FACULTY OF ENGINEERING AND TECHNOLOGY

Lecture- 22

Environmental Pollution-Part 2

Dr. Swati Sachdev,
Assistant Professor,
Dept. of Applied Sciences and Humanities

Subject : Environmental Studies and Disaster Management
Course: B.Sc. Ag. (Ist year)
Subject Code: PPY-211
Semester: IInd sem.

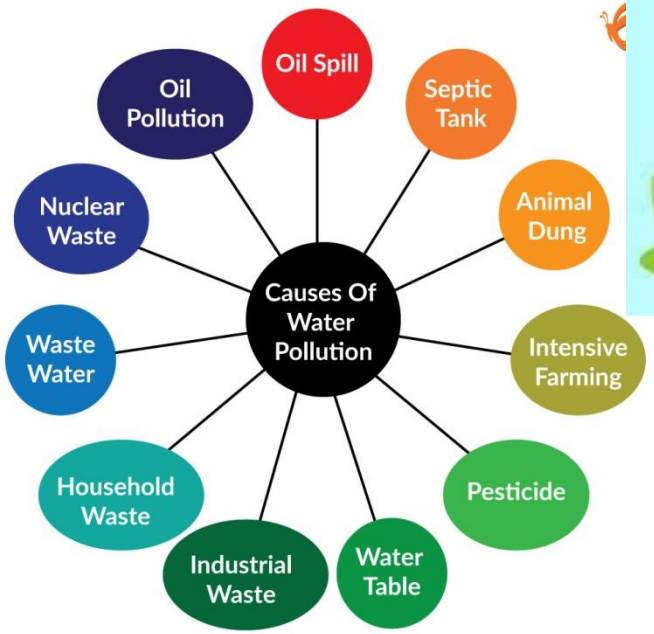
Water Pollution

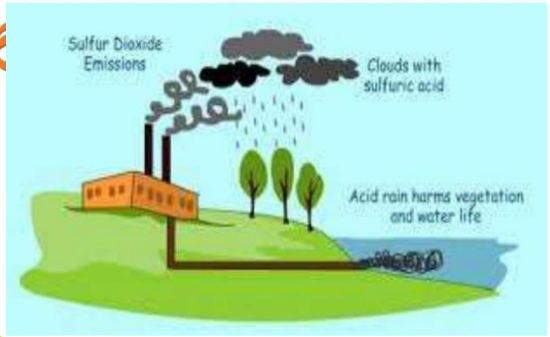
Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds.

Sources: https://images.app.goo.gl/pp1HSAHo8YdZGmQD9; https://images.app.goo.gl/qVRRsfVDV2DanaE59

Causes of water pollution

- Industrial waste
- Sewage and wastewater
- Mining activities
- Agricultural activities
- Animal waste
- Leaching from landfills and underground storage tanks
- Atmospheric deposition
- Urban runoff
- Oil spill
- Acid rain





Acid rain

Sources: https://images.app.goo.gl/UZx3Rmsb6nThzn5V7,

Pollutants causing water pollution

There are several classes of common water pollutants.

Disease-causing agents (pathogens): It include bacteria, viruses, protozoa and parasitic worms that enter water from domestic sewage and untreated human and animal wastes.

Oxygen depleting waste: These are organic wastes that can be decomposed by aerobic (oxygen requiring) microorganisms.

Inorganic plant nutrients: These are water soluble nitrates and phosphates that cause excessive growth of algae and other aquatic plants.

Water soluble inorganic chemicals: It include acids, salts and compounds of toxic metals such as mercury and lead.

Organic chemicals: It include oil, gasoline, plastics, pesticides, cleaning solvents, detergent and many other chemicals

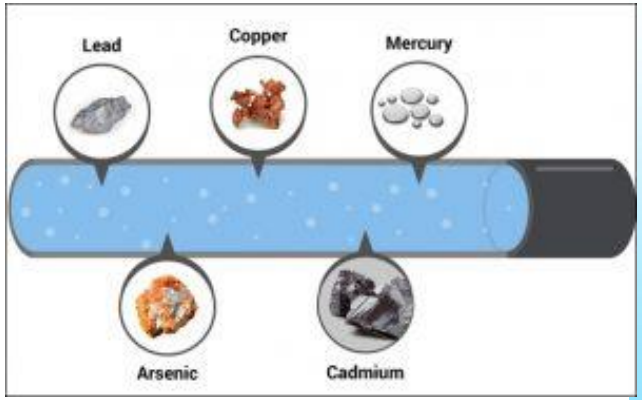
Sources https://images.app.goo.gl/YN4b4YFXg9MDgWpk8; https://images.app.goo.gl/pYZpY2qkx1HbjBvg8;

