Current Environmental Problems, Environmental Legislation

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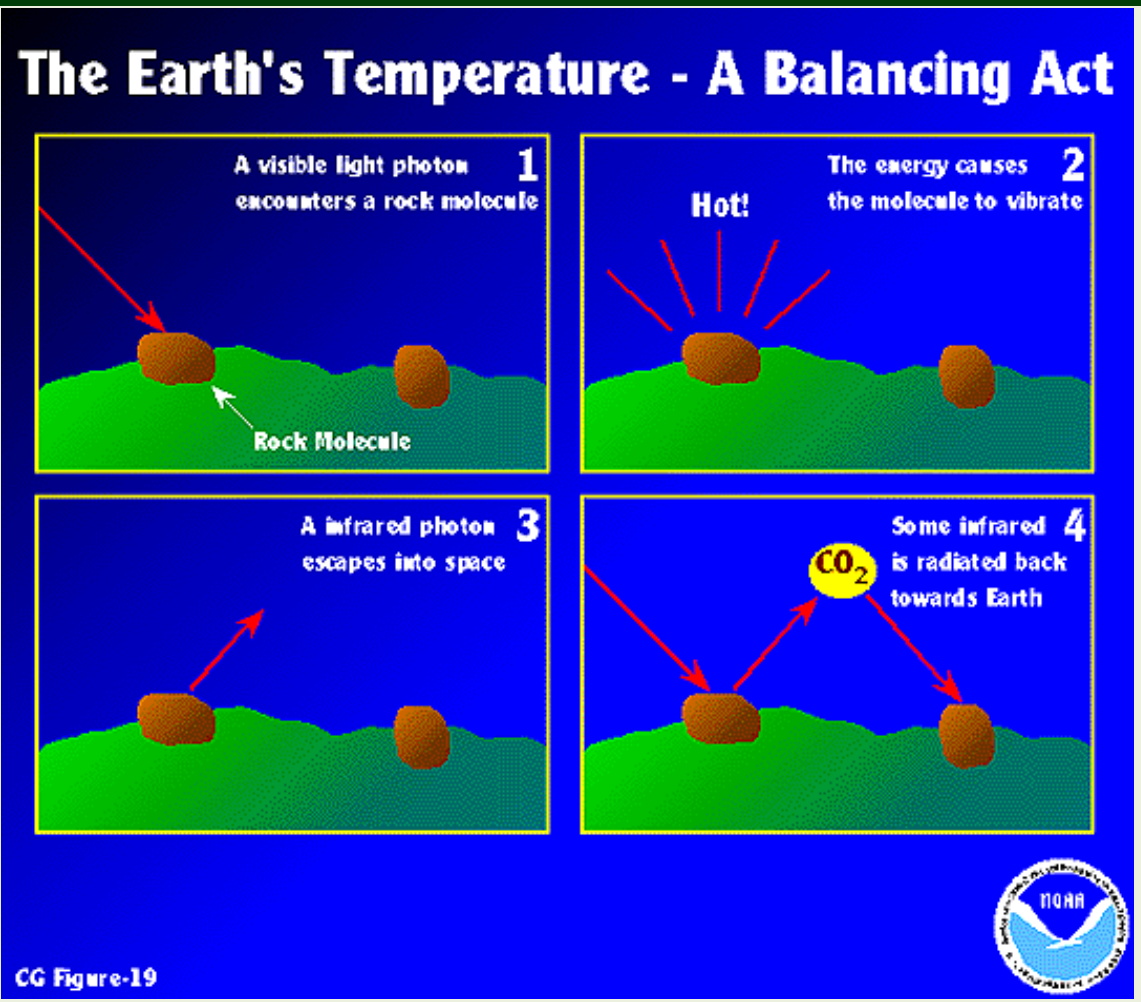
Current Environmental issues

- Greenhouse effect and Global Warming
  - The term greenhouse effect is used to indicate a heat-trapping process caused by gases such as carbon dioxide, and water vapour which are transparent to incoming solar radiations but re-emit the infrared radiations from Earth's surface.
  - Global warming is a long-term rise in the average temperature of Earth as a whole as a result of greenhouse effect.

