(Management Topic in Environmental Studies)

B. Tech 7TH Semester

Global Warming and Climate change

Department: Chemistry
Subject: MTES (CHM 2049)

Contents

DEFINITION OF GLOBAL WARMING AND CLIMATE CHANGE

Global Warming	Climate Change
➢ Refers to temperature increase in the troposphere.	➢ Refers to changes in any aspects of the earth's climate including temperature, precipitation and storm intensity and patterns.
➢ An increase in Earth's average surface temperature due to rising level of greenhouse gases.	➢ A long-term change in the Earth's climate, or of a region on Earth.

Causes of Climate Change

Feedback Mechanisms

Anthropogenic Global Warming

Bio-thermostat

Variations in Solar Radiation

- **Solar Irradiance**
- **Sunspot Activity**
- **Earth-Sun Geometry (Milankovitch cycles)**
- **Atmospheric Dust and Volcanoes**

Distribution of Continents

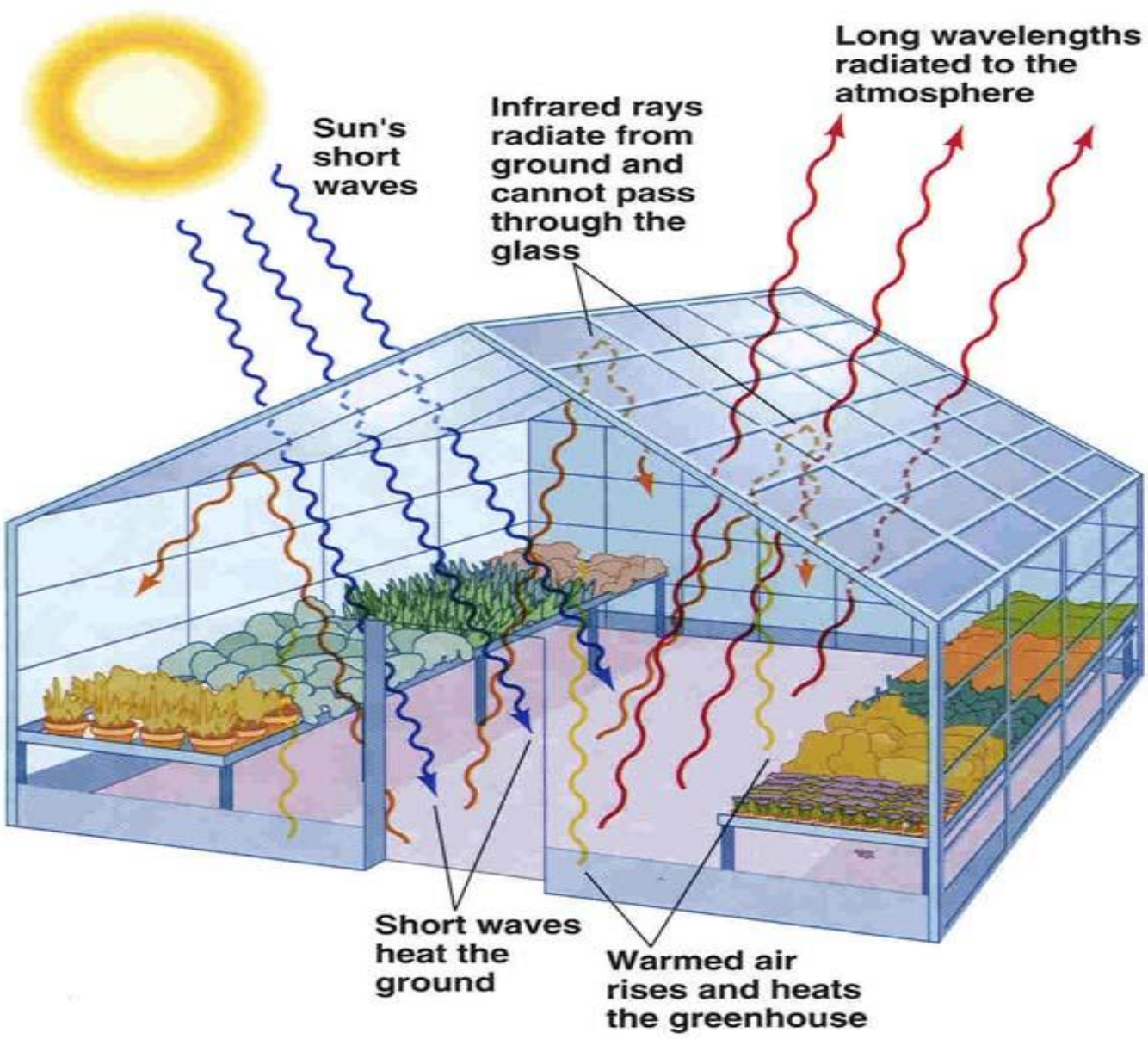
- **Plate Tectonics**
- **Mountain Building**

