

WINTER PROJECT REPORT

# **TO STUDY THE IMPACT OF LAND AND WATER POLLUTION AT “JUHU BEACH”, MUMBAI.**

**Prepared for the Mumbai University in the partial fulfilment of the  
requirement for the award of the degree in**

**MASTER OF MANAGEMENT STUDIES**

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Batch- 2018-2020**

## **Declaration**

I, Sean Rodrigues student of St Francis Institute of Management and Research, hereby declare that this report is my original and authentic work and to the best of my knowledge and understanding, there is no plagiarism or dishonest means involved. Any reference made from secondary data and other resources have been duly acknowledged. I also declare that if found otherwise, my report will render itself null and void.

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## **Acknowledgement**

The completion of these project would have not been possible without the guidance and participation of all the people. Their contributions are sincerely appreciated and acknowledged to the deepest of my heart.

I acknowledge my sincere thanks to St. Francis Institute of Management and Research for providing me the required facilities and opportunity without which this work would not have been possible.

I would also like to thank my project mentor Prof. Vaishali Kulkarni for his constant encouragement and immense support towards completion of project. It gives me immense pleasure to express my hearty gratitude to her for her generous guidance, help and useful suggestions which enabled me to bring out this work in the present shape. I also wish to extend my thanks to my colleagues for support and for their insightful comments and constructive suggestions to improve the quality of this project work. I would also appreciate the efforts of CMC department for helping in placement assistance.

I want to thank my Family and Friends for their support through my journey and their unending love and grace.

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## EXECUTIVE SUMMARY:

Beaches all over the world have been a key tourist spot. People simply like to get away from the hustle bustle of the city and enjoy some sea breeze at the beach. Beaches are beautiful and make people happy, according to a study. The sound of the waves, the pretty view of the sea and walking in the sand and swimming in the blue waters are highly enjoyable and make beaches an attractive destination for many. However when it comes to Mumbai's popular juhu beach, the same can't be said. The "once" pretty beach is now become a trash yard. After seeing the poor state of the popular juhu beach, I participated in many beach clean up drives conducted by an NGO called "BHUMI". The majority of the beach was covered in large stretches of waste, most of which was plastic waste. The sea water had turned greyish brown and it was no longer a pretty sight. Walking the beach meant walking over a pile of trash. As a beach lover I was deeply hurt. It is saddening that government has not taken enough effort to eradicate this problem. As a citizen of Mumbai and as a beach lover, I wish to see juhu beach clean and pretty again and hence I decided to write this paper addressing the primary causes of high land and water pollution surrounding Juhu beach, its impact on marine and human life and also finding ways to solve this immediate problem.

## INTRODUCTION

A global study says that the plastic accumulation near the seas of Mumbai has drastically increased over the years. The survey was conducted on four beaches of Mumbai - Aksa beach (7.9%), Versova Beach (28.8%), Juhu Beach (55.33%) and Dadar (18.6%). However, the most polluted of these beaches was the Juhu Beach with the highest quantity of micro plastic.

Juhu Beach is located 18 km to the north of the city centre in Mumbai. The famous beach is situated on the shores of Arabian Sea in Juhu suburb. It is a key attraction to the locals of Mumbai. The locals swim on the beach, play football or cricket, walk and jog along the shore. It is also known for activities such as horse rides. However in recent times the beach has become highly polluted and also unsafe in terms of hygienic conditions. It poses a threat to beachgoers as swimming in the polluted sea water or playing on the debris filled shorelines can be harmful to the health. Most common trash found were plastic bags, PET bottles, clothes, cement bags, fishing nets, food wrappers, thermocol. Tracing the sources of this high pollution is extremely difficult as most of the debris is washed back from the Arabian sea. In 2018, the BMC claim to have been clearing 50,000 kg of garbage every day at Juhu beach. Despite multiple clean-up drives undertaken by concerned citizens, and efforts from the BMC, Mumbai's waste problem continues to afflict its beaches. It has been exacerbated by the flow of untreated sewage into the Arabian Sea. Dumping of plastic trash in the sea has become a killer for aquatic life and is also affecting the marine food chain. To increase awareness among the citizens of India many social media influencers have been uploading posts regarding this growing concern at Juhu beach. Even though several NGO groups have been formed to tackle this problem, the problem still resides and continues growing. It is time we stop attacking this problem at its target location (Juhu beach) and focus on solving the problem at its sources.

