

Marine Pollution



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Contents



- Pollution defined
- Types of marine pollution
- Sources of marine pollutants
- Impacts of marine pollution
- Cost of marine pollution
- Scale of Jamaica's marine pollution
- Solutions to Pollution

Pollution Defined

- 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 (Faecal Coliform and nutrients)
- Solid Waste
- Chemicals, Metals and Radioactive Substances
- Oil
- Biological

Major Marine Pollutants

Worldwide

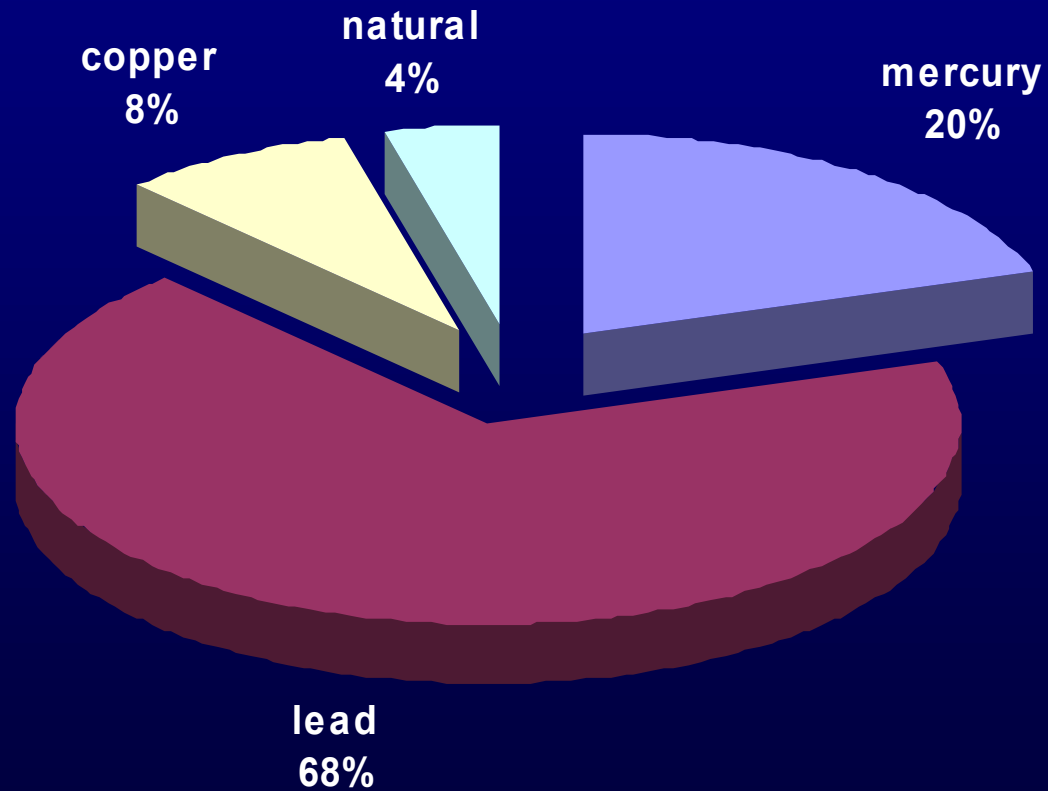
- 10 billion tonnes of ballast water with invasives
- Est. 10,000 million gallons of sewage annually
- 3.25 million metric tonnes of oil annually
- Millions of tonnes of Solid waste

Major Marine Pollutants - Metals

- Introduced dangerous metals include mercury, lead, and copper
- **Heavy Metals** are a great concern because they enter the food chain
- Fuel combustion, electric utilities, steel and iron manufacturing, fuel oils, fuel additives and incineration of urban refuse are the major sources of oceanic and atmospheric contamination by heavy metals
- Copper is dangerous to marine organisms and has been used in marine anti-fouling paints
- Mercury and lead poisoning cause brain damage and behavioral disturbances in children
- Contaminated land runoff, rain of pollutants from the air, and fallout from shipwrecks pollute the ocean with dangerous metals
- Human activities release 5 times as much mercury and 17 times as much lead as is derived from natural sources.

