Bingawan STP, Kanpur
Co-treatment Case Study

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A. City Profile

Kanpur is the tenth most populous city in India[1] and the largest in the state of Uttar Pradesh. Situated on the southern bank of River Ganga the city sprawls over an area of 261.50 km^2 with River Pandu defining its southern boundary. (Figure 1) Kanpur is a main centre of commercial and industrial activities in the state. Presence of industries has resulted in rapid growth of population fuelled largely by in migration, which, in turn has created pressure on the existing infrastructure.

As per Census 2011, Kanpur had a population of 2.77 million while its Urban Agglomeration[3] had a population of 2.92 million[4]. It is expected that the city's population would be around 3 million by 2021 and 3.38 million by 2041[5]. The Kanpur Metropolitan Area[6] extends over an area of 1,640 km^2 and has approximately 5 million inhabitants. (Population details are presented in Annex 1)

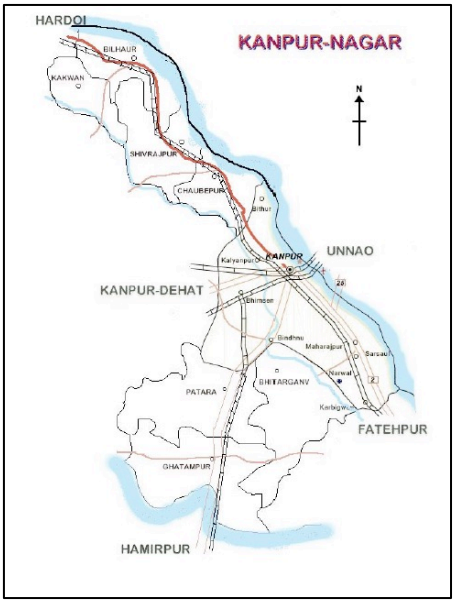

Figure 1 Location of Kanpur

Access to toilets: As per Census 2011, 86 percent of the households in Kanpur had access to individual toilets and 7 percent used public toilets. Access to individual toilets is low in slum areas (356) and the peripheral areas of the city[7].

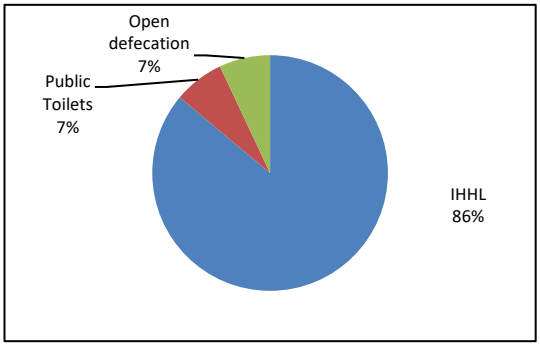

Figure 2: Access to toilets in Kanpur (2011)

Sewage collection and conveyance systems: As per Kanpur Nagar Nigam (KNN), approximately 65 percent of households in Kanpur city are connected to the sewer network[8]. As per Census 2011, 73 percent of households with individual toilets were connected to sewer network while 23 percent have septic tanks. (For details refer Annex 2)

[1] Source: http://worldpopulationreview.com/countries/india-population/cities/ Year 2018
[2] Source: Environmental and Social Assessment with Management Plan for laying of Branch Sewers and Allied Works in Sewerage District-I of Kanpur City, Uttar Pradesh, New Delhi: The Energy and Resources Institute. [Project Report No. 2010WM13], 2013.
[3] Kanpur Urban Agglomeration includes Kanpur (M Corp.+OG) Kanpur (M Corp.) Rawatpur Station Yard (OG) Central Railway Colony (OG) Kanpur (CB) Armapur Estate (CT) Northern Railway Colony (CT) Chakeri (CT)
[4] Source: http://censusindia.gov.in/2011-prov-results/paper2/data_files/India2/Table_2_PR_Cities_1Lakh_and_Above.pdf
[5] Kanpur City Sanitation Plan, 2013.
[6] The Kanpur Metropolitan Region (defined under JNNURM by Kanpur Nagar Nigam) includes Kanpur Nagar Nigam area, 8 kilometres around KNN boundary and newly included 47 villages of Unnao district on the north-eastern side, it spreads till Murtaza Nagar, in the west its limit is upto Akbarpur Nagar Panchayatraj limit, in the eastern side the limit has been expanded on the road leading to Fatehpur and is extended upto the metropolitan region area includes the area of Shukla ganj nagar palika, Unnao Nagar Palika, Akbarpur Nagar panchayat, Bithur Nagar Panchayat area
[7] In which reside 20 percent of the city's households 116215 out of 554,399 households, Census 2011 and 18 percent of the city's population reside in slum settlements
[8] Source: Letter No.2296/D/SWA/NSA/17-18 (dated 27.11.2017) issued by Municipal Commissioner,

Sixty one percent of the city's area is covered by underground sewerage systems[9]. The peripheral areas of the city lack access to sewerage facilities. Areas such as Shyam Nagar, Dehli Sujanpur, Saniganwa and Chakeri ward have been covered partly with sewer lines but households are yet to be connected[10]. Further, in several newly developed colonies located on the outskirts of the city, the sewer branch lines are not connected to the trunk sewer lines resulting in the flow of sewage into open drains and/or fields. Brick sewers, the lifeline of the core city's sewerage system were laid almost 60 to 100 years ago and are now broken, choked and overflowing into storm water drains at several locations.