## LITERATURE REVIEW:

An analysis of the Water Quality Index (WQI) data - that indicates the level of pollution and is recorded monthly by the Maharashtra Pollution Control Board (MPCB) indicated that sea water at popular tourist locations were found to be in 'Bad' category and considered to be 'Polluted' for several months at a stretch. Of the 20 months starting from January 2017 to August 2018 the WQI of Juhu, Versova were rated as 'Polluted' for 11 and 12 months respectively while the WQI at Haji Ali and seawater at Nariman point was rated 'Polluted' for a total of 14 months. The WQI is calculated based on pH levels, dissolved oxygen, biochemical oxygen demand, fecal Coliform of the water. ( Aadesh Pokhare, DNA, 2019)

The study, titled 'This Report is an Alarm For All Of Us' highlights the appalling level of pollution in the Arabian Sea. Specifically, the report warns that the existence of nearly 700 marine species has been threatened due to the rising plastic pollution .Plastic pollution is also destroying the mangroves of Mumbai. More than 50% of the plastic production is of single-use plastic which consists of low-density polyethene, high-density Polyethylene, PP, Polystyrene and PET. Methane and ethylene solar radiation produces greenhouse gases, which could further harm the environment. The report has been prepared by the professors of the Institute's Civil Engineering Department Renjit Vishnuradhan and TI Aldo. According to the World Ocean Network, in many developing countries, 90% of wastewater and 70% of industrial waste are discharged without treatment. In May, nearly 414 million plastic pieces, including one million shoes and 370,000 toothbrushes, were found on an island of the Indian Ocean. And the first casualty is marine life. In March, a 1,100-pound whale starved to death after it swallowed 40kg of plastic. And that's only one of the many, many examples. (Condé Nast Traveller , 2019)

The sandy beaches of Juhu were severely impacted from the oil spill of 2015. Thick patches were seen along the shoreline, with high density of tar balls in various area of beach. Oil soaked debris was also seen accumulated in patches along the stretch of Juhu beach. The stretch of 5.80 km. was severally affected due to spilled oil along the Juhu beach.( Kinchan Chakma, 2018)

It was observed that residential areas, fishing community near Juhu – Danda are the major sources of marine pollution. Waste materials enter into the South Juhu channel through different non-point sources. The domestic sewage channels near sampling station often carry a lot of garbage in the form of plastic bottles, plastic cover/bags, fishing materials, beverage bottles and aluminium cans etc. into the channel especially during weekends. The study

encompassing the period February 2018. The total collected 989 pieces and 59.98 kg of debris from the water flowing through the channel. (Assessment of Marine Litter Based on Tide along Juhu Beach -S. Manickavasagam<sup>1\*</sup>, P. Chellamanimegalai<sup>2</sup> and M. Dhayanath<sup>2</sup> ,2019)

## NEED FOR STUDY

Beaches are known to be a key tourist attraction .The same can be said for the popular “Juhu “ beach of Mumbai ,where many locals and tourists visit to enjoy a fresh breeze .However in recent times the Arabian sea has been spitting out large amounts of trash onto the shores of Juhu beach making this key attraction an unhygienic and dirty place to visit. This citizens of Mumbai and government bodies have been trying to eradicate this growing concern with their regular beach clean ups ,but the problem still continues to worsen. It is time we solve the problem at its source rather than just conducting beach clean ups at its target location ie. Juhu beach .This paper focuses on enlisting and describing the problem at its sources. By focusing on the primary sources of the problem, I am certain that the land and water pollution surrounding Juhu beach will decline drastically in the near future. This study also aims to increase the awareness of people regarding the various harmful effects of the high level of land and water pollution surrounding Juhu beach.



## OBJECTIVES:

- 1.To identify the causes and sources of high levels of land pollution on Juhu beach.
- 2.To study the impact of high levels of pollution on marine and human life surrounding Juhu beach.
3. To analyse the measures that can be taken to eradicate land pollution on Juhu beach.

