Energy and Environment Engineering

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ENVIRONMENT AND ECOSYSTEMS

Introduction: Concept of an ecosystem- structure and functions of ecosystem. Components of ecosystem - producers, consumers, decomposers, Food chains, food webs, ecological pyramids, Energy flow in ecosystem. Bio-geo- chemical cycles, Hydrologic cycle Components of Environment and their relationship, Impact of technology on environment, Environmental degradation. Environmental planning of urban network services such as water supply, sewerage, solid waste management.

ENVIRONMENTAL POLLUTION

Water, air, soil, noise, thermal and radioactive, marine pollution: sources, effects and engineering control strategies. Drinking water quality and standards, Ambient air and noise quality standards

GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT

Engineering aspects of climate change. Acid rain, depletion of ozone layer. Concept of carbon credit. Concepts of Environmental impact assessment and Environmental audit. Environmental life cycle assessment

Marine Pollution

Introduction

- Oceans cover about 71% of the Earth's surface.
- They play an important role in the chemical and biological balance of the life on the earth.
- They are vital to our food security, commerce and transportation.
- Organochloric pollutants, pesticides, polychlorinated biphenyls (PCBs) and a range of other toxic pollutants accumulate within fishes later moving up the food chain to cause reproductive disorders.

Marine Pollution

- It is defined as the discharge of waste substances into the sea resulting in harm to living resources, hazards to human health, hindrance to fishery and impairment of quality for use of sea-water.
- Marine pollution is associated with the changes in physical, chemical and biological conditions of the sea water.
- Eighty percent of marine pollution comes from land.
- Air pollution is also a contributing factor by carrying off pesticides or dirt into the ocean.
- When pesticides are incorporated into the marine ecosystem, they quickly become absorbed into marine food webs.

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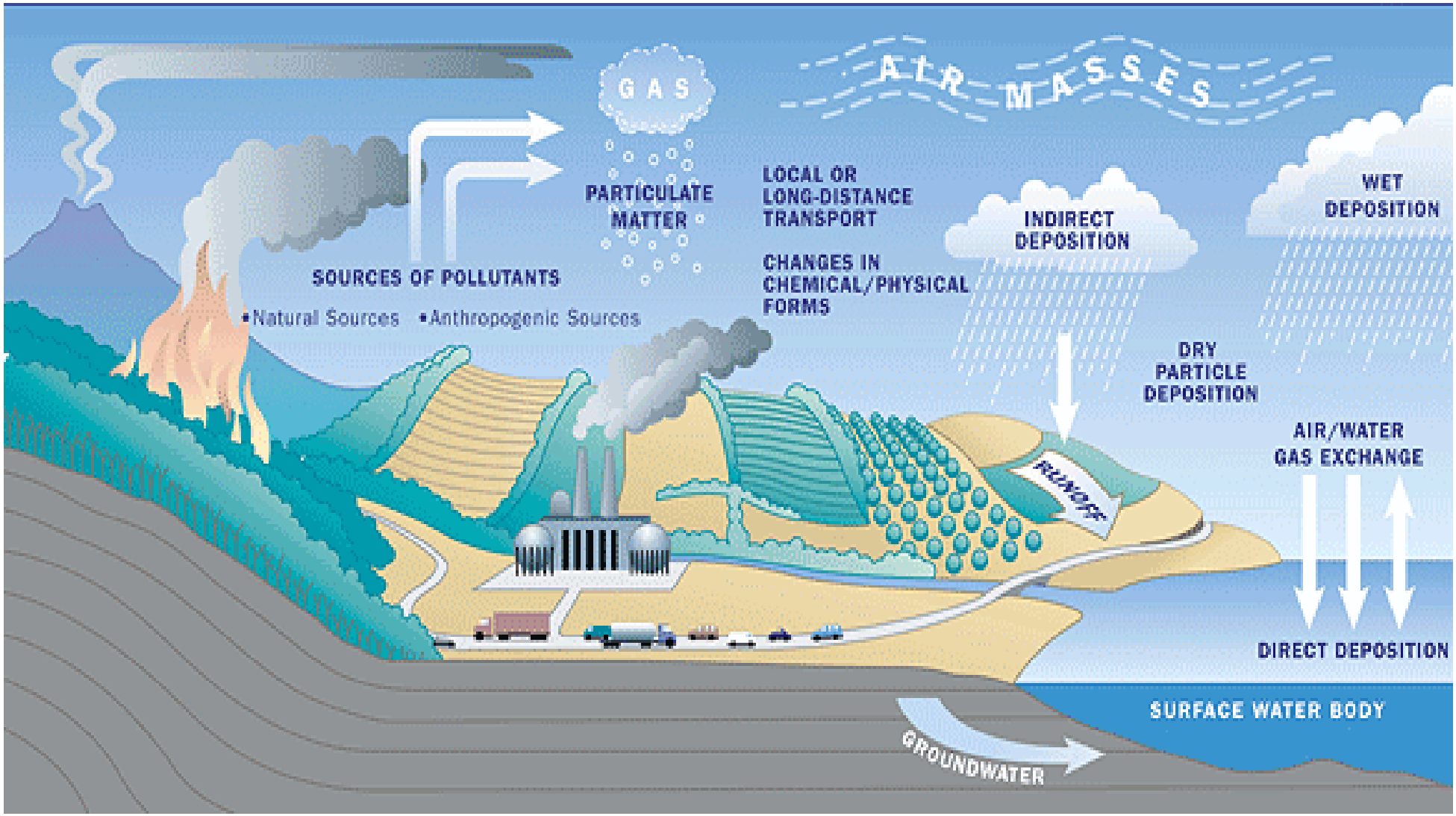
Sources of Marine Pollution



