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Indian Maritime Logistics: Issues And Security Concerns

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Abstract
Maritime Logistics is an integral part of the supply chain for most industries, making it a backbone of global trade. There are 12 major and 187 non-major ports in India. Approximately 95% of the country's merchandise trade by volume and 68% by value is moved through Maritime Logistics.The paper aims to highlight the Indian Maritime logistics security issues. Transit risk is high for Maritime Logistics as it is vulnerable to many challenges like cyberattacks, piracy, port congestion and climate change. Stakeholders of Maritime logistics must take measures to protect themselves from security lapses.

Keyword: *Indian Maritime Logistics, Maritime Security*

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I. Introduction

Maritime Industry is basically waterborne commerce which facilitates trade by transporting cargo on water bodies from one place to another. Maritime service providers are the operators of Ports, Harbours, Shipping companies, Ship engineering companies (building and repair), warehousing and shipment companies. Maritime Logistics is an integral part of the supply chain for most industries, making it a backbone of global trade. Around 80%of global trade in volume and 70% by value are done by Maritime Logistics Companies (UNCTAD, 2022). In 2020 the volume of International maritime shipment was 10.65 billion tons. The capacity of the worldwide merchant fleet grew by about 37 percent between 2013 and 2020, reaching almost two million deadweight tons in 2020 (Statista). Maritime logistics security is measures the industry's stakeholders take to protect it from security breaches. Transit risk is high for Maritime Logistics as it is vulnerable to a plethora of challenges like cyberattacks, piracy and climate change.

II. Review Of Literature

Sarkar et al. (2023) conducted a study on port logistics from Indian perspective. The study highlighted that existing port operating are old and inefficient. The study developed a conceptual framework of issues faced by players involved on port logistics in Industry 4.0 era. The study conducted semi-structured interview and adopted Soft System Methodology (SSM) to understand key challenges faced by port logistics during information transfer, cargo shipment and cargo arrangement.

Tsvetkova and Hellstrom (2022) conducted a descriptive study on the disruptive technology of autonomous shipping. The study discussed critical areas of Maritime Autonomous Surface Ships (MASS). The study discussed value created by MASS and also states the beneficiaries who can leverage and monetize the disruptive technology. The study suggested that autonomous shipping has greater potential in marine logistics.

Iyer and Nanyam (2021) analysed the technical efficiency of 26 coastal terminals in India from study period ranging from 2015-2018. The study used Data envelopment analysis approach for data analysis and interpretation. The study ranked the terminals on the basis of their performance. The study also highlighted the reason for inefficient performance of the terminals. The study found out that terminals in the western coast of India are performing better than the eastern coast in India.

Chandra et al. (2020) analysed the modal shift from road to coastal shipping with reference to automobile logistics in India. The study proposed a mathematical model aimed to optimize the coastal shipping route plan. The study conducted an exploratory study highlighting enablers and challenges in coastal shipping adoption. The study suggested current business and regulatory environment are conducive to modal shift.

Prajapati et al. (2020) studied the key factors impacting the efficiency of Indian Shipping logistics sector. The study ranked the factors associated with the shipping logistics required to make efficient shipping

logistics system. The study proposed a new model hybrid MCDM method with factors ranked accordingly namely- environmental sustainability, supply and demand, operations and port selection.

Birkel and Hartmann (2019) conducted a systematic review discussed comprehensive overview of the risk emerged due to the use of Internet of Things (IoT) technologies in supply chain. The study also raised the security issues as further research directions in technological and environmental sectors of the use of IoT technologies. The review focused on areas like macro-environmental and organisational challenges and risk in maritime sector.

Lee et al. (2018) studied Maritime logistics initiated by Chinese government namely the 'Silk Road Economic Belt' and '21st Century Maritime Silk Road'. The study discussed the impact of controversial corridor on structural change of maritime logistics. The study concluded that corridor development would encroach the scope of the hinterland in China and ASEAN region. The study highlighted that these Chinese projects of Maritime would negatively influence competition in Singapore ports and further cause relocation of manufacturing zones.