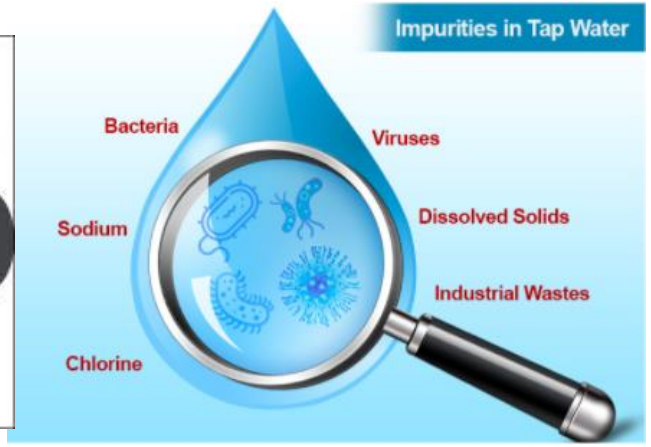
Suspended matter: These are insoluble particles of soil and other solids that become suspended in water. This occurs when soil is eroded from the land. High levels of soil particles suspended in water, interferes with the penetration of sunlight.

Water soluble radioactive isotopes: Another source of water pollution. These can be concentrated in various tissues and organs as they pass through food chains and food webs. Ionizing radiation emitted by such isotopes can cause birth defects, cancer and genetic damage.

Hot water: Generated from power plants and industries that use large volumes of water to cool the plant result in rise in temperature of the local water bodies causing ***Thermal pollution***.

Oil: It is washed into surface water in runoff from roads and parking lots which also pollutes groundwater. Leakage from underground tanks.





Sources https://images.app.goo.gl/WrvVPBB3EZDLuaWq9; https://images.app.goo.gl/rT2C5jezzWJTkf4T7

Effects of water pollution

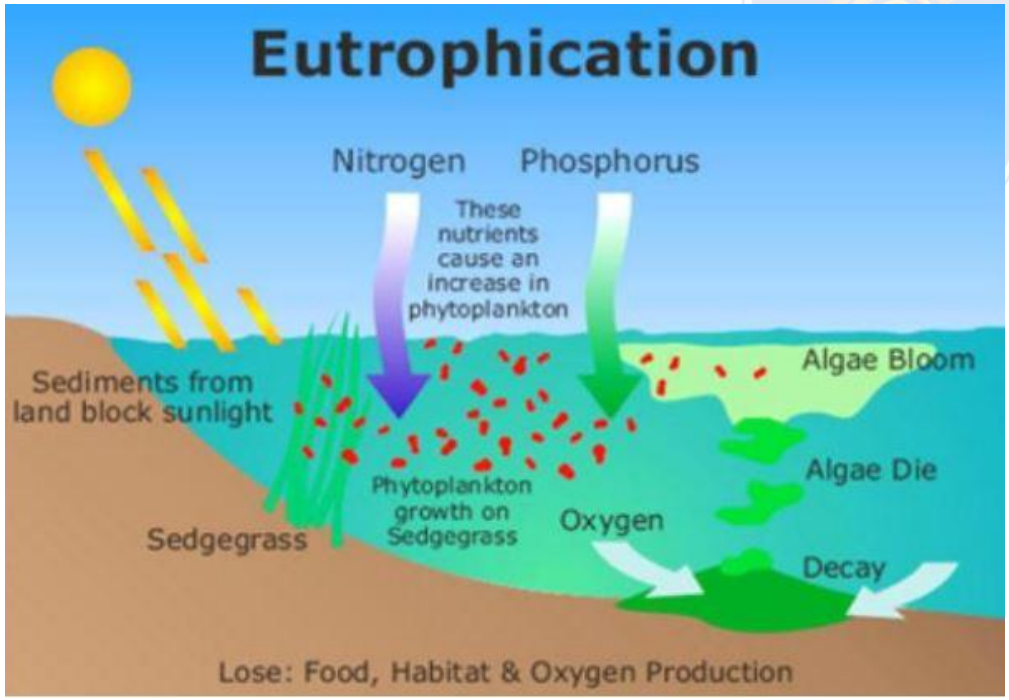
Water-borne diseases

Causes water-borne diseases like **typhoid, dysentery, cholera, diarrhoea, poliomyelitis, etc.**

