

Climate feedback loops →

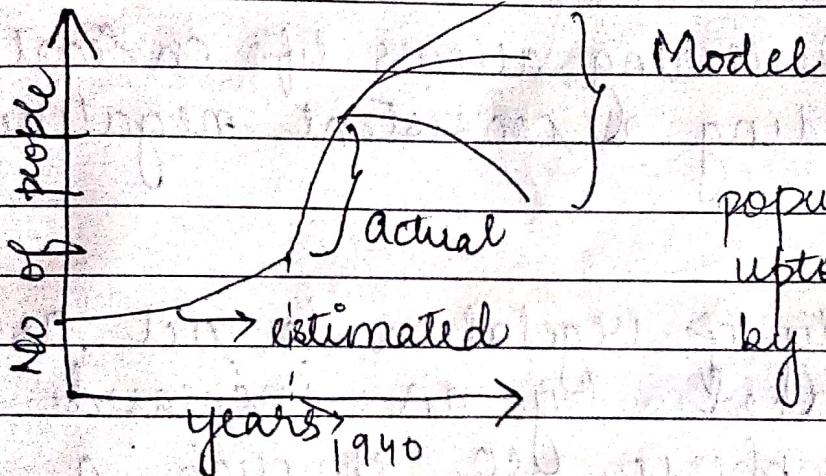
Example - Hydrological cycle

loops : Positive (B increases A)

Negative (B reduces A)

↳ It doesn't mean loop is undesirable

Growth of population graph →

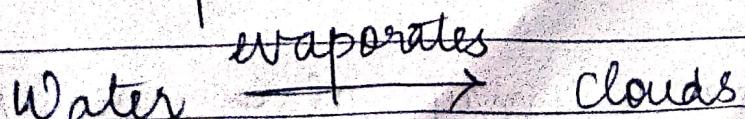


population will rise upto 9 to 10 billion by 21st century

→ Classic example of the feedback loop

→ Any natural system has a carrying capacity. When this carrying capacity is exceeded, the environment can no longer sustain the size of population, resulting in population crash.

→ Another example is water



(more clouds, mo

* Carbon Dioxide Thermostat

CO_2 has kept temperature relatively stable through the process of chemical weathering

This loop is stable

reductⁿ of weathering
allows more CO_2 to stay in atmosphere +

rock takes up CO_2 by chemical process

+ Increased heavy precipitation events + expose rock.

- reduction in heavy precipitation slows rock exposure

Chemical Weathering allows life on Earth to exist by providing a consistent negative feedback effect.

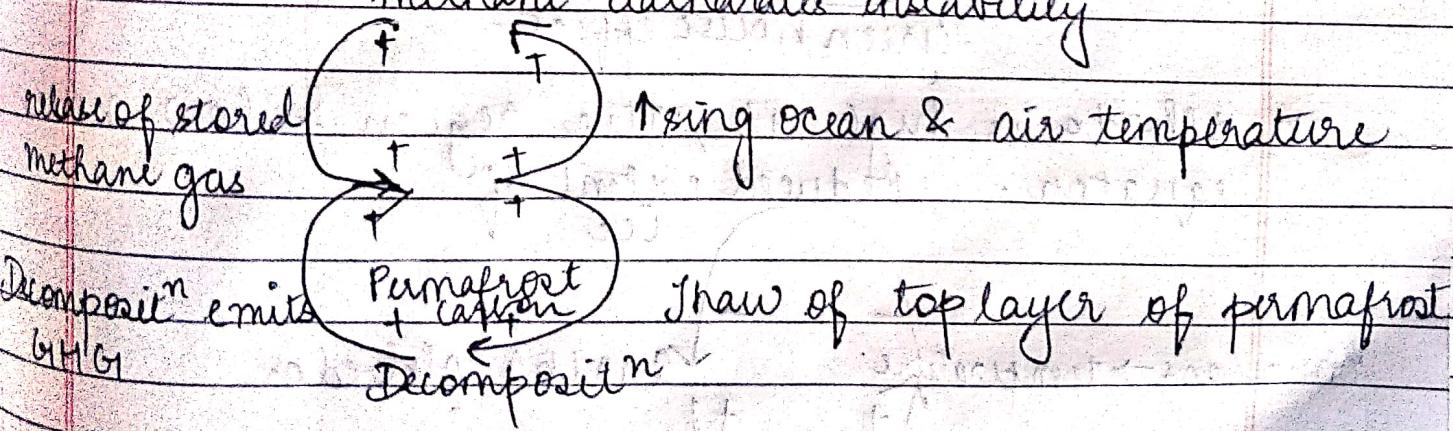
- The ability of vegetation to act as a sink is enhanced by an increased concentration of atmospheric CO_2 through a mechanism known as fertilization effect.
- It is an excellent example of one of feedback loops in the carbon cycle that involves CO_2 emissions.
- Vegetation can only store carbon on a short term time scale - most imp. anthropogenic carbon sink is ocean.
- Climate change may also weaken the buffering ability of oceans.

