Social and Environmental Impacts of Inland & Coastal Waterways

1. Pratik R Chorage, MANET,Pune,Pratik.chorage001@gmail.com

2. Dhawal R Gawde, MANET,Pune,gawdedhawal3@gmail.com

3. Mayuresh N Soman, MANET,Pune,mayureshsoman8@gmail.com

ABSTRACT: 90% of World trade is carried by sea. Shipping poses threats to the environment both on inland and coastal waterways. These problems come from five major sources; routine discharges of oily bilge and ballast water from marine shipping; dumping of non-biodegradable solid waste into the ocean; accidental spills of oil at ports and while underway; Atmospheric pollution from the vessel's power supplies. Social impact includesloss of aquatic life, health problems of human beings, globalization of world economy,coastal trading and many more. The purpose of this special issue is to investigate the current thoughts in shipping economics and strategy.

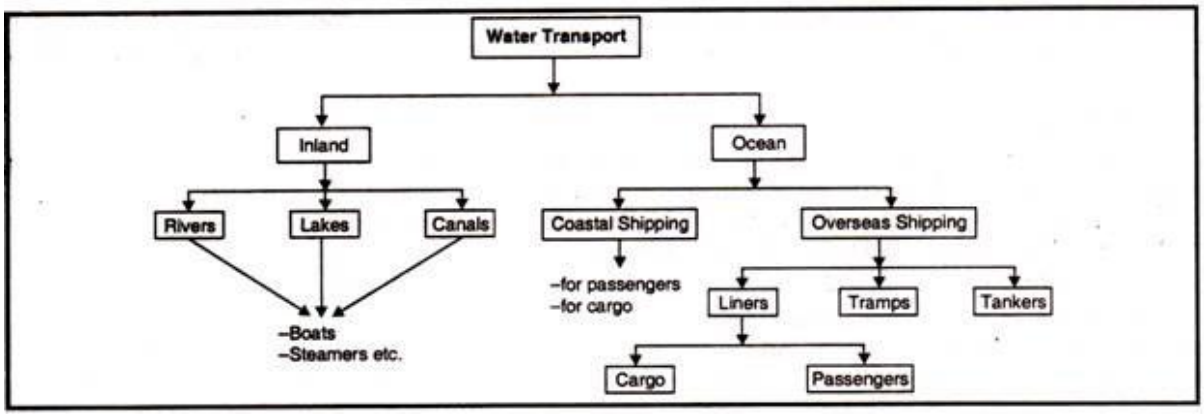
KEYWORDS: Routine discharges, Non-biodegradable waste, Loss of aquatic life, Globalization**,** Coastal trading.

1. What is INLAND WATERWAYS?

Any of the waters (as lakes, canals, rivers, watercourses, inlets, and bays) within the territory of a state as contrasted with the open seas or marginal waters bordering another state subject to various sovereign rights of the bordering state.

2. What is COASTAL WATERWAYS?

The transporting of goods or passengers by a ship registered in one country that takes place solely from port to port of another country (along the **coast**) and usually governed by that country's national law.



3. INLAND WATERWAYS IN INDIA

In India, 14,500 km of river channels are navigable, of which 3,700 km are usable by mechanised boats. But actually, only 2000 km are used. Of the total canal length of 4,300 km in India, 900 km is navigable, but only 330 km is used.

National Waterway-1

Allahabad–Haldia stretch of the Ganges–Bhagirathi–Hooghly river of total length 1620 km was declared as National Waterway-1 (NW-1) in the year 1986.

National Waterway-2

Sadiya–Dhubri stretch of the Brahmaputra river of total length 891 km was declared as National Waterway-2 (NW-2) in the year 1988.

National Waterway-3

Kollam–Kottapuram stretch of West Coast Canal and Champakara and Udyogmandal canals of total length 205 km was declared as National Waterway-3 (NW-3) in the year 1993.

National Waterway-4

Kakinada–Pondicherry stretch of canals and Kaluvelly tank, Bhadrachalam–Rajahmundry stretch of River Godavari and Wazirabad–Vijayawada stretch of River Krishna of total length 1095 km was declared as National Waterway-4 (NW-4) in the year 2008.

