

MARINE POLLUTION AND ITS EFFECTS ON ENVIRONMENT

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Introduction:

After the Second World War not only the public interest in the environment increased in general. Concerns of coastal states about increasing ship-source marine pollution and oil spills started to grow as well. Some of the occurred incidents with tankers clearly demonstrated that oil spills in an environmentally or economically sensitive area could cause irreparable damage. Oil pollution of the ocean comes from shipping activity and offshore oil production. Sea-bed activities on oil exploration and production constitute a relatively small part in the general amount of the pollution of marine environment with oil.

Oil spills can seriously affect the marine environment both as a result of physical smothering and toxic effects. The severity of the impact typically depends on the quantity and type of oil spilt the ambient conditions and the sensitivity of the affected organisms and their habitats to the oil. This paper describes the effect of ship-source oil spills and resultant clean-up activities on the sea shores, marine organisms and birds. Particular attention is devoted to the fact that the caused damage is unpredictable and does not depend on the size of the oil spill. It depends rather on the closeness to the shoreline and vulnerability of the area.

Objectives:

1. To understand the meaning of pollution and marine pollution.
2. To study the types of marine pollution.
3. To study the sources of marine pollution.
4. To study the effects of marine pollution on environment.
5. To suggest preventive measures to minimize marine pollution.

Definitions:

The term 'pollution' describes the occurrence and inputs of wastes and the impact of these wastes on the environment.

Marine Pollution (UN definition) – “The introduction by man, directly, or indirectly, of substances or energy to the marine environment resulting in deleterious effects such as: hazards to

human health, hindrance to marine activities, impairment of the quality of seawater for various uses and reduction of amenities.”

Types of Marine Pollution:

- Sedimentation
- Agricultural runoff (herbicides, pesticides and nutrients)
- Energy (thermal and light)
- Sewage (Faucal Coli form and nutrients)
- Solid Waste
- Chemicals, Metals and Radioactive Substances
- Oil
- Biological

Sources of Pollution from Land:

- 80% of non-biological marine pollution comes from land based activities
- Most obvious inputs via pipes discharging directly into marine waters (sewage, industrial, chemical and food processing wastes)
- Reverie flows into the sea carry pollutants from the entire catchment area.

From Air:

- Global atmospheric inputs to the sea from air discharges

Maritime:

- Oily discharges from ballast water and bilge water during routine ship operations and illegal dumping of solid waste
- Designated dumping grounds at sea (dredged spoil, old munitions, sewage sludge, fly ash, oil based drilling mud)
- Accidental spills from Ships carrying hazardous substances, oil, gas etc.

OIL POLLUTION BY MARITIME INDUSTRY:

The principal cause of marine pollution with oil is shipping. Traditionally shipping is considered to be “a polluting industry”. The world’s tanker fleet counts approximately 7 000 vessels with cargo capacities between 76 000 and 175 000 tons. Usual shipping operations, especially transportation of oil by tankers and accidents, result in the dumping of around 600 000 – 1 750 000 tons of oil into the ocean per year (Brubaker, 1993). Due to the use of pipelines for petroleum

products, oil transportation with tankers decreased significantly (Gennaro, 2004). However, the incidents with this type of vessels and the occurred oil spills occur constantly. The last oil pollution incident, which gained publicity and attention of the mass media, happened in October 2011 off the New Zealand's coast. The grounding off of the tanker "Rena" and the followed oil leaking caused the environmental disaster. This oil spill seriously damaged wildlife, including penguins, seals, dolphins, whales and rare sea birds. Oil spill can lead sometime to the tainting of fish and shellfish. An oil spill directly damages not only animals, plants and corals, fisheries, but also affects human activity in the area of fisheries through damaging of fishing boats, fishing gear, floating fishing equipment. Oil spills affect not only the ocean space around them, but also shorelines, open waters and the seabed; wetlands; corals. They also damage fisheries and coastal amenities. Especially vulnerable for the potential damage is the area of shorelines. The caused damage is unpredictable and does not depend on the size of the oil spill. It depends rather on the closeness to the shoreline and vulnerability of the area. For example, a 9 000-ton diesel fuel spill from the "Tampico Maru", in the Baja California in 1957, damaged over 10 km of coastline. On the other hand, 10 000 tons of crude oil discharged by the "Argea Prima", in Puerto Rico in 1962, caused very little actual damage. The oil spill of 476 000 tonnes of crude oil, caused by the Ixtoc I oil platform blowout in the Gulf of Mexico, had caused relatively little damage. The damage from the "Argo Merchant" grounding in 1976 and oil spill of 50 000 tons were very serious. The oil spill of 40 000 tons by the VLCC "Exxon Valdez" in especially vulnerable area of Prince William Sound in Alaska, in 1989, resulted in an ecological disaster and very long and costly clean-up operations. The same phenomena were observed during the Iran-Iraq and Iraq-Kuwait military actions and resulted oil spills. The oil spill with "Atlantic Empress" with loss of almost 300 000 tons of crude oil in 1978 in the Atlantic Ocean did not cause any significant impact on economy, but seriously damaged an offshore ecosystem around the site of the catastrophe. Under the right conditions the marine environment recovery natural process is incredibly quick and "painless", however, the internal mechanisms of the nature are not endless and marine environment needs proper treatment and protection. The new oil and gas development projects also raise more and more serious concerns of the environmentalists. For example, the recent decision to start the drilling in the Arctic seriously worried the environmentalists especially in light of the climate change issue, which have been widely discussed in the mass media.

