“A STUDY ON SUSTAINABILITY GOALS OF NEW MANGALORE PORT AUTHORITY”

Project Report Submitted in partial fulfillment for the award of the degree of

Master of Business Administration (MBA)

in

International Transportation & LogisticsManagement

by

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INDIAN MARITIME UNIVERSITY

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

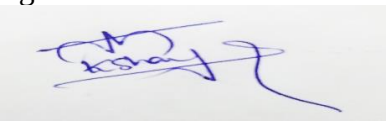
MAY 2024

DECLARATION

I, **AKSHAY KUMAR** bearing Register Number: **2203305003**, student of MBA – International Transportation & Logistics Management, at School of Maritime Management, Indian Maritime University, Chennai Campus, hereby declare that the project report titled **"A STUDY ON SUSTAINABILITY GOALS OF NEW MANGALORE PORT AUTHORITY"** is my original work. This report is being submitted in partial fulfillment of the requirement for the award of the degree of Master of Business Administration (MBA) In International Transportation and Logistics Management (ITLM). The project report is output of my learnings and observations of my research under the guidance of Dr Lekha Ravi. Assistant professor School of Maritime Management, Indian Maritime University, Chennai Campus.

I declare that the information submitted is true and original to the best of my knowledge.

Signature:



AKSHAY KUMAR

Place: Chennai

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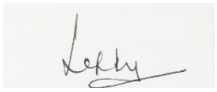
Date: 10/05/2024

CERTIFICATE

This is to certify that this project report entitled **"A STUDY ON SUSTAINABILITY GOALS OF NEW MANGALORE PORT AUTHORITY"** submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus in partial fulfilment of the requirement for awarding the degree, MBA in International Transport and Logistics Management is a genuine work of **AKSHAY KUMAR (Reg No. 2203305003)**.



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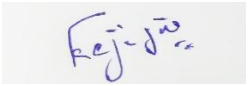

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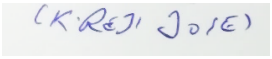

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Date: 10/05/2024

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Last but the least my prayers and thanks to the “almighty” without whom the work would not have been materialized.

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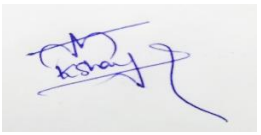

EXECUTIVE SUMMARY

The research study **" A STUDY ON SUSTAINABILITY GOALS OF NEW MANGALORE PORT AUTHORITY "** analyses the sustainability initiatives of New Mangalore Port Authority (NMPA) that has emerged as a leader in sustainable port development within India, guided by the ambitious Maritime India Vision 2030. Through a multifaceted approach, NMPA has implemented a wide array of environmental sustainability initiatives aimed at reducing its ecological footprint while promoting community welfare and inclusive growth.

The main objective of the study is focused on the Key pillars of NMPA's sustainability efforts that include its commitment to environmental conservation, exemplified by the creation of a significant green belt covering 33% of its land area and the planting of over 1 lakh saplings in the past five years. Additionally, investments in renewable energy infrastructure, such as a 5.2 MW solar power plant and rooftop solar panels, have enabled NMPA to meet 100% of its power requirements from renewable sources, resulting in substantial cost savings and reduced carbon emissions.

Efforts towards efficient resource management are evident through the implementation of water harvesting initiatives and the development of sewage treatment plants, leading to self-sufficiency in water supply and responsible waste management practices. By utilizing treated water for irrigation and operational needs, NMPA has minimized its environmental impact and contributed to the conservation of natural resources.

The second objective is focused on the broad study of environmental sustainability initiatives undertaken by major ports along India's east coast and west coast. Various ports, including Kamarajar Port, V.O. Chidambaranar Port, Vishakhapatnam Port, Chennai Port, Haldia Port, Paradip Port, Mormugao Port, Cochin Port, Deendayal Port, Jawaharlal Nehru Port, Mumbai Port, Syama Prasad Mookerjee Port, and Kandla Port, have implemented a range of green initiatives.

These initiatives include the installation of solar power plants, sewage treatment plants, shore power supply systems for vessels, wind barriers, and sapling plantation drives. Ports are also engaged in monitoring environmental parameters, waste management, and renewable energy projects like wind farms and rooftop solar systems. Additionally, efforts such as tree plantation drives and the establishment of dust barriers contribute to enhancing greenery and mitigating environmental impact.

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CHAPTER 1

INTRODUCTION

1.1 INDIAN PORTS

India boasts a sprawling coastline stretching approximately 7516.6 km, ranking it among the world's largest peninsulas. The mainland itself encompasses 5422.6 km of shoreline, while the islands collectively span 2094 km. Notably, Gujarat boasts the world's longest coastline, while Goa holds the distinction of having the shortest. With the 18th longest total coastal length globally, India's coastal expanse spans nine states and four union territories, bordered by the Arabian Sea to the west and the Bay of Bengal to the east. The western coastal states encompass Gujarat, Maharashtra, Goa, Karnataka, and Kerala, while the eastern coastal states comprise Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal. Additionally, India is flanked by four islands: Daman and Diu Islands, Pondicherry, Lakshadweep Islands, and Andaman and Nicobar Islands. In terms of maritime traffic, a positive uptick has been observed in nine out of India's 12 main ports. Cochin Port notably witnessed the most substantial increase in freight handling, marking a 16.5 percent surge. Other ports experiencing expansion include Paradip, Kolkata, JNPT, Mangalore, Visakhapatnam, Kamarajar, Chennai, and Kandla. Among these major ports, Kandla Port, also known as Deendayal Port, emerged as the top performer, handling the highest cargo volume at 110.10 million tonnes.

1.1.1 MAJOR PORTS IN INDIA

- **Deendayal Port**

Located on the Gulf of Kutch near Gandhi Dham in Gujarat's Kutch district, Deendayal Port holds the distinction of being India and Asia's first Special Economic Zone. Renowned for its pivotal role in handling essential commodities such as oil, chemicals, and steel imports, as well as exports like grain, salt, and textiles, Deendayal Port stands as one of India's top revenue-generating ports.

- **Jawaharlal Nehru Port**

Situated on the Konkan mainland in Navi Mumbai, Jawaharlal Nehru Port is India's largest port on the west coast along the Arabian Sea. Functioning as a key gateway for both international and domestic trade, the port predominantly facilitates the export of textiles, carpets, and boneless meat, while serving as a major import hub for machinery, vegetable oil, and medicine.

- **Mumbai Port**

Located west of Mumbai on the Indian west coast, Mumbai Port boasts deep-water facilities and is renowned as India's largest port. With four terminals catering to bulk cargo, liquid chemicals, petroleum, and petroleum products, Mumbai Port plays a vital role in facilitating maritime trade.

- **Mormugao Port**

Nestled in South Goa, Mormugao Port is acclaimed as one of India's premier ports, particularly known for its significant role in the export of iron ore and raw materials.

- **New Mangalore Port**

As Karnataka's sole major port and the seventh largest port in India, New Mangalore Port serves as a vital deep-sea terminal. Renowned for its exports of manganese, granite, coffee, and coconut, the port handles imports ranging from logs to liquefied petroleum gas and petroleum products.

- **Cochin Port**

Cochin Port stands as one of India's largest ports and a crucial node on the Arabian Sea and Gulf route. Situated across Willingdon and Vallarpadam islands, it is a major container shipping port boasting key marine facilities like Cochin Shipyard, Kochi Refinery, and Kochi Terminal.

- **Tuticorin Port**

As a significant deep-sea port and one of India's pivotal maritime hubs, Tuticorin Port ranks among Tamil Nadu's largest container ports. Its strategic importance is underscored by its role in facilitating international trade traffic.

- **Kamarajar Port**

Located on the Coromandel Coast, north of Chennai Port, Kamarajar Port holds the distinction of being India's 12th largest port and the first to become a listed company. It serves as a vital shipping port for the country.

- **Chennai Port**

One of India's oldest ports and the second largest in the country, Chennai Port is a key maritime hub on the Bay of Bengal. It serves as a major port for vehicles, containers, fertilizers, and oil cargo on India's east coast.

- **Visakhapatnam Port**

Situated in Andhra Pradesh, Visakhapatnam Port is among India's largest ports and the oldest natural harbor along the Bay of Bengal. Its specialization in handling coal, iron ore, POL, containers, and other cargo underscores its significance in maritime trade.

- **Paradip Port**

Located in the Jagatsinghpur district of Odisha, Paradip Port is a pivotal deep-sea port on the east coast, positioned at the confluence of the Mahanadi River and the Bay of Bengal. With its own railway and facilities for coal and iron ore processing, Paradip Port is a major maritime gateway.

- **Kolkata Port**

Strategically situated near the Hooghly River in West Bengal, Kolkata Port is a vital commercial port with Haldia Port serving as a significant hub for bulk chemical, petrochemical, and oil cargo, aligning with India's Vision 2030.