Ocean Variation

- **Thermohaline Circulation**

Anthropogenic Global Warming

Principle of Green House Gases ?



Type and sources Greenhouse Gases

High Conc.
- H_2O = 1-3%
- CO_2 = .035%

Trace
- CH_4
- N_2O
- O_3
- CFC's

Naturally occurring

Anthropogenic

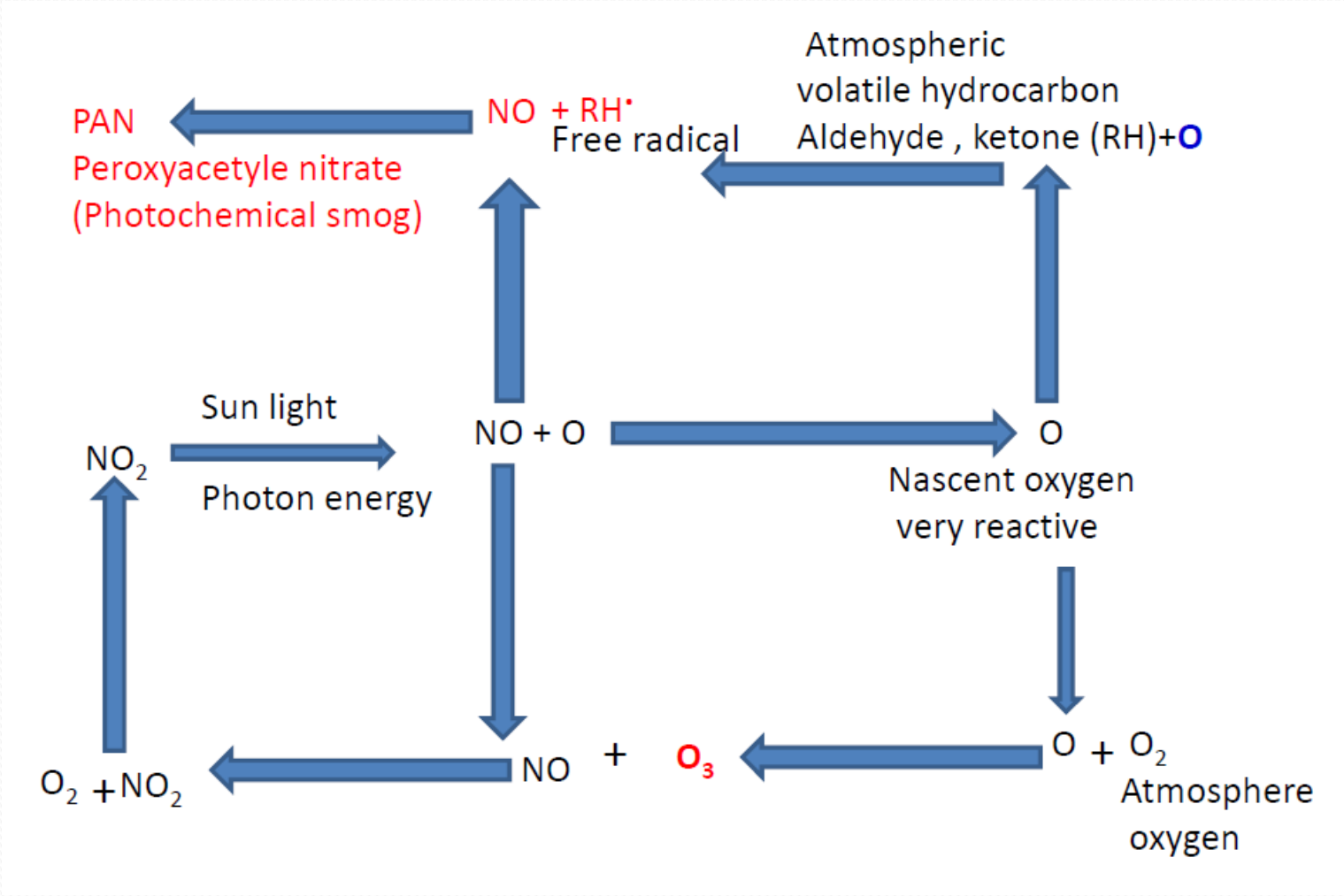
Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