Kalogeraki et al. (2018) identified threats of maritime supply chain. The study proposed a knowledge management methodology in maritime supply chain using semantic web technologies to identify cyber threats in critical infrastructure. The study highlighted the importance of MITIGATE methodology to identify cyber threats on critical cyber infrastructure. The study explored the process- and asset based knowledge management in supply chain. The study highlighted that knowledge flow and content regarding creation, storage, and reuse in providing support.

Voyer et al. (2018) discussed the importance of maritime security to support Blue economy with special reference to Indian Ocean Region (IOR). The study highlighted maritime security facilitates secure navigation routes, receiving critical oceanographic data, protecting marine resources and economic development. The study suggests synergy of marine security and blue economy.

Khurana (2017) conducted a studyon India's Maritime Strategy. The study stressed on the importance of maritime military power and its role in shaping the geo-political, security and economic environment. The study have discussed role of India as 'Net Security Provider' who plays crucial role in regional security and stability.

Tummala and Schoenherr (2011) analysed risk in supply chain risk management. The study proposed a risk management process customised for supply chain. The study categorised risk into phases like risk identification, risk measurement and risk assessment. The study further highlighted phases like risk evaluation, risk mitigation and contingency plans. The study also discussed risk control and management in data management system.

Celik (2010) studied the decision making process regarding operational requirements of merchants ships. The study carried out SWOT analysis and analysed Analytical hierarchy process (AHP) and Technique of order preference by Similarity to Ideal Solution (TOPSIS). The study highlighted the importance of selection of proper adequate marine supplier. The study suggested the importance of SWOT, TOPSIS and AHP methodologies to facilitated the decision making process of supplier selection.

Research Gap

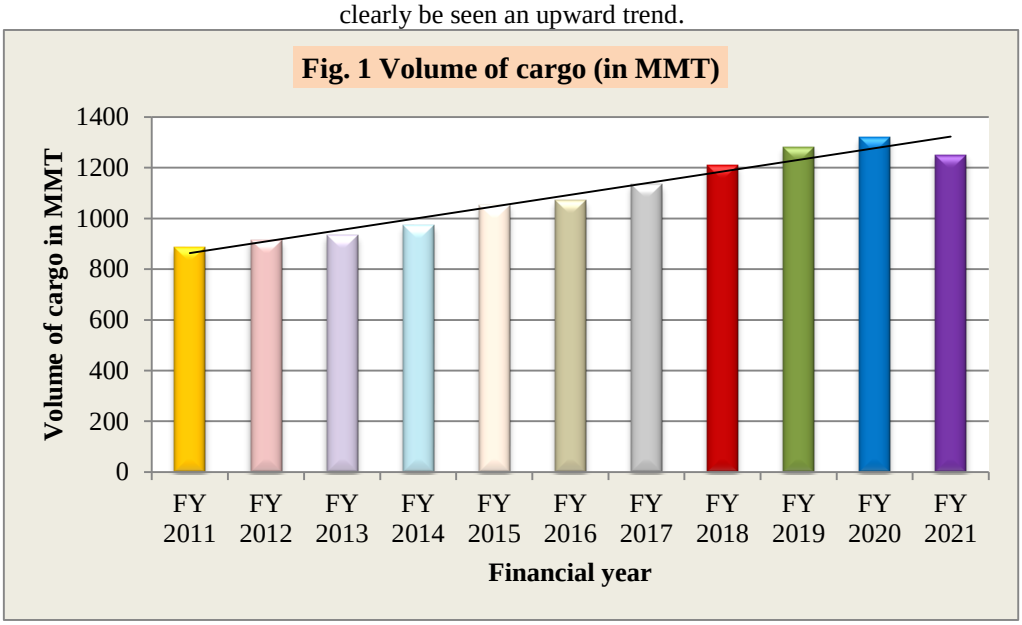
After an in-depth study it was found that many existing studies both national and international focused on issues like efficiency of maritime logistics. Many studies have propounded models aiming towards improved efficiency of the maritime sector. Some international research has been conducted on Maritime security. But in Indian context the sensitive research area of maritime security issues and challenges has not received the mush required attention.

