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A STUDY ON PRACTICAL CHALLENGES OF IMPLEMENTATION: GREEN PORTS in India with special reference to Sustainable Growth: Comparative Analysis

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ABSTRACT – The Government of India has announced Green Ports policies aimed at minimizing waste, carbon, and other harmful emissions from major ports to meet COP26 targets and commitments. The regulations to achieve this goal aim to minimize carbon intensity and create a zero-pollution ecology in the major ports of India with the help of key stakeholders such as, logistics providers, terminal operators' liners, etc. The main objective of the paper is to understand and critique the ongoing initiatives in Indian ports, identify the gaps between these initiatives and the policies, and how easily these policies can be modified to achieve Sustainable Development Goals.
KEYWORDS: Major Ports, Green ports, SDGs, Carbon gas emissions, Green Project Initiatives, Environmental studies.

Introduction:

Indian ports are vital for forex trading and increasing government revenue in different countries. Manufactured goods can only earn foreign currency if they are exported. Airlines cannot deliver certain items. In addition to providing berths, ports are essential for ships to load and unload general cargo. World events are also important for international trade. Covid and the war in Ukraine have made the global economy more stable, but it remains weak. The war in Ukraine has made an economic recovery less likely. However, the impact of global energy markets on prices may result in lower inflation, lower energy prices and lower prices. [1]. The 26th **The United** Nations announced 17 new Sustainable Development Goals and 169 goals to be achieved by 2030.Discussions on maintaining the temperature rise at 1.5°C from 31 October to 13 November 2021. In line with the climate change treaty, India took into account the "Panchami" with the following considerations: I) 500 GW of non-fossil energy capacity by 2030 is the target. By 2030, 50% of energy will come from renewable sources') Save one billion tons of CO2 emissions by 2030.iv) Reducing the carbon intensity of the economy by around 50% by 2030.v) Achievement of the next target of near-zero emissions by 2070.Green gas is essential for reducing gas emissions. The lightest element, hydrogen or H2. The different types of this lighter gas are grey, blue and green. Gray hydrogen is produced by reforming methane with lignite or brown coal, and blue hydrogen is produced by coal gasification combined with a carbon capture storage process; and green hydrogen is produced by electrolysis of water using electricity from renewable energy sources2]. India's ability to export green hydrogen will be greatly facilitated by its ports, which will also facilitate the construction of the necessary equipment, fuel stations, storage bunkers, etc. Ports will also use methanol or ammonia as fuel. [3]. Green hydrogen is essential to

reduce emissions. It is the lightest element, hydrogen or H2. The three types of hydrogen are grey, blue and green. Gray hydrogen is produced by steam reforming of methane using coal or lignite, while blue hydrogen is produced by gasification of natural gas or coal combined with carbon capture. and green hydrogen is produced by electrolysis of water with electricity from renewable sources [2]. India's ability to export green hydrogen will be greatly facilitated by its ports, which will also facilitate the construction of key equipment, fuel stations, storage bunkers, etc. Ports will also use methanol or ammonia as fuel. [4]. Climate change and loss of biological diversity are two aspects of sustainable development that primarily affect environmental protection. The focus of sustainability is primarily on the environment, the economy and society. Sustainable development was first institutionalized in 1992 at the Earth Summit in Rio de Janeiro. In September 2015, **The United** Nations announced 17 new Sustainable Development Goals and 169 goals to be achieved by 2030.The road to the Sustainable Development Goals was paved by the **Rio** Declaration on Environment and Development, World Summit on Sustainable Development, Human Development Goals Summit, Agenda of the International Conference on Population and Development, etc. The five Ps – people, Planet, Prosperity, Peace and Partnership – are the main priorities. Sustainable Development Goal 9 of the Global Development Goals requires resilient infrastructure that promotes inclusive and sustainable industrialization and promotes innovation. This goal was largely achieved through the efforts of Green Harbour. However, these projects also directly benefit other Sustainable Development Goals. Since India is a peninsula, it has an **East Coast** and **West Coast.** There are six major ports on the east coast: **Port** Syama Prasad Mookerjee, formerly called Kolkata Port Trust, Paradip Port, Visakhapatnam Port, Chennai Port, VO Chidambar Anar Port and Enmore Limited Port, and six major ports on the east coast West Coast: Port Authority of Cochin, New Port of Mangalore, Mormuga. In addition, there are 205 small ports in India, of which 68 are considered insignificant on the east coast of India and 137 are considered insignificant on the west coast of India. The port known as Port Vert operates an environmentally friendly and sustainable port activity that helps reduce greenhouse gas emissions. The most important
areas in which the Green Ports projects are implemented are presented below:

