Why Chennai Stinks?

Citizens' effort to understand and solve the Sewage problem

An initiative of ***Arappor Iyakkam***

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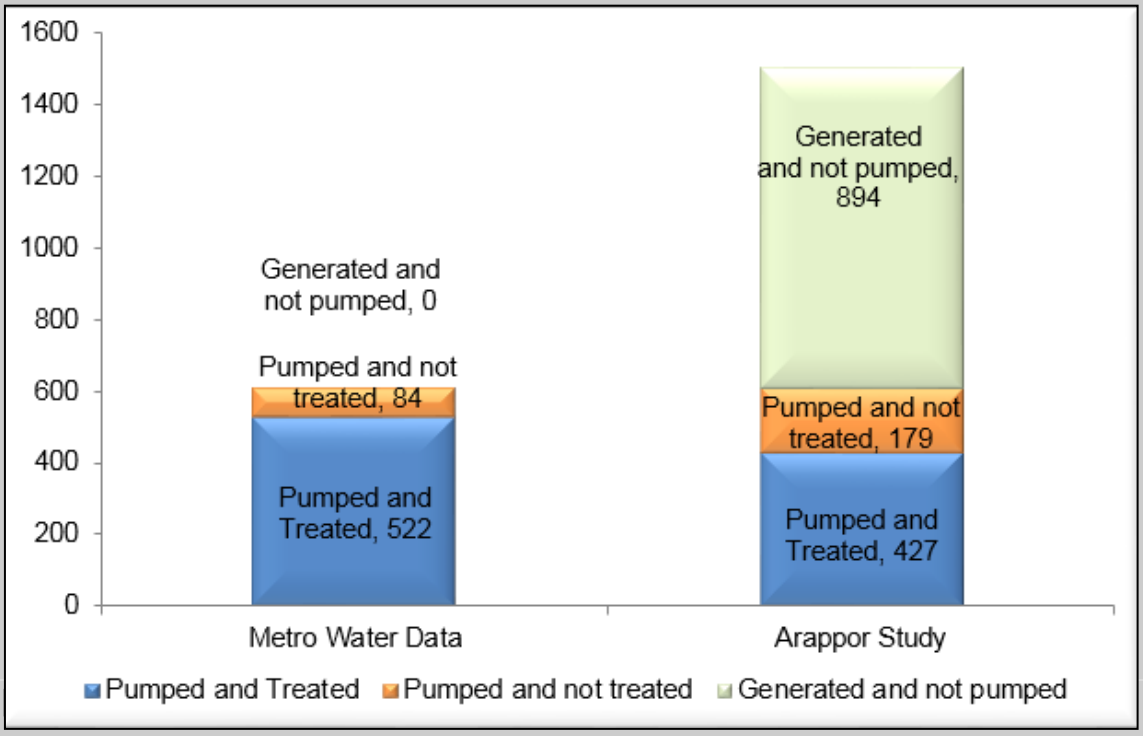
EXECUTIVE SUMMARY

Arappor's study provides an overall understanding of the gaps in the sewerage system of the Chennai region. Untreated Sewage is majorly responsible for contamination of the waterbodies. The study involves analysis of the pumping stations and treatment plants managed by the Chennai Metro Water Supply and Sewerage Board (CMWSSB), illegal sewage connections, waterbodies, and current policies and systems pertaining to sewage management. During the process, we interacted with Chennai Metro Water Supply and Sewerage Board (CMWSSB) workers and officials, general public, and also collected information via the Right to Information Act and online information published by the Government and private studies.

Our key findings based on CMWSSB and online data from reliable studies by experts is that the root cause of improper Sewage Management is gross underestimation of the quantity of sewage generated in Chennai and the false assumption that there is enough capacity to treat the entire sewage generated in the city. CMWSSB states that Chennai generates 550 Million Liters per Day (MLD) of sewage as of 2017. While, as per the study's estimate, Chennai is generating around 1500 to 2000 MLD of sewage, and the treatment plants available today have the capacity of treating a maximum of only 727 MLD (excluding 5 MLD of Villivakkam STP as it does not exist) and currently Metro water treats only 427 MLD of sewage. Even if we conservatively assume that Chennai generates 1500 MLD of sewage, almost **1073 MLD of sewage flows into our waterbodies without treatment everyday**. The graph below explains the difference between the Metrowater data and data from our study.



The amount of sewage discharged into waterbodies in itself is much more than the amount of sewage estimated by CMWSSB. In order to find the solution, the CMWSSB must accept this problem of gross underestimation of sewage in the first place.

The study team did a detailed visit and analysis of 27 pumping stations and 5 treatment plants. Our key observations in the pumping stations:

- **Discharge of untreated sewage into waterbodies**: Out of 27 pumping stations that we audited, 10 pumping stations (37%) discharge untreated sewage into the waterbodies. We also got to know about 3 other pumping stations that discharge sewage into waterbodies from the data collected via RTI.
- **Inadequate experience/knowledge of staff at pumping stations**: In most pumping stations, there was only one operator, who did not have understanding about the process and details about where the sewage is sent.
- **Lack of monitoring facilities in pumping stations**: Most pumping stations do not even have a flow meter to measure the quantum of sewage collected from various areas, and sewage sent to STP. Generally, in the pumping stations, the flow is calculated based on the system capacity and number of hours the motor is running. This is manually recorded in the log books. The entire operation depends on the operators, who are not dependable due to lack of experience, knowledge, and accountability. Therefore, the data generated is not reliable.

The key observations in the treatment plant include:

- **Lack of monitoring mechanisms**: Absence/non-functioning of basic measurement devices, such as flow meters for measuring the quantum of raw sewage and treated sewage, amount of bio gas flared, and sludge/slurry measurement devices. The data that is available at STPs is mostly manually generated and has a lot of scope for manipulation and error.
- **Non-functioning of main equipment** (primary clarifier, secondary clarifier, bio gas engine and so on).
- **Inadequate aeration**: Aeration, one of the main processes in the treatment process, was not occurring to the required level. The success of the treatment is determined by the aeration process.
- **Inadequate treatment**: Random physical inspection of the treated water from the Koyembedu STP at the point of outflow into the waterbody indicated that the water had strong sewage smell and was brown in color. This indicates that the water is not treated to the required standard.
- **Need for Relevant Standards**: As per the standards set for the discharge of treated sewage into the waterbodies, the Biochemical oxygen demand (BOD) value is based on assumption that there is flow of fresh water from upstream, which will help reduce the BOD. However, in the Chennai waterbodies, there is

no freshwater flow. Due to this, discharge of the treated sewage into the waterbody pollutes the waterbody.

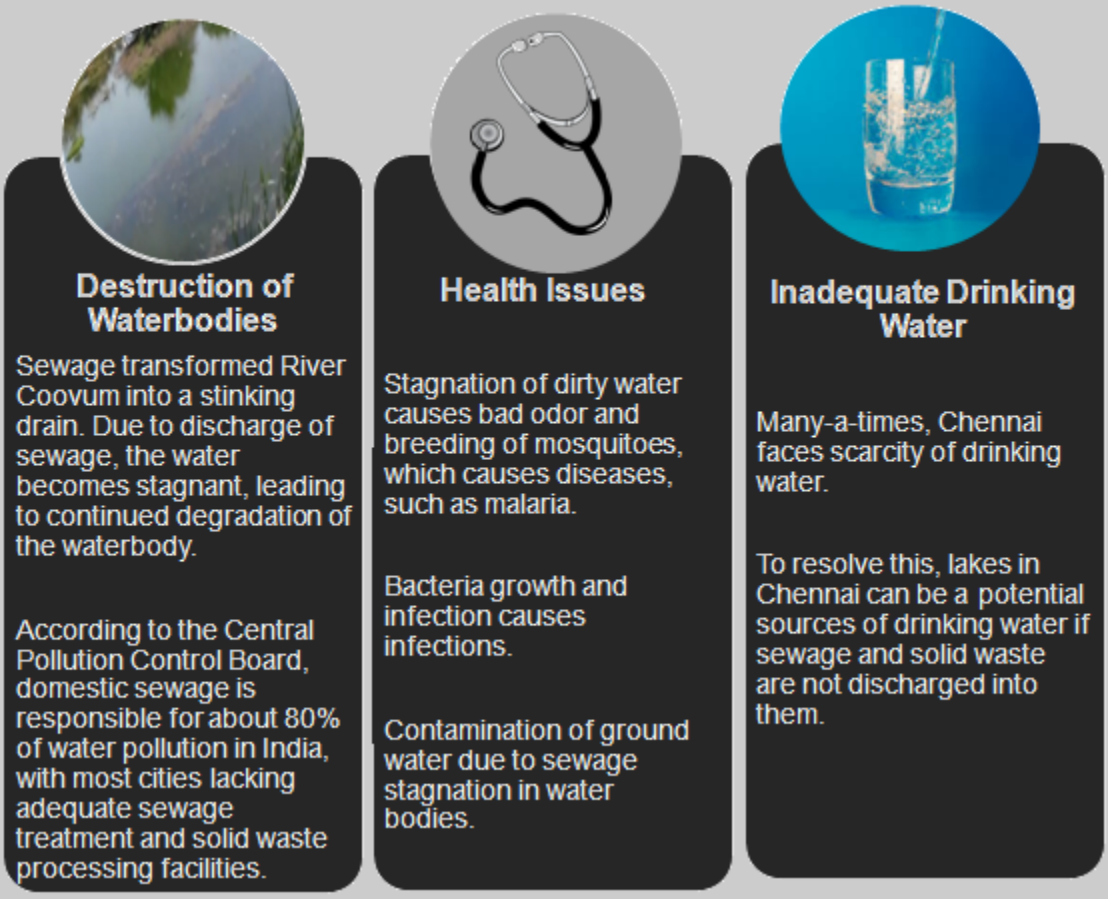
The first and foremost recommendation of the study is that the Government should first accept the problem of gross undervaluation of sewage generated in the city. Only by acknowledging the problem in the first place, a solution can be found. The study recommends adequate manpower and funds to be allocated to construct the required infrastructure, mainly decentralized sewage treatment plants, connecting pipelines and collection of sewage. It is of prime importance to increase the treatment capacity as we are discharging huge volumes of untreated sewage into waterbodies.

The study recommends the installation of automatic level controllers, electromagnetic or ultrasonic flow meters, online monitoring systems to record and publish live data and alarm systems in treatment plants and pumping stations, as there is complete lack of any monitoring facilities and there cannot be complete dependence on the staff (as is currently). These monitoring systems will provide live data about the operations and process parameters of the treatment plants and pumping stations, which will promote adherence to prescribed treatment standards, availability of accurate data, transparency and accountability in operations, and elimination of discharge of sewage into waterbodies from the CMWSSB pumping stations and treatment plants.

The study also recommends amending the regulations to ensure that CMWSSB is responsible to ensure appropriate sewage treatment across Chennai and prevent discharge of sewage into waterbodies, storm water drains, and so on. The study also recommends prohibition of construction of new sewage pumping stations near waterbodies.

INTRODUCTION

We all grew up hearing promises of every Government cleaning Cooum and the funds allocated to do so ranged from hundreds of crores when we were young to thousands of crores now. If anything, we all know that Cooum, many other rivers and canals in Chennai have only become worse with more sewage. Improper Sewage Management has devastating impacts, whereas, it receives very less focus, and therefore, very little is done to resolve the issue. Discharge of sewage into waterbodies has destroyed them, and some waterbodies are not used for extracting drinking water only because of the reason that large quantities of sewage are being discharged into them. According to the CPCB, domestic sewage is responsible for about 80% of water pollution in India. Inappropriate discharge of sewage into waterbodies has the following consequences:



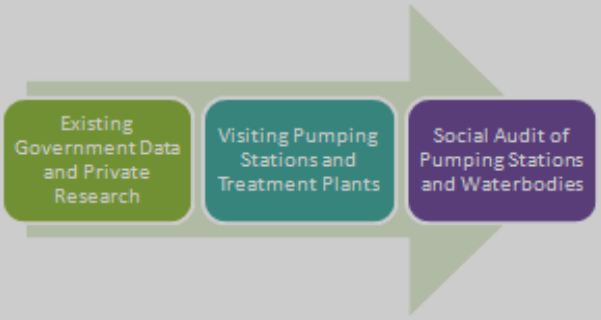
The journey from the Chennai floods (man-made disaster) in 2015 to the Chennai droughts in 2016 has made us realize the importance of waterbodies and the immediate need to protect the waterbodies. At this juncture, we are unable to use our existing lakes for drinking water purposes, whereas we are developing quarries as drinking water sources. The main factors impacting the waterbodies are discharge of untreated

sewage/industrial effluents into waterbodies, dumping of municipal solid waste, dumping of construction debris into lake, encroachments and non maintenance of the waterbodies such as lack of regular desilting.

We need to find solutions to each of the problems in the waterbodies. This study aims to understand in detail about the sewage system in Chennai including the Greater Chennai Region. This is a citizen's effort to understand why our waterbodies stink even though there have been decades of promises of cleaning them. In 2015, during the floods, the Cooum was cleaned due to the heavy rains and floods in a span of 2 days. But, why is Cooum again filled with sewage? The study gives an overall view of the big gaps that exist in our sewerage system, the big problems in each of the stages from sewage generation to treatment and key recommendations to change the status quo.

METHODOLOGY

As the first step, we analysed the online data provided by the Government and other existing studies and news articles. Next, we collected exhaustive information from Chennai Metro Water and Sewerage Board via Right to Information Act, 2005. Simultaneously, we visited sample Sewage pumping stations across various areas and all the treatment plants. Our team also conducted social audits of various water bodies (especially those located near pumping stations). We then met experts and engineers from the field. After the complete analysis, the report has been prepared. Around 20 volunteers participated in this study and the study has been done over the last 6 months.



We audited the following pumping stations and all the treatment plants. The idea was to cover all the areas and at least have 1 pumping station visited in each area. Area 12 has only two pumping stations, Area 14 has one pumping station, and Area 15 does not have any pumping station, and due to small number of pumping stations, we did not do social audit in Areas 12 and 14. This study does not focus on septic management as these systems are planned to be replaced by underground sewerage systems.