Sources of ozone

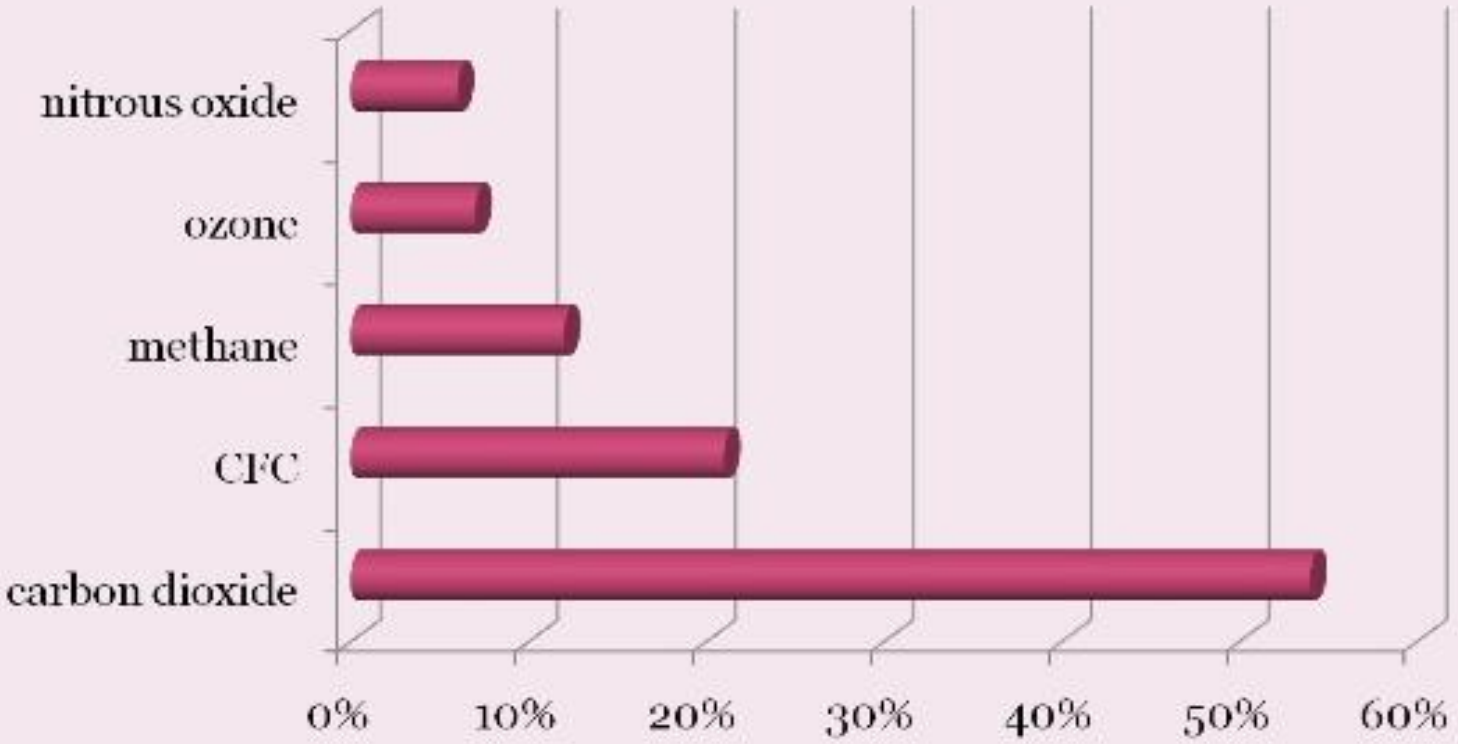
Sources of Green house gases

Carbon dioxide (CO2)- burning fossil fuels and wood.
Nitrous oxide (NO2)- fertilizer use and decomposition of animal wastes.
Methane (CH4)- sediments, swamps, landfills, and in flooded rice paddies.
