“A Study on Marine Pollution with special reference to Oil Spillage of 2017 at Ennore”

A dissertation submitted to the School of Maritime Management,

Indian Maritime University in the partial fulfillment of

Master of Business Administration
in
Port and Shipping Management

By

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UNDER THE SUPERVISION AND GUIDANCE

OF

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INDIAN MARITIME UNIVERSITY

(A Central University under the Ministry of Ports, Shipping and Waterways)

CHENNAI CAMPUS

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SCHOOL OF MARITIME MANAGEMENT
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Certificate

This is to certify that the project report titled **"A Study on Marine Pollution with special reference to Oil Spillage of 2017 at Ennore"** is a bonafide work done by **SUDEV V S (Reg.No:- 2103304022)** in partial fulfilment of the requirement for the award of the degree of Master of Business Administration in Indian Maritime University, Chennai.

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External Viva- voce examination conducted on: -

External Examiner: -

Place : Chennai

Date : 16./. 5../2023

DECLARATION

I, **SUDEV V S,** do hereby declare that the dissertation entitled **"A Study on Marine Pollution with special reference to Oil Spillage of 2017 at Ennore** "is exclusively a bonafidework done by me under the supervision and guidance of **Dr. Emil Mathew**, Assistant Professor, School of Maritime Management and is submitted to Indian Maritime University inpartial fulfilment of the requirement for the award of the degree of Master of Business Administration.

I further declare that no part of this report has been previously submitted to any other university or academic body for the award of any degree or diploma.

Place: Chennai
Date :...../...../2023

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Maritime shipping is one of the important modes of transport carrying over 80% of world trade by volume and 80% of its value (UNCTAD, 2022). The ports function as gateways for global supply chains and stimulate economic growth globally. Although worldwide the shipping sector is considered as one of the least harmful transportations methods from an environmental perspective, it still possesses high risks due to the magnitude of shipping and port activities. Which requires it to meet on its potential role in sustainable development conditions.

Ports and shipping have a significant impact on ocean and coastal development in addition to having various other direct and indirect effects. The effects of port development and extension on coastal habitats and biodiversity could be widespread. However, there are possible negative consequences including oil pollution, air emissions, and the transmission of hazardous aquatic organisms through ballast water. Many anthropogenic challenges, such as climate change, habitat degradation, loss, and invasive species, are brought on by these negative effects and threaten the coastal and marine ecosystems.

Construction, expansion, operation, and other port-related operations are explored in depth for any potential effects on the environment. Despite various assessments, the consequences brought on by the maritime industry are growing, whether on purpose or by accident, which not only causes significant harm to the coastal ecology but also has an impact on nearby economic activity. The idea of sustainable port development aims to address and resolve problems with port construction and operation while simultaneously fostering societal growth and capacity-building in the immediate area surrounding the port. These plans frequently try to concurrently develop the port and the neighbourhood by attending to their individual requirements in a comprehensive manner.

According to the Brundtland Report, "Sustainable development is a development that meets the demand of the present without impairing the capacity of future generations to meet their own need." The idea of sustainable port development is now well-known. Sustainable development is the integration of three essential factors: economic, environmental, and social into all areas of decision-making.

The port structure is a complicated system with many internal and external actors who are port community stakeholders and who have goals and interests in the growth process. In order to achieve and implement the green port plan, which requires the cooperation of several participants including the community, ports cannot operate alone. Involvement of the stakeholders is highly necessary and crucial. The involvement of stakeholders during the planning process results in more thorough information inputs, which can improve the calibre of the environmental decisions. A broad understanding of the intricate and dynamic socio-ecological systems is made possible by the synthesis of scientific and local knowledge.

India, which has a 7500 km long coastline, has a large concentration of people who live close to the seaside. The ecology and sustainable development are seriously threatened by India's rapid industrialisation and globalisation transition. The Indian economy's rapid growth has severely damaged the marine environment by overusing and destroying its natural resources. Development of Ports is crucial for the economy. Ports handle around 90% of EXIM Cargo by volume and 70% by value. In order to meet the ever-increasing trade requirements, expansion of Port Capacity has been accorded the highest priority by the Ministry of Ports, Shipping and Waterways through implementation of well-conceived infrastructure development projects. The capacity of major ports which was 871.52 MTPA at the end of March 2014 has increased to 1534.91 MTPA by the end of March 2020. The Major Ports in the country have an installed capacity of 1534.91 MTPA as on March, 2020 and handled traffic of 704.92 MT during 2019-20. (Year End Review -2020: Ministry of Ports, Shipping and Waterways). India has 13 major ports including Chennai, Kochi, Ennore, Kolkata, Kandla, Mangalore, Mormugao, Mumbai Port Trust, Jawaharlal Nehru Port Trust, Paradip, Tuticorin, Visakhapatanam. Port Blair and 205 notified minor and intermediate ports. Two mega greenfield projects for major ports are under development at Vadhavan (Maharashtra), Paradip Outer Harbour (Odisha). (Sagarmala Official Website). The Non-major transhipment hub at Vizhinjam (Kerala) which is under construction is set to have high impact over the whole maritime transport in far east-Europe trade.

1.2 Background

1.2.1 IMO’s Initiation on Sustainability

The 2030 Agenda for United Nations Sustainable Development and its 17 Sustainable Development Goals (SDGs) were released by the International Maritime Organisation in

2015, and 193 nations ratified them. The SDGs are considered as a chance to change the world for the better and leave no one behind. This Agenda calls for action by all countries to eradicate poverty and achieve sustainable development by 2030 worldwide. Following SDGs are formulated to ensure cultivate the culture of sustainability in all activities related to shipping including port and port city development. 3rd SDG, Good Health and Well-Being is to ensure healthy lives and promote well-being for all at all ages. Beyond the current Emission Control Areas, this is anticipated to have a significant positive influence on the environment and human health, notably that of people living in port cities and coastal towns. 11th SDG, Sustainable Cities and Communities is to make cities and human settlements, safe, resilient a sustainable. It is to ensure that the linkages between ships, port cities, and their residents of them are secure, safe, and have a sustainable environment.

1.2.2 Blue Economy Policy of India

The World Bank estimates that India's total growth will be 6.9% for the entire year, with real GDP increasing 7.7% year over year during the first three quarters of fiscal year 2022/23 (Press Release, World Bank - Indian Economy Continues to Show Resilience Amid Global Uncertainties, April 4,2023) and 77% of the value and 95% of the volume of India's trade is transported by sea transport. The National Policy on Blue Economy for the nation is being finalised by the Ministry of Earth Sciences. On India's Blue Economy, a new policy framework has been created. The draught Blue Economy policy framework envisions the best possible utilisation of all maritime domain sectors, including tourism, ocean energy, living and non-living resources, and others, for the sustainable development of coastal areas. The National Accounting Framework for Blue Economy and Ocean Governance, Coastal Marine Spatial Planning and Tourism Priority, Marine Fisheries, Aquaculture, and Fish Processing are among the major suggestions in this policy document. Manufacturing, emerging industries, trade, technology, services, and skill development, logistics, infrastructure, and shipping, coastal and deep-sea mining, offshore energy security, strategic dimensions, and global engagement. It has proposed a Sustainable framework for a National Coastal Marine under which to make modifications to fulfil the demands of both the local and national levels, an expert group has been constituted. The CMSP (Coastal and Marine Spatial Planning) will act as the cornerstone for the development of the Blue Economy in India's Exclusive Economic Zones, which include the nation's islands, as well as for the advancement of ecotourism and the growth of Blue Flag beaches. A robust national marine

litter policy will also address the growing problem of marine pollution, particularly that caused by plastics and microplastics. The National Coastal Mission, put out by the Ministry of Environment, Forests, and Climate Change, will incorporate the Blue Economy initiatives. The Sustainable Development Goal (SDG) 14 will also be implemented as part of the Blue Economy Policy. (IBEF June 30,2022)

1.2.3 Coastal Community Development

Around 170 million out of 1.4 billion population of India leaves on the coastal area (Climate change, displacement, and managed retreat in coastal India). Many communities' development programme has been accepted by the Indian government as one of its main goals in order to ensure the socioeconomic security of these people. Infrastructure, poverty reduction, per capita income, and the socioeconomic status of the various coastal states in India vary, and some fishing communities are also underdeveloped and lack some basic amenities. Therefore, it is essential for the holistic and long-term development of Indian ports and coastal towns (Ministry of Shipping, 2016). To ensure the sustainable development of the coast, it is crucial to assess the environmental and socioeconomic effects of the Sagarmala-related projects. According to (Central Marine Fisheries Research Institute, Kochi, 2010), there are 4 million fishermen worldwide, including 864,550 families, 61% of which fall into the BPL category (below the poverty line). According to (Central Marine Fisheries Research Institute, Kochi, 2010), there are 4 million fishermen worldwide, including 864,550 families, 61% of which fall into the BPL category (below the poverty line). As a result, they are highly dependent on the black market for money and susceptible to the effects of natural resource depletion (particularly small-scale fishers). To ensure that the fishing community's basic needs—such as access to energy, transportation, and healthcare—are met as well as to advance sustainable fisheries management, an integrated governance strategy is crucial. This program's Sagarmala Development Company (SDC) and Community Development Fund (CDF) will provide funding for the fishing community's different projects.

1.2.4 Green Port Initiatives of India

Given the significance of the environment for sustainable development, the Indian government has launched "Project Green Ports," which aims to transform some of the country's main ports into cleaner and greener ones. The "Swachh Bharat Abhiyaan" and

"Green Ports Initiatives" are the two components of this project, according to the Government of India (2016). Twelve activities are included in this project and will be carried out on a regular basis to achieve all the goals. These activities entail: establishing wastewater treatment plants, sewage plants, and garbage disposal plants; improving Oil Spill Response (OSR) facilities; controlling and forbidding waste disposal into the sea. securing necessary equipment for the monitoring of environmental pollution. procuring dust eliminating and suppressing system. establishing renewable energy production projects in the ports.

As part of a major commitment by the Ministry of Ports and Shipping to offer greener solutions, Union Minister of Ports, Shipping & Waterways and Ayush, Shri Sarbananda Sonowal, unveiled India's first National Centre of Excellence for Green Port & Shipping (NCoEGPS). The Union Minister made the declaration at the just-completed "INMARCO 2022" in Mumbai. The planned NCoEGPS's primary goal is to assist MoPSW in creating and maintaining a legislative and regulatory framework for a green alternative technologies road map for the Indian shipping industry's transition to carbon neutrality and CE principles. The NCoEGPS will concentrate on five main areas to meet this goal:

- Research, Regulation, and Policy
- Human resource development
- Key Partners and Strategic Partners in the Network
- Explore the work area, results, projects, and resources.
- Engage- Past events, upcoming events, dissemination

1.3 Legal Framework

1.3.1 International Convention for The Prevention of Pollution from Ships (MARPOL)

The principal international convention addressing the prevention of maritime environment contamination by ships from operational or accidental causes is The International Convention for the Prevention of Pollution from Ships (MARPOL). The IMO adopted the MARPOL Convention on November 2, 1973. In response to a string of tanker incidents in 1976–1977, the Protocol of 1978 was adopted. The 1978 MARPOL Protocol incorporated the parent Convention because the 1973 MARPOL Convention had not yet been effective. On October 2, 1983, the merged instrument went into effect. A new Annex VI was added to the Convention in 1997 and went into effect on May 19, 2005. This Protocol was approved to update the Convention. Through the years, MARPOL has undergone updates. The

Convention, which now has six technical Annexes, contains rules intended to prevent and minimise pollution by ships—both unintentional contamination and that from ordinary operations. Most Annexes have Special Areas with severe restrictions on operating discharges. The six annexures under MARPOL are

- Annex I Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983)
- Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983)
- Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992)
- Annex IV Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003)
- Annex V Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988)
- Annex VI Prevention of Air Pollution from Ships (entered into force 19 May 2005)

MARPOL Annex I – Prevention of Pollution by Oil

The International Maritime Organization (IMO) has implemented measures to ensure safe transportation of oil by sea, with operational and construction regulations introduced by the MARPOL convention playing a significant role. These regulations have resulted in the safe construction and operation of oil tankers, reducing the risk of oil spills in the event of accidents. For example, requirements such as segregated ballast tanks and double hulls for oil tankers have enhanced the protection of the marine environment. Additionally, MARPOL has introduced standards for allowable discharges of bilge water and oily waters from cargo tanks, using technologies such as oily water separators and oil discharge monitoring systems. These measures have contributed to a noticeable decrease in operational oil pollution in the seas, although compliance enforcement efforts can be further improved. Overall, the regulations introduced by IMO and MARPOL have been successful in reducing accidental oil pollution from oil tankers, and continuous efforts are needed to ensure compliance and further enhance the protection of the marine environment during the transportation of crude oil and oil products by sea. **Regulation 37 explains Shipboard oil pollution emergency plan**

1.3.2 The Merchant Shipping Act, 1958, India

The Merchant Shipping (Marine Pollution) Rules, 2010: These rules are issued under the authority of the Indian Merchant Shipping Act, 1958 and provide regulations for the prevention of marine pollution, including oil spillage. The rules mandate ships to have oil spill response plans, including arrangements for containment, clean-up, and disposal of spilled oil, and require port authorities to have emergency response plans in place. PART XIA of Merchant Shipping Act Titled Prevention and Containment of Pollution of The Sea by Oil provide guidelines to issue pollution prevention certificate to ships(356C.)