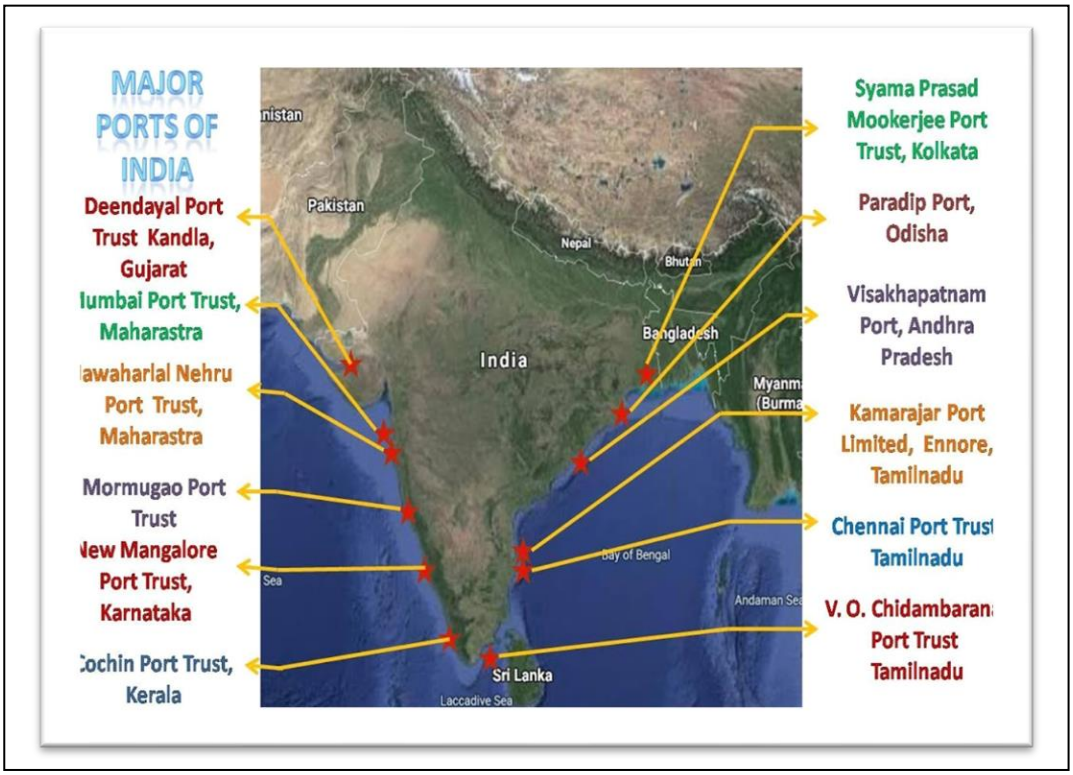

Fig 1.1 Major Ports of India (https://www.scribd.com/)[1]

1.2 INDIAN PORT INDUSTRY OVERVIEW

Ports serve as vital gateways for both goods and passengers, situated at the junction of land and water bodies, be it seas or rivers, facilitating the loading and unloading of cargo and passengers from shipping vessels. They form a crucial component of the global economy and trade networks, serving as intermodal hubs that seamlessly connect rail, truck, barge, ship, and other modes of transportation. This interconnectedness enables the efficient movement of goods both domestically and internationally.

The significance of ports extends beyond economic prosperity, playing a pivotal role in job creation and trade enhancement. Equipped with comprehensive cargo handling infrastructure such as cranes, forklifts, and advanced machinery like RMQC and automated gantry cranes, ports are equipped to handle diverse types of cargo efficiently. They provide berths and mooring facilities for vessels, along with storage facilities such as warehouses and transit sheds for secure

[1] https://unacademy.com/content/railway-exam/study-material/general-awareness/an-overview-of-major-ports-in-india/

cargo storage.

Furthermore, ports offer extensive connectivity options including road, rail, air, and inland waterways, facilitating easy access for businesses and individuals alike. Recognized as critical components of national infrastructure, ports receive government support to ensure their seamless operation and contribution to the country's economic growth.

However, the dynamic nature of global trade and transportation presents challenges and opportunities for ports. Factors such as changes in inland transportation infrastructure, economic structures, and advancements in shipping technology influence the evolution of ports. For instance, shifts in economic policies or technological advancements may lead to changes in the size and significance of ports over time.

1.3 BACKGROUND AND SIGNIFICANCE OF PORTS

Ports have long played a pivotal role in facilitating trade and commerce, serving as crucial interfaces between land and sea routes. With a vast coastline spanning over 7,500 kilometers, India's ports are integral to its economic growth and global connectivity.

Ports have been integral to India's historical and economic fabric for centuries. Situated along a vast coastline, these maritime gateways have played a pivotal role in facilitating trade, connecting cultures, and contributing to economic growth.

India's maritime history dates back to ancient times when it served as a maritime hub, fostering trade with distant lands. The Indus Valley Civilization and the spice trade with Europe are examples of India's rich maritime heritage. With the advent of colonial rule, ports gained strategic importance as trade routes and centers of commerce.

In the modern era, the significance of ports has only deepened. As engines of economic activity, they facilitate the import and export of goods, fuel industrial development, and generate employment. Ports serve as crucial nodes in global supply chains, enabling the movement of raw materials, finished products, and energy resources. Their role extends beyond trade, contributing to regional development, connectivity, and revenue generation for governments.

Given India's growing global economic stature, ports continue to be instrumental in fostering international trade relationships, attracting foreign investment, and boosting the nation's GDP. The government's initiatives, such as Sagarmala and Bharatmala, underscore the importance of port-led development, highlighting the vital role of ports in India's journey toward becoming a global economic powerhouse.

In essence, the background and significance of ports in India are deeply rooted in history and remain pivotal to the nation's present and future economic aspirations

1.4 SUSTAINABLE PORT DEVELOPMENT

Ports are exploring to plan and handle their operations and expansions in the future to facilitate with the restricted environmental area and increased connections between the ports and the cities. By considering this aspect in accordance with the surrounding environment, green growth can evidently be perceived as a socioeconomic driver. Sustainable port development should accommodate and find a balance among social, economic and environmental factors. The sustainable port development concept comprises several basic components concerned in sustainable Study of Sustainable Indicators for Port Environment in Indian Context

Port operations and for the implementation of sustainable port construction and port expansion projects. They include the following:

- Long term insight that endeavors towards an adequate natural imprint;
- Transparent partner interest and partner affirmed methodologies to work and develop;
- The shift from maintainability as a lawful commitment to a monetary driver (financial improvement and practical advancement as integral elements). New financial examples and exercises really taking shape;
- Active sharing of information with different ports and partners;
- Continuous endeavoring towards development in process and innovation.

The Sustainable Port Development Concept not just changes the job of the port expert, yet additionally the manner by which activities are done. Under this idea, the port professional works effectively and beyond legislation by adopting a long-term vision. The procedure is to oblige the future improvement of the port in agreement with the district and common framework.

Key aspects of Sustainable Port strategy are

- Sustainability and efficiency as balancing drivers.
- Active fundamental approaches in design, operation, and maintenance.
- Attract front runners bringing together various stakeholders and better organize the port for a future.

‘Port sustainable development’ depicts the condition in which the port is capable of satisfying its requirements without compromising its specific future. Hence, for ports, sustainability indicates commercial activities and strategies that satisfy the present and future prerequisites of the organization and its stakeholders, at the same time protecting natural and human resources which means that the ports must stabilize their functions as facilitators of trade, coastal stewards, transportation and members of their respective groups. In the recent period, sustainability has

appealed a lot of attention from both the industrial and academic sectors. Concerning the social and economic dimensions, it intends to optimize the operations by enhancing cost effectiveness as well as the working environment in the supply chain. Instead, the environmental aspect intends to mitigate the related negative environmental impacts.

1.5 NEW MANGALORE PORT AUTHORITY - BRIEF HISTORY

New Mangalore Port is a small all-weather water port located in Panambur, Mangalore, Karnataka, India and is the deepest inland port on the west coast. It is the only major port of Karnataka and the seventh largest port of India. The then Prime Minister Indira Gandhi opened it to the public on 4 May 1974. The construction process began in 1962.

Fig 1.2- Overview of NMPA [Source: - NMPA Web]

It is managed by the New Mangalore Port Authority (NMPA). The name "New Mangalore Port" distinguishes it from the city's old port or harbour, known as "Mangalore Jetty" or "Old Jetty". This old port is located south of New Mangalore Port and is now used for fishing and small ferries. A port on the west coast of India, near Mangalore-Panambur. Itis located north of where the Gurpur (Palguni) river meets the Arabian Sea. It is located 170 nautical miles (310 mi) south of Mormugao Port and 191 nautical miles (354 mi) north of Kochi Port. The port is served by National Highway NH-66 (formerly NH-17). The nearest railway station is Thokur but passengers have to get down at Surathkal, whichis on the Konkan railway line and is around 6 km from New Mangalore Port. The port serves Karnataka and to a lesser extent Kerala.

The most important products transportedfrom the port are iron concentrates and pellets, iron ore powders, manganese, granite, coffee, coconuts and containers. Gasoline and petroleum products,

LPG, wood pulp, logs, finished fertilizers, liquid ammonia, sand, phosphoric acid, other liquids and containers are the main products coming from the port and cruise ships can dock at Mangalore New Port. Tourists from all over the world come here to explore the coastal region of Karnataka (Karavali). It provides helicopter service to passengers arriving by cruise ship.[2]

1.6 SUSTAINABILITY STRATEGY

Sustainable development is based on the three pillars of sustainability: economic, environmental and social sustainability. It is only achieved when there is balance or a trade-off between these three aspects.

