

Impact of Pollution on Environment - A Case Study of Coastal Region of Purba Medinipur District, West Bengal

Dr. Jyotirmoy Pandit

Assistant Professor and HoD, Department of Geography
Ramnagar College, Depal, Purba Medinipur, West Bengal, India
jyotirmoy19820@gmail.com

Abstract: *This paper reports the harmful effects of various substances on coastal ecosystem; it analyses the factors responsible for degradation and suggests suitable corrective measures. Various sources for the pollution of coastal environment were identified and the causes for the same are understood. Many of the pollutants that are let into the sea are directly or indirectly by human activities. Around the world, coastal ecosystems are being threatened, degraded, damaged which is pollution. The rapid coastal development as well as significant urban-industrial growth have caused considerable pollution that reduces productivity of coastal ecosystems and at the same time pollution reduces the aesthetic value and also the intrinsic value of the coastal environment. Various regulations and policies have been taken to preventing coastal pollution at the national and international levels. The pollution is much more in off shore region and it is increasing at an alarming rate. Obviously, it is difficult to protect such kind of pollution and here a variety of approaches are urgently required. In this paper, the concept of coastal pollution, causes of coastal pollution, its impacts and preventive measures are discussed*

Keywords: Coastal environment, ecosystem, coastal development, pollution, aesthetic value

I. INTRODUCTION

The coastal region of West Bengal particularly in the district of Purba Medinipur is relatively unfavourable environment due to its frequently changing local ecology, sea condition, terrestrial slope, coast configuration, expansion of off shore and on shore, deposition of sediment carried out by the rivers and some anthropogenic activities are the major factors, those influence the coast. The behavioural pattern and distinctive characters of sea-shore are interacted of the above factors. Moreover, Coastal waters are one of the nation's greatest assets, yet they are being affected with pollution from all directions. World Health Organization (WHO) provided a definition of coastal pollution as "The introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects such as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities."

The heavy concentration of activity in coastal areas, combined with pollutants flowing from streams far inland and others sources, are the primary causes of nutrient enrichment, toxic contamination, sedimentation, and other problems that plague coastal waters. Qasim and Sen Gupta highlighted that in 1984, 5 million tonnes of fertilizers, 55000 tonnes of pesticides, and 125000 tonnes of synthetic detergents were used in India (Gupta S. et al, 1983). On an average, 25% of all these can be anticipated to end up in the ocean every year. More or less of these substances are biodegradable while others are relentless. Their cumulative impact to the coastal environment, over a long period could be quite harmful (Sen Gupta S. et al, 1989). In seas, the coastal life faces threats in many ways, such as overexploitation and harvesting, deposit of waste, contamination, exotic species, dredging and global climate change. One of the major kinds of human impact constitutes a major threat to coastal life: the pollution by plastic debris (Douglas et al., 1987, Beatley, 1991; National Research Council, 1995; Irish and Norse, 1996; Ormond et al., 1997; Tickel, 1997; Snelgrove, 1999;

Jose Derraik G.B., 2002). Not only do degraded waters cause significant ecological damage, they also lead to economic impacts due to beach closures, curtailed recreational activities, and additional health care costs.

II. FACTORS CAUSING COASTAL POLLUTION

2.1 Beach Abrasion

The activity of coastline regression from its prior position is known as abrasion or coastal erosion. Blowing of wind across the water, which produces strong waves, such as ocean waves, induce this abrasion. Continuously occurring large sea waves create a large amount the abrasion process. Abrasion not only reduces the distance between the water and the land, narrowing coastal areas, but it also displaces coastal fish gathering, making it harder for fishermen to fish by the sea.

2.2 Beach Reclamation

Coastal areas near reclamation sinking are led by un-well-planned of sea level rise. Furthermore, seawater can rise to the surface, contaminating and saline the groundwater. This is extremely harmful to coastal communities, particularly those who are involved in cultivation practice.

2.3 Coast Damage

Coastal pollution not only damage the biotic components of the coastal waters, but it also affects the health of individuals who come into contact with contaminated biota or waters at risk. Furthermore, pollution can reduce from the beauty of polluted coastal waterways.