Current Environmental issues



Process

1. High energy wavelengths hit the earths surface

2. Incoming energy is converted to heat

3. Longer, infrared wavelengths hit greenhouse gas molecules in the atmosphere

4. Greenhouse gas molecules in the atmosphere emit infrared radiation back towards earth

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Greenhouses Gases

Some common greenhouse gases

1. Carbon dioxide
2. Methane
3. Nitrous oxide
4. Chlorofluoro carbons

Causes of greenhouse gases

1. Fossil-fuel burning
2. Industrial processes
3. Deforestation
4. Livestock
5. Biomass burning
6. Coal mining

Global Warming Potential (GWP)

$$GWP_i = \frac{\int_{TR}^{TH} a_i c_i(t)dt}{\int_{TR}^{TH} a_{CO_2} c_{CO_2}(t)dt}$$

Where,
a_i is the instantaneous radiative forcing due to the release of a unit mass of trace gas, i, into the atmosphere, at time TR, C_i is the amount of that unit mass remaining in the atmosphere at time, t, after its release and TH is TR plus the time horizon over which the calculation is performed

GHG	GWP for 100 years
CO_2	1
CH_4	23
N_2O	296
HFC - 23	12 000
HFC – 134a	1 300
SF_6	22 200

Source: *IPCC Third Assessment Report* (2001).

