CCI Assignment 2

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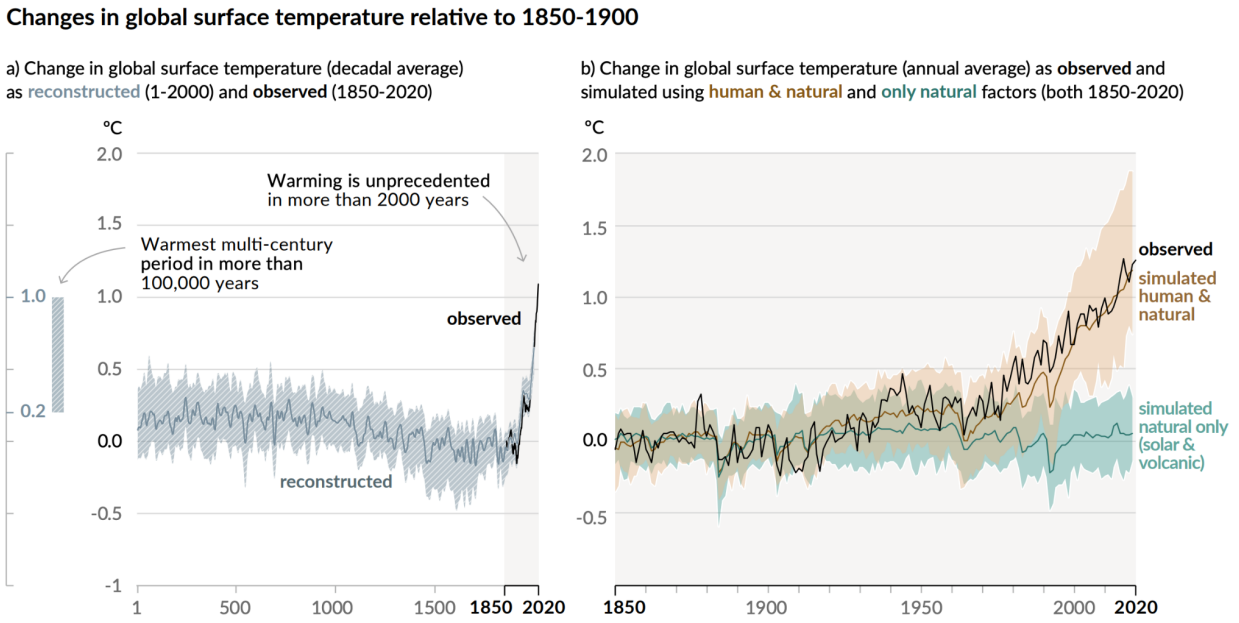
Possible Impact of Climate Change on Surface Temperature