Area Number	Area Name	Pumping Station
1	Tiruvottiyur	1. South Mada street pumping station 2. Perriyamettu Palayam pumping station 3. Westmada street pumping station
2	Manali	4. Manali new town pumping station 5. MMDA Mathur pumping station
3	Madhavaram	6. Chandraprabhu colony pumping station 7. Ramachandranagar SPS
4	Tondiarpet	8. Thendral Nagar Pumping Station 9. RR Nagar pumping station
5	Royapuram	10. Pumping station at the Mint Bus stand
6	Thiru-Vi-Ka Nagar	11. Periyar Nagar pumping station 12. Jawahar Nagar Pumping Station
7	Ambattur	13. Mogappair pumping station
8	Anna Nagar	14. MMDA Colony/East Arumbakkam pumping station 15. Villivakkam Phase I pumping station
9	Teynampet	16. Greams road pumping station 17. Mylapore pumping station 18. Ice House pumping station 19. Lock nagar pumping station 20. Parathasarathy street pumping station 21. Chinnathambi street pumping station 22. Ram Nagar pumping station 23. Ayodhiyakuppam pumping station 24. Thomas road pumping station
10	Kodambakkam	25. T Nagar pumping station
11	Valasaravakkam	26. CMDA Colony Pumping Station
13	Adyar	27. Adyar pumping station

LITERATURE REVIEW

1. **Seminar on Waterways** by the State Government conducted by various experts in 2009

   Experts and government officials have confirmed that carrying capacity of sewer, pumping capacity, and sewage treatment capacity are inadequate to treat the entire sewage flow generated. The experts have also confirmed that discharge of sewage is one of the main factors for pollution of the waterways and for continued degradation in the river environment.

   Factors polluting Cooum river include untreated sewage and treated sewage from sewage treatment plants at Koyambedu, wastewater from illegal drain system, and portion of the treated sewage from Kodungaiyur STP, which is discharged into B'Canal which is connected to Cooum River. Factors polluting Adyar river include uncollected sewage from unorganized sectors, treated sewage from STP Nesapakkam, sewage from encroached slums, sewage and wastewater from non industrial sources, and dhobhi ghats at Saidapet. Factors polluting Buckingham canal and Otteri Nullah include sewage generated from encroached slums and wastewater from unauthorized drainage system. The Buckingham Canal (Mylapore) and Mambalam Drain waterways are more severely polluted than the Adyar and Cooum River, due to insufficient freshwater flow and continuous discharge of domestic wastes.

   Observations of TNPCB include:
   - The Water Quality is good in River Adayar & River Cooum prior to entry into city limit.
   - In locations where treated sewage from CMWSSB plants is discharged deterioration is noticed downstream
   - Otteri Nullah and other water bodies are major carriers of sewage

   The BOD in waterways is very high due to direct infall of sewage – 17 to 375 mg / litre and the presence of disease causing Bacteria & Virus in waterbodies is high, besides mosquito breeding and bad odour.

   The seminar information confirms that sewage treatment plants, pumping stations, stormwater drains, and sewers are causing pollution of waterways. In Chennai, there are systemic deficiencies in sewage collection and disposal which need to be addressed with a time-frame.

Reference
Session 1: http://www.cmdachennai.gov.in/pdfs/SeminarOnWaterways/3.pdf
Session 3: http://www.cmdachennai.gov.in/pdfs/SeminarOnWaterways/5.pdf
Source 5: http://www.cmdachennai.gov.in/pdfs/SeminarOnWaterways/7.pdf
Valedictory Session: http://www.cmdachennai.gov.in/pdfs/SeminarOnWaterways/8.pdf

2. **Status of Water Supply, Wastewater Generation and treatment in class-I cities and class-II towns of India (2009)** According to the CPCB, Delhi generated 3800 MLD of sewage, Mumbai generated 2671 MLD, Kolkata generated 705.86 MLD, Bangalore generated 771.75 MLD, and Chennai generated 447 MLD.

Does such a huge difference between Chennai and other major cities seem realistic?

3. As per EMAT survey there are totally 178 sewer outfalls identified in Chennai City.

4. **Impact of pollution on marine environment - A case study of coastal Chennai - Indian Journal of Science and Technology** - Issued in March 2011
"There has been a continued degradation in the river environment mainly due to increasing population of the city and encroachment on the banks of waterways and discharge of sewage. The uncollected sewage from unorganized sectors, treated sewage from sewage treatment plants namely CMWSSB at Koyambedu, effluents discharged from commercial establishments, sewage generated from encroached slums and waste water from drainage system is finally reaching river cooum. A part of the treated sewage from Kodungaiyur Sewage Treatment Plant is discharged into Buckingham Canal which is connected to Cooum River. Like other city waterways, Cooum River does not have natural flow, and it is getting polluted due to discharge of sewage and waste water from non industrial sources. The sewage which is let into city water base is around 532 MLD and it is more than sewage is collected by CMWSSB treatment plant."

5. Excreta Matters - 71 cities: a survey (A citizen's report by Center for science and environment) published in 2012
The study questions as to why do the rivers and canals remain so polluted when the city has a near-perfect track record in water and sewage provisioning. The report provides valuable data about the outfalls of the sewerage system, the money spent to improve the waterways, and how the efforts of various schemes

has not yielded much results. The study also reiterates that treated water can be reused to greater quantities.

6. As per Central Pollution Control Board and generally accepted standards, sewage is 80% of the water consumption. Therefore, it is important to include research reference about the water consumption patterns. *Domestic Water Consumption in Chennai* is a key study by A.Vaidyanathan (Emeritus Professor, Madras Institute of Development Studies, Chennai) and J Saravanan (Former Centre for Science and Environment staff), which was based on a stratified random sampling procedure to select a total of 1510 households. The study states that metrowater accounts for about 35 percent of the reported consumption of water by sample households. Own well, other's well, and bottled water account for 65%. This data excludes private tankers and other sources.

7. Session 5: Environmental Management, Infrastructure Development and Financing

   Experts confirm that "Chennai waterways are threat to the coastal environment"

   Source: http://www.cmdachennai.gov.in/smps/SMPS_Session5.pdf

ABOUT THE SEWERAGE SYSTEM

According to Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), Chennai generates 550 MLD of sewage as of 2017. Sewage generated from houses and other buildings is collected through the sewerage system of a length of 4000 Km to serve a total 8,10,014 consumers. We need to understand that this sewage is taken through 232 sewage pumping stations. The sewage system of the city is divided into 5 zones with independent zonal collection, conveyance, treatment and disposal facilities. The collected sewage from pumping stations is treated at 5 Sewage Treatment Plants that have an installed capacity of 727 MLD.

SOCIAL AUDIT OF PUMPING STATIONS

Area 1 - Tiruvottiyur

We visited Westmada street, South Mada street, and Perriyamettu Palayam pumping stations.

South Mada street pumping station:

- Every pumping station needs to have at least one plant operator, who has an associated diploma/degree. However, no plant operator is assigned to this pumping station. During our visit, only one field operator was present and his educational qualification was higher secondary only.
- The operator did not know where the sewage was sent to from the pumping station. This person is responsible for the functioning of the pumping station and is supposed to have complete information about the pumping station, whereas he did not even know basic details.

Perriyamettu Palayam pumping station:

Perriyamettu Palayam Pumping Station

- There was no wall/gate around the pumping station.
- No plant operator assigned for this pumping station. Only one field operator was present as the educational qualification of the operator present was high school education.
- He was not wearing uniform, and did not have any ID card.
- He did not know how to measure the total flow of sewage. Based on the extent of level of sewage in the well, he switches on/off the motor.
- He told that the sewage was sent to thiruvottiyur gate pumping station.

Thiruvottiyur gate pumping station: This pumping station is not part of the 232 pumping stations. This pumping station was not functional, and it was a project pumping station. The operator was sleeping in the panel room, did not have ID card/uniform. In spite of the pumping station being a project one, the wells were filled with sewage, and the pipes were rusted. Further, there was sewage around the pumping station in vacant land around it.

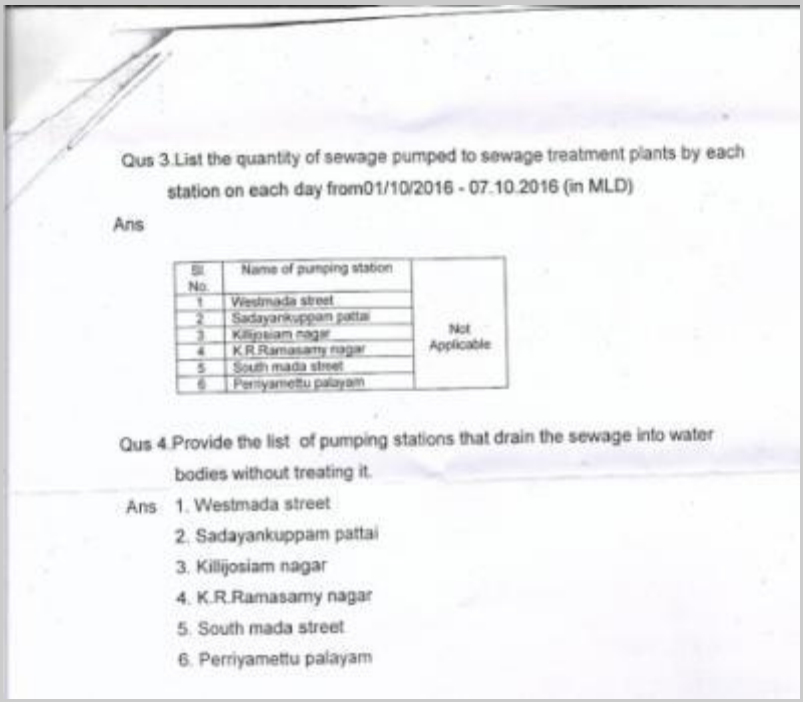
Westmada street:

- Plant operator was not assigned to the pumping station.
- The assigned field operator also owned/worked at a cycled shop near the pumping station. Therefore, he was not available at the pumping station for most of the time.

On further analysis of the area, we found a large quantity of raw sewage is discharged from pumping stations into Buckingham Canal.

Untreated Sewage Discharged Into Waterbodies in Tiruvottiyur

Video: https://youtu.be/PgMPtHCLi0Q



Qus 3.List the quantity of sewage pumped to sewage treatment plants by each station on each day from01/10/2016 - 07.10.2016 (in MLD)

Ans

Sl. No.	Name of pumping station	
1	Westmada street	Not Applicable
2	Sadayankuppam pattai	
3	Killijosiam nagar	
4	K.R.Ramasamy nagar	
5	South mada street	
6	Perriyamettu palayam	

Qus 4.Provide the list of pumping stations that drain the sewage into water bodies without treating it.

Ans 1. Westmada street
2. Sadayankuppam pattai
3. Killijosiam nagar
4. K.R.Ramasamy nagar
5. South mada street
6. Perriyamettu palayam

CMWSSB Reply Confirming Discharge of Untreated Sewage into Waterbodies

According to reply to an RTI (dated 09/03/2017), CMWSSB confirmed that untreated sewage from 6 pumping stations in Thiruvottiyur is discharged into Buckingham canal. Therefore, the raw, untreated sewage collected from entire Area 1 is discharged into the waterbodies without treatment. This is hazardous to the environment, waterbodies, and people living in the area. A minimum of 7.25 MD (million liters of sewage per day) is discharged into Buckingham canal. Following are the details of the pumping stations:

1. Westmada street
2. Sadayankuppam pattai
3. Killijosiam Nagar
4. KR Ramasamy Nagar
5. South Mada street
6. Perriyamettu Palayam

Area 2 - Manali

Manali new town pumping station: During our next audit, we went to the manali new town pumping station.

Manali New Town Pumping Staion

First, the study team audited Kosasthalaiyar river, the waterbody near the pumping station. We found that large quantities of untreated sewage was let into the waterbody. A small pond has been apportioned right next to the river, into which the untreated

Discharge of Untreated Sewage from Manali New Town Pumping Station into Kosasthalaiyar River

this pond flows into the Kosasthalaiyar river.

This sewage discharge is contaminating the waterbody, environment, and causing a health hazard for the people living there.

Video: https://www.youtube.com/watch?v=OsELYIfXmcg&t=111s

The study team then went to the pumping station and spoke to the AE who confirmed the discharge of untreated raw sewage into the “oxidation pond” for many years. He says that they are constructing a sewage treatment plant, and the Detailed Project Report has been prepared. After the construction is complete, the sewage will be sent to the treatment plant. He told that the STP was being constructed on an oxidation pond.

Reply to our RTI by CMWSSB confirms our findings. The pumping station discharges at least 1.4 million liters of untreated sewage each day into an “oxidation pond”, which overflows into the Kosasthalaiyar river. While, oxidation pond should only be used for secondary treatment.

Name of pumping station	Address, Zone number, and Ward number	Capacity (in MLD)	Utilized capacity (in MLD)	Areas from which sewage is collected	Number of household and commercial establishment from which sewage is collected by the pumping station	Cumulative Quantity of sewage received at the pumping station in 2015	Location which sewage discharged	Cumulative Quantity of sewage pumped to STP in 201
Manali New Town I.T Sew Pg St	57th Block Manali New Town, Near Manali New Town police station	2.8 mld /day	1.4 mld /day	Part of Depot-15 & 16	-	509.8 (mld)	Oxidation pond	509.8 (mld)

RTI Reply from CMWSSB Confirming Discharge of Untreated Sewage into Oxidation Pond

MMDA Mathur pumping station:

- We were not allowed to audit the pumping station inside
- People around told us that untreated sewage from this pumping station used to be discharged into the nearby lake. However, this discharge was stopped in 2016.

In area 2, we focused on auditing the waterbodies for discharge of sewage into it, and did not audit the pumping stations.

Area 3 - Madhavaram

Chandraprabhu colony and Ramachandranagar pumping stations:

- Only one field operator was present in each of the pumping stations and their education qualification was only middle school. This shows that plant operators are not assigned to the pumping stations.
- Both the operators told that sewage is sent to Bank colony pumping station, and from there it is sent to Royapuram pumping station. From Royapuram pumping station, the untreated sewage is sent to the sea. This shows their lack of knowledge as

Sewage Pipe into Canal near Chandraprabhu colony PS

untreated sewage should not be discharged into the sea.

- Near the Chandraprabhu colony pumping station, the sewage from various residences is discharged into the Kodungaiyur canal.
  This shows the inadequate collection infrastructure even near the pumping station.
- Near the pumping station in Chandraprabhu colony, there were two huge pipes leading to the Kodungaiyur canal, and through one pipe untreated sewage was frequently discharged from the pumping station, which has been stopped a couple of months back.

Area 4 - Tondiarpet

Thendral Nagar Pumping Station

- 1 Submersible pump was not functioning so it had to be repaired.
- The plant operator was not aware of a lot of basic information, such as the capacity of the backup generator.
- The plant operator did not have his ID card. He said that the ID card was with the JE, who usually keeps all the ID cards as the plant operator may lose it.
- As per CMWSSB, there should be 10 bags of sand to prevent inundation. This was not available in the pumping station.