## METHODOLOGY:

### Data collection method:

Secondary data – Most of the information was taken with gathered from newspaper articles on the Internet and existing research papers.

Research design – Exploratory research design.

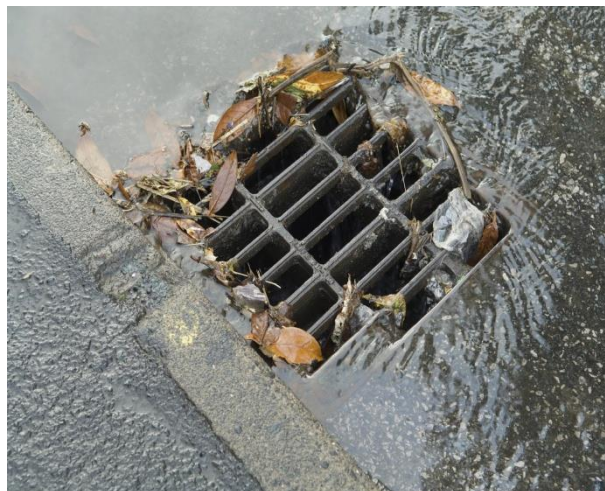
## DATA INTERPRETATION

### **CAUSE OF HIGH LAND AND WATER POLLUTION ON JUHU BEACH:**

The shoreline of Juhu beach and the sea water surrounding it is highly polluted. The primary reasons are :

#### **A] Monsoon showers:**

As per BMC figures on an average it collects 80 to 120 tonnes of garbage per day during monsoons while during the non monsoon period the waste collected daily is around 50 tonnes. During monsoon season the rainwater takes with it all garbage and waste material lying on roads and foot paths, and forces it down the storm drains (also called as nullahs). The storm drains are meant to stop water flooding during heavy rains. The excess water is directed to the Arabian sea. However this excess water also contains the waste materials that were dumped on the road .Thus a lot of garbage is released into the Arabian sea through these storm drains thus contaminating the sea water. These waste materials finally end up on the shores of Juhu beach and other beaches during high tide. This explains the higher amount of plastic and other waste materials pilling up on the shores of Juhu beach during the rainy season.



## **B] DUMPING INTO OPEN DRAINS:**

Every day Mumbai dumps between 80 and 110 metric tons of plastic waste into drains and water channels, according to Vanashakti, an environment group. These storm drains lead to the sea thus all garbage that is thrown in the open storm drains are released into the sea. The Arabian sea then spits away this garbage on the shores of Juhu beach and other beaches

The BMC attempted to prevent people from tossing garbage into the open drains by covering some of them using polycarbonate sheets. But such methods restrict regular cleaning, and a similar covering of the suburban rivers such as the Mithi is neither practical nor allowed by the environmental regulations as that would affect marine life.



During a routine clearing of the drains in Kurla, a suburb of Mumbai, in August, workers fished out a cupboard, a table, a bed and mattresses, among other objects, which were choking the drainage system. Kurla adjoins Dharavi, considered to be one of the world's largest slums, and has a population density of over 50,000 people per square kilometre. The area has several open drains besides the ironically named Mithi (sweet) river — one of the four suburban rivers in Mumbai passing through it. Mithi originates in the Vihar and Powai lakes in north Mumbai and runs a distance of 17.8 kilometers before draining into the Arabian Sea at the Mahim Bay.

In ideal conditions, it should serve as a crucial storm-water drain for Mumbai during excess rainfall, when the two lakes overflow. But in reality, the river is a putrid drain regularly used by residents as a dumping ground for waste.

Workers claim broken water pipes and bamboo pieces — besides the occasional large items of furniture — are regularly dumped by the residents. Not surprisingly, the river pushes out years' worth of garbage every time it rains.



Image: storm drain leading to the sea, releasing with it all garbage

## **C] POLLUTED RIVERS AND CREEKS CONNECTING THE ARABIAN SEA:**

The 2 most polluted rivers that flows into the Arabian sea in the western suburb areas are the Oshiwara river and the Mithi river.