2.4 Land Run Off

The process of surface run off from agricultural farm as well as urban run-off and run off from construction of roads, building, ports and channels can carry soil particles, nitrogen, phosphorus, and minerals. This nutrient rich water can cause obese, algae and phytoplankton in coastal areas known as algal blooms, which have the potential to create hypoxic conditions by using all available oxygen.

2.5 Sewage and Effluents

It is fact that the raw sewage being dumped into the sea and it happens on a regular basis. The waterbodies are so vast and can break down this pleasant liquid, but it still causes many adverse effects on coastal life. Sewage or polluting substances flow through sewage, rivers, or drainages directly into the sea. The release of this substance to the coastal ecosystem leads to reduction in oxygen levels, the decay of plant life, a severe decline in the quality of the sea water itself. As a result, all levels of aquatic life, plants and animals, are highly affected. Domestic sewage and industrial effluents are released in the water courses in and around India in untreated or partially treated form. These, of course, add a mixture of pollutants which include, among others, certain toxic heavy metals and metalloids. The total volume of all discharges from the environs of Bombay is around 365 million tonnes (MT) per year (Sabnis, 1984). Similar discharges from the environs of Calcutta are around 350MT every year (Ghose et.al., 1973).

2.6 Plastic Debris

The plastic is the only substance that is illegal to dump anywhere in the coastal region. It is primarily synthetic organic polymers derived from petroleum. The plastic materials are found to be the major macroscopic pollutants in many published reports about plastic debris found throughout the world. (Colton et al.,1974; Raynor, 1978; Shiber, 1979; Ryan, 1988; Shaw and Day, 1994; Golberg, 1995; Gregory, 1996; McDermid and McMullen, 2004; Moore et al.,2001, 2002; Barnes, 2005; Guillet, 1997; Henderson,2001; Ericksson and Burton, 2003; Otley and Ingham,2003). The variety of these materials has led to a large increment in their use over the past three decades, and they have rapidly moved into all facets of daily life (Hansen, 1990; Laist, 1987). Plastics are lightweight, strong, durable and cheap (Laist, 1987), characteristics that make them suitable for the manufacture of a very wide range of products. Plastic additives are known to disrupt the endocrine system, when consumed, it can suppress marine system, and decrease reproduction rates. Besides DDT, pesticides, furans, dioxins, phenols, and radioactive waste. Heavy metals such as mercury, lead,

nickel, arsenic, and cadmium, can accumulate in the tissues of many species in a bio accumulation process. These same properties happen to be the reasons why plastics are hell risk to the surroundings (Pruter, 1987; Laist, 1987).

2.7 Oil Spills

Oil spills create devastating effects being highly toxic to coastal life. Traditionally shipping is considered to be “a polluting industry” (Gennaro, 2004). Sea is polluted by oil on a daily basis from oil spills, routine shipping, runoffs and dumping. Discharge of cargo residues from bulk carriers can pollute ports, water ways, and sea in many instances vessels intentionally, discharge illegal waste, despite foreign and domestic regulation prohibiting such actions. Oil spills cause a much-localized problem but can be detrimental to local coastal wildlife such as fish, birds and sea others. Oil cannot dissolve in water and forms a thick sludge in the water. This suffocates fish, gets caught in the feathers of marine birds stopping them from flying and blocks light to photosynthetic aquatic plants (Dicks B, 1998). Ships also cause noise pollution that disturb aquatic wild life. An incident on March 24, 1989, the Tanker Vessel Exxon Valdez ran aground 25 miles out of Valdez, Alaska. The impact tore open eight of the ship’s eleven cargo tanks, spewing out 10.8 million gallons of oil into Prince William Sound. Oil impacted hundreds of miles of pristine shoreline, inundating national forest and national park wilderness parcels. The spill wreaked havoc among sensitive coastal ecosystems, killing tens-of-thousands of waterfowl and other wildlife. The affected shoreline also contained significant archaeological treasures (Kurtz, 1995).

2.8 Pollution of Inorganic Waste

Pollution from household garbage, particularly inorganic waste such as plastic bottles and cans, which are difficult to degrade, is one source of pollution in coastal habitats. It can be seen in the highly populated coastal region. For example, one plastic bottle, takes 450 years to break. Chemicals in each component could have a negative impact on the environment. The coastal ecosystem's long-term viability is clearly threatened as a result of this. We can't say that organic waste is safer than inorganic waste.