Chlorofluorocarbons (CFCs)- Freon (a refrigerant)
Halons, such as halocarbons- fire extinguishers.
Water vapor – clouds reradiate heat back to Earth

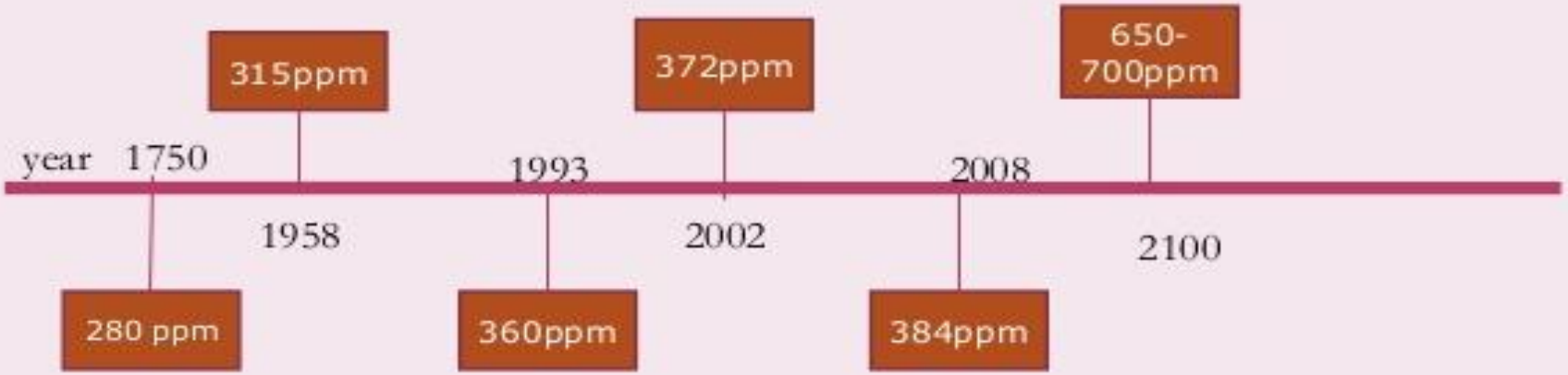
Photochemical Smog and formation of ground level Ozone