III. Indian Maritime Logistics: present scenario

India is a major maritime economy and has a vital role in the world's maritime economy as it is locatedstrategically on the world's shipping routes. India has the seventh longest coastline in Asia, which measures about 7516.6 kilometres, out of which 5423 km is in the peninsular region, and 2094 is in the Island region of Andaman and Nicobar Island and Lakshadweep Island. Presently, there are 12 major and 187 non-major portsin India (IBEF Report, 2021). Approximately 95% of the country's merchandise trade by volume and 68% by value are moved through Maritime Logistics. In 2021, the volume of cargo shipped was 1249.99 million metric tons (Sagarmala Report, 2021). In 2011, the volume of cargo handled by Indian Maritime logistics was 885.45 million metric tons,and in 2021, it was 1249.99, evidencing a 0.41% year-on-year growth. Among major dry commodities, India exports 2% of total export globally and Imports 18% of coal.

Figure 1 depicts the total volume of cargo handled in Indian ports from the financial year 2011-2021. It can clearly be seen an upward trend.

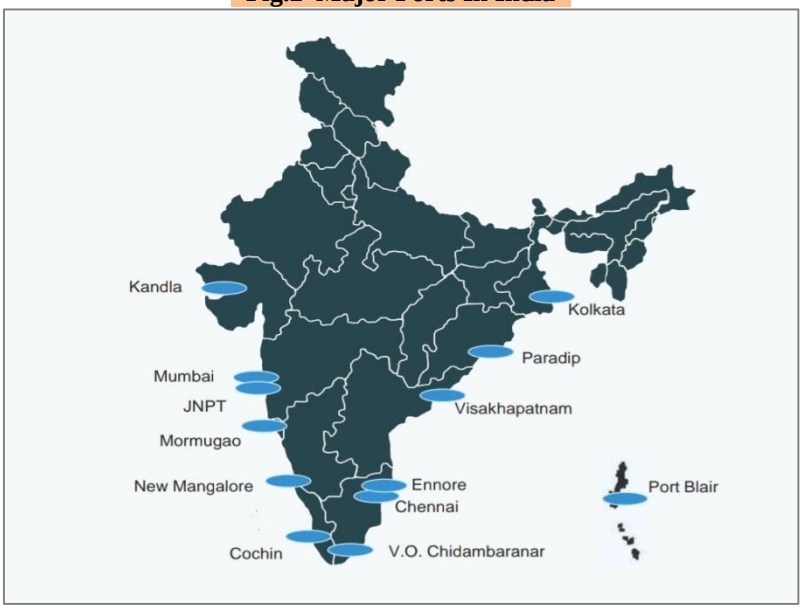
Fig. 1 Volume of cargo (in MMT)



Source: https://www.statista.com/statistics/693091/coastal-cargo-volume-handled-by-major-port-india/

Figure 2 depicts the location of India's major ports in country's map. According to the Indian Port Act, 1908 major port are owned and managed by the Port trust and central government.

Fig.2 Major Ports In India



Source: IBEF report on Ports, 2022

Table 1 shows the volume of cargo handled across India by major ports in 2021. The traffic handled at major ports was 704.6 million tons, evidencing growth of 0.8% during the same period

Table: 1 Volume of total cargo handled by major ports, 2021	
Major ports	Volume (million metric tons)
Deendayal(Kandla)	117.57
Paradip	114.55
Visakhapatnam	68.84
JNPT	64.81
Mumbai	53.32
Haldia D. C.	45.47
Chennai	43.55
New Mangalore	36.5
V. O. Chidambaranar	31.79
Cochin	31.5
Kamarajar (Ennore)	25.89
Mormugao	21.99
Kolkata D. S.	15.9

Source: https://www.statista.com/statistics/693091/coastal-cargo-volume-handled-by-major-port-india/

Objective

To highlight the Indian Maritime logistics security issues

IV. Methodology

The study uses a qualitative research method. The data type is secondary in nature, collected from various journals, government reports and books. Government reports were collected from various websites like Ministry of Ports, Shipping and Waterways, and SagarMala- Ministry of Shipping, Allianz Global Corporate Specialty (AGCS), and International Maritime Organisation.

