

A Case Study Report on Waste water management & Sewage Disposal in Mumbai Suburban Region.

Rohit Ashok Mohite

University of Mumbai

Lalitkumar Kishor Joya

University of West of Scotland

EXECUTIVE SUMMARY

Mumbai has the fourth largest population in the world (12.4 million inhabitants, 2011 Census of India) this results in a lot of regular commuter flow from nearby towns, such as Navi Mumbai and Thane, resulting in a wide range of services. Mumbai has invested in expanding its basic services to meet the population's needs, such as water supply, solid waste disposal, and wastewater collection and treatment in order to meet its growing needs. However, there is a gap between what is offered and what is needed by the general public, creating a gap. The emphasis has been on urban sewerage treatment and disposal in centralized networks traditionally, using water for storage and treatment requires water use as well as capital and energy resources. According to recent figures, 50-80% of untreated wastewater flows into oceans until infrastructure is in place, Indian cities are forced to reconsider sanitation concepts should make full use of cost-effective and long-term solutions.

Domestic wastewater collection, treatment, and disposal facilities have been in place since the 1880s, and have been expanded as the city has grown. There are 1,998 km of sewers, 62 sewage pumping stations, 9 provisional treatment facilities, marine outfalls at three locations, three stage lagoons at one site, and single stage lagoons at two locations in the current sewerage infrastructure with seven areas. The first part of the Mumbai's sewage treatment (stage I) was approved by the Indian government's Ministry of Environment and Forests (MoEF). In 2025, the second stage of MSDP wastewater treatment and discharge facilities are being planned in which phases the developer can incorporate treatment as well as discharge requirements.

The main aim of the MSDP II is to provide cleaner and healthier air for Mumbai residents while reducing the negative impacts of wastewater disposal on the environment. Milan is currently implementing the Phase II Mumbai Sewage Plan which lays out achievable and quantified goals for the year 2025.

It is estimated that the project would cost INR 1,510 million. Approximately 2240 US dollars. Table 1 displays the total expense, operation, and maintenance costs of wastewater treatment plants. Several

scholars have studied water treatment systems in the last few decades.

In South India, Godfrey et al. conducted a water reclamation study using conventional economics, the advantages were worth \$100 each. 3:7 studies looked at the environmental costs of wastewater treatment plants. The authors estimated the economic cost and benefits of water and sanitation improvements. This research aims to decide whether Mumbai's proposed second stage of sewage treatment is advantageous economically, socially, and environmentally.

Rapid urbanization combined with growth has resulted in substantial wastewater production in towns and cities. However, it has yet to be completed. According to the Central Pollution Control Board (CPCB), about 37,000 MLD of class I and 2,855 MLD of class II sewage was generated in 2009. It must now be disposed of. Inessentially, it invariably makes its way through the water system and poses a hazard to the general population. It may sink into the ground and contaminatethe aquifer. Once again, people's water is dirty.

This case study looks at 2 different projects in Mumbai, all of which are designed to improve the quality of the city's waste water and sewage system. Nature and electric-mechanical technology were investigated as part of the initial research for natural and electrical wastewater treatment. Three studies were chosen after a thorough investigation: on three different scales: community, organizational, and person levels. Usage of the land with little to no capital is applied in treating wastewater in all three of the case studies in this study, and returned to the site where it is made for re-use.

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CHAPTER 1**INTRODUCTION**

The right waste water disposal solutions must be considered and a more integrated approach must be used for diverse situations. The basic principle of devolving implementation standard is the basis for decentralized wastewater treatment so that wastewater can be managed at low prices, minimizing the cost of drainage long distances and promoting local reconstruction of treatment wastewater. Treatment and local reuse of wastewater – The twin objectives of equality and sustainability are achieved through the use of locally relevant treatment technology at the Community, administrative and human resources levels.

1.1 What is mean by Sewage?

Sewage is a form of liquid waste that contains a large amount of water as well as various impurities such as waste water from households, offices, factories, and hospitals.

1.2 What exactly is the Sewage Disposal?

The removal of waste from households and factories, such as faeces or polluted water. It is taken away in sewers or drains to be disposed of or converted into a non-toxic form. The process of the removal, destruction or transformation of harmful substances into wastewater, especially via bacterial ammonification and nitrification.

1.3 Need of Sewage Treatment or Disposal

Every day, large industries, factories, and mills produce tonnes of sewage. Any of this waste is so dangerous that allowing it to leave the neighborhood can lead to a variety of diseases as well as pollution of land and water. Solid waste may be easily eliminated, but removing chemical and biological pollutants from these wastes so that they can be sent to safe areas is more difficult. Sewage treatment plants are used to do this. We've arrived at this point because of a few main aspects of tertiary sewage treatment.

Sewage treatment is also known as wastewater treatment, and it involves the treatment of industrial wastewater. In several cities, the sewer transports a portion of industrial wastewater to a sewage water treatment facility, where it has already been treated to reduce pollution in the factories. If it's a combination sewer, storm water would be carried as well. Using pipes and pumps, waste waters are transported to sewage water treatment plants. The following are the basic processes that sewage goes through in a sewage water treatment plant.

1.4 Working of Sewage treatment Plant:

Despite its simplicity, the recycling of treated sewage necessitates meticulous attention to detail and upkeep. The operation of the plant has been defined here.

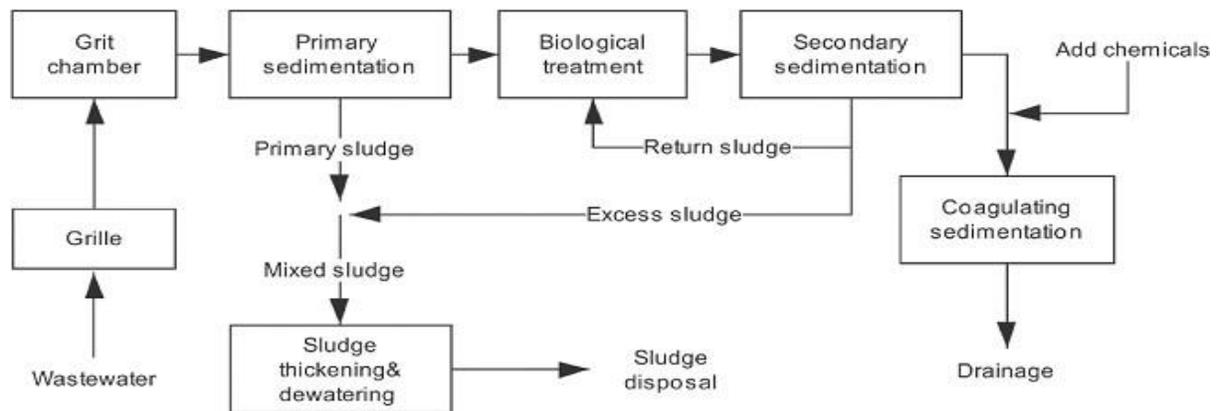


Fig. Working of Sewage treatment Plant

A. Sedimentation: The first step entails settling solid waste so that only liquid matter floats to the surface. The clarification method, or machines known as clarifiers, is then used to isolate the liquid matter from the solid waste. The fundamental idea behind this method is to remove solid waste and leave only liquid waste for the next stage of sewage treatment.