RR Nagar Pumping Station:

- During our visit to the pumping station in the evening at 5:30 PM, the pumping station was locked, and the operator had left for the day. Right behind the pumping station, we could find a waterbody.
- According to RTI reply from CMWSSB – Kodungaiyur STP, RR Nagar is supposed to send the sewage to the STP but is not sending.
- According to RTI reply from RR Nagar pumping station, the sewage is sent to Kodungaiyur STP.

This discrepancy only shows that the sewage is being discharged in the waterbody.

RR Nagar Pumping Station and the Waterbody Behind the Pumping Station

uestion No.	Question	Answer
7.	List the pumping stations that are supposed to send the sewage to the Kodungaiyur Sewage Treatment Plants, but are not sending.	Rajarathinam Nagar Pg. Station Krishnamurthy Nagar Pg. Station

Reply from Kodungaiyur STP Confirming Rajarathinam Nagar (RR Nagar) Pumping Station is Not Sending Sewage to STP

Area 5 - Royapuram

Pumping station at the Mint Bus stand

- The walls of the pumping station are broken
- During our visit, a very young teenager was at the pumping station, who was not aware about the functioning of the plant. He was not wearing uniform as well.

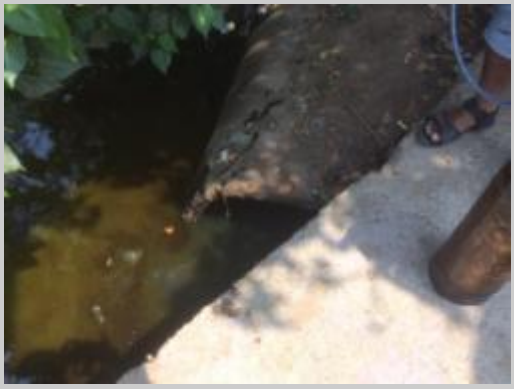
Pumping Station on Mint Bus Stand with Broken Walls

Area 6 – Thiru- Vi- Ka Nagar

Periyar Nagar and Jawahar Nagar Pumping Stations:

- Untreated sewage from the pumping stations are being let out directly into the Vannankuttai waterbody in GKM Colony located next to the K5 Police Station (Peravallur) Jawahar Nagar. This information was provided by PWD workers who regularly clean this waterbody. Looking at the state of the waterbody, it is

obviously visible that large quantities of untreated sewage is discharged into the waterbody.



Untreated Sewage Discharged into Vannankuttai waterbody

Area 7 – Ambattur

Mogappair Pumping Station

The plant operator was aware of the basic details of operation and the systems. However, like the other pumping stations, this pumping station did not have any basic measurement devices.

Area 8 – Anna Nagar

MMDA Colony/East Arumbakkam pumping station: Untreated sewage from the pumping station is discharged into Cooum at midnight. The pumping station handles at least 14 MLD of sewage.

Video: https://www.youtube.com/watch?v=g4suOaGhmgE

Untreated Sewage Discharged from MMDA Colony/East Arumbakkam pumping station at midnight

Villivakkam Phase I pumping station: Untreated sewage is discharged into the Villivakkam/Konnur lake. This pumping station discharges at least 3.8 MLD of untreated sewage into the Villivakkam/Konnur lake.

Untreated Sewage Discharged from Villivakkam Phase I Pumping Station Discharging Sewage into Villivakkam Lake

Area 9 - Teynampet

Greams road pumping station:

- Greams road Pumping Station discharges untreated sewage into Cooum river.
- This pumping station handles 14 million liters of sewage every day.
- People around are worried that they are developing health issues because of the raw dumping of sewage by the pumping station.

Untreated Sewage Discharged from Greams Road Pumping Station

Video: https://www.youtube.com/watch?v=XjWLxciPjs8

Mylapore pumping station:

- Sewage pipe from mylapore pumping station is broken, and sewage overflows from the pipe.
- The below image shows flow of sewage due to gravity. Therefore, in case of full flow, the sewage will overflow into the waterbody.

Broken Pipe from Pumping Station to STP

Ice House pumping station:

- Pressure gauge was not working
- Waste was manually removed from the wells and burnt

Lock nagar pumping station:

- Metro water field operator was managing the pumping station.
- Before we went, he was drinking alcohol with his friends inside the pumping station.
- Located in a very congested area.

Parathasarathy street pumping station:

- Height of the side compound walls is less
- Pumping station is situated right next to a school

Chinnathambi street and Ram Nagar pumping stations:

- Located in very congested areas.
- Total area of the pumping station is very less.

Ayodhiyakuppam pumping station:

- Pumping station did not have any gates/walls and the wells are not covered.
- This poses a serious risk of accidentally anyone falling into the well.
- The pumping station is near the houses constructed by the slum board.

Thomas road pumping station:

- Did not have any operator and was left unattended/unlocked.
- Anyone can enter the pumping station

- The well in Thomas road pumping station was filled with solid waste, which will clog the pump and cause operational issues.

Debris in Pumping Station Well

Area 10 - Kodambakkam

Pumping station in Pondy Bazaar:

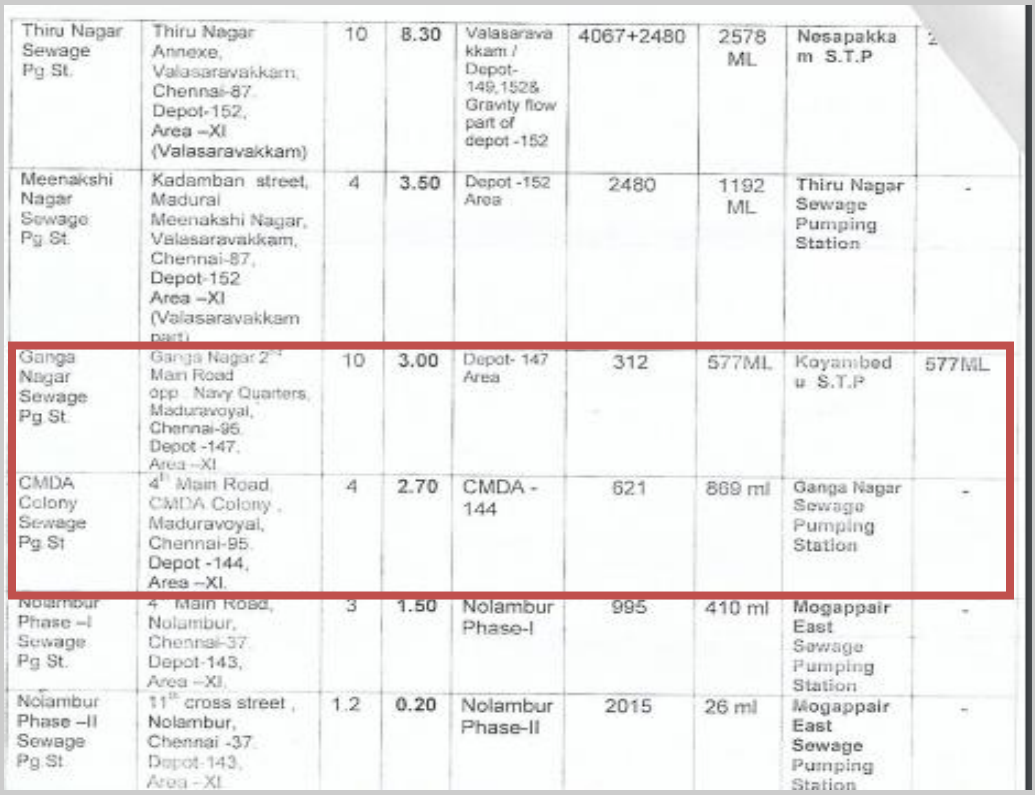
- Field operators not having ID cards
- Unauthorized people residing in the pumping station
- One well is not being used, which indicates underutilization of the facilities available

Area 11 - Valasaravakkam

CMDA Colony Pumping Station:

Sewage from CMDA colony is unaccounted for. As per RTI reply from CMWSSB:

- CMDA colony pumping station claims that it pumps sewage to Ganga Nagar sewage pumping station. However, Ganga Nagar operator confirmed that it does not receive sewage from any other pumping station.
- In addition, the sewage sent from Ganga Nagar pumping station to Koyembedu STP is less than the sewage generated at CMDA. Therefore, contrary to the RTI reply, CMDA colony pumping station does not send the sewage to Ganga Nagar pumping, and this sewage remains unaccounted for, and most likely will be discharged into waterbodies.
- When we went to the pumping station for social audit, the pumping station main gate and control room were locked, and no operator was present around 12:00 noon.



Thiru Nagar Sewage Pg St.	Thiru Nagar Annexe, Valasaravakkam, Chennai-87. Depot-152, Area –XI (Valasaravakkam)	10	8.30	Valasaravakkam / Depot-149,152& Gravity flow part of depot -152	4067+2480	2578 ML	Nesapakkam S.T.P	
Meenakshi Nagar Sewage Pg St.	Kadamban street, Madurai Meenakshi Nagar, Valasaravakkam, Chennai-87, Depot-152 Area –XI (Valasaravakkam part)	4	3.50	Depot -152 Area	2480	1192 ML	Thiru Nagar Sewage Pumping Station	-
Ganga Nagar Sewage Pg St.	Ganga Nagar 2nd Main Road opp. Navy Quarters, Maduravoyal, Chennai-95. Depot -147, Area –XI.	10	3.00	Depot- 147 Area	312	577ML	Koyambedu S.T.P	577ML
CMDA Colony Sewage Pg St	4th Main Road, CMDA Colony, Maduravoyal, Chennai-95. Depot -144, Area –XI.	4	2.70	CMDA - 144	621	869 ml	Ganga Nagar Sewage Pumping Station	-
Nolambur Phase –I Sewage Pg St.	4th Main Road, Nolambur, Chennai-37. Depot-143, Area –XI.	3	1.50	Nolambur Phase-I	995	410 ml	Mogappair East Sewage Pumping Station	-
Nolambur Phase –II Sewage Pg St.	11th cross street, Nolambur, Chennai -37. Depot-143, Area - XI.	1.2	0.20	Nolambur Phase-II	2015	26 ml	Mogappair East Sewage Pumping Station	-

RTI Reply from CMWSSB showing Data Issues

Area 13 - Adyar

Adyar Pumping Station

- During our visit to the pumping station, there were two operators.
- There was no specific discrepancy
- There was no level controller or flow meter.

KEY FINDINGS AT THE PUMPING SIDE

1) **Pumping stations discharging sewage into water bodies**: Most of the pumping stations in the city are located near waterbodies or waterways. In addition, the pumping stations are having underground pipelines connected to waterbodies. This makes it easier for the pumping stations to bypass treatment and discharge the untreated sewage into waterbodies, which destroys the waterbodies. In the 27 Pumping stations visited by the Study team, the following 10 pumping stations were discharging sewage into the waterbodies.

1. Westmada street - Area 1
2. South Mada street - Area 1
3. Perriyamettu Palayam - Area 1
4. Manali New Town - Area 2
5. RR Nagar Pumping Station – Area 4
6. Periyar Nagar - Area 6
7. Jawahar Nagar - Area 6
8. MMDA - Area 8
9. Villivakkam Phase I - Pumping Station - Area 8
10. Greams Road - Area 9

Around 37% of the pumping stations visited have been discharging sewage into the waterbodies. This is a serious issue. We found that 6 of the 10 discharge 100% into waterbodies and if we assume that the other 4 discharges 50%, then the weighted average would be 80%. This would mean that 80% of 37%, i.e. almost 30% of the sewage pumped flows directly into the waterbodies without treating.

Apart from this, the data accessed by the study team through Right to Information shows that the entire set of pumping stations in Area 1 discharge sewage into the waterbodies.

RTI Reply from CMWSSB showing Raw Sewage is Discharged into Waterbodies

Qus 3.List the quantity of sewage pumped to sewage treatment plants by each station on each day from01/10/2016 - 07.10.2016 (in MLD)

Ans

Sl No.	Name of pumping station	
1	Westmada street	Not Applicable
2	Sadayankuppam pattai	
3	Killijosiam nagar	
4	K.R.Ramasamy nagar	
5	South mada street	
6	Perriyamettu palayam	

Qus 4.Provide the list of pumping stations that drain the sewage into water bodies without treating it.

Ans 1. Westmada street
2. Sadayankuppam pattai
3. Killijosiam nagar
4. K.R.Ramasamy nagar
5. South mada street
6. Perriyamettu palayam

2) **Lack of monitoring in the pumping station**: There are no flow meters to measure the quantum of flow of untreated sewage at the pumping stations. The

operators measure the flow using the legacy technique of calculation based on capacity of motors and the duration. The start time and stop time of motors is recorded manually in a log book. Further, using this technique gives inappropriate values because the flow varies from capacity based on the type of installation, maintenance of the equipment, and age of the system. In addition, at the sewage treatment plants also there is no provision to measure the amount of sewage from each pumping station. Therefore, in the entire cycle, there is no accurate measurement/recording of the amount of sewage from pumping stations. Due to lack of this, the sewage is conveniently discharged from the pumping stations into nearby waterbodies. The entire system in pumping stations rely on the plant operator/field operator who can easily manipulate the number of hours motor run or the amount of sewage collected. Transparency is key to solving the issue. If there were flow metres measuring inflow and outflow for each pumping station which is updated online for live, the problems will immediately come to the notice of the Department as well as general public who can pressurize for allocation of sufficient manpower and budget to solve the problem.

3) **Inadequate experience/knowledge of staff at pumping stations**: The entire functioning of the pumping station is greatly dependant on the plant/field operators in the pumping station. The maintenance of most of the pumping stations has been outsourced to private agencies. In some pumping stations, the staff were not available. In addition, in one pumping station, we also found an operator socializing with friends (consuming alcohol). In many pumping stations, the staff are not aware of the basic information, such as the place where the untreated sewage is sent, calculation of the amount of flow, and the functioning. In many cases, the staff recruited by the contractors have only high school/middle school education, while the requirement is to have diploma or engineering plant operators. No proper ID cards are issued to the operators. Many-a-times, the operators are not wearing uniforms, as the CMWSSB has provided only one uniform. While the reliability of the operators is questionable, the CMWSSB has given complete control of the pumping station to the operator without proper monitoring.

Operator without ID card and Uniform

4) **Pumping stations built in a small area**: Many pumping stations are built in a very less, congested area in residential zones and near schools. This causes foul smell for the nearby residents.