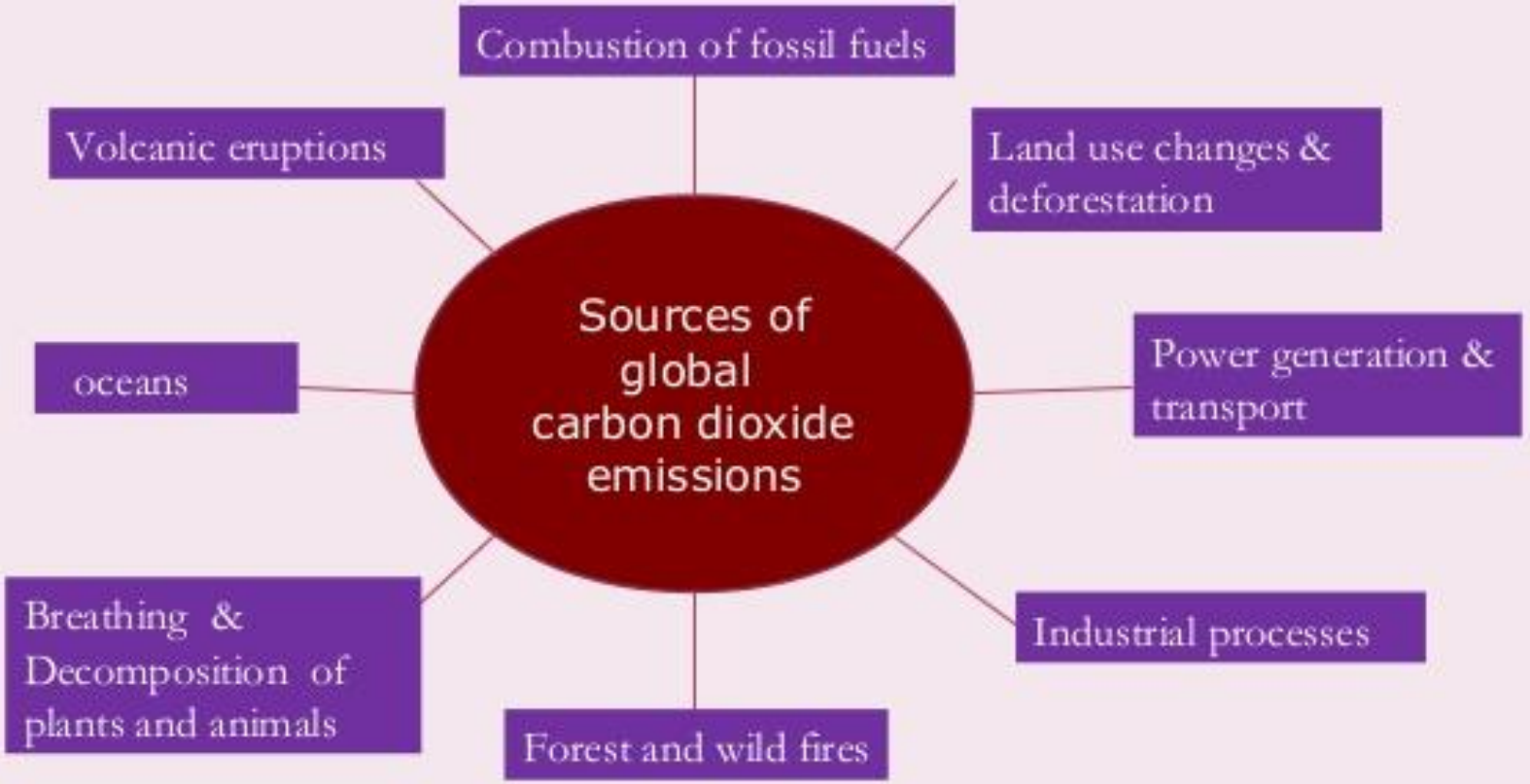
Percent share of greenhouse gases



Time line of global carbon dioxide levels

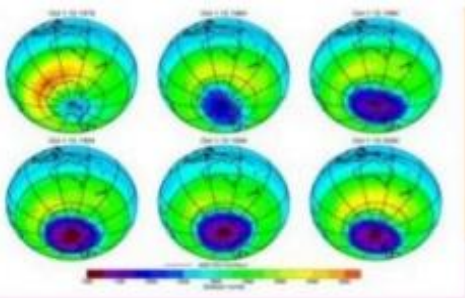


Sources of global carbon dioxide emissions



Depletion of Stratospheric Ozone and Climate change

- Ozone (Greek *ozein*, "to smell"), pale blue, highly poisonous gas with a strong odor
- **The tropospheric ozone**(lower atmosphere) is considered a pollutant at ground level,
- **The stratospheric ozone** (upper atmosphere) is called 'the ozone shield'.
- Chlorine reactions deplete ozone in the stratosphere.
- **Ozone depleting gases** are CFC, halons, nitrous oxide, methane, carbon tetrachloride and methyl chloroform.