- **Section 342A**: This section deals with the power of the central government to make rules for the prevention of oil pollution from ships.
- **Section 343**: This section lays down the obligation of the master of the ship to report oil pollution incidents to the nearest authority.
- **Section 345**: This section requires every ship above a certain tonnage to carry a valid oil pollution prevention certificate.
- **Section 346**: This section provides for the detention and inspection of ships suspected of causing oil pollution.
- **Section 347**: This section deals with the liability of the shipowner for oil pollution damage.
- **Section 348**: This section provides for the establishment of a fund to compensate for oil pollution damage.
  (*MERCHANT SHIPPING ACT, 1958*, n.d.)

1.3.3 National Oil Spill Disaster Contingency Plan, Directorate of Fisheries & Environment Coast Guard

On March 7th, 1986, the Coast Guard took over coordination of marine oil spills at sea from the Directorate General of Shipping. Following the change in authority, the Coast Guard created a draught National Oil Spill Disaster Contingency Plan (NOS-DCP) on April 14, 1988, and distributed it to all relevant agencies for feedback. On November 4th, 1993, the Committee of Secretaries approved the final draught. In July 1996, the NOS-DCP was released and sent to 189 agencies, units, and organisations, of which 67 were recognised as participating agencies. Thirty-seven of the collaborating agencies were designated as resource agency. Since it began operating in July 1996, the NOS-DCP has brought together

the resources of the Indian Coast Guard, state governments, the shipping, port, and oil industries, as well as the resources of all three.

According to the 12 December 2002 amendment to the Allocation of Business Rules, the Ministry of Defence is responsible for matters related to:

- The Central Coordinating Agency for combating oil pollution in various maritime zones
- Implementation of the national contingency plan for oil spill disaster
- Surveillance of maritime zones against oil spills
- Combating oil spills in various maritime zones except within the jurisdiction of ports

The national contingency plan consists of: -

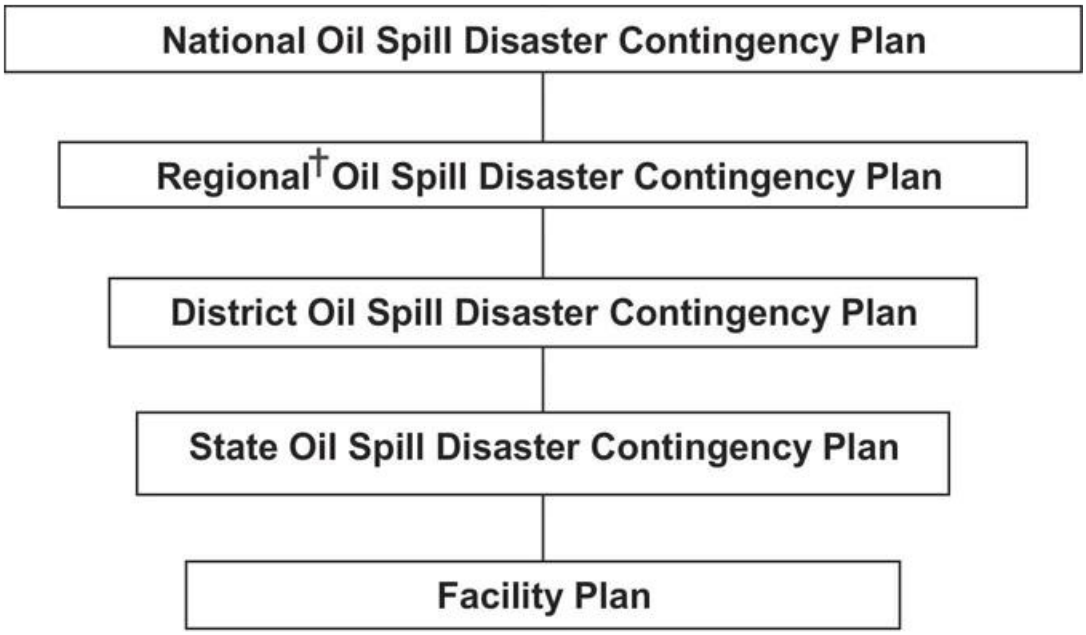

Figure 1:- Elements of National Oil Spill Contingency Plan

Objectives of the plans are as follows: -

- To create a system that is efficient for spill detection and reporting.
- To create sufficient defences against oil and chemical pollutants.
- To enable quick, efficient reaction to oil pollution.

- Must put in place suitable safeguards for the marine environment's protection, the crew, emergency personnel, and general public health and safety.
- to develop effective response strategies to address oil and chemical contamination and dispose of recovered materials in an environmentally responsible manner.
- to set up record-keeping practises that will make cost recovery easier.
- to keep the proof on hand in order to locate the polluter and take appropriate administrative, civil, or criminal action against him or her.

This action-oriented strategy addresses issues including reporting, communication, alerting, assessment, operations, administration, financing, public relations, and agreements with other neighbouring states. The plan designates trained individuals, equipment, surface craft, and aircraft, as well as means of access to these resources. It also assigns responsibility for specific duties to pertinent government departments and agencies. The combined stakeholder arrangements outlined in this strategy are intended to enable a quick and coordinated response to marine oil spills within the designated area. This national strategy is supported by plans created by coastal State authorities, port authorities, and owners of offshore assets. These regional plans detail any agreements for mutual support as well as the local response to maritime incidents.

The incident and security plans used by ships, ports, and offshore sites coexist with this one. To ensure that all the important plans can continue to operate effectively, regardless of the situation, mutual respect between individuals in charge of this plan and all other relevant plans is essential.

According to the Law of the Sea Convention, India has jurisdiction over the Exclusive Economic Zone (EEZ) up to 200 nautical miles seaward of the baseline and the Territorial Sea up to twelve nautical miles from the baseline under the Maritime Zones of India Act, 1976.(*NATIONAL OIL SPILL DISASTER CONTINGENCY PLAN MINISTRY OF DEFENCE, GOVERNMENT OF INDIA*, n.d.)

1.3.4 Coastal Regulation Zones of India

The 2011 Coastal Regulation Zone Notification (CRZ) contributes to the preservation and protection of the coastal region, including its vital environment and marine biodiversity, as well as the livelihood security of the coastal inhabitants and fishermen that live there. In

light of the risk of natural threats to coastal areas and the sea level rise brought on by climate change, it thus encourages the sustainable development of the coast and its infrastructures based on scientific principles. The Environmental Protection Act of 1986 was invoked by the Ministry of Environment and Forests (MOEF) to designate specific coastal lengths as CRZ areas (MOEF, 2018). It is relevant to those regions,

(i) The land area that extends 500 metres along the seafront from the High Tide Line to the landward side.
(ii) The land area between the HTL or the width of the creek along the tidally impacted water bodies, whichever is less on the landward side that is connected to the sea, of 100 metres, which was revised to 50 metres as per the Coastal Regulation Zone Notification, 2018.
(iii) The land area between the High Tide Line and the Low Tide Line, often known as he intertidal zone.
(iv) The water and seabed area (12 nautical miles) from the LTL to the territorial sea; if there are any banks between the sea and the banks, the LTL of both banks; and the tidal zones.
According to the Coastal Zone Management Plan (CZMP) of 1996, the 8,000-acre water spread region of the Ennore Creek is designated as CRZ-1 (Coastal Regulation Zone), where development is rigorously controlled. According to table 1, there are three main zones that make up the Coastal Regulation Zone.

Category	Definition	Regulations
CRZ 1 A	• Ecologically sensitive and important areas • Coastal Habitats such as coral reefs, mangroves, salt marshes, and sand dunes, biologically active mudflats • Area's rich	• No new construction permitted within 500 m of the HTL other than Ecotourism.

	in biodiversity • Historical and heritageareas • Protected areas such as marine reserve, national parks wildlife habitats	
CRZ 2	• The area that has already been developed up to the shoreline • Areas within the municipal limits, which is previously built up and connected with drainage, roads and other infrastructure	• No buildings promoted on the seaward side of the existing roads or of the planned roads • Existing structures are subjected to local town and country planning regulations under the consultation/ public hearing process and also subject to environmental safeguards as per CZMPs.
CRZ 3	• Land areas that are relatively undisturbed and those do not fall under CRZ-II	• Few activities are allowedin this zone.

Table 1:- Coastal Regulation Zones of India- Catergories, Definition, Regulation

1.3.5 Environmental Impact Assessment for Port Development

Environmental impact assessment (EIA) is the evaluation of any environmental impacts and effects that are expected to occur from any project or action. Under the Environmental Protection Act (EPA), 1986, India included EIA Notification to its legal system in 1994. The development and expansion of ports and harbours in India are two highly polluting operations that require the EIA (MOEF, 1994). Following the launch, a number of revisions were taken to improve the environmental clearance process (EC), making it a crucial instrument for making decisions and achieving sustainable development. Three fundamental steps make up the EIA process: (a) scoping and documenting the EIA report; (b) reviewing the results and making decisions; and (c) post-project monitoring (Paliwal, 2006). Additionally, the four stages of the Environmental Clearance process (EC)—Screening, Scoping, Public Consultation, and Appraisal—are carried out by the State Expert Appraisal Committees (SEACs) at the State or Union territory level as well as the Expert Appraisal Committees (EACs) at the Central Government level (MOEF, 2006).

1.4 The Case: - Ennore Oil Spillage 2017

The Ennore oil spill of 2017 happened outside the Kamarajar Port in Ennore, which is a town close to Chennai in Tamil Nadu, India. The leak happened on January 28, 2017, at 4:00 a.m. local time, when the empty oil tanker BW Maple travelling outgoing struck the loaded oil tanker Dawn Kanchipuram travelling inbound. The incident happened two nautical miles off Kamarajar Port in Ennore, a natural harbour on the Coromandel Coast about 20 kilometres north of Chennai. The government-owned public company Kamarajar Port and the town of Ennore are divided by the Ennore Creek, a marshy backwater that spans about 13 km between Pulicat Lake in the north and Kosasthalaiyar River in the south before draining into the Bay of Bengal.

The two ships crashed on January 27 about four in the morning. The Kamarajar port authorities issued a press release in the morning stating that there had been no casualties or injuries to people or harm to the environment. Additionally, it stated that both vessels are securely anchored and that the extents of their damage are being determined. By midday, an oil leak sheen was apparent, dead turtles were washing up on the shore, and locals in the coastal districts reported a strong oil odour. The Indian Coast Guard acknowledged that they were evaluating the situation and provide any necessary help. The spill would be contained

in less than 24 hours, according to the Coast Guard. On January 29, 2017, an investigation into what caused the crash got under way. The Kamarajar Port issued a statement on January 30, 2017, indicating that there had been some oil sheening but no significant environmental harm or human injuries. Additionally, it was noted that oil booms had been placed as a safety precaution around the ship Dawn Kanchipuram to stop any seepage. After the ship's cargo was unloaded and berthed there, the press release stated that vehicle inspections for damage assessment had turned up no evidence of an oil spill other than "some sheens of oil traces." The spillage had reached the coast, according to the fishing community, and they were unable to go fishing since hundreds of fish had perished.

