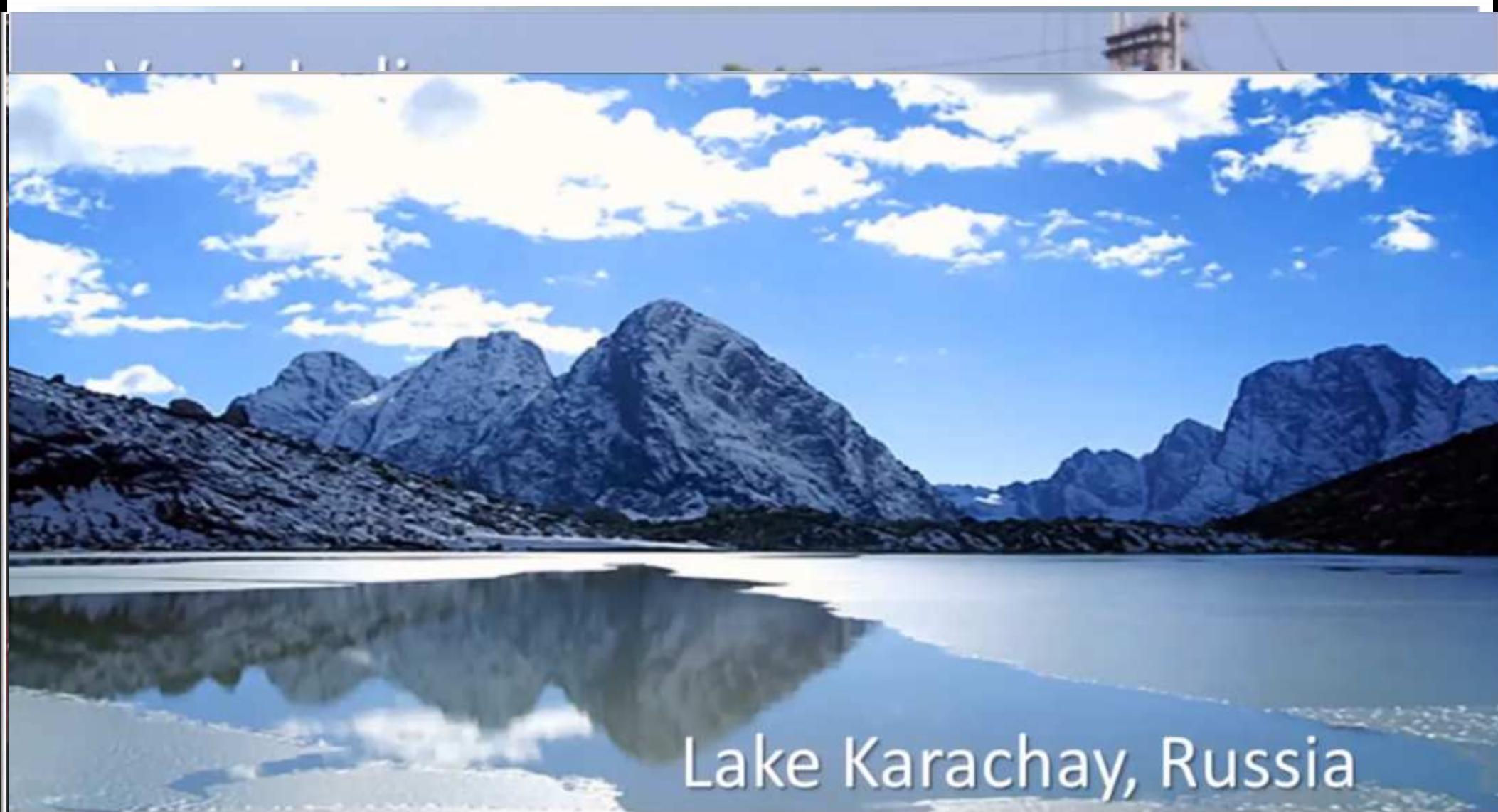


Environmental issues

Class-3:
12th August 2025

Dr . P. Rama Chandra Prasad
Lab for Spatial Informatics



Lake Karachay, Russia

Used for years as nuclear dumping site by the Soviet Union, Lake Karachay has several times been declared the most polluted place on Earth. In fact, it has been said that just 1 hour of exposure here would be lethal.

safe.

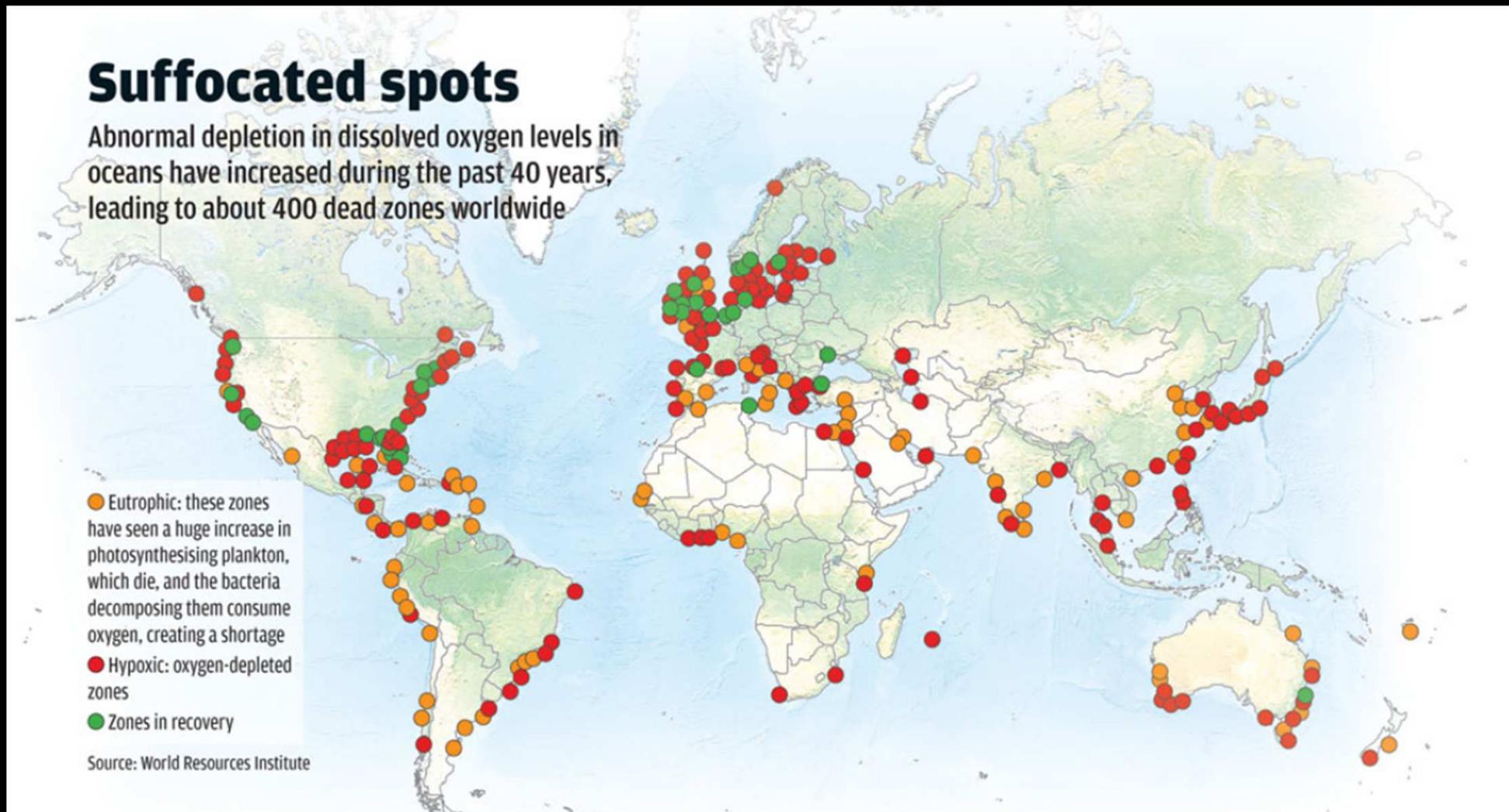
Problems from Human Impact on Environment