V. Indian Maritime Logistics issues And security concerns

The paper discusses four Indian Maritime Logistics issues, namely Cyberattack, Climate Change, Piracy and Port congestion

Cyberattack

Cybercriminalsare attacking Maritime Logistics companies. As per the survey report conducted by Allianz Global Corporate & Specialty (AGCS), almost 44% of maritime professionals have testified that their organisation has been cyberattacked in the past three years. Some of the world's biggest Maritime logistics companies were under cyberattack. Logistics giants- Expeditors International was hacked on February 2022; Hellman Worldwide Logistics was hit by ransomware in December 2021;Marten Transports on October 2021, Port of Houston on August 2021, Maersk, Mediterranean Shipping Companies (MSC), COSCO, Compagnie Maritime d'Affretement and Compagnie Generale Maritime(CMA CGM) and the list goes longer, they all have been targeted. One of the busiest ports of India- Jawaharlal Nehru Port Trust suffered a ransomware attack on February 2022, following similar incidents at US ports and South African ports in the near past (AGCS). Hague-based APM Terminals, which operates Gujarat's Pipavav terminal, was also cyberattacked.

Cybercriminals also manipulate the vessel's electronic system, which disrupts the control centre of the vessel, this result in severe consequences. The United States Cybersecurity &Infrastructure Security Agency (US CISA) and NATO had warned Maritime companies of amplified cyber risk due to the conflict in Ukraine. Cyberattack like jamming of GPS and electronic interference and also incidents of Spoofing of Automatic Identification systems was reported at Black sea (International Maritime Organisation-IMO, 2022)

Climate Change

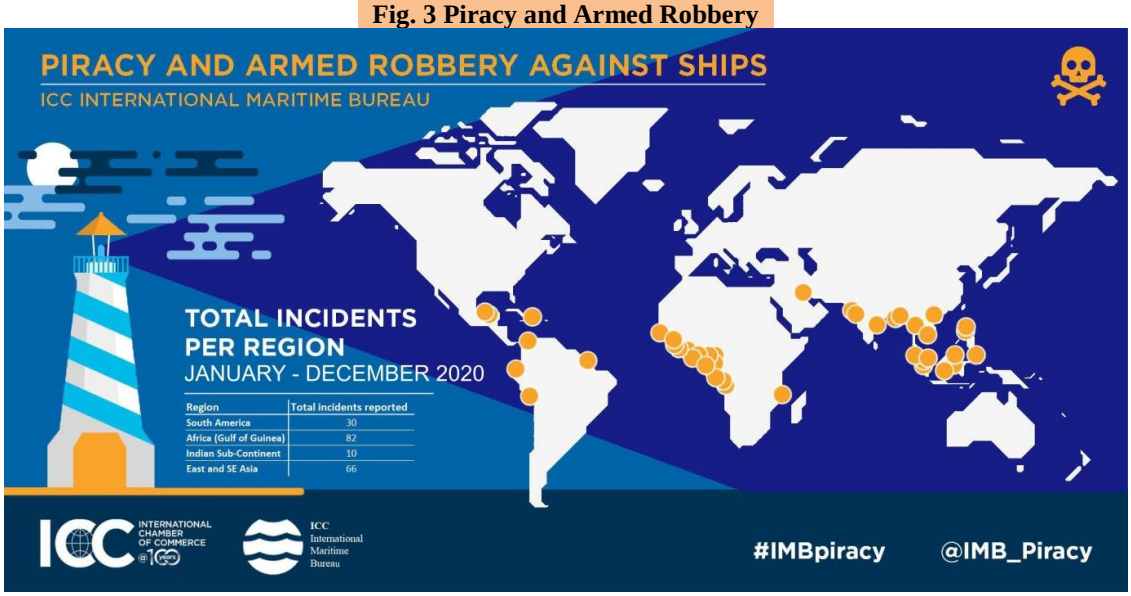
According to the United States- Environmental Protection Agency report, 2022,with about 90% of world trade moving by maritime logistics, they emit 2-3% of global Green House Gases. Emission contains harmful pollutants like tiny black particles and Black Carbon. The shipping industry also emits 10-to-15% of the world's synthetic sulphur oxide and nitrous oxide that cause respiratory illness. This pollution contributes to climate change. In 2018, the International Maritime Organization (IMO) setup strategy to be followed by Maritime companies, in order to cut-down greenhouse gases by up to 40% across the global fleet by 2030 and at least a 50% cut by 2050. The IMO also adopted short-term measures to reduce all ships' carbon emissions by at least 40% by 2030. The pressure of Decarbonisation is mounting upon Maritime logistics companies. They are expected to operate sustainably and reduce carbon and environmental footprint. Resulting of the Paris Agreement goals,nine top multinational companies, namely Amazon, Brooks running, Frog Bikes, Ikea, Inditex,