### **Oshiwara River:**

Oshiwara River is a river in Mumbai, India. It begins in the Aarey Milk Colony, cuts through the Goregaon hills, across the Aarey Milk Colony before emptying into the Malad Creek. On the way it is joined by another creek near Swami Vivekanand Road, before picking up industrial effluents and sewage while crossing the Oshiwara industrial estates and slums



of Andheri . The rivers are ravaged by industrial wastes dumped without concern or fear of the environmental protection authorities. Equally guilty are the general public who recklessly dump household filth and untreated sewage directly into the slowly but surely dying river.

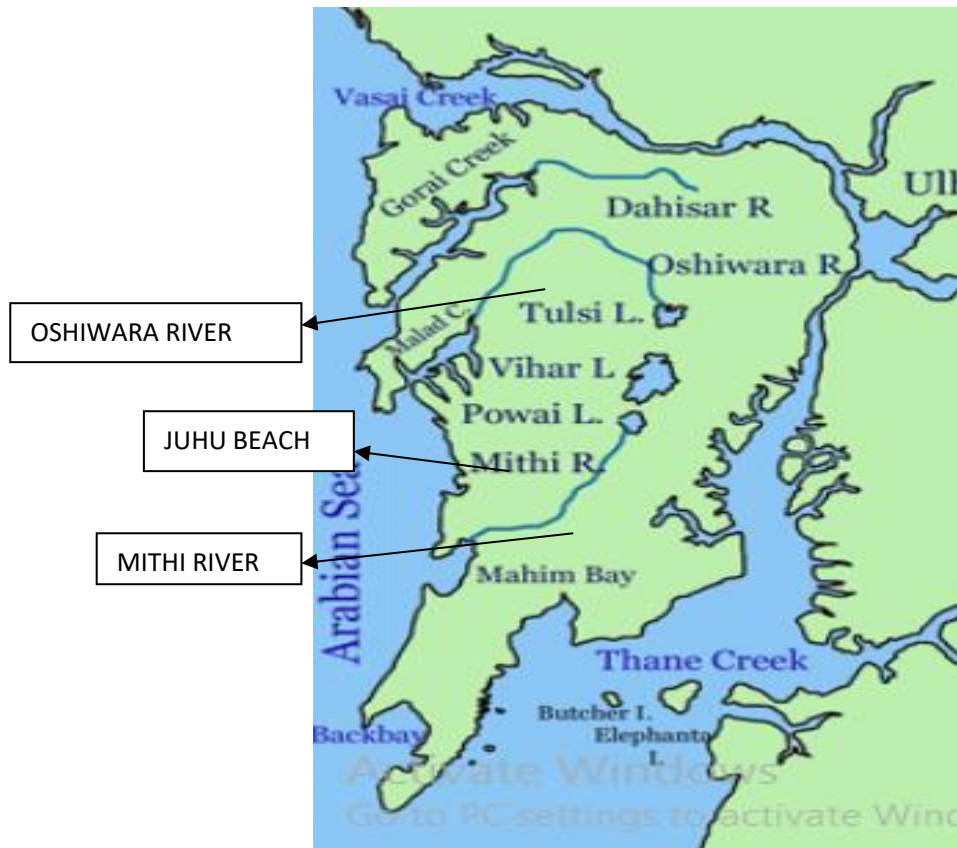


### **Mithi river:**

The river originates from the overflow of Vihar Lake and also receives the overflows from the Powai Lake about 2 km later. It flows for a total of 18 km before it meets the Arabian Sea at Mahim Creek

The river flows through various slum clusters including Asia's largest slum—Dharavi. Almost 70% of the river banks are occupied by lakhs of slum units from where domestic waste and even open defecation waste flows into the river.

The river has been polluted by dumping of raw sewage, industrial waste and municipal waste into the river. Besides this, illegal activities like washing vessels, animals and oily drums, discharge of unauthorised hazardous waste are also carried out along the course of this river.

