WATER POLLUTION

EUTROPHICATION

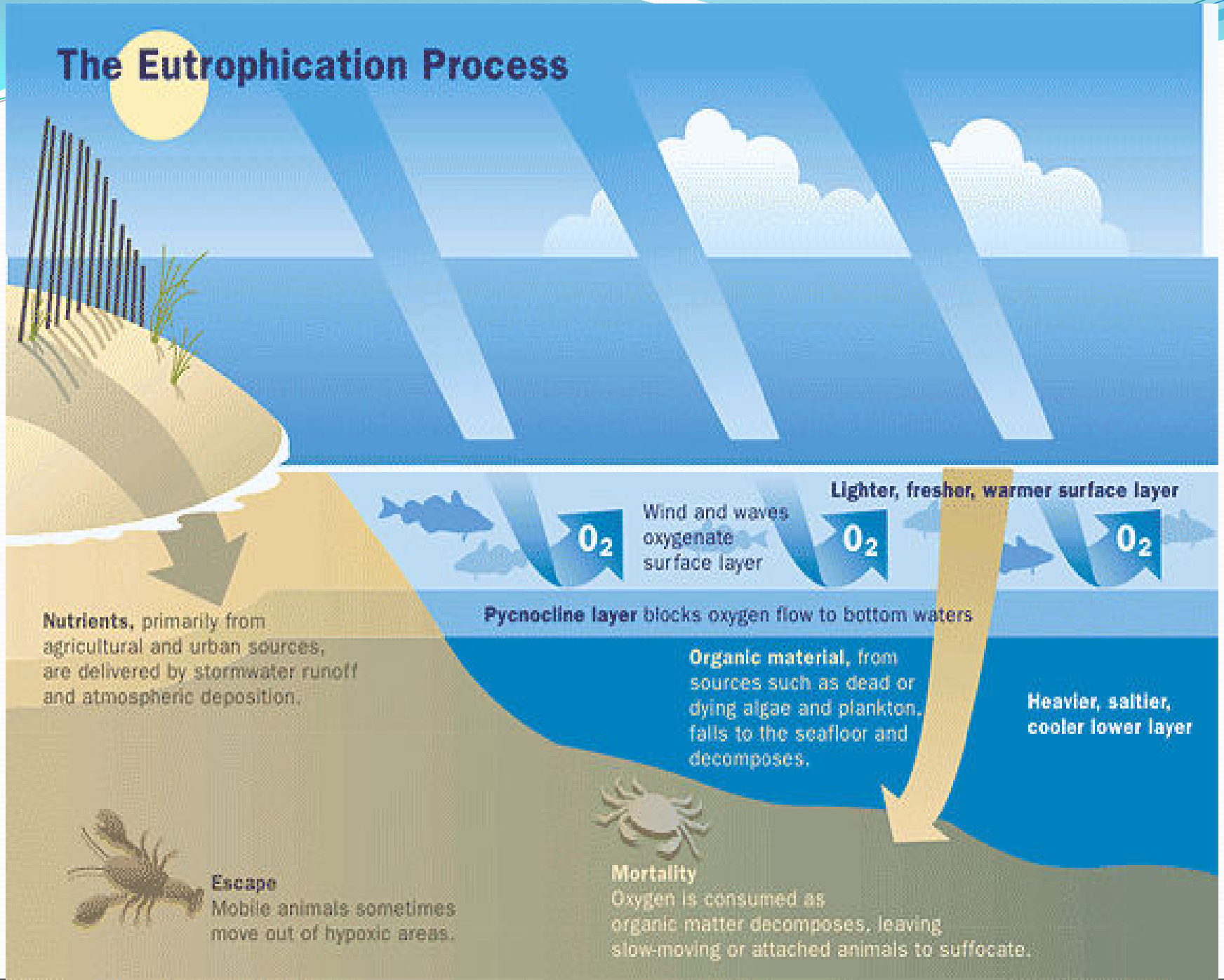
Eutrophication is
a process
whereby water
bodies, such as
lakes, estuaries, or
slow-moving streams
receive excess nutrients
that stimulate excessive
plant growth

World scenario

- Eutrophication was recognized as a pollution problem in European and North American lakes and reservoirs in the mid-20th century. Since then, it has become more widespread. Surveys showed that 54% of lakes in Asia are eutrophic; in Europe, 53%; in North America, 48%; in South America, 41%; and in Africa, 28%.