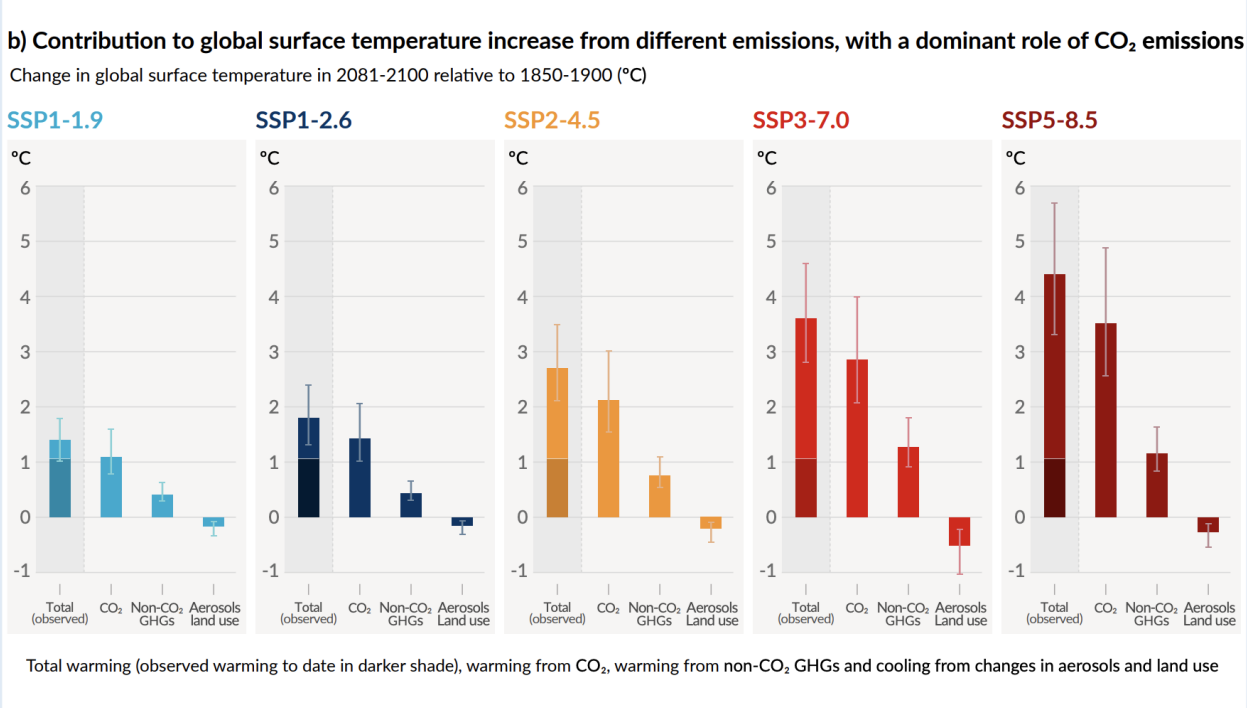
With the increase of global warming over the years, the IPCC AR6 report had clearly indicated serious concerns over the rise of global surface temperature.