- A. Aquatic Environment Issues – Water pollution, Ocean Dead Zones, Water Diversion, Overfishing
- B. Air Quality Issues – Acid rain, Air Pollution, Nuclear Pollution
- C. Climate Change Issues – Greenhouse Effect, Ozone Depletion
- D. Terrestrial Environment Issues – Desertification, Deforestation, Soil pollution, Waste Disposal.
- E. Population Growth Issues – Habitat Destruction, Farming Practices, Fertilizers & Pesticides

Aquatic Environmental Issues

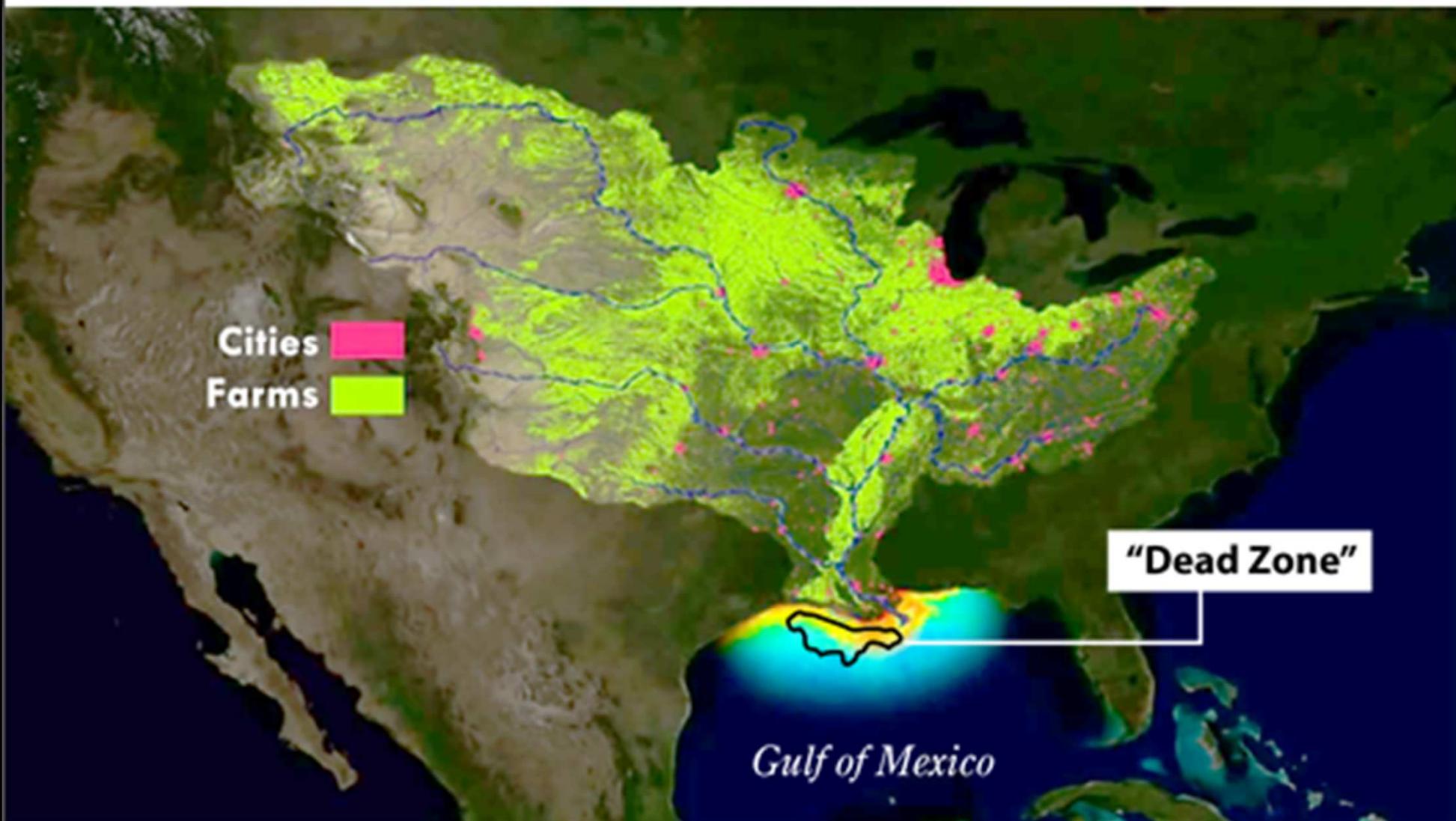
- Water pollution – Eutrophication -Ocean Dead Zones

Eutrophication is magnified as rivers lead into larger rivers and eventually into the ocean – as the Mississippi River network. This leads to ocean dead zones.



Gulf 'Dead Zone' Chokes Marine Life

The Gulf of Mexico at the Mississippi River Delta experiences a seasonal *hypoxia*, or "dead zone," where there is not enough oxygen in the water to sustain marine life.



SOURCE: NOAA

InsideClimate News

Pollution

- *organic pollution* – decomposition of living organisms and their bi-products
- *inorganic pollution* – dissolved and suspended solids as silt, salts, and minerals
- *toxic pollution* – heavy metals and other chemical compounds that are lethal to organisms
- *thermal pollution* – waste heat from industrial and power generation processes
- *radiation pollution* - radioactive materials
- (AIR, Water, Soil) (Noise)

Spills or Dumping in Oceans

Thermal Pollution & Rising Ocean temperatures



BP Oil Rig Explosion 2010



Coral Bleaching

Water Diversion
Ex. Aral Sea
Overfishing
Electro fishing???



Aral Sea



Gulf of Mexico Oil Spill

On April 20, 2010 the Deepwater Horizon offshore oil rig in the Gulf of Mexico exploded, killing 11 workers and leading to the worst oil spill and environmental catastrophe in US history.