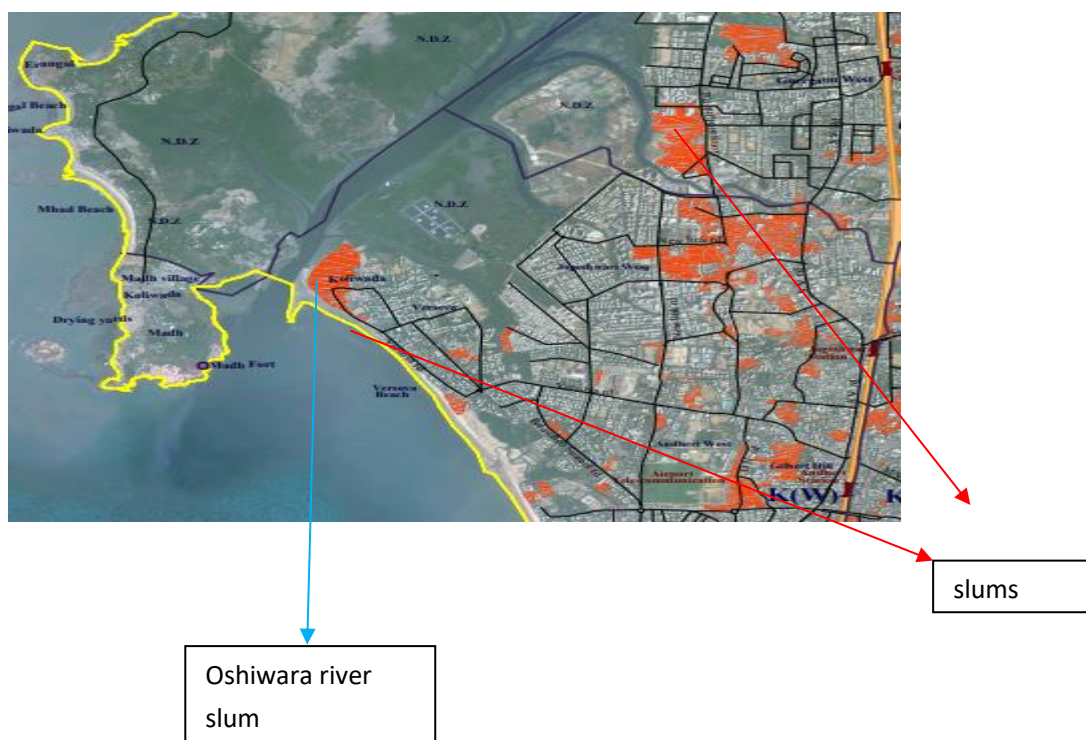


## D] SLUM AREAS ALONG THE RIVERS:

Slum areas along the rivers cause various problems:

- a) They dump their garbage in the river: Slums are not seen as the rightful recipients of the formal systems of solid waste management (SWM). The local government extends its services only to regularised slums which are declared official or recognised under the census of slums. Therefore like developed regions they do not always have garbage trucks to take their garbage away. Hence they simply dispose of their garbage in the rivers which directly flow in the sea and end up on the beaches of Mumbai.
- b) Lack of proper sewage system : The sewage systems in slum areas do not lead to the sewage treatment plants which is responsible for treating treating contaminated waste water from household . Instead the sewage system leads to the rivers thus contaminating it with faecal matter. Thus untreated sewage enters the river which leads to the sea .This leads to the seawater being very polluted and way above its safe limit making it unfit to swim in such a sea and also causes harm to the marine life.