The Coast Guard conducted manual attempts to clean up the oil spill in addition to helicopter missions to track its progress and help. Chennai Corporation cleaned up the oil spill using three large buckets. O. Panneerselvam, the former Chief Minister of Tamil Nadu, visited the site on February 5 and announced that 90% of the clean-up work had been finished, with the final 10% likely to be finished in a few days. On February 6, it was discovered that the viscous heavy oil being cleaned was heavy bunker fuel from the oil tanker Dawn Kanchipuram's fuel tanks, not the ship's cargo. As of 7 February, more than 5700 individuals had removed almost 160 metric tonnes of sludge as a result of the management of the oil leak. According to information provided by the Indian Coast Guard in February 2017, the impacted area was roughly 34,000 square metres (370,000 square feet). According to him, 95 percent of the spill was to the north of the Chennai Port, where sludge had accumulated over an 800-meter (2,600-foot) length at 11 different locations. He continued, saying that the city's Marina Beach coastlines saw little damage and that a 3 km (1.9 mi) stretch of the shoreline in the neighbourhood Tiruvallur experienced oil build-up. The spill's volume was calculated to be 9.9 million US gallons (37,000 m3).

1.5 Objective

This study's goal is to comprehend the impacts of the 2017 Ennore Oil Spill on the environment, society, and the numerous regulatory agencies, conventions, and laws that failed to stop the pollution or contain it. The study also attempts to assess the Directorate of Fisheries & Environment Coast Guard's National Oil Spill Disaster Contingency Plan. The study is crucial given that shipping is expanding the scope of its operations and that environmental effect and protection are becoming increasingly important as they should be.

Following are the key objectives of the study: -

- To understand the after-effects of the Ennore Oil Spill of 2017 on the environment and people
- To evaluate the effectiveness of various regulatory bodies, conventions, and laws in preventing and containing oil spills
- To appraise the National Oil Spill Disaster Contingency Plan and the roles played by the Directorate of Fisheries & Environment and Coast Guard in responding to the disaster.
- To make suggestion for enhancing marine oil pollution prevention and containment action plans and regulations.

1.6 Research Methodology

The purpose of the study was to comprehend how the 2017 Ennore oil disaster affected society and the environment. Utilizing the current legal frameworks and emergency preparedness strategies for oil spills in international and Indian waters, the case study was analysed. National Oil Spill Disaster Contingency Plan, Indian Merchant Shipping Act of 1958, OPRC 90, OPR-HNS 2000, MARPOL guidelines, etc. The speed of the reaction, the sufficiency of the resources deployed to control and contain the leak, and the efficacy of the steps taken to minimise the damage caused by the spill were all taken into consideration when evaluating the effectiveness of the response to the oil spill. The coordination and communication between various organisations, including the government, oil firms, and local people, that were involved in the response to the oil spill were also reviewed.

The following techniques have been used to gather data for the study: -

- Review of literature related to oil spills, regulatory bodies, conventions, and laws related to oil spills, and the Ennore Oil Spill of 2017
- Data collection through interviews with experts in the field, government officials, and residents affected by the oil spill
- Analysis of data to understand the after-effects of the oil spill and evaluate the effectiveness of various regulatory bodies, conventions, and laws

In order to comprehend the impacts of the 2017 Ennore oil leak and assess the efficacy of numerous regulating agencies, conventions, and laws, the study's data was analysed. The information was examined to determine the magnitude of the oil spill's harm to the local ecosystem, the health of the populace, and the socioeconomic effects on the towns.

1.7 Limitations of study

1. Limited scope of data: Relying solely on data collected from fishermen and literature may limit the scope of the study, as other stakeholders, such as government officials, industry representatives, and local residents may have valuable insights that are not captured in the study.

2. Bias in data collection: The perceptions and experiences of fishermen regarding the oil spill may differ from those of the general public. Their economic interests may also have an impact on how they respond, which could skew the information gathered.

3. Limited generalizability: The study's generalizability may be constrained since the Ennore oil spill may have particular traits that set it apart from other oil leak disasters. As a result, it is possible that the study's conclusions will not apply to situations or instances involving additional oil spills.

4. Lack of time for thorough analysis: Completing research on the effects of the Ennore oil leak in a month could not give enough time for a thorough examination of the information gathered, which could restrict the precision and dependability of the results.

Overall, while primary data gathered from fishermen and literature can offer insightful information, it is important to consider the limitations of relying solely on this data and to make sure that a more thorough approach is taken to understand the effects of the Ennore oil spill in a more accurate and representative manner.

CHAPTER 2

REVIEW OF LITRETURE

REVIEW OF LITRETURE

1. **Status of important coastal habitats of North Tamil Nadu: Diversity, current threats, and approaches for conservation: Vikas Madhav Nagarajan, M.Yuvan, Rohith Srinivasan, Nanditha Ram Satagopan, Aswathi Asokan, Anooja A , 22 November 2021.**

   The study describes the distinctive geomorphology and ecology of the coast of North Tamil Nadu. In this area, five significant coastal wetlands—Ennore Creek, Pulicat Lagoon, Adyar Estuary, Kovalam-Muttukadu Backwaters, Odiyur Mudhaliyarkuppam Lagoon, and Kaliveli Lake—were discovered through surveillance. Mangroves, backwaters and creeks, estuary regions, oyster reefs, sandy beaches and sand dunes, seagrass beds, salt marshes, and tropical dry evergreen forests are just a few of the diverse habitats that may be found here. Also identified and noted as such in the checklist are the species that were reported as bycatch. Based on a thorough criteria matrix, the hotspots were evaluated. The ecological significance of these wetlands is also highlighted in this study, along with the risks that they are currently facing and the difficulties and strategies for conservation from a socio-ecological and legal-policy perspective. This study showcases the effects in Ennore creek ecosystem and biodiversity due to recent developmental and urbanisation activities. This helped for the formulation of questionnaire for the personal interview for the data collection.(Nagarajan et al., 2022)

2. **Marine Pollution and International Law: Principles and Practice: Douglas Brubaker, 1993**

   The book is a comprehensive book that explores the legal framework for addressing marine pollution at the international level. The book covers a wide range of topics related to marine pollution, including the causes and consequences of pollution, the legal principles and regulations governing pollution control, and the practical challenges of implementing pollution control measures. The book provides a detailed analysis of key international agreements and conventions related to marine pollution, including the United Nations Convention on the Law of the Sea, the International Convention for the Prevention of Pollution from Ships, and the International

Convention on Oil Pollution Preparedness, Response and Cooperation. It also discusses the role of international organizations, such as the International Maritime Organization and the United Nations Environment Programme, in addressing marine pollution.

3. **Marine Pollution: Sources, Fate, and Effects of Pollutants in Coastal Ecosystems: Ricardo Beiras, 2018**

"Marine Pollution: Sources, Fate, and Effects of Pollutants in Coastal Ecosystems" by Ricardo Beiras is a comprehensive book that examines the sources, fate, and effects of pollutants in coastal ecosystems. The book provides a detailed overview of the different types of pollutants that can impact coastal ecosystems, including chemical pollutants, plastics, and oil spills. The book also explores the ways in which pollutants can enter the marine environment, such as through land-based sources, atmospheric deposition, and shipping activities. It examines the processes that can affect the fate and transport of pollutants in the marine environment, including mixing, dilution, and degradation.

4. **Policies applied by seaport authorities to create sustainable development in port cities: Izabela Kotowska, 3 March 2016.**

Three pillars serve as the foundation for policies promoting steady social and economic progress, pollution reduction, and the preservation of natural resources. Seaports have a big impact on port cities' economic development. In each of these cities, the port creates even thousands of employments that are directly related to port operations. Unfortunately, the port's operations also have an impact on the environment. A significant source of pollution includes both seagoing vessels and land-based modes of transportation. The essay provided insight into how port authorities can promote sustainable transportation expansion by working to reduce transportation externalities.(Kotowska, 2016)

5. **Integrating blue-green infrastructure in urban planning for climate adaptation: Lessons from Chennai and Kochi, India: Francisco García Sánchez, Dhanapal Govindarajulu, January 2023**

   Global interest has been growing in nature-based solutions for climate adaption in cities, such as revitalising blue-green infrastructure (BGI). In the case of India, the quick urbanisation that has occurred since the turn of the century has significantly increased the effects of climate change at a cost to the environment, society, and the economy. In India, coastal cities frequently experience flooding, sea level rise, and urban heat islands as a result of climate change. In order to make BGI a successful climate adaptation practise in coastal towns, this study evaluated the value of scientific knowledge and local knowledge in planning, revitalising, and maintaining it. The social and administrative perspective of BGI as a useful resource for climate adaptation has recently changed, according to this study's findings. Study threw light in to methodology of developing and suitable infrastructure to adapt to the climate change. The study was crucial understand the degree of impact on Chennai due to urbanisation as a port city and future implications of it.(García Sánchez & Govindarajulu, 2023)

6. **Analysis of Marine Pollution in Ennore Region Chennai: J Oliver Paul Nayakam, June 2019.**

   Regular government inspections have evaluated the ranges of various biological, physical, and chemical restrictions in the groundwater and coastal waters of Chennai, and the post-monsoon and monsoon seasons are researched for company norms limits. Low dissolved O2 and high biochemical and COD levels were observed in September in the coastal surface waters of Ennore. A routine survey conducted at numerous locations around the research region revealed that the toxic/trace metal absorptions were significantly higher than the permitted perimeter of international standards. Freshwater inflow during the monsoon caused some of these restrictions to absorb less water, which illustrates that pollution levels are within acceptable ranges. However, it is important to introduce new techniques and a widespread framework which will help reduce the levels of contamination along the coast. The study was crucial to understand the effect of marine pollution in the drinking water

availability and other factors. It initiated the question to enquire about the water availability and quality.(Oliver & Nayagam, 2019)

7. **Preliminary Water Sample Analysis in Ennore Oil Spill Area R. Nagalakshmi, P. M. Rameshwaran and R. Santhosh, 2018**

   Due to collisions, oil leaks and spreads along the shoreline for up to 40 km in the marina beech, giving the wood a dark, high-viscosity appearance. Oil spills put marine life in danger because they release volatile gases that pollute the air, harm people's health, and affect the quality of the drinking water in the neighbouring coastal areas. Villages, natural resources, and the economy are all severely damaged. The major goal of this study is to analyse water samples in areas where there have been oil spills, therefore samples of oil-contaminated water were collected and analysed in a lab from four distinct locations near Ennore port. According to the analysis, the oil spill area's temperature reached a maximum of 28°C, the pH has an acidic nature and falls below 5, and the levels of heavy metals are slightly elevated but within acceptable standards. Oil spill trajectory model estimates that 20 metric tonnes (MT) of oil had been spilt over the Ennore port based on sea surface temperature map and oil spread information obtained from INCOIS.(Nagalakshmi et al., 2018)

8. **An assessment on oil spill trajectory prediction: Case study on oil spill off Ennore Port: S J Prasad, T M Balakrishnan Nair, Hasibur Rahaman,S S C Shenoi and T Vijayalakshmi : 2018**

   Indian National Centre for Ocean Information Services (INCOIS) used the General National Oceanic and Atmospheric Administration (NOAA) Operational Modelling Environment (GNOME), an oil spill trajectory model, to advise and anticipate oil spill drift. Based on the Modular Ocean Model 4p1 (GM4p1), the Global Ocean Data Assimilation System (GODAS) projected and analysed ocean currents were used to push the trajectory model. It was discovered that the spread of HFO determined by the GNOME oil spill trajectory model matched the reported spread from the Sentinel-1A satellite dataset quite well. However, when the trajectory model was forced with anticipated GM4p1 currents, the HFO spread was overestimated. This

conclusion is also supported by additional ground-truth observations from the Indian Coast Guard. (Prasad et al., 2018)

9. **Marine Pollution Fifth Edition: R.B.Clark, 2011**

"Marine Pollution" by R.B. Clark is a widely recognized and authoritative reference book about marine pollution. The fifth edition, published in 2011, provides an up-to-date and comprehensive overview of the sources, effects, and control of marine pollution. The book covers a wide range of topics related to marine pollution, including the sources and nature of pollutants, the ecological and human health effects of pollution, and the various technologies and policies that are used to prevent and mitigate pollution. One of the strengths of the book is its interdisciplinary approach, which incorporates scientific, legal, and policy perspectives on marine pollution. The book also includes numerous case studies and examples from around the world, which help to illustrate the complex nature of marine pollution and the challenges of addressing this critical environmental issue.