Niger Delta

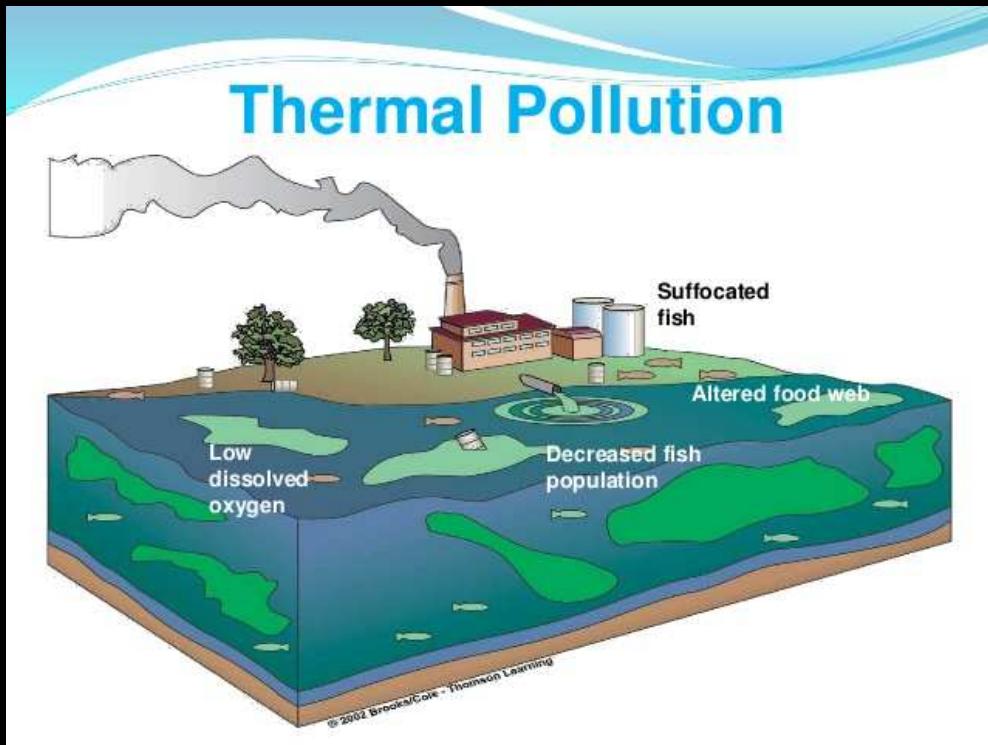
A ruptured underwater pipe spewed almost 5 million barrels of oil into the Gulf over three months, threatening hundreds of miles of beaches, wetlands, and estuaries. Thousands of animals, including turtles, crabs, fish, and birds fell victim, and the local fishing and tourism industries suffered badly



nothing

nd

Thermal Pollution: Warm Water Kills



This increase in temperature—or ‘thermal shock’—kills fish and other animals, and increases plant growth thereby reducing the oxygen supply in the water. The result is often choking algal blooms and dead lakes and rivers

Fishermen row a boat in the algae-filled Chaohu Lake in Hefei, Anhui province, China. Power plants and factories often use river or lake water as a coolant, then release the unnaturally warm water back into the environment.



WWW.NEWS.CN

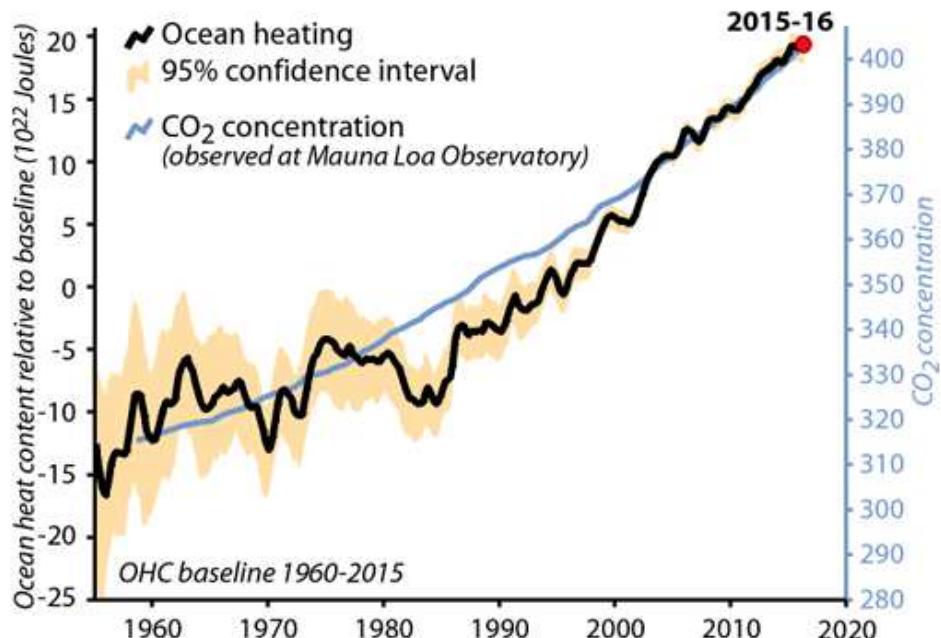
Rising ocean temperatures

Oceans Storing More Heat as CO₂ Builds Up

The oceans have absorbed 90 percent of the extra heat trapped by increasing greenhouse gases. During 2015-2016, the amount of heat stored in the upper 2,000 meters of the oceans reached its highest point on record.

OCEAN HEAT CONTENT AND ATMOSPHERIC CO₂ CONCENTRATIONS

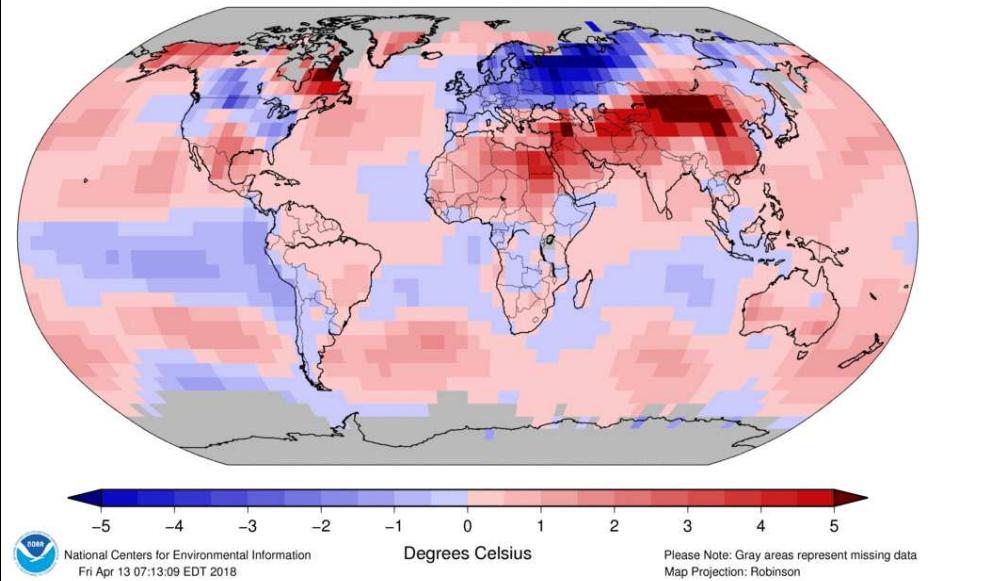
At 0-2,000 meter depth, 12-month running means, 1958-2016



SOURCES: *Taking the Pulse of the Planet* by Lijing Cheng et al., 2017 (ocean heat content data); NOAA (CO₂ data)

Land & Ocean Temperature Departure from Average Mar 2018
(with respect to a 1981–2010 base period)

Data Source: GHCN-M version 3.3.0 & ERSST version 4.0.0



CORAL BLEACHING

Have you ever wondered how a coral becomes bleached?