The Three Pillars of Sustainability

1. Environmental sustainability
2. Economic sustainability
3. Social sustainability

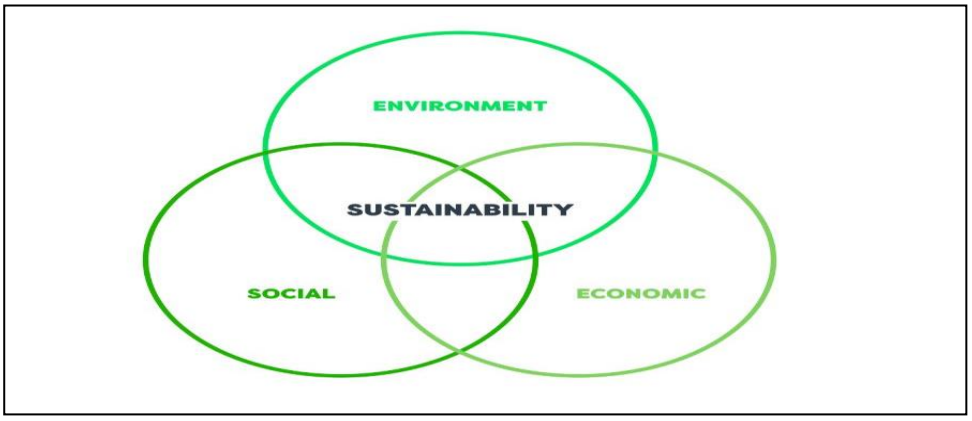

Fig 1.3: Relationship in Sustainable development – Environmental, Social and Economic Concerns (Source: https://www.researchgate.net/figure/Relationship-between-the-three-dimensions-of-sustainability-Source-Tursoy-2009_fig1_341051230)

The revised Environmental and social sustainability framework aims to strengthen the sustainability and accountability of UNEP work. This Framework enables UNEP effective and efficient management of environmental and social impacts throughout the life of a project.

[2] https://newmangaloreport.gov.in/

1.6.1 Environmental Sustainability

All life is ultimately regulated by natural systems, which makes environmental sustainability the first of the three sustainability pillars. Environmental sustainability focuses on the well-being of the environment. This pillar includes air quality, clean water, and biodiversity. As we see with climate change, it's impossible to have social and economic sustainability without environmental sustainability as well.

From a sustainable development perspective, at least six of the United Nations Sustainable Development Goals focus on environmental sustainability:

- Clean water and Sanitation
- Affordable and Clean energy
- Sustainable cities and Communities
- Responsible consumption and Production
- Life below water
- Life and Land

1.6.2 Social Sustainability

Social sustainability includes public health, happiness, human rights, equity, education, and other important factors for community well-being. Within the three pillars of sustainability, social sustainability focuses on ensuring everyone's basic rights and needs are met.

For communities and governments, social sustainability maintains peace and protects people from sickness, poverty, hunger, homelessness, violence, oppression, and other social failings. For businesses, efforts to generate social sustainability include focusing company efforts on creating a positive, diverse, inclusive, and equitable company culture, and making sure every worker is kept safe, treated fairly, and paid a living wage.

From a sustainable development perspective, nine of the UN SDGs - including the first five - focus on social sustainability:

- No poverty
- Zero Hunger
- Good Health and Wellbeing
- Quality Education
- Gender Quality
- Decent work and Economic growth
- Reduced inequalities

Social sustainability and human rights are closely connected. Until everyone's human rights are protected and basic needs are met, it is very difficult to achieve social sustainability in the world, within a specific country, or even at the community level.

1.6.3 Economic Sustainability

Economic sustainability includes economic development, job creation, fair compensation, labor rights, and sustainable, economic circularity. Within the three pillars of sustainability, economic sustainability allows society to innovate, prosper, solve problems, and improve standards of living, but should be pursued in harmony with environmental and social goals.

For communities and governments, social sustainability maintains peace and protects people from sickness, poverty, hunger, homelessness, violence, oppression, and other social failings. For businesses, efforts to generate social sustainability include focusing company efforts on creating a positive, diverse, inclusive, and equitable company culture, and making sure every worker is kept safe, treated fairly, and paid a living wage.

From a sustainable development perspective, four of the UN SDGs directly focus on economic sustainability:

- No poverty
- Decent work and Economic growth
- Industry, Innovation and Infrastructure
- Responsible consumption and Production

Just like the other pillars of sustainability, economic sustainability has important environmental and social impacts. Research shows that bringing people out of poverty, eliminating resource scarcity, and meeting everyone's economic needs significantly improves overall social well-being. However, at the same time, as people and societies become wealthier, they consume more products and services like meat and airplane travel, which has a higher, negative environmental impact.[3]

1.7 OBJECTIVE OF THE STUDY

Indian ports serve as the lifeblood of the nation's economy, handling 95% of its international trade. They facilitate the movement of crucial goods like coal, crude oil, and iron ore, powering industries and generating revenue. Sustainability goals of Indian Ports are based on the three pillars of sustainability: economic, environmental and social sustainability. It is only achieved when there is balance or a trade-off between these three aspects.

1. The main objective of this study is to Analyze Environmental Sustainability initiatives and Social Sustainability initiatives of New Mangalore Port.
2. The secondary objective will be a broad comparison of Environmental Sustainability initiatives of Indian Major Ports in East coast and West coast.

1.8 RESEARCH METHODOLOGY

The research design for this project study is conducted using Secondary data collection methods. This design involves identifying, selecting, and critically analyzing relevant literature on the

[3] https://www.microsoft.com/en-us/sustainability/learn/environmental-sustainability#:~:text=Environmental%20sustainability%20definition,of%20current%20and%20future%20generations.

topic of interest to gain insights and understanding from existing research and preparation of questionnaire for the purpose of primary data collection. The data for this review will be collected from secondary sources, including scholarly journals, conference proceedings, reports, books, and other relevant publications. A comprehensive search strategy will be developed, including the use of online databases, search engines, and relevant keywords to identify relevant literature.

1.9 LIMITATIONS

- The research project may have been constrained by limited time available for data collection, analysis, and interpretation. This could result in limitations in the depth and breadth of the research, and may not allow for a comprehensive investigation of the topic.
- The research project may have been limited by constraints in resources such as budget, access to data or information, or availability of research tools or equipment. These limitations may have impacted the scope and quality of the research conducted.
- Empirical study will be an appropriate way of further research but could not be adopted as the research has limited resources and time.
- Secondary data may contain inherent biases such as selection bias, publication bias, or reporting bias. These biases can impact the validity and reliability of the research findings and may introduce limitations in the interpretation of the data.
- The research project relies on existing data sources, such as literature reviews, reports, journals, published studies. This lack of control over data collection may limit the researcher's ability to obtain specific or in-depth information relevant to the research questions.

1.10 CHAPTER SCHEME

- **First Chapter**

The introductory chapter serves to familiarize readers with the study's context by providing an overview of the industry and summarizing existing research in the related field. It outlines the study's objectives, research methodology, and limitations to give readers an understanding of how the research is being conducted.

- **Second Chapter**

The second chapter presents a comprehensive review of literature, which encompasses

academic papers, journals, and articles related to sustainability initiatives of Indian ports. The literature review is intended to provide readers with an in-depth understanding of the current state of knowledge in the fieldand to identify any research gaps that may exist.

- **Third Chapter**

The focus of the third chapter is to examine the objective of this study is to analysis of Environmental Sustainability initiatives and Social Sustainability initiatives of New Mangalore Port.

- **Fourth Chapter**

The fourth chapter offers a systematic analysis of objective will be the Comparison Study of Environmental Sustainability initiatives of Indian Major Ports.

- **Fifth Chapter**

The fifth chapter of the study presents the findings and conclusions derived from the available information. It serves to summarize and synthesize the results of the research conducted in the preceding chapters.

CHAPTER 2

LITERATURE REVIEW

2.1 REVIEW OF LITERATURE

This literature review seeks to provide a comprehensive review of the literature on the sustainability goals of the New Mangalore Port Authority (NMPA) reveals a multifaceted landscape of research, initiatives, and best practices aimed at fostering environmental stewardship and social responsibility within the port's operations.

Review of Literature: 1

- **AUTHORS:** K. Eswari, Dr. K. Yogeswari
- **DATE OF PUBLICATION:** 2017
- **OBJECTIVE & FINDINGS:** The objective of the report "Study of Sustainable Indicators for Port Environment in Indian Context" is to identify and analyze sustainable indicators, factors, and parameters for port development in India. The report aims to provide a comprehensive understanding of the challenges and opportunities for achieving sustainability in the Indian port sector, with a focus on environmental, economic, and social aspects.