SNo.	Interest areas	Expected by 2030	Expected by 2047
1.	Green Coverage	20	33
2.	Complete Electrification of all the equipment and vehicles	+15%	+90%
3.	Port craft areas	Maximize the use of resources: water treatment, wastewater treatment,	

		desalination and rainwater harvesting	
4.	Sustainable Energy	58%	+90%
5.	Power to the Ship from shore	All vessels 2025	
	Maximize resource use - water treatment, wastewater treatment, desalination and rainwater harvesting	By the year 2030	
6.	Energy efficiency Plant	+20%	
7.	Coastal Shipping facility	Creating the required infrastructure	
8.	Effluent Discharge facility	To ensure policies are followed to ensure policies are followed	
9.	Marine Ecosystem facility	To ensure policies are followed to ensure policies are followed	
10.	Waste Management procedure	To follow the guidelines	
11.	Environment balanced Management	To follow the guidelines	

SN number. Areas of interest expected by 2030to 2047 expected1. Green Coverage 20 332. Complete Electrification of all the equipment and vehicles +15% +90%3. **Seaport** areas Development **of green** hydrogen production capacity of 5 million tons per year and 50 million tons to reduce CO2 emissions. Sustainable Energy +60% +90%5. Supply all ships on land by 2025. Maximum use of resources: water treatment, wastewater treatment, desalination and rainwater harvesting by 20306. Energy efficiency +20%7. Installation of cabotage Creation of the necessary infrastructure8. Drainage installation to ensure compliance with guidelines9. Structure for the marine ecosystem to ensure compliance with the guidelines10Waste Disposal Procedures Follow guidelines11. Environmentally sustainable management Compliance with guidelines

Review of Literature:

Sustainable green ports are a contentious issue worldwide as they aim to reduce greenhouse gas emissions to the lowest possible levels while limiting global warming to the COP26 target of 1.5%. Although there are many different modes of transport, rivers are the most common logistics option for many goods. About 80% of all world trade is carried out by sea, in underdeveloped countries this number could be even higher. [5] The ports will connect shipping lanes with other modes of transport to boost international trade. Due to the large amount of goods traded worldwide by sea, many pollutants cause environmental degradation and destruction. While this eases the logistics

of moving large volumes of cargo, the lack of sustainability in the shipping industry currently causes emissions to be an issue. A well-known development idea **Sustainable** development, which consists in meeting the needs of the present without jeopardizing the needs of the future. The interaction between economy, society and environment is part of the most widespread notion of sustainable development. Instead of giving equal importance to the economy and society, the new paradigm must prioritize the environment.[6]. Warship emissions are explained by a number of studies. However, very few of them address in detail the pollution caused by port operations and the need for sustainable port practices. In the context of sustainable development, ports must be transformed into "green ports". This includes regulating emissions, conducting business properly, implementing green technologies and more.[7]. The degradation of ecosystems results from the operation of ports without protecting nature and the surrounding environment. In this context, it is extremely important to build clean and ecological ports. According to Anderson et al. 'Green ports' represent a revolutionary strategy for achieving sustainable growth that prioritizes the environment over other factors while the port industry grows and expands. It measures the ability of green ports to reduce air, noise, liquid, solid and waste pollution and protect marine life [8]. To promote sustainable development, several countries have started converting existing international ports into green ports. It is estimated that India has the largest population in the world, with the shipping sector accounting for 95% of all trade. Ports play a key role in reducing emissions and their impact on the climate. To achieve net-zero emissions by 2070, India has developed guidelines for the Harit Sagar Green Port. These Green Harbor Principles provide a framework to encourage green initiatives, guide development and set a model for the promotion of all Indian ports. **The main** assumptions of the guidelines include reducing greenhouse gas and other gas emissions, maximizing the use of clean and green energy, **and** implementing green **technologies.**in operational ports, and managing waste according to the 5Rs (waste, recycle) principle.) and monitoring of environmental impact. port operations.9]. The **purpose** of this research project is to clarify the recently proposed standards in India and to assess the current **operations** of the country's major ports in **line** with **green port standards**. The results of this study aim to provide a clear picture of how major Indian ports manage to achieve sustainability