10. **National Oil Spill Disaster Contingency Plan, Directorate Of Fisheries Environment coast Guard Headquarters, CGBR 771, 2015 Edition.**

On March 7th, 1986, the Coast Guard took over coordination of marine oil spills at sea from the Directorate General of Shipping. Following the change in authority, the Coast Guard prepared a draught National Oil Spill Disaster Contingency Plan (NOS-DCP) on April 14, 1988, and distributed it to all relevant agencies for feedback. On November 4th, 1993, the Committee of Secretaries approved the final draught. In July 1996, the NOS-DCP was released and sent to 189 agencies, units, and organisations, of which 67 were recognised as participating agencies. Thirty-seven of the collaborating agencies were designated as resource agency. This was the only regulatory framework which worked to contain the oil pollution in Ennore and reduce its after effects.(*NATIONAL OIL SPILL DISASTER CONTINGENCY PLAN MINISTRY OF DEFENCE, GOVERNMENT OF INDIA*, n.d.)

11. **Impact of January 2017 oil spill on the biota off Chennai, southeast coast of India with emphasis on histological impact on crab, Grapsus albolineatus**

This paper details the series of occurrences that occurred in the Chennai region's coast and biota as a result of an unintentional oil spill near the Ennore port following the collision of two cargo ships. Based on the severity of the oil spill, damage to the biota was observed in several zones to assess the effects it had on the environment. Most of these areas' shorelines had evidence of oil sludge that had been deposited in the rocks and sediments as early as the day after the collision. An extensive examination revealed that sea turtles, crabs, fish, and seaweed that threatened the coastal ecosystem had washed ashore. It was crucial in understanding the effects of organisms and marine habitat with specific examples.(Selvakumar et al., n.d.-a)

12. **The Merchant Shipping Act, 1958, India**

The Merchant Shipping Act, 1958 is a comprehensive legislation that governs various aspects of shipping, including oil spillage. The Act has several sections that deal with oil pollution and its prevention, such as section 342-348. These sections aim to prevent and minimize the harmful effects of oil pollution from ships on the environment and ensure that the shipowners are held liable for any damage caused by their vessels. Understanding about existing rules and regulation was crucial in studying its effect or success towards the cause. It also helps to make suggestions inside legal purulence (*MERCHANT SHIPPING ACT, 1958*, n.d.)

13. **Studies on short term weathering of spilled oil along Chennai coast in South India: K. Sivagami, V. Jaa Vignesh, P. Tamizhdurai, Bokam Rajasekhar, N. Sakthipriya, Indumathi M. Nambi, May 2019.**

The article looks at how oil behaved in the early stages of a spill off the coast of Chennai, South India. To comprehend the physical and chemical changes in the spilt oil caused by weathering, the study included laboratory experiments and outdoor observations. The essay emphasises the significance of comprehending how spilled oil weathers in order to successfully respond to oil spill occurrences. According to the study, the oil that was spilt along the Chennai coast underwent significant weathering during the initial days of the disaster, changing the oil's viscosity and

density. The study also discovered that compared to fresh oil, aged oil was less likely to harm the environment.(Sivagami et al., 2019)

14. **Water quality Parameters and it influences in the Ennore estuary and near Coastal Environment with respect to Industrial and Domestic sewage: Mohan Raj V., Padmavathy S., and Sivakumar S., July 2013**

    The objective of this analysis was to ascertain the impact of home and industrial sewage on the coastal and estuarine water quality parameters of Ennore. Due to the ongoing discharge of domestic sewage and industrial effluent, the concentrations of water quality parameters such temperature, pH, salinity, total hardness, nitrite, nitrate, ammonia, and phosphate, among others, were over the coastal water level. The home sewage and industrial effluent emitted from the neighbouring human settlements and industrial establishments may be the cause of the higher nutrient levels estimated from the Ennore estuary.(Raj, 2013a)

15. **Challenges towards sustainable port development in India: the adverse effects of port development on coastal ecology and community in Ennore: case study: Balaji Balasubramanian, 2018**

    Ports and shipping are essential to the development of the coast, but they also pose several threats to the maritime environment and the local coastal population. The triple bottom line—the economic, environmental, and social dimensions of each decision—is integrated into all facets of sustainable development. The Ennore port in India is used as a case study in this paper to examine and analyse the obstacles to the advancement of sustainable development of Indian ports. The goal of this study were to draw attention to the lack of agreement regarding the significance of the two pillars of sustainability—the environmental and the social—and to investigate the various degrees of implementation challenges in India.(Balasubramanian, 2018)

CHAPTER 3

CASE STUDY

3.1 Ennore Creek

Ennore Creek is a tidal creek located in the state of Tamil Nadu in southern India, near the city of Chennai. Ennore Creek is situated on the eastern coast of India, just north of Chennai. It is a part of the Ennore estuary which is formed by the confluence of the Kosasthalaiyar River and the Buckingham Canal. Ennore Creek is a shallow tidal creek with an average depth of around 2-3 meters. It is surrounded by marshy wetlands and mudflats, which are an important habitat for a variety of bird species. The Ennore Creek ecosystem supports a diverse range of flora and fauna, including several species of fish, crabs, molluscs, and birds. The creek is also home to mangrove forests, which play a crucial role in stabilizing the shoreline and providing a habitat for many aquatic species.

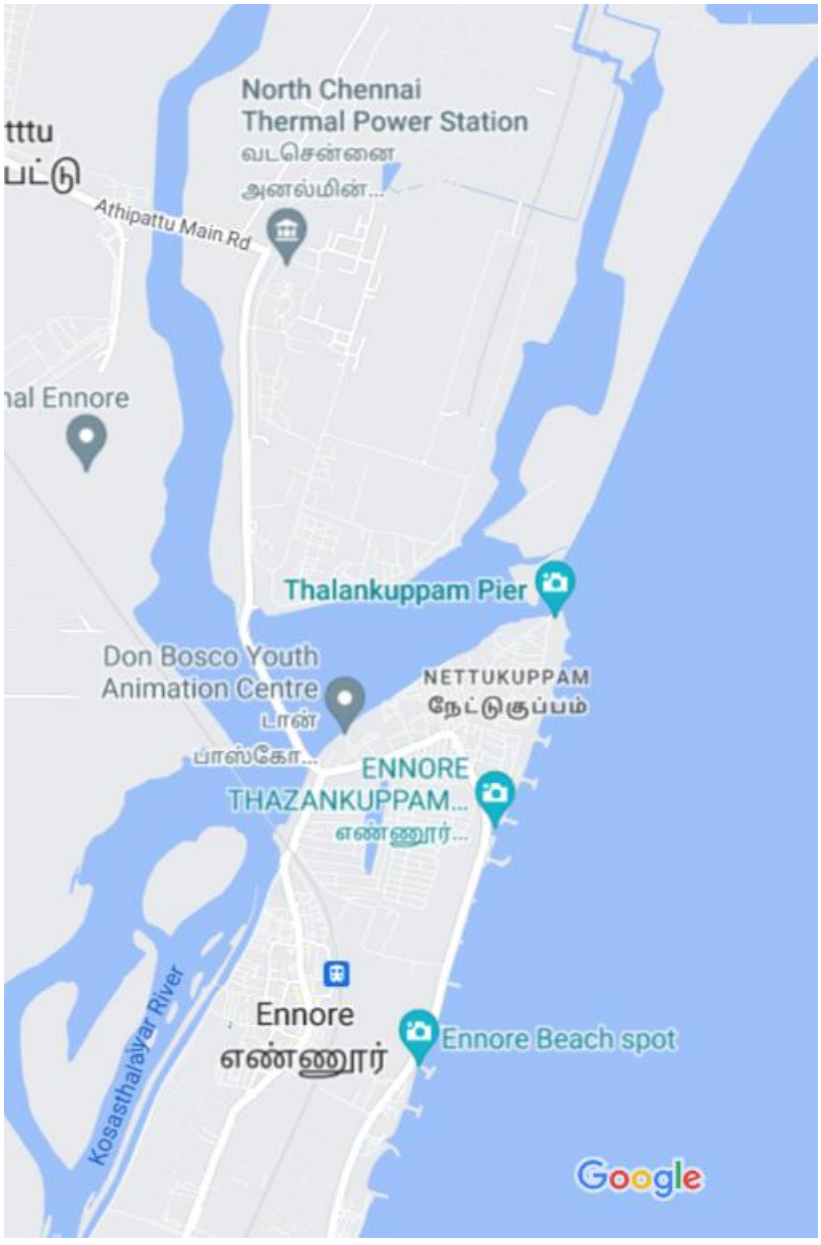

Figure 2:- Ennore Creek Map

Ennore Creek is an important fishing ground for the local fishing communities in the region. The creek provides a diverse range of aquatic habitats, including mudflats, mangrove forests, and shallow waters, which support a variety of fish and shellfish species. Some of the important fish species found in the creek include shrimp, crab, mullet, sardines, and anchovies. The fishing activities in Ennore Creek are mainly carried out using traditional fishing techniques,

such as gill netting, drag netting, and long-lining. The fishing season in the creek generally starts from August and continues until February. During this period, the creek attracts many fishing boats from nearby villages, providing livelihoods for many local fishermen and their families.

The industrial development in the Ennore Creek area and the Kosasthalaiyar River basin can be traced back to the early 20th century when the British colonial government established a harbour in Chennai to facilitate trade and commerce. Over the years, the region saw rapid industrial growth, especially after India gained independence in 1947. One of the earliest industrial establishments in the region was the Ennore Thermal Power Station, which was commissioned in the 1970s. It was followed by the establishment of several other industries, including oil refineries, chemical plants, and fertilizer factories. The construction of the Ennore Port in the 2000s further accelerated the industrialization of the region.

However, the rapid industrialization of the region also had negative environmental consequences, particularly on the water quality of the Kosasthalaiyar River and Ennore Creek. The discharge of untreated industrial effluents and sewage into the river and creek has severely degraded the water quality, leading to the accumulation of toxic substances in the sediments and posing a threat to human health. In recent years, there has been increasing concern over the environmental impact of industrial activities in the region, and there have been efforts to address the pollution issue. The Tamil Nadu Pollution Control Board has implemented various measures to regulate industrial effluent discharge, and there have been initiatives to promote sustainable development practices in the region. However, the challenge of balancing economic development with environmental conservation remains a major concern in the Ennore Creek area and the Kosasthalaiyar River basin.

3.2 Human Settlement

The respondents of the study are the fisherman community in the Njettukuppam locality (Ooru) where fisherman is living in clusters. In the ward one (zone one) of Greater Chennai Corporation were the ennore port is situated there are 8 such clusters (Ooru). Njettukuppam has an approximate population of 1500. Majority of the population depends on fishing as primary occupation. Respondents conveyed that there are enough schooling and health care facilities. While field visit a lower primary school was in the vicinity and higher secondary school is 1.5 km away from Njettukuppam. The current generation is choosing alternative

professions with help of education. They are studying medical, engineering and many more disciplines. But the settlement area is in treat of high level of erosion and lack of land availability. The air pollution and scarcity of drinking water are the biggest challenge for human settlements.

As previously discussed, the human settlement has faced numerous difficulties as a result of environmental degradation and pollution, including the Tsunami, which they endured for more than a year, the 2017 oil spill, which left them without a means of transportation for more than six months, and finally the corona pandemic, which forced them to stay inside for more than two years.