B. Aeration: Wastewater or sewage has a high BOD, or biological demand for oxygen, which necessitates aeration. Aerators assist in meeting this demand. By quickly combining the waste with the oxygen provided in the aeration tanks, the aerators aid in increasing the oxygen content. As a result, wastewater is treated quickly.

C. Disinfection: There are a variety of methods that aid in the treatment of wastewater, depending on the waste. Disinfection, on the other hand, is usually the last step in the wastewater treatment process. This method disinfects wastewater and removes toxins, allowing it to be disposed of in local water tanks.

1.5 Benefits of Sewage water treatment to our society

A. Provides pure, healthy water after it has been treated.

Most people are unaware that wastewater can be converted into usable water. During the treatment process, toxins are eliminated, resulting in pure and nutritious water. Just about 3% of the world's water is drinkable. While it is a natural resource, evaporation and rain take a long time to extract pollutants. The solution is easier than wastewater treatment, and the result is crystal clear, clean reusable water.

B. You can save money

A well maintained and regulated Industrial Wastewater Treatment plant will help you save money over time while ensuring compliance with regulations and legislation.

C. It's good for the community.

The primary goal of water treatment is to eliminate toxic chemicals. As a result, when it reaches the ground, it would have no harmful effects on the environment. If you're concerned with hazardous waste, it might be a

hassle. It is suggested that a high-quality wastewater treatment facility be purchased as a significant investment.

D. Water conservation

Because of the Effluent Treatment Station, you are saving a lot of water. Since the plant recycles old material, there is less pollution, which is beneficial for the climate.

E. A method of reducing waste

1.6 Objective of the Case Study

- 1) The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed of without danger to human health or unacceptable damage to the natural environment.
- 2) To study the sources causing the Sewage and system for sewage Management
- 3) To Study the regeneration of Bio-diversity affected by Waste-water in Mumbai Suburban district
- 4) To study the various ways to tackle the issue of waste-water management.

CHAPTER 2

REVIEW OF LITERATURE

1. “Vinayakam Jothiprakash, Marcus Joseph Tobias (2020) Published a Study of the Socioeconomic Spillovers of Sanitation: Sewage Treatment Plants in Navi Mumbai, India”. This case study covers various factors such as People from rural areas move to cities in search of a decent quality of life as a result of urbanization and industrialization. The massive influx of migrants to major cities in fast-developing countries like India puts a lot of strain on city infrastructure, especially the water supply and sanitation systems, as well as sanitation infrastructure like the wastewater collection network, treatment by sewage treatment plants (STPs), sewage disposal system, and reuse delivery system. As a result, about 80% of the existing drinking water intake is converted to wastewater. In a number of cases, the services offered have either been insufficient or have been poorly managed. According to Kulkarni, Wanjule, and Shinde (2018), only 10% of the sewage released in India is treated before being deposited into water bodies or on the earth. Wastewater is mostly unregulated in most cities, contaminating both land and groundwater supplies. ^[1]

2. “Ritesh Vijay (2016) published research paper Impact of sewage discharges on coastal water quality of Mumbai, India: present and future scenarios”, “this paper explores Using MIKE 21, the simulation thesis evaluates the effect of sewage discharges on the current and expected water quality along the Mumbai

coast. Water content parameters such as dissolved oxygen (DO), biochemical oxygen requirement (BOD), and faecal coliform (FC) are compared to defined guidelines. For the current coastal hydrodynamics and observed water quality parameters, the simulation is validated. The validated model is also used to forecast scenarios for pumping station upgrades as well as improvements in wastewater intake, treatment, and disposal systems. The current coastal environment's water quality does not meet the necessary requirements, but it increases significantly in the forecast scenarios. Despite a significant change in FC, it falls short of optimal levels when no medication for bacteria elimination is taken into account. The simulation research stresses the importance of pursuing solutions such as the reuse or recycling of processed effluent as a means of conserving water.” [2]

3. “Indrayani Nimkar (2014) published research paper on the Status Of Sewage Treatment Plants: A Case Study Of Mumbai City Conference: International Conference On Green Technology For Environmental Pollution Prevention And Control (ICGTEPC) September 2014. In this case study she discussed the key causes of water contamination in India are unmanaged urbanization, population explosion, and insufficient sewage treatment and disposal capability. One of the causes for water contamination in the coastal area is a significant difference between sewage generation and treatment in Mumbai. This paper provides an overview of Mumbai's sewage treatment plants (STPs), which would be useful in determining the extent of water contamination caused by untreated sewage disposal, pollution control strategies, and treatment technologies for reuse or recycling treated water. The source of generation, treatment capability, technology used, and reuse of treated water at 62 STPs in Mumbai is investigated. In Mumbai, institutional wastewater is the primary source of sewage. In Mumbai, sewage is generated at a rate of 2700 million litres per day (MLD). A total of 1998 MLD of sewage treatment capacity is available, with 1700 MLD of sewage being collected for treatment. 4 STPs have a treatment capacity of more than 200 MLD, and 48 STPs have a treatment capacity of less than 1 MLD, out of a total of 62 STPs. various technologies have been used to treat sewage produced, with the Moving Bed Bio Reactor (MBBR) being used in the majority of the STPs (14). STPs also mentioned using filtered waste water for gardening and flushing in around 13% of cases. Using ArcGIS, the location and capability of the treatment plants were mapped against Mumbai's population distribution and drainage system for a more detailed study of STP allocation according to population. [3]

4. “Hamsa Iyer (2016) Published a Case Study of Mumbai: Decentralized Solid Waste Management”, this paper investigates the extent to which various institutions/communities have made effective waste management attempts. Owing to a lack of adequate channels for handling rejects and sanitary waste, most individuals are unable to reach 100 percent decentralized control. More specifically, since local corporations are financially dependent on the center and state to survive, it is critical to comprehend their failures and shortcomings. Regardless of these limitations, it makes sense to assess energy and material recovery potentials and connect them to urban waste management. We will contribute to the development of

greener, more sustainable cities by using various examples and a technology supplier for bio-medical waste.