Michelin, Patagonia, Tchibo, and Unilever, have pledged to move cargo on ships using zero carbon fuel by 2040.

Piracy and Armed robbery

Maritime piracy is a worldwide problem. According to Maritime Global Security, the distinction between 'piracy' and 'armed robbery' depends on the jurisdiction where the crime occurred. The act is called piracy when perpetrated in international waters outside the jurisdiction, and an act is called armed robbery when perpetrated inside territorial waters. The International Chamber of Commerce's - International Maritime Bureau (IMB) annual piracy report recorded increased piracy and armed robbery incidents in 2020. IMB's Piracy reporting centre received inputs of 195 such incidents compared to 162 cases in 2019. The incidents included three hijacked vessels, 11 vessels fired upon, 20 attempted attacks, and 161 vessels boarded. The regions of crime occurrence are South America 30, Africa (Gulf of Guinea) 82, Indian Sub-continent 10 and East and South-east Asia 66 (**Fig 3**).

Fig. 3 Piracy and Armed Robbery

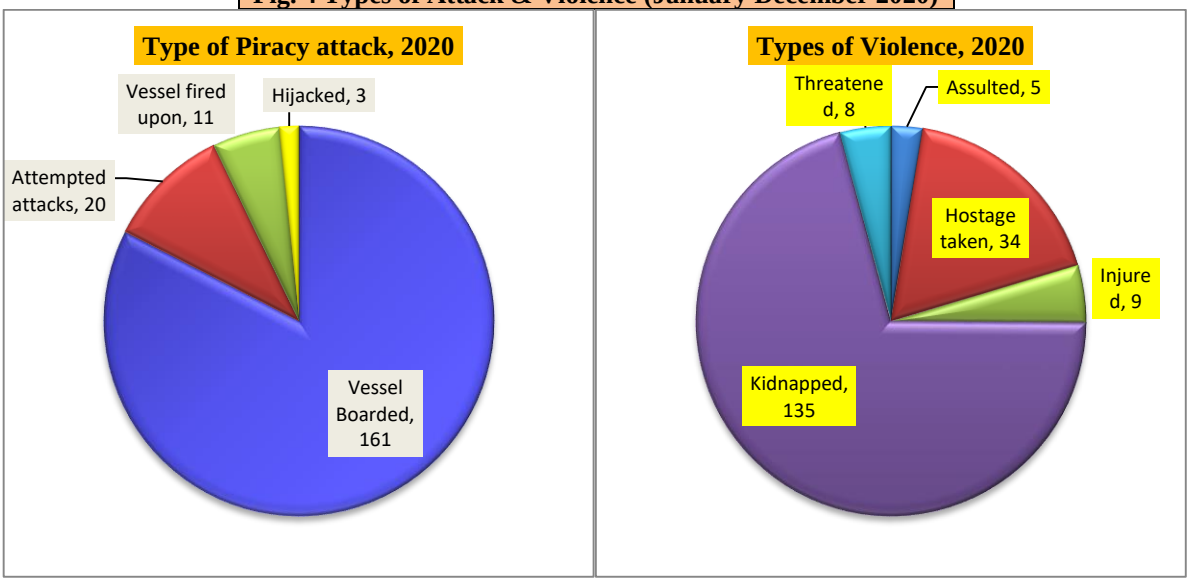


Source: IMB Report on Piracy and Armed Robbery against Ships, 2021

Types of Attack& Violence (January December 2020)