3.3 Ecological Impact – Background

The Ennore Thermal Power Plant started operating in the late 1970s, which marked the beginning of the industrialization and urbanisation without adequate consideration for sustainability. The Kosathiyar River's collected cooling water was re-flowed into the river at a higher temperature. Due to the city effluents that also flow through Buckingham Canal, the Kosathiyar River was already becoming contaminated. Rich marine organisms in the Kosathiyar River began to become less abundant due to the higher water temperature and chemical presence. They reacted by moving to the sea floor, which offered better living circumstances than the basin. Due to this circumstance, fishermen who had previously relied on the Kostahiyar River for their livelihood had to investigate fishing in the sea.

While the shipping was beginning to concentrate on the coasts of ennore. Kamarajar Port limited (Ennore Port) began as an exclusive thermal coal birth to meet the requirements of Tamil Nadu Electricity Board (TNEB). The construction of Ennore Port was carried out in three phases. The first phase, which involved the construction of two berths with a capacity of 15 million tonnes per annum, was completed in 2005. The second phase, which included the construction of two additional berths and a coal terminal with a capacity of 16 million tonnes per annum, was completed in 2009. The third phase, which involved the construction of two more berths and a container terminal with a capacity of 1.4 million twenty-foot equivalent units (TEUs) per annum, was completed in 2014. Ennore Port has since emerged as a major seaport in southern India, handling a variety of cargo, including coal, iron ore, petroleum products, and containers. It has also played a significant role in promoting the

economic development of the region, providing employment opportunities, and contributing to the growth of trade and commerce.

But developments of numerous ports nearby namely Kamarajar, Kattupalli and Chennai imposed restrictions for fishing boats to enter many coastal regions since the zone falls within 3 kilometres of harbours The fisherman was compelled by this to fish farther out in the sea. which, on the other hand, raises the fishing coast per voyage.

The tsunami of 2004 severely devastated the fishing population's environment as they dealt with numerous other issues. Their homes were destroyed by the tsunami, and they lost all access to basic services like drinking water and infrastructure. For up to six months at the period when they suffered the most, they were unable to go fishing. The Ennore Creek community, especially the fisherman who depended on the water for their livelihood, was severely affected by the 2004 Indian water tsunami. The tsunami wrecked fishing nets and boats in Ennore Creek, which are necessary equipment for fisherman. Many fishermen lost their homes, their belongings, and in some cases even their families. Because it took time for fishermen to fix or replace their equipment and for the fish population to recover from the effects of the tsunami, the damage to the fishing industry was severe and long-lasting. For them to return for fishing and to restore the living circumstances, it nearly took six months.

The tsunami not only directly affected fishermen, but it also indirectly affected the regional economy. In the area, trade and commerce were disrupted by the destruction of infrastructure, such as roads and buildings, which resulted in job losses and decreased economic activity. This in turn had an impact on the fishermen's ability to make a living by selling their catch. The tsunami victims were assisted by the Indian government's relief and recovery operations. This included extending financial aid to fishermen so they could fix or replace their boats and gear, as well as training courses so they could learn new skills and diversify their sources of income. Overall, the Ennore Creek community, particularly the fishermen, experienced a major and long-lasting impact as a result of the 2004 tsunami.

In the due course the thermal powerplant continued it development and the air pollution due to smoke, particles of fly ash and cooling water effluence increased with due course. Which further destructed the marine ecosystem in Kosathiyar river mouth and coastal region. The miseries of tsunami were intensified due to reduced fish catch and high coast of voyage.

Many industries also developed in the region during the early 2000s in the bank of Kosathiyar river opposite to ennore creek along with thermal powerplant. These industries are accused to be flowing their effluents to Kosathiyar river without proper treatment. The rich mangrove forest which was lining the banks of Kosathiyar and ennore coast was also depleted due to negative effects of industrialisation. Which lead to accelerated erosion and extinction if many animals in the area including, deer's, wolfs, etc. The situation continued and the whole environment and livelihood of ennore creek undergone tremendous change.

Ennore port began to handle ammonia which led to more adverse effects to marine organisms and fisherman. Ammonia spillage was reported numerous times from reception facility and leakage from pumping lines. Ammonia is harmful for the marine organism and fisherman when it meets skin while they are in water.

Forwarding during the widespread flood in Chennai, Kosathiyar river was the major exist point for water to flow out from city. There were numerous small canals connecting the interior parts of Chennai and Kosathiyar basin. Due to the poor planned construction in the area the waterways got obstructed which cater as the primary reason for the flooding.The flood water carried enormous amount of waste including plastics and slurry which settled down in to the river bed which again affected negatively to the river which was already devastated by pollution and other industrialisation activities. The reduction in the area reduced amount of water and fish entering the mouth during high tide and they will move back to sea asap. Which further forced fishermen to go high seas for fishing.

3.4 Oil Spill of 2017

About two nautical miles off Kamarajar Port in Ennore, Time (IST), BW Maple, an outbound Liquefied Petroleum Gas (LPG) tanker, and an inbound chemical tanker, MT Dawn Kanchipuram, collided. The MT Dawn's hull was reportedly torn, causing damage to the ship's accommodations and the deck's pipelines, according to the local port authority. According to reports from Indian Coast Guard, East, this mishap caused 196.4 metric tonnes of Heavy Furnace Oil (HFO) to spill. The oil drifted with waves and reached coasts stretching from Thiruvottiyur to Uthandi about 34 kilo meters. Due to the high fog on that day the fisherman only found out about the spillage around 6-7 am in the morning when they were ready to go for fishing. By then Coast Guard initiated National Oil Spill Disaster Contingency Plan. Figure 2 depicts the location of the HFO spill. (Prasad et al., 2018)

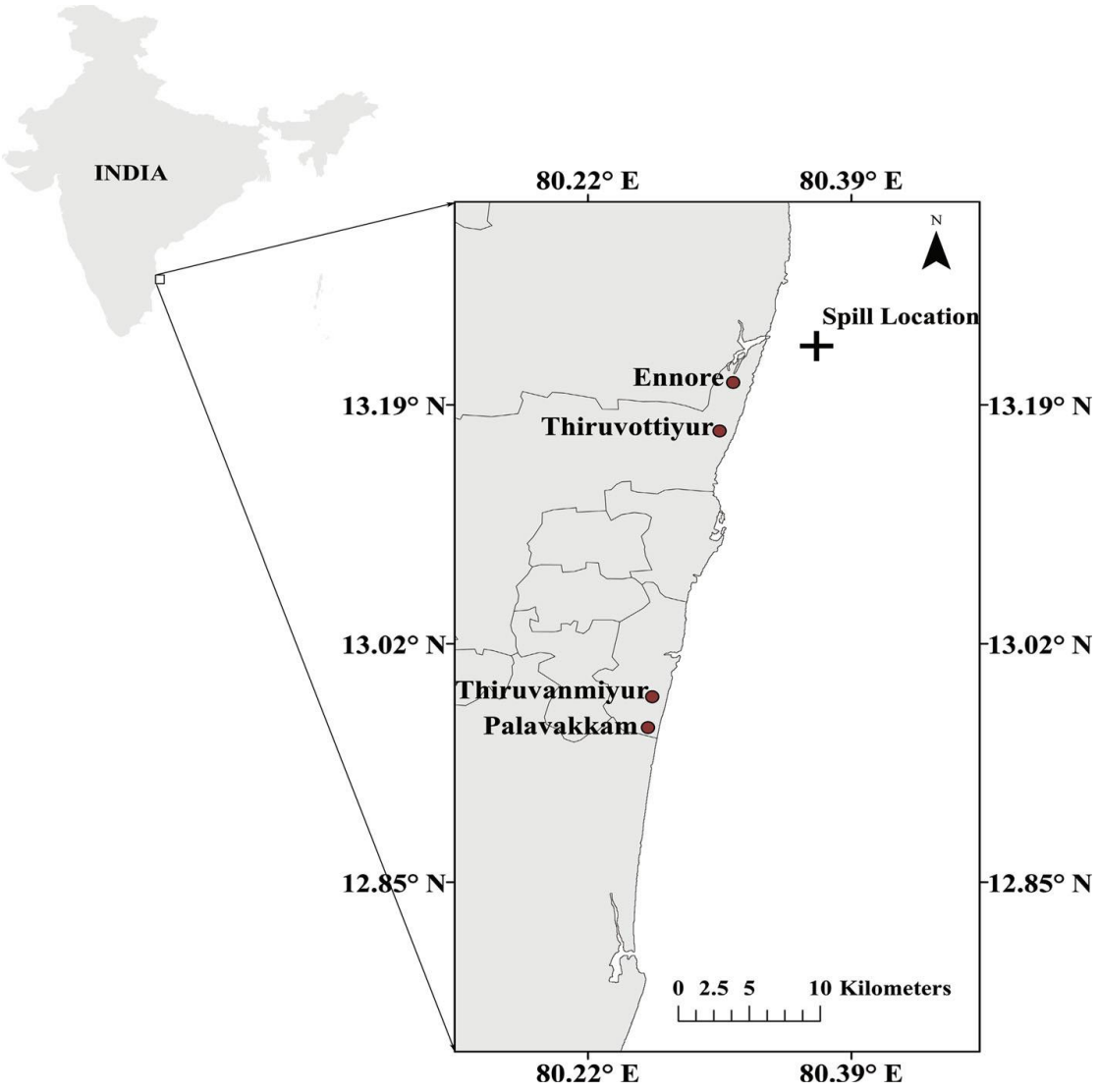

Figure 3:- Ennore Oil Spillage Location Map (S J Prasad, 2018)

By sunrise, dead fish and turtles were visible along the coastlines as well as oil sheens. Respondents to a field study stated that no announcement or awareness of an oil spill existed until they discovered the oil on the shore and received confirmation from the port when they later approached. A press report from Kamarajar Port stated that "no major spill has occurred." The clean-up effort then went on for another two weeks under Coast Guard control. They were somewhat effective in removing the oil muck from the coast. However, only after a month did the fishermen begin to travel to sea to fish. The responders recalled daily 20L drums being hauled away in multiple truckloads.

3.4.1 Impact on Marine Environment

Oil Spillage

No matter how big or small or where it occurs, an oil spill is seen as a major threat to the maritime ecosystem. Several aromatic hydrocarbons, alkanes, xylenes, and cycloalkanes, among other compounds, are found in petrochemical oil and are known to be hazardous to both fish and people. Animals higher up in the water column, including sea turtles and dolphins that surface to breathe, can be killed by floating oil. The Olive Ridley turtle, a species of sea turtle that is listed as threatened by the International Union for the Conservation of Nature, is well recognised for choosing India's coastline as its favourite nesting location. And since the spill, reports state that nearly 40 turtles have already washed ashore drenched in oil.

It is a fact that the oil was cleaned up to a great extend but its after effects was far reaching. Gaps on the base of abandoned catamarans and sand beds of ennore port was favourite breading station for many kinds of turtles and crabs (Grapsus albolineatus). Many studies and respondents confirmed that the settlement of oil in sand bed and sea bed which came in to interaction with the eggs of various organisms caused mutation and impotency which reduced the population of marine organisms. The respondents recall visuals of turtles moving to sea in hundreds of numbers after hatching and now it is even hard to spot one egg in the area. During oil spillage many organisms trapped in the oil also got killed in large numbers. The following pictures indicates the alarming effect of oil spillage on marine organisms: -

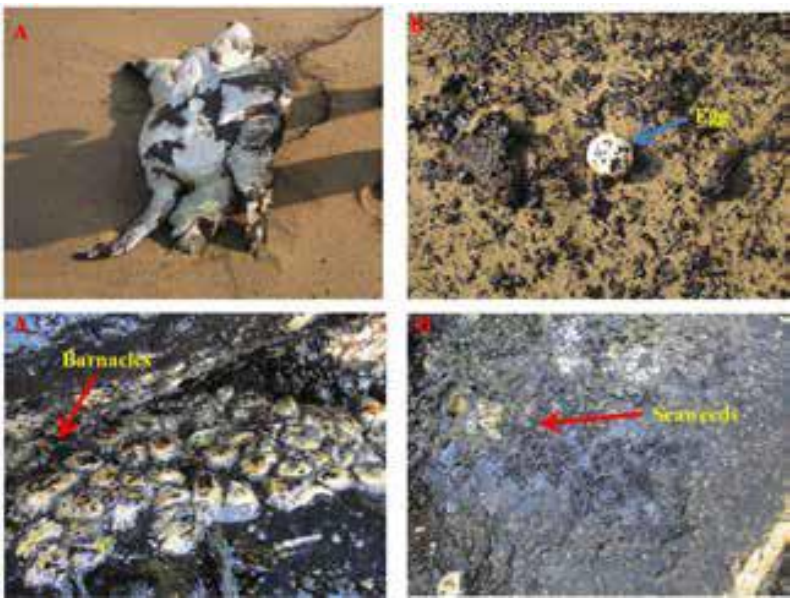

Figure 4:- Impact of oil spill (A) Dead olive ridley turtle in zone 2 (B)

Oil got covered in the top layer in spot near spill happened which reduced oxygen content in water and organisms were unable to float above to take breath. The suffocation also led to death of many. The oil layer reduced oxygen content in water and increased temperature of water which caused death of many organisms. The oil got settled on gills of organisms which tried to breath and settle downed to cause death.