HEALTHY CORAL

- 1 Coral and algae depend on each other to survive.



Corals have a symbiotic relationship with microscopic algae called zooxanthellae that live in their tissues. These algae are the coral's primary food source and give them their color.

STRESSED CORAL

- 2 If stressed, algae leaves the coral.



When the symbiotic relationship becomes stressed due to increased ocean temperature or pollution, the algae leave the coral's tissue.

BLEACHED CORAL

- 3 Coral is left bleached and vulnerable.



Without the algae, the coral loses its major source of food, turns white or very pale, and is more susceptible to disease.

WHAT CAUSES CORAL BLEACHING?



Change in ocean temperature
Increased ocean temperature caused by climate change is the leading cause of coral bleaching.



Runoff and pollution
Storm generated precipitation can rapidly dilute ocean water and runoff can carry pollutants — these can bleach near-shore corals.



Overexposure to sunlight
When temperatures are high, high solar irradiance contributes to bleaching in shallow-water corals.

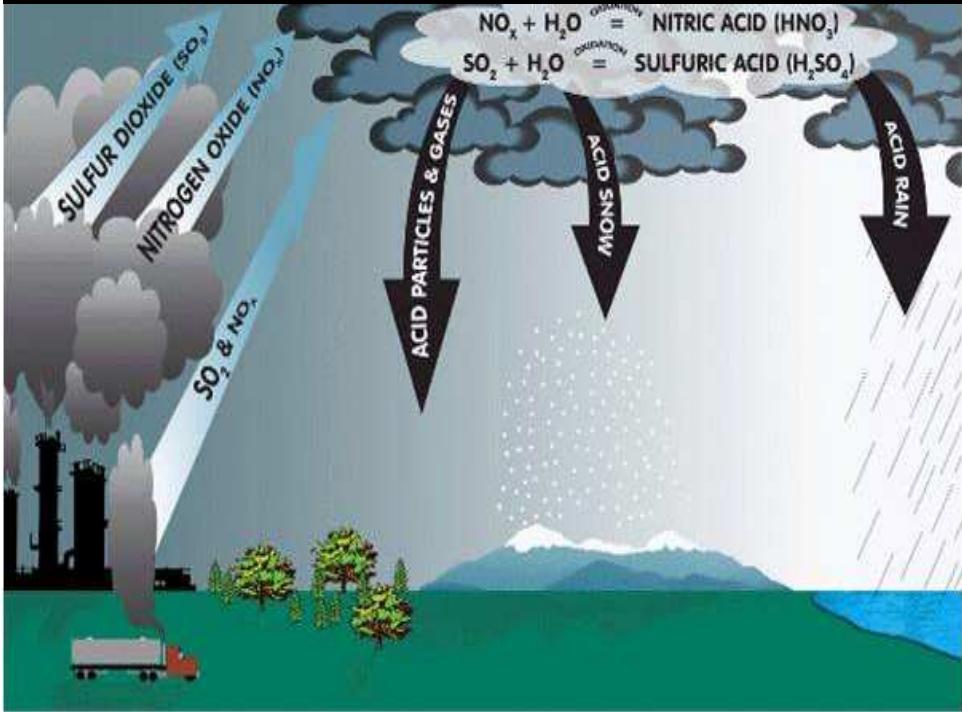


Extreme low tides
Exposure to the air during extreme low tides can cause bleaching in shallow corals.



NOAA's Coral Reef Conservation Program
<http://coralreef.noaa.gov/>

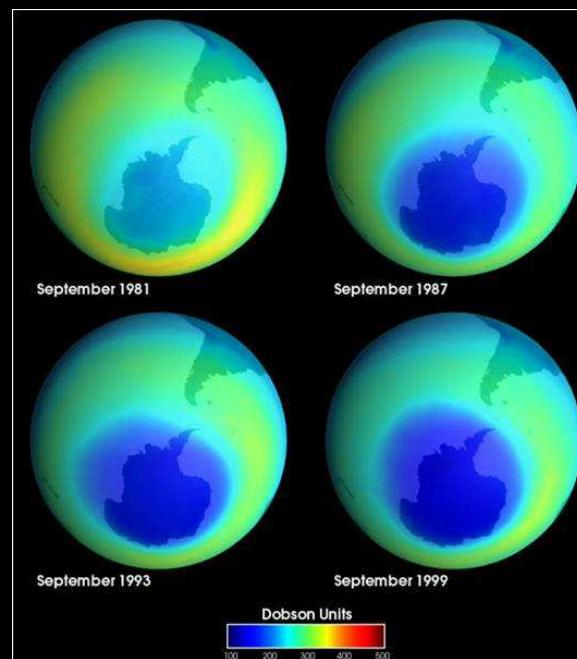
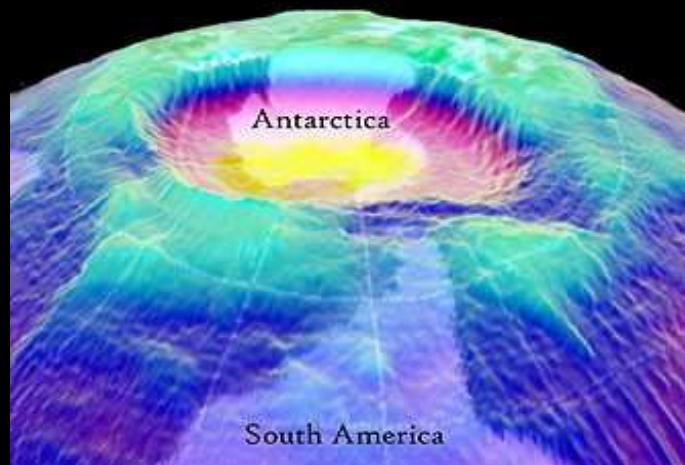
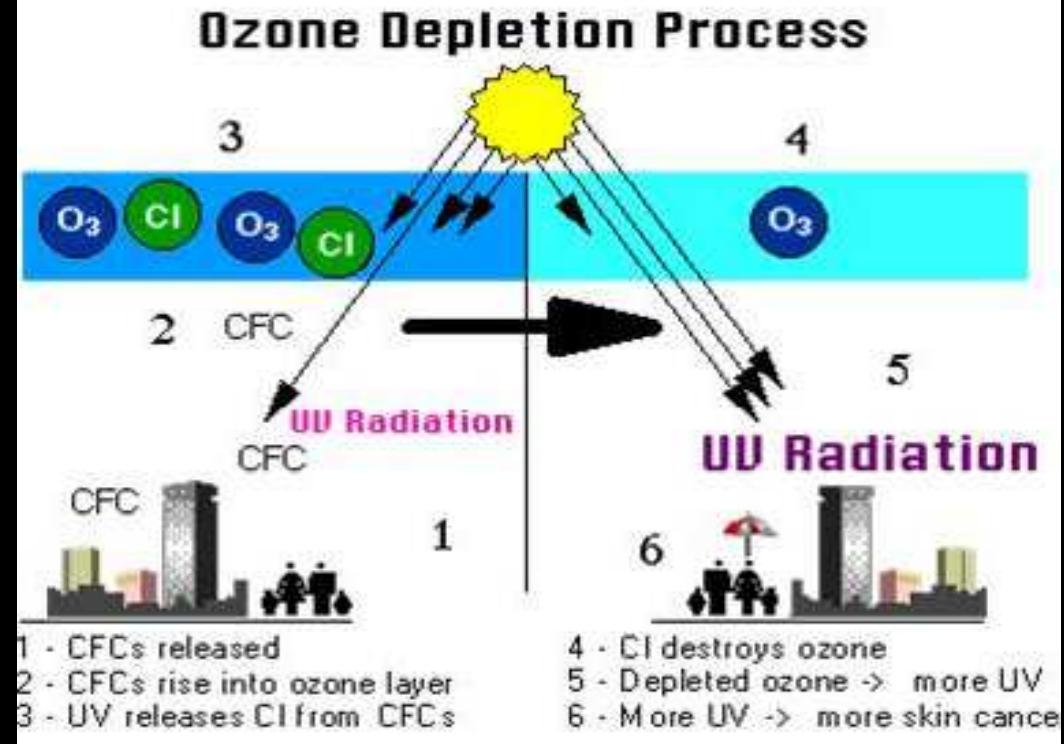
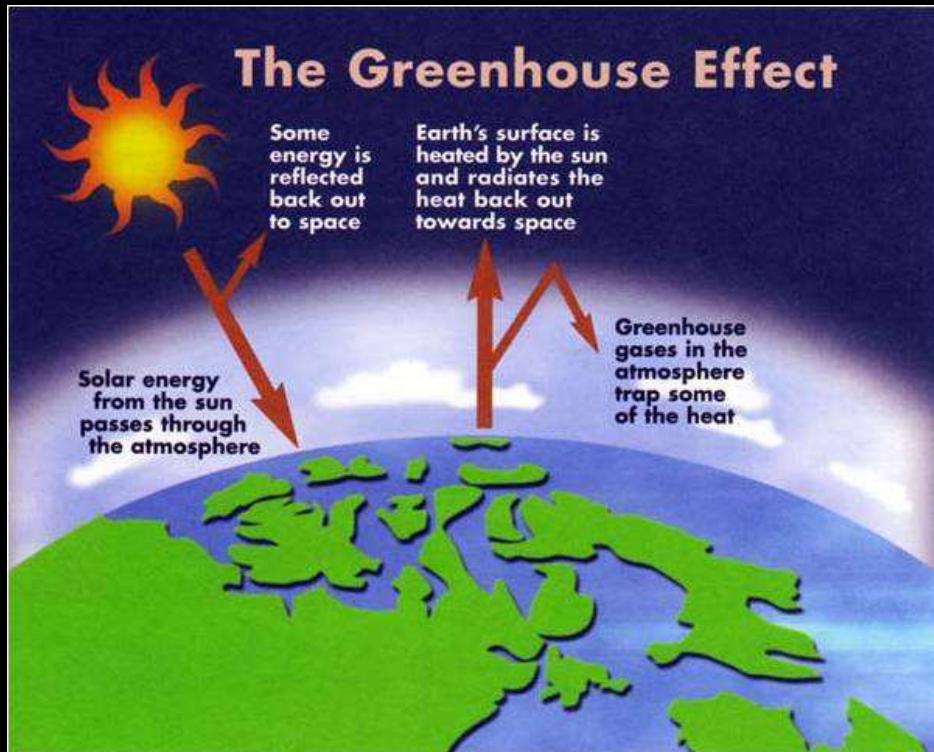
Acid Rain