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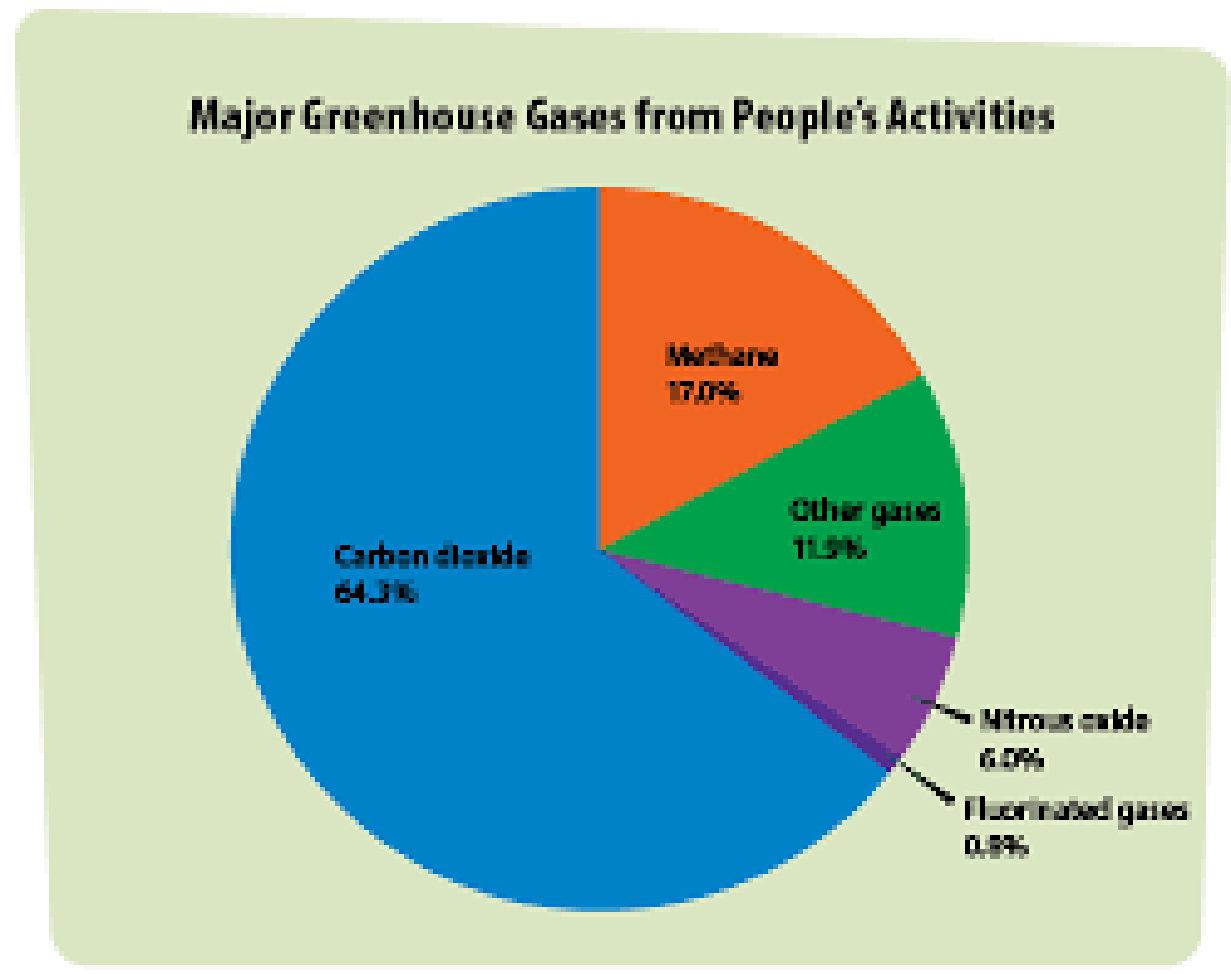
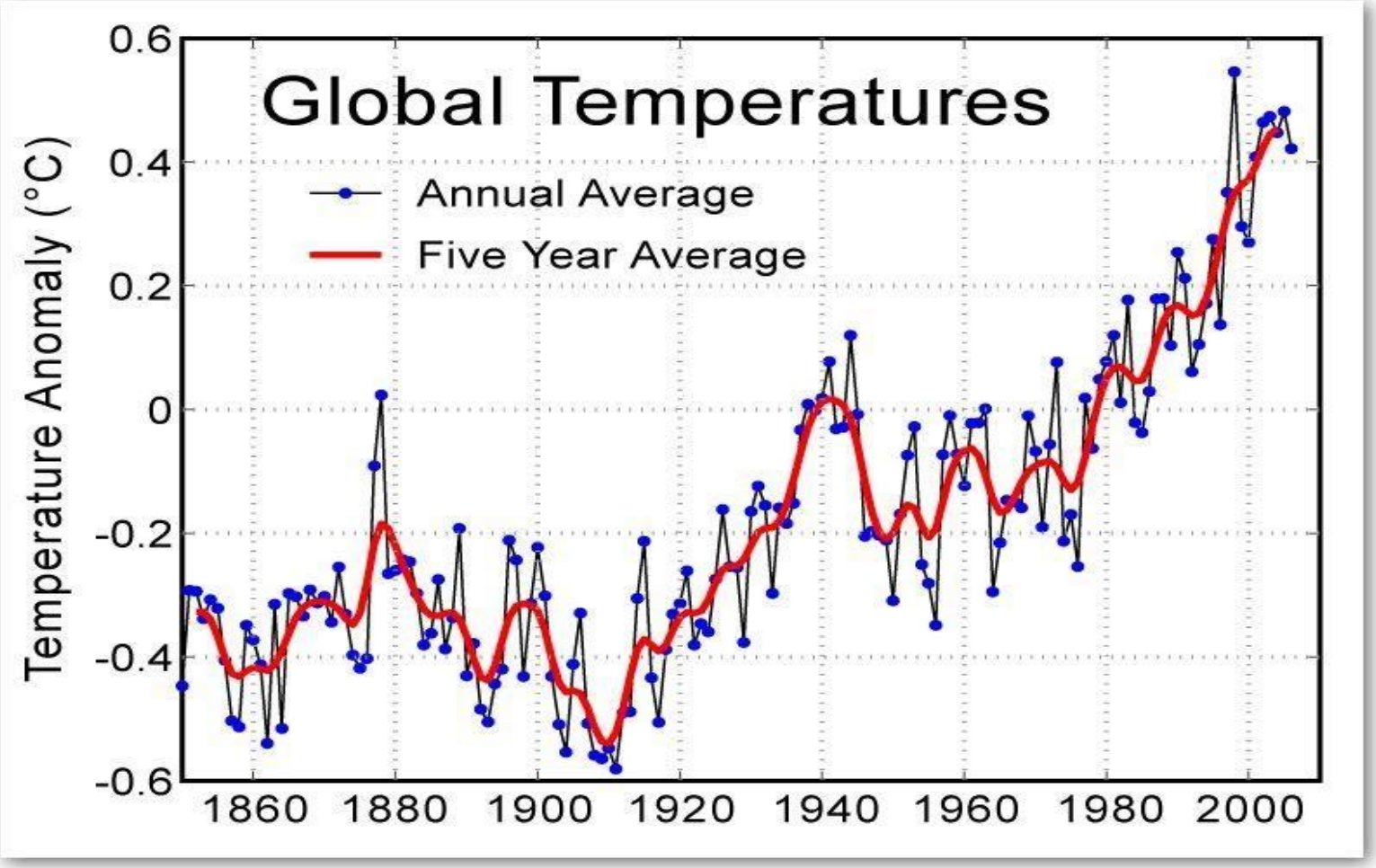
Effects of CO_2 increase

1. Air and the Earth's surface may grow warmer.
2. The stratosphere may become cooler.
3. Temperate and polar regions may become warmer leading to the reduction in the ice cover of the earth.
4. Rainfall may be higher than what it is present in the temperate regions.
5. The greater amount of evaporation due to excess warmth .