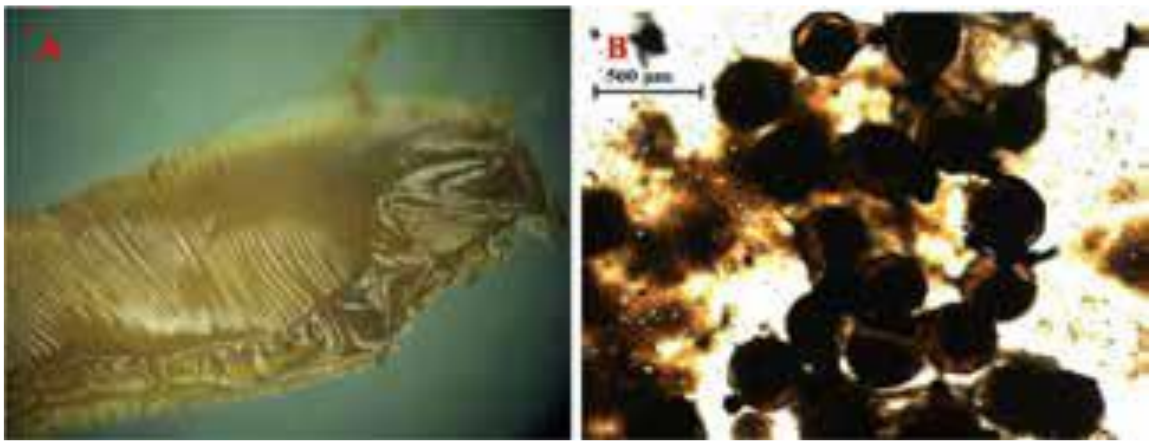

Figure 5:- Photomicrographs showing oil deposition in the gills (A) and

Ennore Creek became a less desirable location for breeding due to the presence of numerous chemicals. Fish were forced farther away by the threat of having their eggs covered in oil when the oil that had been deposited on the sea bed went deeper into the water. Many plants were impacted by the oil in the water, including the abundant mangroves that lined the coast and prevented erosion. The field trip reveals that mangroves are on the verge of extinction. Many species found shelter and breeding grounds in the mangroves.

Additionally, oil poses a serious threat to sea birds that dive for fish. At this time of year, migratory birds from all over the world, including flamingos and Siberian cranes, go to warmer regions. Heavy oil alters the hydrophobic qualities of the feathers of the birds, which decreases their capacity to stay warm and exposes people to harsh weather and even death from overheating. The fact that oily liquid sheets float and reflect sunlight is another issue because it lessens the amount of light that reaches the water. Deeper photosynthesis pauses as a result, which disturbs the ecosystem's delicate equilibrium. And there's more after that. The chemicals employed in oil dispersants, coupled with the mud and clay particles existing in the sea, mix and settle as heavy, oil-rich particles on the bottom. According to marine biologist Rahul Muralidharan, "This is a problem for bottom-feeding invertebrates, especially commercially valuable species like prawn and crabs whose primary

habitat is the seabed." According to marine biologist Rahul Muralidharan, "the presence of such acutely poisonous compounds in the fish could prove fatal to animals up the food chain." The 2017 oil disaster served as the tipping point for many marine creatures that were already under stress from numerous other challenges.(Selvakumar et al., n.d.-b)

Ammonia Leakage

As mentioned earlier the defects in reception facility and underwater pipeline for near by ammonia plant is also causing chemical spill in to the water. High quantities of ammonia can interfere with the respiratory and metabolic functions of marine creatures, causing gill tissue damage, decreased oxygen intake, and an increase in mortality. Ammonia can also alter the pH of seawater, which can have an impact on marine creatures' physiology. Liquid ammonia exposure can result in serious respiratory issues, chemical burns, and rashes on the skin and eyes in people. Ammonia can burn and irritate the lips, throat, and stomach if consumed. Long-term exposure to excessive ammonia levels can potentially harm the lungs and cause other severe health issues. To prevent direct exposure to ammonia in its liquid state, it is crucial to handle the substance carefully and adhere to the necessary safety precautions. Respondents also confirmed that they were having severe skin issues when they came in to contact with ammonia spilled water. Due to the frequent leakages fish and other organisms also abandoned the area.

Erosion of Ennore Coast

Although this is not related to the oil spillage or pollution. Ennore creek has undergone tremendous erosion due to development of many ports related structures nearby. Studies indicate that the incursion of sea to land is evident in all areas of Indian coast and developmental activities and constructions are accelerating it. Within a stretch of 50 km coast of Chennai has three ports with many births. The construction of breakwaters and wharfs involve deposition of humongous landfill into sea which accelerated the incursion further. Ennore coast has the natural protection of mangroves which was destroyed due to industrial construction and oil in water. Recently only seawalls were built to contain the rate of erosion. Respondents recall that the tsunami impact was so intensive only because there was no seawall at that time. The erosion is leading to loss of sand beds which is ecosystem for many organisms. The hamlets of Njettukuppam with maximum population of fisherman (around 1500 peoples) is in threat of being sunk in near future.

3.3.2 Impact on Livelihood

The Oil spill has drastically brought down the revenue earned by fisherman. There are numerous reasons accountable for it. According to the respondents they were already struggling due to the lack of fish catchment in the Kosathiyar river and coast of ennore due to pollution and restriction by ports to enter. In earlier day they were used to spread nets in the high seas and wait till morning and retrieve net to collect fish. Later it became impossible due to probable passage of vessels which is threat to fishing net and even life of fishermen who depend on fibre boats. The Oil spillage polluted the water from high seas to the coast. It killed many marine organisms and covered eggs of the offspring. As described in the previous section. Fish moved far from coast to leave in oil free environment. This increased the cost per voyage of the fisherman. They used to fish from the river itself or coastal region which is incurred very low fuel coast. Now they are traveling 15-30 nautical miles approx. to catch fish. This increased the fuel cost which adds up to Rs.10000 per voyage and the volume of fish they get also released. Which increased cost per unit of fish and profit from it. In whole they are only able to catch less amount fish with high cost and low profit.

After the oil spill, cleaning up took approximately two weeks, and it took at least a month for the sea to return to its previous state. Fishermen were neither employed or receiving any cash at this time, and even when they did start fishing, the catch was insufficient. After oil spill the buyer's showed reluctance towards fish from ennore creek. On the initial days the fish had oil smell. Later it cleared but the buyers were alert about the presence of hydrocarbons in the flesh. Numerous studies also confirmed there were traces on chemical. The fisherman of ennore creek tried to shift their catchment area to coast near neelankari where the effects were not that severe. Still if the fish was caught by fisherman from Ennore so many showed reluctances and some used it as an argument to negotiate for lesser price.

Government is providing subsidy on the fuel price. But it is limited to one who owns a boat and registration. But most of the residents are either working on other boat or leasing one. In that circumstance the reduction is not passed to them. The fisherman is unable to raise cost to cover multiple days of voyage. They limit the voyage to 1-4 days in a month which itself cost them 60000-75000 in whole. Since they are fisherman without stable income and being residents of a highly environment sensitive area any financial institution is ready to provide them loans even for education of children.

To compensate for the pollution and loss of source of Income High Court of Madras under Written Petition No.8249 of 2018 ordered for compensation for the fisherman who directly affected and sellers of fish who were indirectly affected by the pollution which amounted Rs.200000 and Rs.100000 respectively. But the interviews revealed that the fisherman only received a first instalment of Rs.8000 rupees per family. They stated that they were informed that each man is entitled to get Rs.8000 and Rs.12000 for women. But no more support was distributed to them except first instalment. (*IN THE HIGH COURT OF JUDICATURE AT MADRAS*, n.d.)

On later days buyers got out of the stigma of buying ennore caught fish which improved condition by a bit. Still, they are following the schedule of fishing 4-5 days in a month and men. The trolling restriction which is inevitable is also making fisherman's life miserable.

Even in all these miseries not much residents have relocated to other parts. The primary reason is their lifestyle which is intensely bonded with sea and the emotional attachment and legacy they carry. Even if some are interested relocate according to the respondent's tenants does not entertain fisherman community, they are unable to get financial support form banks. The one who gets higher education I slowly moving out of the place, but a large chunk of them are illiterate or unskilled to do any works other than fishing. This makes their relocation nearly impossible.

3.3.3 Impact on Drinking Water

Drinking water scarcity is eminent in ennore port area from the tsunami time itself. Since respondents depend upon water supply by government for household the spillage was not directly affected on the drinking water. But respondents expressed the opinion that the water had oil smell in nearby hamlets who use the ground water. Many health issues were also found among the community who uses the such water sources.

More than oil, ammonia spillage has higher effect on drinking water. Near by hamlets to Njettukuppam who utilises the ground water stated that occasionally the water turns in to pale yellow colour and smells odd. Intense yellow stain and decay is found on teeth of the residents. They strongly believe that this is due to the presence of ammonia in drinking water.(Raj, 2013b)

3.3.3 Impact on Health

Although the coastal community was not directly involved the cleaning procedures following Oil spill. On later days they encountered interaction with oil left out on both shore and water. Respondents recall that many of them who gone for fishing in days following the spillage has affected with irritation for eyes, skin rashes, burns and breathing problems. Any of them was not common symptoms. Various respondents reported various difficulties. Since the diet of the coastal community was concentrated on sea food some experience poor appetite since they were not able to consume fish for many days. Some of them who tried initially got gastrointestinal disturbance.

But due to the continued pollution from thermal powerplant and chemical effluents in water from industry still they are getting inflammation and burns on skin. Due to the ash and dust in air children are prone to have breathing problem like asthma. Although they are getting medical support to treat these issues, there is no permanent solution to stop the pollution which is cause of these

The respondents stated that there was enough medical support to address such issues. The government polyclinic in the ward 1 has provided them medical support for most of the issues. But from the interview responses local authorities has not paid enough attention about updating data or monitoring such situation. And they are not initiating any remedial measures.

CHAPTER 4

ANALYSIS

4.1 Overview for Oil Spillage at Ennore

From various news reports (The Hindu, Time of India, Wion) and respondents' testimony the oil tanker Dawn Kanchipuram, which was coming in laden, collided with the outbound empty tanker BW Maple at 4:00 local time on January 28, 2017, there was a spill. Under MARPOL Annex I – Prevention of Pollution by Oil and section 342A-348 of Indian Merchant Shipping Act 1958 (1.3 Legal Framework) there are well laid regulations and conventions to be followed to prevent ships from spilling oil. In the case study the spill has already happened and primary objective should be to reporting and responding against the spill. News articles state that Coast guard was informed about the incident around 5:30 hrs in the morning which means after 1:30 hrs of the incident. By the time the oil travelled along the waves to reach to the coasts. It was clear failure of reporting systems. (*MERCHANT SHIPPING ACT, 1958*, n.d.)