Sources https://images.app.goo.gl/7EtJjbTx5mCZFhjY7

Eutrophication

Nutrient enrichment in water bodies result in **Eutrophication.** It cause destruction of biodiversity and lack of potable water. Increase in nitrate and other toxins make water unfit for drinking and can increase infant mortality.



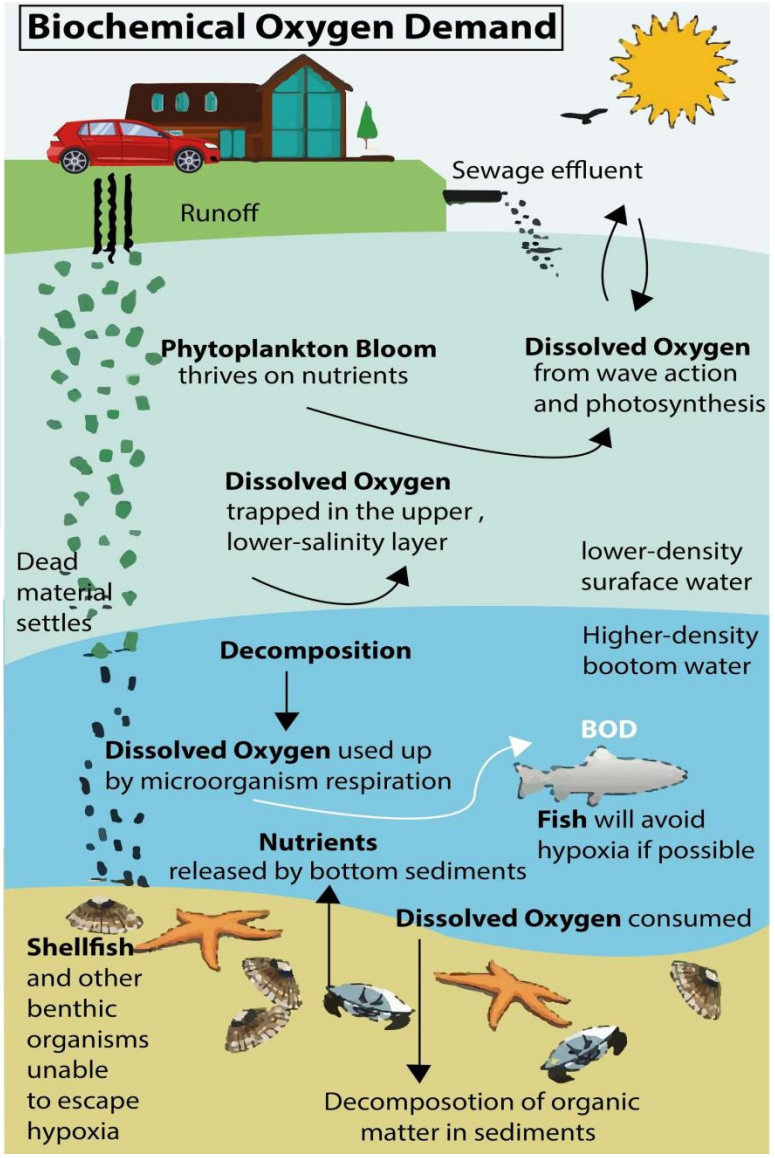
Sources: https://images.app.goo.gl/Dmq1N4kxCGk5yARx9; https://images.app.goo.gl/Pmv1XQkCKZFAK3NH9

Biological Oxygen Demand

Increase **Biological Oxygen Demand (BOD).** BOD is the amount of oxygen required to decompose organic matters in water bodies by micro-organisms. Thus BOD is used to measure level of organic pollution in water bodies.