Sewage treatment facilities: Kanpur is divided into four sewerage districts. The inner old city area lying along the bank of River Ganga is covered under Sewerage District I and the waste water generated is treated at Jajmau Sewage Treatment Plant (STP). There are four treatment trains at Jajmau, with a combined treatment capacity of 214 MLD, which treat domestic sewage as well as industrial effluent. Sewerage District II covers the southern parts of the city (including Kakadeo, Shashtri Nagar, Geeta Nagar, Anwarganj etc.) and the waste water generated is treated at the Bingawan STP which has an installed capacity of 210 MLD. Sewerage District III covers the western part of the city and has a STP at Baniyapura with capacity of 15 MLD. An additional STP is proposed under Atal Mission for Rejuvenation and Urban Transformation (AMRUT) at Panka with a capacity 70 MLD. Sewerage District IV covers four wards of eastern Kanpur and the waste water generated is treated through a 42 MLD STP at Sajari. (Details of STPs in terms of installed capacity, waste water flow and technology is presented in Annex 3)

The total installed capacity of STPs in Kanpur is 481 MLD. The total amount of waste water inflow at STPs is 240[11] MLD which is around 50 percent of the total treatment capacity.

Septage Management: As mentioned above the city has about 101,424 households (23 percent) connected to septic tanks[12]. At present, there is no organised system for collection and treatment of septage from septic tanks. Private operators desludge septic tanks and have been disposing the collected septage in open areas / field / drains. The vehicles used are tractors mounted with suction pumps and tanker with an approximate capacity of 3 kL. The private operators desludge the septic tanks of individual households on demand and charge a fee ranging from INR 1,000 to 1,500 per septic tank.

As a part of its initiative towards making the city clean KNN has recently put in place a project which allows decanting of septage collected by private desludging operators at Bingawan STP. Further, the KNN under AMRUT has acquired 13 suction machines (capacity of 4 KL) and 4 super suckers to clean the chocked up sewers in the core city.

Institutional Arrangements: Multiple institutions are involved in management of sewage in Kanpur. The Uttar Pradesh Jal Nigam (UPJN) is responsible for planning, designing, construction and implementation of capital projects for sewerage along with Operation and Maintenance (O&M) of large Sewage Pumping Stations (SPS) and STPs. Kanpur Jal Sansthan, KNN is responsible for maintenance of trunk sewers, lateral sewers and collection of revenue from house connections.

City's Vision for Sanitation: Kanpur prepared its City Sanitation Plan in 2013. Given its location on the banks of River Ganga, the city has been receiving funding support under various Government of India (GoI) programs including Ganga Action Plan (GAP), Jawaharlal Nehru Urban Renewal Mission

[9] 1995 km out of 3300 km. Source: http://kmc.up.nic.in/Documentary%20Evidence_ANNEXURE/ANNEXURE-4.1%20AMRUT%20SLIP%20Sewerage%20Kanpur.pdf

[10] Ibid

[11] Assuming 50 percent of installed capacity as the waste water flows at Baniyapur and Sajari.

[12] Source: Census 2011

(JNNURM) and AMRUT to improve its waste water treatment systems. Under JNNURM and GAP the focus was on renovation and rehabilitation of existing sewerage infrastructure (including SPSs and rising mains), expanding the sewerage network to uncovered areas, augmenting treatment capacities of existing STPs and establishing new STPs in Sewerage Division II, III and IV. Under AMRUT the city plans to expand its sewerage network and connect households in uncovered outlying / peripheral areas to the sewerage network. In fact, 66 percent of the total approved funding under AMRUT is for this component. The city also plans to make the system more efficient by rehabilitation and renovation of existing sewer lines in core city and the existing SPSs. (For details of various projects undertaken and planned for the city refer Annex 4).

B. Co-treatment – Genesis

At present, co-treatment of septage is being undertaken at only one STP, namely Bingawan. The Bingawan STP is located in Sewerage Division II which covers the southern part of the city. Most of the households in this division are not currently connected to the sewerage network and depend on onsite systems such as septic tanks. As mentioned above, the city plans to expand the sewerage network in this division and connect the uncovered households to the sewerage network through house connecting chambers.

The Bingawan STP has an installed capacity of 210 MLD and is designed as an Upflow Anaerobic Sludge Blanket (UASB) Reactor system. The STP receives waste water flow ranging from 80 to 90 MLD. The presence of spare treatment capacity was a key contributing factor for initiating co-treatment of septage at Bingawan.

The main driver for initiating co-treatment was to put an end to the practise of dumping of septage in open areas / drains by private desludging operators. In June 2017, KNN took a decision to tighten the noose on these private desludging operators. Vigilance teams were put in place and the resultant surveillance led to many of them being caught disposing septage in vacant plots and drains. They were fined and charges were framed against them under the provisions of Municipal Solid Waste Management Rules and the National Green Tribunal.