. STUDY– This document mainly focuses on green port development activities in a variety of topics, including solar power plants, electric vehicles and other port equipment, environmentally friendly bunker and fuel stations, ammonia fuelling and other LNG **filling stations, charging stations for** electric **vehicles.**, offshore wind projects, **onshore power,** green roofs, shipping, waste recycling and wastewater **bans.** Table: Current Status of Green Port initiatives in the Coastal India-East:

Green Port Innovative	SMPort	Pardip	Visakhapatnam	Chennai	EPL	VOCA

Solar based power plants	1 M. W	10 M.W-Proposed	10 M.W 280-Kilowatt Rooftop	500 K.W	300 KW	1065 K.W
Electric based vehicles & other equipment	Not existing	Not existing	Not existing	Not existing	Not existing	Six electric cars
Green Ammonia bunkers & refuelling plants	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
LNG Bunkering availability	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
Electric Vehicles charging points	Not existing	Not existing	Not existing	Not existing	Not existing	Available
Offshore wind energy projects	Not existing	Not existing	Not existing	Not existing	Not existing	2MW
Shore to Ship Power supply	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
Green Cover	available	Applicable	Applicable	Applicable	Applicable	Applicable

Coastal Shipping	available	Applicable	Applicable	Applicable	Applicable	Applicable
Waste Management	available	Applicable	Applicable	Applicable	Applicable	Applicable
Prohibition of Effluent discharge (MARPOL)	available	Applicable	Applicable	Applicable	Applicable	Applicable
Cargo traffic (Metric tonnes)	58.175	116.133	69.03	48.56	38.74	34.12
Cargo handled (Coal, Fertilisers, Liquid cargo) %	16.20	54.67	36.68	0.56	56.43	26.67
Operating Income	2642	1733.32		833.77	832.63	596.83
Operating expenditure	1670	682.44		571.74	159.32	246.40
Operating ratio	63.32%	39.40%		68.58%	19.33%	45.28%

*Data obtained from Administrative and Annual Accounts and Audit Reports of respective ports' websites for the financial year 2021-22.

Table 2 Status of Green Port initiatives in the West Coast

Green initiatives	Copa	NMPA	MoPA	MbPA	JNPA	DPA

Solar power plants	Not existing	available	240 KW	available	available	
Electric Powered vehicles & port equipment	Not existing	available (2 electric buses)	Not existing	Not existing	Not existing	Not existing
Green Ammonia bunkers &refuelling facilities	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
LNG Bunkering	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
Electric Vehicles charging stations	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
Offshore wind energy projects	Not existing	Not existing	Not existing	Not existing	Not existing	Not existing
Shore to Ship Power supply	available	Not existing	available (for Indian navy/Coast Guard vessels)	Not existing	Not existing	Not existing
Green Cover	available	available	available	available	available	Yes
Coastal Shipping	available	available	available	available	available	available
Waste Management	available	available	available	available	available	available
Prohibition of Effluent discharge (MARPOL)	available	available	available	available	available	available
Cargo traffic (In metric tonnes)	34.56	39.30	18.60	59.90	75.99	127.12

Cargo total handled (Coal, Fertilisers, Liquid cargo) %	0.92	12.90	69.33	20.30	0	21.67
NOI	715.81	644.85	433.38	1896.97	2186.62	1971.93
NOI	367.31	260.23	258.83	1110.58	1211.58	816.26
Operating ratio figure	51.5%	40.37%	59.73%	58.55%	55.42%	41.38%

