

Project report on

Climate Change and Carbon Emission

Introduction

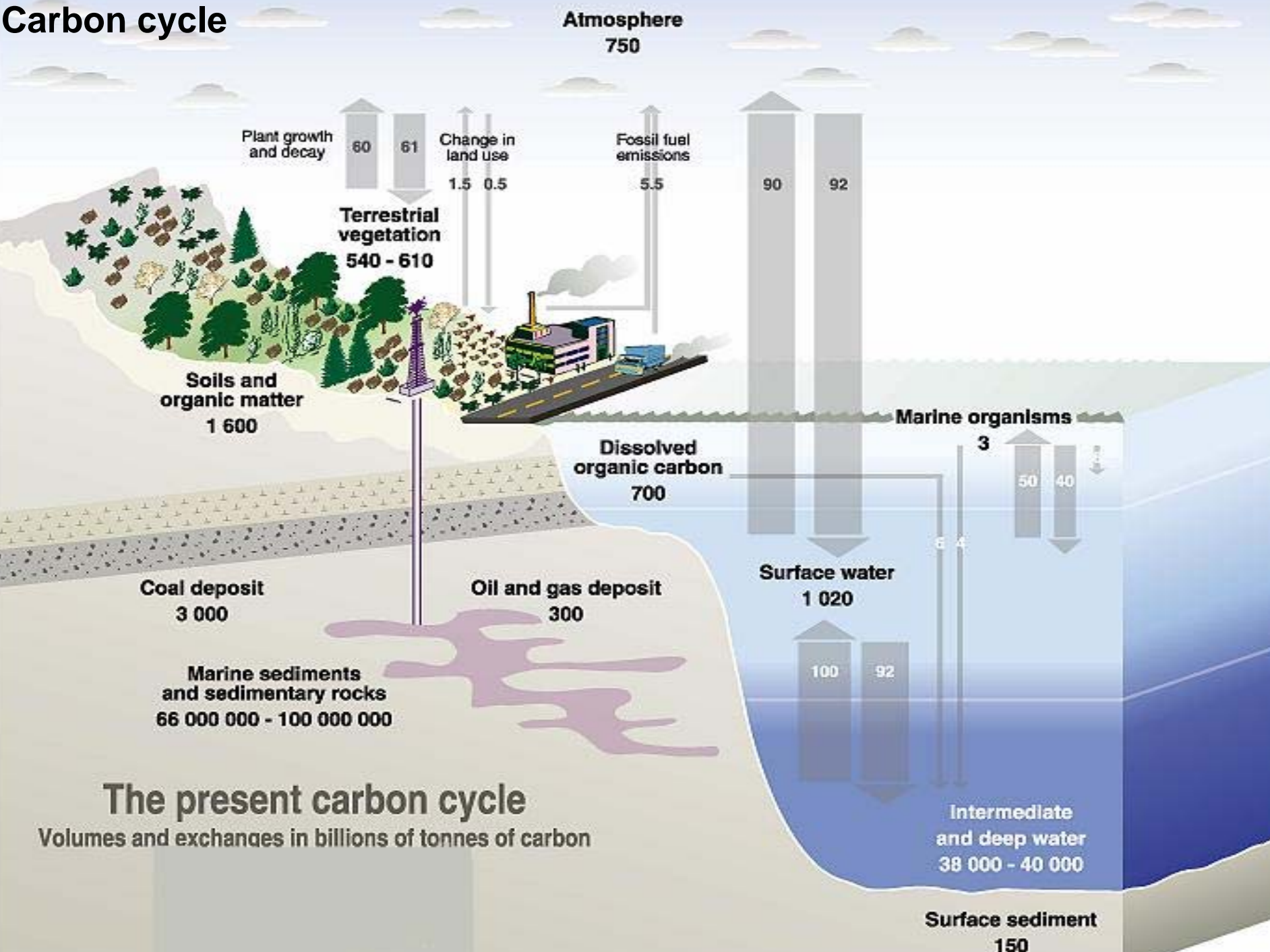
Climate is not the same as weather, but rather, its meteorological elements include precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost, and hail-storms, and other measures of the weather.

Atom-wise in the atmosphere Nitrogen (78%), Oxygen (21%), Argon (0.93%) and Carbon (0.03%)

Temperature is the key factor which affect climate.

Main effect of carbon increment in atmosphere is global warming, and greenhouse effect due to radiative forcing which is the cause of other effects.