BOD Level

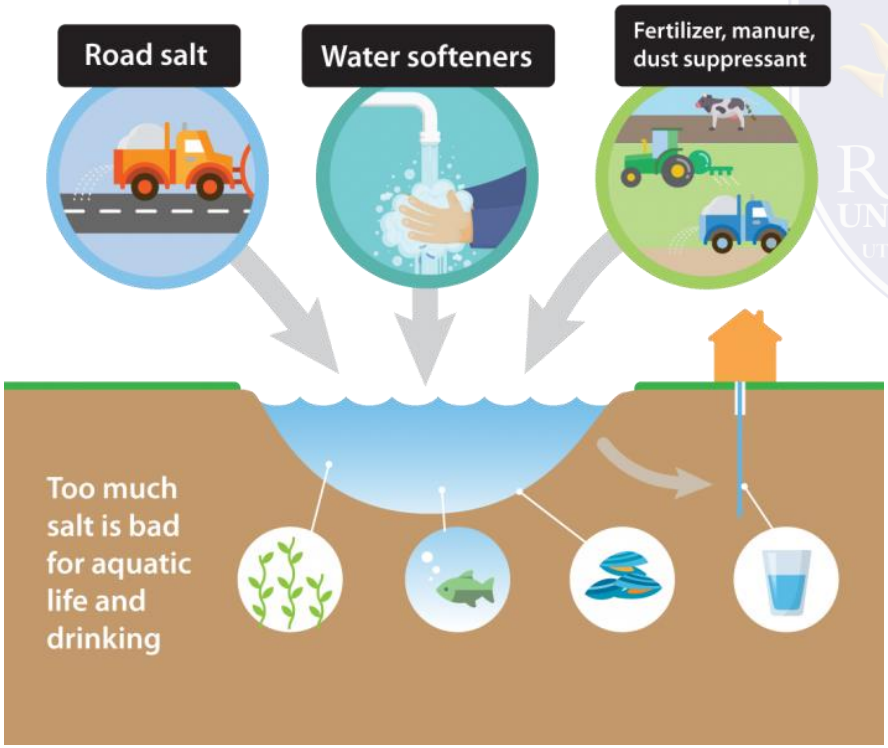
BOD Level *(in ppm)*	Water Quality
1 - 2	**Very Good** There will not be much organic waste present in the water supply.
3 - 5	**Fair: Moderately Clean**
6 - 9	**Poor: Somewhat Polluted** Usually indicates organic matter is present and bacteria are decomposing this waste.
100 or greater	**Very Poor: Very Polluted** Contains organic waste.