Ozone depletion results in 'ozone hole' in upper atmosphere. During the 1980s, scientists discovered a "hole" in the ozone over Antarctica.

- **Ozone depletion leads to more UV radiation - skin cancer and cataracts and depression of the immune system.**
- **Each 1% drop in ozone is thought to increase human skin cancer rates by 4-6%.**

Impact of Global Worming

National Oceanic and Atmospheric Administration-*Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) 2007*

- **Earth's average surface temperature has increased by more than 1.4°F (0.8°C) over the past 100 years**
- By the end of the 21st century, **carbon dioxide concentration** will increase from 490 to 1260 ppm.
- **Global mean sea level** has been rising at an average rate of 1.7 mm/year over the past 100 years. Global sea level rose about 17 cms in the last century
- Both the extent and thickness of **Arctic sea ice** has declined rapidly over the last several decades. The Greenland and Antarctic ice sheets have decreased in mass.
- **Glaciers and ice caps** are retreating everywhere around the world —in the Alps, Himalayas, Andes, Rockies, Alaska and Africa.
- Since the beginning of the Industrial Revolution, **the acidity of surface ocean waters** has increased by about 30 percent.

Influence amount and pattern of precipitation, Drought

Impact of Global warming

1. Frequent temperature extremes (killer heat waves).
2. Changing rainfall patterns.
3. Rise in sea levels.
4. Frequent storms and coastal flooding
5. Changes in regional climate could alter forests, crop yields, and water supplies
6. Drought
7. Food shortages due to shift in agricultural food production
8. Greater warming near the poles
9. Air pollution made worse by warming.
10. Asthma, bronchitis, emphysema complications
11. Expansion of Deserts into existing rangelands.
12. Unable to contain spread of infectious diseases

IMPACT OF GLOBAL WARMING

2009 Indian floods

The 2009 India floods affected various states of India in July 2009. The most affected states were Karnataka, Orissa, Kerala, Gujarat and North-East Indian states, with over 200 people reported dead, and a million homes destroyed.