2.9 Over-Exploitation of Natural Resources

The activities related to sand mining and overfishing are the major examples of coastal exploitation. To catch an abundance of fish, many fishermen employ non-environmentally friendly fishing equipment. Due to excessive collection of sea sand and other resources, the depth of shallow water increases, as a result the coastal waves rush to the shore with great force.

2.10 Atmospheric Pollution

Dust, debris, plastic bags and others material are blown by wind flow to sea ward from landfills and other area raising levels of carbon dioxide in the atmosphere, are acidifying the sea, the aquatic ecosystem and modify fish distribution.

2.11 Non-Point Source

National Oceanic and Atmospheric Administration (NOAA) stated that 80% of pollution to the coastal environment comes from the land. Non-point source pollution is one of the biggest sources, which occurs as a result of runoff. The source of this pollution includes like- septic tanks, cars, trucks, and boats, plus larger sources, such as farms, ranches, and forest areas. Millions of motor vehicle engines drop small amounts of oil each day onto roads and parking lots. Much of this, too, makes its way to the sea. Non-point source pollution can make river and ocean water unsafe for humans and wildlife.

III. OBJECTIVES OF STUDY

1. To identify the factors responsible for causing coastal pollution
2. To estimate the effect and impact due to coastal pollution to coastal environment.
3. To study the Digha-Shankarpur coastal region and Haldia Industrial Region and its impact on coastal environment.
4. To suggest policy measures to prevent coastal pollution and to create sustainable marine environment

IV. DIGHA-SHANKARPUR COASTAL REGION

Digha- Shankarpur Coastal area lies in the southwest corner of the Purba Medinipur district of West Bengal. This area locates in the coastal tract of adjoining Bay of Bengal and border of West Bengal and Orissa. It is the most popular tourist spot of Purba Medinipur coastal belt. It is physically characterised by sand dunes, beaches, longshore currents, and low vegetation coverage. The extents of the study area is between latitudes 21°36'50" N and 21°30'00"N and longitudes 87°29'40" E and 87°37'00"E. The width of the area is 2.5 to 3.0 Km from the low tide level and length is 14 Km from the Orissa border to the Jaldha Mouza. The Digha planning area comprises of 42 mouzas under Kanthi sub-division of which 17 mouzas are in Ramnagar Police Station and 25mouzas are in Digha Police Station. Total area of this planning area is 8752.63 Acres. Digha and Shankarpur are two popular sea resorts known for their stunning beaches, scenic views, and relaxing atmosphere. These two enchanting sea resorts in West Bengal, India, boast breathtaking natural beauty that mesmerizes visitors. Digha's 7-kilometer-long beach, with its golden sand and crystal-clear waters, offers a perfect setting for sunbathing, swimming, and water sports. The surroundings of Digha are also stuffed with attractive spots like New Digha Beach, Old Digha Beach, Digha Mohana (estuary), Oceania Beach, Udaypur Beach, Talsari Beach, Dheusagar, Marine Aquarium, Science City and National Museum, Amrabati Park, Chandaneswar Temple, Digha Gate etc. Shankarpur, on the other hand, is a serene and secluded haven, with its 14-kilometer-long beach lined with casuarina trees and mangrove forests. The delta region's confluence of rivers and sea creates a unique landscape, with breathtaking views of the sunset. As the waves gently lap against the shore, the tranquil atmosphere and soothing sea breeze make these resorts an ideal getaway from the chaos of city life. Apart from the long, tree-lined beach, the main attraction is the Shankarpur Fishing Harbour Project. With their pristine beaches, scenic views, and relaxed ambiance, Digha and Shankarpur are perfect destinations for those seeking a peaceful retreat amidst nature's splendor.

