MARINE POLLUTION

Abstract:

Marine pollution poses a significant threat to ocean ecosystems and human health, resulting from a myriad of sources, including industrial discharges, agricultural runoff, plastic waste, and oil spills. This article reviews the various types of marine pollutants, their sources, and their ecological and economic impacts. We highlight the detrimental effects of micro plastics on marine life, the bioaccumulation of toxins in the food web, and the socio-economic ramifications for coastal communities reliant on fisheries and tourism. Furthermore, we discuss international policies and initiatives aimed at mitigating marine pollution, emphasizing the need for collaborative global action. The article concludes by advocating for enhanced public awareness, stricter regulations, and innovative technologies to address and prevent marine pollution, ensuring the health of our oceans for future generations.

Introduction:

Marine pollution is the introduction of harmful substances or contaminants into the ocean and coastal environments, resulting in adverse effects on marine life, ecosystems, and human health. This pollution can stem from various sources, including land run off, industrial discharges, shipping activities, oil spills, and atmospheric deposition. Common pollutants include plastics, chemicals, heavy metals, and untreated sewage. The consequences of marine pollution include habitat degradation, loss of biodiversity, and negative impacts on fisheries and coastal communities.

‘marine pollution’ is a global issue as it has impacted at least 267 species worldwide, including 86% of all sea turtle species, 44% of all seabird species and 43% of all marine mammal species. This impacts include fatalities as a result of ingestion, starvation, suffocation, infection, drowning, entanglement.

Types of marine pollution:

Marine pollution is a combination of chemicals and trash, most of which comes from land sources and is washed or blown into the ocean. This pollution results in damage to the environment, to the health of all organisms, and to economic structures worldwide.

Our ocean is being flooded with two main types of pollution: chemicals and trash.

1. Chemical / nutrient pollution:

Chemical contamination, or nutrient pollution, is concerning for health, environmental, and economic reasons. This type of pollution occurs when human activities, notably the use of fertilizer on farms, lead to the runoff of chemicals into waterways that ultimately flow into the ocean. The increased concentration of chemicals, such as nitrogen and phosphorus, in the coastal ocean promotes the growth of algal blooms, which can be toxic to wildlife and harmful to humans. The negative effects on health and the environment caused by algal blooms hurt local fishing and tourism industries.

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2. Trash pollution:

Marine trash encompasses all manufactured products—most of them plastic—that end up in the ocean. Littering, storm winds, and poor waste management all contribute to the accumulation of this debris, 80 percent of which comes from sources on land. Common types of marine debris include various plastic items like shopping bags and beverage bottles, along with cigarette butts, bottle caps, food wrappers, and fishing gear. Plastic waste is particularly problematic as a pollutant because it is so long-lasting. Plastic items can take hundreds of years to decompose.
This trash poses dangers to both humans and animals. Fish become tangled and injured in the debris, and some animals mistake items like plastic bags for food and eat them. Small organisms feed on tiny bits of broken-down plastic, called micro plastic, and absorb the chemicals from the plastic into their tissues. Micro plastics are less than five millimeters (0.2 inches) in diameter and have been detected in a range of marine species, including plankton and whales. When small organisms that consume micro plastics are eaten by larger animals, the toxic chemicals then become part of their tissues. In this way, the micro plastic pollution migrates up the food chain, eventually becoming part of the food that humans eat.

3. Plastic pollution:

In the ocean, plastic pollution can kill marine mammals directly through entanglement in objects such as fishing gear, but it can also kill through ingestion, by being mistaken for food.

4. Noise pollution:

Underwater noise from ships and industrial activity can disrupt marine life in many ways, including:

Disrupting communication: Noise can mask the sounds that animals use to communicate, making it harder for them to find each other, coordinate hunts, and warn of predators.

Disorienting animals: Noise can disrupt the echolocation signals that animals like dolphins and toothed whales use to navigate and hunt.

Causing stress: Noise can cause stress in animals.

Displacing animals: Noise can displace animals from their habitats.

Causing physical harm: Noise can cause physical harm, including temporary hearing loss.

