Climate Change

- Greenhouse effect is the phenomenon where heat from the Sun is trapped in the Earth by atmospheric gases such as CO_2.
- Trapping some of the heat is good because it keeps the Earth warm enough to be habitable.
- Human activities are producing more CO_2 and thus more heat is being trapped in the Earth which is leading to global warming.
- If the planet keeps getting warmer, there will be stronger storms, more flooding, droughts, wildfires and water shortages.
- We can reduce this global warming by generating electricity from clean sources like solar and wind and driving less.

Climate Science

- The whole action of climate change is the interaction of incoming solar energy and land.
- The interaction phenomenon of energy is a function of the surface.
- Sea mostly absorbs or transmits energy, hardly any reflection.
- Snow and deserts majorly reflect the energy.
- In atmosphere multiple scattering happens. Multiple scattering means that energy is scattered by different molecules in the atmosphere.
- When Earth emits the same amount of energy that it absorbs, the energy budget is in balance, and its average temperature remains constant.
- But this balance does not happen because the surfaces are different.
- Today the energy which is incoming is not going back and hence imbalance occurs and temperature of earth is increasing.
- How much energy the earth receives is a function of the particular season and day. The seasonal difference occurs due to the elliptical orbit of the sun.
- The energy difference also occurs because the axis of the earth is inclined.
- Seasons are caused by Earth's tilted axis (and maybe latitude also).
- When the southern hemisphere is tilted towards the sun, it is summer in southern hemisphere and winter in northern hemisphere and vice versa.
- The tilt of Earth's axis relative to its orbit around the sun results in predictable changes in the duration of daylight and the amount of sunlight received at any latitude throughout a year. These changes in the sun's energy are thought to be too small to be the cause of the recent warming observed on Earth.
- The temperature has been increasing for many years but the solar irradiance has been decreasing and the sun's energy output has not changed enough over the decades and hence one can conclude that the incoming solar radiation is NOT responsible for the increasing temperature.
- The major reason for climate change is the anthropogenic reasons and burning of fossil fuels.
- The variables used to measure climate and weather are same, but climate is the observation of these variables over a long period of time (decades or centuries) and weather is a short-term observation of these variables.
- Albedo is the ratio of energy reflected back by the atmosphere to the energy incoming. Albedo is different for different surfaces.
- Energy is transferred by the principles of thermodynamics between various regions.

- Sun energy is maximum in the equatorial region. When the temperature is more the pressure will be less. Winds (Thermal energy) have a tendency to move from high pressure to low pressure region.
- Hadley cells are created due to these differences.
- For more info on Hadley cells- https://www.youtube.com/watch?v=El3UEMU9V5s
- Biosphere is dependent upon the transfer of energy from one surface to another.
- Boundary between troposphere and Stratosphere is called tropopause.
- Mean temperature anomaly has been increasing for many years and is seen most significantly over the northern hemisphere and varies from -4 to 4 C. It saw a sharp increase after the 1960s.
- It is due to the northern hemisphere picking up more energy and more human activity over it.