5) **Pumping stations with inadequate infrastructure**: Some pumping stations lack very basic facilities. Pumping stations do not have level controllers. The operators switch on/off the motor by manually checking the levels. Many-a-times, there is overflow of sewage from the upstream manhole due to high levels in the pumping stations. Therefore, automated level controller is essential for appropriate functioning of the pumping stations. There are other basic infrastructural facilities, for example, Ayodhya nagar pumping station and Perriyamettu Palayam pumping stations did not have walls around them. In Ayodhya nagar, the wells were not even covered, which could be dangerous. Pumping station near old mint bus stand has broken walls, which was closed with asbestos sheet. Many pumping stations are very old, cover for the well, sand bags, and so on. The pumping station wells in some places are filled with debris, such as plastics. This would choke pumps frequently and cause sewage-build up and overflows. This will also cause pump maintenance and operational issues.

Well in Pumping Station Containing Debris

Many of the sewage pipes are damaged and broken, which cause overflow of sewage into the waterbodies.

Sewage Pipe Broken and Causing Overflow

6. **Location of the Pumping Stations:** Most of the pumping stations are located near waterways, and they do discharge the sewage into the waterways on a regular basis. Metro water says that many pumping stations have pipes to the

nearby waterbody for emergency purposes only. But this is primarily used to bypass treatment.

AUDIT OF SEWAGE TREATMENT PLANTS

The below table shows the various STPs, their original capacity, their amount of sewage treated and discharged, and the amount of reuse of treated water.

Name of the treatment plant	Actual Capacity	Average Sewage Treated per Day accessed through RTI	Amount of Water into Waterbodies after treatment	Amount of Water Reused
Koyembedu	34	120.4	105 MLD	15 MLD
Koyembedu	60			
Koyembedu	120			
Kodungaiyur	80	214.86	187.35 MLD	27.65 MLD @ 15.15 KL
Kodungaiyur	80			
Kodungaiyur	110			
Villivakkam	5	NA	4.2 MLD	NA
Nesapakkam	23	99.3 MLD	99 MLD	Sample Data: 4266000 ML was sold in June 2016 to Corporation for Rs 15,000
Nesapakkam	40			
Nesapakkam	54			
Perungudi	54	74.46 MLD	95 MLD	Sample Data: 4000 KL was sold in June 2016 to TNRDC for Rs 33,400
Perungudi	60			
Alandur	12	12.5 MLD		

Koyambedu Sewage Treatment Plant

Koyambedu has 3 sewage treatment plants of capacity 34 MLD, 60 MLD and 110 MLD. The study team visited all the 3 treatment plants and made the following observations

34 MLD

- It is very important to measure the flow/quantity of sewage for effective sewage management. However, flow meters were not functioning in this unit, and flow was manually measured using the level scale in this digital era.
- No proper mechanism to handle sludge. The excess sludge from the process is dumped in low lying areas within the treatment plant right from the inception of the treatment plant. During rains, this sludge will be washed away, and again pollute the waterways. Further, if there is proper treatment, it will be difficult to accommodate the sludge within the premises for the entire life period. With modern techniques, better mechanisms should be used to handle the sludge and derive value from the sludge. Adequate sludge generation is also a measure of proper treatment. Therefore, it is important to monitor and manage sludge appropriately.
- The bio manure is sold to people. However, no records are maintained for this by the treatment plant.
- 2 aerators were not in working condition. Aerators are of prime importance in an STP, which infuse air and is the basis of aeration, which treats the water to remove dissolved solids.
- If the treatment is happening properly, the aeration tank will have an earthy smell (smell of moist soil) and the water will be of dark brown colour. However, in the 34 MLD, the aeration tank had earthy and sewage smell.

60 MLD

- Flow meters were not working, and as stated earlier it is important to measure flow using latest technology.
- As per design, the sludge is fed into bio digester, which produces biogas. Next, the gas engine produces electricity from the biogas. This electricity can be used to run the STP. However, in the 60 MLD unit, the biogas engine was not working for many months. Due to which, the greenhouse gases from the bio digester were flared into the environment, which causes air pollution. In addition, the STP could have been self reliant by producing its own electricity, while in reality, it uses electricity from TNEB.

110 MLD

- No bio mass in the Aeration tank as the water color was very light brown. The aeration tank needs to have sufficient biomass, and the ratio of the biomass, oxygen, and sewage needs to be maintained. The micro-organisms in the biomass metabolize the suspended and soluble organic matter. In case there is no biomass, the aeration process does not happen adequately.
- No mechanisms to measure the amount of biogas flared.
- It is important to measure the amount of sludge generated as it an important process parameter. However, there are no mechanisms to measure the amount of sludge generated.

Near Metro Zone apartments in Koyambedu, huge volume of sewage is discharged into the waterbody. The treated sewage from the Koyambedu Treatment Plant is discharged here. However, this treated sewage is brown in colour and has a strong sewage odour, which also indicates that the treatment is insufficient. Treated water needs to be odourless and colourless.

Video: https://www.youtube.com/watch?v=Snw7_1aujbA

Discharge of Treated Sewage from Koyembedu STP

Nesappakam Sewage Treatment Plant:

Overall, the aeration process, which is the crux of sewage treatment was improper as identified by the lack of earthy smell near the aeration tank, inadequate biomass as identified by the appearance and light brown colour of the water. Foaming and Algae formation in aeration tank shows improper treatment and poor maintenance. Absence of

proper flow measurement techniques, flaring of greenhouse gases, non-production of biogas for over few months in any of the plants highlight the poor maintenance of the plant.

Findings of 23 MLD:

- 3 aerators under repair for long period.
- Aeration tank should have earthy smell. But the aerator tank did not have any smell.
- 1 secondary clarifier under repair for long period. Secondary clarifier is an essential equipment in the treatment unit. Secondary clarification is performed after aeration and is the last stage in the treatment process (excluding chlorination). Proper treatment in the secondary clarifier is important to ensure quality of treated water. While there are two clarifiers, it is important to ensure that all the essential equipment are in a working condition.

Findings of 54 MLD:

- 1 Primary Clarifier under repair. The purpose of a clarifier is to remove solids, produce a cleaner effluent and reduces the volume of sludge.
- Algae formation in the aeration tank, which indicates poor maintenance of the equipment.
- Foaming in 3 rows of the aeration tank, which indicates improper treatment.
- Water in the secondary clarifier also having foam. This indicates that the quality of the treated water is not good.

Findings of 40 MLD:

- 1 Detritus tank equipment not working, which indicates equipment is not properly maintained. Detritus helps removing in solid matter.
- Aeration tank should have earthy smell. But the aerator tank did not have any smell.
- No bio-mass in aeration tank.

Kodungaiyur sewage treatment plant

Findings of 110 MLD:

- Foaming in Primary clarifier, aeration tank, secondary clarifier, and treated water. Foaming (especially in treated water) indicates inadequate treatment.
- Earthy and sewage smell from aeration tank.

- Frequent bio-gas flaring in spite of operating at below capacity, and the quantum of gas flared is not measured. In this unit, even when the utilized capacity of the plant is only around 50%, the biogas generated is in excess of this unit's requirement for electricity. Due to this, biogas is flared into the environment, which causes air pollution and precious gas is also wasted, which could have been used for better purposes. Capacity of flare is 300 m3 per hour.
- Flaring data from the first ten days of January from logbook of the STP:
    - 02/01/2017 - Flaring from 11 AM to 1 PM
    - 04/01/2017 - Flaring from 10 AM to 1 PM
    - 09/01/2017 - Flaring from 11 AM to 4 PM

The Zone 1 (80 MLD) and Zone 2 (80 MLD) units are not functioning properly.

Findings of Zone 1 and Zone 2:

- Zone 1 - 1 Clarifier not working
- Zone 2 - 1 Secondary Clarifier not working
- 7 aerators not working and are broken
- Zone 2 aeration tank was completely filled with foam and foam flying all around the place
- Staircase to some of the tanks was rusted and broken
- No proper flow meters and sludge handling mechanisms

Clarifier Not Functioning

Drying Beds

Extracts from Log book of Zone I

Date:-16/09/2016

Primary clarifier	West=no record	East=23hrs
Secondary clarifier	**north=no records**	**south=no record**

60hp aerators	ii.)PMCC-II Aerator 1 = 6:00-19:00 (13HRS), Aerator 2 = 19:00-5:00 (10HRS), Aerator 3=6:00-19:00 (13HRS), Aerator 4=19:00-5:00 (10HRS), Aerator 5=6:00-19:00 (13HRS), Aerator 6=19:00-5:00 (10HRS), Aerator 7=6:00-19:00 (13HRS), Aerator 8=19:00-5:00 (10HRS)	**i.)PMCC-I{1,2,3,4,5,6,7,8=no record}**

Date:-8/10/2016

Primary clarifier	West=no record	East=23hrs
Secondary clarifier	**north=no records**	**south=no record**
60hp aerators	ii.)PMCC-II Aerator 1 = 6:00-19:00 (13HRS), Aerator 2 = 19:00-5:00 (10HRS), Aerator 3=6:00-19:00 (13HRS), Aerator 4=19:00-5:00 (10HRS), Aerator 5=6:00-19:00 (13HRS), Aerator 6=19:00-5:00 (10HRS), Aerator 7=6:00-19:00 (13HRS), Aerator 8=19:00-5:00 (10HRS)	**i.)PMCC-I{1,2,3,4,5,6,7,8=no record}**

Notice that, in the above records, there is no data for the primary clarifier, and both the secondary clarifiers. In addition, aerators in one of the aerator tanks have not been used throughout the day. These records indicate issues with the equipment or bypassing of the process.

As per RTI reply from CMWSSB, Rajarathinam pumping station and Krishnamurthy nagar pumping station are supposed to send sewage to Kodungaiyur pumping station, but are not sending.

Alandur STP and Perungudi STP

Many lorries were waiting in queue to discharge the sewage into treatment plant. The entire street was stinking. The STP does not have proper security as anyone can enter the treatment plant from the side entrance and as the area is huge, it is easy for trespassers to enter into the treatment plant. The treatment plant's bypass channel was filled with water. If the channel was not being used, it would have dried up or filled with waste. A lot of Water logging is visible in non-monsoon season in the STP and also between the STP and dumping yard. In addition, there was no access to the treated sewage outflow channel due to growth of vegetation.

Alandur Sewage Treatment Plant - 12 MLD

- No proper water circulation in the primary clarifier
- Secondary clarifier is not working
- Foaming in Aeration tank and very less earthy smell
- Only 3 out of the 10 drying beds were being used. The reason given was low sludge generation, which again shows that the treatment is not sufficient.
- Hand written log book, which provides scope for manipulation of data, inadequate data recording, lack of clarity, and control by one person
- The actual and operating capacity of the Alandur STP is 12 MLD while it receives 12.50 MLD from Nilamangai nagar pumping station. Therefore, it receives more sewage that the actual capacity.

Improperly Maintained Drying Bed in Alandur STP

Hand Written Records in Alandur STP

Perungudi STP

54 MLD

The below images show foaming in aeration tank.

60 MLD

Bio gas plant in maintenance for over a week during our audit.

In Perungudi STP, we could not access the outlet channel from the plant to the maturity pond due to the growth of vegetation. This being the case, we are unsure of how the samples are tested at this stage.

Villivakkam STP

The Villivakkam Sewage Treatment Plant is nothing but the Villivakkam/Konnur lake. The raw sewage collected from around VIllivakkam is discharged into the Villivakkam/Konnur lake directly without any treatment. Each day, close to 5 million liters of sewage is discharged into the lake. This has polluted the lake and caused complete degradation of the waterbody.

Untreated Sewage Discharged into Villivakkam Kannur Lake

KEY FINDINGS AT THE TREATMENT SIDE

Improper functioning of treatment plants

Huge capital investment and large acres of land are invested into a sewage treatment plant. Due to poor maintenance, the treatment plants in Chennai are in a bad state and their improper functioning is polluting our water bodies. During our visit to the treatment plants, we identified major issues such as the main equipment at the treatment plants were not functioning, the sludge disposal and slurry handling are not appropriate, treatment plants are bypassed, the treatment is insufficient, greenhouse gases are emitted to large quantities, legacy systems, and inadequate infrastructure.

Poor maintenance of the treatment plants

Crores of money are spent to establish and maintain sewage treatment plants. However, the maintenance of the plants is poor due to which the quality of sewage treatment is affected. Many-a-times, the contractors maintain the plant very poorly, and after the plant is handed over to CMWSSB, the life of the plant is negatively impacted due to the poor maintenance of the contractor. In addition, the STPs are constructed only for domestic sewage, while industrial wastes are also illegally discharged into the sewerage network. Due to these reasons, the lifespan of the plant reduces.

Lack of monitoring in the treatment plants

The STPs lack automated monitoring facilities, which is critical to ensure that the treatment is according to standards. There is huge reliance on the staff to manually perform tasks like measuring the amount of sewage inflow and outflow. The flow meter is either not available or is not working. There is no means to check the quantum of sewage received from each sewage line as there is only one common inlet line. Furthermore, there are no facilities to measure the volume of glasses flared or sludge generated.

Lack of measurement devices

In most of the treatment plants, basic devices like flow meters are not available or are not working. The amount of flow is manually measured using the level scale on the wall of the inlet channel. The amount of sludge generated or sold is not measured. There are no devices to monitor if the plant is bypassed or no automated methods to monitor the quality of the treated sewage.

Inadequate capacity

The available capacity at treatment plants in Chennai is way below the amount of sewage generated in the city. The treatment capacity is 727 MLD, while our estimated amount of sewage that is generated is 1952 MLD. Due to which, many pumping stations discharge the untreated sewage into waterbodies. In addition, the infrastructure to connect the pumping stations to the treatment plants is also not available. Non-functioning of equipment (clarifiers and aerators) in the treatment plant further reduces the treatment capacity and quality. Therefore, CMWSSB needs to increase the capacity to treat the entire sewage by constructing new treatment plants. In addition, CMWSSB is focusing on tertiary treatment plants and investing huge funds in those projects, while it is imperative to first get the basics rights by appropriately doing secondary treatment of the entire sewage that is currently generated.

Lack of reuse of treated water: After treatment, major portion of the treated water is discharged into the waterways, which are heavily polluted and have sewage outfalls. Therefore, discharging treated water into polluted waterways is not economical. STPs need to promote the reuse of the treated water among industries as there is inadequate water supply even for drinking purposes. This will help reduce the demand for fresh water, protect waterbodies, and create revenues for the STP.