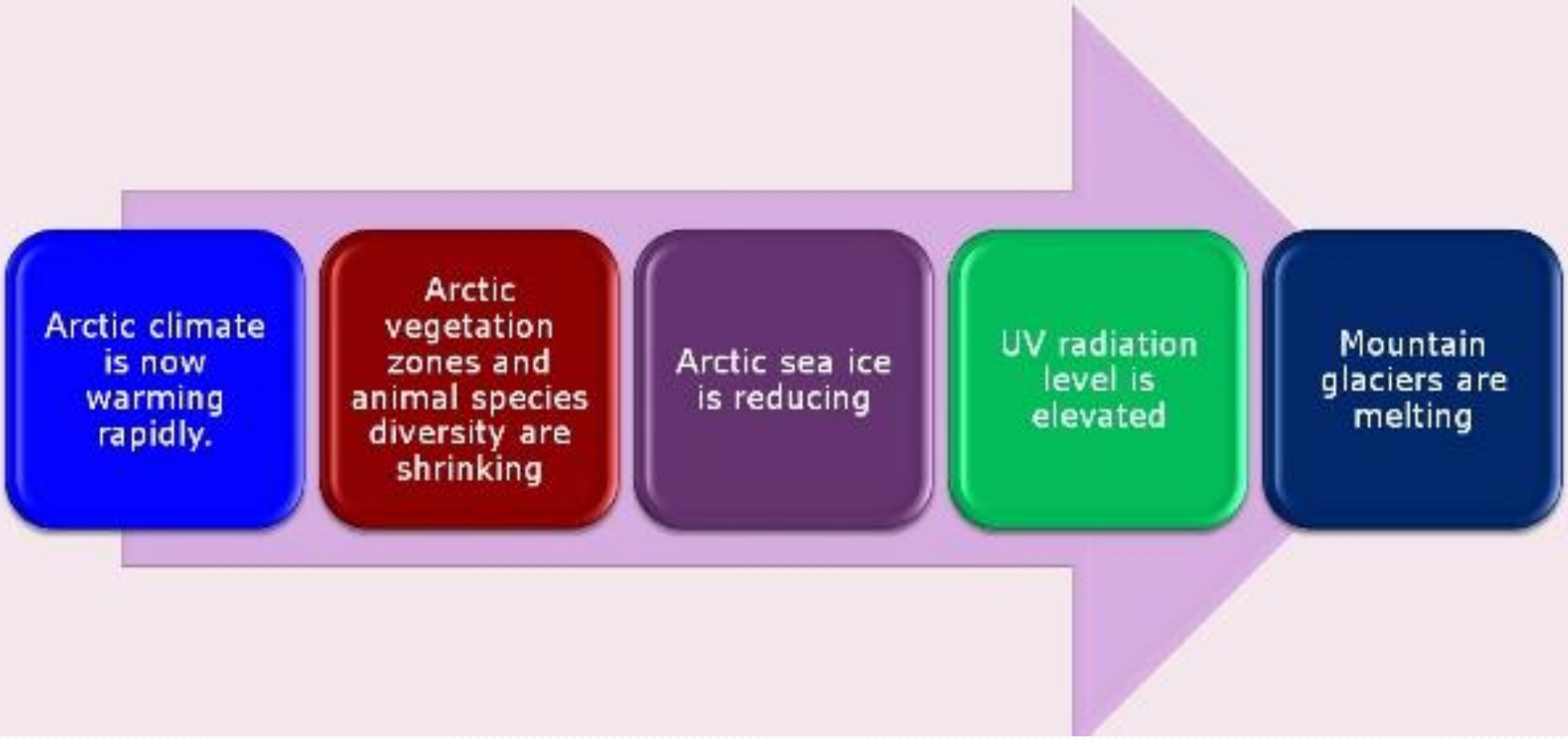
CAUSING BAD THINGS

- 2002, Colorado, Arizona and Oregon endured worst wildfire seasons ever
- dust storms in Montana, Colorado and Kansas
- floods hundreds of millions of dollars in damage in Texas, Montana and North Dakota
- snow accumulation has declined 60
- winter seasons shortened in Cascade Range in Oregon and Washington

- According to WHO, malaria, diarrhea, malnutrition and floods related to climate change cause about 150,000 worldwide deaths.
- IPCC reported 250 million more Africans are without potable water due to climate related stress.
- Flooding linked to rising sea levels displaced millions of people.

Evidences of climate change :

Arctic climate impact assessment (ACIA, 2004)



Mitigation of Global Warming

- Conservation
  - Reduce energy needs
  - Recycling
- Alternate energy sources
  - Nuclear
  - Wind
  - Geothermal
  - Hydroelectric
  - Solar
  - Fusion?

- Use less heat and air conditioning
- Drive less and drive smart
- Factory install smoke filters
- Plant a tree
- Vehicles use unleaded petrol
- Enforce the law on behalf of polluting the environment
- Environmental campaign