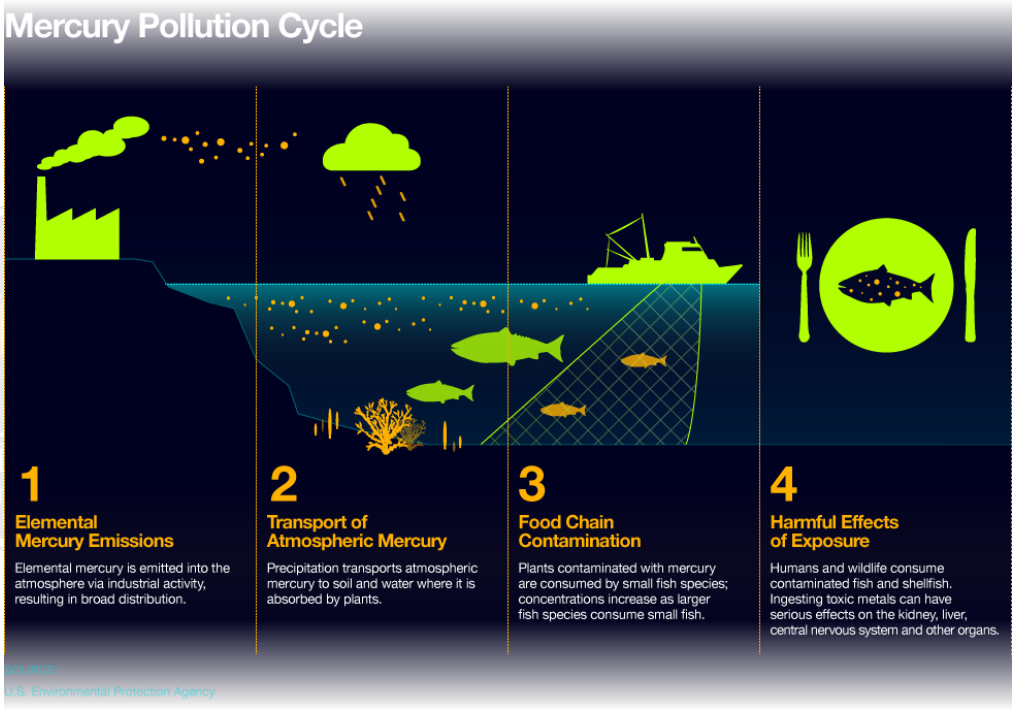


Sources: https://images.app.goo.gl/h2pKrfER3p3MY8m9A; https://images.app.goo.gl/ueMbTxuh5sHLYc68A

Water salinization and contamination of food chain

Increase water salinity





Toxic compounds like metals contaminate food chain

Sources: https://images.app.goo.gl/4GTtBv2w6wxiw1L4A; https://images.app.goo.gl/dcmDJ5pA8wwdt7Vv8