Key findings

- Identification of sustainable indicators for port development, covering planning, construction, operation, and maintenance phases.
- Analysis of the vision, mission, and quality policies of major Indian ports, highlighting their commitment to sustainable linkages with port-based industries and users, economic growth, and leveraging resources for facilitating economic activities.
- Emphasis on the need for integrating sustainable concepts in planning and maintenance strategies for port infrastructures, with a focus on social, economic, and environmental development.
- Discussion on the importance of ecosystem services as a methodology for evaluating port development outcomes and achieving broad public support.
- Recommendations for improvement, such as adopting green port methodology, updating to the latest Environmental Management System (EMS) accreditation, and balancing economic, environmental, and social aspects in port operations.
- These findings contribute to the understanding of sustainable port development in the Indian context and provide insights for port authorities, policymakers, and stakeholders to

enhance sustainability in port operations and infrastructure.[4]

Review of Literature: 2

- **AUTHORS**: Mihir K Das
- **TITLE: A critical issue and challenge of sustainability at Indian Ports**
- **DATE OF PUBLICATION:** 2020
- **OBJECTIVE & FINDINGS:** The objective of the research is to address the critical issue and challenge of sustainability at Indian ports, with a specific focus on corporate social responsibility (CSR).

Key findings

- The impact of greenfield ports on the environment and the need for environmental impact assessments
- The need for smart integration of employee performance and community involvement at ports
- The formal introduction of CSR in Indian ports and the increasing societal expectations of corporate contributions to society
- The importance of aligning new infrastructure development in eco-sensitive regions, including ports, with environmental laws and guidelines
- These findings underscore the complex and multifaceted nature of sustainability and CSR challenges faced by Indian ports, and the need for strategic and integrated approaches to address these issues.[5]

Review of Literature: 3

AUTHORS: Ministry of Port Shipping and waterways

TITLE: Harit sagar Green Port Guidelines

DATE OF PUBLICATION: 2023

OBJECTIVE & FINDINGS: The main objective of the "Harit Sagar" Green Port Guidelines is to promote sustainable development and reduce the carbon footprint of major ports in India. The guidelines aim to achieve this by optimizing port procedures, inducting

[4] https://pureadmin.qub.ac.uk/ws/portalfiles/portal/496277985/SHIP_WP1_Port_Sustainabilty_Final.pdf
[1]https://www.researchgate.net/publication/344300361_CSR_A_critical_issue_and_challenge_of_sustainability_at_Indian_Ports_Mihir_K_Das
https://pib.gov.in/PressReleasePage.aspx?PRID=1992273#:~:text=To%20meet%20the%20larger%20vision,energy%20more%20than%20their%20demand.

green technologies, reducing wastages, and taking steps to reduce carbon intensity per unit of cargo handled. The document also provides guidance to major ports for drawing out a comprehensive plan of action to achieve targeted outcomes in terms of quantified reduction in carbon emission over defined timelines.

Key findings

- The guidelines recommend conducting a baseline study of Environment Performance Indicators (EPIs) related to GHG emissions and carbon footprint, and submitting the report to the Ministry of Ports, Shipping and Waterways within three months of the launch of the guidelines. The study should establish a baseline using internationally/nationally accepted protocols/methods for GHG emissions and carbon footprint, and other EPIs listed in Annexure-D.
- The document also recommends recognizing and awarding the best three Green Performing Ports of the year based on an evaluation criterion. The Ministry of Ports, Shipping and Waterways has the power to interpret and clarify any provision of the guidelines and relax the provisions in public interest, within the overall framework and spirit of the guidelines, in case of difficulties in implementation.
- Overall, the "Harit Sagar" Green Port Guidelines aim to establish frameworks towards attaining carbon neutrality with zero disturbance to the ecosystem dynamics of the surrounding aquatic and atmospheric environment.

Review of Literature: 4

- **AUTHORS**: United Nations ESCAPE
- **TITLE: Sustainable and Resilient Port Development in ASEAN and Indian Sub-Continent**
- **DATE OF PUBLICATION:** 2021
- **OBJECTIVE & FINDINGS:** The objectives of the study on Sustainable and Resilient Port Development in ASEAN and Indian Sub-Continent were to understand the current status of sustainable and resilient port development in the regions, identify common challenges, analyze best practices, and develop strategies to enhance sustainable and resilient port development and maritime connectivity.

Key findings

- Ports in the region are primarily driven by compliance rather than focusing on the benefits of sustainability. There is a need to emphasize the benefits of sustainability

and explore methods to increase these benefits.

- Sustainability and resilience are not widely used as management indicators to [6]measure port performance, and there is a lack of tools for measuring or reporting sustainability and resilience, making it difficult to compare ports with each other.
- The study identified the need for a standard template for in-depth comparison between ports on sustainability and resilience, as well as guidelines for resolving the identified issues in the future.
- The report emphasizes that sustainable and resilient port development can ultimately contribute to enhancing port productivity and value, despite being initially perceived as additional cost factors or compliance requirements.
- The study also highlights the importance of capacity building activities and cooperation with governments to promote sustainable practices in port management, with a focus on designing a framework and strategy that identifies the benefits of adopting sustainable practices.

Review of Literature: 5

- **AUTHORS**: Prathvi Thumbe Narasimha, Pradyot Ranjan Jena, Ritanjali Majhi (Department of School of Management, National Institute of Technology Karnataka)
- **TITLE: Sustainability Performance Assessment Framework for Major Seaports in India**
- **DATE OF PUBLICATION:** 2022
- **OBJECTIVE & FINDINGS:**

Objectives:

- To conceptualize a sustainable seaport development structure for Indian major seaports.
- To incorporate seaport sustainability-related indicators from global seaports literature studies.
- To confirm the proposed structure through empirical validation in the context of Indian major seaports.
- To prioritize sustainable development dimensions based on stakeholder perspectives.
- To assess the importance of economic, social, and environmental dimensions in seaport sustainability development.
- To provide insights for future research on sustainable improvement strategies for seaport

[6] https://www.unescap.org/sites/default/d8files/event-documents/Report_SustainabilityResilience_ISC_ASEAN.pdf https://www.researchgate.net/publication/360225718_Sustainability_Performance_Assessment_Framework_for_Major_Seaports_in_India

expansion and development.

Findings:

- Seaport top-level authorities in India perceive economic dimension as the most important for seaport sustainability development.
- Seaport social performance and environmental performance are considered the least significant dimensions by Indian seaport managers and maritime experts.
- The majority of seaport managers and maritime experts support the inclusion of proposed sustainable practices in all four sustainable development dimensions.
- The research study highlights the importance of involving various seaport stakeholders in decision-making for sustainable seaport development.
- The study contributes to maritime research by providing insights on crucial areas for sustainable seaport development.
- Seaport managers are advised to balance sustainability-related practices and activities considering the perspectives of diverse seaport stakeholders.

Review of Literature: 6

- **AUTHORS:** BALAJI BALASUBRAMANIAN
- **TITLE: CHALLENGES TOWARDS SUSTAINABLE PORT DEVELOPMENT IN INDIA**
- **DATE OF PUBLICATION:** 2018
- **OBJECTIVE & FINDINGS:**
- To identify the socio-economic and environmental issues arising from port development in Ennore, India.
- To assess the impact of port development on biodiversity, fisheries, and livelihoods of local communities.
- To evaluate the effectiveness of current environmental regulations and community engagement practices in mitigating adverse effects of port development.
- To propose recommendations for promoting sustainable port development practices in India.

The findings of the dissertation include

- Loss of biodiversity and fisheries in the Ennore creek has significantly affected the livelihoods of fishermen and small-scale business owner's dependent on the creek.
- Despite environmental considerations and regulations in place, there is a gap between the actions promised by port officials and the actual implementation of measures to mitigate

environmental impacts.

- The engagement of community stakeholders, especially the fishermen community, in decision-making processes related to port expansion is essential for addressing social issues and ensuring transparency in the development process.
- There is a need for enhanced knowledge sharing, long-term vision, and comprehensive studies involving multiple ports and stakeholders to effectively address the challenges of sustainable port development in India.[7]

Review of Literature: 7

- **AUTHORS:** Chin-Shan Lu, Kuo-Chung Shang
- **TITLE: Crucial Sustainability assessment criteria for international ports**
- **DATE OF PUBLICATION:** 2014
- **OBJECTIVE & FINDINGS:**
- Develop sustainability assessment attributes for the port sector.
- Highlight important criteria for sustainability assessment in international ports.
- Identify crucial sustainability assessment factors to assist port corporations in policy-making and decision-making processes.

The findings of the research include

- Social issues related to staff job security and safety were ranked as the most important sustainable assessment criterion.
- Economic issues were deemed the most important dimension in the context of international port sustainability assessment in Taiwan.
- Environmental practices and social concerns were also identified as significant factors in port sustainability assessment.
- The study emphasized the importance of considering a wide range of sustainability dimensions, including environmental, economic, and social aspects, in the assessment criteria for international ports.
- Recommendations were made for future research to explore the effects and causes of sustainability assessment criteria, involve stakeholders' perspectives, and apply the research approach in other countries or regions.