Carbon cycle

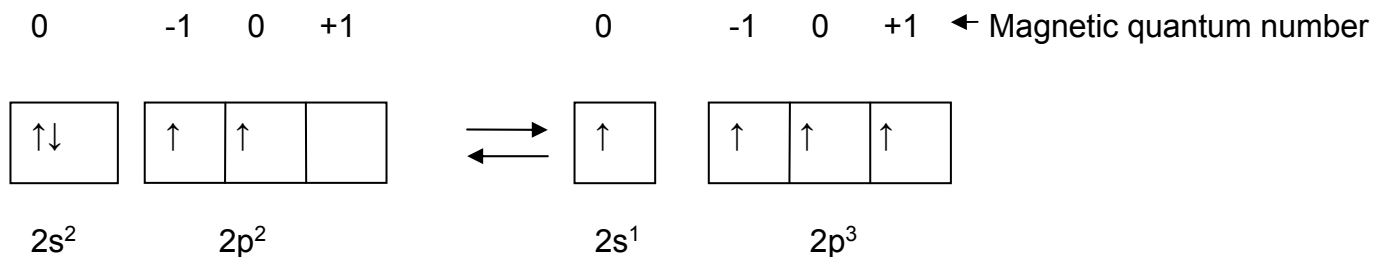


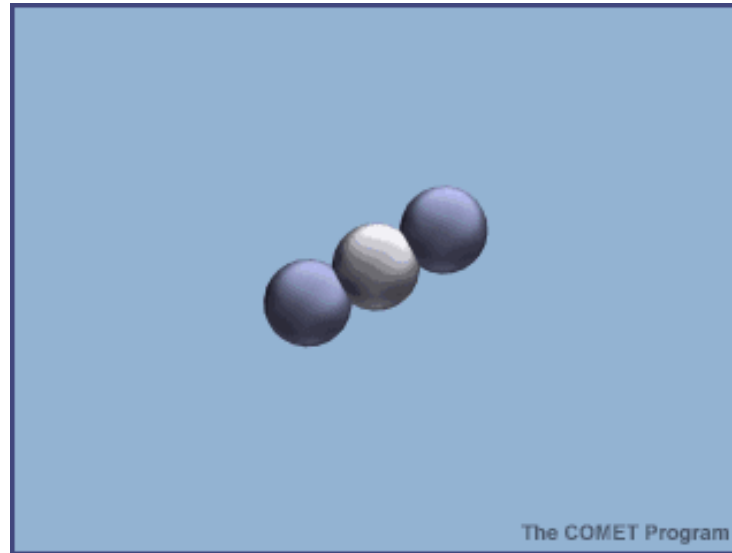
The present carbon cycle

Volumes and exchanges in billions of tonnes of carbon

Why Carbon and Carbon Compounds are Concerned?

- Any molecule made up of similar or different types of atoms having loose bonding, on absorbing radiation its atoms vibrate and eventually radiate back the same radiation. If any space is full of such molecules then radiation will be trapped and will make greenhouse condition.





- It has a great affinity for bonding with other small atoms, including other carbon atoms, and its small size makes it capable of forming multiple bonds. Carbon occurs in all organic life.
- Carbon dioxide, water vapor, methane, and nitrous oxide are loose bonded molecules and their amount in atmosphere is more. So they are main greenhouse gases of earth

Emission of Carbon Compounds and Radiative Forcing:

GAS(formula)(quantity)year	Pre-1750 concentration	Current tropospheric concentration	GWP* (100-yr time horizon)	Atmospheric lifetime (years)	Increased radiative forcing(W/m ²)
⁴ Carbon di oxide(CO ₂) (ppm)2004	280	377.3	1	variable	1.66
Sources of emission- 1.Natural- Root Respiration, plant Respiration, sea spray, volcanic outgassing, the combustion of organic matter, and the respiration processes of living aerobic organisms. 2.Anthropogenic- Fossile fuel and cooking wood burning, agricultural allied activities.					
⁴ Methane (CH ₄)(ppb)2004	730/688	1846/1730	23	12	0.5
Sources of emission- 1.Natural- Anaerobic decay of organic matter, wetland, ocean, termites, hydrates. 2.Anthropogenic- Landfills, livestock, waste treatment, Biomass burning.					
⁵ Carbon monoxide(CO)(ppb)	<50	~100	-	Some months in troposphere	-
Sources of emission- 1.Natural- Volcanic activity, bushfires 2.Anthropogenic- Automobile and industrial incomplete carbon oxidation, cooking fuel, tobacco smoke.					
⁴ CFC-11 (trichlorofluoromethane) (CCl ₃ F) (ppt) 2004	0	253/250	4600	45	0.34 for all halocarbons collectively, including many not listed here
⁴ CFC-12 (dichlorodifluoromethane) (CCl ₂ F ₂) (ppt) 2004	0	545/542	10600	100	
⁴ Carbon tetrachloride (CCl ₄) (ppt) 2004	0	93/92	1800	35	
⁴ Methyl chloroform (CH ₃ CCl ₃) (ppt) 2004	0	23/22	140	4.8	

