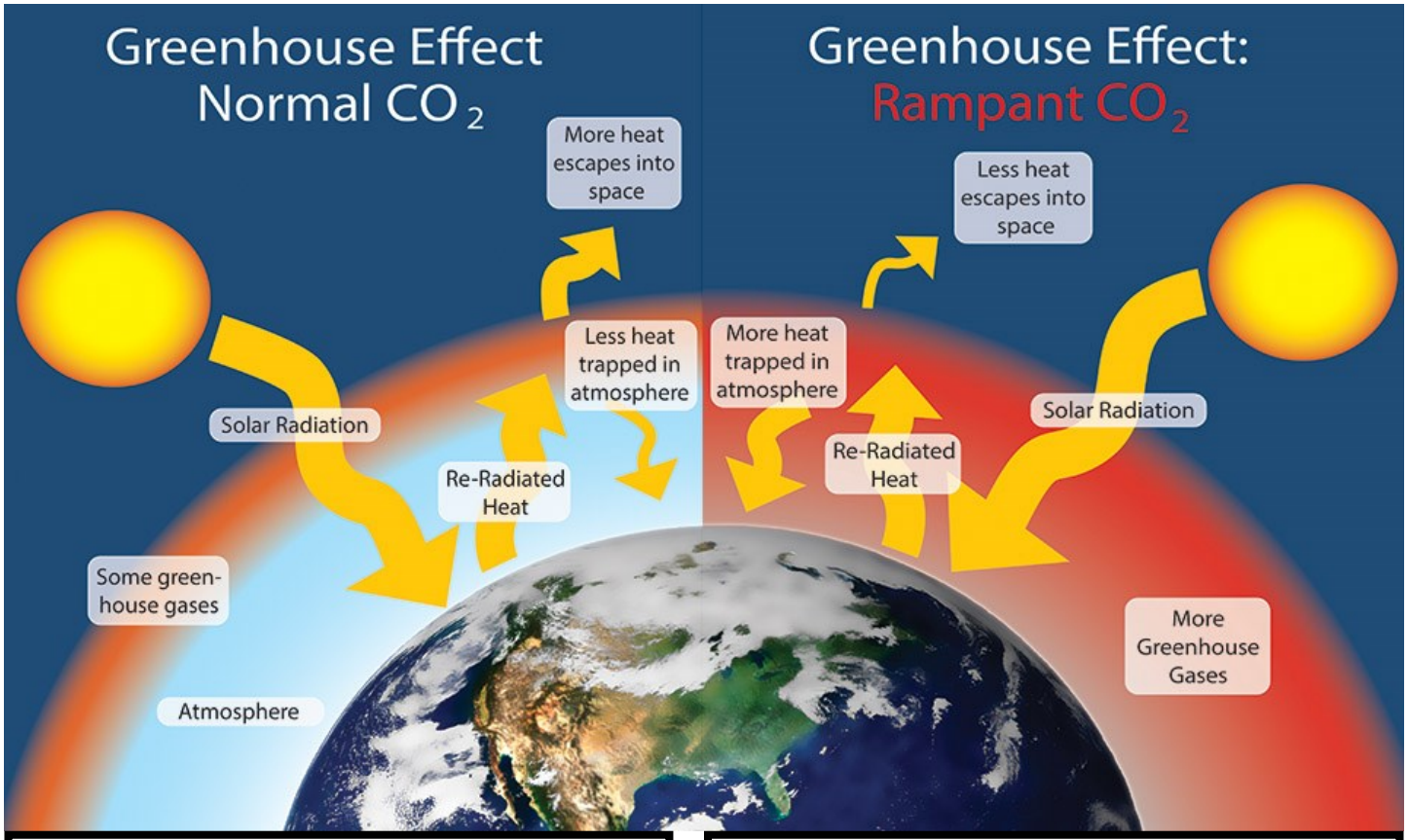
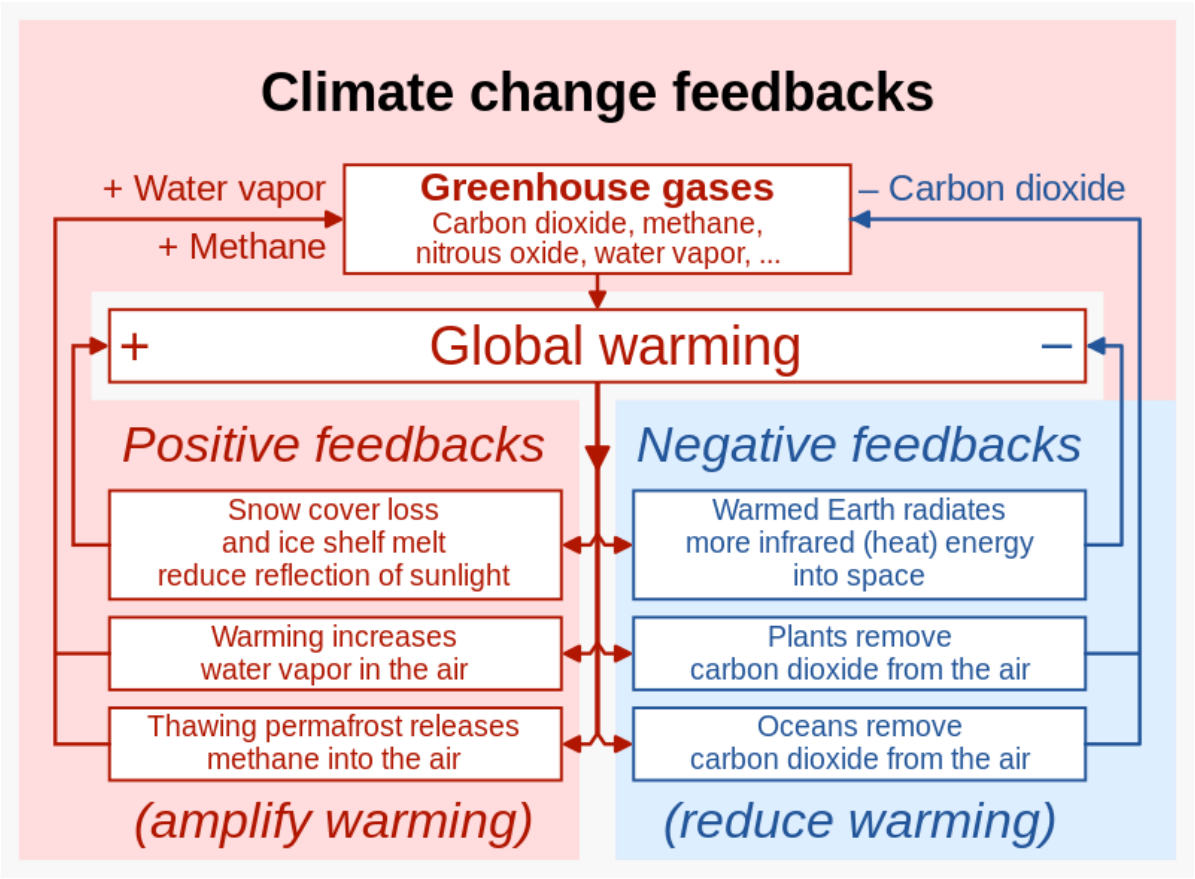
GREENHOUSE EFFECT : BACKGROUND TO GLOBAL WARMING / CLIMATE CHANGE