Sources of Marine Pollution

The marine environment becomes polluted and contaminated through various sources and forms. Major sources of marine pollution are the…..

- Inflow of chemicals
- Dumping of solid waste
- Discharge of radioactive elements
- Industrial and agricultural effluents
- Agricultural effluents
- Man-made sedimentation
- Oil spills

Types of Marine Pollution

There are five main types of inputs of pollution into the ocean:

- Direct discharge of waste into the oceans
- Ship Pollution
- Atmospheric Pollution
- Deep Sea Mining
- Surface Runoff

Direct discharge of waste into the oceans

- Ocean dumping is internationally defined as "any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms, or other man-made structures at sea, and any deliberate disposal at sea of vessels, aircraft, platforms, or other man-made structures at sea."
- Dumping of waste materials from factories and industries, tankers and ships and sewerage waste materials into the oceans.
- Pollutants also enter the sea directly from urban sewerage and industrial waste discharges, sometimes in the form of hazardous and toxic wastes.

The effects of dumping on the ocean are difficult to measure and depend on complex interactions of factors including type, quantity, and physical and chemical properties of the wastes.

Ship Pollution

- Spilling of oil from tankers and offshore rigs in the oceanic area is also another example of sea pollution.
- Spilling of oil can happen inadvertently where small doses of oil are leaked into the oceans by the tanker ships or in a massive scale where gallons and gallons of oil are leaked into the water surface of the ocean after the collision of vessels.
- Ships can pollute waterways and oceans in many ways. Oil spills can have devastating effects. While being toxic to marine life, polycyclic aromatic hydrocarbons (PAHs), found in crude oil, are very difficult to clean up, and last for year.
- It has been estimated that container ships lose over 10,000 containers at sea each year.

Atmospheric pollution

- Wind blown dust and debris, including plastic bags, are blown seaward from landfills and other areas.
- Dust from the Sahara moves into the Caribbean and Florida during the warm season .
- Since 1970, dust outbreaks have worsened due to periods of drought in Africa.
- The USGS links dust events to a decline in the health of coral reefs across the Caribbean and Florida
- Climate change is raising ocean temperatures and raising levels of carbon dioxide in the atmosphere. These rising levels of carbon dioxide are acidifying the oceans.

