Environmental Degradation in Indian Ocean:
The Dilemma of Marine Pollution in Pakistan Coastline

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Abstract

Indian Ocean is the third largest ocean in the world spanning over an area of 73,556,000 Square. kilometers, that covers three continents, Africa, Asia, and Australia. Pakistan is an emerging strategic and geopolitical significant state of the South Asia; it has 1046 kilometers of coastline across the Arabian Sea, a region of Northern Indian Ocean. The country's largest province 'Baluchistan' possesses 800 kilometers of coastline, whereas remaining 246 kilometers is in 'Sindh' province. The level of marine pollution is extremely high in Karachi, an economic hub and populous port city of the Sindh. The Karachi Port harbour area is full of toxic pollutants until they are evaporated or settle down at the bottom. The objective of this paper is to highlight the dilemma of marine pollution in Pakistan's coastline especially in the port city of Karachi. The study is aimed to provide remedial measures to preserve endanger rare marine species of Pakistan's territorial waters. The paper will also provide an empirical and theoretical overview of coastal governance in Pakistan.

Keywords: Indian Ocean; Pakistan Coastline; Sindh; Karachi Port Trust; Marine Pollution.

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1. Introduction

The protection of the marine environment is one of the most important ecological issues of the century. In past few decades it became an important aspect of international negotiations on environmental security. The industrialization in 20th century played an important part in air and marine pollution. Some basic sources of marine pollution are ocean dumping, offshore oil and gas installations, industrial wastage and wastage from our emerging number of ship liners. Marine pollution effect animals ingest, the chemicals are later eaten by large animals, which then affects the whole food chain. The long-term effect on marine life can include cancer, failure in the reproductive system, behavioral changes, and even death.

The marine pollution in Arabian Sea especially in Karachi coast has become a severe hazard for the human life, marine environment and vessels. The governments on all administrative levels failed to respond on the emerging aspect of environmental security and no systematic work ever done by administrative side till to date. There isn't any explicit strategy for sewage treatment and dumping harmful wastes in the ocean. Although there are various laws to address this issue but these laws were never enforced sternly. In other factors, Lack of resources and proficiency are the major causes behind the marine pollution in Pakistan. The industry does not have waste treatment facilities. Additionally, lack of solid waste management and sanitation system became a reason behind the pollution of the harbour waters. It is important that measures should be taken for the awareness of community regarding their role in the protection of environment. Through awareness complain the authorities could reduce the dumping of waste in bays and Nullahs (ducts).

2. Research Methodology

The paper is aligned with the concept to investigate challenges of marine pollution in Pakistani coastline. This argument based, strategic policy research employs a qualitative research methodology (Creswell, 2009; Barbour, 1998). Fresh insights are presented through a combination of analytical efforts that are primarily reflexive in nature (O'Reilly, 2009). Keeping in view the type and nature of study, both qualitative and analytical techniques

have been utilized. Moreover, authentic books, monographs, journals, newspapers and online resources are utilized to produce a quality paper for the readers. The reason for seeking to combine methods may be to compensate for each other's' shortcomings (Barbour, 1998). They also present a concise, but useful, list of the advantages and limitations of each method, a handful of references for additional reading and a tutorial exercise asking readers to apply what they have learned (Rice, 1999).

3. Analysis & Discussion

3.1 Marine Pollution from Domestic Sources

The domestic and industrial wastes play vital role in polluting sea water. The problem of pollution increased considerable due to the indiscriminate discharge of effluent from industrial and agricultural sources and disposal of untreated liquid and solid wastes generated from domestic sources into the sea (Sayied, 2007). According to the authorities, Karachi produces 500 million-gallons per day of contaminated water being discharged into the sea directly, through public sewers, nallahs, streams and rivers. Around one fifth of waste generated by the industries, while rest is the municipal sewage. Currently only one treatment plant in the Korangi industrial state is functional with a capacity of treating 26 million gallons of industrial waste. Although there are two other waste treatment plants each were set up in Mahmoodabad and SITE to effect primary and secondary treatment facility but government failed to make them functional.

Karachi produces approximately 13,000 tons of solid waste every day which mostly ends up in Karachi harbour. There are no designated landfill sites in the city, therefore the solid waste dumped into ocean or rain water streams which ultimately washed into sea after monsoon floods. The rapid increase in inhabitants of coastal city, it producing constant pressure and challenge to the environmental protection. The lack of sewer treatment plants, the solid waste disposal, and unprocessed wastewater through rivers have an unpleasant effect on coastal waters.