Source: Admin, Annual and Audit Reports of. Ports Websites (FY-2021-22)

Discussions and Results:

Analysed data currently available shows that the east coast will handle 364.75 million tons of freight traffic in fiscal year 2021/22, while the west coast will handle 355.28 million tons. Hard coal, fertilizers, iron, POL products, containers and other goods are handled in the port. Coal, fertilizer and iron ore are some of the most polluting transported goods.154.81 million tonnes (42%) and 90.64 million tonnes (25%) of pollutants are treated on the east and west coasts, respectively. One of the best forms of green energy is solar energy. When it comes to harnessing solar energy for operational purposes, the major ports on the east coast fare better than those on the west coast. The potential for expanding wind energy is enormous. Port VO Chidambaram has started to invest in harnessing wind power as an energy source on the east coast. Electric cars are a new technology that will help reduce carbon emissions. However, only a few ports have started using electric vehicles. However, only a few ports have started using electric vehicles. In addition, charging infrastructure will be installed in all ports to encourage the use of electric vehicles. All major ports should introduce incentive programs for private contractors, longshoremen, middlemen and export and import ports for the use of electric cars in ports and transport to non-port destinations. In order to reduce greenhouse gas emissions, the ports should immediately set up "green" ammonia bunkers, filling stations and LNG bunkers. Every port is obliged to set up infrastructure that will enable ships to be gradually supplied with energy on land. By the end of 2023, the first phase of shore power supply for these vessels will be completed, followed by a second phase for naval and other coastal vessels in 2024 and a third phase for EXIM vessels in 2025.Each port supports the promotion of vegetation, cabotage, waste management and the reduction of wastewater emissions. Ports should encourage tenants of port land to develop green spaces by offering rent discounts to increase the number of green spaces. The Indian coast offers greater potential for cabotage. Increased movement of people and goods between coasts of India will reduce fuel consumption, traffic congestion and urban pollution. While waste management is a priority for all ports that has not been measured, green initiatives are now establishing measures to measure and monitor the amount of waste generated and disposed of in order to sort a variety of waste such as hazardous waste, e-waste, etc. solid waste. Results based on plastics, battery

waste, construction and demolition waste and biomedical waste. The waste water is also sufficiently cleaned in all ports. ships on the coast.

The exploitation rates on the east and west coasts are 50% and 51% respectively. Major ports on the east and west coasts score well in terms of operational efficiency. However, all ports except JNPA, a container-focused port, emit large amounts of pollutants due to their daily operations. In order to replace the existing equipment and buy new ones, it is necessary to put into operation environmentally friendly cargo handling facilities. Cargo affected by the must be stored in covered sheds and all open cargo must be properly covered a tarpaulin. Environmental performance indicators covering waste management, sustainability and air, water, waste water and noise pollution should be reviewed for implementation and compliance in all major ports. The environmental verifier should independently produce environmental performance indicators, which should then be uploaded to their website. All ports are financially burdened with pensions and other social costs, but funds from the port's operating margins should be used for green port programs that promote the long-term development of present and future generations in the region where the port operates. conclusion: Compared to large West Coast ports, large East Coast ports handle more polluting cargo while protecting the environment through eco-friendly activities such as solar power, wind power, electric cars, electric charging infrastructure, etc. West Coast ports handle less polluting cargo, but need to differentiate still advocate for environmentally friendly measures to support sustainable development on the west coast.For the 2021-2022 financial year, all ports will have an operating surplus of around Indian rupees. 7,918 crore or 50% of operating margin. Even a 1% operating surplus, i. H..79 crore rupees per year, will contribute significantly to the conservation of the major Indian ports ecosystem that is being damaged by this activity. The current analysis is based on annual reports from major ports, which focus more on financial and traffic statistics than on environmental data.. Although environmental measures are now being implemented in all major ports, there is no monitoring and reporting system. The so-called Green Harbor guidelines have produced a clearly defined compliance methodology and goals. After putting these recommendations into practice, there is still room for further research on this topic.

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