Heavy Metals Entering Oceans

Heavy Metals

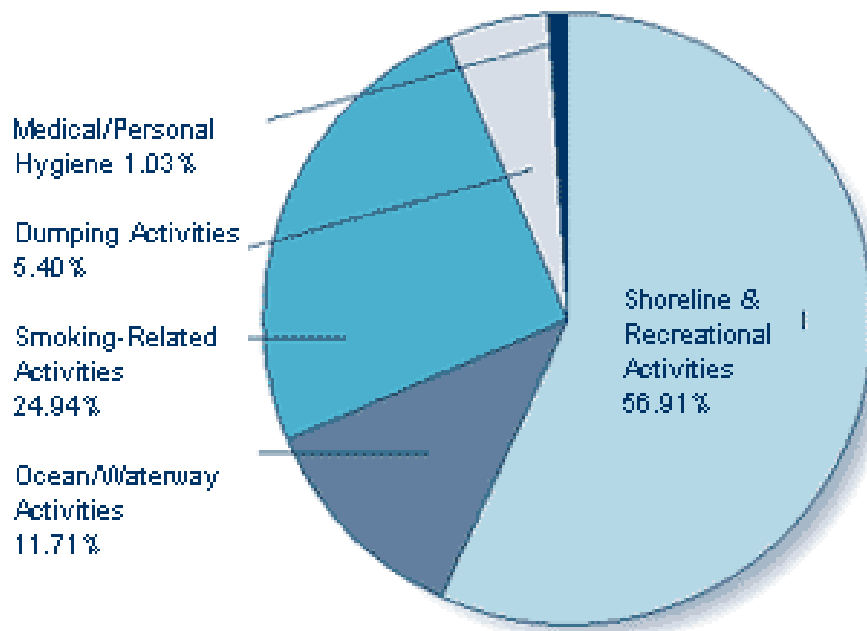


Major Marine Pollutants - Solid Waste

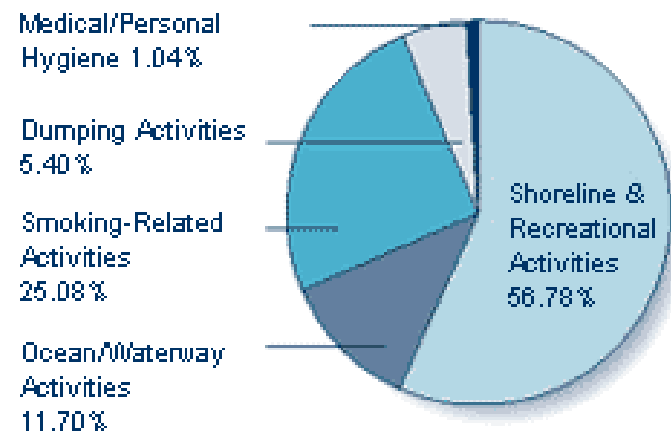
International – Marine Debris Sources

Debris Collected from...