[4]

5. “Prof. Nandy B. Prof. Sharma, G., Published a case study report on Recovery of consumer waste in India - A mass flow analysis for paper, plastic and glass and the contribution of households and the informal sector (Article) Conservation and Recycling Volume 101, 27 June 2015, Pages 167-181 in this case study The collection, transportation, and treatment of urban solid waste deviates from the mass flow envisaged by municipal agencies and planning authority in most Indian municipalities. While several reports have concentrated on the environmental issues caused by unchecked waste disposal and combustion, we provide a qualitative analysis of the different actors' attempts to save resources and recycle, as well as a quantitative estimation of the volume of material collected at various points. In India, both the informal sector (garbage collectors, waste pickers, waste retailers, small shops, and itinerant merchants) and households play a critical role in consumer waste recovery. A case study was conducted in order to get a greater understanding of the contribution of homes, garbage collectors, and itinerant waste merchants to the recovery of consumer waste. Our research indicates that consumer waste is recovered much more effectively in India than has previously been recorded in the literature. The waste recovery process is multi-staged, with biodegradable waste, inserts, and extremely non-recyclable waste making up the majority of the final waste that enters the municipal corporation. Every year, India's households, itinerant waste traders, and garbage collectors recycle 1.2-2.4 million tonnes of newspapers, 2.4-4.3 million tonnes of cardboard and mixed paper, 6.5-8.5 million tonnes of plastic, more than 1.3 million tonnes of glass, more than 2.6 million tonnes of metal waste, and 4-6.2 million tonnes of other recyclable material. In India, 30-60% of all paper and cardboard is recycled, 50-80% of all plastic is recycled, and almost 100% of all glass bottles are recycled. [5]

CHAPTER 3 RESEARCH METHODOLOGY

In this case study, we have collected data from various government agencies. When we look at the waste water management system in Mumbai, where people and organizations are attempting to handle their waste in a more decentralized manner. Methodology for identifying the critically impacted on Suburban environment, Industry & Society due to residential land use activities and thereby developing an index is discussed in detail below. Any research within the realm of urban planning is interdisciplinary due to the heterogeneous nature of the various sectors it caters and co-opts from. In a developing country like India, availability of structured data is a major concern for such a research [Anil Kumar, 2010] [7].

3.1 The background of the research and data collection

We gathered information from the Central Pollution Control Board of the Government of India and the Maharashtra Pollution Control Commission Department of the Government of Maharashtra, the data collected in form of quantitative and qualitative format. The quantitative and qualitative methods were applied during the study. This incorporated with field survey of Gorai Dumping Ground and data presentation. Officials claim that about 60% of the city's population is actually unconnected to the sewerage system, and that existing STPs only perform a primary treatment before discharging wastewater into the sea. The latest plants would presumably perform a tertiary treatment. ^[5]

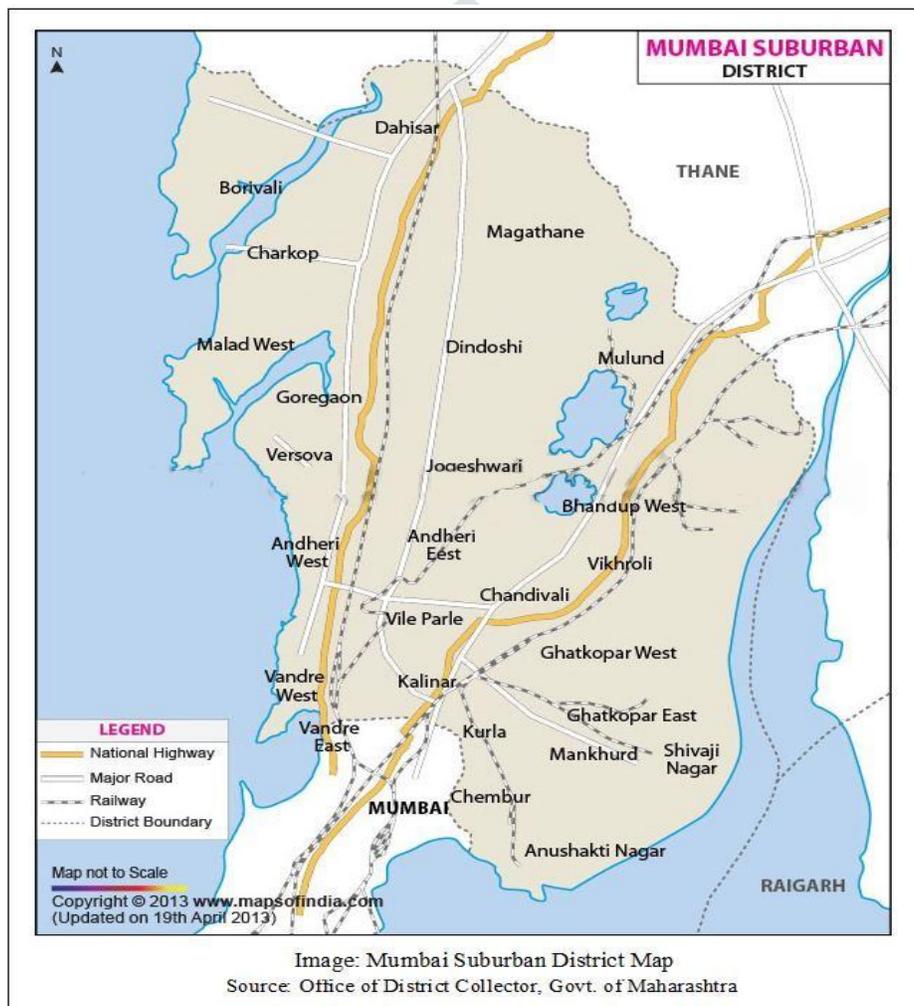


CHAPTER 4

Waste-water Treatment & Sewage Disposal System

In Mumbai Suburban region

In 1970, the Maharashtra government was the first in the country to issue rules under the Maharashtra Prevention and Control of Pollution Act, 1969. With the rise in environmental consciousness and the addition of new environmental regulations.



Decentralized wastewater treatment and municipal recycling for sustainable urban water management are mainstreamed in Maharashtra. For decades, centralized waste disposal in urban areas has become the traditional method for management. Urban local bodies were also responsible, with some money allocated for river washing, for wastewater, drains and sewage treatment plants.

According to the Central Pollution Control Board, the majority of processing plants do not function satisfactorily due to insufficient collection systems, lack of resources to run the installation, lack of electricity, or even lack of wastewater. In order to be recycled, waste must be shipped to. In most cities though, waste water is intercepted and sent to treatment stations via a sewage grid concentrated mainly on expenditure on more centralized systems, infrastructure, pipelines, and electro-mechanical and chemical treatment plants.

4.1 Source of water supply to City of Mumbai

On a daily basis, 3750 million litres of water are delivered to Mumbai city and suburban areas; however, owing to weak monsoon conditions this year, a 15% water cut has been implemented. This water is sourced from a variety of lakes and rivers. 2100 MLD of the total 3750 MLD of water is handled at the Bhandup Complex and distributed to the city and western suburban wards.