Emission of Greenhouses Gases



Emission of Greenhouses Gases



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Environmental Effects of Global warming

1. Climate change
2. Rise in sea level
3. Reduced agricultural production
4. Storms
5. Adverse effects on human health
6. Loss of ecosystems and biodiversity

Control measures of Global warming

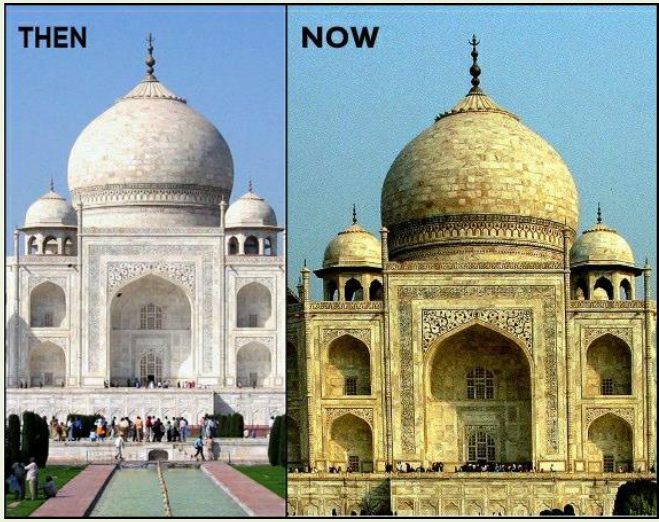
1. Reduction in the use of fossil fuels
2. Shifting to the renewable energy sources that do not emit greenhouse gases
3. Increasing the use of energy efficient and cleaner production technologies and practices
4. Reducing deforestation, adopting better forest management practices, and undertaking aforestation to sequester carbon

Acid Rain

Acid rain refers to a condition in which natural precipitation becomes acidic after reacting chemically with pollutants in the air.

Causes of Acid Rain

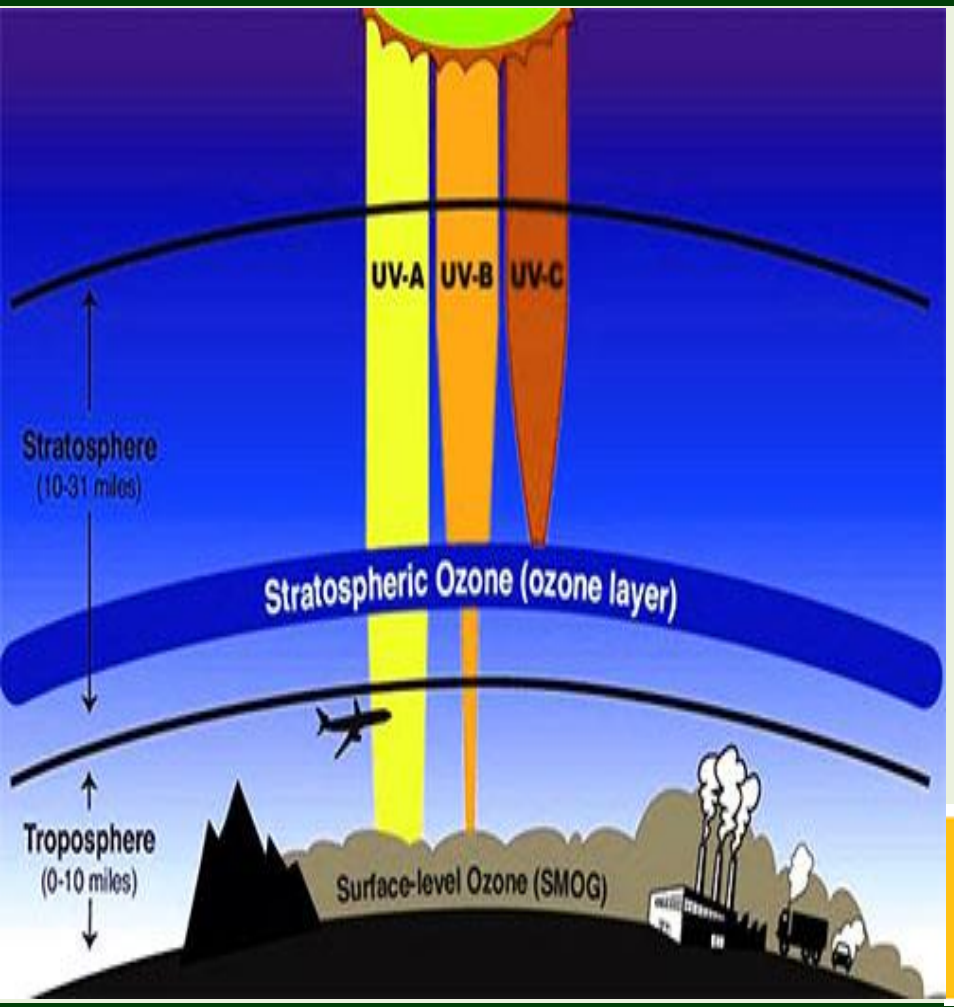
Burning of the fuel as well as the use of nuclear weapons leading to the evolution of large amounts of sulphur dioxide (SO_2) and nitrogen dioxide (NO_2), which get converted to sulphurous acid and nitric acid, respectively.