GAS(formula)(quantity)year	Pre-1750 concentration	Current tropospheric concentration	GWP* (100-yr time horizon)	Atmospheric lifetime (years)	Increased radiative forcing(W/m ²)
⁴ HCFC-22 (chlorodifluoromethane) (CHClF ₂) (ppt) 2004	0	174/155	1700	11.9	0.34 for all halocarbons collectively, including many not listed here
⁴ HFC-23 (fluoroform) (CHF ₃)2001	0	14	12000	260	
⁴ Perfluoroethane (C ₂ F ₆) (ppt) 2001	0	3	11900	10000	
⁴ Trifluoromethyl sulfur pentafluoride (SF ₅ CF ₃) (ppt) 2004	0	0.16	~18000	~3200	<0.0001
Sources of emission- 1. Natural - Sulfur compounds are emitted in volcanic eruption. 2. Anthropogenic - refrigerant, propellants and cleaning solvents.					
⁶ Particulate carbon	-	variable	-	variable	+0.1 to +0.4
Sources of emission- 1. Natural - Volcanic eruption, wind blown dust, forests fires, sea spray. 2. Anthropogenic - Construction sites, cement industries, incomplete combustion.					
⁷ Asteroid	40000 tons/yr. containing >0 to 3.0% carbon by mass				

Effect on Climate

- In the 20th century earth surface temperature increment is around (0.6 ± 0.2) °c due to most of anthropogenic activities as believed. This slight increment in temperature changed climate of earth dramatically. Greenhouse gases are main reason for temperature increment, so we take a look on main carbon-emissions.

1. Physical Effects

- Main physical effects are temperature, precipitation, humidity, sunshine, wind velocity, fog, frost, and hailstorms, tornado, and other measures of the weather.
- Due to temperature increase power generation efficiency decreases, water vapor increases, microbial growth increases, ice caps melt, more fresh water in ocean, ocean circulation pattern slows, northern Europe gets cooler, equator warms, ocean phytoplankton grow, temperature differential between regions increases, wind increases, more salt swept from ocean to atmosphere, more lightening takes place, atmospheric reaction spontaneity increases, humidity increases, corrosion increases. More damage to plastic.

- Computer simulation shows that carbon soot particles concentration in polar ice is increasing, so albedo from ice surface is decreasing and energy absorption increasing so ice melting also increase.
- Due to carbon particles layer on leaves, photosynthesis decreases.

2. Chemical Effects

- Due to temperature increment, activation energy of molecules decrease so spontaneity of reaction increases, all biological activity go up, this enhances microbial growth and increases atmospheric carbon emission.

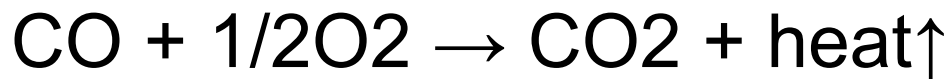
Major Reactions Of Carbon Compounds In Atmosphere

Reactions Of Carbon Dioxide:

pH of precipitation decreases. Because we know that, “Concentration of CO₂ in water = KH * partial pressure of CO₂” in atmosphere, where KH is Henry’s constant for a particular temperature at equilibrium.

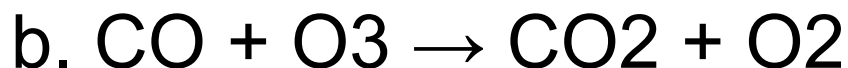
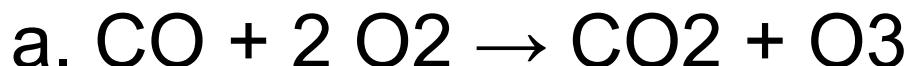
Carbon Monoxide Reactions:

Reaction with O



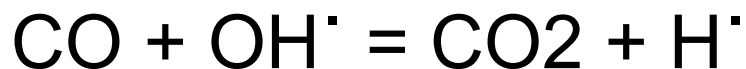
-Producing green house gas.