Unbalancing predator-prey interactions: Noise can increase the risk of mortality by unbalancing predator-prey interactions.

Indirectly affecting other species: Noise pollution can indirectly affect other species in the ocean ecosystem

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Some examples of how underwater noise affects marine life include:

Beluga whales: Can detect icebreaking ship sounds from up to 85 kilometers away, and may panic and flee at distances of 35 to 50 kilometers.

Narwhals: May modify their vocalizations and head towards shore when exposed to ship noise.

Seals and whales: May respond to seismic surveys with an escape response.

5. Oil spills:

Oil spills can damage marine ecosystems and coastal communities in many ways, including:

Killing marine life

Oil spills can kill marine life by poisoning or suffocating them. For example, oil can coat the feathers of seabirds and the fur of marine mammals, making it difficult for them to regulate their body temperature. This can lead to hypothermia and death. Oil can also be ingested by marine life when they try to clean themselves or eat oiled prey.

Harming fish and shellfish

Oil can harm fish and shellfish by causing changes in their growth rates, reproduction, or even death. Oil can also make fish and shellfish unsafe for humans to eat.

Damaging coral reefs and mangroves

Oil spills can damage coral reefs and mangroves.

Harming coastal communities

Oil spills can harm coastal communities by threatening the livelihoods of small-scale fisheries. Governments often prioritize oil development over fisheries, which can lead to conflicts with fishers and social consequences for coastal communities.

Releasing toxic fumes

Fumes from oil spills can be harmful to humans when inhaled, and can also cause burns, eye irritation, and neurological issues.

Causes of marine pollution:

(a) land based sources

Marine pollution is mainly caused by land-based activities because of the many ways that substances and waste are carried into the ocean from land:

- Runoff: Agricultural runoff, sewage discharge, and industrial waste are carried into the ocean by rivers and streams.
- Wind: Wind can blow plastic and other debris into the ocean.
- Air pollution: Air pollution can carry dust, pesticides, and other particles into the ocean.
- Oil spills: Oil spills and leaks can pollute the ocean.
- Desalination plants: Desalination plants discharge brine into the ocean, which can impact the coastal ecosystem.

(b) Marine based sources

Pollution from ships, offshore drilling, and accidental oil spills significantly impacts marine environments.

1. **Pollution from Ships**: Ships contribute to marine pollution through ballast water discharge, which can introduce invasive species, and the release of oily bilge water, sewage, and hazardous cargo residues. The emissions from ships also contribute to air pollution and greenhouse gas emissions, affecting both ocean health and climate change.
2. **Offshore Drilling**: Offshore oil drilling poses risks of routine discharges, including drilling muds and produced water, which contain harmful chemicals. The infrastructure needed for drilling can also disrupt marine ecosystems, affecting fish and other wildlife.
3. **Accidental Oil Spills**: Accidental spills from tankers, pipelines, or drilling rigs can have devastating effects on marine life and coastal ecosystems. Oil coats the feathers of birds, damages fish habitats, and can lead to long-term ecological consequences. Cleanup efforts are often challenging and can take years, if not decades, to restore affected areas.

(c) Improper waste management

Poor waste disposal methods significantly contribute to the buildup of garbage in the oceans in several ways:

1. **Landfills and Dumping**: Inadequately managed landfills can lead to waste being washed into nearby rivers and streams during heavy rains. This waste can eventually make its way to the ocean. In some cases, illegal dumping in coastal areas directly contributes to marine debris.
2. **Single-Use Plastics**: The widespread use of single-use plastics, combined with poor disposal practices, results in significant amounts of plastic waste entering the marine environment. Items like bags, straws, and bottles can easily escape waste management systems and end up in oceans.

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3. **Lack of Recycling Infrastructure**: In many regions, insufficient recycling facilities mean that recyclable materials are often discarded as trash. When this waste ends up in landfills, improper handling can cause it to break down into smaller pieces, contributing to micro plastic pollution.
4. **Urban Runoff**: In urban areas, storm water runoff can carry trash and debris from streets and parks directly into waterways. This runoff often includes a mix of materials, such as plastics, food wrappers, and other non-biodegradable items.
5. **Fishing Waste**: Improper disposal of fishing gear, such as nets and lines, can lead to "ghost fishing," where discarded gear continues to trap marine life. This not only adds to ocean debris but also impacts marine ecosystems.
6. **Inadequate Education and Awareness**: Lack of public awareness about proper waste disposal and recycling practices can lead to careless behaviors, such as littering. This directly contributes to the accumulation of trash in oceans.