National Waterway-5

Talcher–Dhamra stretch of rivers, Geonkhali–Charbatia stretch of East Coast Canal, Charbatia–Dhamra stretch of Matai river and Mahanadi delta rivers of total length 620 km was declared as National Waterway-5 (NW-5) in the year 2008.

National Waterway-6

Lakhipur-Bhanga stretch of 121 km of the Barak River is the 6th waterway. It was accepted as National Waterway in January 2013 by Union Cabinet.

Also,India has a long coastline, spanning 7516.6 kilometres, forming one of the biggest peninsulas in the world. It is serviced by 13 major ports (12 government and 1 corporate) and 187 notified minor and intermediate ports.

Environmental and Social impact of inland & coastal water ways:

The environmental impact of shipping includes greenhouse gas emissions, acoustic, and oilpollution. The International Maritime Organization (IMO) estimates that Carbon dioxide emissions from shipping were equal to 2.2% of the global human-made emissions in 2012 and expects them to rise by as much as 2 to 3 times by 2050 if no action is taken.

Ballast water

Ballast water discharges by ships can have a negative impact on the marine environment.

Cruise ships, large tankers, and bulk cargo carriers use a huge amount of ballast water, which is often taken on in the coastal waters in one region after ships discharge wastewater or unload cargo, and discharged at the next port of call, wherever more cargo is loaded. Ballast water discharge typically contains a variety of biological materials, including plants, animals, viruses, and bacteria. These materials often include non-native, nuisance, invasive, exotic species that can cause extensive ecological and economic damage to aquatic ecosystems along with serious human health problems.

Ballast Water Pumping out

Wildlife collisions

Marine mammals, such a whales and manatees, risk being struck by ships, causing injury and death. For example, if a ship is traveling at a speed of only 15 knots, there is a 79 percent chance of a collision being lethal to a whale.

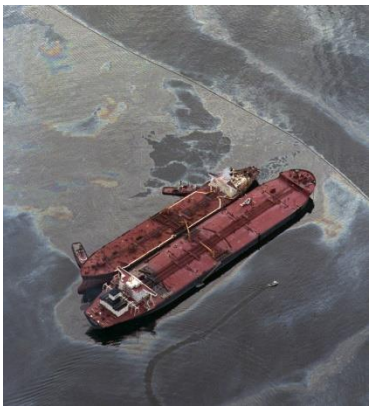
One notable example of the impact of ship collisions is the endangered North Atlantic right whale, of which 400 or less remain. The greatest danger to the North Atlantic right whale is injury sustained from ship strikes. Between 1970 and 1999, 35.5 percent of recorded deaths were attributed to collisions. During 1999 to 2003, incidents of mortality and serious injury attributed to ship strikes averaged one per year. In 2004 to 2006, that number increased to 2.6. A death from collisions has become an extinction threat.

Right Whale hit by vessel

Oil spills

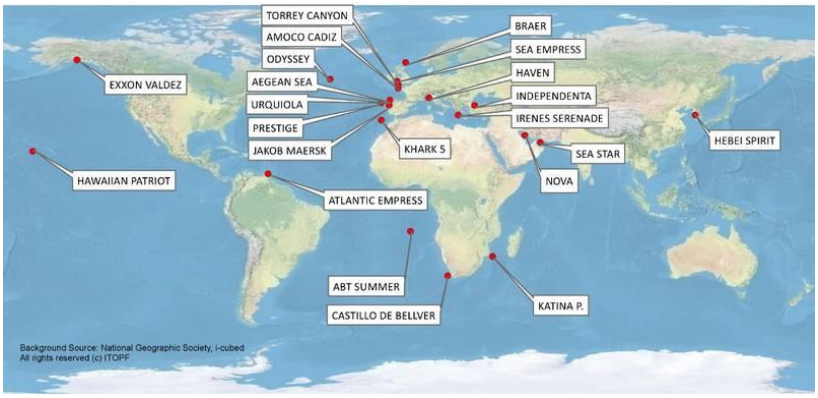
Most commonly associated with ship pollution are oil spills. While less frequent than the pollution that occurs from daily operations, oil spills have devastating effects. While being toxic to marine life, polycyclic aromatic hydrocarbons (PAHs), the components in crude oil, are very difficult to clean up, and last for years in the sediment and marine environment. Marine species constantly exposed to PAHs can exhibit developmental problems, susceptibility to disease, and abnormal reproductive cycles. One of the more widely known spills was the Exxon Valdez incident in Alaska. The ship ran aground and dumped a massive amount of oil into the ocean in March 1989. Despite efforts of scientists, managers and volunteers, over 400,000 seabirds, about 1,000 sea otters, and immense numbers of fish were killed.