3.2 Contamination from Industrial Sources

Karachi is among the biggest industrial city and economic hub of Pakistan. It has almost 6000 small and large industrial units

which produces a huge amount of industrial waste every day. Although small industries are part of almost every zone of Karachi but there are three basic industrial zones which contains large industries. These zones include Sindh Industrial Trading Estate (SITE) in the North, The Landhi Industrial Trading Estate (LITE) in the East and the Korangi Industrial Area (KIA) in the South (Sayied, 2007). The industries established in LITE and SITE generates a huge amount of toxic waste and is discharged directly into Layari River which eventually ended in Arabian Sea through Karachi harbour. On the other hand, untreated toxic waste produced from KIA is discharged into the Malir River which then pollute Korangi Creek and ultimately ended inside the Indus Delta. Experts believe that everyday almost 2000 tons of untreated Biochemical Oxygen Demand (BOD) of domestic & industrial wastes is discarded into the shoreline of Karachi. Furthermore, it is estimated that two rivers of Karachi city, Lyari and Malir Rivers, are over polluted by nickel produced by industry toxic which is extremely harmful for population living along with the river banks. The characteristic smell of hydrogen sulphide in parts of the city is a sign of the intense bacterial activity from the presence of organic wastes (Biodiversity Action Plan, 2000).

3.3 Contamination from Solid Waste

The Karachi Municipal Corporation (KMC) is an institutional body which collects solid waste from city. The city has two landfill sites, each with an area of 500 acres and a combined capacity to absorb 2000 tons of waste per day for 20 years (Sayied, 2007). However, there are so many undesignated dumping places emerged which KMC is endeavouring to prevent. There are very few incinerators are established which are not good enough to treat huge amount of solid waste. Most of these incinerator works on solid wastes produced by hospitals. Another big concern is that although there is an institution for garbage collection but unfortunately due to lack of sources and lack of interest from the provincial and local administrations KMC fails to collect garbage on daily basis. The non-collection of garbage or solid waste produces harmful diseases and health issues in effected districts and surrounding areas. Wastes are scavenged and burned, exposing scavengers to health hazards, adding to the already severe problem

of air pollution and creating opportunities for pests to breed and to spread diseases (Sayied, 2007). Some of the Multinational Companies (MNCs) have contracts with private garbage collection companies who dump the garbage in Sea or river banks because these private companies won't have any contract with KMC to dump the waste on designated sites.

3.4 Oil Pollution

Sources of oil pollution in Pakistan include effluent discharges, mechanized fishing boats and the cleaning of bilged and tank washing by the large number of merchant vessels as well as oil tankers that passes through the Exclusive Economic Zones (EEZ) of Pakistan (Sayied, 2007). According to one estimate every year more than 2500 oil tankers visit Karachi port which carries approximately 34 million tons of crude oil to fulfil the domestic needs. Although there are regulations placed by the KPT to keep the effects of pollution at minimum but implementations of these laws are not practically enforced. The vessels berthed alongside Karachi port often exonerate oil and sloppy waste within the harbour.

3.5 Tasman Spirit Oil Spill Disaster

On July 28, 2003 a Greek oil tanker named Tasman Spirit collided into rocks at the break water of Karachi port. As result, around 35000 tons of crude oil spilled in Arabian Sea. Fumes from the volatile organic compounds and mist containing hydrocarbons, accompanied by a strong smell, dispersed into the residential area of the city (ENS April 4, 2006). People living near to the harbour evacuated and the picnic area of Clifton beach was almost ecologically destroyed. The worst oil spill in Pakistan's history affects the city socially and economically. Schools restaurants and business centres within the 15 kilometres of radius were closed for weeks. The property went down on the lowest of past ten years. Furthermore, residents of Karachi lost the famous picnic point which converted into worst spot. On health grounds, hospitals reported severe cases of dizziness, nausea, headache and sore throat in surrounding areas.