Reaction with O₃

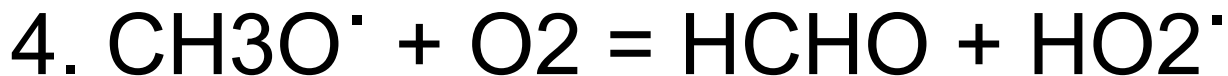
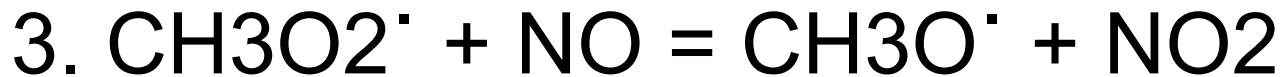
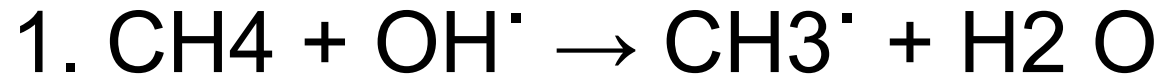


- Producing green house gas.

Roughly 80% of ·OH in the troposphere reacts with CO.



Methane Reactions In Troposphere:



CFCs Reactions In Troposphere:

1. $\text{CFCs} + h\nu \rightarrow \text{Cl}^\bullet$
2. $\text{Cl}^\bullet + \text{O}_3 \rightarrow \text{ClO}^\bullet + \text{O}_2$
3. $\text{ClO}^\bullet + \text{O}^\bullet \rightarrow \text{Cl}^\bullet + \text{O}_2$