Effective preventive measures can significantly lower the danger of ship pollution. However, spills will unavoidably happen despite best efforts. When this occurs, it's important to make sure that effective preparations are made to provide a prompt and coordinated response to pollution incidents involving oil and hazardous and noxious substances (HNS), in order to minimise any negative effects. The international agreement known as the International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90) establishes a framework for international cooperation and assistance in anticipating and responding to significant oil pollution disasters.

This regulatory framework is extended to cover pollution incidents involving hazardous and noxious substances, or chemicals, by the Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol). States that have ratified OPRC 90 and the OPRC-HNS Protocol are expected to set up a national framework, comprising a designated national authority, a national operational contact point, and a national contingency plan, for reacting to oil and HNS pollution incidents. A minimal level of reaction tools, communication strategies, ongoing training, and drills are required to support this.

4.1.1 Reporting Procedure

Article 4 of OPRC 90 explains Oil pollution reporting procedures. Each party should require any events aboard their ship or offshore unit involving an oil leak or a potential oil discharge to be reported without delay by the masters or other people in control of ships flying its flag and people in charge of offshore units under its jurisdiction. to the closest coastal State in the case of a ship. To the coastal State that has authority over the unit in the case of an offshore unit. instruct its maritime inspection vessels or aircraft and other appropriate services or officials to report without delay any observed event at sea or at a sea port or oil handling facility involving a discharge of oil or the presence of oil; require persons having charge of sea ports and oil handling facilities under its jurisdiction to report any event involving a discharge or probable discharge of oil or the presence of oil to the competent national authority or ask civil aircraft pilots to immediately report any event at sea that involves an oil discharge or the presence of oil to the closest coastal State, or, as the case may be, to the international organisation.(*International Convention on Oil Pollution Preparedness, Response and Co-Operation, 1990*, n.d.)

In India Coast Guard is the nominated authority to address the issues. So Kamarajar port authority should have been informed Coast Guard as soon as the spill was observed. It is unclear at which stage the delay has occurred. But since the spillage happened in the anchorage of Kamarajar Port authority can be held responsible for the delay. The analysis indicates that there are enough guidelines for reporting oil spillage which has many provisions to be made according to the national oil spill contingency plan which differ for each state. This may cause ambiguity in executing the task while the contingency arises. The early reporting will help to contain effect of spillage to wider area, especially coast.

And any of the guidelines in inclusive of actions to be taken or reporting the pollution in coast to the nearby residents to keep them informed and cautious. The same has happened ennore. According to respondents, the information of spillage was confirmed around 7:30 - 8:00 hrs when they so the oil on coast and reported to port and they confirmed the spillage.

4.2 International Guidelines on Response Plan

Article 3 of OPRC 90 titled Oil pollution emergency plans instruct that both offshore and on shore parties (vessel, ports, and authorities) must have an oil pollution contingency plan. Section 3 of article 2 & 3 explains,

Each Party shall demand that owners and operators of offshore units subject to its jurisdiction have emergency plans for oil pollution that are coordinated with the national system set up in accordance with article 6 and approved in accordance with protocols established by the competent national authority. And each Party shall require oil pollution emergency plans or similar arrangements that are coordinated with the national system established in accordance with article 6 and approved in accordance with procedures established by the competent national authority. This requirement shall apply to authorities or operators in charge of such sea ports and oil handling facilities under its jurisdiction as it deems appropriate.

On the amendment that is 2000 Protocol on Preparedness, Response And Cooperation To Pollution Incidents By Hazardous And Noxious Substances (OPRC-HNS 2000). Article 14 proposes National and Regional Systems for Preparedness and Response. The Article lay-down that each Party shall build a nationwide system for swift and efficient response to situations involving pollution. A national contingency plan for preparedness and response that includes organisational relationships must be included as a minimum in this system. It must also designate the competent national authority or authorities responsible for preparation for and response to pollution incidents, the national operational contact point or points, and an authority with the authority to act on behalf of the State to request assistance or decide to provide the assistance requested.(*2000 PROTOCOL ON PREPAREDNESS, RESPONSE AND CO-OPERATION TO POLLUTION INCIDENTS BY HAZARDOUS AND NOXIOUS SUBSTANCES*, n.d.)

Additionally, each Party shall establish a minimum level of pre-positioned equipment for responding to pollution incidents commensurate with the risk involved, as well as programmes for its use, an exercise programme, and other relevant entities, as appropriate, in cooperation with the shipping industries and industries dealing with hazardous and noxious substances, port authorities, and other relevant entities. A method or organisation to coordinate the response to a pollution incident with, if applicable, the capabilities to mobilise the necessary resources should be continually available along with such capabilities.

Each Party shall make sure that up-to-date information is provided to the Organisation, either directly or through the appropriate regional organisation or arrangements, regarding the location, telecommunication data, and, if applicable, areas of responsibility of authorities

and entities, information on pollution response tools, and expertise in fields related to pollution incident response and marine salvage that may be made available to other States, upon request.

4.3 Relevance of National Oil Spill Disaster Contingency Plan in the context of Ennore Oil Spillage

India has a well laid down plan for responding to Oil spill accidents which is being passed to the jurisdiction of Indian Coast Guard. A critical analysis of the plan will analyse the effectiveness of the plan and its execution. As a signatory to the United Nations Convention on the Law of the Sea (UNCLOS), India is required to protect and preserve the marine environment. The 42nd Amendment to the Indian Constitution mandates that the State of India seek to protect and improve the environment. This programme serves as a gauge of how well the State upholds its constitutional commitments and obligations under the Law of the Sea Convention.

On March 7th, 1986, the Coast Guard took over coordination of marine oil spills at sea from the Directorate General of Shipping. Following the change in authority, the Coast Guard prepared a draught National Oil Spill Disaster Contingency Plan (NOS-DCP) on April 14, 1988, and distributed it to all relevant agencies for feedback. On November 4th, 1993, the Committee of Secretaries approved the final draught just after 3 years of OPRC 90. In July 1996, the NOS-DCP was released and sent to 189 agencies, units, and organisations, of which 67 were recognised as participating agencies. Thirty-seven of the collaborating agencies were designated as resource agency. Since it began operating in July 1996, the NOS-DCP has brought together the resources of the following organisations: the Indian Coast Guard, the State Governments, and the Oil, Shipping, and Ports sectors. This action-oriented plan addresses issues like reporting, communication, alerting, assessment, operations, administration, finances, public relations, and agreements with other neighbouring states. The plan designates trained individuals, equipment, surface craft, and aircraft, as well as means of access to these resources. It also assigns responsibility for specific duties to pertinent government departments and agencies.

4.3.1. Combat Agencies

Section 3.1.2 of National Oil spill disaster contingency plan details combating agency for spill based on jurisdiction. Combat Agencies are operationally responsible for acting in accordance with the applicable contingency plan to respond to an oil spill in the marine environment. Table 3.2 lists the Combat Agency in charge of handling responses to marine oil spills around the world.

Source / Location	**Statutory Agency**
from ships	the relevant Designated Authority under the Merchant Shipping Act, 1958
from offshore installationsand upstream pipelines	the relevant Designated Authority under the Petroleum Act, 1934
from shore terminals, refineries and downstreampipelines	the relevant Designated Authority under the Petroleum and Natural Gas Regulatory Board Act, 2006
in major ports	**the relevant Port Authority under the Major Ports Act**
in non-major ports	the relevant Designated Authority in the Coastal State, or UnionTerritory

Table 2:- Combating Agency for Oil Spill

An oil spill occurred in the port's grounds and extended all the way to the coast. The responsible party for responding in this instance is the port operator or the relevant state government body, along with national plan stakeholders. Therefore, the Indian Coast Guard, a participant in the national plan, should cooperate with Kamarajar Port Ltd., the port's operator, and the state government authority. According to the available literature, the Indian Coast Guard's single crew carried out the entire operation in a noteworthy manner, coordinating with the neighbourhood aid organisations. It is true that it can be challenging to follow regulations in an emergency because the top priority is to contain the leak. However, there is still a noticeable gap in the state authorities' response. The port authority has released press releases with false information and delayed reporting.

4.3.2 Allocation of Responsibilities

Section 3.2 of NOS-DCP explains responsibilities allocated to each stake holders in the plan. The Ministry of Defence, which has administrative control over the Coast Guard organisation, oversees centralising coordination for major oil spills in coastal and marine environments in different maritime zones. The National Oil Spill Disaster Contingency Plan is maintained and carried out by the Indian Coast Guard (ICG). Additionally, the Indian Coast Guard oversees serving as the Central Coordinating Agency for the fight against oil pollution in various maritime zones, except for the waters surrounding ports and areas up to 500 metres away from offshore production platforms, coastal refineries, and facilities like single buoy moorings, crude oil terminals, and pipelines. The Coast Guard will also perform the following duties in its capacity as the Central Coordinating Authority for the fight against oil pollution. Examines the progress reports provided by the State Crisis Management Groups, reply to inquiries from the State Crisis Management Groups and the District Crisis Management Groups and Provide a list of specialists and officials, organised by State, who are "concerned" with handling oil pollution situations.

In accordance with the National Disaster Management Act of 2005, Section 3.2.4 specifies that the State Governments of coastal states oversee coordinating district and local administration and implementation of the National Plan for shore line response. The State and District Authorities will offer a wide range of site-specific resources and information, either in relation to environmental impacts or response activities through authorities, including emergency services, port and harbour authorities, local conservation organisations, and departments of transportation, conservation and resource management, and environmental protection.

As was already mentioned, it is the responsibility of the state government to deliver and facilitate all information in order to coordinate and carry out all local authorities. However, this communication must be two-way, which means that it must be shared with both the community that has been impacted by the spill and the local authorities. No such guidelines are specified anywhere, and they have also never been put into practise anywhere. The seriousness of the situation was not made clear to the respondents, and no formal notices or assistance were given to them. Their local knowledge can also be used in the operations. The coastal community should be considered in the overall strategy.

It is required by Section 3.3.15, which outlines the responsibilities of Coastal State Governments and State Pollution Control Boards, to take all necessary precautions to prevent pollution on the shoreline. From Thiruvottiyur to Uthandi in Ennore, pollution impacted a large portion of the coastline, and despite two weeks of cleaning operations, no further attempts were made to monitor the situation on the shore or take corrective action for pollution. In order to give priority to protecting such grounds from oil spills and the usage of dispersants, local fisheries authority must help/advise local groups in identifying the rich fishing grounds. However, the responders could not think of any such support. They relocated by themselves to far locations in search of catchment areas. It is anticipated that the Central Marine Fisheries Research Institute would assist in determining how the spill will affect the fish and the livelihood of local fishermen. help identify the different species of fish that can be found there. aid in re-establishing fishing in the area after clean-up. aid in calculating the economic damage caused by the ban on fishing in the impacted area. To comprehend the variations in marine fisheries resources' abundance in connection to environmental change, the creation of appropriate mariculture technology for fish, shellfish, and other culturable organisms in open waters to augment production of capture fisheries, in order to offer consulting services.

The Mangrove Society of India is anticipated to serve as a watchdog, offer advice on problems relating to mangrove conservation, and support and organise efforts connected to mangrove restoration as a result of oil pollution. The mangroves in the Ennore and Kosathiyar river basin are practically dead, yet nothing is being done to address the problem.

4.3.3 Levels of Response to Oil Spillage

The NOSDCP divides the readiness and response standards for oil pollution into three "tiers." By expanding the geographic region across which the response is coordinated, the tier method to oil contingency planning identifies resources for reacting to spills of increasing severity and complexity. It offers a useful way to categorise response levels and a useful framework for planning. Three tiers of reaction are recognised by the NOSDCP.

Tier 1

When a small leak occurs, Tier 1 is concerned with being ready and responding quickly within the capacity of the facility operator or port authority. The highest limit of "tier-I" will

be seven hundred tonnes, but the level of reaction preparedness that is necessary will be determined by the risk assessment of oil pollution and the surrounding environment and reflected in the standard of inventory for ports, oil agencies, and coastal States.