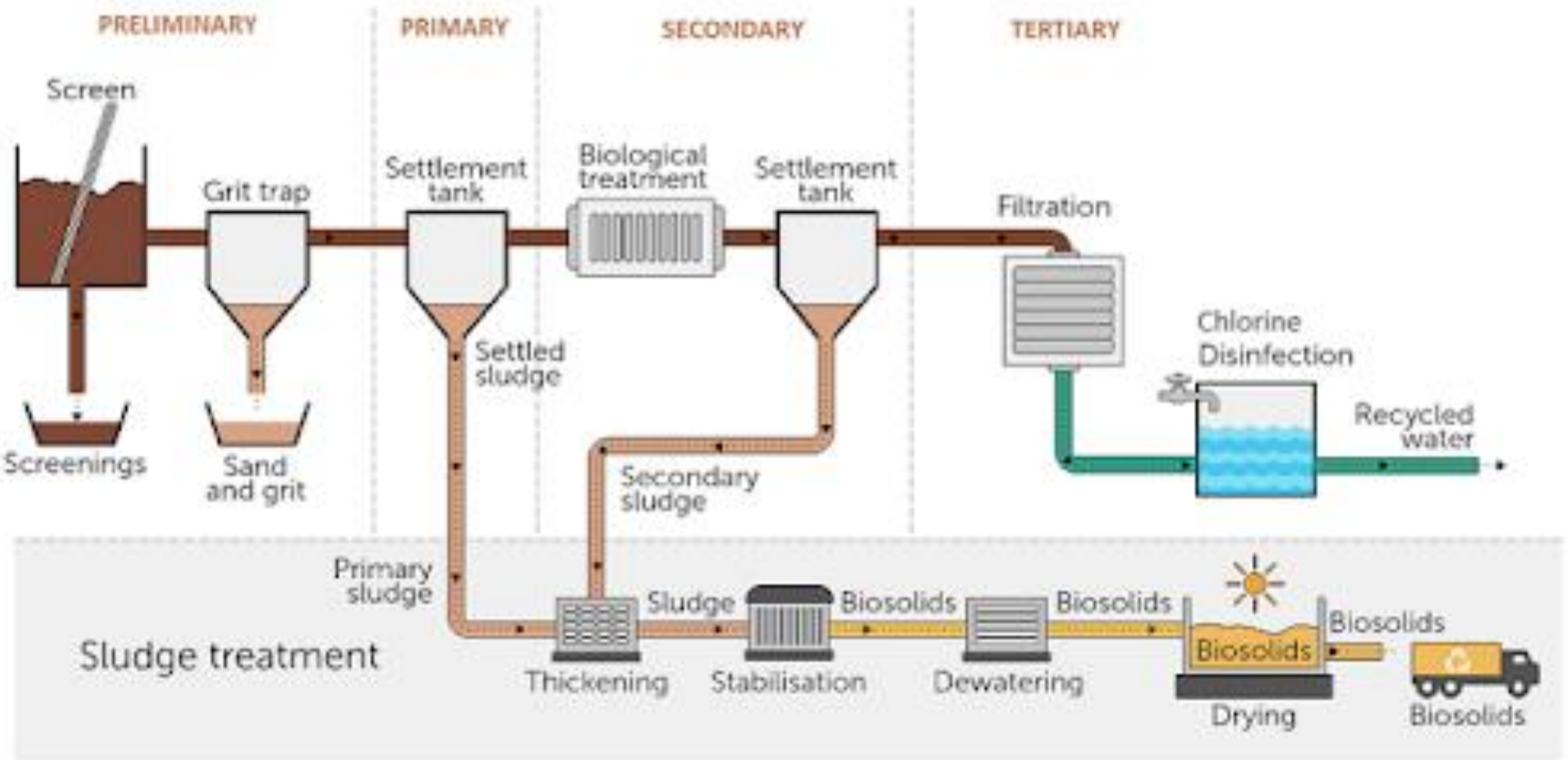
Control measures

Effluent treatment plants (ETP) or **sewage treatment plant** (**STP**) are designed to treat wastewater (also known as effluent) through these can reduce the pollution load in the recipient water.

The treated effluent can be reused for either gardening or cooling purposes wherever possible.

Wastewater treatment include **physical, chemical and biological methods.**

Wastewater treatment involves three stages viz., **primary, secondary and tertiary treatment.**



Sources https://images.app.goo.gl/xVkh9WBnDzmcYKG36

Marine Pollution

Marine pollution can be defined as the introduction of substances to the marine environment either directly or indirectly resulting in adverse effects on human health, reduce marine activities and deteriorate the quality of sea water.

Oil spill

Sources https://images.app.goo.gl/LmBqfzypwTEwVKcbA; https://images.app.goo.gl/KY5Ed6yXZa1NUFcZA; https://images.app.goo.gl/e1GvduRZ8ZvMndkq7; https://images.app.goo.gl/4aMhee9dSASZXruo9

Causes of marine pollution

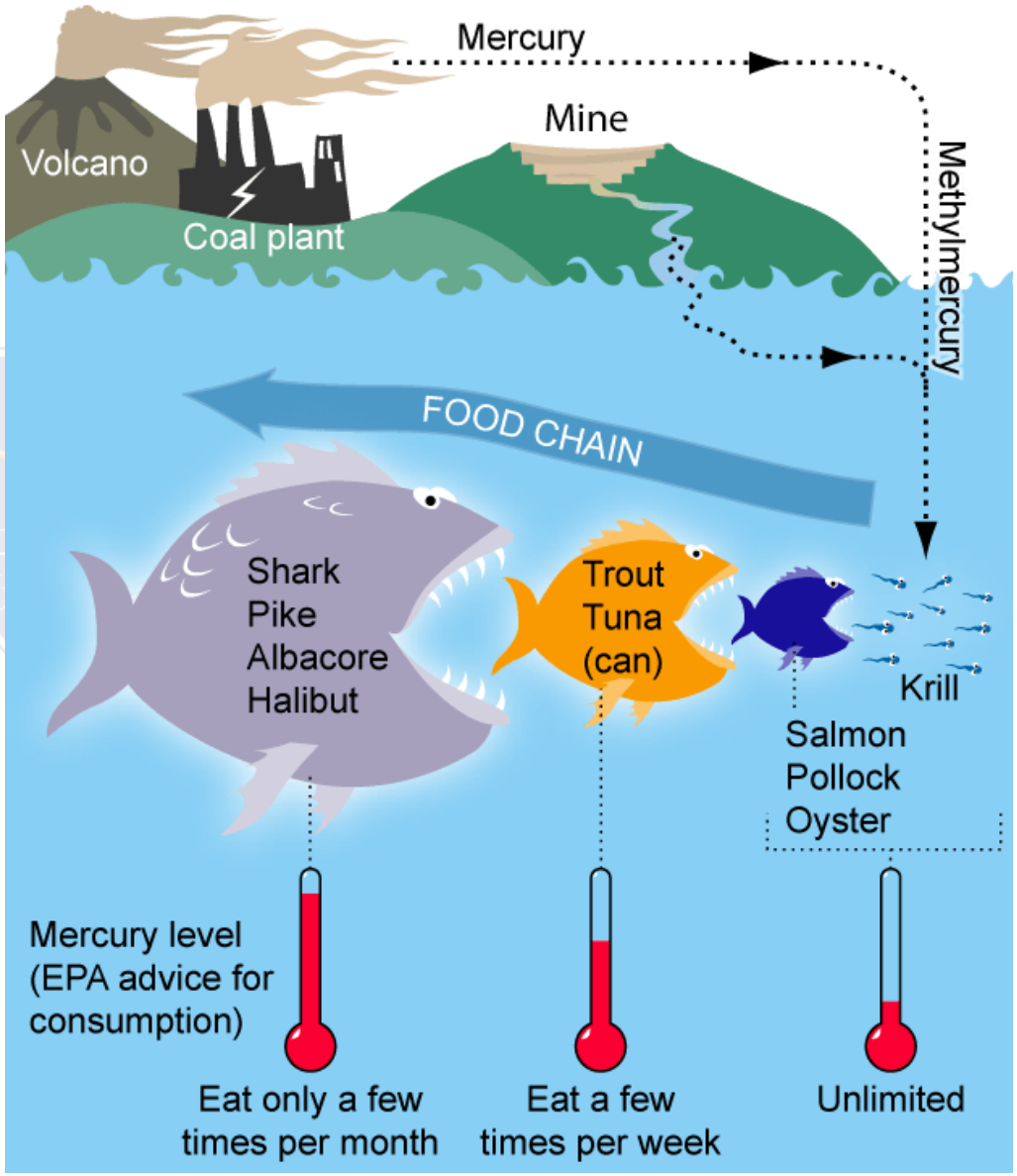
Several causes of marine pollution are similar to general water pollution, while are some specific causes that pollute marine waters.