Private desludging operators come together: Confronted with strict enforcement by KNN, the private desludging operators came together and formed a committee naming it the "Kanpur South City Tankers Committee". With approximately 25 members the committee sought to negotiate a viable solution to this problem with KNN. Subsequently a series of meetings were conducted under the chairmanship of Additional Municipal Commissioner, KNN with representatives of Kanpur South City Tankers Committee to work out a viable alternative. The KNN recognised the contribution of private desludging operators and also used it as an opportunity to regularise their work and ensure that it meets the norms and standards set for management of septage.

Setting the Standard Operating Procedures (SoPs) through a process of Confrontation, Consultation and Consensus Building

29.08.2017	Decision was taken to allow decanting of septage by private desludging operators at the Bingawan STP
31.08.2017	Rate for single trip was fixed at Rs. 500 per trip. This was objected to by the Kanpur South City Tankers Committee as every truck was likely to make multiple trips in a day and the resultant costs would be prohibitive. The Committee made a representation asking the KNN to consider fixing a monthly charge of 1,000-1,500 per month
11.09.2017	In a meeting chaired by the Additional Municipal Commissioner, KNN it was decided that all private desludging operators would have to register their trucks by paying a registration fee of INR 1,000 (per truck) which is to be renewed

	annually and pay a user charge of INR 3,500 per month with no ceiling on the number of trips either on a daily or monthly basis.
23.10.2017; issued in newspapers on 19.11.2017	Through a series of meetings, detailed bye-laws for co-treatment have been developed which were published in newspapers on 19.11.2017 for making the citizens and private desludging operators aware of the same. These have been issued as a notification under the UP Municipal Act 1959 Section 541 (42) but are yet to be published in the official gazette (at the time of the field visit in February 2018) • **Registration**: Private operators have to register with the KNN after paying a registration charge of INR 1,000 per truck. This amount is to be paid annually for renewal of registration. • **Tipping Fee**: Private operators have to make a monthly payment of a fixed tipping fee (INR 3,500) for using decanting facilities at the Bingawan STP. There is no upper limit on the number of visits by a truck daily or monthly. • **Payment:** The registration charge and tipping fee will be collected by the KNN or any other agency which may be engaged by KNN to collect these charges. The collections thus made have to be deposited in the KNN account within 24 hours. • **Issuing a receipt:** The KNN will issue a receipt for all payments made. The receipt must clearly mention the date, month and duration for which the payment has been made. It is the responsibility of the private desludging operator to safely keep a copy of the receipt and produce it for review as and when required by the municipal authorities. A copy of this receipt has to be shown to the supervisor at the STP while seeking entry. • **Charges for Households:** The private operators can charge households INR 600 for desludging one septic tank[13]. • **Health and Safety of staff:** The private desludging operators must ensure that the staff (driver and helper) use protective gear such as gloves and masks. He must also ensure that they have an identity card. Every tanker must have a mobile number clearly displayed on it. • **Fine for illegal dumping:** If the private operators are found disposing the septage anywhere else except for the STP designated they will be liable to pay a fine. The amount of the fine has not been specified in the bye-laws. • **Record keeping at STP:** It is mandatory for the STP to maintain a record of the vehicle owner, driver / helper using the decanting facility. A log book needs to be maintained and entry of all trucks using the facility has to be made by the specially employed supervisor.
28.11.2017	As an incentive to private desludging operators the one time registration charge has been waived off by the KNN till 31st March 2018. (Letter No.2296/D/SWA/NSA/17-18). This facility has been extended to attract private operators from peripheral areas of Kanpur UA and to ensure proper treatment of septage collected thereby protecting the environment.

[13] Discussions with city officials have revealed that the fee being charged at present ranges from INR 1,000 to 1,500 per septic tank.