HOW CAN WE CUT GLOBAL WARMING POLLUTION

put existing technologies for building, cleaner cars and

reducing pollution from vehicles and power plants Hybrid gas-electric engines

manufacture more efficient appliances and conserve energy

more modern electricity generators into widespread use

renewable energy sources such as wind, sun and geothermal

DO TO HELP FIGHT GLOBAL WARMING

choose a compact fluorescent light bulb over an incandescent bulb

Three 60 Watt Bulbs

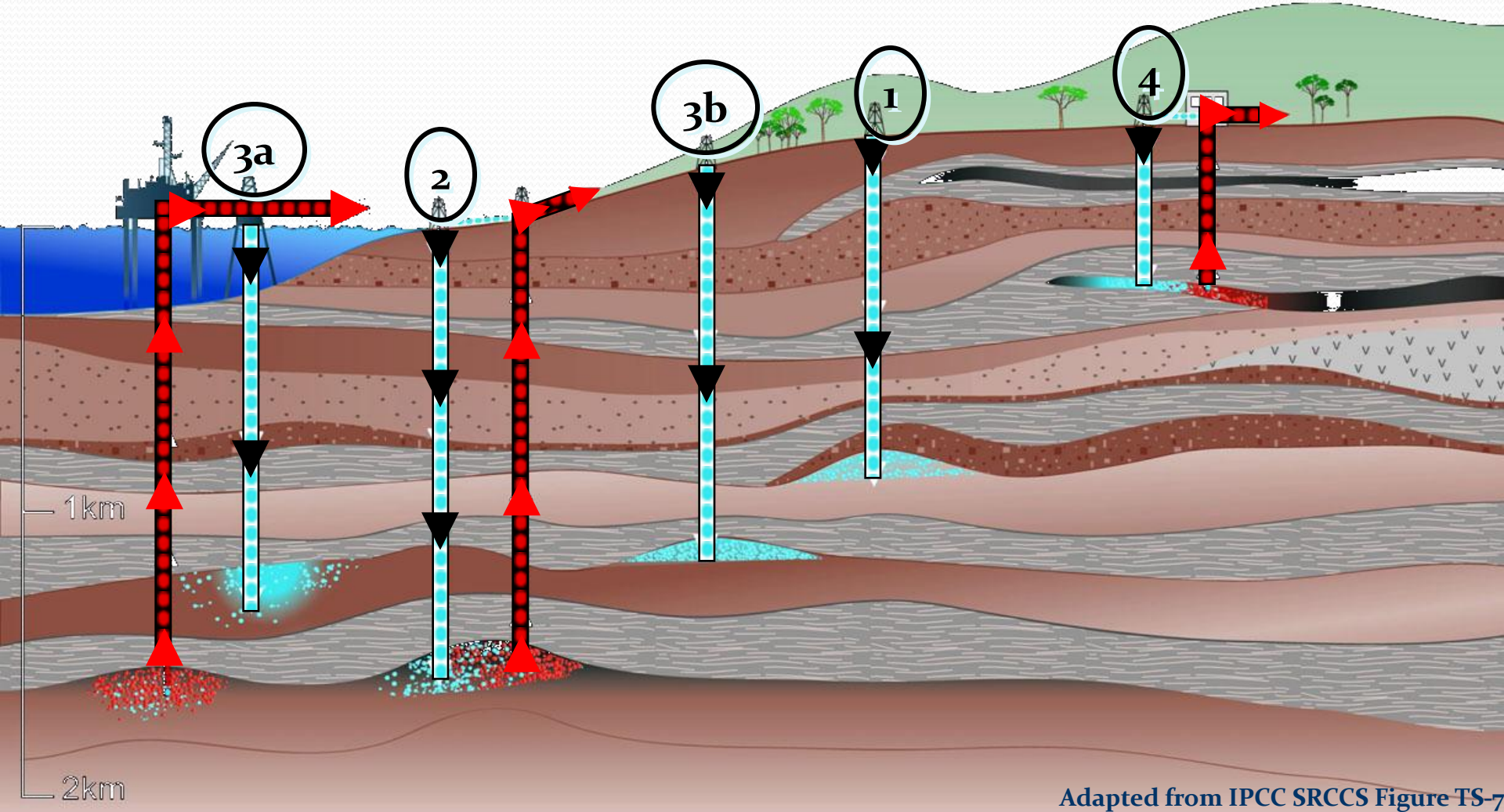
fluorescent light bulb

opting for a refrigerator with the Energy Star label

refrigerator

Storage of CO_2 in Geological Formations

1. Depleted oil and gas reservoirs
2. CO_2 in enhanced oil and gas recovery
3. CO_2 in enhanced coal bed methane recovery



Adapted from IPCC SRCCS Figure TS-7


Measure consumption of environmental resources
Calculate emissions
Report consumption and emissions externally
Identify reduction
Reduce consumption
Reduce emissions
Environment Sustainability

THANK YOU


MASS EXTINCTION
BUSH FIRES
SEVERE DROUGHT
NEXT 100 YEARS