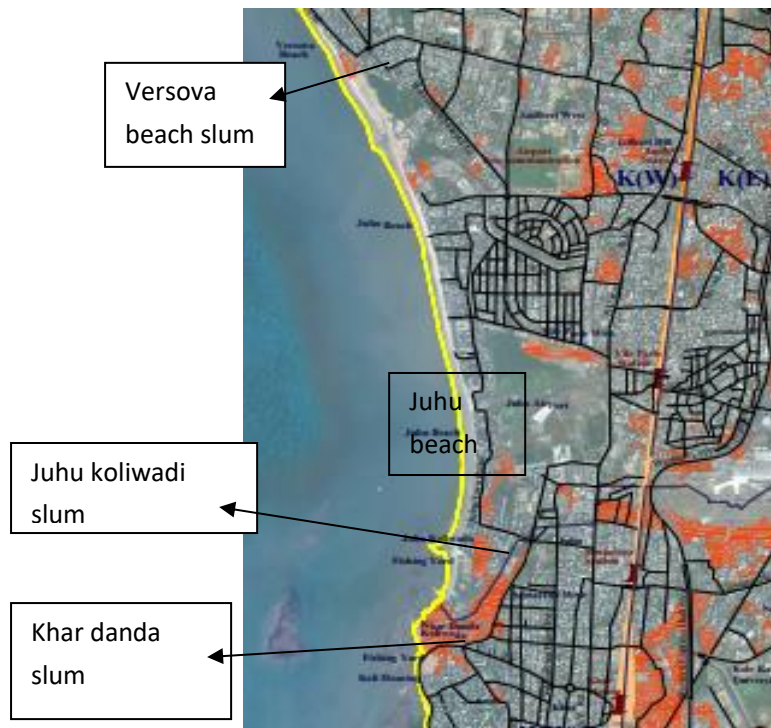
### *SLUMS ALONG MITHI RIVER:*





## OTHER SLUMS :

There are a few slums on the coastline facing the Arabian sea near Juhu and Versova which could also be dumping their waste in the sea. Slums away from the river and sea could also be dumping their garbage in open drains which lead to the sea.



## INDUSTRIAL WASTES DISCHARGED IN RIVERS AND CREEKS:

Industrial effluents discharged in Mithi river and the creeks in Mumbai also contribute to the high pollution on the shores of Juhu beach. There are many industries along Mithi river that dispose chemicals and other harmful effluents in rivers which lead to the sea and thus contaminating it and making it unsafe.

## E] FISHING NETS DISPOSED OFF ON JUHU BEACH:

After going for several clean up drives with the NGO “Bhumi”, I found that along with tons of plastic and other waste materials, the sand along the shores also contained considerable number of fishing nets sunk in the sand. It was also observed that several dead fishes were trapped under these fishing nets thus also affecting marine life. This also causes a stink on the beach as these dead fishes rot and give out a foul odour.



## 2. IMPACT ON HUMAN AND MARINE LIFE:

### **A] IMPACT OF POLLUTED SEA WATER ON HUMANS:**

According to the analysis done by the Maharashtra pollution control board , the water quality index (WQI) of sea water at Juhu is 45 . It was 45.2 at Mahim, 46.1 at Worli Sea Face and 46.8 at Nariman Point – hinting high-level presence of pollutants all along the seas. WQI between 38 and 50 is classified as polluted; a reading between 63 and 100 indicates clean water. The WQI for water in Mithi River was at its worst – 28 – when the readings were taken in October 2017.

About 75% or 2016 million litres per day (MLD) is treated in sewage treatment plants (STPs) and 655 MLD of untreated sewage is discharged directly into rivers ,creeks and the sea. This untreated sewage comes mainly from the slum areas along Mithi river and Oshiwara river who do not have proper sewage systems. This means you would be swimming or playing with faecal matter when you visit these beaches — ingestion of which can lead to nausea, vomiting, diarrhoea, stomach pain, headache and fever, respiratory infections, and skin and eye irritation. The faecal bacteria also thrives on the sands and sediments on the beaches. A lot of locals of Mumbai swim in Juhu beach .Children are seeing playing in the water. The extremely polluted water can be very dangerous for them.

Further, the waste that ends up in these waters are consumed by planktons. The fish in the sea eat these planktons, and much of the fish in the market comes from these waters .Some areas of Juhu beach are also a major fishing ground. Therefore there is a possibility that people may fall sick by eating fishes that were caught near Juhu beach.

## **B] THREAT TO MORNING WALKERS AND JOGGERS:**

A lot of citizens including celebs are known to take a morning walk or run. The waste stretches of garbage on Juhu beach not only make this difficult but also pose a threat to them.

Residents from Juhu said that the garbage could lead to health problems in the area. “Apart from plastic, the sea has been throwing trash that includes needles, syringes and many other discards from hospitals. This poses a serious health concern to citizens taking morning walks or jogs at the beach,” said Hansel D’Souza, activist and president, Juhu Citizens Welfare Group.

## **C] DESTRUCTION OF NATURAL BEAUTY:**

Beaches are considered a natural gift of nature. A lot of people visit beaches just for the beautiful sight the beach offers them. However the huge amount of plastic and other waste spread out on the shoreline of Juhu beach has made it a disgusting and horrifying sight. Moreover, layers of garbage also stink making this beach unbearable for its visitors. The sea water has turned grey instead of blue, hence spoiling the natural beauty of the beach.