Maritime logistics have certain high-risk routes like the Strait of Malacca- between Malaysia and Indonesia, the Gulf of Aden- between Africa and Yamen and the Gulf of Guinea on the southern coast of West Africa, where many incidents of piracy have occurred in the past. The Gulf of Guineais particularly dangerous for Maritime Logistics Companies. In 2020, 95% of total kidnapping cases were reported from the region over 22 incidents, with almost 80% of attackers armed with guns (IMB Report, 2021). According to ICC-IMB annual piracy report there has 161 incidents of vessel boarded by pirates (**Fig 4**). In types of violence during Piracy and Armed robbery the highest case was of kidnapping (**Fig 4**)

Fig. 4 Types of Attack & Violence (January December 2020)



Source: IMB Report on Piracy and Armed Robbery against Ships, 2021

According to the IMB Piracy and Armed Map 2022, on 24th January 2022, unnoticed robbers boarded a bulk carrier in Haldia port and escaped with the ship's engine spares. The crew on routine rounds noticed the theft. On 13th July 2021, at Haldia port berthed bulk carrier was robbed. A broken entrance door, engine room wrecked, and the Duty engine crew noticed missing spares.

On 03rd July 2022, at Kandla Anchorage, Gujarat, unauthorised persons boarded an anchored tanker. Port control and coast guard officials carried inspection of the tanker. Many properties of the tanker were reported to be missing. A similar piracy incident happened on 18th November 2021Kandla Anchorage in an anchored general cargo ship where the unauthorised person on the forecastle deck was seen entering the bosun store. When the alarm was raised, the person escaped. There was no report of theft.

Port Congestion

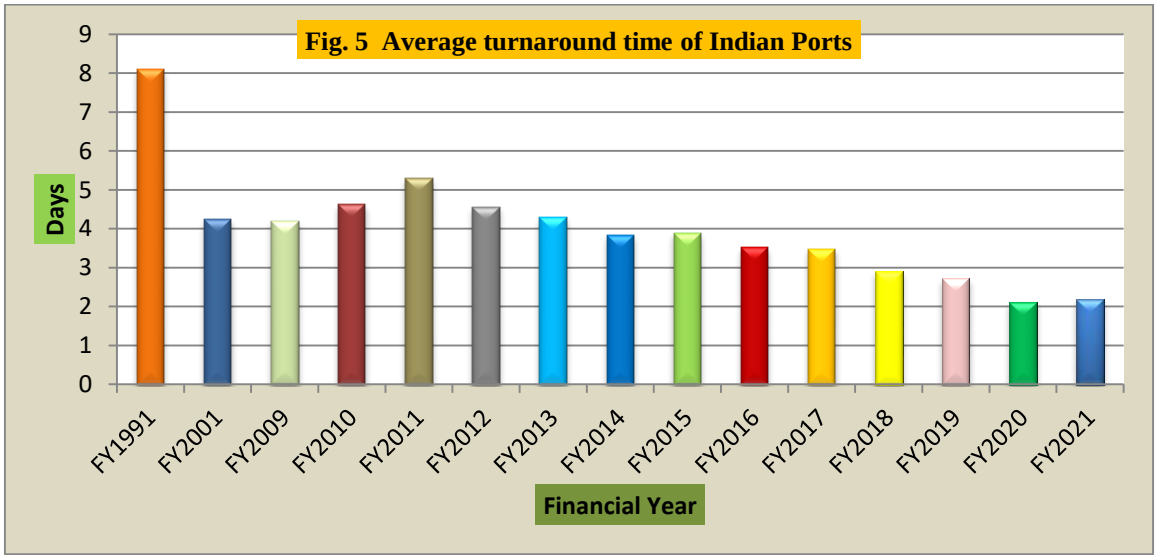
Port congestion happens when ships are unable either load or unload the cargo. Port congestion is a bottleneck in the smooth functioning of Maritime logistics. In Maritime Logistics, 'time is money, and such hindrance shoots the cost of transport. The time taken by a vessel to arrive and depart from the port is known as turnaround time. The Turnaround time is used to measure the efficiency of port operations (Cogoport). Turnaround time varies among the countries. Some countries havefewer arrival and some countries' ports host ships with few containers loaded during each port call. The countries like Japan, Taiwan, Hong Kong, and China have better port infrastructure and technology, facilitating them to handle the greater number of vessels with greater volume. They have the benefit of economies of scale. When compared with other countries in the Shipping Turnaround time, India lies 18th rank internationally with a Median Turnaround time of 0.92 day (**Table 2**). This means that container ship spends approximately around 0.92 days in ports during port calls. Japan has the first rank with 0.34 days in port, depicting the least number of days.