[7] https://commons.wmu.se/cgi/viewcontent.cgi?article=1604&context=all_dissertations
https://www.researchgate.net/publication/312236097_Identifying_crucial_sustainability_assessment_criteria_for_container_seaports

Review of Literature: 8

- **AUTHORS:** Weeraphong Sankla1 & Thanyaphat Muangpan1
  (Faculty of Logistics, Burapha University, Thailand)
- **TITLE: Smart and Sustainable Port Performance in Thailand: A Conceptual Model**
- **DATE OF PUBLICATION:** 2022
- **OBJECTIVE & FINDINGS:**

Objectives

- To identify and analyze the main factors and indicators of smart and sustainable port management in the Eastern Economic Corridor (EEC) in Thailand.
- To develop a conceptual model for smart and sustainable port performance based on the identified factors and indicators.
- To assess the relationship between the factors and indicators of smart and sustainable port management through quantitative analysis methods.

Findings

- The research identified three dimensions of smart and sustainable port management: environmental, social, and economic aspects.
- Within the environmental dimension, indicators such as international port environmental management standards certification and application of wastewater treatment technologies were highlighted.
- The social dimension included indicators related to community engagement and social responsibility initiatives within port operations.
- The economic dimension focused on indicators such as financial sustainability and economic growth strategies for ports.
- Through a mix of qualitative content analysis and quantitative confirmatory factor analysis, a conceptual model for smart and sustainable port management was developed.
- The study confirmed the relationship between the identified factors and indicators, providing insights into how these aspects contribute to overall port performance and sustainability.[8]

Review of Literature: 9

- **AUTHORS:** Adani Ports and Special Economic Zone Limited
- **TITLE: Sustainability Report of Adani Port**

[8]https://www.researchgate.net/publication/360425549_Smart_and_Sustainable_Port_Performance_in_Thailand_A_Conceptual_Model

- **DATE OF PUBLICATION:** 2016
- **OBJECTIVE & FINDINGS:**

Objectives:

- Key Material Aspects: The primary objective was to identify and prioritize the key material aspects that are significant for APSEZ's sustainability performance. This involved engaging with stakeholders to understand their concerns and perspectives on various sustainability issues.
- Stakeholder Engagement: Another objective was to enhance stakeholder engagement by developing sustainability questionnaires and involving various stakeholder groups such as employees, customers, suppliers, community members, and environmental institutions. The aim was to gather feedback, prioritize material aspects, and ensure inclusivity in the reporting process.
- Financial and ESG Reporting: The report aimed to provide transparent and comprehensive information on APSEZ's economic performance, environmental impact, and social initiatives. This included disclosing data on economic value generated and distributed, energy consumption, waste management, community development, and other relevant aspects.

Findings:

- **Key Material Aspects:** Through stakeholder engagement and prioritization processes, APSEZ identified nine most significant material aspects, including energy, water, emissions, economic performance, occupational health & safety, and local communities. These aspects were selected based on stakeholder feedback, sustainability context, materiality, and data availability.
- **Stakeholder Engagement Impact:** The stakeholder engagement process led to the identification of material aspects critical for APSEZ's sustainability performance. The outcomes were discussed with the Sustainability Steering Committee, and final aspects were selected based on stakeholder priorities, sustainability context, material significance, and data completeness.
- **Reporting Coverage:** The report covered the identified material aspects in varying degrees, with data provided where necessary. The focus areas included energy, water, emissions, economic performance, compliance, grievance mechanisms, occupational health & safety, and [9]local communities. The report also highlighted the impacts created across the value chain and outlined management procedures for addressing these impacts.

[9] https://www.adaniports.com/-/media/Project/Ports/Sustainability/Documents/APSEZ-Sustainability-Report-FY17.pdf
https://ficci.in/api/pdf1/EMP?fileID=23777&fileName=study_Smart_Safe_SustainablePorts.pdf
https://newmangaloreport.gov.in/sites/default/files/inline-files/NMPA%20CSR%20Policy_2023.pdf

Review of Literature: 10

- **AUTHORS:** CRISIL Market Intelligence and analytics
- **TITLE: Smart, Safe and Sustainable ports**
- **DATE OF PUBLICATION:** 2022
- **OBJECTIVE & FINDINGS:**
- Analyzing the current state of India's ports.
- Identifying opportunities for adopting innovative technologies and practices for economic growth and environmental impact reduction.
- Exploring the challenges faced by India's ports.
- Proposing a comprehensive approach to address these challenges.
- Highlighting the importance of collaborations and partnerships in achieving smart, safe, and sustainable ports.
- Providing insights for policymakers, port authorities, and stakeholders to contribute to ongoing efforts for creating a safe, smart, and sustainable port system.

The findings of the report include

- The need for efficient and sustainable port infrastructure due to India's rapid economic growth.
- The importance of a green port policy to propel India towards global leadership in safe, sustainable, and eco-friendly ports.
- Measures to enhance port sustainability, such as increasing the use of renewable energy, curbing emissions, and improving waste management.
- Targets for reducing carbon emissions and increasing green initiatives in ports.
- Emphasis on digitalization, innovation, and environmental sustainability for creating smart, safe, and sustainable ports.
- The significance of port automation, smart technologies, and workforce development in enhancing operational efficiency, safety, and competitiveness.
- The role of collaborations and partnerships in addressing complex challenges and achieving multifaceted goals for port development.
- Recommendations for investing in advanced technologies, strengthening regulations, and promoting best practices to ensure the safety and security of Indian ports.

Review of Literature: 11

- **AUTHORS:** New Mangalore Port Authority (NMPA)
- **TITLE:** NMPA CSR & Sustainability Policy
- **DATE OF PUBLICATION:** 2020
- **OBJECTIVE & FINDINGS:**

Objectives:

- To align all CSR projects and programs with the guidelines provided by the Ministry of Shipping.
- To establish a structured process for reviewing proposals and executing CSR initiatives.
- To implement a robust monitoring system for tracking the progress of CSR projects.
- To promote sustainable development in business operations and CSR initiatives.

Findings:

- The NMPT CSR strategy focuses on balancing economic, environmental, and social aspects, emphasizing community empowerment, inclusive growth, environmental protection, and technology promotion.
- The CSR Committee, led by the Chairman of NMPT, is responsible for formulating and recommending CSR proposals, monitoring activities, and managing expenditure.
- The execution and implementation of CSR projects involve internal resources, external agencies, NGOs, or collaborations with other ports, ensuring adherence to the CSR policy.
- Regular progress reports on CSR activities are submitted quarterly for review by the CSR Committee, which may recommend actions based on the reports.
- Impact assessments are conducted by independent agencies to evaluate the outcomes of CSR projects, ensuring sustainability, scalability, and replicability.
- Comprehensive documentation of CSR projects is maintained, including baseline data, implementation processes, outcomes achieved, and recommendations for scalability and replicability.
- The CSR Execution & Monitoring Committee oversees the progress of projects, collects baseline data, sets milestones, and ensures transparency in fund utilization and impact assessment.

CHAPTER 3

SUSTAINABILITY INITIATIVES OF NEW MANGLORE PORT AUTHORITY

3.1 ENVIRONMENTAL SUSTAINABILITY INITIATIVES OF NEW MANGALORE PORT AUTHORITY (NMPA)

Green Port Initiatives at New Mangalore Port under MARITIME INDIA VISION-2030

New Mangalore Port (NMPT) serves as a prime example of sustainable port development in India, aligning with the ambitious objectives outlined in the Maritime India Vision 2030. Over the past five decades, NMPT has witnessed significant growth in trade and commerce while prioritizing environmental preservation. Embracing the green port initiatives set forth by the Ministry of Ports, Shipping & Waterways, NMPT has spearheaded various endeavors aimed at enhancing its environmental performance.

Situated amidst the scenic beauty of the Arabian Sea and the Western Ghats, NMPT has dedicated 33% of its land area to greenery, establishing a lush green belt around its vicinity. The port has embarked on an extensive tree plantation drive, with over 100,000 saplings planted in the last five years and ongoing efforts in this regard. With ISO 14001 certification underscoring its commitment to environmental stewardship, NMPT has meticulously planned and executed initiatives to address key concerns such as drinking water and sewage management within the port premises.

A significant milestone in NMPT's sustainability journey is the establishment of a Sewage Treatment Plant with a capacity of 1.20 MLD, ensuring efficient treatment of domestic sewage generated within the port and township areas. The treated water is utilized for watering the green belt and sprinkling in operational zones. Additionally, the port has implemented measures to handle hazardous waste responsibly, including the installation of Slop Reception facilities for visiting vessels and the development of an Oil Spill Response plan to mitigate environmental risks.

Recognizing the importance of water conservation, NMPT has implemented a comprehensive rainwater harvesting plan, creating large water bodies covering 64,217 sq. meters within the port area. These initiatives have not only met the port's water requirements but also contributed to the replenishment of nearby village wells.

In a significant move towards renewable energy adoption, NMPT has installed a 5.2 MW solar plant along with rooftop solar panels, generating a total solar energy output of 34.95

million KWH as of December 2021. This has enabled NMPT to meet 100% of its power requirement through solar energy, resulting in a substantial reduction of approximately 29,709 tonnes of carbon footprint and significant cost savings on electricity bills.

