HEAT BUDGET (Earth's Energy Budget)

1. Introduction

Heat budget refers to the balance between incoming solar radiation (insolation) and outgoing terrestrial radiation from the Earth. It explains how the Earth maintains nearly constant average temperature over long periods of time.

2. Components of Heat Budget

- Incoming Solar Radiation (Insolation): Shortwave radiation from the Sun reaching the Earth's atmosphere.
- Reflection (Albedo): About 30% of incoming solar radiation is reflected back to space by clouds, atmosphere, and surface.
- Absorption: Around 70% is absorbed by the atmosphere, oceans, and land surface.
- Outgoing Terrestrial Radiation: Longwave radiation emitted by the Earth back into space.
- Greenhouse Effect: Certain gases trap outgoing heat and maintain Earth's temperature.

3. Mechanism of Heat Budget

At the top of the atmosphere, the average incoming solar radiation is about 100 units. Approximately 30 units are reflected back to space. The remaining 70 units are absorbed by the Earth-atmosphere system. To maintain equilibrium, Earth radiates 70 units back to space in the form of longwave radiation.

4. Latitudinal Heat Imbalance

Equatorial regions receive surplus heat, while polar regions experience heat deficit. This imbalance is balanced through atmospheric circulation and ocean currents.

5. Importance of Heat Budget

- Maintains Earth's average temperature (~15°C).
- Controls global climate system.
- Drives atmospheric circulation and ocean currents.

- Helps in understanding climate change and global warming.