

Impact of pollution on marine environment -A case study of coastal Chennai

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Abstract

This paper reports the impact of pollution on marine ecosystem; it analyses the factors responsible for degradation and suggests suitable corrective measures. Around the world, marine ecosystems are being threatened, degraded, damaged or destroyed by human activities, one of which is pollution. The rapid population growth and enormous urban and coastal development in many of the world's coastal regions have caused considerable concern that anthropogenic pollution may reduce biodiversity and productivity of marine ecosystems, resulting in reduction and depletion of human marine food resources. In addition, pollution reduces the aesthetic value and also the intrinsic value of the marine environment, whether the pollution is visual (such as oil pollution and plastic debris) or invisible (such as chemical compounds). The recent pictures coming out of the oil spills off the Gulf of Mexico in the United States and also the container tanker collision off the Mumbai coast are vivid examples. Another main reason for concern about marine pollution is related to the direct effects of pollution on human health. Because many pollutants accumulate in marine organisms, humans are exposed to pollutants when they consume food from polluted areas. Marine pollution occurs when unsustainable elements gain entry to water masses, potentially causing spread of invasive organisms, diseases and can turn water quality potentially toxic. Most sources of marine pollution are land based, such as wind blown debris, industrial / domestic pollutants discharged and potential spillovers from freight/ bulk ocean carriers. When toxins are concentrated upward within the ocean food chain, many elements combine in a manner highly depletive of oxygen, causing estuaries to become anoxic. As these materials are incorporated into the marine eco system, they quickly become absorbed into marine food webs. Once in the food webs, these cause mutations, as well as diseases, this can be harmful to humans as well as the entire food web. Globalization has brought in its wake increased demand on scarce resources leading to rapid depletion of a wide range of non degradable products viz., metals, plastics, rubber products, which in turn generate huge amounts of solid wastes causing pollution at the entry of marine waters. Besides the coastal regions of India are characterized by slums, with poor sanitation facilities aggravating the problem. Suggestions are offered, both invasive and non invasive which can definitely reduce the burden placed on our valuable resources which may soon vanish unless the counter measures are implemented effectively.

Keywords: Marine ecosystem, anthropogenic pollution, estuaries, poor sanitation.

Introduction

The impact of globalization on environment and sustainable development remains in the transition for India. Due to increased emphasis given to export and foreign exchange earnings, liberalizing, industrial production, dropping barriers to entry of foreign companies and goods, expanding privatization, and cutting government spending. The Indian economic environment is also largely squeezing its natural resources, at a faster pace, exploiting resources and effluents of affluence are thrown into the sink of water bodies, land, air, commercialization, of agriculture, expansion of industries, urbanization high level of migration, have led to disastrous effect on marine environment. Modern consumers desire a life style based on mobility, convenience and product disposability, has led to further advancement of resource inefficiency and waste generation. Marine pollution occurs when harmful effects or potentially harmful effects can result from the entry into the ocean of chemicals, particles, industrial agricultural and residential waste, noise or the spread of invasive organisms. Most sources of marine pollution are land based agricultural run off, and wind blown

debris. Many potential toxic chemicals adhere to tiny particles, which are then taken up by plankton, and benthos animals, most of which are either deposit or filter feeders in this way, toxins are concentrated upward within ocean, food chains, many particles combine chemically, in a manner highly depletive of oxygen, causing estuaries to become anoxic. When pesticides are incorporated into the marine ecosystem, they quickly become absorbed into marine food web, once in the food web, these pesticides, can cause mutations, as well as diseases which can be harmful to humans as well as the entire food web. Toxic metals can be introduced into marine food webs, These can cause a change to tissue matter, biochemistry, behaviour, reproduction, and suppress growth in marine life also many animal feeds have a high fish meal content, In this way marine toxins can be transferred to land animals, and appear later in meat and dairy products.

Factors causing marine pollution

Direct discharge of industrial waste & sewerage

Pollutants enter rivers and sea directly from urban sewerage and industrial waste in the form of hazardous

and toxic water. Some minerals discharged in the course of mining can cause problem, which can interfere with the life history and development of coral polyps. These minerals and heavy metals such as mercury, effects the water quality, imbalances the oxygen levels, it later on settles down on the continental shelf's, which are a breeding ground of most species of fishes.

Land run off: Surface run off from farming as well as urban run off and run off from construction of roads, building, ports, channels, and harbors, can carry soil particles, laden with carbon, nitrogen, phosphorus, and minerals. This nutrient rich water can cause fleshy, algae and phytoplankton to thrive, in coastal areas known as algal blooms, which have the potential to create hypoxic conditions by using all available oxygen.