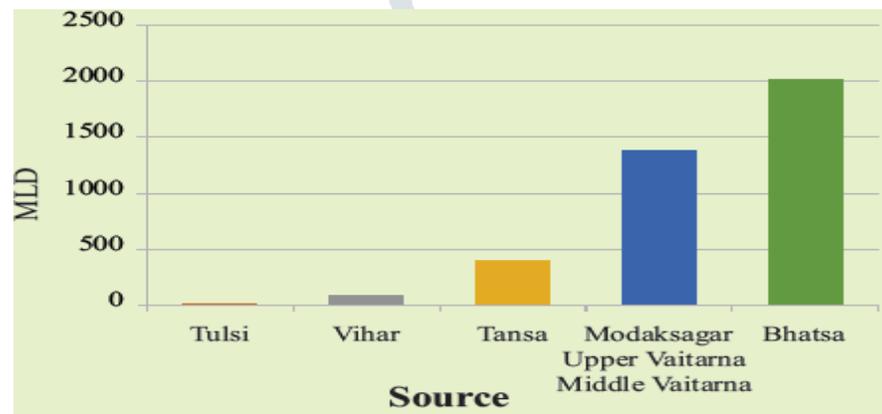


Chart: Sources of Water Supply to the City of Mumbai
Source: Brihnmumbai Municipal Corporation

4.2 Sources of Wastewater in Mumbai

Given the volume of sewage effluent produced, it appears that the STPs supplied by MCGM are insufficient and underutilized. Currently, 60% of the population lives in slums. The lack of sanitation, adequate drainage, and collection systems has harmed the coastal environment, creeks, and river quality. The government must provide irrigation services for areas that have been built in an unorganized manner. Both major residential/commercial developments must secure environmental approval, according to a recent MOEF notice dated 7.7.2004 and guide lines. In addition, the project proponent should conduct an R.E.I.A. and put in place an EMP. The schemes have been redirected to provide STP and solid waste disposal on their own property. This

intervention would aid in raising environmental consciousness among locals, as well as reducing domestic emissions and MSW disposal issues.

4.2.1 Industrial Waste Water Quantity Effluent in Mumbai

No. of industries	No. of Polluting Industries		No. of Polluting Industries	No. of Non Polluting Industries
	Water	Hazardous		
Mumbai & Mumbai Suburban	658	250	2387	5463

Table: Status of the Polluting & Non Polluting Industries

Source: Maharashtra Pollution Control board Govt. of Maharashtra

The MPCB tracks the STP's output efficiency on a daily basis. MCGM was also served with a show cause notice for failing to adequately run and administer STP.

4.2.2 Domestic Effluent in Mumbai- Mithi River

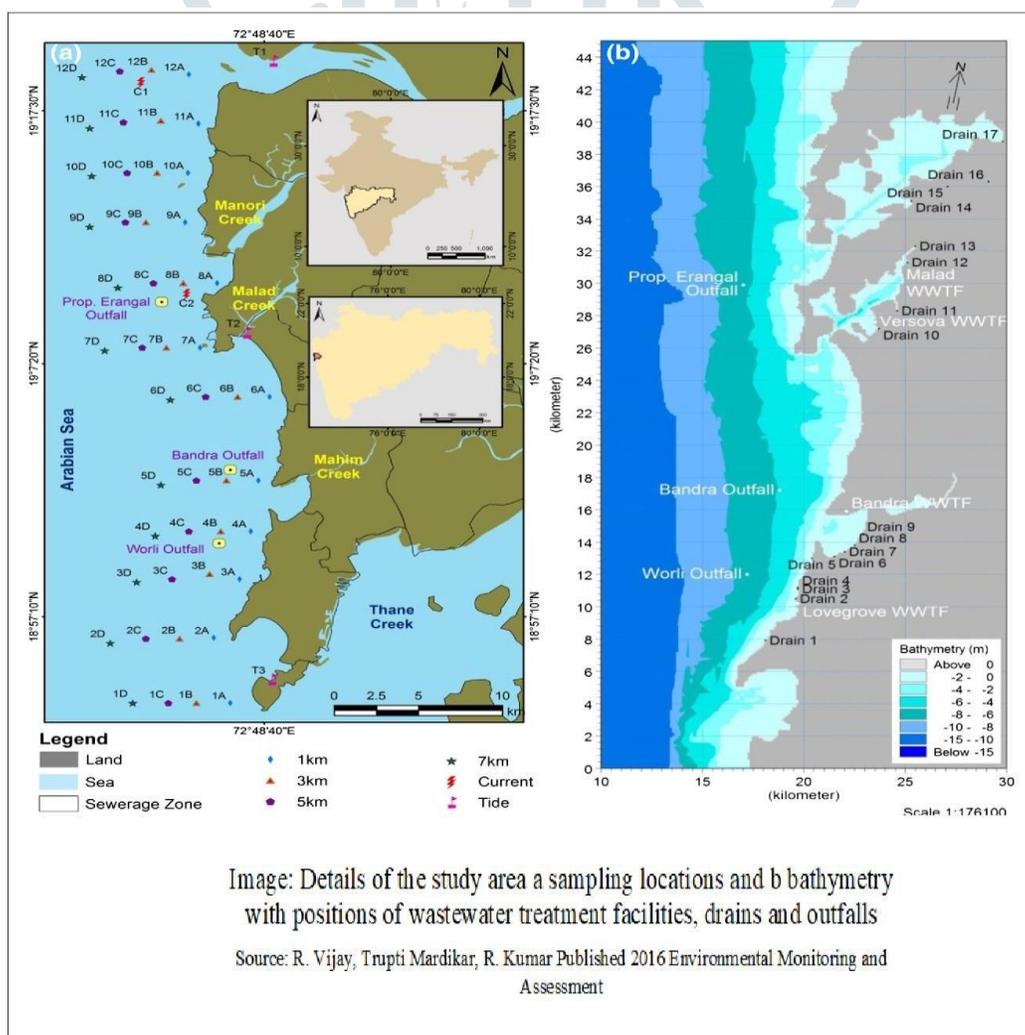
The Mithi River is the only big river in this region. This river is formed by the confluence of the Powai and Vihar Lakes' tail water discharges. The Mithi River flows from Powai to Mahim, passing through the residential and industrial areas of Powai, Sakinaka, Kurla, and Mahim over a stretch of around 15 kilometers.



Image: Sludge and Garbage floating In Mithi River
Source: The Hindu, Feb. 18, 2019

People use this river as an open sewer, dumping untreated water, human waste, and trash into it uncontrolled. Aside from that, criminal practices such as cleaning oily drums and dumping unregulated radioactive waste are also carried out along the river's bank. The Mithi River's carrying capacity has been limited due to the disposal of organic waste, sludge, and garbage. Marine life is threatened by sewage and human pollution in the sea, and the river is showing signs of complete life support system failure. The Mahim Bay Area, where the Mithi River meets the Arabian Sea, is home to the "Salim Ali Bird Sanctuary," a designated bird sanctuary where migratory birds come to nest. This area is densely forested, and this delicate eco environment must be seen from an emissions standpoint to avoid being ruined.

4.3 Effect of sewage discharges on Mumbai's coastal water quality



4.4 Active & Proposed Sewage-water Treatment Plants in Greater Mumbai Municipal Corporation.

Although the directives of the Central Pollution Control Board are obligatory for local councils, they must be considered for prospective project planning. In the next five years, as seen in the Table below, the 'Municipal Corporation of Greater Mumbai' has taken action in order to update wastewater treatment facilities to meet Central Board of Control requirements.