Exxon Valdez incident in Alaska



It took 25 years for Alaska otters to get over the Exxon Valdez

Oil spill



Top 20 Tanker Oil Spills.

In general, oil spills can affect animals and plants in two ways: from the oil itself and from the response or clean-up operations. Understanding both types of impacts can help spill responders minimize overall impacts to ecological communities and help them to recover much more quickly.

Spilled oil can harm living things because its chemical constituents are poisonous. This can affect organisms both from internal exposure to oil through ingestion or inhalation and from external exposure through skin and eye irritation. Oil can also smother some small species of fish or invertebrates and coat feathers and fur, reducing bird's and mammal's ability to maintain their body temperatures.

4. What Creatures Are Most Affected by Oil Spills?

Since most oils float, the creatures most affected by oil are animals like sea otters and seabirds that are found on the sea surface or on shorelines if the oil comes ashore. During most oil spills, seabirds are harmed and killed in greater numbers than other kinds of creatures. Sea otters can easily be harmed by oil, since their ability to stay warm depends on their fur remaining clean. If oil remains on a beach for a while, other creatures, such as snails, clams, and terrestrial animals may suffer.

Sound pollution

Noise pollution caused by shipping and other human enterprises has increased in recent history. The noise produced by ships can travel long distances, and marine species that may rely on sound for their orientation, communication, and feeding, can be harmed by this sound pollution.The Convention on the Conservation of Migratory Species has identified ocean noise as a potential threat to marine life.

Atmospheric pollution

These occur under two distinct sets of circumstances; while underway and while docked (for light, heat, ventilation, etc.). For sea-going vessels, emissions while in port are of greater concern than those while underway, because they are more likely to affect adjacent populations; at sea, of course, there is no adjacent population. Exhaust gases from ships are considered to be a significant source of air pollution, both for conventional pollutants and greenhouse gases.

Conventional pollutants

Air pollution from ships is generated by diesel engines that burn high sulphur content fuel oil, also known as bunker oil, producing sulphur dioxide, nitrogen oxide and particulate, in addition to carbon monoxide, carbon dioxide, and hydrocarbons. Of total global air emissions, shipping accounts for 18 to 30 per cent of the nitrogenoxide and 9 per cent of the sulphuroxides. Sulphur in the air creates acidrain which damages crops and buildings. When inhaled the sulphur is known to cause respiratory problems and even increases the risk of a heartattack.

Greenhouse gas pollutants

3.5 to 4 per cent of all climate change emissions are caused by shipping, primarily carbon dioxide.

Sewage

The cruise line industry dumps 255,000 US gallons (970 m^3) of grey water and 30,000 US gallons (110 m^3) of black water into the sea every day. Black water is sewage, wastewater from toilets and medical facilities, which can contain harmful bacteria, pathogens, viruses, intestinal parasites, and harmful nutrients. Discharges of untreated or inadequately treated sewage can cause bacterial and viral contamination of fisheries and shellfish beds, producing risks to public health. Nutrients in sewage, such as nitrogen and phosphorus, promote excessive algal blooms, which consumes oxygen in the water and can lead to fish kills and destruction of other aquatic life. A large cruise ship (3,000 passengers and crew) generates an estimated 55,000 to 110,000 litres per day of black water waste.

Cleaning

Grey water is wastewater from the sinks, showers, galleys, laundry, and cleaning activities aboard a ship. It can contain a variety of pollutant substances, including fecalcoliforms, detergents, oil and grease, metals, organiccompounds, petroleum hydrocarbons, nutrients, foodwaste, medical and dental waste. Sampling done by the EPA and the state of Alaska found that untreated grey water from cruise ships can contain pollutants at variable strengths and that it can contain levels of fecal coliform bacteria several times greater than is typically found in untreated domestic wastewater. Grey water has potential to cause adverse environmental effects because of concentrations of nutrients and other oxygen-demanding materials, in particular. Grey water is typically the largest source of liquid waste generated by cruise ships (90

to 95 per cent of the total).Estimates of grey water range from 110 to 320 litres per day, per person or 330,000 to 960,000 litres per day for a 3,000-person cruise ship.