Location of the STPs: Chennai's STPs are all situated at the far corners of the city. Wastewater is pumped across the city to these plants located on the outskirts. After treatment, major portion of the treated water is discharged into the waterways, which flow across the city again. Due to this, the number of hours between sewage generation and sewage treatment increases, which again causes issues at the treatment side.

Disadvantages of Private, Decentralized Treatment Plants

It is practically not feasible to have sewage treatment plants in residential apartments because of the installation cost involved, apartment societies do not have the capacity to maintain and operate such facilities. Maintaining such facilities will require dedicated staff for each STP and there are not enough trained people to manage STPs.

KEY FINDINGS AT THE COLLECTION SIDE

Absence of underground sewerage connections

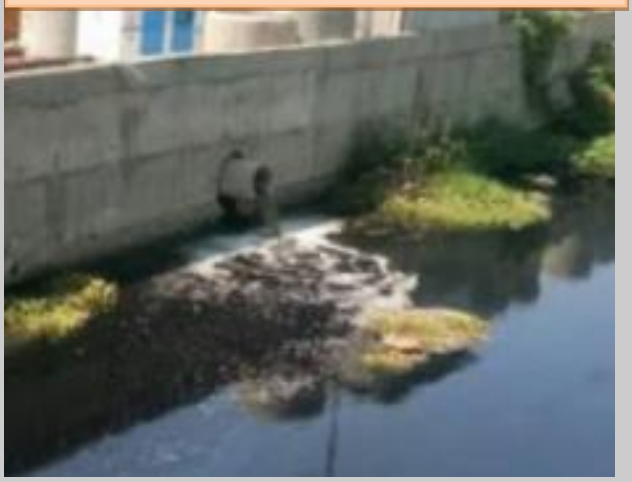
In many areas, the construction of underground sewerage has not been completed. The construction has been pending for many years. In addition, in some areas, the underground sewage connections have not been completed. But, the CMWSSB website shows that the underground connections are completed. For example, area - III Madhavaram, the underground sewage connection work is in progress for many areas. But the MAWS policy note shows that underground sewage connections are provided. In addition, even in the city where underground sewerage is provided, there are many houses that do not have the underground sewerage connection. Many slums do not have proper sewerage connections.

Illegal sewage connections into waterbodies

Across Chennai, illegal residential and commercial sewage lines discharge waste into waterbodies. This is not restricted to areas where underground sewage connections are not available. Illegal connections into waterbodies is a problem in nearly all areas of Chennai.

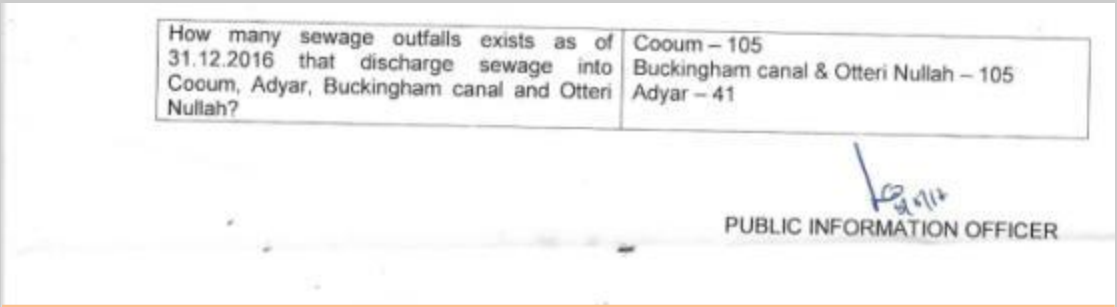
The above images show illegal sewage discharge into a waterbody near the Hindustan Bible Institute & College in Medavakkam Tank Road, Kilpauk.
Video: https://www.youtube.com/watch?v=4yNiC6XSxzQ&feature=youtu.be

Untreated Sewage Discharged into Waterbody in Thiruvottiyur



Untreated Sewage Discharged in Madhavaram

The below reply from CMWSSB shows the number of sewage outfalls into Cooum, Buckingham Canal, Otteri Nullah and Adyar. This is the official outfall count, while the actual count may be actually higher.



How many sewage outfalls exists as of 31.12.2016 that discharge sewage into Cooum, Adyar, Buckingham canal and Otteri Nullah?	Cooum – 105 Buckingham canal & Otteri Nullah – 105 Adyar – 41

PUBLIC INFORMATION OFFICER

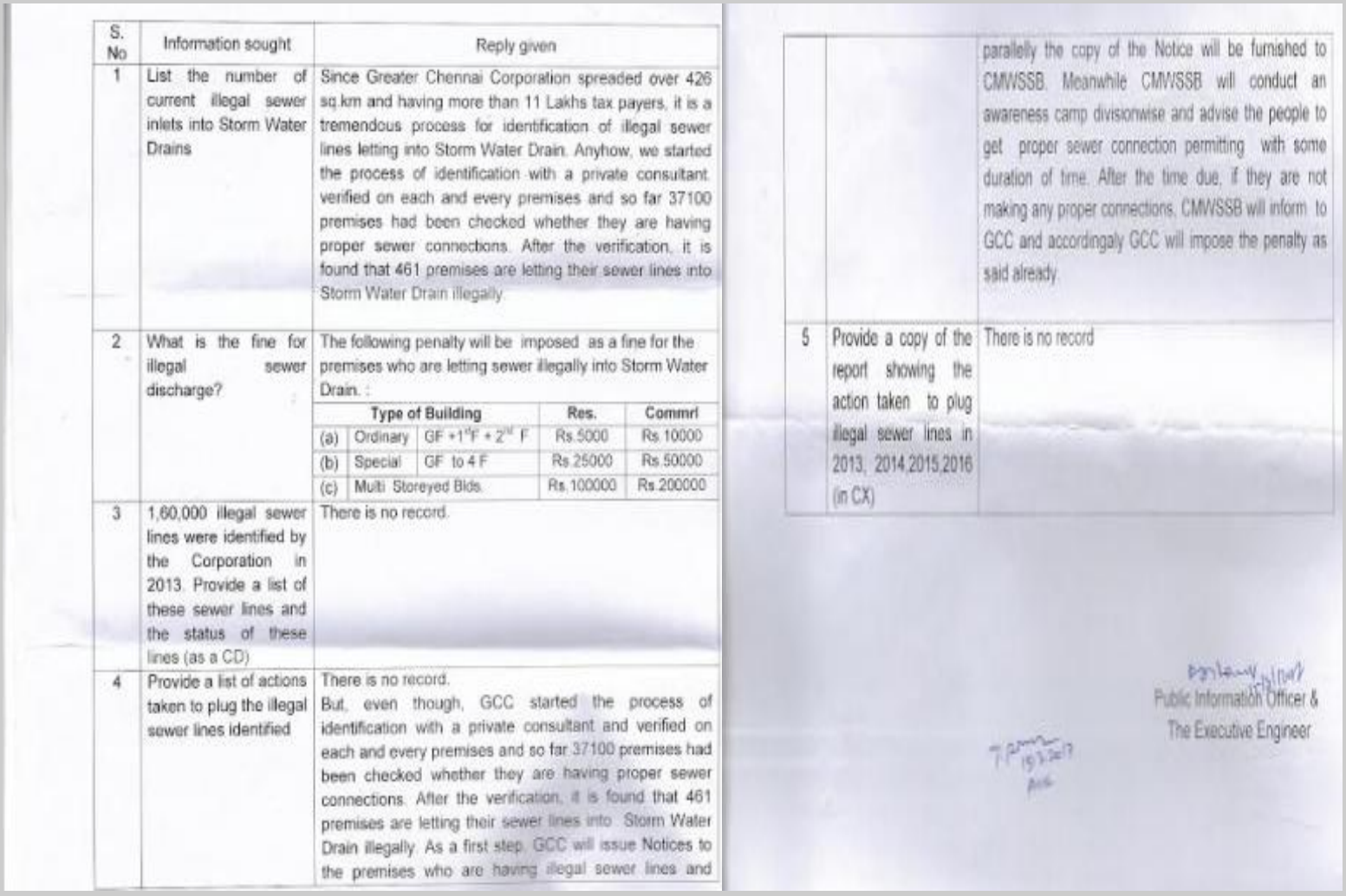
RTI Reply from CMWSSB showing Sewage Outfalls in some of the Waterbodies

Sewage discharged into Storm Water Drains

The purpose of storm water drains (SWDs) is to drain rainwater into the nearest waterbody, and help recharge the groundwater. However, in many areas the SWDs are used to discharge sewage, which pollutes the water bodies and also clogs the SWDs. In 2013, the Chennai Corporation had told that it has identified 1.6 lakh illegal sewer inlets into SWDs across the city. However, no action was taken to resolve the issue. Storm water drains continue to be filled with sewage. The Chennai Corporation has informed us in the RTI that it does not even have the record of the 1.6 lakh illegal sewer connections into the Storm Water Drain. The following RTI reply from corporation shows that not much progress has been made to plug these illegal sewage outfalls into Storm Water Drains.

Also, the Corporation have only identified 461 households with illegal sewer lines. Even on those, they have not penalized them but sent to Metro water for creating awareness and giving sewer connections. This also raises a crucial question of who should be responsible for illegal sewer connections. The accountability for any illegal sewage discharge should wrest with MetroWater. But today, both MetroWater and Corporation hold each other responsible for this mess and neither of them is willing to take up accountability.

Reply from Chennai Corporation showing that no action has been taken for illegal sewer lines into SWDs



S. No	Information sought	Reply given
1	List the number of current illegal sewer inlets into Storm Water Drains	Since Greater Chennai Corporation spreaded over 426 sq.km and having more than 11 Lakhs tax payers, it is a tremendous process for identification of illegal sewer lines letting into Storm Water Drain. Anyhow, we started the process of identification with a private consultant verified on each and every premises and so far 37100 premises had been checked whether they are having proper sewer connections. After the verification, it is found that 461 premises are letting their sewer lines into Storm Water Drain illegally.
2	What is the fine for illegal sewer discharge?	The following penalty will be imposed as a fine for the premises who are letting sewer illegally into Storm Water Drain. :
		Type of Building / Res. / Commrl (a) Ordinary GF +1st F + 2nd F — Rs.5000 — Rs.10000 (b) Special GF to 4 F — Rs.25000 — Rs.50000 (c) Multi Storeyed Bldg. — Rs.100000 — Rs.200000
3	1,60,000 illegal sewer lines were identified by the Corporation in 2013. Provide a list of these sewer lines and the status of these lines (as a CD)	There is no record.
4	Provide a list of actions taken to plug the illegal sewer lines identified	There is no record. But, even though, GCC started the process of identification with a private consultant and verified on each and every premises and so far 37100 premises had been checked whether they are having proper sewer connections. After the verification, it is found that 461 premises are letting their sewer lines into Storm Water Drain illegally. As a first step, GCC will issue Notices to the premises who are having illegal sewer lines and parallelly the copy of the Notice will be furnished to CMWSSB. Meanwhile CMWSSB will conduct an awareness camp divisionwise and advise the people to get proper sewer connection permitting with some duration of time. After the time due, if they are not making any proper connections, CMWSSB will inform to GCC and accordingaly GCC will impose the penalty as said already.
5	Provide a copy of the report showing the action taken to plug illegal sewer lines in 2013, 2014 2015 2016 (in CX)	There is no record

Public Information Officer &
The Executive Engineer

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Raw Sewage in Storm Water Drains Across Chennai

Lorries Discharging Sewage Into Water Bodies / SWDs

Many areas still do not have underground sewerage connections. In these areas, septic tanks are maintained and lorries collect sewage from these places. The lorries are meant to discharge the sewage at STPs by paying Rs 100. However, many of these private, registered lorries discharge the sewage into waterbodies, storm water drains, and canals. However, metro water or PWD does not take any preventive measures. If complaints are filed, the metro water says that monitoring private lorries is not within their scope. While for specific case in Kil Ayanambakkam (photo given below) the corporation suggested that this is outside their scope, and this belongs to Thiruverkadu municipality. There is no departmental accountability to monitor, prevent, and punish discharge of raw sewage into water bodies.

ESTIMATION OF TOTAL SEWAGE GENERATED, PUMPED AND TREATED:

Even though Metrowater claims that it generates, pumps and treats 550 MLD of sewage, the data is grossly misrepresentative of facts. If this was true then we will not have any sewage in our waterbodies. The study estimates the Sewage collected, Pumped and Treated based on the facts available in the public domain and information accessed from Metrowater through Right to Information Act.

Estimation of Total Sewage Generated:

As a generally accepted standard and the protocol followed by Central Pollution Control Board, 80% of the water consumed is estimated to be the sewage generated in the city. We have used three different, reliable methods to estimate the sewage quantity:

1. Chennai Metro Water Supply and Sewerage Board supplied 830 MLD of water during normal times. However, as you may be aware, many of us depend largely on bore well for water for general usage. Domestic Water Consumption in Chennai is a key study by A.Vaidyanathan (Emeritus Professor, Madras Institute of Development Studies, Chennai) and J Saravanan (Former Centre for Science and Environment staff), which was based on a stratified random sampling procedure to select a total of 1510 households. The study states that Metrowater accounts for about 34 percent of the reported consumption of water by sample households. Own well, other's well, and bottled water account for 66%. This data excludes private tankers and other sources.

   Therefore, if 34% of our consumption in Chennai is 830 MLD, our 100% consumption estimates to 2441 MLD. Therefore, 80% of the water consumed is 1952 MLD, which is the estimated sewage generated. Based on this figure, we claim that Chennai generated 1500 to 2000 MLD of sewage.

1	Metro Water Supply (as per policy note of Municipal Administration and Water Supply Department 2016 - 2017)	830 MLD
2	Daily water consumption by source ratio (Metro water: Other sources*) as per Chennai Corporation Estimation 2004 and Domestic Water Consumption in Chennai	34:66
3	Water supplied from other Sources (830 / 34 X 66) Includes bore well, private suppliers, and own wells	1611 MLD
4	Total Water Consumption in Chennai (1 + 3)	2441 MLD
5	Sewage Generated (Sewage is 80% of the water supply as stated by Central Pollution Control Board.)	1952 MLD

2. As per the Bureau of Indian Standards, IS:1172-1993, a minimum water supply of 200 litres per capita per day (lpcd) should be provided for domestic consumption in cities with full flushing systems. With the population of nearly 90 lakhs for Greater Chennai, our water consumption is 1800 MLD. 80% of this value is 1440 MLD, which is the estimated sewage based on the lpcd.