Future Of Earth's Climate

1. High Emission Scenario
 2. Mid-Range Emission Scenario
 3. Low Emission Scenario
- } population & fissile fuel

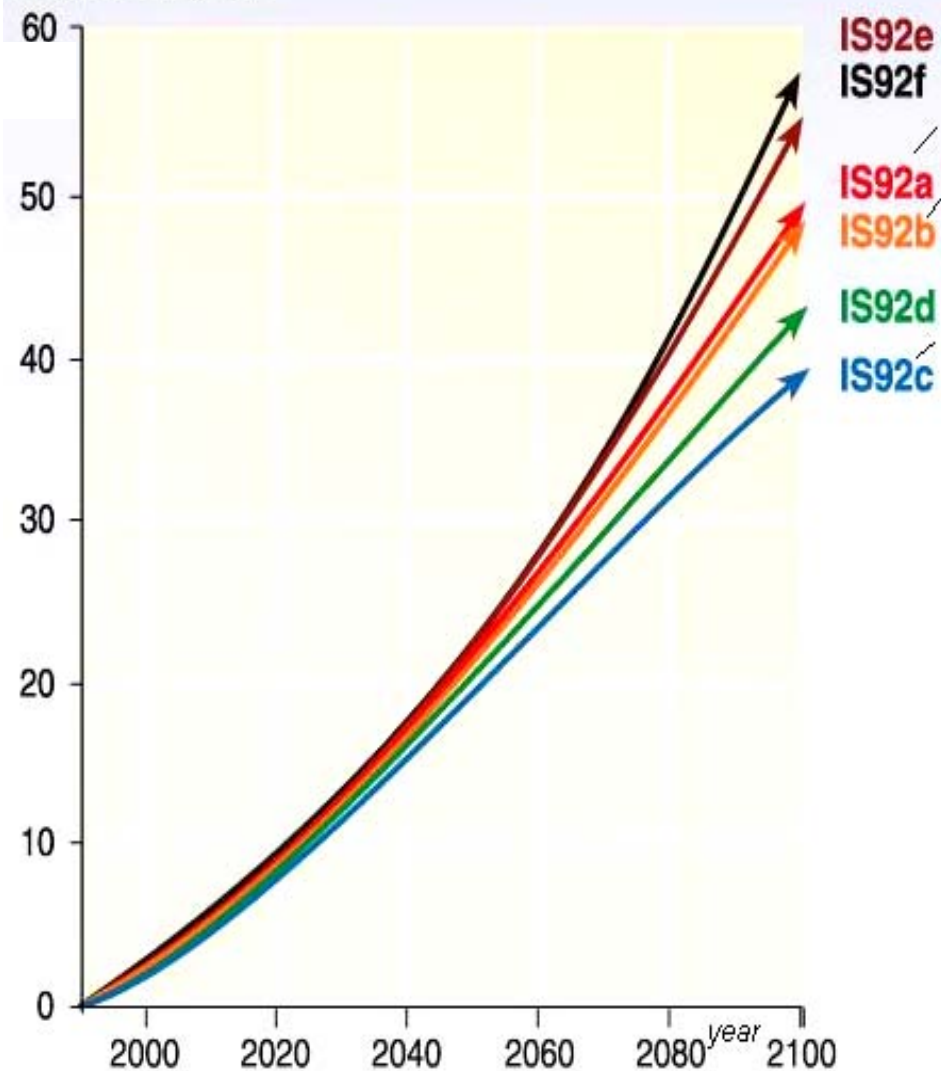


The six IPCC scenarios

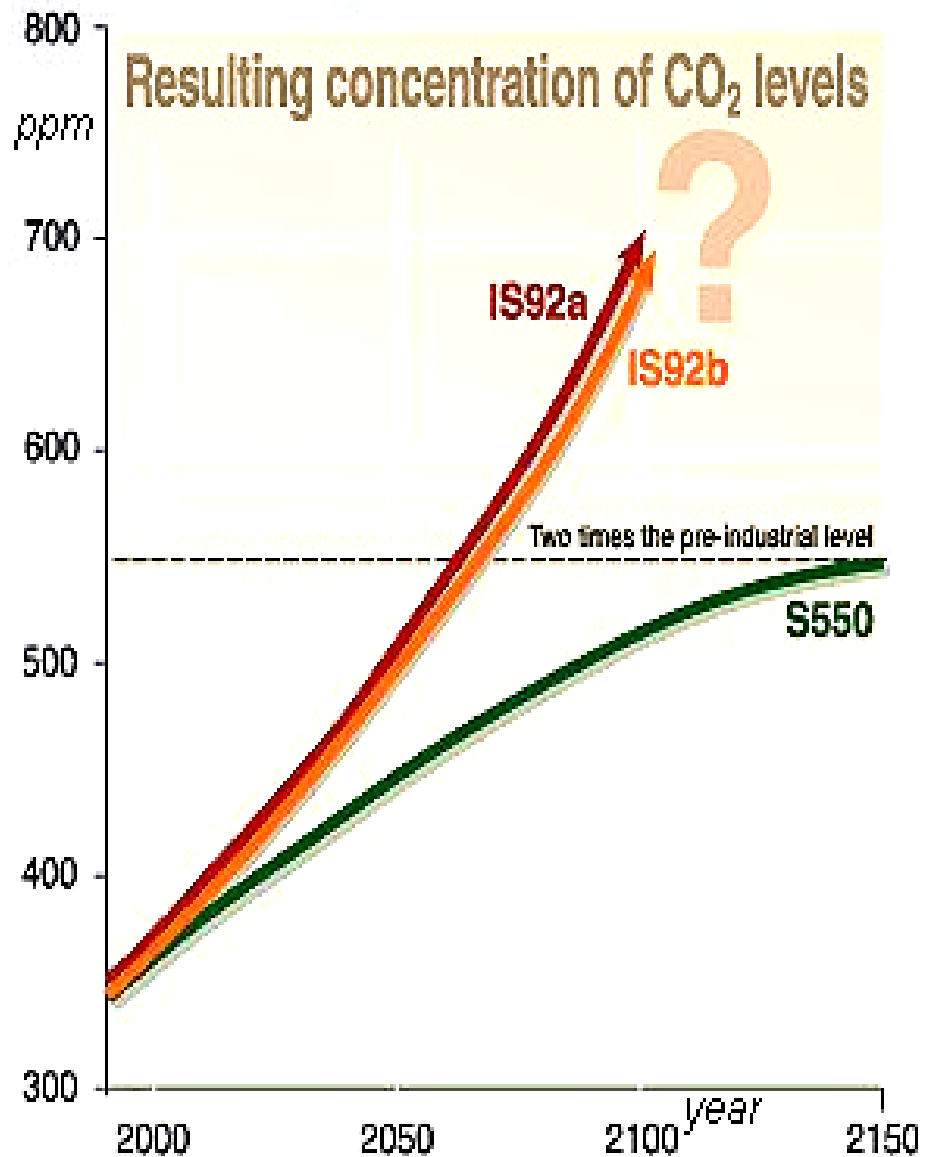
Scenario	Population	Economic growth	Energy supplies
IS92a,b	World Bank 1991 11.3 billion by 2100	1990-2025: 2.9% 1990-2100: 2.3%	12,000 EJ conventional oil 13,000 EJ natural gas Solar costs fall to \$0.075/kWh 191 EJ of biofuels available at \$70/barrel
IS92c	UN medium-low case 6.4 billion by 2100	1990-2025: 2.0% 1990-2100: 1.2%	8,000 EJ conventional oil 7,300 EJ natural gas Nuclear costs decline by 0.4% annually
IS92d	UN medium-low case 6.4 billion by 2100	1990-2025: 2.7% 1990-2100: 2.0%	Oil and gas same as IS92c Solar costs fall to \$0.065/kWh 272 EJ of biofuels available at \$50/barrel
IS92e	World Bank 1991 11.3 billion by 2100	1990-2025: 3.5% 1990-2100: 3.0%	18,400 EJ conventional oil Gas same as IS92a,b Phase out nuclear by 2075
IS92f	UN medium-high case 17.6 billion by 2100	1990-2025: 2.9% 1990-2100: 2.3%	Oil and gas same as IS92e Solar costs fall to \$0.083/kWh Nuclear costs increase to \$0.09/kWh