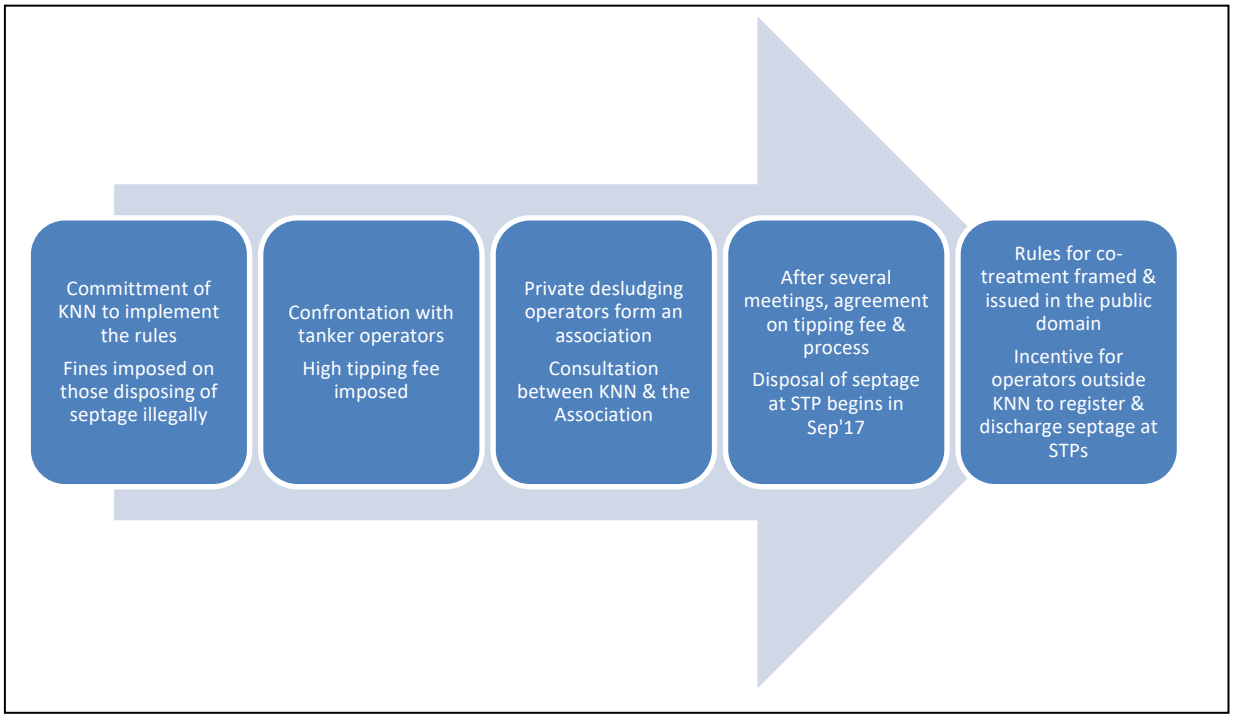

Figure 3: Setting the Standard Operating Procedures (SoPs) through a process of Confrontation, Consultation and Consensus Building

C. Co-Treatment at Bingawan STP

Plant Details

The Bingawan STP has an installed capacity of 210 MLD and is designed as an Upflow Anaerobic Sludge Blanket (UASB) Reactor system. Discussions with officials of the UPJN (who are currently operating the plant) revealed that that the STP receives waste water flow ranging from 80 to 90 MLD. It is expected that later this year, once the construction of a diversion drain at Sisamau is completed, the STP will start receiving additional waste water flows of 80 MLD taking the total waste water flows to around 170 MLD. The presence of spare treatment capacity was a key contributing factor for initiating co-treatment of septage at Bingawan.

The STP serves an area of 130 km^2 (approximately one fourth of the city's area) and has approximately 0.261 million connections[14]. Within the area served by the Bingawan STP the total length of sewer lines is 75 km^2 and there are 7,500 manholes and 4 Sewage Pumping Stations (SPS).

Table 1: Details of Bingawan STP

Division	***STP – Name***	***Installed Capacity***	***Waste Water Flow***	***Technology***	***Project***
Division II	Bingawan	210 MLD	80-90 MLD	UASB	JNNURM II

The treated waste water is used by institutions such as KNN and National Thermal Power Corporation (NTPC) for horticulture purposes. The remaining treated water is discharged into River Pandu. The sludge is currently being disposed within the STP boundary. However, samples have been sent for testing for viability for agricultural use at IIT Kanpur and the officials are hopeful that they will be able to sell the sludge to be used as bio-fertilizer in the future.

[14] Including 0.23 million residential connections, 8376 institutional connections, 22669 commercial and 150 others

Planning and Implementation of Septage Co-treatment

Co-treatment of septage at Bingawan STP was initiated in September 2017. There are 21 private desludging tankers that are registered with KNN for decanting septage at Bingawan. Discussions with the supervisor (employed for the decanting facility) revealed that the daily number of tractor mounted tankers (capacity of 3 kL) discharging septage at the STP ranges from 60-80. On Sundays, the numbers are much higher than on week days presumably because the households prefer to get their septic tanks desludged on a holiday.

Volume and Quality of Septage

The facility receives about 60-80 truckloads of septage on a daily basis or about 0.18 to 0.24 MLD of septage which is blended with 80-90 MLD of sewage (which is less than 5 percent of the sewage flows). The STP Manager observed that septage addition and co-treatment has not resulted in any operational challenges at the STP or any adverse impact on the quality of treated water.

The data on raw sewage for the year 2017 shows that addition of septage to sewage (since September 2017) has not resulted in any significant changes in TSS and BOD and the values are well within the characteristics assumed at design stage (BOD 322 mg/l and TSS 418 mg/l). (Figure 5 and Figure 6)

Infrastructure Investments and Operational Changes for Co-treatment

Receiving Station: A manhole, for receiving septage, has been created at the STP's entrance into which private desludging operators decant their tankers. The manhole was created prior to the initiation of co-treatment at a cost of approximately INR 0.8 million[15]. The area around the manhole was subsequently paved and a gradient was created to allow any spillage to flow back into the manhole. The manhole is large and allows three tankers to decant simultaneously.

The septage mixes with the waste water being received by the STP through the manhole and a pipe connecting the septage receiving manhole to the inlet chamber of the STP, prior to the preliminary treatment process and the combined waste stream subsequently undergoes the entire treatment cycle. (For details on the Bingawan STP refer Annex 5) Discussions with staff at the STP revealed that the implementation of co-treatment did not require any retrofits or additions to the treatment train or changes in O&M protocols at the STP. The staff, however, observed that if more septage is received, they could consider installing a primary settling tank for the septage to provide primary treatment to the septage flows prior to mixing with sewage, and lower the pollution load on the aerobic treatment processes.