- The municipal waste and sewage from residences and hotels in coastal towns directly discharge wastes into the sea.
- Direct dumping of plastic waste near sea shores and beaches.
- Pesticides and fertilizers from agriculture washed off the land by rain, enter water courses and eventually reach the sea.
- Petroleum and oils washed off from the roads normally enter the sewage system but stormwater overflows carry these materials into rivers and eventually into the seas.
- Ships carry many toxic materials such as oil, liquefied natural gas, chemicals, etc. may result in marine pollution due to ship accidents and accidental spillages. Offshore oil exploration and extraction also pollute the seawater to a large extent.

Sources: https://images.app.goo.gl/T6PF5oEkWymdtFwH9; https://images.app.goo.gl/V7bEyBVd4Q2ddHVm6; https://images.app.goo.gl/A6vzda4eg1MHePix5; https://images.app.goo.gl/FYk8JaTx1ACXHfKk7

Effects of marine pollution

- Depletion of oxygen from marine water due to degradation of excess organic waste.
- Increase risk of toxicity to humans via contamination of food chain.
- Reduce marine biodiversity.



Sources:https://images.app.goo.gl/Z7jCZBYpJrivyMv49; https://images.app.goo.gl/ZbERLC2oiXV6Bywe7

Control measures

- Reduce use of single-use plastics.
- Reduce waste production
- Prohibit littering waste off-shores and beaches.
- Perform operations such as sea mining and transportation of hazardous materials more safely to prevent accidents.
- Do not dump untreated municipal or industrial waste into marine water.
- Reduce use of agrochemical and other materials that sweep out to marine water via run-off or during storm events.

Thermal pollution

- Temperature plays an important role in determining the conditions in which living organisms can survive.
- Any undesirable, harmful change in natural temperature i.e., increase or decrease in temperature beyond normal, disturbing the natural heat balance of the surroundings is called ‘Thermal Pollution’.

Causes

- The major cause of thermal pollution is release of hot water from industries to water bodies.
- Industry such as power plants use water to convert it into steam that is used to drive the turbines and generate electricity. For efficient functioning of the steam turbines, the steam is condensed into water after it leaves the turbines. This condensation is done by using water from a water body to absorb the heat. This heated water, having temperature at least 15°C higher than the normal is discharged back into the water body. The warm water not only decreases the solubility of oxygen but changes the breeding cycles of various aquatic organisms.
- There are several indirect causes that induce thermal pollution such as soil erosion, deforestation, natural causes, disposal of sewage, etc.

Effects

- Reduce water dissolved oxygen (DO).
- Reduce biodiversity
- Increase toxin level in water bodies
- Affect reproductive health of aquatic life.
- Increase migration to other aquatic areas.
- Increase metabolic activity and disrupt food chain

Prevention methods

- Use of cooling ponds
- Cooling towers
- Artificial lakes
- Can be used for other activities such as industrial and space heating, etc.


THANK YOU :)