Temp ↑ → Large quantity of fresh water in ocean travel to oceans depth through melting of glaciers

Without the ability to surface carbon concentration ↑es absorption of Carbon ↓

* Phytoplankton blooms: when plankton dies carbon of their bodies enter back into carbon cycle.

* Permafrost & Methane clathrate hydrates → methane clathrate instability

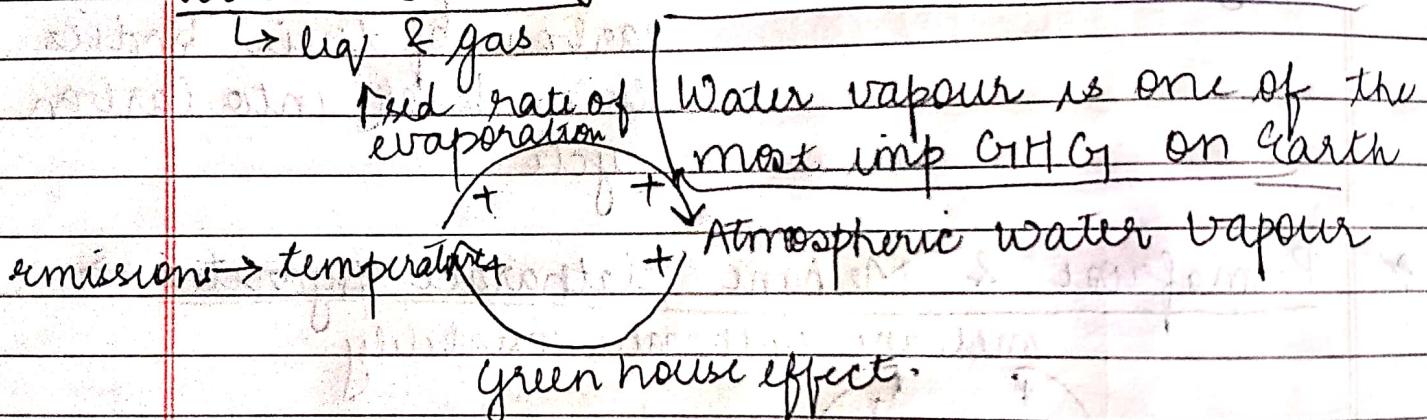


Permafrost → covered by snow whole year
(permanently frozen)

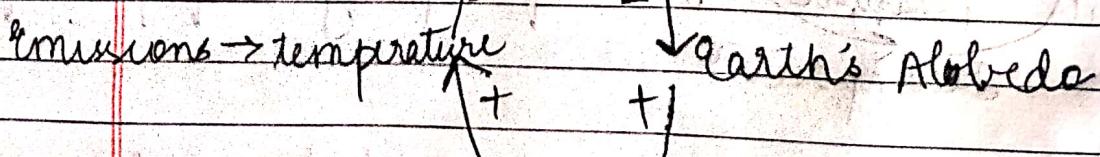
- When ice melts, creates depression
- In water covered environment, anaerobic methane producing bacteria can begin decomposition of stored carbon.