Scenario of sea level rise

Sea level rise, cm



Concentration of CO₂ in ppmv (part per million by volume)



3. Health Effects

- Due to increment in temperature and humid conditions pathogens and vector increases so diseases due to these also increases.
- Complications with asthma, bronchitis, emphysema, pneumonia and other lung diseases; irritations to the nose, throat and ear canal;
- Breathing difficulties, chest pain and headaches;
- Increased sensitivity to allergens;
- Reduced alertness;
- Diminished lung function;
- Weakened immune system; and increased risk of heart disease.

- CO can cause dizziness, slowed reaction times, headaches, an increased risk of heart disease and may promote the development of arteriosclerosis.

UV causes-

- Skin cancer;
- Eye cataracts;
- Weakened immune system;
- Reduced plant yield;
- Damage to ocean eco-system;
- DNA damage;

Recommendations For Carbon Emission Control:

- **Individual Effort:**
- **Global Effort:**
 1. United Nations Framework Convention on Climate Change (UNFCCC);
 2. Intergovernmental Panel On Climate Change (IPCC); IPCC is science authority for the UNFCCC.
 3. Kyoto Protocol to reduce fossil fuel consumption.
 4. Montreal Protocol on Substances That Deplete the Ozone Layer;
 5. World Health Organization (WHO); emphasis on health.
 6. National Aeronautics And Space Administration (NASA); metrological analysis.
 7. National level rules and regulations.



Our views:

1. Use of high efficiency equipments to reduce power consumption;
2. Pot vegetation in houses;
3. Minimum use of allotropic medicines;
4. Development of non carbon emitting equipments;
5. Use of environmental friendly material which can be recycled;
6. Be vegetarian;
7. Plantation in barrel land;
8. One child family plan;
9. Minimize deforestation;
10. Less use of man made organic cosmetics;
11. Design of low carbon emission chullha;
12. Use bio-fuel for domestic cooking;
13. Shifting cultivation should be stopped;
14. Use minimum possible resources;
15. Less use of chemical compounds;
16. Production of compounds which can recycled;
17. Use of solar energy for various purposes;
18. Filling of Underground mines by appropriate material such as to minimize the inter-crustal pressure and volcanic eruption;
19. Balancing unequal distribution of urbanization and industrialization;
20. Less storage of commodities.

- **Conclusion:**

Nature has a buffer capacity to counter act the change in climate either by naturally or anthropogenic ally to some extent. If climate changes occur beyond this limiting capacity, than nature will become pseudo. Today climate change is main issue which globally affect over temperature, precipitation, wind pattern, biodiversity lose and economic pressure etc. Scientists have predicted some future data about climate change which is terrible. So all are aware of these reports and many organizations in world are coming forward to implement some rules and regulations to control anthropogenic carbon emission. If this scenario continues than within some centauries most of species might be eliminated from biosphere of earth. This effect can not be minimize by regional efforts until unless any global efforts.



Thanks