Solid waste

Solid waste generated on a ship includes glass, paper, cardboard, aluminium and steel cans, and plastics. It can be either non-hazardous or hazardous in nature. Solid waste that enters the ocean may become marinedebris, and can then pose a threat to marine organisms, humans, coastal communities, and industries that utilize marine waters.Marinemammals, fish, seaturtles, and birds can be injured or killed from entanglement with plastics and other solid waste that may be released or disposed of ships. On average, each cruise ship passenger generates at least two pounds of non-hazardous solid waste per day.

5. STEPS TAKEN TO REDUCE THE IMPACTS

REDUCTION OF ENVIRONMENTAL IMPACT THROUGH IMPROVED HULL DESIGN

Environmental impact can be reduced by improved ship hull design that achieves reductions of:

• Operational emissions through improved hull form resulting in reduced fuel consumption;

• Accidental pollution through improved hull strength and/or subdivision resulting in reduced spillage of oil or of dangerous goods in case of an accident.

Other emerging areas linked to environmental impact are:

• The phenomenon of wake wash, i.e. the waves generated by passing ships and the disturbance they produce. Wash is of particular relevance for ships designed for high speed operation (though in practice it is often a problem when these ships travel at lower speeds in estuary and harbour areas).

REDUCTION OF NOISE POLLUTION

- Reduction of noise from gas turbine propulsion systems is an issue for high-speed ferries. However, the main cause of noise and vibrations in ships is cavitation on the propeller. Cavitation occurs mainly due to the non-uniform wake field in which the propeller operates. There are two ways to reduce noise and vibrations:

1. Appropriate design of hull-propeller interaction. Make the inflow more uniform i.e. improve the wake field, e.g. by using bulbous sterns or by moving the propeller out of the wake.
2. Improve the cavitation behaviour of the propeller in a given wake field by designing new blade sections to reduce vibration excitation (not really a hull design problem).

- Noise pollution and vibrations which affect the quality of the environment both inside the ship(working conditions for the crew and passengers) and outside. It has further been suggested that an improvement in quality of design and fabrication, with an increase in scantlings, would increase the lifetime of ships and thereby reduce the number of ships to be scrapped, leading to both environmental and economic benefits. However, research is needed to test this assertion.

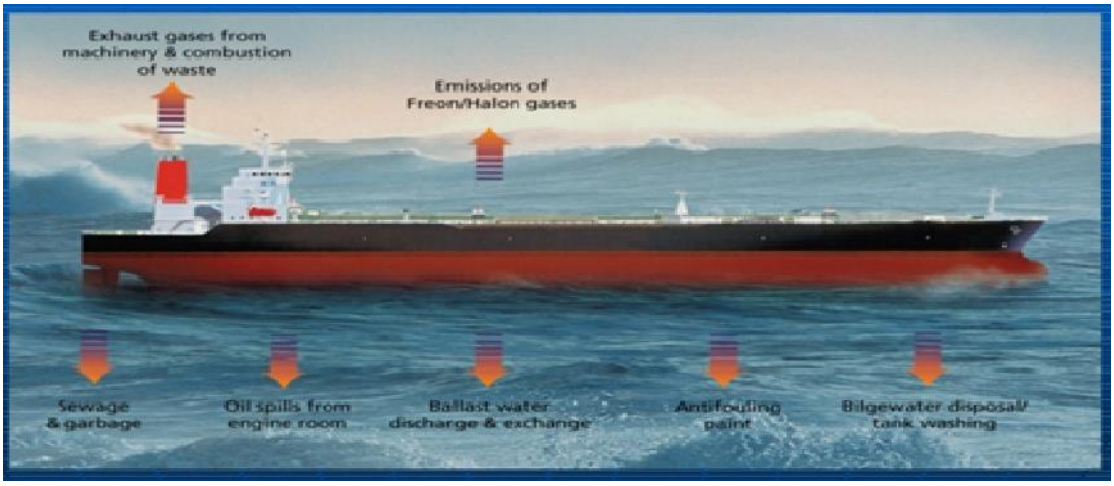
Also there are some other ways which are implemented in order to prevent to marine pollution like conventions and rules specified in the MARPOL.