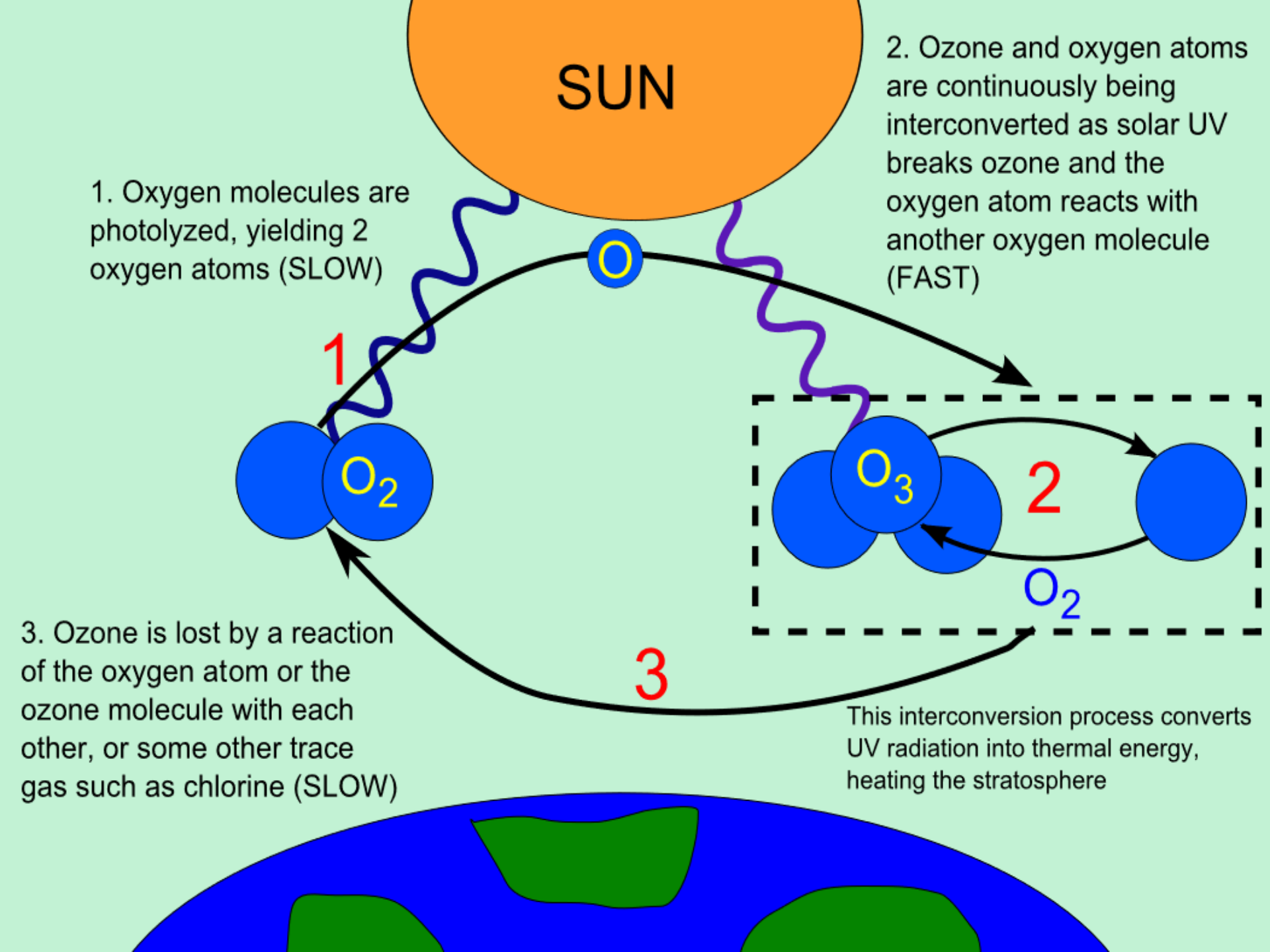
Effects of Acid rain

1. Reduction in population of flora and fauna
2. Damage to terrestrial ecosystems
3. Corrosion of buildings
4. Effect on human beings

Ozone Layer and Its Depletion



The decrease in the concentration of ozone (O_3) in stratosphere is known as ozone layer depletion.


SUN
1. Oxygen molecules are photolyzed, yielding 2 oxygen atoms (SLOW)
2. Ozone and oxygen atoms are continuously being interconverted as solar UV breaks ozone and the oxygen atom reacts with another oxygen molecule (FAST)
3. Ozone is lost by a reaction of the oxygen atom or the ozone molecule with each other, or some other trace gas such as chlorine (SLOW)
This interconversion process converts UV radiation into thermal energy, heating the stratosphere
O
1
O_2
O_3
2
O_2
3

Ozone Depleting Potential (ODP)

Dobson Unit (DU) = 2.6867 x 10^{20} molecules per meter square

Designation	Chemical Name		Relative ozone-depleting potential
CFC-11	CCl_3F	trichlorofluoromethane	1
CFC-12	CCl_2F_2	dichlorodifluoromethane	1
CFC-113	$C_2Cl_3F_3$	trichlorotrifluoroethane	0.80
CFC-114	$C_2Cl_2F_4$	dichlorotetrafluoroethane	1
CFC-115	C_2ClF_5	chlorodifluoromethane	0.6
CFC-22	$CHClF_2$	chlorodifluoromethane	0.05

Source : Report on Chlorofluorocarbons of the Institution of Environmental Health Officers, U.K., 1989.

ODS	Atmospheric lifetimes (years)	ODP
Freons:		
- CFC-11	55	1.0
- CFC-12	116	1.0
- CFC-113	110	1.1
- CFC-114	220	0.8
- CFC-115	550	0.5
Halons:		
- H-1301	67	16.0
- H-1211	40	4.0
- H-1202	33	1.3
CCl_4	47	1.1
CH_3CCl_3	47	0.1
CH_3Br	35	0.6