3. According to CPCB, Delhi generated 3800 MLD of sewage in 2009. Delhi's population is 16.75 million (as per census 2011), which is double of Chennai's population (8.5 Million as per census 2011). Therefore, the sewage generated should also be at least half of the sewage generated, which works out to be 1900 MLD.

Therefore clearly, our sewage generation must be somewhere between 1440 MLD to 1952 MLD in Chennai. For calculation purposes, the study will assume a conservative generation of 1500 MLD.

Estimation of Total Sewage Pumped:

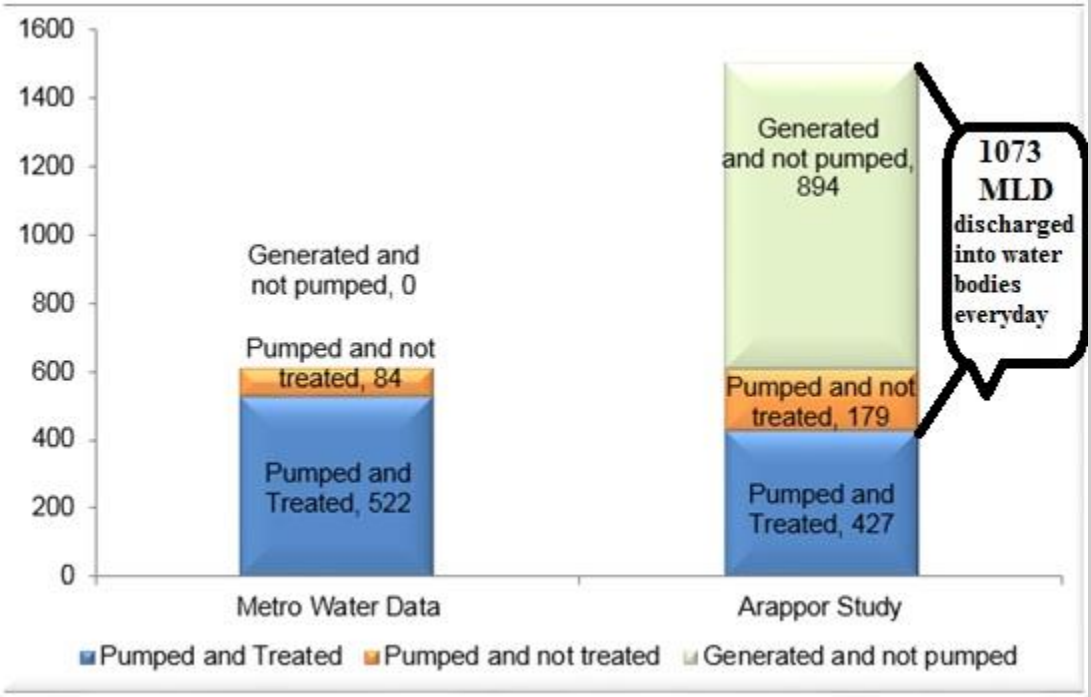
Chennai Metrowater claims that it has 232 pumping stations and that it collects 550 MLD of sewage. But data accessed through Right to Information from different areas has been collated together and it has been found that there are a total of 245 pumping stations in Chennai. The entire list of pumping stations has been collated including the capacity of the pumping station, utilized capacity and the treatment plant it is sent to for treatment. The entire list of data from pumping station has been listed in Annexure I. Many small pumping stations send their sewage to large pumping stations and relay pumping stations. From there, the sewage is sent to the sewage treatment plants for treatment. The total capacity of all the 245 pumping stations works out to almost 1500 MLD whereas actual sewage collected by these pumping stations are only 605 MLD everyday.

Estimation of Total Sewage Treated:

Chennai Metrowater has a total of 5 treatment plants. Based on the data given by the Sewage Treatment plants accessed through Right to Information Act, the total installed capacity of the Sewage Treatment plants is 727 MLD and the total average sewage treated is 522 MLD. The data accessed through RTI is attached in Annexure II. Based on this data given by the Metro water through RTI, we find that while on an average 605 MLD of water is pumped everyday, 522 MLD is treated everyday. This difference is

because some of the pumping stations claim that they send higher quantity to treatment plant than what the sewage treatment plant has acknowledged. For Example: Purasawalkam pumping station claims that they send 90 MLD of sewage to Kodungaiyur STP whereas Kodungaiyur STP claims that they receive only 41.69 MLD from Purasawalkam PS.

However, from the field visits the study team made, it is clear that there is a lot more sewage outflow into waterbodies from pumping stations. We found at least 35% of the pumping stations discharging sewage into waterbodies. We need to understand that it was not clear whether the rest 65% send completely to sewage treatment plants. It is only that the study team was not able to find any evidence and hence we can say that at least 35% of the pumping stations discharge into waterbodies. We also found that 6 of the 10 discharge 100% into waterbodies and if we assume that the other 4 discharges 50%, then the weighted average would be 80%. Therefore out of the 605 MLD, if we assume that 80% of 35% of the sewage is not treated and sent to waterbodies, then a total of 179 MLD is sent to waterbodies without treatment everyday. According to our study, out of the 605 MLD pumped, since 179 MLD is sent to waterbodies, the total estimated sewage treated everyday amounts to 427 MLD.



While Metrowater claims that they generate 550 MLD, their data says that they pump 604 MLD of sewage and treat 522 MLD everyday. Our study clearly suggest that we generate nearly 1500MLD of sewage every day, out of which only 605 MLD is pumped and only 427 MLD of it is treated. Therefore, nearly 1073 MLD of sewage (=1500 MLD

generated – 427 MLD treated) is directly let into waterbodies stinking our rivers and waterbodies.

SUMMARY OF KEY FINDINGS

- According to CMWSSB, the total generation of sewage in Chennai is only 550 MLD, while this study finds that the conservative estimate of sewage generated in the city is 1500 MLD.
- In addition, the study finds that the total quantity pumped from pumping stations to treatment plants is only 606 MLD, and the amount of sewage treated is 427 MLD only.

As part of the study, we visited 27 pumping stations across various areas and 5 treatment plants. Our key observations in the pumping stations:

- **Discharge of untreated sewage into waterbodies**: Out of 27 pumping stations that we audited, 10 pumping stations (37%) discharge untreated sewage into the waterbodies. We also got to know about 3 other pumping stations that discharge sewage into waterbodies from the data collected via RTI.
- **Inadequate experience/knowledge of staff at pumping stations**: In most pumping stations, there was only one operator, who did not have understanding about the process and details about where the sewage is sent. In addition, the educational qualification of the operator was also high school/higher secondary school in many pumping stations.
- **Lack of monitoring facilities in pumping stations**: Most pumping stations do not even have a flow meter to measure the quantum of sewage collected from various areas, and sewage sent to STP. Generally, in the pumping stations, the flow is calculated based on the system capacity and number of hours the motor is running. This is manually recorded in the log books. The entire operation depends on the operators, who are not dependable due to lack of experience, knowledge, and accountability. Therefore, the data generated is not reliable.
- **Pumping stations built in a small area**: Many pumping stations are built in a very less, congested area in residential zones and near schools. This causes foul smell for the nearby resident
- **Pumping stations with inadequate infrastructure:** Some pumping stations lack very basic facilities, such as walls. In addition, pumping stations do not have level controllers. The operators switch on/off the motor by manually checking the levels. However, these automatic level controllers can automatically turn on/off the motor based on the sewage level in the wells.

- **Location of the Pumping Stations**: Most of the pumping stations are located near waterways, and they do discharge the sewage into the waterways on a regular basis

The key observations in the treatment plant include:

- **Improper functioning of treatment plants:** Due to poor maintenance, the treatment plants in Chennai are in a bad state and their improper functioning is polluting our water bodies. During our visit to the treatment plants, we identified major issues such as the main equipment at the treatment plants were not functioning, the sludge disposal and slurry handling are not appropriate, treatment plants are bypassed, the treatment is insufficient, greenhouse gases are emitted to large quantities, legacy systems, and inadequate infrastructure.
- **Poor maintenance of the treatment plants:** STPs are constructed only for domestic sewage, while industrial wastes are also illegally discharged into the sewerage network. Due to these reasons, the lifespan of the plant reduces and the treatment is also negatively impacted.
- **Lack of monitoring in the treatment plants:** The STPs lack automated monitoring facilities, which is critical to ensure that the treatment is according to standards. There is huge reliance on the staff to manually perform tasks like measuring the amount of sewage inflow and outflow. The flow meter is either not available or is not working. There is no means to check the quantum of sewage received from each sewage line as there is only one common inlet line. Furthermore, there are no facilities to measure the volume of glasses flared or sludge generated.
- **Lack of measurement devices:** In most of the treatment plants, basic devices like flow meters are not available or are not working. The amount of flow is manually measured using the level scale on the wall of the inlet channel. The amount of sludge generated or sold is not measured. There are no devices to monitor if the plant is bypassed or no automated methods to monitor the quality of the treated sewage.
- **Inadequate capacity:** The available capacity at treatment plants in Chennai is way below the amount of sewage generated in the city. The treatment capacity is 727 MLD, while our estimated amount of sewage that is generated is 1952 MLD. Due to which, many pumping stations discharge the untreated sewage into waterbodies.
- **Lack of reuse of treated water:** After treatment, major portion of the treated water is discharged into the waterways, which are heavily polluted and have sewage outfalls. Therefore, discharging treated water into polluted waterways is not economical.

- **Location of the STPs**: Chennai's STPs are all situated at the far corners of the city. Wastewater is pumped across the city to these plants located on the outskirts. After treatment, major portion of the treated water is discharged into the waterways, which flow across the city again. Due to this, the number of hours between sewage generation and sewage treatment increases, which again causes issues at the treatment side.

Key issues at the collection side include:

- **Absence of underground sewerage connections**: In many areas, the construction of underground sewerage has not been completed. The construction has been pending for many years. In addition, even in the city where underground sewerage is provided, there are many houses that do not have the underground sewerage connection. Many slums do not have proper sewerage connections.
- **Illegal sewage connections into waterbodies:** Across Chennai, illegal residential and commercial sewage lines discharge waste into waterbodies. This is not restricted to areas where underground sewage connections are not available. Illegal connections into waterbodies is a problem in nearly all areas of Chennai.
- **Sewage discharged into Storm Water Drains:** In many areas the SWDs are used to discharge sewage, which pollutes the water bodies and also clogs the SWDs. Storm water drains continue to be filled with sewage. The Chennai Corporation has informed us in the RTI that it does not even have the record of the 1.6 lakh illegal sewer connections into the Storm Water Drain.
- **Lorries discharging sewage into waterbodies/SWDs**: Many of private, registered lorries discharge the sewage into waterbodies, storm water drains, and canals. However, metro water or PWD does not take any preventive measures. If complaints are filed, the metro water says that monitoring private lorries is not within their scope. There is no departmental accountability to monitor, prevent, and punish discharge of raw sewage into water bodies.
- **Leakages from Manholes**: Many-a-times, there are leakages from the manholes during to blockages, legacy infrastructure, and high level at the pumping station.

RECOMMENDATIONS

Acceptance of the problem:

CMWSSB needs to accept that the actual sewage generation in Chennai is three or four times higher than the estimated 550 MLD, and the pumping and treatment capacity is not sufficient to meet even the current sewage generation. CMWSSB needs to accept that major quantity of the sewage generated is discharged into waterbodies without any treatment. In a denial mode, it is not feasible for CMWSSB to ensure appropriate sewage management in the city. CMWSSB needs to have a short term and long term sustainable plan to upgrade and build the collection, pumping, and treatment infrastructure and facilities to meet the current and anticipated demand based on population increase. As it is difficult to pump sewage from all areas to treatment plants in the corners of the city due to various problems, such as velocity issues, it is recommended that CMWSSB build smaller treatment plants in various locations. This will also help easier maintenance of infrastructure. The mitigation steps needed to prevent discharge of sewage into waterbodies needs to be done on a quick pace within a period of 6 months. CMWSSB is focusing on tertiary treatment plants, while the collection infrastructure and secondary treatment infrastructure is not in place. It is important to get the basic infrastructure in place before moving to tertiary treatment plants.

Adequate resource allocation:

CMWSSB can build and maintain the infrastructure only when enough resources (monetary and human) are provided. Major portion of the Chennai river restoration trust's funds should be invested in building sewerage system. Adequate manpower (having the necessary qualification and training) should be available to maintain the system and low attrition rate should be ensured. As the health of people working in the industry is impacted, it is necessary to have extra manpower to work in rotational basis, and ensure proper protective gears are used. Separate team should be available for monitoring purposes to ensure proper functioning of the entire system, right from collection, through pumping, treatment, till final disposal. In addition, CMWSSB needs to complete projects within the timeline. The construction of underground sewerage systems is in progress/pending for a long time, and the deadlines are being extended. Similarly, the construction of tertiary treatment plants is long overdue and STPs in Thiruvottiyur and Sholinganallur are also not completed, while the deadline has passed.

Online Monitoring Systems for STPs and Pumping Stations: Install:

- Electromagnetic or ultrasonic flow meters

- Automatic level controllers
- Online monitoring systems
- Alarm Systems
- CCTV Cameras

For pumping stations, flow meters to measure the quantum of sewage received and sewage that is pumped out to be automatically recorded and the information should be automatically sent to the concerned officials. Level controllers help to automatically manage the flow based on the level of sewage.

The information from the flow meters, level controllers and other process parameters needs to be automatically recorded using the online monitoring systems. Like the 17 categories of highly polluting industries, online effluent quality and emission monitoring systems should be installed for the STPs. National Green tribunal has given order to implement online monitoring systems in Delhi STP (http://delhi.gov.in/wps/wcm/connect/72d7ac0049871210b7a9bf018ef168b1/6-2012%28PB-I%29OA11-8-2015.pdf?MOD=AJPERES&lmod=-287594179). The data generated in the online monitoring system should be available to TNPCB and general public (similar to information available about lake levels). All this information should be available online for TNPCB and general public.

Alarm Systems for STPs and Pumping Stations should also be mandatory to raise flags when systems are bypassed in pumping stations and sewage treatment plants. This needs to be a comprehensive system to identify if there is flow in the bypass line, surge in flow due to leakages or mechanical issues, and so on. The records of alarms should also be available online for TNPCB and general public as this is an issue of public interest. Any bypass leads to pollution, and therefore it is important for the public to be aware of this. CCTV cameras should be available for all STPs and pumping stations.