Preventive measures to avoid oil pollution by Maritime industry:

- **Ship's design**

Requirements for double hulls or double bottoms are being introduced. In 1992, the MARPOL Convention was amended to make it mandatory for tankers of 5,000 dwt and more (ships ordered after 6 July 1993) to be fitted with double hulls, or an alternative design approved by IMO (Regulation 13F in Annex I of MARPOL 73/78). The requirement for double hulls that applies to new tankers has also been applied to existing ships under a programme that began in 1995 (Regulation 13G in Annex I of MARPOL 73/78). All tankers have to be converted (or taken out of service) when they reach a certain age (up to 30 years old).

- **Maintenance & Owner responsibility**

Ship owners must ensure a high standard of maintenance. No matter how well a ship is designed, built and equipped — unless it is properly maintained, it will sooner or later become a maritime safety risk. The responsibility for regular and good maintenance always rests with the ship owner.

- **Competence**

It is the responsibility of the ship owner to recruit crews that are competent and experienced. The crews should also be continuously trained. Many accidents are due to the human factor, and unless the crew members do their job right it does not really matter how well equipped the ship is.

- **Navigational aids & Onboard equipment**

Better navigational equipment — for example, electronic charting — is needed. All ships must have radar systems to improve navigation (large ships must have two systems that operate independently). In busy shipping corridors, traffic separation schemes and vessel traffic control are required to reduce the risk of a collision. High-standard fire-fighting equipment must be available and strict fire safety regulations apply on board. Monitoring and control equipment should be installed on ships so that discharged oil-water mixtures can be traced back to the ship that was carrying the oil.

- **Inspections**

Frequent inspection of ships, particularly older ones, are imperative. Since 1995 all tankers and bulk carriers aged five years and over have been subject to a specially enhanced inspection programme which is intended to ensure that any deficiencies — such as corrosion or wear and tear resulting from age or neglect — are detected.

- **Reception facilities**

Better facilities are needed in ports for ships to leave their oily liquid waste and solid oily waste. In MARPOL Special Areas, such port reception facilities are required. However, in order to further reduce marine oil pollution from shipping such facilities should be made universally available in all ports where oil and oily wastes are handled. These facilities should, preferably, be made available at no extra cost.

- **Cargo owner & consumer responsibility**

The responsibility for upholding safe sea transports of oil products rests also with the cargo owners and the end users, the consumers of the products. Cargo owners should not use sub-standard vessels, but should be prepared to pay for high-quality shipping. Ultimately, the additional costs for choosing to charter safe and well maintained ships will (marginally) affect the price of the products, but it is a small price to pay as a means to prevent as far as possible the pollution of the coastal and marine environment by oils.

Conclusion:

Accidental or deliberate, operational discharges and spills of oil from ships, especially tankers, offshore platforms and pipelines, is the most obvious and visible cause of oil pollution of the marine environment. Various natural physical, chemical and biological degradation processes are the cause of oil spills into marine environment.

The impact of oil spills can be far-reaching, from an environmental as well as a socio-economic perspective. Marine and coastal habitats, wildlife species, recreational activities, local industry, and fisheries, are among the resources and sectors that can be negatively affected by oil spills. It affects seabirds, marine mammals, fish and shellfish, and bottom-living animals. It destroys beaches, destroys aquaculture, fisheries and deteriorates health effects from cleanup operations.

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