The USGS (United States Geological Survey) studies and provides information on dust events, including their causes, consequences, and potential solutions

Ship Pollution

Ships can pollute waterways and oceans in many ways:

- Oil spills can 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.
- Discharge of cargo residues from bulk carriers can pollute ports, waterways and oceans. In many instances vessels intentionally discharge illegal wastes despite foreign and domestic regulation prohibiting such actions.
- It has been estimated that container ships lose over 10,000 containers at sea each year (usually during storms).
- Ships also create noise pollution that disturbs natural wildlife

Deep Sea Mining

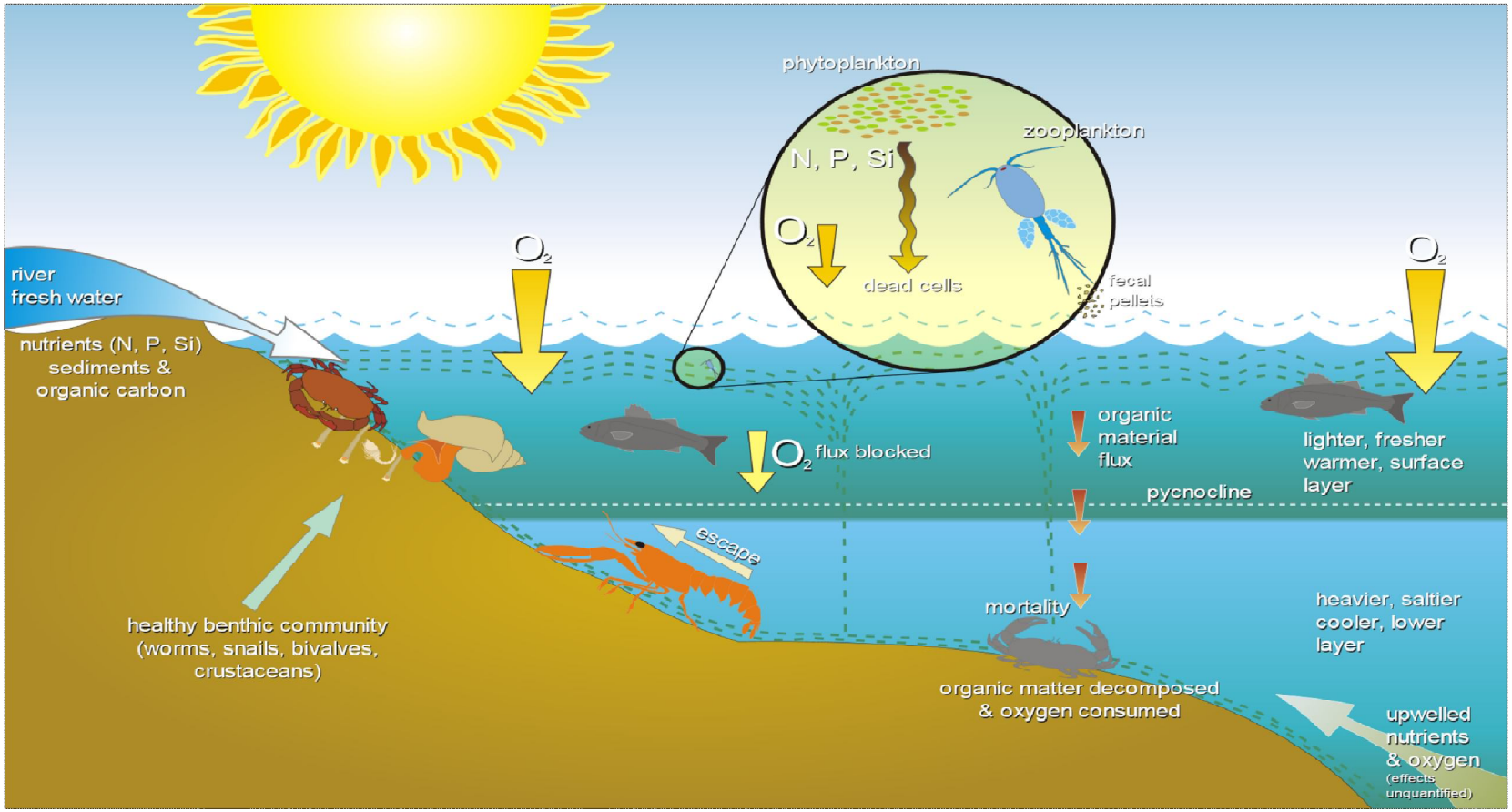
- Ocean mining sites are usually around large areas of polymetallic nodules or active and extinct hydrothermal vents at about 1,400 - 3,700 meters below the ocean's surface.
- The deposits are mined using either hydraulic pumps or bucket systems that take ore to the surface to be processed.
- Removing parts of the sea floor disturbs the habitat of benthic organisms, possibly, depending on the type of mining and location, causing permanent disturbances.
- Near bottom plumes occur when the tailings are pumped back down to the mining site.
- Surface plumes cause a more serious problem. Depending on the size of the particles and water currents the plumes could spread over vast areas.
- Aside from direct impact of mining the area, leakage, spills and corrosion would alter the mining area's chemical make up