Furthermore, NMPT has embraced LED lighting technology for enhanced energy efficiency and embarked on mechanization efforts to minimize dust pollution in operational areas. The port is transitioning to e-vehicles for its fleet, with plans to gradually replace all vehicles with electric alternatives. Looking ahead, NMPT is committed to constructing facilities for solid waste management, exploring opportunities for reusing dredged materials, and evaluating the feasibility of setting up an LNG Terminal to facilitate LNG bunkering.

In addition to adhering to ISO 14001 and MARPOL standards, NMPT is in the process of implementing OHSHAS 18001 certification, underscoring its dedication to international occupational health and safety standards. Through these holistic efforts, NMPT continues to pave the way for sustainable port development in India, ensuring a balance between economic growth and environmental conservation.

3.1.1 PORT RECEPTION PLAN AT NEW MANGALORE PORT

The New Mangalore Port (NMPT) has been actively implementing various green port initiatives in line with the Maritime India Vision 2030, which aims to develop sustainable ports in India. Here are some of the key initiatives undertaken by NMPT.

The New Mangalore Port Trust has its own Slop reception facilities and commissioned during the year 1998 for receiving of Slop oil/ bilge water/ waste oil/ dirty ballast containing oil was discharged by the ship through pipe line berthing at Berth no. 10, 11& 12 and sludge / waste oil from the foreign and coastal vessel will be received in KSPCB authorized road tankers. Operation and maintenance of Port Reception facility was outsourced duly following the E-Tender which is authorized by the KSPCB.

The dedicated 5000 KL tank for receiving Slop oil/ bilge water/ waste oil/ dirty ballast containing oil from foreign vessels and 500 KL tank for receiving Slop oil/ bilge water/ waste oil/ dirty ballast containing oil from coastal vessels.

Fig 3.1 NMPA Slop Reception Facility Area [Source: - NMPA Web]

Fig 3.2 NMPA Slop Reception Facility Tank [Source: - NMPA Web]

- SOPs (Standard Operating Procedure) for reception and disposal of Slop oil/ bilge water/ waste oil/ dirty ballast containing oil / sludge from foreign and costal vessels which was approved by the KSPCB and customs.
- No Port charges are levied for collection of Oily waste and available 24x7, however 24hrs advance notice is required for arrangements.

Fig 3.3 Disposal of waste from foreign and costal vessels [Source: - NMPA Web]

Fig 3.4 Disposal of Sludge /Bilge water from vessel to authorized KSPCB Truck [Source: - NMPA Web]

Standard Procedure for disposal of Noxious liquid substances / liquid chemicals from vessel visiting New Mangalore Port (Annex-II)

- The master/ steamer agent on behalf of vessel will intimate the quantity and details of Noxious liquid substances / liquid chemicals to port the through SwachhSagar Portal.
- According to the declaration from vessel, the port will inform respective Terminal Managers of the cargo receivers for reception and transportation of Noxious liquid substances / liquid chemicals from port.

- The receiver must make necessary arrangement for collection of liquid chemicals from the vessel.
- The concerned shipping agent / Terminal Managers of the cargo receivers has to obtain necessary permission from the Port Authority & Customs for each vessel for disposal of Noxious liquid substances / liquid chemicals.
- The detail of authorized vehicle with GPS tracking and experienced personnel involved in the reception and transportation of Noxious liquid substances / liquid chemicals to be intimated to port by taking the permission.
- The reception operation to be commence in presence in pollution control officer of the port.
- The waste delivery receipt for the Noxious liquid substances / liquid chemicals disposed has to be signed by master of vessel and the terminal manager of cargo receiver.
- The copy of waste delivery receipt to be submitted/forwarded by shipping to the Pollution Control Cell of Marine Department, NMPT (marpol-res@nmpt.gov.in). disposal of Noxious liquid substances / liquid chemicals.
- The waste delivery receipt for the Noxious liquid substances / liquid chemicals disposed has to be signed by master of vessel and the terminal manager of cargo receiver.
- The Terminal Managers of the cargo receivers has to obtain the Bill of entry with applicable duty paid if any which must not charge from the vessel or otherwise Declaration of customs must be submitted to the pollution control cell of NMPT. (marpol-res@nmpt.gov.in)

Swachhta Action Plan Monitoring of activities

Improving the Quality of Harbor water

The Port has dedicated 02 numbers boats meant for cleaning of harbor water regularly twice a day and quality will be monitored every month by testing the Harbor water through NABL accredited Laboratory and all the parameters are complying with KSPCB permissible Standards Total Expenditure: Rs.1.20 Crore during 2022-23

Fig 3.5 Port is handling the ship generated waste from the vessels [Source: - NMPA Web]

3.1.2 GREENBELT AND LANDSCAPING

The Port has created a green belt around its vicinity and has earmarked 33% of its land area exclusively for greenery. For the last 5 years 1 lakh saplings were planted and the process is still going on.

- No one can resist nature. Greenery sooths any number of fried & tense nerves & brings the peace of mind- the utmost necessity of human life.
- NMPA has created surroundings full of natural settings- the wild flowing streams, the tall green trees, the smooth carpet of green grass & myriad variety of flowers, blooming in different colours & size presenting a riot of colours, the nature is full of such beautiful things.
- NMPA premises is having total 54 tree species of plants.
- NMPA has developed gardens in the office premises as well as in the township
- More than 30 acres of garden is well developed in the township as well as office premises consisting of lush green lawns, different types of hedges, different flowering & non flowering shrubs, ground covers, Rockery & water cascades. This beautiful garden of NMPA received first prize in the large-scale garden competition of the flower exhibition- 2001 conducted by Govt. Horticulture dept. & Siri horticulture society- Mangalore
- Under Bamboo plantation mission nearly 500 bamboo plants are planted both in refinery and township for carbon sequestration and improve the aesthetics.

Fig 3.6Greenery of NMPA [Source: - NMPA Web]

3.1.3 ELECTRIC VEHICLE USAGE AT NEW MANGALORE PORT

The port is also not lagging behind in usage of e-vehicles. All the port vehicles will be changed to electrical vehicles in phases. Two electric buses will be hired for transportation in operational areas inside the harbor in view of adopting multi-clean fueled vehicles.

The New Mangalore Port (NMPT) has taken a significant step towards sustainable transportation by introducing electric vehicles (EVs) within its operational area. While the current implementation is limited, it represents a promising start with further expansion potential. Let's delve deeper into this initiative:

Current Scenario

- **Electric Buses:** NMPT currently utilizes two electric buses for transporting port users and stakeholders within the wharf area. These buses effectively contribute to:
    - **Reduced Air and Noise Pollution:** By replacing conventional diesel buses, EVs significantly minimize air and noise pollution within the port premises, improving air quality and creating a quieter working environment for both personnel and wildlife.

- **Carbon Footprint Reduction:** Replacing diesel with electric power translates to lower carbon emissions, contributing to NMPT's overall sustainability goals and mitigating climate change impacts.

- **Electric Cars:** NMPT currently utilizes electric cars for port users and stakeholders within the wharf area. These cars effectively contribute to:
  - **Reduced Air and Noise Pollution:** By replacing conventional diesel buses and cars, EVs significantly minimize air and noise pollution within the port premises, improving air quality and creating a quieter working environment for both personnel and wildlife.
  - **Carbon Footprint Reduction:** Replacing diesel with electric power translates to lower carbon emissions, contributing to NMPT's overall sustainability goals and mitigating climate change impact

Fig 3.7 Chairman launches new fleet of electric cars on 15/09/2023at NMPA [Source: - NMPA Web]

Potential for Expansion

- **Vehicle Fleet Electrification:** NMPT can consider expanding its EV fleet by gradually replacing other diesel-powered vehicles like forklifts, cargo trucks, and service vehicles with electric alternatives. This comprehensive approach would further minimize emissions and showcase NMPT's commitment to clean transportation.
- **Charging Infrastructure:** To support a larger EV fleet, NMPT needs to invest in establishing a robust charging infrastructure within the port area. This includes installing

strategically located charging stations with sufficient capacity and diverse charging options to cater to various EV types and usage patterns.

- **Collaboration with Stakeholders:** Partnering with shipping lines, terminal operators, and local companies to promote EV adoption within the broader port ecosystem can significantly amplify the impact. Incentives for using EVs, joint investments in charging infrastructure, and knowledge sharing can accelerate the transition towards clean transportation in the entire port community.