The agencies ought to be able to respond quickly to an oil spill in their locality. The capability consists of trained personnel and tools. If more resources are needed, they are typically available from the local port authority, businesses in neighbouring industries through mutual aid agreements, or locally from the Indian Coast Guard.

Tier 2

The preparedness and reaction to a spill that needs the coordination of several sources of manpower and equipment are within the purview of Tier 2. "Tier 2" refers to a wide range of spill quantities and probable scenarios, for which aid may be provided by local organisations or by national sources located outside of the surrounding area. Other local, regional, and national resources will be required to enhance the Combat Agency's resources.

Tier 3

Tier 3 is concerned with a major spill that necessitates the use of all national resources and, depending on the situation, may necessitate the use of regional and global systems. Positive advance customs arrangements are essential to support a successful endeavour at this level of response. The Combat Agency will need help from the local, regional, national, and perhaps even worldwide levels. Through the Ministry of External Affairs, the Statutory Agency will enable access to international resources.

Around 261.5 tonnes of heavy furnace oil leaked from the Dawn Kancheepuram. It can be handled as a Tier 1 spillage based on the amount of leakage. However, it is suggested that environmental conditions should be considered while choosing the intensity of response. Ennore Creel is in the ecologically sensitive and significant coastal control zone 1 which consist Coral reefs, mangroves, salt marshes, sand dunes, and biologically active mudflats are examples of coastal habitats and require special attention. The first action specified in KPL's oil spill contingency plan is leak control. The state government, the coast guard, and port authorities will work together to respond to any oil leak that is categorised as tier II, as mentioned in the environmental impact studies carried out for establishing various facilities

within the port. Additionally, the initial wave of mitigation actions must be mobilised by the port's Oil Spill Response Team (OSRT).

However, despite these protocols, a first denial that a spill had even happened and a subsequent refusal to alert the coast guard only served to highlight the port's lack of readiness. Containment of the emergency reaction was never accelerated because the oil within 24 hours reached beaches about 30 km south of the port.

4.4 Remedial Measures: Legal Perspective

According to study, there were numerous gaps in the spillage reporting and response system, which had an impact on the coastline 30 km to the south of the incident. The habitat of Ennore Creek has been negatively impacted for a long time as a result of neglecting numerous environmental risks that threaten marine ecology and fisherman's way of life. However, in order to assist fishermen in re-establishing their way of life and providing for themselves after the loss and damage they endured, the High Court of Madras has decided to adequately compensate them. The petition was filed by Meenava Thanthai K.R.Selvaraj Kumar, Meenavar Nala Sangam (Fisherman welfare association) represented by its President Mr.M.R.Thiyagarajan and including The Secretary to Government Union of India, Ministry of ShippingTransport Bhavan, The State of Tamil Nadu represented by Secretary to Government Fisheries Department, The District Collector Thiruvallur District, The District CollectorSingaravelar Malligai, The District Collector Kancheepuram District, M/s. Kamarajar Port Limited represented by its Chairman, MT DAWN Kanchipuram, Arya Voyagers Private Limited represented by its Managing Director, MT B.W.Maple, M/s. Interocean Shipping I P Limited, The Director of Fisheries Chennai as respondents. Written petition under Article 226 of the Indian Constitution asking for Writ of Mandamus to order second respondent to compensate those harmed by oil spillage that occurred on January 28, 2017, as a result of the collision of the ships M.T. Dawn and MT BW Maple near Kamarajar Port in Chennai.(*IN THE HIGH COURT OF JUDICATURE AT MADRAS*, n.d.)

1. The petition sought compensation for the suffering and financial loss the oil spill caused for the fishermen and those who depended on fishing for their livelihood. Each party asserted the following which has been approved by the court.

2. According to the list that is displayed at the Fisheries Department counter, fishermen who are actively engaged in the fishing industry will receive interim compensation of Rs. 2,000,000 per head.
3. Fishermen who are 58 years of age or over would receive interim compensation of Rs. 2,000,000 per person.
4. The equipment and vessels used for fishing, such as boats, machinery, fish nets, etc., must be replaced right away with money received in compensation.
5. People involved in directly selling seafood along the coast would receive interim compensation in the amount of Rs. 100,000 per individual.
6. The other people who indirectly depend on or are associated with the fishing industry are to get interim compensation of Rs. 100,000 per person.
7. According to experts, assuming the "utmost care" is to be done, it will take at least three to five years to restore the ecosystem and shoreline. This will be accomplished with extreme caution.

And the High Court of Madras ordered to collect the fund from respective Protection and Indemnity club of the vessels who is the wrong doer. The verdict contained following terms,

The U.K. P & I Club shall deposit a sum of Rs.141 Crores, strictly without prejudice, towards the various claims made by the fishermen and their Associations for a total of Rs.240 Crores, preferred by the Government of Tamil Nadu, including the restoration claims of Rs.10 Crores. This deposit must be made within 14 days of the date on which an order is made by this Hon'ble Court. In addition, the U.K. P & I Club and the Steamship Mutual Underwriting Association Limited shall, on behalf of the Owners of the LPGC BW Maple and M.T. Dawn Kanchipuram, also arrange for the execution of a Bank Guarantee for a sum of Rs.84 Crores to secure the remaining claims out of the total claim of Rs.240 Crores. The petitioner shall provide a bank guarantee in the amount of Rs. 5.68 billion for the Department of the Environment's claim that was paid by Kamarajar Port Ltd. The bank guarantee shall remain in effect until the claim covered by the guarantee is finally decided by a competent court or settled. The Bank Guarantee dated 31.08.2017 signed by Kotak Mahindra Bank Ltd. must be promptly returned to the U.K. P & I Club upon fulfilment of the conditions, along with a document verifying the return or discharge of the said Bank Guarantee. The State of Tamil Nadu and the District

Collector of Thiruvallur District must upon request offer their approval and consent to the Secretary to Government Union of India respondent in order to authorise the Dawn Kanchipuram to sail out of Kamarajar Port Ltd., Ennore.

As a result, enough for compensation was requested, and the court provided actionable recommendations. The verdict as it was carried out, however, is not reflected in the respondent's statement. All of them claimed to have gotten their initial payment of Rs. 8000 roughly a month after the ruling. Later, they were informed that men would receive one more instalment of 8000 rupees, while women would receive 12,000 rupees. Nowhere in the order does it indicate these conditions or divisions. The distribution of the funds is recommended to consider each person's income and kind of work. And five years later, they still have not received the second instalment. According to the directive, the ships can only leave once the payment has been made in full. As a result, it might be said that they have sailed out. The fisherman claims that there were significant errors in the distribution of compensation, and further information is statutory in nature, which restricts the scope of this inquiry.

CHAPTER 5

FINDINGS AND SUGGESTIONS

5.1 Findings

1. The Ennore Creek ecology, which was already experiencing severe environmental issues as a result of industrialization in the area without adequate environmental protection measures, has been disrupted by the 2017 Ennore Oil Spill. The lack of prompt notification and response to the spill led to the pollution of almost 30 kilometres of beachfront. The effects of the spill are still evident because there was no intentional effort made to restore the marine environment.

2. The disappearance of numerous species along the shore has a negative influence on fishermen's livelihoods, and they have not received the necessary assistance. They have not gotten the money they are entitled to, according to a High Court of Madras ruling. The thermal power plant's air pollution, chemical effluents from nearby industries in the Kosathiyar River, increased water temperature brought on by the thermal power plant's discharge of cooling water, accelerated erosion as a result of the port's extensive construction, and the extinction of mangroves as a result of chemicals are just a few pollution-related problems that plague the fishing community. The neighbourhood also has a variety of health issues, which are made worse by pollution from oil spills.

4. To stop oil spills and noxious material pollution, there are several national and international laws and protocols. Sections 342 A to 348 of the Indian Merchant Shipping Act, which is the primary document for reference, provide explicit instructions for carriers on how to report and respond to an oil spill.

5. The National Oil Spill Disaster Contingency Plan of India is well-organized and complies with the 2000 Protocol on Preparedness, Response, and Cooperation to Pollution Incidents by Hazardous and Noxious Substances and the International Convention on Oil Pollution Preparedness, Response, and Co-operation 1990 (OPRC 90) standards (OPRC-HNS 2000). Even though all norms and recommendations were followed, the system was unable to control the spill and monitor its effects.

6. The National Oil Spill Disaster Contingency Plan includes several organisations that are concerned with the environment as stakeholders. For the restoration of the maritime environment and associated ecosystem, there are no set rules or directions. Either there are insufficient gaps in the cooperation of numerous parties, or there are too many restrictions making implementation challenging.

5.2 Suggestions

1. A comprehensive study must be carried out on the response proceedings of ennore oil spillage response to found out lacunas in execution to review the action plans according to it. Scope of this study was limited to published literature reviews and primary data collected from fisherman community.

2. It is necessary to revise the National Oil Spill Disaster Contingency Plan in order to consider recommendations for restoring the marine environment, the welfare of the coastal community, and the necessity to implement blue economy policies in order to support sustainable development.

3. The coast guard, as the responsible authority, should perform routine monitoring and assistance should be provided on reporting without delay from both parties. All facilities, such as ports, that pose a risk of oil pollution should have enough combat equipment and facilities to contain at least a tier 1 spillage. Based on the volume of hazardous cargo handled, higher authorities like the Ministry of Port Shipping and Waterways can provide advice on the level of preparation for response that each port should have.

4. To stop the exploitation of environmentally vulnerable places like Ennore Creek, which is hastening the erosion of the Indian Coast and upsetting the balance of the ecosystem, more strict coastal conservation zone regulations and buildings are needed.

5. Priority must be given to reducing pollution from thermal power plants and other enterprises along the banks of the Kosathiyar River.

6. Each state needs to be more diligent in protecting its coastlines, and agencies like fisheries and ocean studies need to build programmes to track how the growth of maritime trade affects marine ecology and try to restore it.

7. Government and the judiciary should keep an eye on the human settlement situation in Ennore Creek and take the necessary steps to give them the help and compensation to which they are entitled.

8. A proper record of future spills and accidents, together with the response and corrective actions, should be preserved and evaluated on a regular basis.

CHAPTER 6

CONCLUSION

6.1 Conclusion

In his first speech to the legislature, Prime Minister Narendra Modi said, "Our coastline area may be a route for world trade." One element of India's goal to become a superpower resembles China's port-led development strategy. Since increasing exports is the main goal of "Make in India," it is generally agreed that the coastal economic zones are the ones that drive development. This is only profitable if the manufacturing plans are close to ports and, consequently, coastal locations. The Ministry of Shipping's expansive Sagarmaala project calls for both the development of new ports and the modernization of existing ones. By the end of 2017, the maritime industry is anticipated to handle 1,758 million metric tonnes of cargo, up from 976 million metric tonnes in 2012.

But this spill has shown a deplorable situation, giving a glimpse into how prepared and accountable organisations like the Kamarajar Port, the state pollution control board, the coast guard, and the state Coastal Zone Management Authority are in a crisis. Sea traffic will inevitably increase as coastal trade and industry are emphasised, increasing the likelihood of incidents like the collision between the Maple and the Dawn Kanchipuram. Therefore, the nation urgently has to reengineer its action plans to stop such occurrences and manage their consequences. Preventing such accidents from harming the marine environment, coastal region, and coastal towns should be a top priority. Action plans for marine ecological restoration must be adopted to repair the harm that has already been done.

According to the triple bottom line (TBL) economic theory, businesses should pledge to give social and environmental issues the same amount of attention as earnings. According to TBL theory, there should be three bottom lines: profit, people, and the environment. The entire maritime industry is moving away from fossil fuels and toward new, environmentally friendly methods like cold ironing. When creating and revising policies, a for humanity to advance, the planet and its inhabitants are necessary. Every other advancement is either feudal or degenerate. Multifaceted approach that considers all these factors is crucial. The effects of the environmental disaster, which are still being felt in the neighbourhood, expose our deadly negligence when it comes to environmental issues. Due to pollution, the livelihood, natural environment, and daily life of the entire fishing community are becoming more and more challenging. The Kosathiyar River runs through Chennai like a lifeline, and the city's future rests on the restoration of these waterways and marshlands, both of which need to be guarded fiercely.

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