- 350-950 billion tonnes carbon could be released from the permafrost.
- Within the permafrost there is also another source of CH_4 : methane clathrate hydrate. 1m^3 of solid methane clathrate can hold up to 164m^3 of methane gas.

Water Feedback



- Albedo is high at artic region & low near equator. Reduced extent of ice

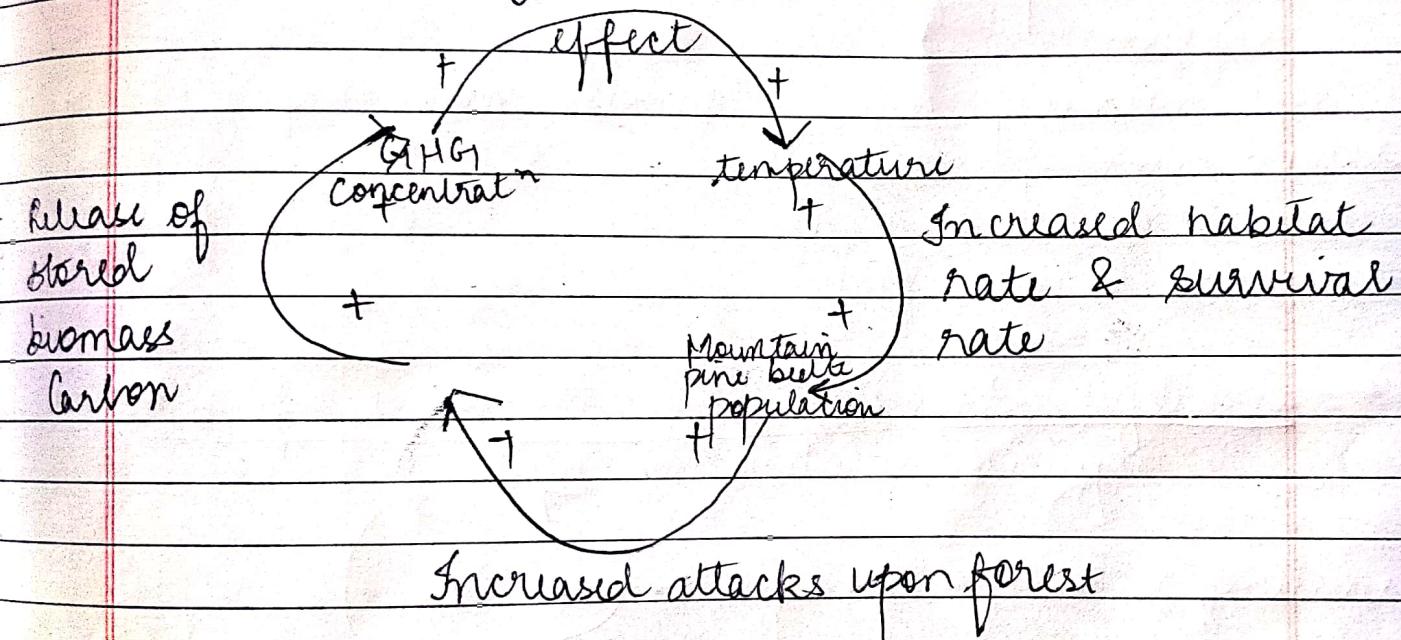


- There are two types of clouds
 - dense (low level)
 - not dense (high level)

The Mountain Pine Beetle → (Bark beetle)

→ Pine Beetle lays its eggs. It produces a blue fungus into the tree's tissues. Fungus prevents water & nutrients in tree. Eventually they kill the tree. Normally attacks on old or weakened trees.

Greenhouse



Radiative Forcing - Difference b/w Sunlight absorbed by the Earth & energy radiated back to space