Manhole for receiving Septage at Bingawan STP

Decanting of Septage in progress at Bingawan STP

[15] As mentioned by UPJN staff

The access to the STP (and the decanting facility) is through a dirt road off the Hamirpur (Naubasta) highway. The trucks are permitted entry between 8 am and 7 pm which also corresponds to the duty timings of the supervisor especially appointed for this operation. Since the boundary wall for the STP complex has not yet been constructed, the trucks are not permitted entry after 7 pm. The supervisor maintains a log book in which the records with details of each truck using the facility.

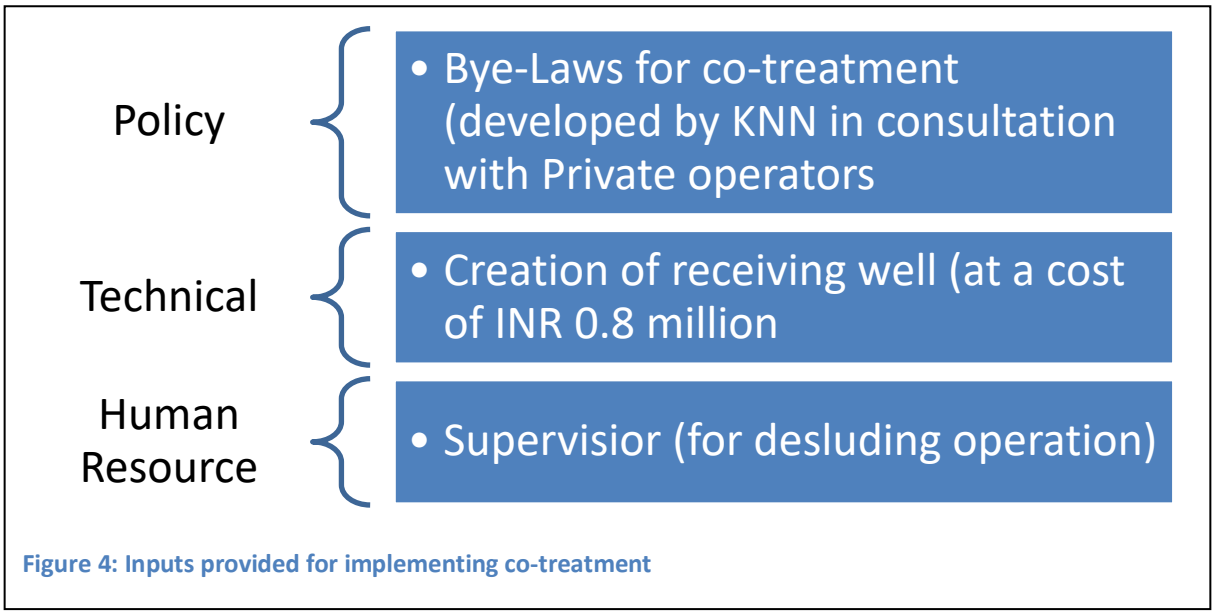

Figure 4: Inputs provided for implementing co-treatment

Supervisor Jiten Sharma with the register used for record keeping

Septage sampling protocols: At present, random sampling of septage takes place which is tested at the existing laboratory at the STP. Discussions with officials of UPJN revealed that they plan to acquire an instant analyser which will allow them to conduct immediate testing for specific parameters in the septage prior to discharge at the STP. This will help in ensuring that industrial waste is not dumped at the STP.

Record keeping protocols: A specially appointed supervisor maintains a log book in which he records the following details per truck – registration number of the vehicle, location from where the truck has originated and the phone number of the owner / driver. The driver of the truck needs to carry a copy of the monthly payment receipt issued by the KNN. This is checked by the supervisor before allowing the vehicle to discharge their septage load.

Safety protocols: As per the bye-laws for co-treatment framed by the KNN, the private operators must ensure that the staff (driver and helper) use protective gear such as gloves and masks. They must also be equipped with the necessary tools at all times. However, our visit revealed that this practice was not being implemented.

Financial Details

The STP had to incur capital expenditure of about INR 0.8 million for creating a special receiving area including a manhole for discharge of septage. Discussions with staff of UPJN revealed that there are no additional capital costs for making any changes or additions to the plant post initiation of co-treatment. They also shared that there have been no changes in the overall O&M costs[16].

The annual registration charge and the monthly tipping fee charged to the private desludging operators have emerged as revenue sources for the KNN. As seen in Table 2 approximately INR 0.462 million has been collected since September 2017 from the 21 registered private tankers.

Table 2: Co-treatment – Capital Costs and Revenue generated (approximations)

Category	***Details***	***Amounts (in INR)***
Capital Cost	Receiving area for decanting	**INR 0.8 million**
O&M Cost	None made so far	
Revenue Generated	Registration Charge (@ INR 1,000)	**INR 21,000**
	Tipping Fee (@ INR 3500 per truck / month)	INR 73,500 per month
		INR 441,000 since Sep 2017
	Total	**INR 462,000**

Performance Details

Discussions with officials revealed that there haven't been any significant changes in BOD and TSS at both inlet and outlet points post co-treatment of septage at Bingawan STP. The BOD levels of the treated effluent were found to be marginally higher than the prescribed level of 30 mg/l, this has been found to be the case even prior to mixing of septage in sewage flows (prior to September 2017) (Figure 5). For TSS, the levels were found to be well within the prescribed levels (100 mg/l) both prior and post co-treatment (Figure 6).