## **D] HINDERS SPORTS ACTIVITY OF CHILDREN:**

Juhu beach is known to be a place where a lot of children play football, cricket and other sports. Many times football and cricket are played in the hard wet set (close to the seawater) as it is more level and easier to run on. However due to the vast stretches of plastic and other debris on the wet sand, children are no longer able to play. Moreover the debris sometimes contains syringes and other medical equipment which can pose a threat to children who play on the beach.

## **E] IMPACT ON MARINE LIFE:**

According to Marine biologists, a bad WQI (Water quality index) means low levels of oxygen in water. The level of oxygen will decline if poor water quality marred with sewage and plastic take over the surface of areas close to the coast. Not only will it wipe out marine life, it will lead to a tremendous drop in fish catch, according to E Vivekanandan, consultant and scientist, Central Marine Fisheries Research Institute. Also the waste that ends up in these waters are consumed by planktons. The fish in the sea eat these planktons and thus get infected too.

The environmental impact of marine litter is multidimensional. It can cause serious environmental problem with the possible transfer of toxic chemical substances to the marine habitats. Marine debris includes timber, glass, metal and plastic from many different sources. Recently, the accumulation and possible impacts of microplastic particles in the ocean have been recognized as an emerging environmental issue. Environmental damage due to plastic and other marine debris can be defined as mortality or sub-lethal effects on biodiversity through:

- physical damage by ingestion

- entanglement in ghost nets (fishing nets lost or left in the ocean) and other debris

- chemical contamination by ingestion and

- alteration of community structure, including the importation of alien species .

Exposure of plastic debris to the variety of physical, chemical and biological processes in ocean results in fragmentation and size reduction. In general, potential chemical effects are likely to increase with a reduction of size of plastic particles while physical effects, such as the entanglement of dolphins and other animals in drift plastic, increase with the size and complexity of the debris.

### 3. STEPS WE CAN TAKE TO REDUCE/ERRADICATE THE LAND AND SEA POLLUTION ON JUHU BEACH:

Thousands of tons of garbage is picked up daily from the shores of Juhu beach by the BMC and NGOS. Citizens have joined up too to make sure their beach remains clean. Despite these efforts, Juhu beach still remains highly polluted. The sea throws back all the garbage that is dumped or discharged in the sea back to the shores of Juhu beach. Thus simply trying to solve this problem by picking up all trash from the shores is not a permanent solution. We need to try to tackle this problem at its sources.

#### **A] REGULAR BEACH CLEAN UPS:**

The need to find solutions to tackle the problem at its source is crucial, however it is necessary that we continue to have regular beach clean ups by the NGOs and the BMC .

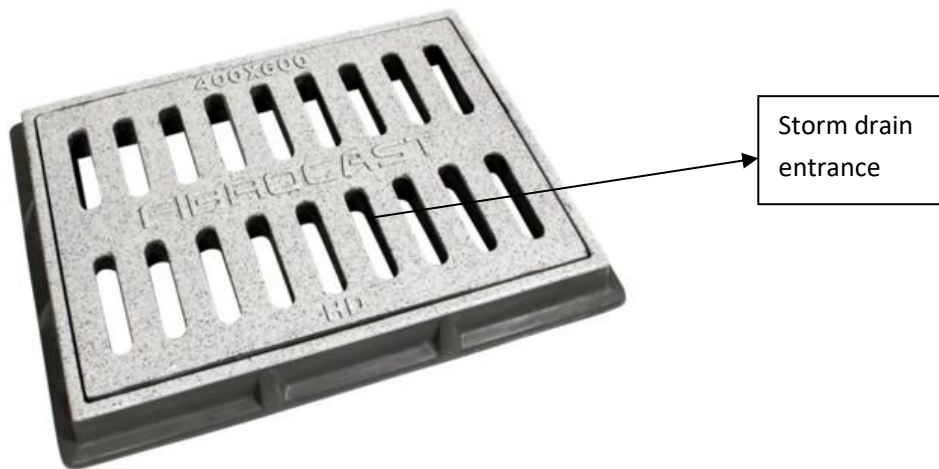
#### **B] OPEN DRAINS MUST BE SHUT:**

People are known to throw garbage into open drains. Therefore the government bodies need to make sure that these drains are closed all over the city. Also people need to be made aware of the consequences of throwing garbage into such drains.