In Digha-Shankarpur coastal region, due to rapidly increasing tourist flow from 1990s and recurrence flow of tourists almost throughout the year and from 2000 onwards, a huge number of hotels along with recreational activities has been developed. The coastal resorts are grappling with alarming levels of pollution, threatening the very essence of their natural beauty. Throwing of food waste and committing nuisance and burning of solid waste are the main causes for the pollution in the beach areas. The once-pristine beaches are now littered with plastic waste, discarded fishing nets, and sewage effluents, harming marine life and posing health risks to tourists and locals alike (Verma et al., 2016). At sea beach, the crabs are seen as dead by trampling of human being. Apart from the pedestrian density, beach is polluted by the excreta of horse, of-road vehicle movement, outer shells of green coconut, waste of food stall close to beaches. The officials of MARC say "Earlier there were many birds in this forest, but now they are not found at all; it has converted into area for picnicking, garbage, plastic burnt etc.". The lack of effective waste management infrastructure and inadequate sewage treatment facilities exacerbate the issue, leading to contaminated seawater and coastal erosion. Mangrove forests, crucial for shoreline stability, are also vulnerable to destruction due to encroachment and pollution.

V. HALDIA INDUSTRIAL REGION

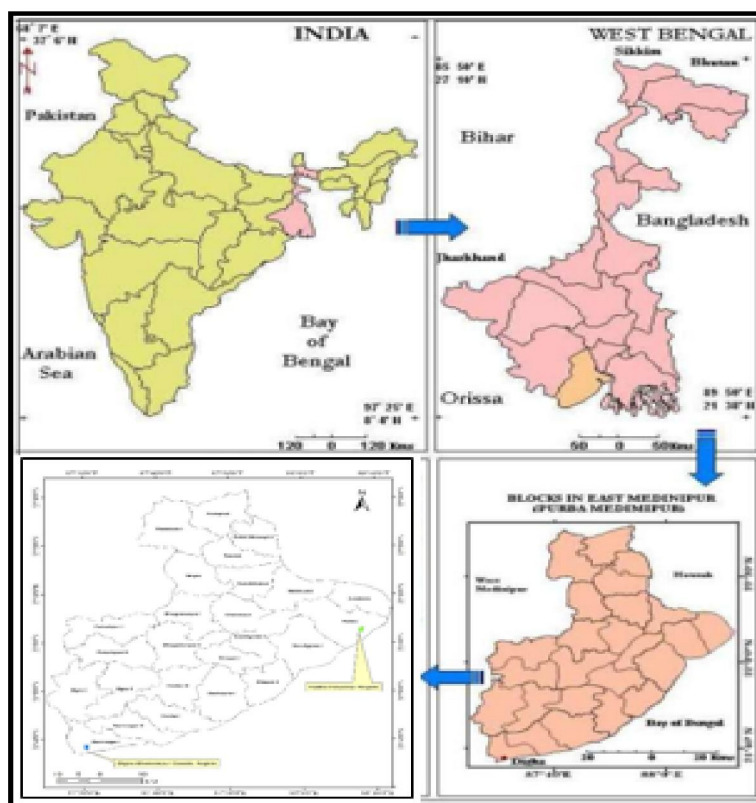
The Haldia Industrial Region, located in Purba Medinipur district, West Bengal, India, is a major industrial hub and a key driver of the state's economy. It is situated approximately 125 km south west of Kolkata, near the confluence of the Hooghly and Haldi rivers. The geographical extension of this region is from 22°03'52.98" N to 22°08'35.76" N latitude, and 88°07'53.15" E to 88°09'03.61" E longitude. It is one of the fastest growing industrial towns of West Bengal emerged as a municipality in 9th June, 1997 with the 29 wards and the areal coverage is 109.89 sq.km of this industrial town.

Haldia has been rapidly emerging as an industrial town of West Bengal and setting up of Haldia Dock Complex as a subsidiary trade port for Kolkata. This industrial complex is basically port based. In present, there are about 388 industrial units with an estimated investment of approx. Rs. 108 billion where 45000 peoples are directly employed and nearly its double are indirectly employed. The industrial town has several factories including Chemical Industry that comprises the companies that produce industrial chemicals, the Petroleum Industry is involved in the global processes of exploration, extraction, refining, transporting and marketing petroleum products, Almost 4% of India's production of petroleum products and 13% of India's polymer production are found in Petrochemical and Downstream Industries, Food-processing Industry that supply of fruit and vegetables and cheaper labour source allow the state a competitive