- Phosphorus is often regarded as the main culprit in cases of eutrophication in lakessubjected to point source pollution from sewage. The concentration of algae and the tropic state of lakes correspond well to phosphorus levels in water.

- Between 1950 and 1995, 600,000,000 tonnes of phosphorus were applied to Earth's surface, primarily on croplands. Control of point sources of phosphorus have resulted in rapid control of eutrophication, mainly due to policy changes.


The Eutrophication Process
Lighter, fresher, warmer surface layer
Wind and waves oxygenate surface layer
O2
O2
O2
Nutrients, primarily from agricultural and urban sources, are delivered by stormwater runoff and atmospheric deposition.
Pycnocline layer blocks oxygen flow to bottom waters
Organic material, from sources such as dead or dying algae and plankton, falls to the seafloor and decomposes.
Heavier, saltier, cooler lower layer
Escape
Mobile animals sometimes move out of hypoxic areas.
Mortality
Oxygen is consumed as organic matter decomposes, leaving slow-moving or attached animals to suffocate.

Sources of high nutrient runoff

Characteristics of point and nonpoint sources of chemical inputs

Point sources

- Wastewater effluent (municipal and industrial)
- Runoff and leachate from waste disposal systems
- Runoff and infiltration from animal feedlots
- Runoff from mines, oil fields, unsewered industrial sites
- Overflows of combined storm and sanitary sewers
- Runoff from construction sites >20,000