Sr.	Waste Water Treatment Facility Zone	Flow of STP in MLD (Proposed)	Proposed Treatment
1	Colaba	37	Preliminary Treatment, Primary, Secondary And Tertiary Treatment With Recycle And Reuse Facilities
2	Worli 493	493	
3	Bandra + Dharavi	826	
4	Versova	225	
5	Malad	847	
6	Bhandup - Phase I	323	
7	Ghatkoper - Phase I	506	

Table: Waste Water treatment & proposal treatment center

Source: Brihnmumbai Municipal Corporation

4.4.1 Operation of Existing Sewerage System

The operation of the pipe sewers is connected to the residents. As is customary, these are taken care of by concerned ward officials. Complaints about main sewers are handled by central agency employees who are under the direct supervision of this department.

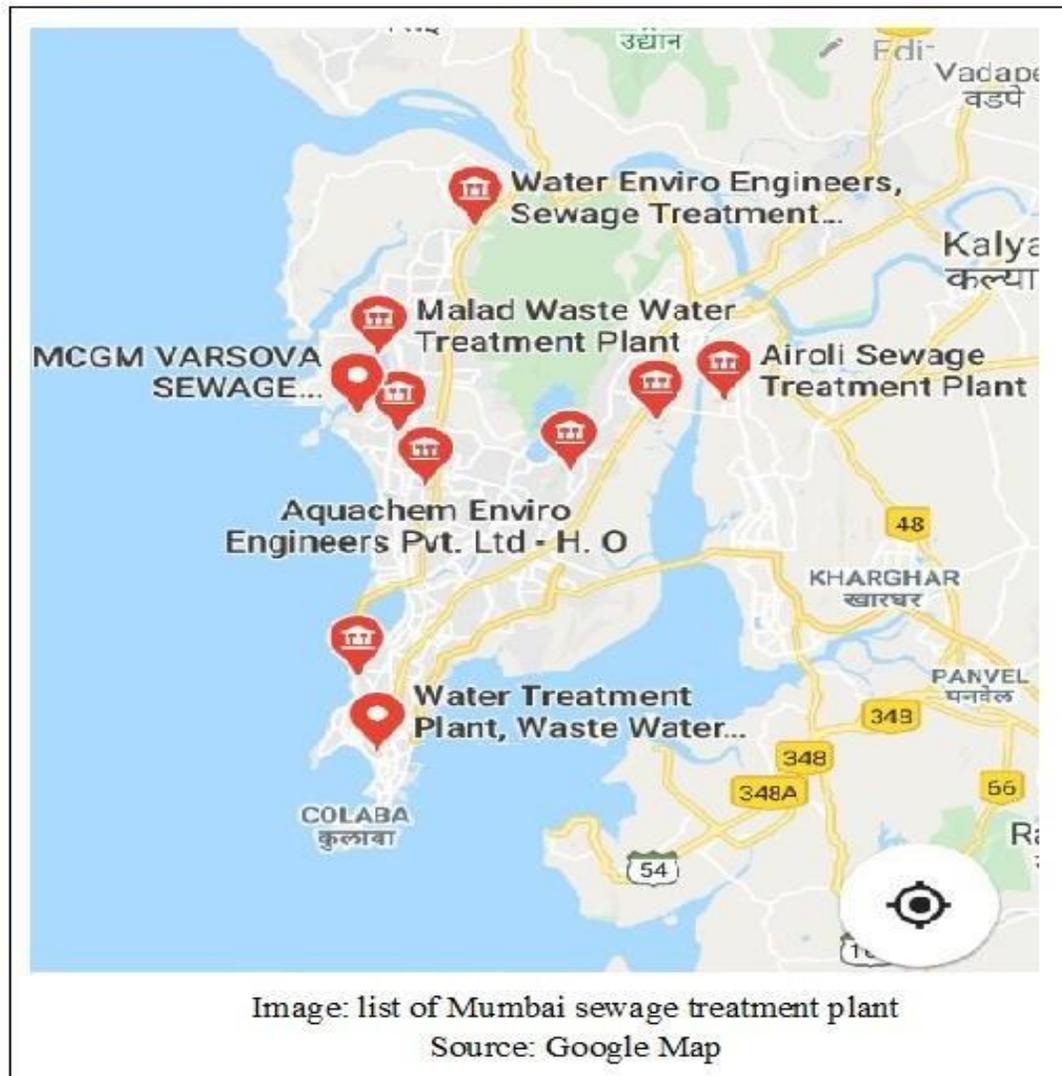
Table 1.1: Operation of Sewerage System in City of Mumbai

Source: Brihnmumbai Municipal Corporation, Mumbai

Total Approx. length of Sewerage lines in city	1,998 km.(various Sizes)
Number of Approx. Manholes in City	69289
Total Approx. number of street connections	295990
Total Sewage pumping Stations	58 nos.
Installed capacity of pumping stations	18990 Mld
Total length of Sewer lines	1,998 km.(various Sizes)

According to an estimate, the estimated delivery of potable water to Mumbai is 3750 million liters a day. Around 80% of the water generated is effluent or wastewater. This processing must not

generate toxic waste water which must be disposed of in a manner that does not harm the environment. The corporation shall obey all relevant environmental regulations as well as the Act for the Prevention of Pollution of Water.



The entire Mumbai district is covered by seven septic-zone lines: Colaba, Worli, Bandra, Malad, Versova, and Ghatkavad amongst others. Other treated effluent is discharged into the Arabian Sea by coastal ocean outfalls aglets in the Colaba, Worli, and Bandra areas. Through aerated lagoon discharge points, such as Versova, are pumped into the Malad Creek while untreated sewage is dumped into the Thane Creek.

4.4.2 Sewage Disposal System

The provision of sanitation and waste water treatment facilities to the people of Mumbai is a legal requirement of MCGM. Waterborne pathogens cause 80 percent of diseases in India, so proper and healthy waste treatment is critical. In addition to health issues, improper waste treatment has a negative impact on the environment. The Sewerage Operation Department's laboratory in Dadar has been testing coastal water in Colaba, Worli, and Bandra. According to the same report, when compared to SWII Standards, pH levels in Colaba, Bandra, and Worli are around the prescribed standards, while turbidity.

4.4.3 Operation Strategy of the Department

the Sewerage Operations department is responsible for handling, conveying, treating, and disposing of the sewage services that the two separate departments installed in Mumbai. Additionally, this organization does shortens sewage pipes, sets new manholes, replaces faulty portions of the sewer system, and elevates faults. Various maintenance works for deteriorated sewage lines. The Department is also provides vehicle services to the Water Supply and Sewer Divisions. It is overseen by the Treasurer.