Surface Runoff

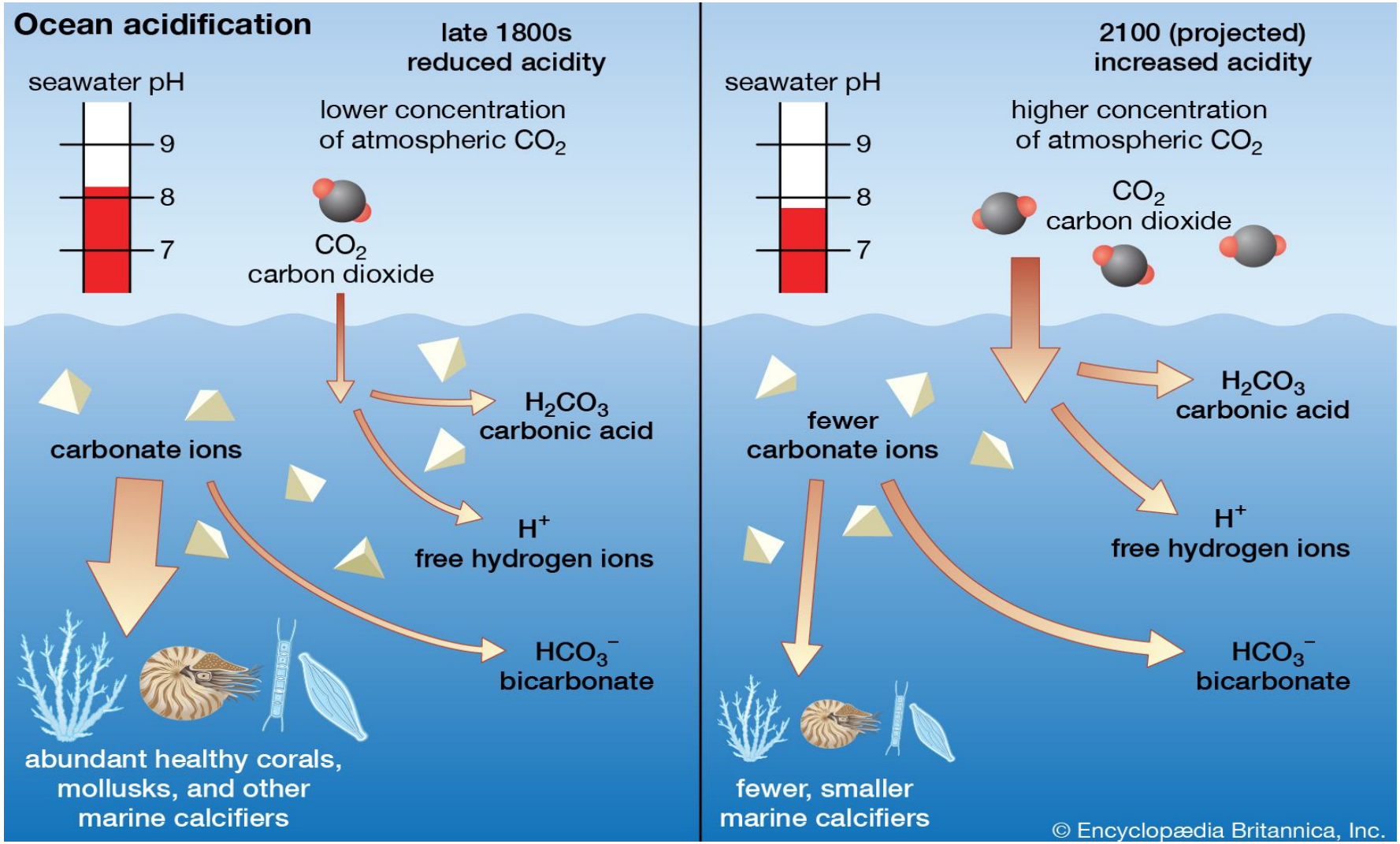
- Surface runoff from farming, as well as urban runoff and runoff from the construction of roads, buildings, ports, channels, and harbours, can carry soil and particles laden with carbon, nitrogen, phosphorus, and minerals.
- Polluted runoff from roads and highways can be a significant source of water pollution in coastal areas.
- About 75% of the toxic chemicals that flow into Puget Sound are carried by stormwater that runs off paved roads and driveways, rooftops, yards and other developed land.