On the other hand, the oily beaches were telling the story of disturbing effects of oil pollution on marine life. The shore was full of dead fishes and sea turtle as it was breading season. On larger scale it directly affected the sea food industry; nearly 80,000 fishermen were affected because of sharp decline of seafood prices which catastrophically came down up to 70%. Owing to the low off-take, traders at fish harbour had to curtail bulk procurement which forced fishermen to fish in the coastal areas of Thatta and Badin rather than in the affected zone, and also to dispose of their catch at whatever rate offered (Janjua et.al 2006). Till date the effects of Tasman spirit oil spill can be seen on waters of the Port of Karachi. The Karachi harbour was famous for its lively marine life and different species of fish, especially, dolphins which were seen inside transparent waters of Karachi harbour before the Tasman oil spill and now it's part of history for the residents of Karachi.

4. Causes of Marine Pollution in Karachi Harbour

Karachi is the capital city of Sindh province which is also the largest and most populist city of Pakistan. The city of Karachi is famously known for its port and vast industrial units which plays an important part in revenue generation and advancement of the country. Most of the exports and imports have been done through the Karachi port and Karachi harbour played key role in development of country according to the needs of modernization. Besides its significant role the Karachi is also known for its polluted shores. It is most contaminated coast of Pakistan. The obvious reasons behind the maritime pollution in Karachi harbour are population and industry. But there are some focal areas which are known as the disposal points of solid and industrial wastes and these points are the key factors behind the pollution of marine environment of Karachi and Pakistan.

4.1 Port Qasim Area

Port Qasim is an important harbour located in the South of Karachi near to the Indus Delta. The Port Qasim is the key source behind the pollution in Indus delta. The major source of pollution is from the shipping activities inside the port, the wastewater from Pakistan Steel Mill and Power Generation Plants (Sayied, 2007).

4.2 Korangi Industrial Area (KIA)

The Korangi Industrial area is located in south east of Karachi city and is known for multiple industries which include pharmaceutical, chemical cottage, textile, auto engineering industries as well as oil refineries and power plants which directly discharge its waste into the Korangi creek waters. The number of industries mentioned above contains highly toxic waste which is harmful for marine life and human population living near to the creek waters.

4.3 Malir River and Gizri Creek Areas

The Malir River is situated in south east of Karachi city. The river is polluted from domestic sewage, industrial effluent and wastes from Landhi cattle colony. Ultimately, the untreated wastes from Malir River then drain into sea through various creeks and eventually contaminate the coastal waters.

4.4 Lyari River and Sindh Industrial Trading Estate (SITE)

Lyari River is the only river who passes through from the Karachi city. The Lyari River plays vital role as Drainage River throughout the monsoon season. Because it passes through most populist districts of Karachi city, therefore it contains sewage wastes from populist districts around it and industrial wastes from thousands of industries located near to it in SITE area. Only the small portion of it was treated but nearly 75% of the polluted water is polluted and ultimately dumped into the Karachi harbour and pollutes the Marine life. Besides sea pollution it also causes the infection, diseases and life-threatening pelages such as Malaria, Dengue, Chicken Goiania and many others which are extremely harmful for the human population living in surrounding areas.

4.5 Hub Industrial Trading Estate (HITE) and HUBCO

Hub Industrial Trading Estate (HITE) is situated at the boarder of Sindh and Baluchistan province. It is an emerging industrial zone and as a part of China Pakistan Economic Corridor (CPEC) this area is developing rapidly. The industrial waste produced from HITE is drained into the Hub River which finally ends in the

Arabian Sea and contaminates the shoreline. Similarly, HUBCO power plant which is also located in Baluchistan-Sindh boarder area near to the hub city is also produce considerable amount of untreated effluent and ultimately it drained into the sea through the Hub River. The development of industrial city and power plant make population grew in neighboring areas but un-treated waste not only contaminate the drinking water but also produce health issues in human population living near to the Hub river as well as Gadani Ship breaking industry which is also situated near to the area where hub river ends into the Arabian Sea.

5. Findings and Results

5.1 Harbour Pollution

A tremendous amount of solid and liquid waste from Karachi city dumps into the harbour and its surrounding premises which plays disastrous role in jeopardizing the Marine Environment and the Marine Ecosystem. The industrial waste matter contains chemicals which become fundamental reason behind the deprivation of hull and apparatus of vessels in dock due to their deterioration effects. Furthermore, the solid wastes such as garbage and plastic bags pose technical hitches in operations in harbour and are aesthetically unpleasant. The polythene bags also play adverse role in choking the cooling water intake of operational ships. Because of polythene the vassal suffers relentless damages which results in their prolonged unavailability to attend the ship's berthing/un-berthing. The delaying ships movement affects other ships and cumulatively tantamount to great economical loss to the Nation (Survey Report, 2009).