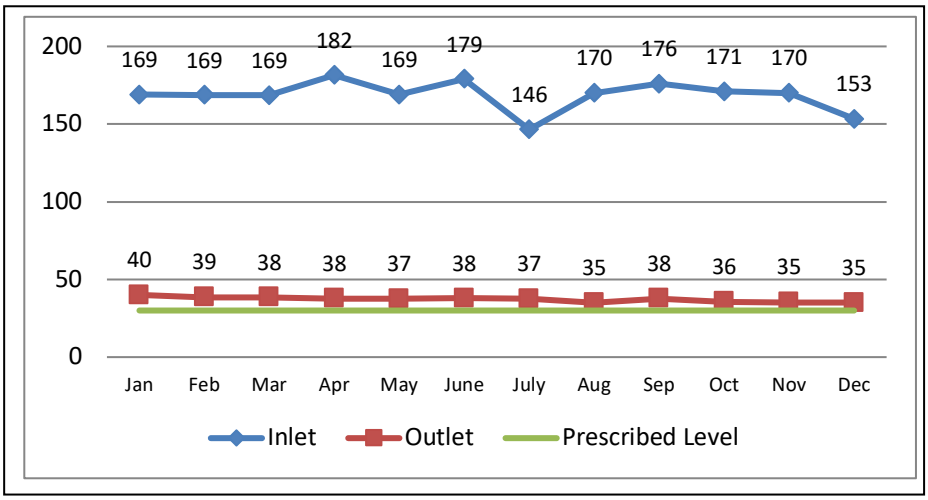

Figure 5: BOD levels (raw sewage and treated effluent) mg/l (2017)

[16] Monthly O&M cost is 22.5 million

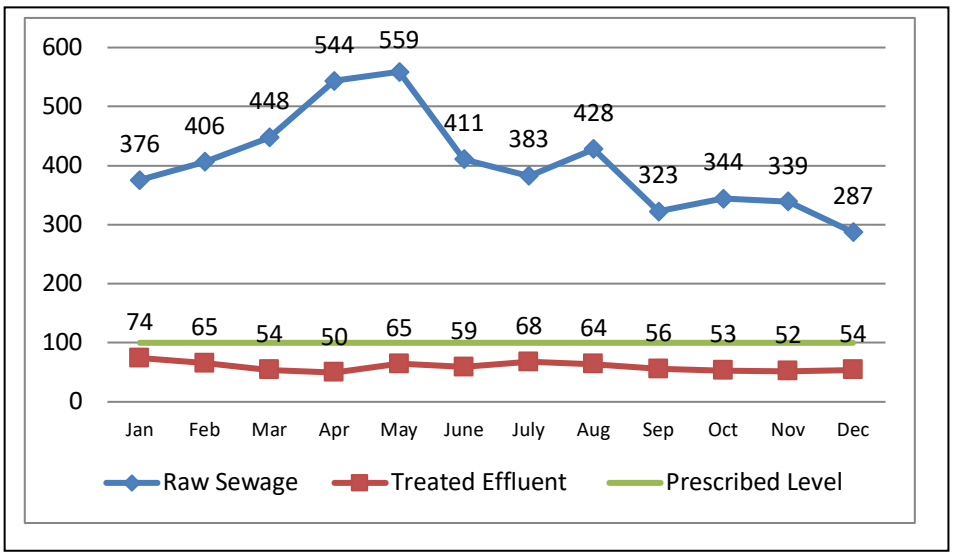

Figure 6 TSS levels (raw sewage and treated effluent) mg/l (2017)

Officials also shared that septage is rich in bacteria as it has already undergone some preliminary treatment in the septic tank. The addition of septage aids the anaerobic treatment process at the STP and would potentially reduce the BOD levels of the treated wastewater.

Officials shared that it is likely that some industrial waste is being brought in by the tankers but the STP is in the process of formulating an observation and testing protocol to identify and eliminate industrial waste. As mentioned above the STP is considering getting an instant analyser to test specific parameter of septage. Further, since the sewage arriving at the STP contains about 10% - 15% industrial effluent, there seems to be less concern over the tankers bringing in industrial waste.

D. Impact of co-treatment

- **City population being served by co-treatment**: Given that there are anywhere between 60-80 trips per day, it is estimated that the co-treatment of septage at Bingawan is able to provide septage treatment solution for between 27,000 – 0.112 million households with septic tanks annually[17].
- **Regularisation of private desludging operators:** The 21 private tankers who are registered with the KNN for decanting septage at the Bingawan STP have been regularised. Their activities are now regularly monitored by the KNN through the log books that are maintained at the STP.
- **Environmental Impact:** The initiative coupled with strict enforcement of the provisions of the Municipal Waste Management Rules and the recommendations of the National Green Tribunal have ensured that illegal dumping of septage has been reduced dramatically in Division II.
- **Potential Source of Revenue:** The annual registration charge and the monthly tipping fee charged to the private desludging operators have emerged as a revenue source for the KNN. In the last six months approximately INR 0.462 million have been collected.

