD	0		Co-treatment not possible
20.		Salori 2 14 MLD	52		Co-treatment possible
21.		Naini 80 MLD	32		Co-treatment possible
22.	Mirzapur	Vindhyanchal (7 MLD)	25	12	Co-treatment possible
23.	Varanasi	Bhagwanpur (9.8 MLD)	40	162	Co-treatment possible
24.		Dinapur (80 MLD)	181		Co-treatment possible
25.		Dinapur (120 MLD)	713		Co-treatment possible
26.		Goithala (120 MLD)	980		Co-treatment possible
27.		DLW (12 MLD)	67		Co-treatment possible
28.		Ramna (50 MLD)	150		Co-treatment possible
29.	Ramnagar	10 MLD	0	12	Co-treatment not possible
30.	Kannauj	Amrapur (13 MLD)	20	14	Co-treatment possible



# Septage treatment in the cities with existing or proposed FSTPs and Co-treatment – Viability check

AAETI

- Total STPs- 30
- Co-treatment possible- 24
- Co-treatment not possible-5
- Co-treatment not possible still proposed-  
Ramnagar and Kanpur



# Septage treatment in the cities with no existing or proposed STP, FSTP and Co-treatment

AAETI

Name of the town	Nearest City	Distance
Najibabad	Bijnor	33
Nagina	Bijnor	30
Chandpur	Bijnor	30
Dhampur	Bijnor	37
Hastinapur	Muzaffarnagar	45
Gajraula	Garhmuktesar	14
Jahangirabad	Anupshahr	17
Babrala	Naraura	7.6
Soron	Kasganj	13
Gangaghat	Unnao	14
Sant Ravidas Nagar (Bhadohi)	Mirzapur	30
Mughal Sarai	Varanasi	15
Saidpur	Hapur	18

1. Co-treatment in the nearby city having STP after assessing the operational and economic feasibility.
2. Cities not having nearby STP can go for cluster FSTP, if the town is situated in the vicinity of a town having existing septage treatment infrastructure.



# Conclusion and way forward

- In order to protect the water quality of Ganga River it is suggested that ULB/State Government should develop sewage treatment plant with co-treatment facility or standalone faecal sludge treatment plant not having any treatment facility in the town.
- The towns which have existing STP's with spare capacity (under-utilized) or proposed for new STP's, should develop the co-treatment facility within the STP.
- The towns where STP's are running to its design capacity and no scope of scaling up it further, could explore implementing standalone FSTP for FS treatment.
- Before finalizing the co-treatment implementation in a particular STP, Detailed Project Report (DPR) should be prepared looking at the **other planning and designing aspects** such as land availability to accommodate additional modules, potential and efficiency of existing STP/SPS technology to cater FS, technology selection for dewatering and solid – liquid separation, approach road for desludging vehicles to reach STP/SPS, sludge treatment and reuse.





**CAPACITY BUILDING INITIATIVE ON  
MAKING GANGA BASIN CITIES WATER-SENSITIVE**

**Thank you**

EMAIL: [sww-aaeti@cseindia.org](mailto:sww-aaeti@cseindia.org)

