Maritime ENGLISH
Session 2 – Sources of Pollution

Marine & Shipping Sources of Pollution
Port Operations
Sources of Pollution

- Liquids
- Solids
- Mixed Waste
- Air Pollution
Liquids

- Ballast Water
- Bilge Water
- Bunker Fuel
- Tank Washing
- Oil spills
Liquids – Ballast tanks

- Compartments at the bottom of a ship that are filled with liquids for stability and to make the ship seaworthy.

- Ballast water taken up at sea and released in port is a major source of unwanted exotic marine life. (Invasive Species)

- Can spread human pathogens and other harmful diseases and toxins
Liquids – Bilge Water

- The bilge is the lowest compartment on a ship where the two sides meet at the keel.

- The water that collects in the bilge must be pumped out to prevent it from becoming too full and threatening to sink the ship.

- Depending on the ship's design and function, bilge water may contain water, oil, urine, detergents, solvents, chemicals, pitch, particles, and so forth.
Liquids– Bunker Fuel

- Bunker fuel is technically any type of fuel oil used aboard ships.

- **Number 5 fuel oil** and **Number 6 fuel oil** are called residual fuel oils (RFO) or heavy fuel oils. More Number 6 oil is produced compared to Number 5 oil, the terms *heavy fuel oil* and *residual fuel oil* are sometimes used as names for Number 6.
A major component of tanker architecture is the design of the hull or outer structure. A tanker with a single outer shell between the product and the ocean is said to be single-hulled.

Most newer tankers are double-hulled, with an extra space between the hull and the storage tanks.

All single-hulled tankers around the world will be phased out by 2026, in accordance with the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL). The United Nations has decided to phase out single hull oil tankers by 2010.
Tank washing is necessary on a routine basis for preventing excessive accumulation of sludge.

In general, tanks are washed at least every four months. Unless the sludge is regularly removed, drainage will be slow.

The fuel oil tanks washing must be completed before the vessel delivers the discharge to the port and leaves the port.
Liquids – Oil Spills

- Oil spills can have devastating effects.
- Toxic to marine life, polycyclic aromatic hydrocarbons (PAHs), the components in crude oil, are very difficult to clean up.
- Last for years in the sediment and marine environment
- Exxon Valdez Alaska March 1989. Over 400,000 seabirds, about 1,000 sea otters, and immense numbers of fish were killed.
Solids – Dunnage & Garbage

- **Dunnage**
  - Material used in stowing cargo either for separation or the prevention of damage.

- **Garbage**
  - MARPOL Annex V bans all overboard disposal of plastics and limits other discharges based on the form of the material and the vessel's location and distance from shore. The regulated garbage includes solid wastes (other than sewage) generated during normal operations at sea.
Solids – Garbage

(1) Vessel garbage management must be viewed as a system that includes port reception facilities, and this system needs to be combined with the integrated solid waste management system for land generated Waste.

(2) There is a need for new and improved on-board garbage treatment technologies, a problem that may be resolved in part by adapting commercial equipment used in homes, retail establishments, and industry.

(Committee on Ship borne Wastes, National Research Council)
Sewage

- The discharge of raw sewage into the sea can create a health hazard and, in coastal sea areas, can also lead to a depletion of oxygen in the water and visual pollution.

- The revised MARPOL Annex IV apply to new and existing ships of 400 gross tonnage and above or ships which are certified to carry more than 15 persons, engaged in international voyages.
Occasionally during a voyage, cargo may spoil and mariners are faced with the need to manage the problem.

The ideal way to manage cargo that spoils during a voyage would be to offload it from the ship to be managed on land.

Dumping spoilt cargo at sea should only be considered when there is a marked degree of urgency, facilities on land are unavailable, and it will not cause harm to the environment or human health.
Cargo Residues & Lost Containers

- Discharge of cargo residues from bulk carriers can pollute ports, waterways and oceans

- It has been estimated that container ships lose over 10,000 containers at sea each year (usually during storms...
Exhaust emissions from ships are considered to be a significant source of air pollution, with 18–30% of all nitrogen oxide and 9% of sulphur oxide pollution.

The 15 biggest ships emit about as much sulphur oxide pollution as all cars combined. "By 2010, up to 40% of air pollution over land could come from ships".

Sulphur in the air creates acid rain which damages crops and buildings.
Air Pollution

- Legislation on Marine Sulphur Fuel 2005 limiting to 0.1% by mass the S content of marine fuels used by ships at berth, from 1 January 2010
- Use of shore-side electricity
Port Operations

- Dredging
- Ships at Berth
Port Operations – Dredging

- Underwater excavation is called **dredging**.

- After the **initial excavation** needed to establish a channel, dredging must be done periodically to keep it clear and safe for navigation. This is called **maintenance dredging**.

- Once sediments are dredged from the waterway, they are called **dredged material**.
Port Operations – Dredging

- Disturbs the seabed & creates turbidity.
- Sediments may be contaminated and need safe disposal.
- Once sediments are dredged from the waterway, they are called dredged material.
- Sediments may be reused or reintroduced.
Port Operations – Ships at Berth

- Loading & Unloading Cargo.
  - Spillages & Leaks
  - Exhaust emissions from docks side vehicles
  - Noise
  - Onshore infrastructure (roads & railways)

- Shipboard Generators
  - Provide electricity onboard – create air & noise pollution