Fukushima Daiichi Disaster
Nuclear Pollution



Climate Change Issues

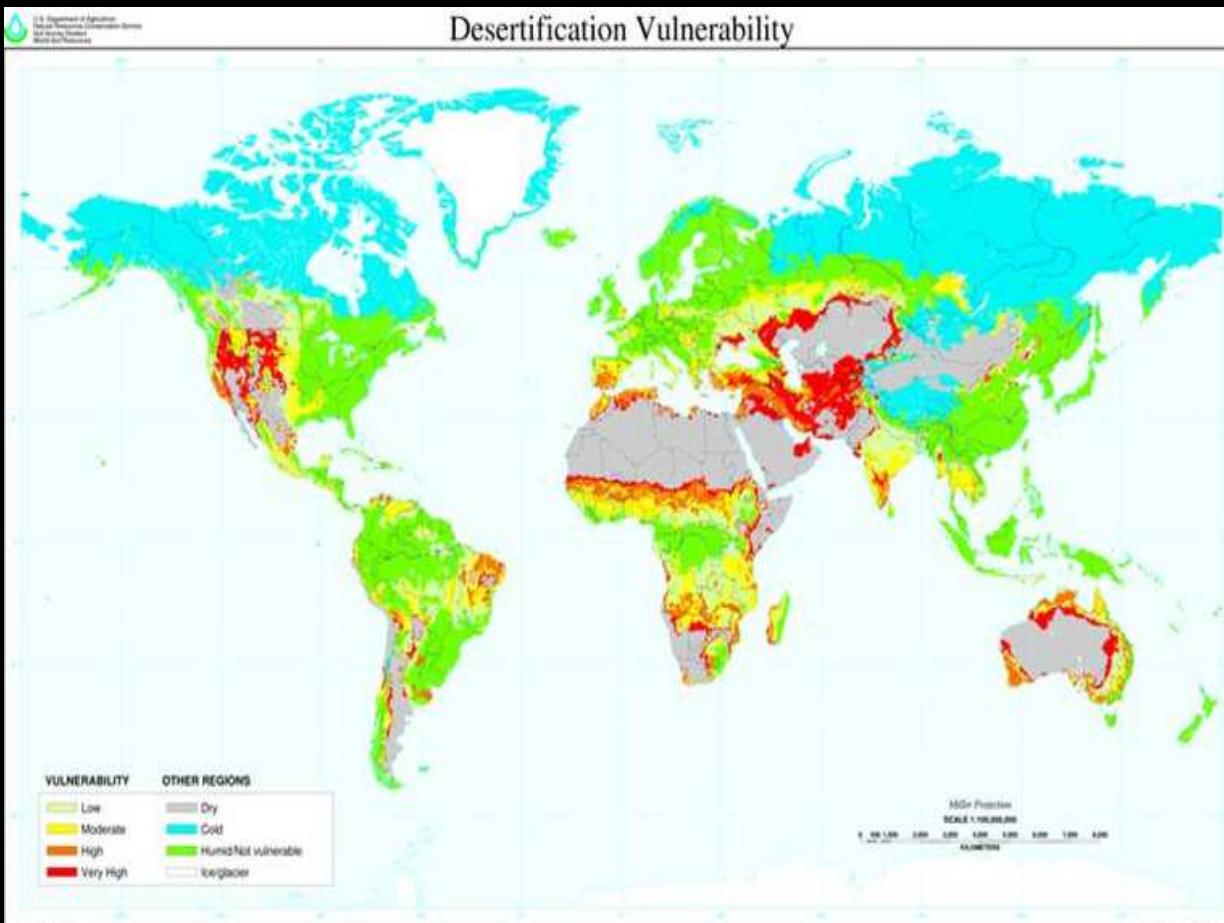


Ozone Hole over Antarctica

Desertification

Process of turning the productive land into desert

*A land degradation process that involves a continuum of change of the plant and soil resource,
Also a situation on the desert expansion.*



Factors:
Human activities
Climate change

Thar desert

Desert Greening
Ex. Kubuqi-- China

Kubuqi a successful example of desert greening



Figure 4.5. Liquorice plantation.