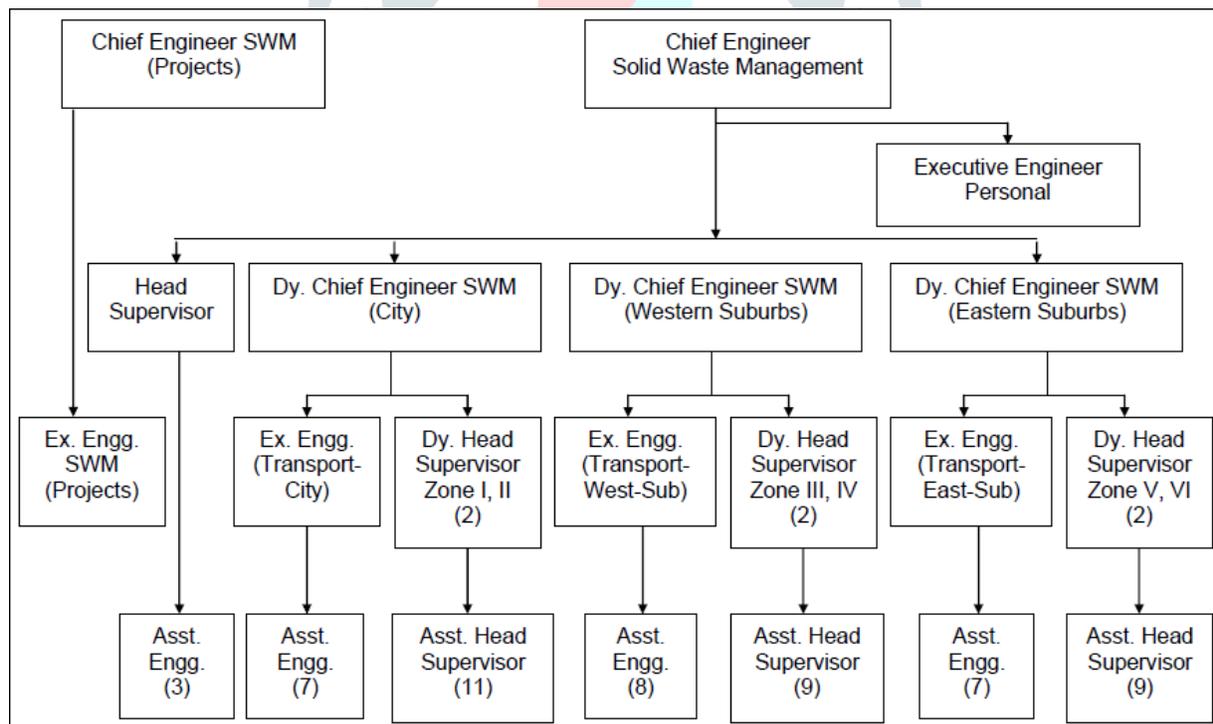


Figure 3: Organisation Chart of SWM Department of MCGM

Source: Brihnmumbai Municipal Corporation

4.4.4 Department of Hydraulic Engineers

The department's hierarchical structure is well-structured, with the Chief Engineer (SWM) serving as the department's director. He reports to the Additional Municipal Commissioner/ Municipal Commissioner and the Dy. Municipal Commissioner. A group of three deputy The Chief Engineer is assisted by four Chief Engineers and four Executive Engineers (SWM). Greater Mumbai is divided into three zones: the City Zone, the Eastern Zone, and the Western Zone. The Western Suburban Zone and the Suburban Zone. The job is managed at the zonal level. by a Deputy Chief of staff (DHS). Ward offices are located under the zonal offices.

The Department of Water Projects plans to build an ETP to prevent water wastage (30 to 35 MLD) during the treatment period. The water source from utility sources is only available on a short-term basis. The ingress of foul water during non-supply hours through joints, disconnected ties, tampered mains, defective fittings, and other means is the root cause of pollution. Despite the fact that sufficient care is taken to track the water quality at all points from the source to the end point at the consumer's tap, pollution accidents do occur. Many of Mumbai's catchment areas' water supplies are free of chemical pollution and other contaminants.

The department's operations can be divided into four groups.

- I. Sewers
 - a) Pipe sewers (less than 18 inches in diameter)
 - b) Main sewers (of size 18 inches & above)
- II. Pumping, care, and disposal are the next steps.
- III. Transportation Service Providers
- IV. Sewer planning and construction, such as

CHAPTER 5

FINDING AND RECOMMENDATIONS

5.1 Findings of Case Study

5.1.1 Mumbai's Sewage and Solid Waste Management Issues

A. Faulty Primary Collection System and Old dated Sewage Lines

With nearly 65 lakh people commuting every day, there is a high number of floaters and dailycyclists, which contributes to road littering (Jain 2004). Streets in many parts of the city are in poor repair owing to a lack of timely street cleaning, and surface water drains are clogged due to solid waste pumped into them. Only main roads are washed seven days a week, and only 77 percent of roads are cleaned six days a week (SWM Cell 2003). Currently, door-to-door waste disposal is limited to just 15% of total waste collected, with the remainder left unsorted. Because of the lack of segregation, a portion of the garbage dumped at landfill sites is recyclable. As a result, the amount of garbage that needs to be disposed of has increased. The problem is exacerbated in Mumbai by the high density and huge proportion of slum dwellers. Since slum and pavement dwellers lack access to proper facilities, they must dispose of their waste in public areas such as roads, drains, and railway tracks. Hawkers lead to road littering.

B. Disposal of wastes with respect to the Average sewage collection

Land accessible for dumping and the construction of landfill sites for waste disposal is becoming scarce as cities grow. In the MCGM field, there are only four landfill sites with a 5-year estimated lifetime. MCGM will have a tough time finding new waste disposal sites in the immediate future to meet current waste generation levels as well as those created by the new population.

5.1.2 Where did the government fail?

- 1) Lack of planning and management of the administration.
- 2) The MRDPA, which was established after the 2005 Mumbai floods, has only met six times in total. The rate at which this independent authority has been producing has been slowing recently means that the progress will soon be restored.
- 3) Short-term option that is not long-term
- 4) There is no concrete solution in order to get Mithi out of its sewer-like condition.
- 5) Pollution, stench, and encroachment have long harmed Mithi's ecology and majesty. The threats it poses to people's lives and livelihoods are a red flag that requires immediate attention.

5.1.3 Lack of awareness among the public on the existing facility and procedures for obtaining sewer connections.

- 1) The private agency's responsibilities were not well defined, resulting in inadequate collection and transportation.
- 2) As a result, the water that arrives at the treatment facility is laden with floating materials and coarse solids. This causes clogging during transportation and increases the waste burden on the treatment units, lowering the productivity of the aerobic pond and facultative stabilization pond.
- 3) The causes of the above issues were discovered to be a lack of institutional cooperation between the private firm, TWAD, and the community.
- 4) It was also discovered that these departments blame one another for their failures.
- 5) The productivity of the STP in many sites is extremely low, with just 40% BOD elimination. This is mostly attributable to poor influent content, lagoon silting, and the creation of anaerobic conditions, all of which contribute to the plant's decreased productivity. The dilemma could be effectively addressed by making authorities aware of their obligations and attempting to form public-private alliances.
- 6) Poor land use policies and pollution disposal into rivers have culminated in a public protest and appeal calling for proper land use and wastewater reuse for irrigation and Pisciculture.
- 7) Due to the low quality of treated wastewater, crop selection, and land use trend, wastewater reuse for agriculture has not been effective.