Given the positive response to this initiative the KNN officials are keen on upscaling the same to other STPs in the city.

[17] Estimated based on number of households that can be serviced when septic tank sizes varies from 4 to 10 m^3, desludging truck size of 3 kL and when desludging is done once every 3-5 years.

E. Key lessons and practices

- Enforcement mechanism by the ULB is critical as an incentive for the private desludging operators to move towards a regulated regime.
- Facility to receive septage at STP should provide a screening process to remove solids
- The plant receives septage without any storage to provide equalization. While there have been no reported process disruptions, the plant would be advised to create septage storage capacity at the decanting facility to a) intercept any unwanted loads from being discharged into the STP (by bypassing any suspect loads that may be industrial in nature) and b) avoid shock loading at the STP.
- Costs charged for disposal at an STP should be minimal; the key idea is to ensure that septage is treated properly and not disposed of into the open environment
- There should be consultation and negotiation between the ULB and private desludging operators to arrive at a mutually acceptable process of collection, transportation and safe disposal of the septage so that it is treated at a designated facility. ULBs should be open to encouraging private desludging operators from nearby peri- urban areas to also discharge collected septage at the STP if co-treatment capacity exists.
- Safety protocol should be put in place to identify and eliminate industrial waste from being disposed of at co-treatment facilities; this must include random testing of the septage arriving at the STP.

Annex I: Kanpur – Population, Households and Area

A.	**Population**	
i	Municipal Corporation (Kanpur Nagar Nigam, 2011[18])	2.77 million
ii	Kanpur Urban Agglomeration, 2011[19]	2.92 million
iii	Population,2017[20]	2.91 million
iv	Projected population, 2021[21]	2.99 million
v	Projected population, 2031[22]	3.18 million
vi	Projected population, 2041[23]	3.38 million
B	**Households**	**0.522 million**
C	**Area (Kanpur Nagar Nigam)**	**261 km^2**

Annex 2: Status of access and collection and conveyance systems in Kanpur

Table 1: Access to toilet facilities (Census 2011)

Access to Sanitation Facilities	**Number of households**	**%**
Individual Toilets	450,135	86.10
Public Toilets	36,073	6.90
Open defecation	36,596	7.00
Total households	**522,804**	**100.00**

Table 2: Collection and Conveyance systems (Census 2011)

	Number of households	**%**
Piped sewer	326,753	72.59
Septic Tank	101,424	22.53
Other Flush System	6,273	1.39
Pit with slab / VIP	7,319	1.63
Without slab/ open pit	2,091	0.46
Night soil disposed into open drain	4,705	1.05
Night soil serviced by human	522	0.12
Night soil serviced by animal	1,045	0.23
Total	**450,132**	**100**

[18] Source: http://censusindia.gov.in/2011-prov-results/paper2/data_files/India2/Table_2_PR_Cities_1Lakh_and_Above.pdf
[19] Source: http://censusindia.gov.in/2011-prov-results/paper2/data_files/india2/Million_Plus_UAs_Cities_2011.pdf
[20] Source: City Sanitation Plan, Kanpur, 2013; the decadal growth rate witnessed during 2001-2011 is 7.8% and the same decadal growth rate has been assumed for the years 2011-2021
[21] Source: City Sanitation Plan, Kanpur, 2013
[22] Ibid.
[23] Ibid.

Annex 3: STPs in Kanpur

Table 1: Sewage Treatment Plants in Kanpur city – Details

Division	***STP – Name***	***Installed Capacity***	***Waste Water Flows***	***Technology***	***Project***
Division I	Jajmau	5 MLD	4.81 MLD	UASB	GAP I
		130 MLD	98 MLD	ASP	GAP I
		36 MLD[24]	18.45 MLD	UASB *CEFT*	GAP I
		43 MLD		ASP	JNNURM I
Division II	Bingawan	210 MLD	80-90 MLD	UASB	JNNURM II
Division III	Baniyapura	15 MLD[25]	7.5 MLD		JNNURM I
District IV	Sajari	42 MLD	21 MLD		JNNURM III
		481 MLD	**240[26] MLD**		

[24] 27 MLD sewage is mixed with 9 MLD of industrial effluent

[25] As per projections, 124 MLD STP shall be required for sewerage district – III. As 15 MLD STP has already been commissioned at Baniyapur, there is a proposal for constricting an additional STP at Panka with a capacity of 50 MLD. Need for a proposal for an additional 59 MLD.

[26] Assuming 50 percent of installed capacity as the waste water flows at Baniyapur and Sajari.

Annex 4: Projects undertaken in Kanpur under various GoI programs

A. Projects undertaken under Ganga Action Plan

1	Three treatment plants to treat domestic sewage and tannery effluent were constructed at Jajmau	5.0 MLD UASB[27]
		130 MLD ASP (Activated Sludge Process)
		36 MLD UASB (Common Effluent Treatment Plant, to treat industrial waste with domestic waste)
2	Collection systems to convey the wastewater from industries to 36MLD treatment plant	12 kms.

The treated effluent from 130 MLD and 36 MLD STP's is pumped to sewage farm channel and used in land irrigation by the farmers. The treated effluent of 5.00 MLD STP finds its way to river Ganga through open drain.