Impact of marine pollution:

1. On marine life

Marine pollution can have many negative impacts on marine life, including:

Entanglement

Large pieces of plastic can trap and entangle marine mammals and fish, preventing them from escaping.

Ingestion

Small pieces of plastic can be mistaken for food by marine species, leading to starvation, suffocation, and toxic contamination.

Toxic contamination

A single plastic particle can absorb up to one million times more toxic chemicals than the water around it.

Invasive species

Floating plastic items can help transport invasive species, which can threaten marine ecosystems, biodiversity, and the food web.

Habitat damage

Marine debris can threaten the habitats that marine species depend on.

Hypothermia

Oil pollution can destroy the insulating ability of fur-bearing mammals and the water repellency of a bird's feathers, exposing them to the harsh elements.

Shell dissolution

Increased amounts of atmospheric CO2 cause increasingly acidic conditions that dissolve the shells of marine organisms like ptero pods

2. On human health

If humans are exposed to these toxic chemicals for long periods of time, then this can result in dangerous health problems, which include hormonal issues, reproductive issues, and damage to our nervous systems and kidneys.

3. On economy

Marine pollution has a significant economic impact on the following areas:

Tourism: Marine debris can reduce the number of days visitors spend on beaches, which can lead to a loss of tourism dollars and jobs. For example, a NOAA-funded study found that doubling the amount of marine debris in coastal Alabama led to a loss of $113 million in tourism dollars and nearly 2,200 jobs.

Real estate: Polluted waters can cause real estate prices to drop by 25%.

Fisheries: Fish are ingesting more plastic pollution, which could harm fisheries.

Income per capita: Marine pollution can directly decrease income per capita by 6.7%.

Coastal areas: Pollution spillover from neighboring areas can intensify the negative economic consequences on the affected coastal areas.

Ecosystem services: Marine plastic pollution can impact ecosystem services, such as the provision of fisheries, aquaculture, and materials for agricultural use.

Solution and preventive measures:

Solutions for marine pollution include prevention and cleanup. Disposable and single-use plastic is abundantly used in today's society, from shopping bags to shipping packaging to plastic bottles. Changing society's approach to plastic use will be a long and economically challenging process. Cleanup, in contrast, may be impossible for some items. Many types of debris (including some plastics) do not float, so they are lost deep in the ocean. Plastics that do float tend to collect in large "patches" in ocean gyres. The Pacific Garbage Patch is one example of such a collection, with plastics and micro plastics floating on and below the surface of swirling ocean currents between California and Hawaii in an area of about 1.6 million square kilometers (617,763 square miles), although its size is not fixed. These patches are less like islands of trash and, as the National Oceanic and Atmospheric Administration says, more like flecks of micro plastic pepper swirling around an ocean soup. Even some promising solutions are inadequate for combating marine pollution. So-called "biodegradable" plastics often break down only at temperatures higher than will ever be reached in the ocean.

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Nonetheless, many countries are taking action. According to a 2018 report from the United Nations, more than sixty countries have enacted regulations to limit or ban the use of disposable plastic items.

Conclusion:

Marine pollution poses a significant threat to ocean ecosystems, wildlife, and human health. Plastics, chemicals, and waste not only disrupt marine life but also affect food security and livelihoods, particularly for coastal communities.

Addressing this crisis is crucial for preserving biodiversity, ensuring clean water, and combating climate change. Collective action is essential; individuals can reduce plastic use and support sustainable practices, while governments must enforce stricter regulations and promote marine conservation initiatives. Corporations should adopt sustainable practices and take responsibility for their environmental impact.

Together, we can protect our oceans for future generations. It's time to unite in this effort—every action counts!

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