

# CLIMATE CHANGE

- **Climate change**
- Any permanent change in weather phenomena from the normals of a long period average is referred as climate change. Eg. The global temperature has increased by 2 to 3 °C and increase in CO<sub>2</sub> from 180ppm to 350ppm.

- **Climate variability**
- The temporal changes in weather phenomena which is part of general circulation of atmosphere and occurs on a yearly basis on a global scale. Climate change and climate variability are the concern of human kind in recent decades all over the world. The recurrent drought and desertification seriously threaten the livelihood of over 1-2 billion people who depend on the land for most of their needs. The weather related disasters viz. drought and floods, ice storms, dust storms, land slides, thunder clouds associated with lightening and forest fires are uncommon over one or other region of the world. The year 1998 was one of the recent weather related disaster years, which caused hurricane house in Central America and floods in China, India and Bangladesh. Canada and New England in the U.S. suffered heavily due to ice storm in January while Turkey, Argentina and Paraguay with floods in June 1998. Vast fires in Siberia burned over three million acres of forests. Human and crop losses are the worst phenomena in such weather disasters, affecting global economy to a considerable extent

The 1997-'98 El-Nino events, the strongest of the last century is estimated to have affected 110 million people and cost the global economy nearly US \$ 100 billion. Statistics compiled from insurance companies for the period 1950-1999. Show that major natural catastrophes which are mainly weather and climate related caused estimated economic losses of US \$ 960 billion. Most of the losses were recorded in recent decades. Increase in aerosols due to emission of green house gases including black carbon and chlorofluorocarbons (CFCS), ozone depletion, UV-B filtered radiation, cold and heat waves, global cooling and warming and “human hand” in the form of deforestation and loss of wetlands in the process of imbalanced development for betterment of human kind may be caused factors for climate variability and climate change.

## **Causes of climatic variability**

### **A. External causes**

- i) Solar output: An increase in solar output by 0.3% when compared to 1650 –1700AD data.
- ii) Orbital variation:
  1. Earth orbit varies from almost a complete circle to marked ellipse (Eccentricity).
  2. Wobble of earth's axis (Precession of equinox)
  3. Tilt of the earth's axis of rotation relative to the plane of the orbit varies between 21.8° and 24.4 °.

### **B. Internal causes**

- i) Changes in the atmospheric composition. Change in the green house gases especially CO<sub>2</sub>
- ii) Land surface changes particularly the afforestation and deforestation
- iii) The internal dynamics of southern oscillation – changes in the sea surface temperature in western tropical Pacific (El-Nino/La-Nina) coupled with Southern Oscillation Index, the Tahiti minus Darwin normalized pressure index leading to the ENSO phenomena
- iv) Anthropogenic causes of climate variation in green house gases and aerosols.

## Effects of climate change

1. The increase concentration of CO<sub>2</sub> and other green house gases are expected to increase the temperature of the earth.
2. Crop production is weather dependant and any change will have major effects on crop production and productivity.
3. Elevated CO<sub>2</sub> and temperature affects the biological process like respiration, photosynthesis, plant growth, reproduction, water use etc. Depending on the latitude the CO<sub>2</sub> may either offer beneficial effect or may behave otherwise also.

# Global warming

- **Global warming**, the phenomenon of increasing average [air temperatures](#) near the surface of [Earth](#) over the past one to two centuries. Climate scientists have since the mid-20th century gathered detailed observations of various [weather](#) phenomena (such as temperatures, [precipitation](#), and storms) and of related influences on [climate](#) (such as [ocean currents](#) and the atmosphere's chemical composition). These data indicate that Earth's [climate](#) has changed over almost every conceivable timescale since the beginning of geologic time and that the influence of [human](#) activities since at least the beginning of the [Industrial Revolution](#) has been deeply woven into the very fabric of [climate change](#).

- Many climate scientists agree that significant societal, economic, and ecological damage would result if global average temperatures rose by more than 2 °C (3.6 °F) in such a short time. Such damage would include increased [extinction](#) of many plant and animal species, shifts in patterns of [agriculture](#), and rising sea levels. The IPCC reported that the global average [sea level](#) rose by some 19–21 cm (7.5–8.3 inches) between 1901 and 2010 and that sea levels rose faster in the second half of the 20th century than in the first half. It also predicted, again depending on a wide range of scenarios, that by the end of the 21st century the global average sea level could rise by another 29–95 cm (11.4–37.4 inches) relative to the 1986–2005 average and that a rise of well over 1 metre (3 feet) could not be ruled out.

- The scenarios referred to above depend mainly on future concentrations of certain trace gases, called [greenhouse gases](#), that have been injected into the lower [atmosphere](#) in increasing amounts through the burning of [fossil fuels](#) for industry, [transportation](#), and residential uses. Modern global warming is the result of an increase in magnitude of the so-called [greenhouse effect](#), a warming of Earth's surface and lower atmosphere caused by the presence of water vapour, [carbon dioxide](#), [methane](#), [nitrous](#) oxides, and other greenhouse gases. In 2014 the [IPCC](#) reported that concentrations of carbon dioxide, methane, and nitrous oxides in the atmosphere surpassed those found in ice cores dating back 800,000 years. Of all these gases, carbon dioxide is the most important, both for its role in the greenhouse effect and for its role in the human economy. It has been estimated that, at the beginning of the industrial age in the mid-18th century, carbon dioxide concentrations in the atmosphere were roughly 280 parts per million (ppm). By the middle of 2014, carbon dioxide concentrations had briefly reached 400 ppm, and, if fossil fuels continue to be burned at current rates, they are projected to reach 560 ppm by the mid-21st century—essentially, a doubling of carbon dioxide concentrations in 300 years.