Pollution Prevention & Reduction measures

In our bid towards improvement of the environmental performance,some of the pollution control measures employed are as follows:

- Utilization of low sulphur fuel oil & Maximization of Refinery Ultra Low Sulphur Off-Gas as fuel.
- Low NOx burners provided in process heaters
- Installed advanced Cyclone system in PFCCU
- Maximum utilization of fin fan coolers, followed by trim coolers for all products and column overheads
- Pioneered the use of Hydrogen peroxide for the removal of Sulphides and Phenols which was later adopted by other Refineries in India
- An advanced Waste Water Treatment Plant having Sequential Batch Reactor (SBR), Membrane Bio Reactor (MBR), Ultra Filtration (UF) and Reverse Osmosis (RO), maximized treated effluent recycle in the Refinery.
- Maximum utilization of Tertiary Treated domestic sewage from Mangalore city.
- Acoustic Hoods, Silencers & Mufflers are provided in various noise-generating equipment drastically reducing noise levels.
- PFCC spent catalyst is being sent to cement industry for Co-processing.
- Oily sludge generated in the ETPs is processed in the Delayed Coker Unit (DCU).
- Installed closed blow down diverters in DCU to mitigate dust and odour generation, if any.
- Installed Fog generation system, dry fog system, closed conveyors, water sprinklers, wind breaking wall and floor sweeping machine to prevent the generation and carryover of dust generation during handling of the Petcoke
- Continuous monitoring is being done for the following environmental parameters,

- Ambient Air quality at 10 locations in and around the refinery.
- 2 Continuous Ambient Air Quality Monitoring Systems
- SOx, NOx, CO and PM in Stack gas (Manual and Online)
- Treated Effluent quality
- Ground and Surface Water quality in and around the refinery
- VOC/ fugitive Emissions survey
- Noise Level inside the process units and along the refinery boundary wall
- Work Environment Monitoring including Industrial Hygiene studies.

3.1.4 SOLAR POWER

NMPT has recently completed the installation of a 5.2 MW solar power plant, complemented by rooftop solar panels on its buildings and storage sheds. This initiative has allowed NMPT to meet 100% of its energy needs from renewable sources. As a result, the port has witnessed a significant reduction of approximately 29,709 tonnes in its carbon footprint over the past five years, leading to substantial savings of around Rs. 23 crores in electricity bills.

In a notable achievement, NMPT has emerged as the first among the 12 major ports in the country to achieve complete self-sufficiency in energy and water resources, while also enhancing green cover within its expansive premises.

Addressing the daily power requirements of approximately 26,000 units for port operations, including residential areas, the solar power generated from the 5.2 MW plants plays a crucial role. NMPT Chairman P.C. Parida emphasized that no other port has achieved such a level of energy independence.

The journey towards solar power adoption at NMPT commenced in response to the government's directive for major ports to embrace sustainable practices in 2015. Since then, NMPT has progressively expanded its solar infrastructure, starting with a 350-kW rooftop power plant in April 2016, followed by a 4 MW ground-mounted photovoltaic plant spanning 14 acres.

Further reinforcing its commitment to renewable energy, NMPT is in the process of commissioning an additional 840-kW rooftop power plant. Chairman Parida mentioned

that despite an initial investment of about Rs. 33 crores in solar plants, the annual savings in power bills amount to approximately Rs. 5 crores, in addition to various social benefits. Previously procuring power at Rs. 9 per unit from MESCOM, NMPT now benefits from solar power at a significantly reduced cost of less than Rs. 3 per unit.

Fig 3.8 Solar Panel Installation

3.2 SOCIAL SUSTAINABILITY INITIATIVES OF NEW MANGALORE PORT AUTHORITY (NMPA)

Corporate Social Responsibility (CSR) and Sustainability is Port's commitment to its Employees, Customers, Business partners, Civil society groups, Government and Non-Government organizations, local communities, environment and society at large to conduct business in an economically, socially and environmentally sustainable manner, whereby it serves the interests of the society by taking responsibility for the impact of its activities. NMPA recognizes direct and indirect impact of its business activities on the society and strives to integrate its business values and operations by a way of conducting business, which enables the creation and distribution of wealth for the betterment of the society at large in an ethical and transparent manner. It is also committed to continuously upgrade its CSR endeavours to make positive impact on the society. NMPA has developed this Corporate Social Responsibility (CSR) and Sustainability Policy as per the MoPSW framework for Sagar Samjik Sahayog Corporate Social Responsibility guidelines for Major Ports 2023. Any point not covered by this Policy would be interpreted in accordance with the guidelines forwarded /issued by Ministry of Ports, Shipping and Waterways from time to time.

Vision of CSR Policy of NMPA: NMPA commits itself to contribute to the society, discharging its corporate social responsibilities through initiatives that have positive impact on society at large, especially the community in the neighborhood of its operations by

improving the quality of life of the people, promoting inclusive growth and environmental sustainability.

Mission of CSR Policy of NMPA: To sincerely & effectively discharge Port's responsibility in the identified CSR thrust areas and other areas listed out in this policy.

The NMPA CSR strategy is linked to the core function of the Port, whereby it achieves a balance of economic, environmental and social imperatives. The thrust of the CSR and sustainability will clearly be on empowerment of communities, inclusive socio-economic growth, environment protection, promotion of green and energy efficient technologies, development of backward regions and upliftment of the marginalized and under-privileged sections of the society.

CSR activity mainly focused social & environmental welfare of the community as per the guidelines issued by MoPSW from time to time. The following are the thrust areas of activities under NMPA CSR;

- Drinking water facility.
- Education and Imparting Vocational training.
- Setting up of skill development centers, imparting skill training, Entrepreneurship Development programme and Placement assistance programme for youth.
- Electricity, non-conventional & renewable energy sources.
- Health and Family Welfare.
- Promotion of livelihood for economically weaker sections through forward and backwards linkages.
- Disaster Management including Relief to victims of Natural Calamities, like earthquake, cyclone, drought & flood etc. in any part of the country.
- Community Centers / Night Shelters / Old Age Homes.
- Basic infrastructure in villages through adoption.
- Construction and / or operation of Hostels (especially those for SC/ST and girls).
- Pollution control measures, environment friendly technologies, preservation / restoration of environment / ecology and for sustainable development goals.
- Sanitation and Public Health Action suggested by the Ministry of Environment, Forest and Climate Change pertaining to Charter of Corporate Responsibility for Environment protection for 17 categories of Industry.
- Waste recycling in civil construction or other public use, STP, oil pollution.
- Activities / projects related to removal of plastic from marine ecology.
- Use of the materials taken out of the dredging activities for the public go

CHAPTER 4

BROAD COMPARISON OF ENVIRONMENTAL SUSTAINABILITY INITIATIVES OF INDIAN MAJOR PORTS IN EAST COAST AND WEST COAST.

4.1 GREEN PORT INITIATIVES OF INDIAN MAJOR PORTS

India's major ports, located on both the east and west coasts, are critical hubs for maritime trade and economic activity. With increasing awareness of environmental sustainability, these ports are implementing various initiatives to reduce their ecological footprint and promote sustainable development. This comparative analysis examines the renewable energy adoption, waste management practices, green infrastructure initiatives, and compliance with regulations in major ports on the east and west coasts of India.

4.1.1 MAJOR PORTS ON THE EAST COAST

1) **Kamarajar Port**

- Installed 20KLD sewage treatment plant at Administration Building and 10KLD Plant at car parking yard.

Fig 4.1 Sewage treatment plant [Source: - KPA Web]

2) **V.O. Chidambaranar Port**

- Installation for 140 KW roof top solar power plant through TEDA.
- Installation of 5 MW ground based solar power Plant through IWs SEC.
- Installed of 500 KVA capacity shore Power supply system for vessels.

3) **Vishakhapatnam Port**

- Installed Solar Panel System – 500 KW Roof top Solar Panels commissioned at Sports Complex.
- Sapling Plantation for Greenery – 1,15,000 No's of Saplings planted (1,00,000 shelter plantation and 15,500 VPT areas.

4) **Chennai Port**

- Implementation of tree and sapling plantation initiatives.

- Planting trees in open spaces, along avenues, and in corners.
- Deployment of rooftop solar power plants with capacities of 100 KW and 400 KW (installed at the Old Administrative Building, Hospital Annex Building, Passenger Terminal, Anchor Gate Building, and Old Diabetic Centre Building). These installations generate approximately 6.5 lakhs units of electricity per year. Additionally, the transition from conventional light fittings to energy-efficient LED light fittings is being carried out gradually, resulting in savings of 9.5 lakhs units per year.

5) Haldia Port

- Installed Wind Screen / Dust Barrier.
- Sapling Plantation for Greenery – 10000 plants in the port area.

6) Paradip Port

- Roof top solar Project.
- Road sweeping machine.
- Sapling Plantation for Port Greenery.
- Sewage treatment Plants.

4.1.2 MAJOR PORTS ON THE WEST COAST

1. Mormugao Port

- Roof Top solar Power system 200KW (150KW + 50KW) at Mormugao Port.

Fig 4.2 200-MW of Rooftop Solar Systems [Source: - Mormugoa Port Authority Web]

- Shore Power supply to breakwater & Mole berth (400KVA) at Mormugao Port.
- Shore Power supply at Finger Jetties No.2 and No.3 (400 KVA) at Mormugao Port.

- Tree Plantation at Port's Operational and Non- Operational areas.

  In the Year 2018 – 2019 they Planted 1000 Plants

  In the Year 2019 – 2020 they Planted 2500 Plants

  In the Year 2020 – 2021 they Planted 1350 Plants

Fig 4.3 Tree Plantation drive at Mormugao Port [Source: - Mormugoa Port Authority Web]

2. Cochin Port

- Monitoring water and Sediment Quality parameters at seven locations in the back water of cochin port.
- Monitoring of Ambient Air Quality at four locations in cochin port.
- Stack Monitoring near the DG Set in the Power House.
- Noise level monitoring at three locations in the Port Sea.
- Effluent Treatment Plant at Cochin port Trust Hospital.
- Plantation of tree saplings.
- Installation of Bio-digesters.