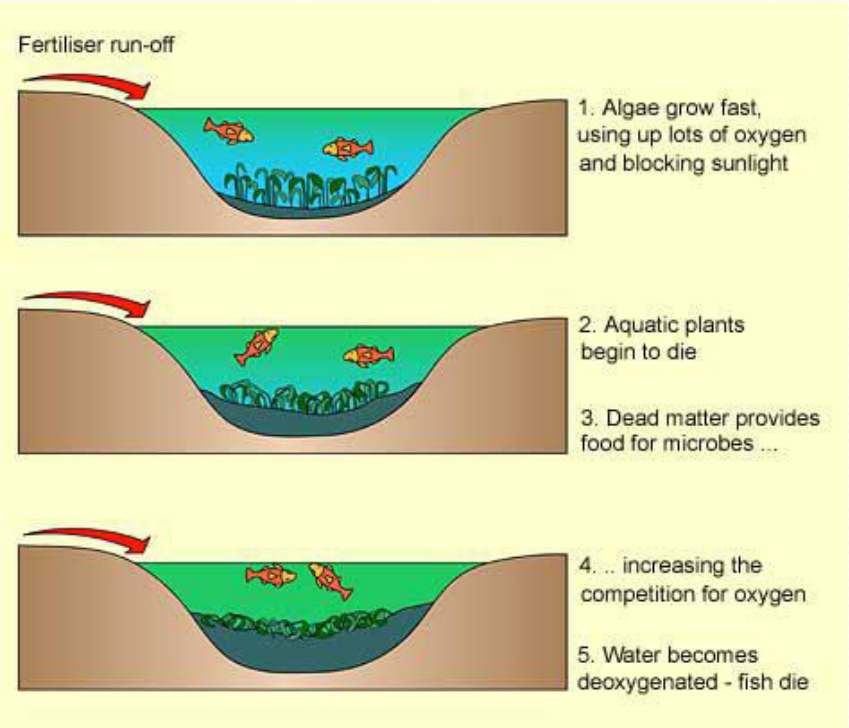
Nonpoint Sources

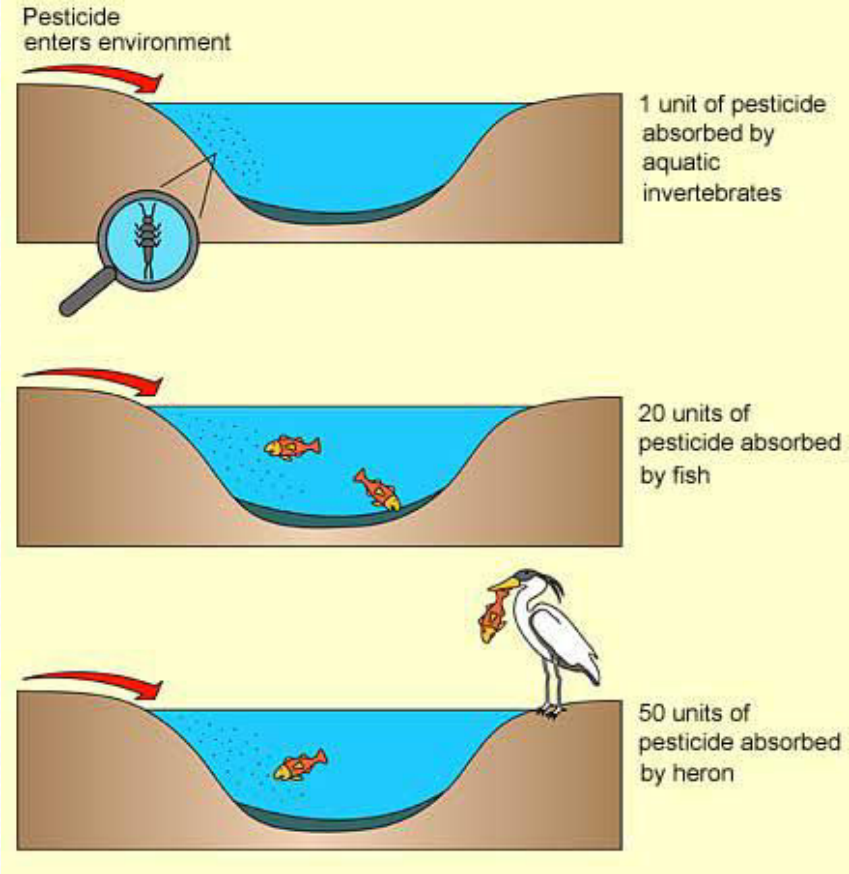
- Runoff from agriculture/irrigation
- Runoff from pasture and range
- Urban runoff from unsewered areas
- Septic tank leachate
- Runoff from construction sites <20,000 m^2
- Runoff from abandoned mines
- Atmospheric deposition over a water surface
- other land activities generating contaminants

Adverse effects of eutrophication on lakes, reservoirs, rivers and coastal marine waters

- • Increased biomass of phytoplankton
- • Toxic or inedible phytoplankton species
- • Increases in blooms of gelatinous zooplankton
- • Increased biomass of benthic and epiphytic algae
- • Changes in macrophyte species composition and biomass
- • Decreases in water transparency
- • Taste, odor, and water treatment problems
- • Dissolved oxygen depletion
- • Increased incidences of fish kills
- • Loss of desirable fish species
- • Reductions in harvestable fish and shellfish
- • Decreases in perceived aesthetic value of the water body