Figure 4.4. Sand barrier technology using a grid pattern of bundled Salix (willow) stems, crop straw and other materials.



Figure 5.6. Kubuqi Seven Star Lakes Desert Park

"Kubuqi model"

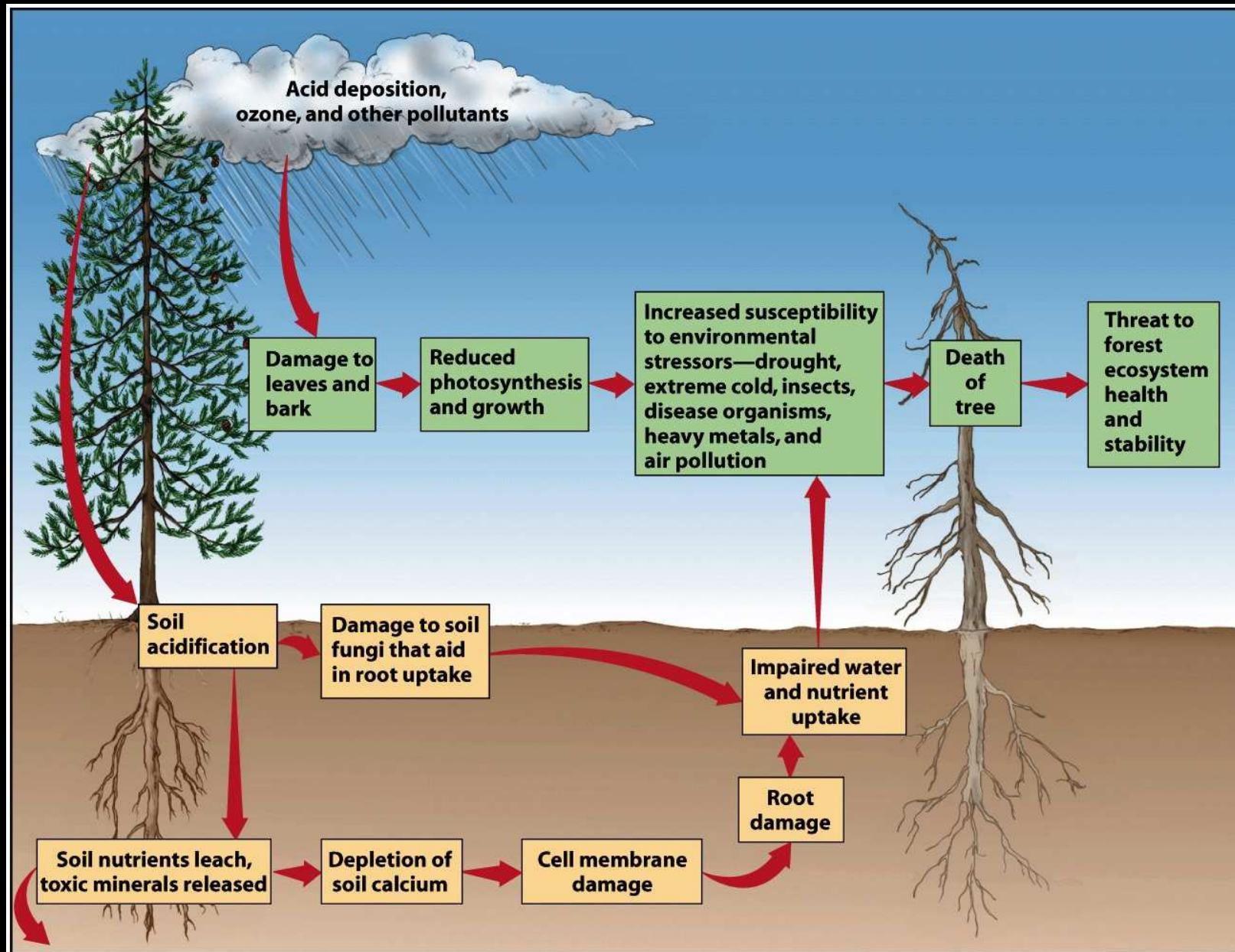
Deforestation

Deforestation – *the permanent destruction of indigenous forests and woodlands.*

Causes include

- *Conversion of forests to agricultural land to feed people*
- *Development of cash crops and cattle raising esp. in tropical countries*
- *Commercial logging that is not regulated*
- *Poor soils in humid tropics do not support agriculture for long so more clearing becomes necessary*

Acid Deposition and Forest Decline



Soil Pollution

Ways that soil can become polluted, such as:

- *Seepage from a landfill*
- *Discharge of industrial waste into the soil*
- *Percolation of contaminated water into the soil*
- *Rupture of underground storage tanks*
- *Excess application of pesticides, herbicides or fertilizer*
- *Solid waste seepage*

Most common chemicals involved in causing soil pollution
are:

- *Petroleum hydrocarbons*
- *Heavy metals*
- *Pesticides*
- *Solvents*

Waste Disposal



Waste, or rubbish, trash, junk, garbage is an unwanted or undesired material or substance.

It may consist of the unwanted materials left over from a manufacturing process (industrial, commercial, mining or agricultural operations,) or from community and household activities.

The material may be discarded or accumulated, stored, or treated (physically, chemically, or biologically), prior to being discarded or recycled.

Population Growth Issues

- *Urbanization*
- *Habitat Destruction*
- *Farming Practices*
- *Fertilizers & Pesticides*

Urbanization

Concerns:

- *Public Health*
- *Food Supply*
- *Freshwater*
- *Coastlands and Oceans*
- *Forests*
- *Biodiversity and Habitat Destruction*
- *Global Climate Change*