Ship pollution: Oil spills can have devastating effects being highly toxic to marine life. The polycyclic aromatic hydrocarbon, are the component in crude oil. Which are very difficult to clean up, and last for years in the sediments and marine environment?

Discharge of cargo residues from bulk carriers can pollute ports, water ways, and oceans in many instances vessels intentionally, discharge illegal waste, despite foreign and domestic regulation prohibiting such actions. Ships also cause noise pollution that disturb aquatic wild life.

Atmospheric pollution: Windblown dust and debris, including plastic bags, are blown sea ward from land fills and other area the raising levels of carbon dioxide in the atmosphere, are acidifying the oceans, These are in turn altering, the aquatic ecosystem and modify fish distribution.

Deep sea mining: Ocean mining sites are large areas on the ocean floor. 1400-3700 meters below the sea surface. These sites contain, precious metals, such as silver gold copper, manganese, cobalt and zinc. Hydraulic pumps take the ore to the surface, the removal of parts of ocean floor, disturbs the benthic layer, increased toxicity of water column, and sediment plumes from tailings. The cloudiness on water increase, it could negatively effect light penetration, and affect the food web of the area.

Acidification: Oceans are natural carbon sink, because they absorb carbon dioxide from atmosphere, due to this they turn acidic, but due to this corals, shell fish may become incapable to form shells. The methane clathrate reservoirs that are found on the ocean floors, they trap large amounts of green house methane. This lead to thickening of sea water to 3-14 meters.

Eutrophication: Eutrophication implies increase in chemical nutrients, cause increased plant growth and decay, this leads to depletion of oxygen, and severe

reduction in water quality, affecting fish and other animal population. Rivers empty into oceans, many chemicals, used as fertilizers, and waste from livestock and humans cause production of oxygen depleting chemicals, leading to hypoxia and creation of dead zone.

Plastic debris: Discarded plastic bags, six pack rings, and other forms of plastic waste, which is dumped into the ocean present danger to wild life can threaten through entanglement, suffocation and ingestion. Plastic additives are known to disrupt the endocrine system, when consumed, it can suppress marine system, and decrease reproduction rates. Besides, PCB,s DDT, pesticides, furans, dioxins, phenols, and radio active waste. Heavy metals such as mercury, lead, nickel, arsenic, and cadmium, can accumulate in the tissues of many species in a bio accumulation process.

Objectives of study

1. To identify the factors responsible for causing marine pollution
2. To estimate the effect and impact due to marine pollution to marine life.
3. To study the Chennai Ennore coastal port region and its impact on marine environment.
4. To suggest policy measures to prevent marine pollution. To create sustainable marine environment

Chennai- Ennore port- A case study

This paper makes an effort the impact of pollution in the Chennai Ennore port region. Ennore is a busy area with heavy economic activities, the port region facilitates, transit, and cargo loading and unloading, there is heavy vehicular traffic, the fishing port is always functions in an active manner, besides there are numerous, house dwelling surrounding, schools, commercial establishments, shops, small restaurants, marriage hall, hospitals, some processing, industries, chemical industries, refineries, etc. The infrastructure facilities at the port are inadequate, with poor drainage facilities, improper waste clearance, very bad roads. The water quality report was collected from the recorded from the Tamil Nadu pollution Board in the year 2009. Which stated that the water quality tested positive of high ammonia, high nitrite, similarly high petrocarbon, values were observed, near the harbour, phenols, and high concentration of cadmium and mercury were also observed. The presence high quantities of phenols and cadmium is due industrial effluents being discharged without treating. High levels of ammonia from waste water discharge, PHC and Hg from boat traffic and harbour activities. To explain the ennore coastal environment system, it is mainly found that anthropogenic sources and several biogeochemical processes are taking place in the marine ecosystem. Eutrophication is found high which is showing 24-51%. It consists of variables such as Doph, SS, ammonia-N phosphate, and silicate- copper contamination is as high as 10.61%. Metals such as Zinc

was 10.11% the surface waters, estuary, and adjacent coastal waters are found highly polluted, Solid waste dumping from the adjoining areas, windblown debris, are other contributing factors.

Marine fish production

Marine production is showing a decline due to several reasons marine pollution is the major among them.

Causes for dwindling marine production

1. Capture resources are either stagnant or falling the reasons owe to,
2. Overexploitation of natural resources,- deep sea trawl net
3. Excessive increase in fishing fleet - mechanized, and motorized boats
4. Discharge of sewerage, and drainage into sea
5. Discharge of solid waste into the sea
6. Discharge of industrial effluents into the sea
7. Land blown debris plastics, Rubber, etc.
8. Oil spills, increase in hydrocarbon into the sea.