Table 2. Global median turnaround time of ports		
Rank	Median Turnaround time	Days
1.	Japan	0.34
2.	Taiwan	0.44
3.	Hong Kong	0.52
4.	China	0.62
5.	Turkey	0.62
6.	Republic of Korea	0.64
7.	Spain	0.66
8.	Thailand	0.67
9.	Panama	0.69
10.	United Kingdom	0.73
11.	Brazil	0.77
12.	Netherlands	0.80
13.	Singapore	0.80
14.	Malaysia	0.80
15.	Philippines	0.89
16.	Vietnam	0.90
17.	Italy	0.92
18.	India	0.92
19.	United Arab Emirates	0.95
20.	Germany	0.98
21.	Indonesia	0.99
22.	United States	1.03
23.	Belgium	1.04
24.	Russia	1.31

Source:https://www.statista.com/statistics/1101596/port-turnaround-times-by-country/

Average Turnaround Time

As seen in **figure 5** India's logistics average turnaround time was approximately 8.1 days 1991.In 2021 it was 2.18 days (Sagarmala).The operational efficiency of Indian ports has improved over the years but still lags behind the global average.



Source: Sagarmala., 2021

VI. Conclusion

Maritime Logistics Security issues not only pose threat to Maritime Industry it has severe cascading effect on Supply chain, international trade and global economy. Maritime logistics issues like Port congestion, harsh climate, Piracy, Cyberattack, manipulating vessel automatic identification systems, jamming vessel navigation systems necessitates the need to oversee the movement of ships in real time.

The International Maritime Organisation (IMO) suggests counteractive measures like robust cybersecurity, digital linking of each elements of supply chain,Automatic identification systems (AIS) and developing better GPS to know the precise location and arrival / departure time of vessel. It also suggests

developing smart vessel capable exchange data in real time. As pledged under Paris Agreement a growing number of vessels are opting for large efficient vessels fuelled.

The government of India has launched its flagship program 'Sagarmala' on 25th March 2015. Its objective is to improve country's logistic sector performance by focussing on Maritime sector. The core of Sagarmala project is 'Port-led development'. It targets to double the cargo carrying capacity share both in case of Inland and coastal waterways. It has 802 projects under its ambit under different category like Port modernisation; Port linked Industrialisation, Connectivity enhancement and coastal community development. Out of these total 802 projects 202 projects are complete with an amount of Rs.99,280 Crores. 29 project have already been implemented with budget of Rs 45,000 Crores on Public Private Partnership (PPP) and 173 projects have allotted budget of 54,000 crore on Engineering Procurement and Construction mode (EPC). To curb issues like piracy, India has deployed naval warship continuously for more than 13 years in coordination with other countries to escort merchant ship from risky routes.

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