B. Projects undertaken under JNNURM

JNNURM I
Renovation/Rehabilitation of existing Common Sewage Pumping Station (CSPS)
Renovation/Rehabilitation of existing 5 MLD & 130 MLD sewage treatment plants and 36 MLD tannery waste water treatment plant
Renovation/Rehabilitation of existing intermediate sewage pumping stations 7 No.
Renovation/Rehabilitation of existing tannery sewage pumping stations 4 No.
Renovation/Rehabilitation of existing rising mains tannery waste water pumping stations 4 No.
Laying of 350 mm to 2000 mm diameter trunk sewers in 69.00 Km length in core area of the city.
Augmentation of 130 MLD capacity Jajmau STP by constructing another unit of 43 MLD based on ASP technology.
15 MLD capacity MPS and STP at Baniyapura in Sewerage District III. As per projections, 124 MLD STP shall be required for sewerage district – III. As 15 MLD STP has already been sanctioned, the proposal of remaining required STP of 109 MLD is under preparation
JNNURM II
Sewage treatment plant of 210 MLD at Bingawan. New DPR for balance requirement of 105 MLD STP and MPS are under sewerage system.
JNNURM III
Comprehensive proposals have been made in this project to provide sewerage facilities in sewerage district IV of Kanpur for 4 wards namely Chakeri (10), Sanigawan (19) Delhi Sujanpur (53) and Shyam Nagar Sujatpur (77).
Intermediate sewage pumping stations of 14 and 40 MLD respectively
42 MLD main sewage pumping station and a STP of 42 MLD capacity laying of 130.90 km RCC sewers and other allied works

[27] Up flow anaerobic sludge blanket process

C. Projects under AMRUT

S. No.	***Objective***	***Projects***	***Cost (INR million)***
1	**To achieve universal coverage**	Regularizing illegal connections	50
		Septage management (13 suction machines; Cap- 4 kl, 4 super sucker)	90
		Investigation & survey of existing damaged sewer lines, manholes and overflow of sewage manually and through CCTV survey	25
2	**To make system efficient by rehabilitation**	Regular cleaning of existing old sewer Network through machine with latest technology	300
		Rehabilitation work in some wards of Old area of Kanpur due to extensive damage and over flow.	500
		Replacement of damaged & choked lines and refurbishment / construction of manholes and lining of old existing sewer with CIPP and other methods	2200
		Gap in existing sewerage network and provision for construction of new house connecting chambers	500
3	**To increase efficiency of existing pumping Stations**	Up gradation of old STPS with the facility of Automation	2900
		Replacing old pumps with energy efficient pumps and establishment of SCADA	
		Rehabilitation of rising main and its appurtenant work up gradation of existing IPS & SPS	800
4	**Increase the coverage of developing areas**	Expansion of sewerage distribution network with household connection in uncovered pockets	17000
		New STP	1200
5	**To improve the quality of sewage testing**	Establishment/up gradation of sewage Testing lab and Monitoring system	50
6	**Efficiency in charges Collection**	Online billing , tracking system & spot billing machine	15
		Rehabilitation and expansion of payment collection centre.	10
7	**Grievance Redressal**	Online complaint redressal system. Toll free phone numbers for complaint redressal System.	10
			25,650

Annex 5: STP Details for Bingawan STP

Name of STP and its location	Bingawan, Zone II		
Year of installation	2016		
Cost of construction	INR 1270.619 million		
Program under which it was funded	JNNURM		
Area served by the plant	130 **km^2**		
Users connected to STP	Category	Numbers	%
	Residential	230000	88.06
	Institutional	8376	3.21
	Commercial	22669	8.68
	Others	150	0.06
	Total	261195	100.00
Sewerage Network Details	Length of sewerage network		725.00 Kms
	Number of manholes		7500
	Number of pumping stations		4
	City area covered by the network		Approximately 25 Percent
Treatment Technology and Design Details	UASB		
	Installed Capacity		210 MLD
	Existing Waste Water Flow Received		**80 – 90 MLD**
	Details of raw sewage characteristics assumed in design stage	COD	523.00 mg/l.
		BOD	322.00 mg/l.
		TSS	418.00 mg/l
Actual hourly flows (MLD) measured at STP inlet	Average 83 MLD		
List of chemicals used in the process of treatment and annual average consumption	Poly electrolyte 13080 kg/year		
Provision for nitrogen removal	No		
Sludge treatment and disposal method	Belt Filter press		
Disposal point for the treated water	River Pandu		
Power back up /DG sets provided	1.25 MVA		
Monthly O&M expenditure	INR 22.5 million		

Annex 6: List of officials met at Kanpur

S. No.	Name, designation, organisation	Mobile	Email
1.	Brijesh Kumar Bhadauria (PE) UP JAL NIGAM	9473943052	brijeshupjn@gmail.com
2.	Abhinav Srivastava	7605636044	romil2lal@gmail.com
3.	Awinash Chandra Maurya	9412305773	awinashmaurya93@gmail.com
4.	Mr. Amrit Lal Bind, Additional Municipal Commissioner, Kanpur Municipal Corporation	86018 33333	
5.	Pankaj Srivastava, City Health Officer, Kanpur Municipal Corporation	8601800803; 840099110	drpankaj05@gmail.com