Policy Amendment and Enforcement of Regulations

- **Amend Chennai Metropolitan Water Supply and Sewerage (Second Amendment) Act, 2012:**
    - Section 5 Functions of the Board: Add “Adequately treat the entire sewage generated across all areas of Chennai as per standards of the Pollution Control Board”
    - Section 5 Functions of the Board: Add “ensure that untreated sewage generated in Chennai is not discharged into any lake, river, stream, canal, pond, storm water drain, channel, nallah, wetland, or any other waterbody”

- Include that “CMWSSB is wholly responsible to ensure appropriate sewage treatment and disposal across Chennai, and to work with other departments to ensure appropriate sewage management”.
- Provide the power to CMWSSB to ensure that other departments cooperate with CMWSSB to ensure appropriate sewage management.
- As per the act, one of the non-official directors shall be a person to represent the interests of the general public. This director should be an eminent person from social group that has been working for waterbodies or sewage issues. The directors name and contact details should be available on CMWSSB web site, and he/she should be accessible for the public.
- Provide a penalty in case of inappropriate discharge/untreated sewage
  - Residential - Rs 50,000
  - Residential Multistoreyed – Rs 2,00,000
  - Commercial - Rs 5,00,000
  - CMWSSB - Rs 5,00,000 and departmental action for corresponding area engineers

- **Pass GO to prohibit construction of pumping stations near water bodies**: Polluting industries are prohibited to be established near waterbodies. Similarly, pumping stations are also discharging raw sewage into water bodies, and sewage is the main cause for pollution of water bodies. Therefore, pumping stations should not be constructed near water bodies (including the current pumping stations that are under construction). A GO needs to be passed with immediate effect, and if any pumping station is constructed in violation of this, the pumping station should be demolished.
- **Approval of Construction Only After Sewerage System is Available**: Construction of residential flats/individual houses/commercial establishments should be constructed only after proper sewage management infrastructure facilities are made available.
- **Activities should promote and facilitate implementation of regulations**: Metro water officials and workers still find it difficult to make a shift from manual to machinery-based cleaning of clogging. They find it uncomfortable to use the safety gear as it leads to itching and discomfort. As manual scavenging has been banned, it would be more appropriate to construct bigger machine holes than manholes in the areas where construction is in progress. However, CMWSSB is still constructing only manholes.
- BOD and COD values to be based on if there is upstream flow of fresh water. Currently, the treatment standards for discharge of sewage into waterbodies is based on the assumption that there is flow of fresh water from upstream, which

will help treat the water as it flows to the sea. While in Chennai in all the waterbodies, there is no fresh water flow from upstream except during rainy season.

Reuse of Treated Water and Power Self Sufficiency: Currently, huge quantities of treated sewage is discharged into waterbodies, which are already polluted. This discharge of treated sewage further increases the pollution of waterbodies. Therefore, reusing the water will reduce the demand of fresh water and also help prevent the pollution of water bodies. If treated water is reused, adherence to standards will be higher. All STPs should use the sludge to generate bio gas with proper efficiency/effectiveness. This will help ensure proper treatment, recovery of energy from the sludge, thereby preventing improper disposal of sludge. Currently, the biogas production is very ineffective and greenhouse gases are flared. For example, there was bio gas production in the Nesapakkam plant and Koyambedu 60 MLD plant. Therefore, attaining power self sufficiency, without dependence of TNEB, should be attained. The sludge from old units could be used in the new units within the same STP to generate biogas.

ANNEXURE I

Data from Pumping Stations

The table given below shows the data given by various area engineers accessed by the study team through RTI. It displays the amount of sewage sent from pumping stations to either other pumping stations or sewage treatment plants. To calculate the amount of sewage sent to treatment plants or waterbodies, we need to consider the pumping stations that send the sewage directly to the treatment plants or waterbodies. To avoid double inclusion, we need to leave out the pumping stations that send the sewage to other pumping stations. For example, in area 3, in Chandraprabhu Colony pumping station, the sewage is sent to Bank Colony, which then sends the sewage to Kodungaiyur STP. Therefore, the sewage quantity of Bank Colony includes the sewage quantity of Chandraprabhu Colony. So, while calculating the sewage sent to Kodungaiyur STP, we need to include Bank Colony and leave out Chandraprabhu Colony.

In the below table, we have put an * near pumping stations that send the sewage directly to treatment plans or waterbodies. Therefore, we need to add the sewage quantity from these pumping stations only which comes to 605 MLD.

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
1.	1	West Madha Street*	1.37	Buckingham Canal
2.	1	Sadayankuppam*	1.1	Buckingham Canal
3.	1	Kilijosiyam Nagar*	1.35	Buckingham Canal
4.	1	K.R.Ramasamy nagar*	1.07	Buckingham Canal
5.	1	South Madha Street*	1.3	Buckingham Canal
6.	1	PeriyamettuPalayam*	1.06	Buckingham Canal
7.	2	Manali New Town*	1.4	Oxidation Pond
8.	2	MMDA Mathur*	1.65	Kodungaiyur STP

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
9.	3	Thanikachalam Nagar	0.3	Chandraprabhu Colon SPS
10.	3	Chandraprabhu Colony	0.8	Bank Colony SPS
11.	3	Muthumariamman koil street	0.2	Mehta Nagar SPS
12.	3	Meha Nagar SPS	0.5	Bank Colony SPS
13.	3	Ramachandra Nagar	0.5	Bank Colony SPS
14.	3	Bank Colony SPS*	2.7	Kodungaiyur STP
15.	4	Tondiarpet F new PS (relay)*	33	Kodungaiyur STP
16.	4	Tondiarpet A PS	8	
17.	4	Tondiarpet D	2.2	
18.	4	Tondiarpet E	3.4	
19.	4	Kannadasa Nagar*	12.5	Kodungaiyur STP
20.	4	Muthamizh Nagar PS*	3	Kodungaiyur STP
21.	4	CB Road	2.6	
22.	4	Erukkuncherry (Relay)*	61	Kodungaiyur STP
23.	4	RK Nagar North PS*	7.5	Kodungaiyur STP
24.	4	MKB Nagar PS	16	
25.	4	Damodara Nagar	1.25	
26.	4	Poongavanam	1.76	
27.	4	Thendral Nagar*	2.8	Kodungaiyur STP
28.	4	DBK PS	2.4	
29.	4	RR Nagar*	0.72	Kodungaiyur STP

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
30.	4	KM Nagar*	0.56	Kodungaiyur STP
31.	4	Ranganatha Puram	0.6	
32.	4	Singara Vel Nagar	0.72	
33.	4	Vinayagapuram	0.3	
34.	4	TV Nagar	3.5	
35.	4	N Nagar PS	1.2	
36.	4	Kadumbai Amman*	6.2	Kodungaiyur STP
37.	4	Kamaraj Salai	3	
38.	4	KB4	1.5	
39.	4	Tondiarpet F Old	2.3	
40.	4	Kasimedu	6.96	
41.	4	Senniamman Koil	0.55	
42.	4	Verra Kutty	0.64	
43.	4	Vyasarpadi Ps	6.6	
44.	4	Vyasarpadi lake area PS	6.5	
45.	4	Melpattadai	3.9	
46.	4	Bharathi Nagar	0.36	
47.	4	RK Nagar South*	2.5	Kodungaiyur STP
48.	5	Royapram (Relay)	12.84	
49.	5	*Tondiarpet B**	6.4	Kodungaiyur STP
50.	5	*Napier Park**	5.4	Kodungaiyur STP
51.	5	Law College	4.909	

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
52.	5	*Walltax Road**	5.8	Kodungaiyur STP
53.	5	Langs Garden	6.4	
54.	5	North Wall road	6.7	
55.	5	Tondiarpet C	2.58	
56.	5	*Sydenhams Road**	1.91	Kodungaiyur STP
57.	5	Bojaraja Nagar	0.896	
58.	5	Kathpada	0.655	
59.	5	Meenambal Sivaraj Nagar	0.189	
60.	5	Sathiyavani Muthu Nagar	0.35	
61.	5	Border Thottam	1.56	
62.	5	Chetty Thotam	0.277	
63.	5	Reserve Bank	0.36	
64.	5	Cemetry Road	Same as EC Road?	
65.	5	Navalar Neducheizhian Nagar	0.42	
66.	5	Malayappan street	2.9	
67.	5	Link Road	-	
68.	5	EC Road	0.79	
69.	5	Stanley	0.4356	
70.	5	*Muthamizh Nagar PS**	2.36	Kodungaiyur STP
71.	6	Perambur	47.87	Erukkancherry
72.	6	Purasawalkam*	90	Kodungaiyur STP
73.	6	Nammalwarpet	12.8	Purasaiwakkam PS

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
74.	6	Kolathur*	12.5	Kodungaiyur STP
75.	6	Villivakkam Sector*	23.8	Kodungaiyur STP
76.	6	KP Park	2.9	Purasaiwakkam PS
77.	6	Venkateshpuram*	2.5	Kodungaiyur STP
78.	6	Ekangipuram	7.24	Perambur
79.	6	Sembium	8.9	Perambur
80.	6	Periyar Nagar	5.6	Perambur PS
81.	6	Jawahar Nagar	2.45	Perambur PS
82.	6	Dimmasamy Darga	3	Sembium
83.	6	Kennedy Square*	9.66	Kodungaiyur STP
84.	6	Sivananda Nagar	1.74	Kolathhur
85.	6	Sathyavanimuthu Nagar	0.5	Nammalwarpet
86.	6	VOC Nagar	0.3	Pursaiwalkam PS
87.	6	Murugan Nagar	0.18	Villivakkam Sec
88.	7	Anna Nagar West	0.92	
89.	7	Mogappair*	13.77	Koyembedu STP
90.	7	Korattur*	5.68	Koyembedu STP
91.	7	Five Star	0.34	
92.	7	Nehru Nagar	0.04	
93.	7	Teachers Colony	0.02	
94.	7	Thirumalai Priya Nagar (VOC) Street Lift Station	0.03	
95.	7	Pillayar Koil Street	0.03	

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
96.	7	Sangam Street Lift Station		
97.	7	Kulakkarai Street Lift Station	0.04	
98.	7	SIDCO Nagar Lift Station	0.03	
99.	7	Pallam Street SPS	0.24	
100.	7	Vivekananda Nagar	0.15	
101.	7	SRB Nagar		
102.	7	Karukku SPS	0.7	
103.	7	Tendral Nagar Lift Station	0.01	
104.	7	Lenin Nager Lift Station	0.03	
105.	7	Karuppan Kulam SPS	0.8	
106.	7	Ayyankulam SPS	0.1	
107.	7	Elango Nagar	1.84	
108.	8	Anna Nagar A	3	Anna Nagar B
109.	8	Anna Nagar B*	16.5	Koyembedu STP
110.	8	Anna Nagar C	6	Anna Nagar B
111.	8	East Arumbakkam SPS*	14	Koyembedu STP
112.	8	Shenoy Nagar	5	Kilpauk SPS
113.	8	Villivakkam Phase II	1.5	Villivakkam Phase I
114.	8	Padmanaba Nagar	1.9	West Arumbakkam
115.	8	Osankulam SPS	0.12	Kilpauk SPS
116.	8	Sastri Nagar SPS	0.8	Purasawakkam SPS
117.	8	NSK Nagar	0.2	East Arumbakkam

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
118.	8	Barathipuram	0.72	Shenoy Nagar
119.	8	RV Nagar	0.45	Shenoy Nagar PS
120.	8	Dr Ambedkar Nagar	0.12	Anna Nagar A PS
121.	8	Halls Road	0.06	Shennoy Nagar SPS
122.	8	VOC Nagar	0.5	Shennoy Nagar SPS
123.	8	Annai Sathya Nagar	0.06	Anna Nagar SPS
124.	8	PP Garden SPS	0.72	NSK Nagar SPS
125.	8	Chetpet	2.5	Purasawakkam SPS
126.	8	PH Road SPS	0.08	Purasawakkam SPS
127.	8	Ayanavaram	5.4	Perambur PS
128.	8	Kilpauk SPS	4.2	Purasawakkam SPS
129.	8	Villivakkam Phase I PS*	3.8	Villivakkam Lagoon
130.	8	Villivakkam Sector B	3.8	Villivakkam Sector A
131.	8	North Jagannaha Nagar SPS*	0.4	Villivakkam Lagoon
132.	8	Periyar Salai Pumping Station	1.9	Ayanavaram PS
133.	8	Gandhi Nagar	0.33	Anna Nagar A
134.	8	Pachakkal Veerasamy street	0.18	Ayanavaram PS
135.	8	Thiruvalluvar Nagar	0.8	Nammalwarpet PS
136.	9	Greams Road	14.3	Purasawakkam SPS
137.	9	Ice House	23.1	Adyar PS
138.	9	North Mylapore	13.5	Adyar PS
139.	9	South Mylapore	10.43	Adyar PS

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
140.	9	Kodambakkam A*	11.04	Koyembedu STP
141.	9	Karneeswar Pakode	1.48	North Mylapore
142.	9	Nandanam	1.17	T Nagar
143.	9	Seethammal Colony	2.88	South Mylapore Pumping Station
144.	9	Thomas Road	2	T Nagar SPS
145.	9	TS Park	4.2	Ice House
146.	9	Amudham Colony	1.05	Saidapet B
147.	9	Ayodhia Kuppam	0.03	Ice House PS
148.	9	Girappa Road	1.2	Greams Road
149.	9	Pallaku Mannikam	0.45	South Mylapore Pumping Station
150.	9	Puliyurpuram	1.2	Kodambakkam Pumping Station
151.	9	Ram Nagar	0.5	Ice House Pumping Station
152.	9	Namasivayapuram	0.48	Kodambakkam Pumping Station
153.	9	Anbu Colony	0.3	Anbudham Colony
154.	9	GN Chetty road	0.41	Greams Road
155.	9	Krishnamma Road	0.31	Greams Road
156.	9	Kumarappa Road	0.36	Greams Road
157.	9	Vada Agaram	0.17	Kodambakkam Pumping Station
158.	9	Parthsarathy Stn	4	ice house
159.	9	Chinna Thambi	0.693	Parthasarthy