Note on River Cooum

An east flowing river, Cooum River originates from Kesavaram Anicut in Kesavaram village built across Kortaliyar River. It passes through Vellore and Tiruvallur districts before entering the Chennai city. It has a length of 65 km and a catchment area of about 138 sq km. The river is mainly used for agricultural purposes before it reaches Chennai. Out side Chennai the river is generally dry .Water flow is observed only during rainy season. Flow is observed when the river reaches Chennai city and it is primarily due to discharge of sewage from Thiruverkadu and Maduravoil. River length with in Chennai city is 18 km. Like other city water ways River Cooum is not perennial and most of the time it serves as carrier of sewage. Stanley duct connects Cooum River with Buckingham Canal. The river merges with the Bay of Bengal near Napier Bridge. Another major water body which reaches River Cooum is the Virugambakkam Canal. Minor channels like Haddows Road canal carries rain water and sewage into Cooum River.

The capacity of Sewage Treatment plants in Chennai city is as follows

Existing treatment plants: 1. Villivakkam = 54 mld, 2. Nesappakkam = 23 mld, 3. Koyambedu = 34 mld, 4. Kodungaiyur = 80 + 80 = 160 mld.

Newly constructed plants: 1. Perungudi = 54 mld, 2. Nesappakkam = 40 mld, 3. Koyambedu = 60 mld, 4. Kodungaiyur = 110mld.

As on mar 2008, 99% of Chennai city is connected to sewage treatment plants Number of dwellings covered is 5,46,094 the length of sewer mains 2671 km Number of pumping station 185 numbers. The treatment capacity of the 5 sewage treatment plants 486mld. Most parts of the

Chennai city have been provided with storm water drainage system and under ground sewerage system for collecting the city sewage and conveying to the sewage treatment plants.

Present status

Despite several measures taken to improve aesthetic conditions of the waterways, 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 in to Buckingham Canal which is connected to Cooum River. Like other city water ways 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.

Prevailing trend: The Tamil Nadu Pollution Control Board under the Monitoring of Indian National Aquatic Resources (MINARS) Programme is monitoring the water quality at River Cooum at 11 locations. The parameters monitored are BOD, TSS, COD, PH, Amonical Nitrogen, TDS and Chlorides. The statistical analysis of river water quality reveals that there is no improvement in the River water Quality from 1991 onwards. The sewage is discharged by Koyambedu Sewage Treatment Plant at an outfall near Aminjikarai. Here the BOD and TSS level are meeting the standards. The level of BOD and dissolved oxygen decreases as the river flows towards Bay of Bengal. Simultaneously there is increase in levels of TDS, COD, Chlorides and TSS levels as the river reaches the sea. Except at Aminjikarai this could be attributed to discharge of treated sewage from koyambedu sewage treatment plants. Throughout the entire stretch within Chennai city the River seems to be in septic condition. Due to action of high tide and due to influx of sea water the TDS levels are very high at Napier Bridge, Laws Bridge Chindadiripet and Quai-de-Milleth Bridge. Policy measures for restoration of river water and protection of marine environment in Chennai may help:

1. To restore the river quality all encroachments, in Cooum River Bank should be removed and direct discharge of sewage should be prevented. The river should also be dredged and desilted to remove sludge. The river should be flushed with storm water during rains. This process can ensure that the river is restored in a natural manner.



2. Strict adherence to regulation and licensing by the government in order to use high technology for treating effluents and sewerage from household, commercial establishments, and industries. And practice responsible coastal management.
3. To provide, facilities and infrastructure in port,
4. To regulate and prevent uncontrolled increase in motorized and mechanized boat fleet which cause discharge of waste and hydrocarbon, into the sea.
5. To prevent deep sea mining and protect the ocean floor, and save the flora and fauna of the marine organisms.
6. To ban testing of Radio active tests in the ocean waters, as these cause hazard to coral reefs, and continental shelf.
7. To create awareness to public, by information by educating them to safeguard the environment, prevent global warming, and adopt sustainable fishing and harbor activities.
8. Reducing the human population, and ensuring livelihood to communities which depend upon coastal occupations for their living.

Conclusion

The study has brought out the factors that are responsible for marine pollution and has highlighted the effects. It explains the geographical layout, it highlights the pressure of population, dependence of coastal communities, and pathetic condition of ports, the river water bodies and how polluted water reaches the sea. It also emphasizes on the emergence of slums along the banks of the river bodies all along Chennai, how this can be removed by giving alternative sites and facilities. It also drawn attention on the excessive port and harbor activities, the poor infrastructure, bad planning by the state in maintaining and preventing damage. This study emphasizes how awareness and information and public and private participation and together lead to a sustainable marine environment, It can pave way mitigating global warming, and preserving and protection of precious marine resources.