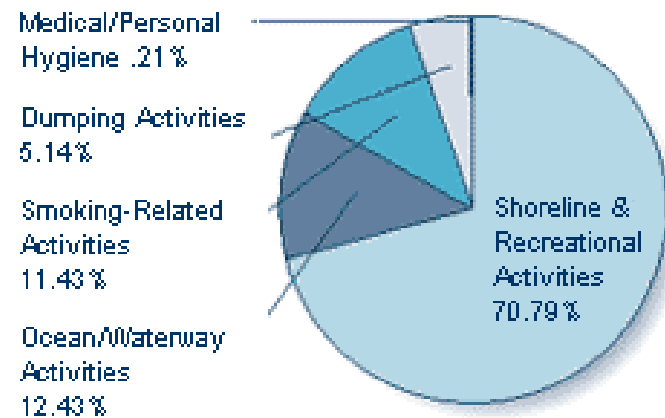
...Land and Underwater Cleanups



...Land Cleanups

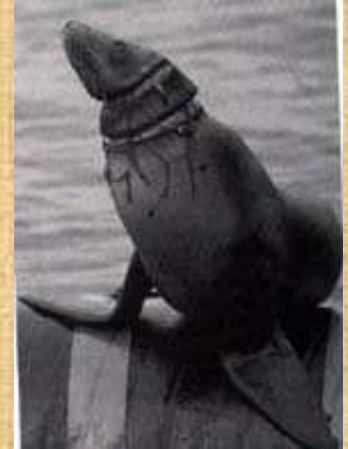


...Underwater Cleanups



Major Marine Pollutants – Solid Waste

- A large portion and great danger is non-biodegradable plastic
- 46,000 pieces of floating plastic/sq mile of ocean surface off the N.E U.S. coast.
- Sea turtles mistake plastic bags for jellyfish and die from internal blockages.
- Seals and sea lions starve after being entangled by nets or muzzled by six-pack rings (decomposition time 400 years).
- Plastic debris kills 100,000 marine mammals and 2 million sea birds die annually



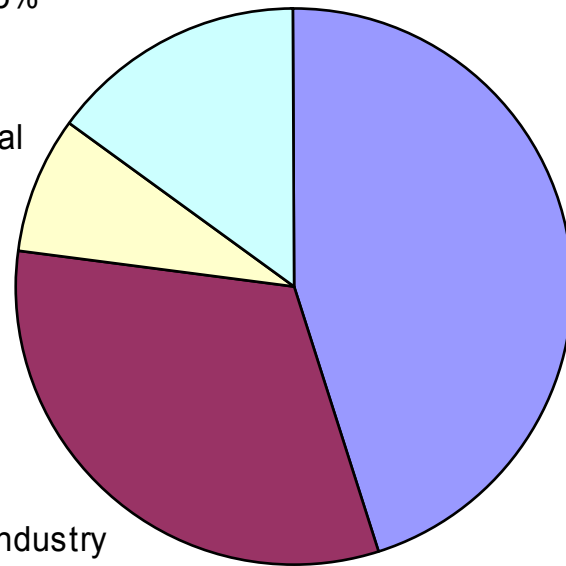
Major Marine Pollutants - Oil

Marine Oil Pollution

LandBased Sources
15%

Natural
8%

Oil industry
32%



Marine transport
45%

Major Marine Pollutants - Biological

- International Maritime Organization top ten: Cholera, Cladoceran Water Flea, Mitten Crab, toxic algae (R,G,B tides), Round Goby, European Green Crab, Asian kelp, Zebra Mussel, North Pacific Seastar, North American Comb Jelly.
- Spreading infestation of Jamaican waters by a Green mussel

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)
- Riverine flows into the sea carry pollutants from the entire catchment area.

From Air

- Global atmospheric inputs to the sea from air discharges

Sources of Pollution cont'd.

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 muds)
- Accidental spills from Ships carrying hazardous substances, oil, gas etc.

Impacts of Marine Pollution

Generally marine pollution affects ecosystem health, public health, recreational water quality and economic viability in the following ways:

- Mechanical
- Eutrophication
- Saphrogenic
- Toxicity
- Mutagenic and Carcinogenic

Cost of Marine Pollution

- 3.25 million metric tons of oil wasted vs. 3.4 million tons used by Jamaica annually
- 100,000 mammal and 2 million bird deaths annually
- Reduction of GDP by decreasing fishery resource (11.9k tonnes – 7.7k landed 1960-97) and decreased tourism earnings
- Loss of bio-diversity and potential life saving medicines (for AIDS & Cancer)

Solutions to Pollution

Two main methods

- Correction – costly and time intensive
- Prevention – requires attitude changes

Coastal Scientists believe that prevention is better than cure since the effects of marine pollution may be irreversible and we may therefore be creating everlasting damage to the marine ecosystem.

“An ounce of prevention is worth a pound of cure”

Marine Pollution Conventions

There are no less than 6 international marine pollution conventions. Some are listed below:

- **Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (1972) *The Oslo Convention***
- **Convention for the prevention of pollution from ships (1973) *MARPOL***
- **Convention for the Prevention of Marine Pollution from Land-based Sources (1974) *The Paris Convention***
- **Convention for the Protection of the Marine Environment of the North-East Atlantic (1992) *The OSPAR Convention***

Internet References

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<http://www.oceanlink.island.net/ask/pollution.html>