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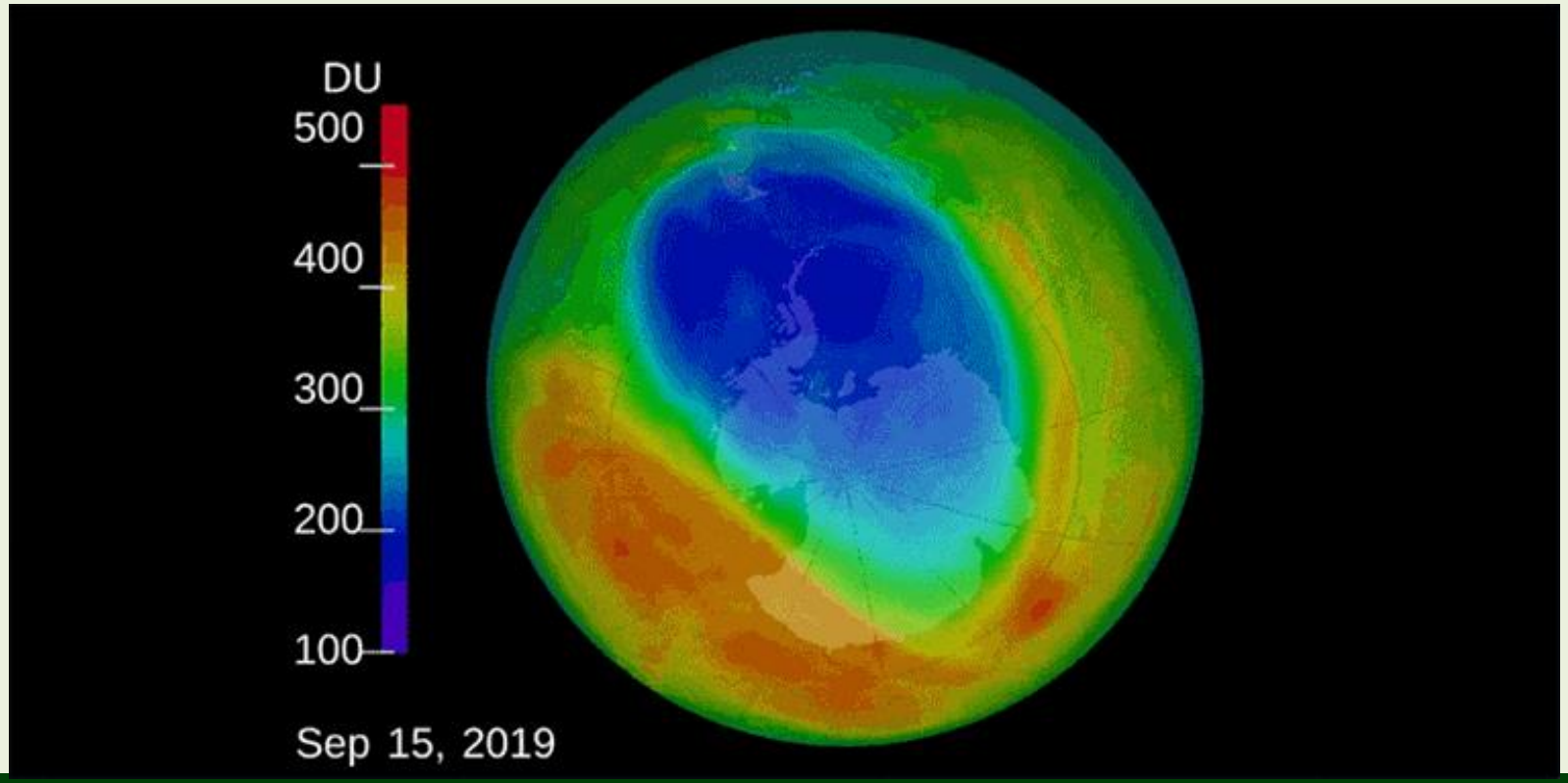
Ozone Hole

The thinning of ozone layer or reduction in concentration of ozone especially over the area of Antarctic continent is known as ozone hole, which covers approximately seven million square kilometer.



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The Environment Protection act 1986

Objective- It provides for the protection and conservation of the Environment.

1. To protect the forests and wildlife in the country.
2. To improve the quality of life by protection of environment.
3. To co-ordinate the activities of the various regulatory agencies already in existence.
4. To appoint environment officers to check environmental pollution.
5. Establishing environmental laboratories.

Air (Prevention and Control of Pollution) Act of 1981

Objective- It provides the prevention , control and abatement of air pollution. Provisions of the Act has to be implemented by Central Pollution Control Board along with the state board.

Functions-

1. setting of the air quality standards, collecting data on air pollution, organizing training, awareness programmes, establishing laboratories
2. Specify air pollution control areas and set standard for vehicle emissions.
3. Penalties for violation of its provisions. Applies to all.

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central Government)
Sulphur Dioxide (SO_2), µg/m^3	Annual* 24 hours**	50 80	20 80
Nitrogen Dioxide (NO_2), µg/m^3	Annual* 24 hours**	40 80	30 80
Particulate Matter (size less than 10 µm) or PM_{10} µg/m^3	Annual* 24 hours**	60 100	60 100
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m^3	Annual* 24 hours**	40 60	40 60
Ozone (O_3) µg/m^3	8 hours* 1 hour**	100 180	100 180
Lead (Pb) µg/m^3	Annual* 24 hours**	0.50 1.0	0.50 1.0
Carbon Monoxide (CO) mg/m^3	8 hours* 1 hour**	02 04	02 04
Ammonia (NH_3) µg/m^3	Annual* 24 hours**	100 400	100 400
Benzene (C_6H_6) µg/m^3	Annual*	5	5
Benzo(a)Pyrene (BaP)- particulate phase only, ng/m^3	Annual*	1	1
Arsenic(As), ng/m^3	Annual*	6	60
Nickel (Ni), ng/m^3	Annual*	20	20

Water (Prevention and Control of Pollution) Act 1974

Objective-

It prevents, controls and provides maintenance or restoration of wholesomeness of water.