eutrophication

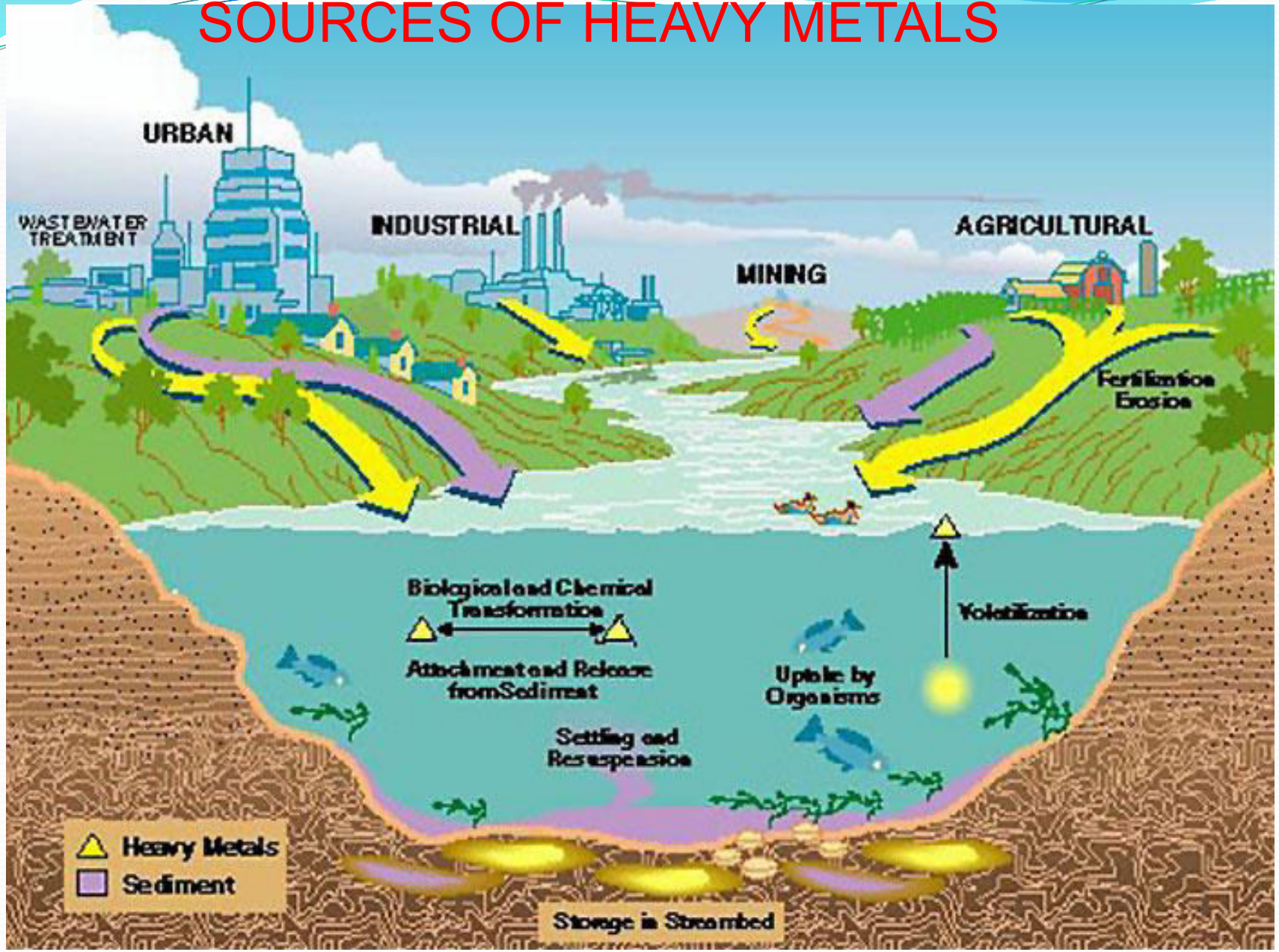




INDUSTRIAL EFFLUENTS AND WATER POLLUTION

HEAVY METAL WATER POLLUTION

SOURCES OF HEAVY METALS



The term heavy metal is some whatimprecise, but includes most metals with an atomic number greater than 20, but exclude alkali metals, alkaline earths, lanthanides and actinides

Metals like Hg,Pb, Cd, As, Cr, Zn, Cu, Mn,and Fe whether essential or not, when present in aquatic environment above certain levels may constitute contamination

Effects

Bio-concentration/bioaccumulation/magnification

Phytotoxic

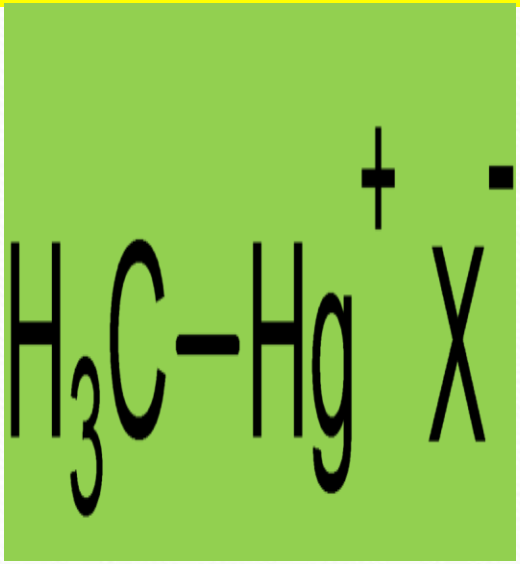
Carcinogenic and teratogenic

Chronic/ acute/lethal/sublethal/synergestic


SHIRANUI SEA
Minamata River
Chisso Factory
Hyakken Harbour
Minamata Bay

Mercury pollution causes minamata disease"Mad Hatter's Disease”

Permissible limit of Hg in drinking water is 0.001ppm (WHO)



Methyl, ethyl, phenyl and organo mercurial compounds are toxic

Hg pollution -INDIA

- Recent studies have shown that the total mercury pollution potential from coal in India is estimated to be 77.91 tonnes per annum, if average concentration of mercury in coal is assumed to be 0.272 ppm. About 59.29 tonnes of mercury per annum is mobilised from coalfired thermal power plants alone. The five super thermal power plants in the Singrauli area, which supply 10 per cent of India's power, are responsible for 16.85 per cent or 10 tonnes per annum of total mercury pollution through power generation.