Habitat Fragmentation & Destruction



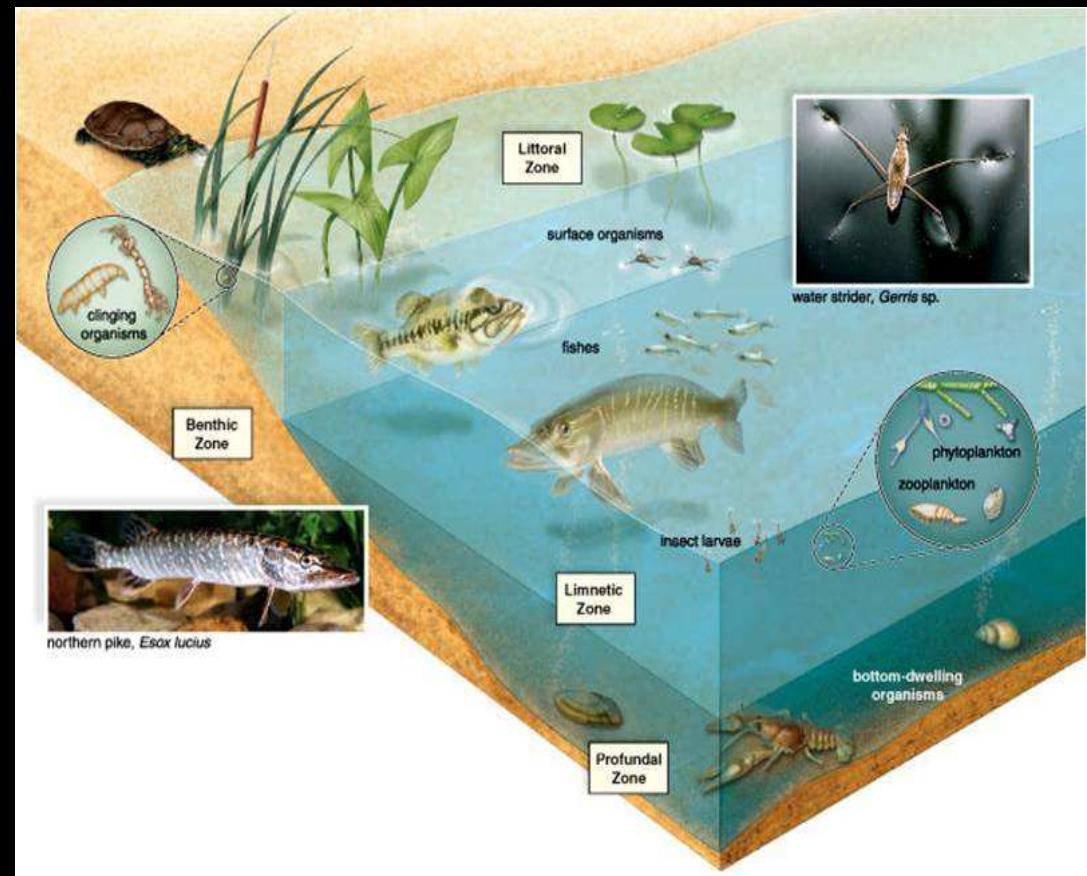
Habitat destruction and fragmentation is a process that describes the emergences of discontinuities (fragmentation) or the loss (destruction) of the environment inhabited by an organism.

It results in

- 1.Loss of resident species
- 2.Loss of food sources
- 3.Loss of ecosystem functions provided by the habitat

Biodiversity Threats

- Habitat loss & Fragmentation
- Invasive species
- Pollution
- Climate Change
- Over exploitation
- Human Populations



We are at the onset of a mass extinction event (6th)

Farming Practices

Negative environmental impacts from unsustainable farming practices include:

Land conversion & habitat loss

Wasteful water consumption

Soil erosion and degradation

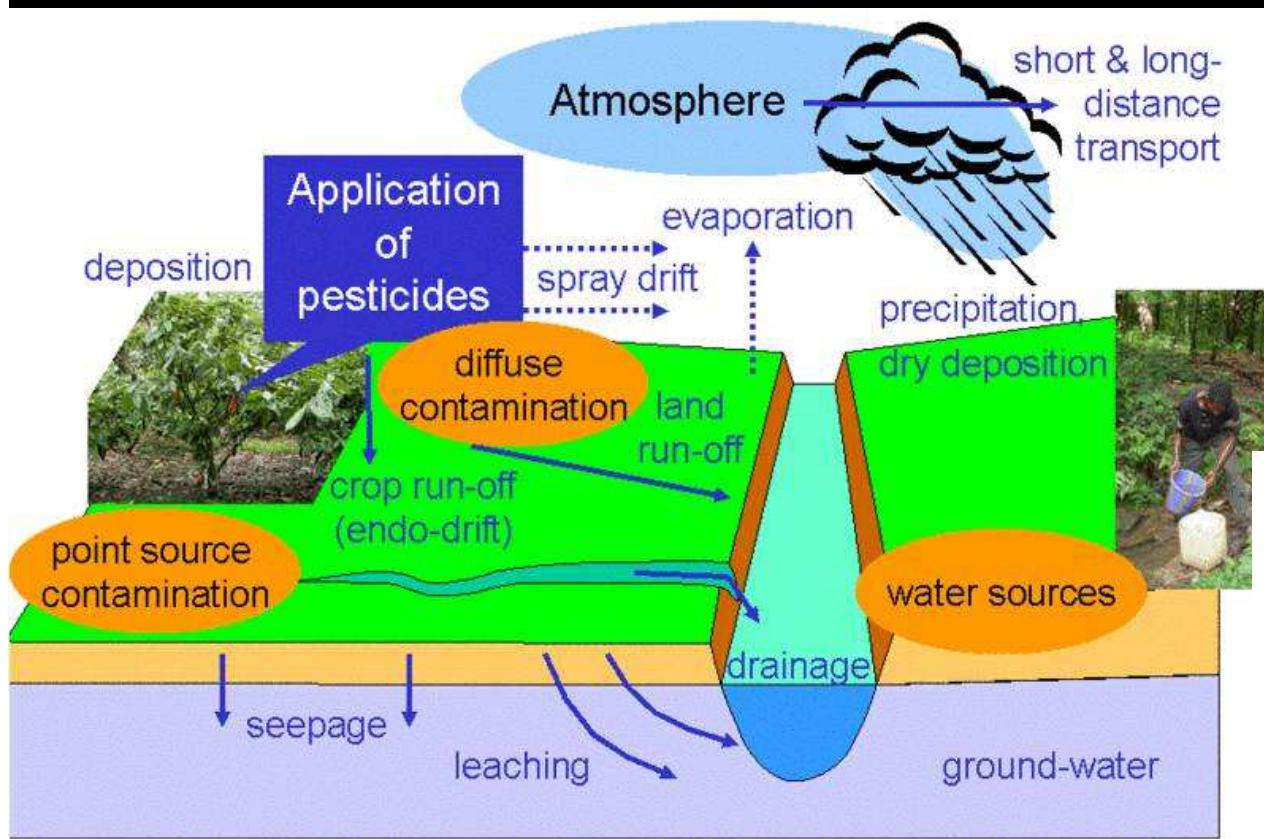
Pollution

Climate change

Genetic erosion

Fertilizers and Pesticides

Bioaccumulation Biomagnification



Stockholm Convention Treaty The Dirty Dozen

DDT – pesticide

PCBs - Industrial

Dioxin - waste

Furans - waste

Aldrin - pesticide

Chlordane - pesticide

Dieldrin - pesticide

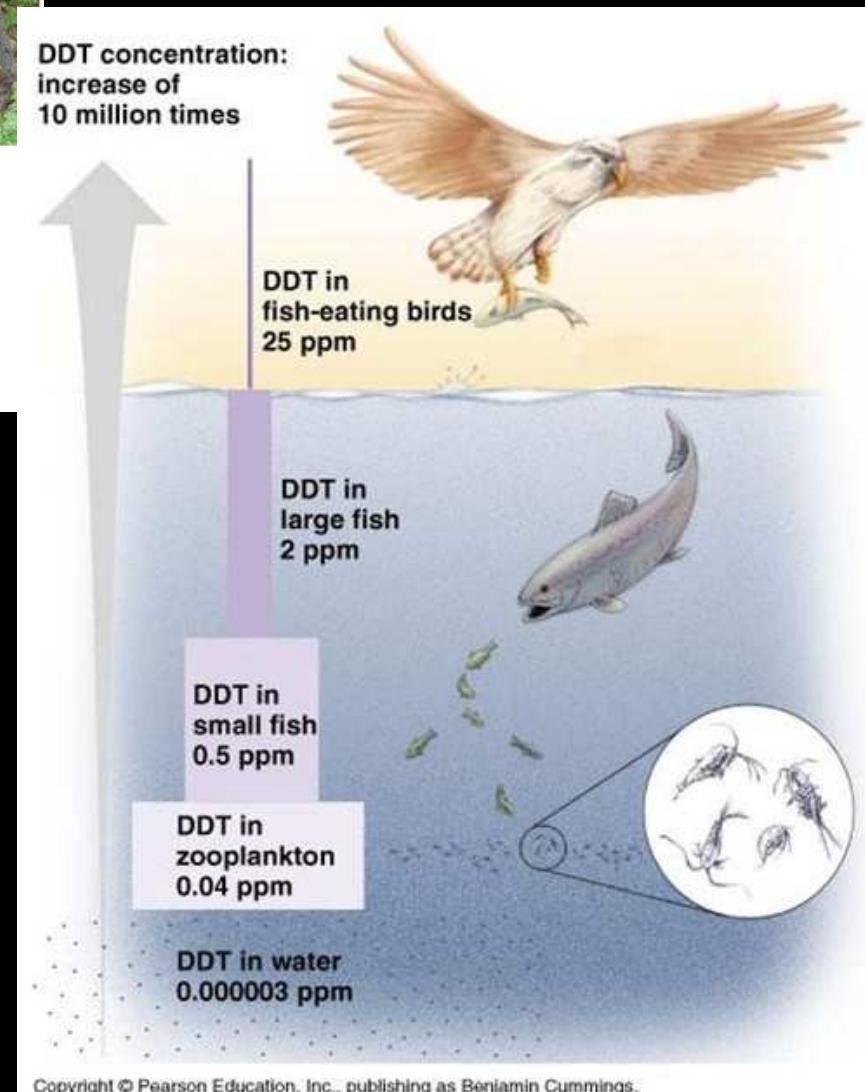
Endrin - pesticide

HCB – pest/ waste

Heptachlor - pesticide

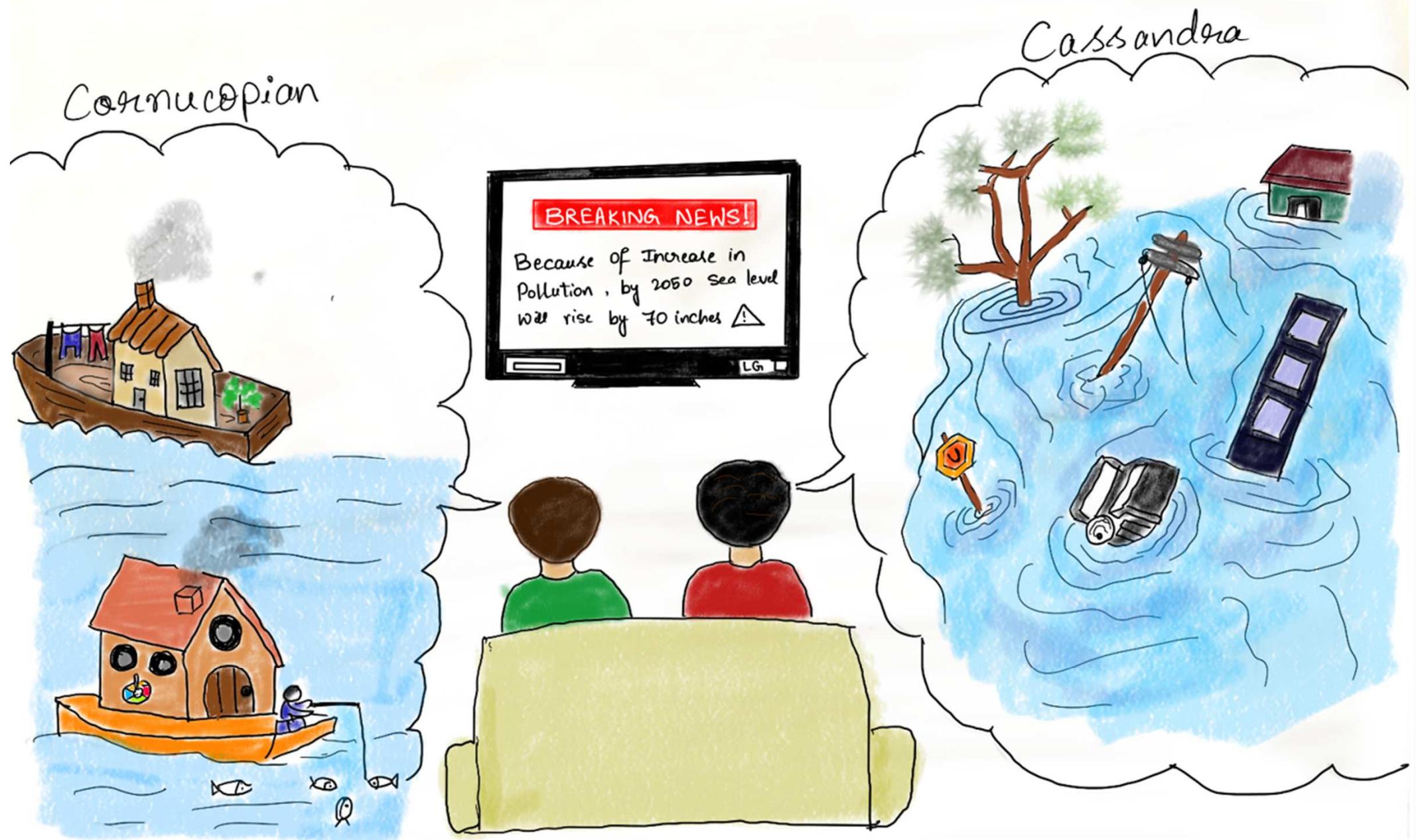
Mirex - pesticide

Toxaphene - pesticide



Are things getting better or worse?

- *Many people think environmental conditions are better*
 - *Cornucopians: Human ingenuity will solve any problem*
- *Some think things are much worse in the world*
 - *Cassandras: predict doom and disaster*
- *How can you decide who is correct?*
 - *Are the impacts limited to humans, or are other organisms or systems involved?*
 - *Are the proponents thinking in the long or short term?*
 - *Are they considering all costs and benefits?*





Surprising that our civilization doesn't have the money to move water to the permanent regions of Africa, but has money to search for water on Mars. This only confirms that poverty exists not because we cannot feed the poor but because we cannot satisfy the rich. It's easy to be civilized, harder to be human.

<https://uk-air.defra.gov.uk/research/ozone-uv/moreinfo?view=antarctica-hole-explained>

<https://www.thehindubusinessline.com/news/science/thar-desert-was-once-tropical-forest-new-fossil-discovery-reveals/article23683395.ece>

<https://www.youtube.com/watch?v=xzKWbQkLFB0>

<http://www.chinadaily.com.cn/a/201808/06/WS5b678ab7a3100d951b8c8b07.html>