5.1.4 Why is the Mithi River so vital to Mumbai?

1) Domestic Pollution

Mumbai has used Mithi as a big sewer over the years. This "polluted" canal, though, is a lifeline for low-lying coastal cities like Mumbai. Mithi functions as a natural storm irrigation system that, if fully functional, will keep the city from floods. The city's deluge in 2005, which killed over 1,000 people, was caused by inefficient flooding during heavy rainfall combined with high tide. Thanks to the concrete limits on the banks of the river the solid waste is shivering, which significantly decreases the river's drainage ability.

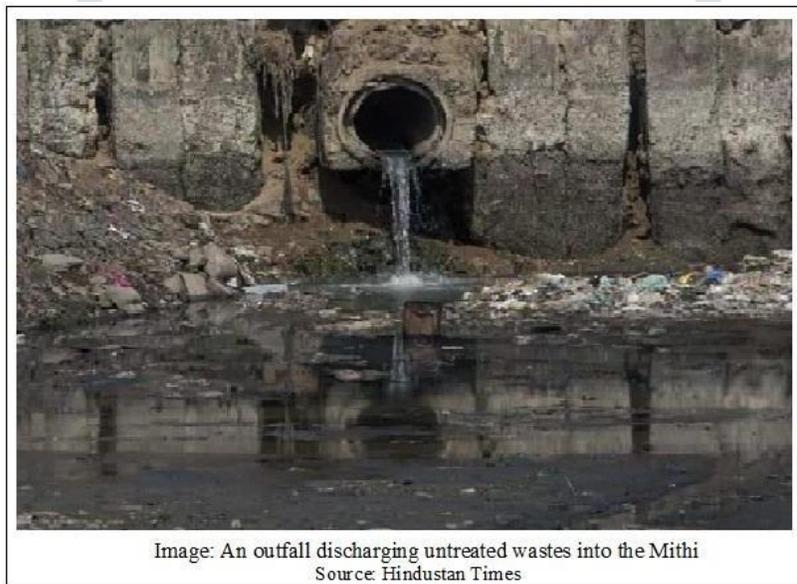
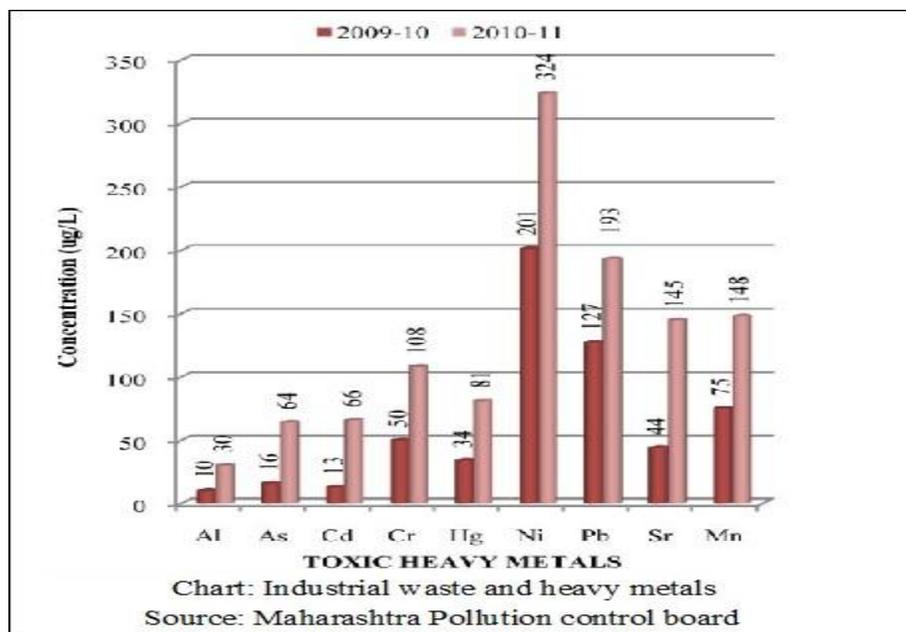


Image: An outfall discharging untreated wastes into the Mithi
Source: Hindustan Times

2) Industrial waste and heavy metals

Alongside domestic waste, about 7 percent of the waste come from over 1,500 factories and more than 3,000 illicit facilities across the river. Many of these sectors include oil refining, textiles and colorants, tanneries, car washing centers and so on. Untreated waste does not only contain solid waste such as plastics and metals, but also dissolved contaminants such as hazardous chemical waste, asphalt, litter and more.



The 2012 research to assess heavy metal level in Mithi revealed that several heavy metals had exceeded the maximum allowed range. This suggests the water is not safe for domestic or even commercial applications. Not to mention the danger to the people live by the river and water life.

3) Additional Sources

We need to be concerned not just about plastics, pesticides and sewage. In addition, the Mithi River is affected by biological harmful to the environment. The increase in the pollution-related mineral content results in an increase in algal content called eutrophication, which is a measure of contamination level. The river Mithi has had elevated eutrophication levels that are not surprising. Another pest is Water Hyacinth, an invasive plant species and a spawning ground for the mosquitoes. The pest blocks the canal. Water hyacinth and eutrophication are also considered to lead to oxygen loss, to destroy marine organisms, and to increase the need for biological oxygen (BOD) which is one of the requirements of water quality determination.

5.1.5 Action Plane by BMC for Regeneration of Mithi River

A. The Brihnmumbai Municipal Corporation (BMC) has devised ambitious proposals for the over 19Km long Mithi channel, which flows from Powai to the Arabian Sea near Mahim and is also referred to as Mumbai's garbage-strewn modular.



Image: Mithi river cleaning drive in Mumbai on April 29, 2020.

Source: Vijayanand Gupta/HT Photo

B. The BMC works on many aspects of the regeneration of the river, including a growing greenbelt on its banks around Powai and Jogeshwari-Vikhroli forward Link Road. The offer Paper prepared by BMC comprises an evaluation of economic planning opportunities for commercial and public activities along the banks of the river and boating facilities in order to enhance tourism.

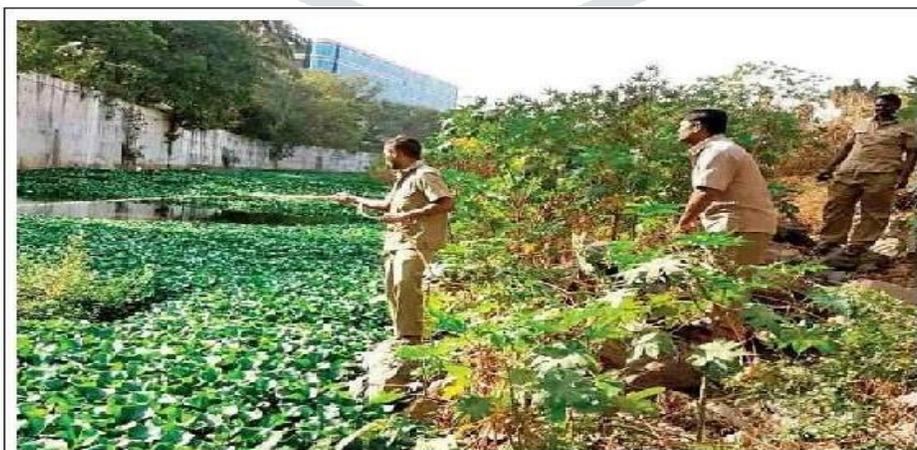


Image: The Water Hyacinth smothering the Mithi River

Source: Daily News Analysis Dated: 28 February 2020

C. **Mithi River Development and Protection Authority (MRDPA)**

In 2013, the National Green Tribunal requested that the 239 factories that polluted the river be shut down. In 2015, the Maharashtra Pollution Control Board (MPCB) released 100 of these industrial units and by 2018, power and water supply for 200 industrial units running across the city of Mithi was disconnected. More than 700 other small-scale factories in the past few years have also been shutdown in order to reduce increased effluent volumes in the canal.

