

WHY IS GLOBAL WARMING ABOVE 1.5°C A PROBLEM? [2/3]

TIPPING POINTS – CRYOSPHERE

What are tipping points? The Paris Agreement's goal is "to keep the rise in mean global temperature well below 2°C and preferably limit the increase to 1.5°C". Exceeding "tipping points" is one of the main reasons why this commitment was made. Just like a tree branch can only withstand a certain amount of pressure before it breaks, some planetary systems exposed to climate change impacts may reach their tipping point and change into something different as a result.

Tipping points in cryosphere. Cryosphere is a term for all areas on Earth where water is in solid form. Some mountain glaciers, e.g. in the Alps, have already passed their tipping point and even if the climate doesn't get any warmer from now, they will disappear. Other major cryospheric systems may exceed their tipping point if the warming gets just a little over 1.5°C. And while it may take decades, even hundreds of years before the cryosphere melts completely, it has worldwide consequences: sea level rise, different albedo values or methane released to the atmosphere. All of these changes will further exacerbate the warming.

01 SEASONAL ARCTIC OCEAN ICE COVER

The Arctic Ocean ice cover is quickly declining – the amount of summer sea ice has dropped in recent years to roughly a third of what it used to be in the 1980s. Melting sea ice **uncovers water surface**, which absorbs more solar irradiation than ice, and thus **exacerbates the warming**.

If the temperature rises by 2°C or more, the North Pole will be ice-free in summer. If the warming doesn't exceed 1.5°C, it is likely that some ice will remain even during the warm season.

02 GREENLAND ICE SHEET

Greenland ice sheet covers 1.7 million km², roughly 80% of Greenland. Its thickness is generally 2000 m and its complete melt would take several hundreds of years, causing a global sea level rise of 7 m.

If the temperature rises by 1.5 to 2°C, **irreversible melting** of the Greenland ice sheet will probably start, which could result in **a global sea level rise up to 2 m** within the next two hundred years.

05 WEST ANTARCTIC ICE SHEET

This ice sheet contains 2.2 million km³ of ice. It is not fixed by land very well and it may **"slide" to sea** (marine ice sheet instability). If the West Antarctic ice sheet collapsed, the global sea levels would quickly rise by up to 5 m.

If the temperature increases by 1.5 to 2°C, **irreversible melting** of the West Antarctic ice sheet will probably start.

03 PERMAFROST

The ground in vast areas of Siberia and North America stays below 0°C for a long time. If it melts, a huge amount of methane (greenhouse gas) will be released to the atmosphere, **speeding up global warming**.

If the global temperature rises by 2°C, 28–53% of the global permafrost will melt. Further warming (between 2 and 3°C) may cause the permafrost to collapse. The estimated annual methane emissions from the melted permafrost are 4–16 Gt CO₂eq (depending on the speed of melting), which is 10–30 % of the annual global emissions caused by human activities.

04 MOUNTAIN GLACIERS

A number of major rivers get their water from glaciers, which are quickly melting in most mountain areas today.

If temperatures keep rising and glaciers grow smaller, large areas of America and Asia **will not have enough water for irrigation**.

The temperatures in this infographic refer to global warming above pre-industrial levels. The current warming is approx. 1.2°C.