5.2 Destruction of Marine Habitats/ Wetlands

The unsympathetic impact of the contaminants has endangered the marine ecology. The highly toxicities effluent from the untreated industrial plants and the oxygen malnourishment originated by the raw sewage has radically overwrought the maritime life. The toxic pollutants have not only adversely affected the marine life but have also destroyed the marine habitats and the wetland, making them unsuitable for their normal role in the ecosystems (Survey Reports, 2009).

5.3 Human Health Hazards

All regional and international scientific societies and forums have consensus that pollution in any form is hazardous to human health. It generates miscellaneous nature of infections both directly and indirectly. According to one study based on lead contaminated marine life concluded that seafood infected with laid leads to anaemia, kidney failure, and brain damage. Moreover, the pollutants pose serious health hazard to those who are involved in activities such as swimming or diving. The beach visitors are also exposed to same hazards (Douglass, 2006).

5.4 Destruction of Mangrove Forests

The contaminated seawater from Karachi city carried by summer currents eastward into the mangrove forests of the Indus Delta. Karachi is situated near to the Indus Delta and most of the creeks which are located on the south east of Karachi city plays vital role in polluting it. The Mangrove forests have been known for its significance to minimize sea water effects on delta areas. But due to the constant and tremendous discharge of chemicals and sewage waters, the Mangrove forests have been destroyed. Although, efforts have been made to plant new forests on constant basis but due to toxic waters the efforts are partially succeeded.

5.5 Effects on Fisheries

Pakistan has a small industry of fisheries which contributes a considerable role in economy. But toxic waters of our shoreline are destroying this industry as toxins ingested by fish are being brought into the food chain causing health problems and occasional rejection of our fish exports by foreign importers. Due to degradation of the ecosystem, un-sustainable exploitation of marine resources, a number of fish species have either vanished or their production hampered (Latif, 2005).

5.6 Maritime and Naval Assets

The Navy has a significant role in today's security-oriented environment. The Pakistan Navy (PN) has most of its establishment at Karachi harbour. Most of the PN warships and

submarines are berthed in PIDC channel, Karachi. The polluted waters of harbour minimize the life of naval assets. The PN fleet units berthed at Karachi Harbour make use of sea water for cooling of various equipment/machinery, which frequently malfunction/fail due to presence of floating debris/plastic bags and toxic elements, thus affecting the efficiency and performance of these systems significantly. Such critical failures result in extensive maintenance/ frequent repair work, reduction in equipment/machinery life, increased down time and compromise on operational availability of combatant units (Latif, 2005).

6. Recommendations

1. Complete or partial ban on use of polythene bags, single used plastic utensils (i.e plastic bags, water bottles, straws, cups, utensils, dry cleaning bags, take-out containers), and any other plastic items that are used once and then discarded.
2. Recycling of once used plastic items will be a source of elimination of environmental pollution as well as will provide new recycled utensils for daily use.
3. Civil society as well as NGO / INGOs are to advised to conduct regular campaigns for cleanup of coastal belts especially picnic and visiting points. This is the most effective way of fighting against oceanic plastic pollution.
4. Seminars and conferences on domestic / national level should be organized to extend common awareness among the masses regarding causes and effects of all types of pollution, counter measures and strategies.
5. National legislation on the issue of air, water and soil pollution is the dire need of the day. Effective and well in-time strategies to regularize industrial waste and other polluting elements is considered mandatory.

7. Conclusion

In short, the study shows that sources of marine pollution are based on industrial and solid wastes from populist city of Karachi. That’s way the international and local environmental

INGOs and NGOs clearly indicating that the coastal waters of Karachi harbour are most polluted in shoreline of Pakistan. The authorities need to put up efforts especially the sewage and industrial treatment plants are the necessity of the time and in case of negligence the destructive effects of the untreated waste would become more visible on humans as well as marine life near to the Karachi harbour.

As a matter of fact, the development has positive effects on setting the high standards of human life but without treated waste it will introduce the hazard to nature and human population. It would certainly destroy the natural beauty of famous Baluchistan beaches. Therefore, it is the dire need of the day to development common awareness for environment preservation and all necessary actions should be taken to secure the environmental security for the betterment of our future generation and indigenous spices of our enrich coastal waters.

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