- The 1973 International Convention for the Prevention of Pollution from Ships, and the 1978 Protocol for its implementation which entered into force on 2 October 1983 (referred to as MARPOL 73/78), put in place a set of discharge standards and equipment requirements designed to prevent oil pollution.
- The main reasons for oil spilling are,

1) Grounding
2) Collision
3) Bilge cleaning
4) Loading or discharging petroleum products etc.

- Grounding and collision can be effectively avoided by proper passage planning. Also precaution can be taken while bilge cleaning, loading and discharging petroleum products.
- Annex V of MARPOL 73/78 regulates the discharge of garbage from ships. All discharge of plastics is prohibited anywhere in the world. Wood dunnage may be discharged beyond twelve nautical miles from the shore if it has been pulped. Food waste may be chopped up and discharged at sea. Unfortunately, monitoring and enforcing these regulations is very difficult.
- The First Intersessional Meeting of the IMO Working Group on Greenhouse Gas Emissions from Ships took place in Oslo, Norway on 23–27 June 2008. It was tasked with developing the technical basis for the reduction mechanisms that may form part of a future IMO regime to control greenhouse gas emissions from international shipping, and a draft of the actual reduction mechanisms themselves, for further consideration by IMO's Marine Environment Protection Committee (MEPC).
- As one way to reduce the impact of greenhousegas emissions from shipping, vetting agency Right Ship developed an online "Greenhouse Gas (GHG) Emissions Rating" as a systematic way for the industry to compare a ship's CO_2 emissions with peer vessels of a similar size and type. Based on the International Maritime Organisation's (IMO) Energy Efficiency Design Index (EEDI) that applies to ships built from 2013, Right Ship's GHG Rating can also be applied to vessels built prior to 2013, allowing for effective vessel comparison across the world's fleet.
- Due to the environmental impact of shipping, and sewage in particular MARPOL annex IV was brought into force September 2003 strictly limiting untreated waste discharge. Modern cruise ships are most commonly installed with a membrane bioreactor type treatment plant for all black water and grey water, such as, Xenon or Rochem which produce near drinkable quality effluent to be re-used in the machinery spaces as technical water.

This picture introduces all the SHIPBOARD SEA POLLUTION SOURCES



6. **Future planning**

The Union Cabinet, chaired by Prime Minister NarendraModi, has approved to pass the official amendment of the National Waterways Bill, 2015.

Here are some key points you need to know:

- The bill seeks to add 106 inland waterways to the existing six National Waterways on the recommendations of the Parliamentary Standing Committee on Transport, Tourism and Culture and comments of several state governments

- The bill will also look after the renovation and maintenance of the existing waterways

- Out of the 106 new waterways, 18 have already been identified. These include five waterways each from Karnataka and Meghalaya, three each from Maharashtra and Kerala, one each from Tamil Nadu and Rajasthan

- The bill also aims to help the Inland Waterways Authority of India (IWAI) to develop the feasible stretches for Shipping and Navigation.

7. Conclusion

Although inland and coastal shipping is widely regarded as an environmental friendly form of transport, the literature review shows that inland and coastal shipping needs more transhipments than its counterpart. These transhipments are often not included in the analysis of environmental performance of inland and coastal shipping, while studies have shown that transhipment consumes energy and thus cause emissions. Environmental and social impacts are harmful but as we all know there are always two sides of coin social impacts are very helpful rather than creating problems for human beings as the population is day by day increasing, technology is also more becoming advanced.

DON’T CREATE A PROBLEM BE THE SOLUTION TO THE PROBLEM

References:

1)http://waterwiki.net/index.php?title=Inland_Waterway_Transport(IWT)

2)https://en.wikipedia.org/wiki/Environmental_impact_of_shipping

3)http://timesofindia.indiatimes.com/india/Shipping-ministry-for-developing-inland-waterways-to-decongest-transport-corridors/articleshow/29745027.cms

4)http://timesofindia.indiatimes.com/topic/environmental-and-social-impact-assessment

5) Environmental Performance of Inland Shipping(Author-Jos Nellen MAY2011)