NORMAL : The atmosphere is mostly transparent to incoming short wave solar radiation from the sun which is absorbed by the earth.
The earth emits long wave radiation (it is a cooler body than the sun) and the atmosphere is less transparent to this due to greenhouse gases such as carbon dioxide, methane and water vapour. This helps maintain a steady earth/ atmosphere temperature which stays in balance and is suitable for life. **GOOD**

ENHANCED : Burning of fossil fuels, industrial processes and agricultural practices release carbon dioxide and methane into the atmosphere. This alters the composition of the atmosphere and makes it less transparent to the terrestrial outgoing long wave radiation.
This traps more heat in the earth/atmosphere system, leading to climate change and global warming which may release even more greenhouse gases. **BAD**



Arctic methane releases

Warming is also the triggering variable for the release of carbon (potentially as methane) in the arctic. Methane released from thawing permafrost such as the frozen peat bogs in Siberia, and from methane clathrate on the sea floor, creates a positive feedback.

Thawing permafrost

Western Siberia is the world's largest peat bog, a one million square kilometer region of permafrost peat bog that was formed 11,000 years ago at the end of the last ice age. The thawing of its permafrost is likely to lead to the release, over decades, of large quantities of methane. As much as 70,000 million tonnes of methane, an extremely effective greenhouse gas, might be released over the next few decades, creating an additional source of greenhouse gas emissions.

Hydrates

Methane clathrate, also called methane hydrate, is a form of water ice that contains a large amount of methane within its crystal structure. Extremely large deposits of methane clathrate have been found under sediments on the sea and ocean floors of Earth. The sudden release of large amounts of natural gas from methane clathrate deposits, in a climate tipping event, has been hypothesised as a cause of past and possibly future climate changes. The release of this trapped methane is a potential major outcome of a rise in temperature; it is thought that this might increase the global temperature by an additional 5° in itself, as methane is much more powerful as a greenhouse gas than carbon dioxide. The theory also predicts this will greatly affect available oxygen content of the atmosphere.

Decomposition

Organic matter stored in permafrost generates heat as it decomposes in response to the permafrost thawing. The amount of carbon stored in the permafrost region is estimated to be around two times the amount of carbon that is in the Earth's atmosphere. As the tropics get wetter, as many climate models predict, soils are likely to experience greater rates of respiration and decomposition, limiting the carbon storage abilities of tropical soils.

Peat decomposition

Peat, occurring naturally in peat bogs, is a store of carbon significant on a global scale. When peat dries it decomposes, and may additionally burn.[58] Water table adjustment due to global warming may cause significant excursions of carbon from peat bogs. This may be released as methane, which can exacerbate the feedback effect, due to its high global warming potential.

Rainforest drying

Rainforests, most notably tropical rainforests, are particularly vulnerable to global warming. There are a number of effects which may occur, but two are particularly concerning. Firstly, the drier vegetation may cause total collapse of the rainforest ecosystem. For example, the Amazon rainforest would tend to be replaced by caatinga ecosystems. Further, even tropical rainforests ecosystems which do not collapse entirely may lose significant proportions of their stored carbon as a result of drying, due to changes in vegetation.

Forest fires

Many mid-latitude regions, such as Mediterranean Europe, will experience decreased rainfall and an increased risk of drought, which in turn would allow forest fires to occur on larger scale, and more regularly. This releases more stored carbon into the atmosphere than the carbon cycle can naturally re-absorb, as well as reducing the overall forest area on the planet, creating a positive feedback loop.

Desertification

Desertification is a consequence of global warming in some environments.[67] Desert soils contain little humus, and support little vegetation. As a result, transition to desert ecosystems is typically associated with excursions of carbon.