5.2 **Recommendation**

A. **Socio-economic and environmental Balance**

Drones will be used to survey the river before and after the project, and the results will be analyzed to create new solutions. Children and people from various Mumbai colleges, schools, and offices will be mobilized to help solve the Mithi River plastic contamination issue with a solution-based approach.

1. A municipal sewerage grid that is autonomous (individual sewerage system at each source with wastewater collection pits, cesspits or small sewage works, latrines, etc).
2. To guard against illness, sewage and rainwater must be collected and removed safely.
3. Surface water and groundwater quality must be maintained or improved.
4. Construction of permanently watertight sewers, pressure pipes, and drains, as well as reconstruction of overflowing sewers, pressure pipes, and drains.
5. Drainage works are being optimised.
6. To deal with peak loads, sewers and storage chambers must be well dimensioned (avoidance of flooding of properties, roads and land).
7. Sewer lines should be routed properly, and outfalls should be arranged properly (in combined systems).
8. Installations for flow management.
9. Use of products that satisfy both technological and sanitary requirements.
10. Pisciculture is the use of irrigation for irrigation and aquaculture.

B. A new circular economy based model for Mithi River restoration.

With our emphasis on circular economy and environmental planning, we've directed clean-upsto ensure that the collected plastic waste doesn't end up in the waste disposal area but returns to circulation to create revenue for residents.

C. What should the people do?

Understanding and educating the people who live around Powai Lake and along the Mithi is critical, as the practice and carelessness associated with littering is a socioeconomic issue. This ongoing campaign to include people in clean-up has resulted in a behavioral shift in the neighborhood. People are learning to love and care for the river, which aids in achieving a degree of preservation when people avoid littering and stop others from littering.

D. How will the local government assist?

The most significant impediment is the dense population density along the Mithi's banks. As critical as recovery is, the fact that the majority of the population comes from a low-income family cannot be overlooked. Rather than seeing this as a single problem, it should be seen as an incentive to involve people in a circular economy and create a long-term pollution-reductionstrategy is needed for the protection of the river and its inhabitants. The administration is expected to move quickly to build STPs that will divert wastewater away from the river while also providing a suitable waste collection system for residents and businesses along the Mithi.

CONCLUSION

❖ We cannot afford to lose our freshwater supplies to contamination as our population and needs expand. Not only have we shown that we are inefficient when it comes to using our capital sustainably, but we have also neglected to save our magnificent estuarine environment. Nonetheless, the rising demand and declining condition of Mithi and other freshwater bodies can serve as a wake-up call to all of us. The fact that a vibrant river representing a vast, majestic environment has been converted to a sewer is a sad circumstance. The environment and the glory of Mithi have long been destroyed by waste, stench, and encroachment. The threats it poses to people's lives and livelihoods are a red flag that requires immediate attention.

❖ In order to protect the river and the inhabitants, the administration's help is needed. The administration is expected to move quickly to build STPs that will divert wastewater away from the river while also providing a suitable waste collection system for residents and businesses along the Mithi.

❖ Even after all that has been accomplished by men, it is nevertheless insufficient. Every single day, more garbage is dumped into the river. To combat this problem, further preparation and initiative are needed, but many people are reluctant to volunteer for Mithi clean-up because of the noxious condition in which the river currently finds itself, while the administration focuses on short-term solutions.

BIBLIOGRAPHY

References

1. Vinayakam Jothiprakash, Marcus Joseph Tobias (2020) Study Of The Socioeconomic Spillovers Of Sanitation: Sewage Treatment Plants In Navi Mumbai, India” Asian Development Bank Institute ADBI Development Case Study No. 2020-1 (May)
2. Ritesh Vijay (2016) Impact of Sewage Discharges On Coastal Water Quality of Mumbai, India: Present and Future Scenarios” January 2016 Edition.
3. Indrayani Nimkar (2014) Status Of Sewage Treatment Plants: A Case Study Of Mumbai City Conference: International Conference On Green Technology For Environmental Pollution Prevention And Control (ICGTEPC) September 2014
4. Hamsa Iyer (2016) Published a Case Study of Mumbai: Decentralized Solid Waste Management” Procedia Environmental Sciences Volume 35, 2016, Pages 101-109
5. Nandy B. ,Sharma, G., Recovery of consumer waste in India - A mass flow analysis for paper, plastic and glass and the contribution of households and the informal sector(Article) Conservation and Recycling Volume 101, 27 June 2015, Pages 167-181
6. ASEAN. (2008). ASEAN marine water quality management guidelines and monitoring manual. Australia: New Millennium Pty Ltd.
7. Central Pollution Control Board (1993). “Criteria for classification and zoning of coastal waters (Sea Waters SW)—a coastal pollution series: COPOCS/6/1993-CPCB, Central Pollution Control Board New Delhi,” June 1993
8. Mishra, P., Panda, U. S., Pradhan, U., Kumar, C. S., Naik, S., Begum, M., & Ishwarya, J. (2015). Coastal water quality monitoring and modelling off Chennai city. Procedia Engineering, 116, 995–962.
9. Vijay, R., Sardar, V. K., Dhage, S. S., Kelkar, P. S., & Gupta, A. (2010); “Hydrodynamic assessment of sewage impact on water quality of Malad Creek, Mumbai, India. Environmental Monitoring and Assessment”, 165(1–3)
10. Vijay, R., Bhattacharyya, T., Sharma, R., Dhage, S. S., & Sohony, R. A. (2011b). GIS based water quality indexing of Malad creek, Mumbai: an impact of sewage discharge. Journal of Environmental

Science and Engineering, 53(2), 143–150.



Websites

1. <https://indianexpress.com/article/cities/mumbai/bmc-revises-effluent-discharge-norms-for-stps-floats-fresh-tenders-6584718/>
2. <https://www.livemint.com/news/india/cpcb-asks-sewage-water-treatment-plants-to-adopt-covid-19-precautions-11616940066991.html>
3. <https://timesofindia.indiatimes.com/city/mumbai/no-sewage-treatment-plant-in-mumbai-meets-ngt-norms/articleshow/69319069.cms>
4. <https://timesofindia.indiatimes.com/city/mumbai/sewage-treatment-plant-inaugurated-in-mumbai/articleshow/79184099.cms>
5. <https://www.suez.in/en-in/our-offering/success-stories/our-references/offering-concrete-solutions-to-mumbai-for-its-growing-wastewater-problem>