#### **C] STORMDRAINS :**

As we have discussed earlier , garbage thrown on the streets are swept away into the storm drains (nullahs) during the rainy season. Fixing nets to filter plastic and other waste at the point where the storm drain meets the sea is not an option as these plastic and other waste that enter the drain could clog the waterway leading to the sea. The plastic bottles and bags get stuck in the net and thus clog the drain.

A better solution would be to make the storm drain water entrance in such a way that it is too small to let through plastic bottles and other waste .So the plastic bottle /bags are not small enough to fit through the holes of the storm drain openings. However this could be a very cumbersome and time taking process, and not to mention a costly one too. Therefore the best and most obvious way to prevent garbage entering storm drains during rains is that people stop throwing garbage on roads and footpaths. They need to be made aware of this indirect consequence of throwing garbage on the ground. The people need to change collectively to solve this problem.



#### **D] IMPLEMENTATION OF PROPER SEWAGE AND WASTE DISPOSAL SYSTEMS IN SLUM AREA:**

As discussed earlier ,slum areas located near Mithi river and Oshiwara river are known to dispose garbage in the river. Also these backward areas lack a proper sewage system which connects to the sewage treatment plants. Thus raw sewage which includes faecal matter is directly disposed into the rivers which lead to the sea. To address these problems the government needs to build proper sewage lines in the area so that it is treated in sewage treatment plants before it is discharged in the sea. Also a proper garbage collection system must be implemented in such slum areas. People living in such slums must also be made aware of the consequences of dumping garbage in the rivers and must be encouraged to not dispose waste into the rivers.

#### **E] INDUSTRIES:**

Industries must warned and the fine should be increased for discharging chemical and other waste into the rivers.

#### **F] AWARENESS:**

Awareness needs to be created among people in general. They must be made aware of the poor state of Juhu beach and its consequences to marine and human life. The major cause of the problem surrounding high pollution on Juhu beach is its people and their actions. If the people change their mentality,I am certain that the pollution level at Juhu beach would go down.

## LIMITATIONS:

1. Since most of the study is based on secondary research, there is a possibility that this study has missed out on a possible source/sources of problem related to the high levels of plastic pollution near the areas surrounding Juhu beach. Tracing this problem back to its true source can be extremely difficult as we do not have a tracker of any kind on the debris found on the shores of the beach. In reality they could have come from anywhere.
2. Most of the research is based on secondary sources. Even though most of the sources of information comes from the Indian government and BMC sites and articles , there is no way to validate that their primary research is 100 % accurate.

## FUTURE SCOPE:

This research project can be taken one step ahead by other researchers to help prove the facts given in the findings. Most of the data gathered on the sources of water and land pollution on the Juhu beach is based on secondary research. In order to make this research data accurate and more appealing, one needs to conduct primary form of research by on site investigation of the sources of pollution . This can be done by physically going to the locations and observing or studying the phenomenon which causes the rivers and sea to be polluted. For example, according to one of the secondary sources, dumping of garbage in the Mithi river is a major cause of high pollution on Juhu beach. To prove this a researcher can physically visit Mithi river and observe the phenomenon happening.

## CONCLUSION:

The high land and water pollution on Juhu beach is a growing concern. It has spoilt the natural beauty of the beach and also become unhygienic and dirty. It has also affected marine and human life in countless ways .This problem has to be tackled now at its sources with efforts of the government and also the local people .The local people need to be made aware of the consequences of dumping wastes into rivers , creeks and open drains. With the government and the citizens efforts together, I am sure that the once so called paradise, would see better days again.

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Badri chatterjee ,Hindustan times



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Submitted	3/13/2020 9:21:00 AM
Submitted by	Papinder K. Nagi
Submitter email	library@sfimar.org
Similarity	10%
Analysis address	library.unimu@analysis.arkund.com

## Sources included in the report

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