Provisions of the Act has to be implemented by Central Pollution Control Board being a main agency.

Functions-

1. Establishes standards of the water quality and effluent
2. Polluting industries must seek the permission to discharge the waste into effluent bodies.

Surface water quality criteria for different uses (specified by CPCB, 1979 and the Bureau of Indian Standards, 1982)

S. No	Water quality parameter	Characteristic of water body				
		A *	B *	C *	D *	E *
1	Dissolved Oxygen (DO) mg/l (minimum)	6	5	4	4	3
2	Biochemical Oxygen Demand (BOD), mg/l (max)	2	3	3	-	-
3	Total Coliform organisms ** MPN/100ml (max)	50 **	500	500	-	-
4	Total Dissolved Solids (TDS) mg/l (max)	500	-	1500	-	2100
5	Chlorides (as Cl^-) mg/l (max)	250	-	600	-	600
6	Colour, Hazen units (max)	-	10	300	300	-
7	Sodium Absorption Ratio (max)	-	-	-	-	20
8	Boron (as B), mg/l (max)	-	-	-	-	-
9	Sulphates (as SO_4^{-2}), mg/l (max)	400	-	400	-	1000
10	Nitrates (as NO_3^-) mg/l (max)	20	-	50	-	-
11	Free Ammonia (as NH_3) mg/l (max)	-	-	-	1.2	-
12	Conductivity at 25°C micro mhos/cm (max)	-	-	-	1000	2500
13	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5
14	Arsenic (as As), mg/l (max)	0.05	0.2	0.2	-	-
15	Iron (as Fe), mg/l (max)	0.3	-	-	0.5	-
16	Fluoride (as F), mg/l (max)	1.5	1.5	1.5	-	-
17	Lead (as Pb), mg/l (max)	0.1	-	0.1	-	-

Note: * Classes of water use:

A Drinking water source without conventional treatment but after disinfection
B Out door bathing (organised)
C Drinking water source with conventional treatment followed by disinfection.
D Propagation of wild life, fisheries.
E Irrigation, industrial cooling, controlled waste disposal.

Wildlife Protection Act of 1972

Objective- Wildlife protection Act of 1972 defines wildlife to include any bird or animal and aquatic or land vegetation, form part of any habitat.

Function-

1. Under the Act, Central government work with state governments to regulate or prohibit the conversion of forest in agriculture or urban land.
2. Protection against natural hazards
3. Maintenance of water supply in water bodies present in Forest.
4. Protection of lines of communication and transportation

Forest Conservation Act of 1980

Objective- It provides for the protection and conservation of the forests.

Under the Act, a state government may regulate or prohibit in any forest the clearing of land for cultivation, pasturing of cattle, or clearing the vegetation for any purpose.

Function-

1. Protection against natural hazards
2. Maintenance of water supply in aquifers.
3. Protection of lines of communication and transportation
4. Preservation of public health.
5. Mandatory for land owner.

Environmental protocols

- Montreal Protocol (1987)
  - The Montreal Protocol is a global agreement to protect the stratospheric ozone layer by phasing out the production and consumption of ozone-depleting substances (ODS).
  - Objective: to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion
- Convention on Biological Diversity (CBD) (1993)
  - The Convention on Biological Diversity (CBD) is an international agreement adopted at the Earth Summit in 1992.
  - Objectives:
    - conservation of biodiversity
    - sustainable use of biodiversity
    - equitable sharing of the benefits arising from the use of genetic resources
- Kyoto Protocol (1997)
  - The Kyoto Protocol to the United Nations Framework Convention on climate change is an amendment to the international treaty on climate change.
  - Objective: Stabilization of greenhouse gas concentrations in the atmosphere

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Issues involved in enforcement of Environmental Laws

- Illiteracy
- Growing population
- Ignorance
- Economic reasons
- Insufficiency of laws

Thank You

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