- Septage treatment Plant of 100 cu' m. capacity in the Port area at South end of Willingdon lsland.

- Road sweepings, office waste, Waste materials from quarters' shops etc. are being collected, segregated to Bio- Degradable & Non Bio Degradable by the Kudumbasree workers engaged by the Kochi Municipal Corporation and transported to the Waste Disposal Plant of KMC at Brahmapuram.

- Single used Plastic Kits, Bags, Bottles etc. are being collected in the Dust Bins provided at various Office Premises and are being shredded into small particles and

reused it by mixing the same in the Tar Mix for road work.[10]

- Solar power plants by Port.
- Shote power /cold ironing.

Fig 4.4 Floating solar plant at Cochin Port [Source: - Cochin Port Authority Web]

3. **Deendayal Port**

- Preparation- of Environment Management &. Monitoring Plan (EMMP) or Green Plan.
- For acquiring equipment required for monitoring environmental pollution.
- For setting up of Sewage / Waste water treatment Plants / Garbage Disposal Plant.
- Sapling Plantation for Greenery - The MoU has been executed between DPT and Forest DePartment for 35200 Plantation and Maintenance over 31.94 Ha. DPT land at New Kandla and greening of Gandhidham UPto FY2021.
- Wind Farm of 6.0 Mw(3*2Mw) WTG's & Wind Farm of 14.7 MW (7*2. lMW) WTG's.

4. **Jawaharlal Nehru Port**

    - Environmental Monitoring as part of Environmental Management and Monitoring Plan the ambient air, marine water, marine ecology, drinking water, sewage quality, noise level is monitored through IIT Madras.
    - Continuous Ambient Air Quality Monitoring Station (CAAQMS).
    - Solid Waste Management awareness training sessions conducted for JN

1. [10] https://paradipport.gov.in/
2. https://vizagport.com/
3. https://www.chennaiport.gov.in/home

Port Employees, Schools, Township Residents, Central Industrial Security Force, JN Port Cleaning Workers, and Truck Drivers etc.

- Sapling Plantation for Greenery – 34% of the Port area is under green cover including mangroves Port, 5000 Tree Plantation in Port estate.[11]
- Setting up Projects for energy generation for renewable energy sources- Roof top Solar System. The installed capacity of solar power system at JNPT. & Installation of 0.8 MWP solar plant.

5. **Mumbai Port**
    - Reception facility for Waste Oil/Sludge/Slops generating from Ships.
    - Installation of Roof top Solar PV System - Roof top with combined capacity of 401kWp installed on CAPEX model.

6. **Syama Prasad Mookerjee Port**
    - Installed the Dust Barrier.
    - Sapling Plantation for Greenery - 2000 Sq.M area.
7. **Kandla Port**

    Continuous Ambient Air Quality Monitoring Station (CAAQMS).

    Solid Waste Management awareness training sessions conducted for JN Port Employees, Schools, Township Residents, Central Industrial Security Force, JN Port Cleaning Workers, and Truck Drivers etc.

    Sapling Plantation for Greenery – 34% of the Port area is under green cover including mangroves Port, 5000 Tree Plantation in Port estate.

Renewable Energy Adoption

Renewable energy adoption is a cornerstone of sustainability initiatives in major ports across India. Both east and west coast ports have demonstrated a commitment to integrating renewable energy sources, particularly solar power, into their operations.

On the east coast, Paradip Port in Odisha stands out for its significant strides in renewable energy adoption. The port has invested in solar power installations to reduce its reliance on fossil fuels and mitigate carbon emissions. Similarly, Chennai Port in Tamil Nadu has

4. [11] https://www.vocport.gov.in/
5. https://smportkolkata.shipping.gov.in/

embraced solar energy solutions, leveraging its abundant sunlight to power port operations. These initiatives not only contribute to environmental sustainability but also reduce operational costs over the long term.

On the west coast, ports like Jawaharlal Nehru Port (JNPT) in Maharashtra have also prioritized solar energy adoption. With its large-scale solar power installations, JNPT has reduced its carbon footprint and contributed to India's renewable energy goals. Mumbai Port, another major port on the west coast, has followed suit by implementing solar power projects to harness clean energy and reduce reliance on conventional power sources.

Waste Management

Effective waste management practices are crucial for minimizing environmental pollution and promoting sustainability in major ports. Both east and west coast ports have implemented robust waste management systems to address this challenge.

Ports on the east coast, such as Chennai Port and Visakhapatnam Port, prioritize waste management as part of their sustainability strategies. These ports have established comprehensive waste segregation, recycling, and disposal mechanisms to minimize pollution and promote a cleaner environment. By implementing efficient waste management practices, these ports not only reduce their environmental impact but also contribute to the overall health and well-being of local communities.

Similarly, ports on the west coast, including Mumbai Port and Kochi Port, have adopted similar initiatives to manage waste effectively. Through the implementation of waste segregation programs, recycling facilities, and proper disposal methods, these ports mitigate pollution and promote sustainable waste management practices. By prioritizing waste management, these ports demonstrate their commitment to environmental stewardship and responsible resource utilization.

Green Infrastructure

Investing in green infrastructure is essential for mitigating environmental impact and promoting sustainability in major ports. Both east and west coast ports have implemented various green infrastructure projects to achieve these objectives.

On the east coast, ports like Paradip Port and Visakhapatnam Port focus on afforestation drives and pollution control measures as part of their green infrastructure initiatives. By planting trees and implementing measures to reduce pollution from port activities, these ports enhance local biodiversity and mitigate environmental degradation. Additionally, these

ports invest in green spaces and eco-friendly infrastructure to create sustainable environments within port premises.

Similarly, ports on the west coast, including Mumbai Port and JNPT, prioritize green infrastructure projects such as rainwater harvesting and sewage treatment plants. These initiatives aim to conserve water resources, minimize water pollution, and enhance environmental sustainability. By investing in green infrastructure, these ports demonstrate their commitment to sustainable development and environmental conservation.

CHAPTER 5

FINDINGS AND CONCLUSION

5.1 FINDINGS

The findings presented in the introductory chapter serve as guiding lights, illuminating the path towards a more sustainable future for Indian ports. It's evident that sustainability has transcended its status as a buzzword and has entrenched itself as a focal point for port authorities, policymakers, and stakeholders alike. The delicate balancing act between economic advancement and environmental stewardship emerges as a central theme, emphasizing the imperative of adopting a holistic approach to port operations.

Moving on to the review of literature, it's akin to embarking on a treasure hunt through the vast expanse of existing knowledge on sustainable port development in India. As I sift through studies by eminent scholars such as K. Eswari, Dr. K. Yogeswari, Mihir K Das, and Balaji Balasubramanian, I glean insights into diverse facets of sustainability, ranging from environmental impact assessments to corporate social responsibility. Themes of community engagement, regulatory efficacy, and capacity building resonate deeply, underscoring their pivotal roles in fostering sustainable port ecosystems.

The third chapter unfolds like a case study, offering a close-up examination of the environmental and social sustainability initiatives undertaken by the New Mangalore Port Authority. Here, I witness the tangible manifestations of sustainability in action – from waste management protocols to community development endeavors. The port's unwavering commitment to balancing economic prosperity with environmental and social responsibility serves as a beacon of hope, illustrating the transformative power of sustainable practices.

In the subsequent chapter, a broad analysis of environmental sustainability initiatives across major Indian ports unfolds before me. It's akin to surveying a landscape dotted with varied hues of sustainability endeavors, each port boasting its strengths and grappling with its weaknesses. Yet, amidst this diversity, a common thread emerges – the urgent need for standardized practices and knowledge sharing to elevate the entire industry's environmental performance.

Finally, in the synthesis chapter, the pieces of the puzzle come together to form a cohesive picture of sustainable port development in India. The findings resonate with me on a profound level, reaffirming the multifaceted nature of sustainability and the collective responsibility incumbent upon all stakeholders. As I reflect on the implications of this study, I am filled with a sense of optimism tinged with urgency – optimism for the transformative potential of sustainable practices and urgency to translate insights into action.

5.2 CONCLUSION

In conclusion, the study on sustainable port development in India has shed light on the critical importance of balancing economic growth with environmental conservation and social responsibility in the port sector. Through a comprehensive review of literature, analysis of environmental and social sustainability initiatives at New Mangalore Port, comparison of sustainability practices across major ports, and synthesis of key findings, the study has highlighted the challenges, opportunities, and best practices in promoting sustainability in Indian ports.

The findings underscore the need for a holistic approach that integrates sustainable indicators, community engagement, regulatory effectiveness, and capacity building to enhance sustainability in the port industry. By emphasizing the significance of adopting best practices, standardizing sustainability measures, and fostering collaboration among stakeholders, the study provides valuable insights for policymakers, port authorities, and stakeholders to drive sustainable and resilient port development in India. Moving forward, continued efforts towards sustainable port development will be essential to ensure long-term environmental, social, and economic benefits for the Indian port sector and the communities it serves.

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