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
				PS
160.	9	Independence Day Park	3.5	Greams Road
161.	9	Arunachalam Street	0.37	Parthasarthy PS
162.	9	Lock Nagar	0.29	Napier Park
163.	9	Mandavelipakkam	2.2	Adyar PS
164.	10	Nesapakkam*	80.17	Nesapakkam STP
165.	10	T Nagar*	18.54	Koyembedu STP
166.	10	CIT Nagar	7.36	Nesapakkam SPS
167.	10	Kodambakkam B*	9.46	Nesapakkam STP
168.	10	Saidapet B	7.46	Nesapakkam SPS
169.	10	West Arumbakkam*	8.72	Koyembedu STP
170.	10	Jaffarkhanpet	6	Nessapakkam SPS
171.	10	Salligramam*	9.52	Koyembedu STP
172.	10	Saidapet A	3.11	Nesapakkam SPS
173.	10	Jai Balaji Nagar*	1.13	Nesapakkam STP
174.	10	KK Nagar B	5.27	Nessapakkam SPS
175.	10	Virugambakkam*	6.3	Koyembedu STP
176.	10	Ashok Nagar	1.26	Nessapakkam SPS
177.	10	Sathya Murhy Block	0.49	Nessapakkam SPS
178.	10	Bharathidasan Colony	0.59	Nessapakkam SPS
179.	10	Sarathy Nagar	2.28	Jafferkhanpet SPS

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
180.	10	Thiru Nagar	0.42	nesapakkam SPS
181.	10	Gothamedu	0.22	Saidapet D
182.	10	Kulasekarapuram*	1.14	Koyembedu STP
183.	10	Gandhi Nagar*	0.91	Koyembedu STP
184.	10	Alagiri Nagar	0.48	Padmanabha Nagar SPS
185.	10	Abith Colony	0.21	Saidapet C SPS
186.	10	VOC Nagar	0.26	Saidapet C SPS
187.	10	Annai Sathya Nagar	0.4	Nessapakkam SPS
188.	10	Samiar Thottam	0.11	Saidapet C SPS
189.	10	Srinivasapuram	0.7	
190.	11	Ramakrishna Nagar SPS	4.5	Thiru Nagar SPS
191.	11	Thirunagar SPS*	8.3	Nesapakkam STP
192.	11	Meenakshi Nagar SPS	3.5	Thiru Nagar SPS
193.	11	Ganga Nagar SPS*	3	Koyembedu STP
194.	11	CMDA colony SPS	2.7	Ganga Nagar SPS
195.	11	Nolambar Phase I	1.5	Mogappair East
196.	11	Nolambur Phase II	0.2	Mogappair East
197.	12	Nilamangai Nagar*	14	Alandur STP
198.	12	Kannan Colony	1.2	Nilamangai Nagar
199.	13	Adyar old and New	45	LB Road SPS and Perungudi SPS

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
200.	13	LIC Colony	32	LB Road SBS
201.	13	Indira Nagar	15	LB Road SPS
202.	13	Thiruvanmiyur	14	LB Road SPS
203.	13	Gandhi Nagar	6.5	LB Road SCS
204.	13	Velachery *	15	Perungudi STP
205.	13	Kotturpuram	3.5	LB Road SCS
206.	13	Guindy	3.5	Velachery SPS
207.	13	Ekkattuthangal	5	Nessapakkam SPS
208.	13	Saidapet D	4.5	Saidapet B
209.	13	Taramani	4.5	LB Road SCS
210.	13	Thiruvalluvar Nagar	4.25	Thiruvanmiyur SPS
211.	13	BV Nagar *	2	Perungudi STP
212.	13	512 HIG	0.8	Thiruvallur Nagar SPS
213.	13	Thanthai Periyar Nagar	2.2	LB Road
214.	13	Sector V	3.4	Velachery SPS
215.	13	Murughu Nagar	6.5	LIC Colony SPS
216.	13	PTC Colony	2	LB Road
217.	13	Kalachetra Colony	1.25	Besant Nagar II SPS
218.	13	Seethapathi Nagar	3.5	LB Road
219.	13	Periyar Nagar	2.5	Velachery SPS
220.	13	Orrandiamman Koil Sreet	3.3	LIC Colony SPS
221.	13	Saidapet C	3.5	Nessapakkam SPS
222.	13	Sidco Main	1.5	Ekkanthangal

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
				SPS
223.	13	Foreshore Estate	1	Adyar SCS
224.	13	AG's Colony	7.5	LIC Colony SPS
225.	13	Velachery Lakshmi Nagar	3.25	LIC Colony SPS
226.	13	RA Puram	0.1	Adyar SCS
227.	13	Besant Nagar I	1.5	Indira Nagar SPS
228.	13	Besant Nagar II	4.5	Indira Nagar SPS
229.	13	Kanagam	0.4	LB Road SCS
230.	13	Pallipattu	2.5	LB Road SCS
231.	13	SIDCO Lift	0.7	Ekkanthangal SCS
232.	13	SKP Puram	0.2	Adyar SCS
233.	13	Govinda Sami Nagar	0.5	Adyar SCS
234.	13	Todhunter Nagar	0.3	Saidapet D SPS
235.	13	Valluvar Nagar	0.25	Indira Nagar SCS
236.	13	Rajaji Nagar	0.6	Thiruvallur Nagar SPS
237.	13	Brahmin Street	1	Orandiamman SPS
238.	13	Bharathi Nagar	3.3	Velachery SCS
239.	13	Suriya Nagar	0.02	Kotturpuram SCS
240.	13	Bharathi Avenue	0.03	Kotturpuram SCS
241.	13	Neruppumedu	0.2	Saidapet C SCS
242.	13	Nagi Reddy Thotam	0.02	Sidco Main SCS
243.	13	Baby Nagar	0.8	Dr Seethaparthy Nagar SPS

Sl No	Area	Pumping Station	Utilized Capacity (MLD)	Destination
244.	13	Maanjolai	0.02	Ekkattuthangal SCS
245.	14	LB Road (Relay)*	60	Perungudi STP
	Total		**605 MLD**	

ANNEXURE II

Data from Sewage Treatment Plants

The table below is from the treatment plants, which shows the original capacity of each treatment plant and the amount of sewage received from each pumping station.

Name of STP	Capacity	Inflow from Pumping Station	Total Inflow
Koyembedu			
• Korattur		5.6	
• Mogappair		15.3	
• Anna Nagar B		16	
• Arumbakkam East		17.5	
• Kodambakkam A		11.5	
• Arumbakkam West		8.5	
• Gandhi Nagar		1.5	
• Kulasekarapuram		2	
• Saligramam		12	
• Tnagar		17	
• Virugambakkam		7	
• Koyembedu Market		2.5	
• Ganga Nagar		4	
Total	214		120.4
Kodangayur			
• RK Nagar (n)		7.38	
• RK Nagar (s)		2.05	
• Tondiarpet F		34.8	
• Purasawakkam Part		18.19	
• Kolathur		8.42	
• Kenndy Square		7.02	
• Villivakkam Sector A		7.78	
• Napier Park		5.53	
• Wall Tax Road		6.17	
• Sydenhams Road		1.79	
• kannadasan Nagar		12.54	
• Muthamiz Nagar		2.36	
• Kadumbadi Amman Nagar		7.52	

Name of STP	Capacity	Inflow from Pumping Station	Total Inflow
• TNHB Mathur		1.5	
• Erukancheri		61.73	
• Thendral Nagar		2.52	
• Madavaram Bank Colony		4.06	
• Purasawakkam Part		23.5	
Total	270		214.86
Perungudi			
• Adyar		10.5	
• LB Road		59.46	
• BV Nagar		2.2	
• Kannagi Nagar		2.3	
Total	114		75
Alandur			
• Nilamangai Nagar		12.5	
Total	12		12.5
Nessapakkam			
• Nesapakkam Terminal Pumping Sation		82	
• Kodampakkam B		9	
• Jaibalaji Nagar Pumping Station		1.3	
• Valasaravakkam		7	
Total	117		99.3
Villivakkam	5		0
Grand Total (Excluding Villivakkam where there is no STP)	727		522.06

ANNEXURE III

Sewage Treatment Plants under construction

Sl. No.	Location	Capacity in mld	Estimate cost (`crore)	Present stage (as per government records)	Current Status
1	Thiruvottiyur	31	26.33	Works will be completed by March 2017.	However, the construction of this STP has not been completed
2	Sholinganallur	18	33.71	Works will be completed by December 2016.	However, the construction of this STP has not been completed.

ANNEXURE IV

GOVERNMENT FUNDS

Under ground sewerage schemes have been completed in 4 of the 42 added areas. They are Madhavaram, Valasaravakkam, Alandur, and Meenambakkam. In 16 added areas namely Thiruvottiyur, Kathivakkam, Surapattu, Puthagaram, Kathirvedu, Ambattur, Nolambur, Maduravoyal, Porur, Ullagaram-Puzhuthivakkam, Pallikaranai, Ramapuram, Perungudi, Sholinganallur, and Karapakkam, underground sewerage schemes are under progress. For Mugalivakkam tender has been cancelled, estimate has been revised and retender invited.

For 11 added areas namely Manali, Chinnasekkadu, Edayanchavadi, Sadayankuppam, Kadappakkam, Nerkundram, Karambakkam, Manapakkam, Injambakkam, Okkiyam Thoraipakkam and Jalladampettai DPRs prepared and will be taken up under AMRUT and other funds. Preparation of DPRs for providing under ground sewerage scheme for the balance 11 added areas viz. Puzhal, Mathur, Theeyambakkam, Vadaperumpakkam, Nandambakkam, Kottivakkam, Palavakkam, Neelankarai, Madipakkam, Semmencherry and Uthandi, will be taken up by engaging consultants.

Sewerage schemes taken up under CMCDM

Sl. No	Name of the scheme	Estimate Cost (` crore)	Status of works
2011-12 Sewerage Improvement Schemes			
1	Laying of force mains between pumping stations	9.26	Works completed and put into use
2	Enlargement of Sewage Pumping Mains	20.39	
3	Insertion of UGSS manholes in Mogappair, construction of Roadside pumping stations with submersible pumpsets	14.08	

4	Improvement to existing Sewage Pumping stations	11.24	
5	Enlargement of sewer mains	31.18	
6	Procurement of sewerage maintenance equipments	9.90	Machines purchased and in use
7	Re-routing and enlargement of Sewage Pumping Mains and allied works	36.55	Works will be completed by December 2016.
2012-13 Under Ground Sewerage Schemes			
8	Kathivakkam	86.15	Works will be completed by September 2016.
9	Sholinganallur-Karapakkam	110.90	Works will be completed by March 2017.
10	Ramapuram	48.50	Works will be completed by March 2017.
11	Procurement of sewerage maintenance equipments	15.20	Machines purchased and in use
2013-14 Under Ground Sewerage Schemes			
12	Thiruvottiyur (Annai Sivagami Nagar)		Work completed and commissioned.
13	Nolambur	8.51	Works will be completed by August 2017
14	Surapattu	26.01	Works will be completed by September 2017
15	Puthagaram & Kathirvedu	35.00	Works will be completed by September 2017

16	Mugalivakkam	54.79	Retender invited.
	Total	**577.66**	

Jawaharlal Nehru National Urban Renewal Mission

Sl. No	Name of the scheme	Estimate Cost (`crore)	Status of works
1	Providing water supply and sewerage facilities along Rajiv Gandhi Salai	41.77	Works completed
Under Ground Sewerage Schemes			
2	UllagaramPuzhuthivakkam	28.08	Works will be completed by December 2016.
3	Ambattur (Package-II, III, IV & V)	130.91	Works completed under Packages III, IV & V). For Package II Work will be completed by March 2017.
4	Maduravoyal	57.45	Works will be completed by December 2016.
5	Porur	38.29	Works will be completed by September 2016.
6	Perungudi	20.19	Works will be completed by March 2017.
7	Pallikaranai	58.61	Works will be completed by December 2016.
	Total	375.30	
Deposit works for other local bodies			
8	Avadi Municipality	158.05	Works will be completed by

			December 2016.
9	Tambaram Municipality	160.97	Works will be completed by March 2017.
10	Thirumazhisai Town Panchayat	20.47	Works will be completed by December 2016.
11	Sriperumbudur Town Panchayat	47.40	Works will be completed by March 2017.
	Total	386.89	

Works Taken up under TNUDP-III

Sl. No	**Name of the Scheme**	**Est. cost (` in crore)**	**Status of works**
1	Madhavaram – UGSS	50.22	Works completed
2	Thiruvottiyur – UGSS	87.63	Works will be completed by October 2016.
3	Ambattur, Phase:I – UGSS	65.75	Works completed.
	Total	**203.60**	

During the Budget 2012-13, it was proposed to plug 337 sewage outfalls at a cost of `300 crore. This would prevent untreated sewage from 210 entering Chennai city water ways. This sewage would be appropriately treated and disposed. In the first phase, works for plugging 179 of the 337 outfalls were taken up and are in progress. An amount of `150 crore was sanctioned under Infrastructure and Amenities Fund. These works will be completed by January 2017. In the second phase, to carry out the balance works for plugging of 158 sewage outfalls, Government has sanctioned `163 crore. Second phase works are proposed to be carried out under 7 Packages. Under Package- I Adyar river basin 60% of work completed. Work order issued for 3 Packages covering Buckingham canal and Cooum river basin. For the balance 3 packages tenders received and for 1 Package tender under evaluation. For the remaining 2 packages tenders rejected and for 211 one package tenders were received and under evaluation for the remaining one package tender has to be called for.

Extracts from Policy Note of Municipal Administration and Water Supply (2016 to 2017) - Administrative sanction has been accorded by the Government of Tamil Nadu for construction of a 45 MLD capacity Tertiary Treatment Reverse Osmosis (TTRO) plant at Koyambedu to supply treated water to the industries at Irungakattukottai / Sriperumbudur / Oragadam etc. at a cost of `394 crore. Work order for this work has been issued and work will be commenced shortly.

Extracts from Policy Note of Municipal Administration and Water Supply (2013 to 2014) - The Hon'ble Chief Minister has emphasized the need for re-cycling of waste water which can be utilized for industrial purposes. This will relieve the pressure on the overall availability of water for drinking purposes. The Chennai Metropolitan Water Supply and Sewerage Board is in the process of putting up a 45 MLD Tertiary Treated Reverse Osmosis Plant in Koyambedu. More such projects will be implemented under the PPP mode for recycling sewage to meet industrial needs.

Extracts from Policy Note of Municipal Administration and Water Supply (2016 to 2017) - The Hon"ble Chief Minister of Tamil Nadu has announced on the floor of the Assembly that Government would promote reuse of treated waste water for industrial purposes in place of fresh water. To cater to the Industries and Power plants in North Chennai, another 45 MLD TTRO 213 Plant would be set up at Kodungaiyur at a cost of `255 crore with funding from TNSUDP. Administrative approval has been accorded by Government of Tamil Nadu. Tender for the above work has been received and under evaluation.