Human Impacts- (Anthropogenic activities) on Marine Environments

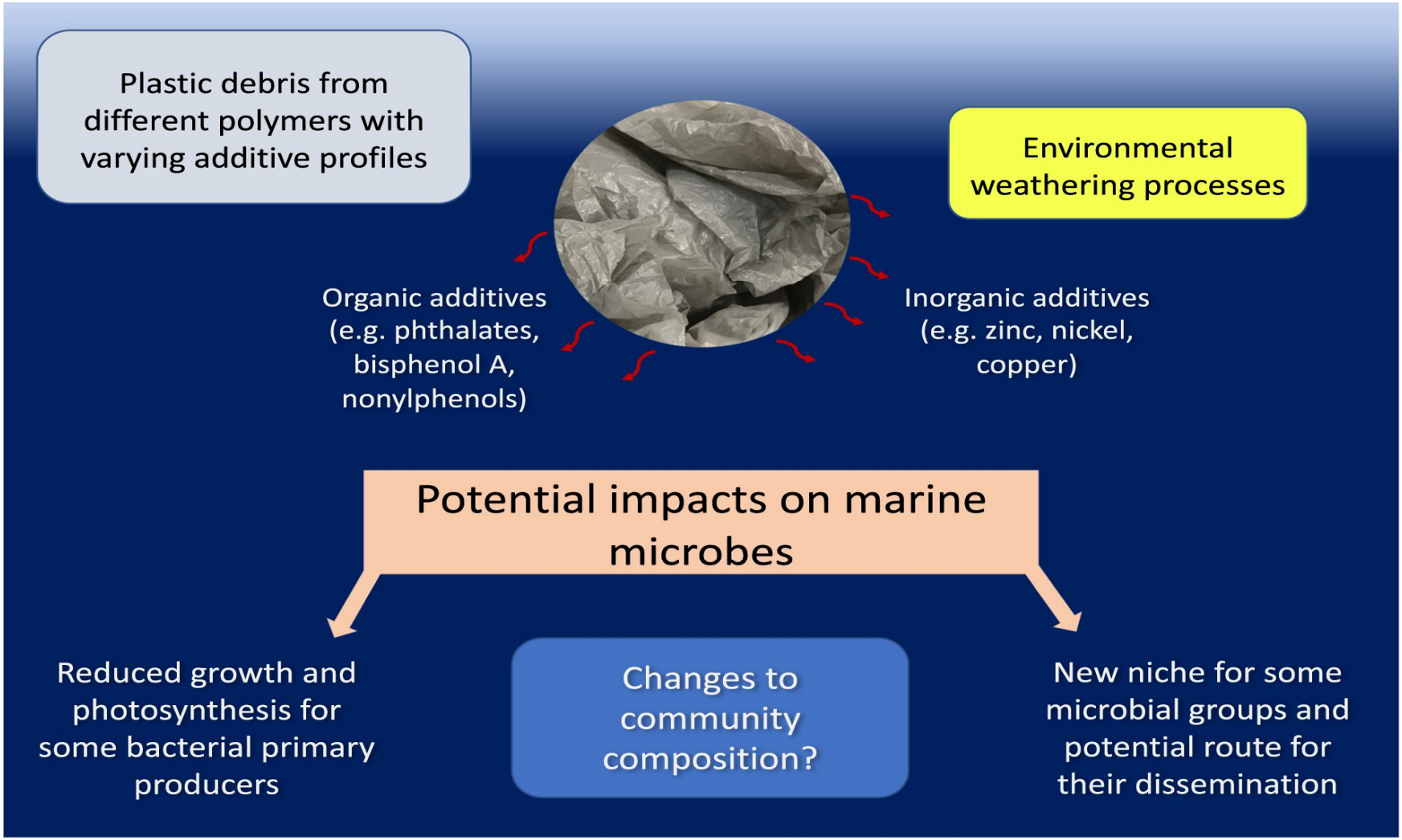
1. Eutrophication



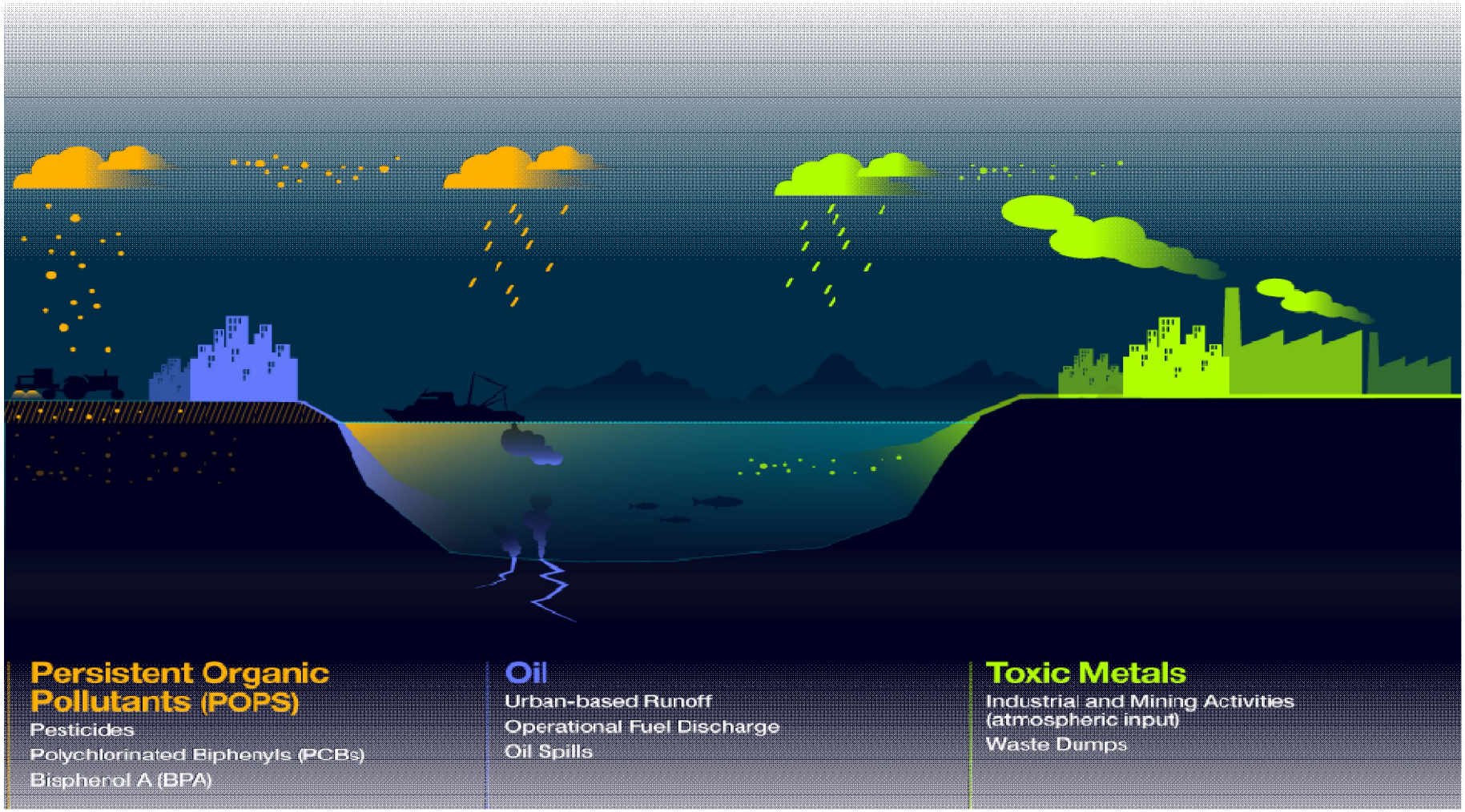
2. Acidification



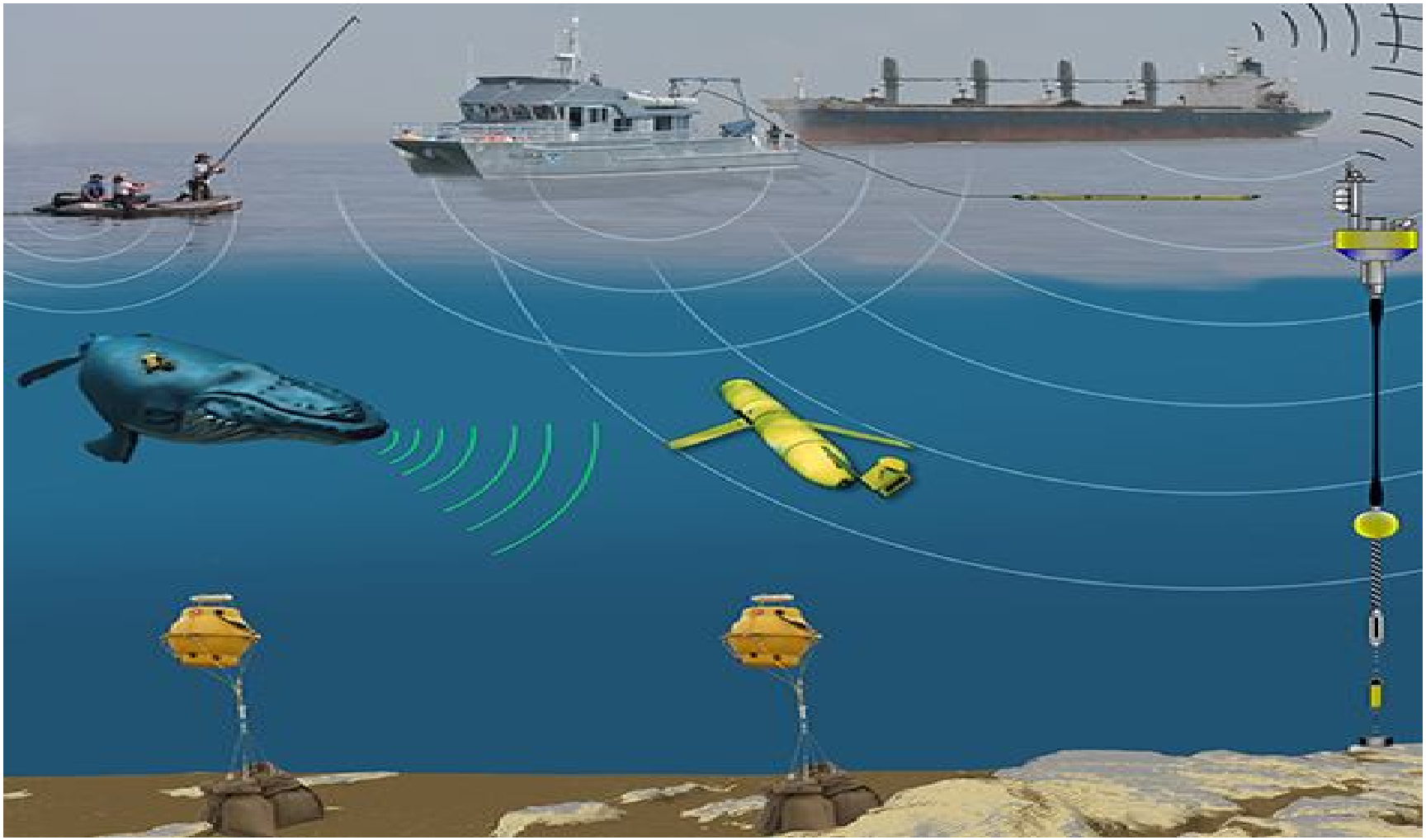
3.Plastic Debris



4. Other Toxins



5. Noise Pollution



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

Mitigation Measures

- Reduce input of toxic pollutants
- Treat sewage primary, secondary and tertiary treatment
- Ban dumping of wastes and raw sewage in the sea
- Ban ocean dumping of sludge and hazardous dredged material
- Protect sensitive areas from development, oil drilling, and oil shipping
- Regulate coastal development
- Skimming
- Creating awareness
- Government rules regulation

Thank You