edge in food processing industry, Edible Oil Industry where a huge quantity of crude edible oil imported from South East Asia and in same way the finished products can be sent into the large world market, Bio-diesel Industry that can be made from both virgin or used vegetable oils (edible and non-edible) and also from animal fats, IT and IT-enabled Industries have adopted several measures to spread the IT infrastructure right across the state, Ship-building Industry that purchased the land from HDA to build shipyards in Kukrahati (Haldia) along the river Hooghly for large and small ships respectively, In Haldia along with other industries Automobile Manufacturing Plant is also found, the Logistic Hub is one of the several major public private partnership (PPP) projects being implemented by Haldia Development Authority (HDA) and Karnataka based Shree Renuka Sugar Ltd. has set up as refinery plant. During 1991 to 2004 about Rs. 10,000/- crore was invested in Haldia industrial complex, which accounted for 36 per cent of total investment in West Bengal. It is found that, within two decades Haldia has transformed from an important port city to the most coveted industrial destination in eastern India as well as gateway to south East Asia.

Behind the significant growth of Haldia Industrial Region in West Bengal has had a number of impacts on the coastal environment, including the high levels of pollution, with pollutants coming from oil refineries, petrochemical units, from ships and other industries i.e., affect air, soil and water quality. The pollutants can also come from residential and automobile emissions, as well as from dry open land. Rapid urbanization and industrialization have led to land use changes, such as the conversion of natural areas to built-up or cropped areas. The shallow groundwater aquifers in the area are susceptible to saltwater encroachment due to over-extraction of groundwater. The coastal plain in the area is susceptible to flooding during heavy rains and cyclonic storm surges.

VI. LOCATION MAP OF STUDY AREA



VII. RECOMMENDED APPROACHES

Despite the stunning natural beauty, one of the famous tourist destination of coastal resort in W.B., Digha-Shankarpur coastline as well as the West Bengal's economy, offering opportunities, employment, and pillar of economic development, Haldia Industrial region are facing now an environmental crisis, necessitating urgent attention from

authorities, locals, and tourists to adopt sustainable practices, invest in waste management infrastructure, and promote eco-tourism to preserve the region's ecological integrity. To set up appropriate measures to protect the sensitive coastal ecosystems, some attempts are given below.

1. Strictly follow the government rule and regulation in order to use of high technology for treating effluents and sewerage from household, commercial establishments, and industries. And practice responsible coastal management.
2. Need to regulate and prevent uncontrolled increase in motorized and mechanized boat fleet which cause discharge of waste and hydrocarbon, into the sea.
3. To prevent deep sea mining and protect the sea floor, and save the flora and fauna of the marine organisms.
4. Planned properly to the residential zone rather than concentration in a particular region.
5. To prohibit the testing of Radioactive tests in the ocean waters, as these cause hazard to coral reefs, and continental shelf.
6. Need to create awareness to public, by information by educating them to safeguard the environment, prevent global warming, and adopt sustainable fishing and harbour activities.
7. Planned to reduce the human population, and ensuring livelihood to communities which depend upon coastal occupations for their living.
8. Different natural and artificial measures for ground water recharge should be taken.
9. Need awareness to locals about the problems of the industry-urban expansion and feel importance of preserving coastal environmental resource.
10. Plantation programme and existing forest protection schemes should be developed to restore ecological imbalance.

VIII. CONCLUSION

Haldia Industrial Region and Digha-Shankarpur region are situated in a sensitive coastal environment in the district of Purba Medinipur. The continuous modifications of landscape due to the un-planned growth are increasing the risk and vulnerability of the area day by day. The study has brought out the factors that are responsible for coastal pollution and has highlighted the effects. Although, it explains the geographical layout, it highlights the pressure of population, dependence of coastal communities, rigorous condition of ports, the poor infrastructure, bad planning by the state in maintaining and preventing damage and how polluted water reaches the sea. This study emphasizes awareness, decision-making process involving public and private participation of local people, professionals, legal experts, planners and together lead to preserving and protection of precious coastal resources and moreover form a sustainable coastal environment.

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