First, lets see how surface temperature has changed historically -

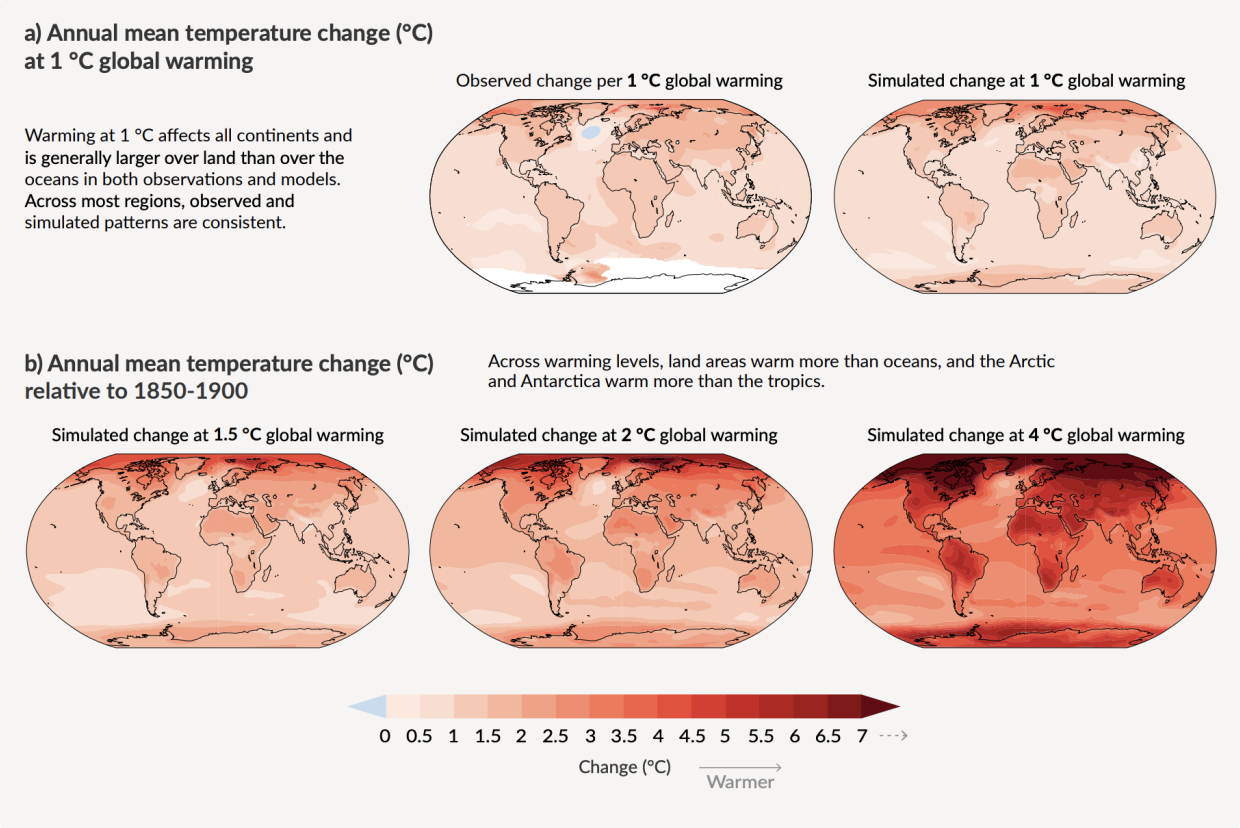


Observe - The rise in global surface temperature is much higher than anticipated by the end of 2020. This is due to excessive emission of greenhouse gases from human activities and less aerosols involvement to control the rise of surface temperature.

Now, let's look into how climate change will affect surface temperature in coming years as per IPCC AR6 report. Many methodological advances and new datasets contributed to produce statistically significant results in the AR6 report.



Also look into the entire Earth's temperature heatmap over the years -



<u>Conclusion -</u>

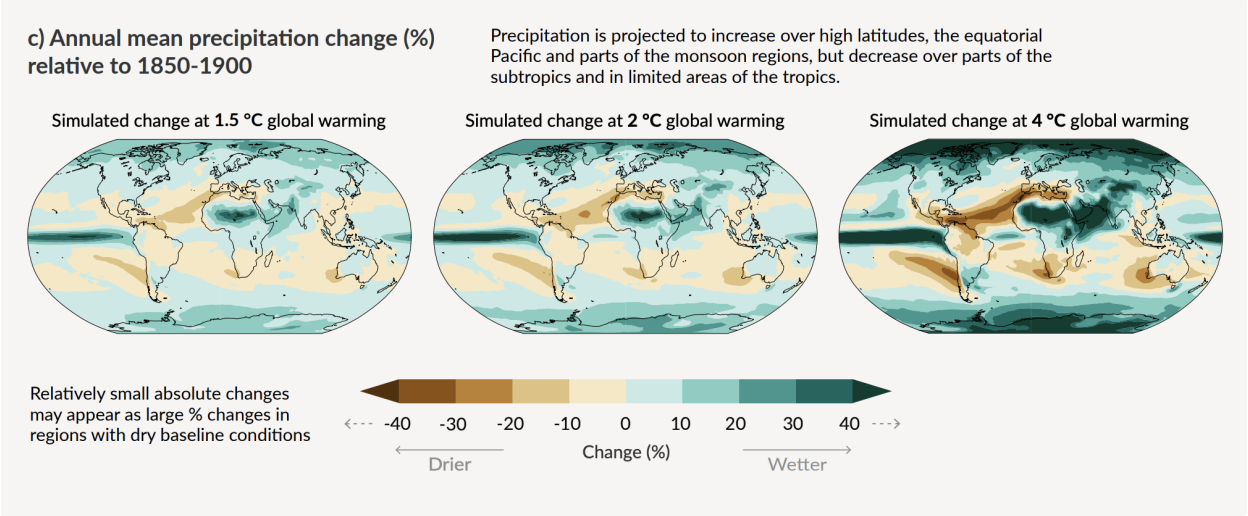
Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO2 and other greenhouse gas emissions occur in the coming decades.

Possible Impact of Climate Change on Precipitation

How can climate change affect precipitation?

Climate change can affect the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air. When more moisture-laden air moves over land or converges into a storm system, it can produce more intense precipitation—for example, heavier rain and snow storms.

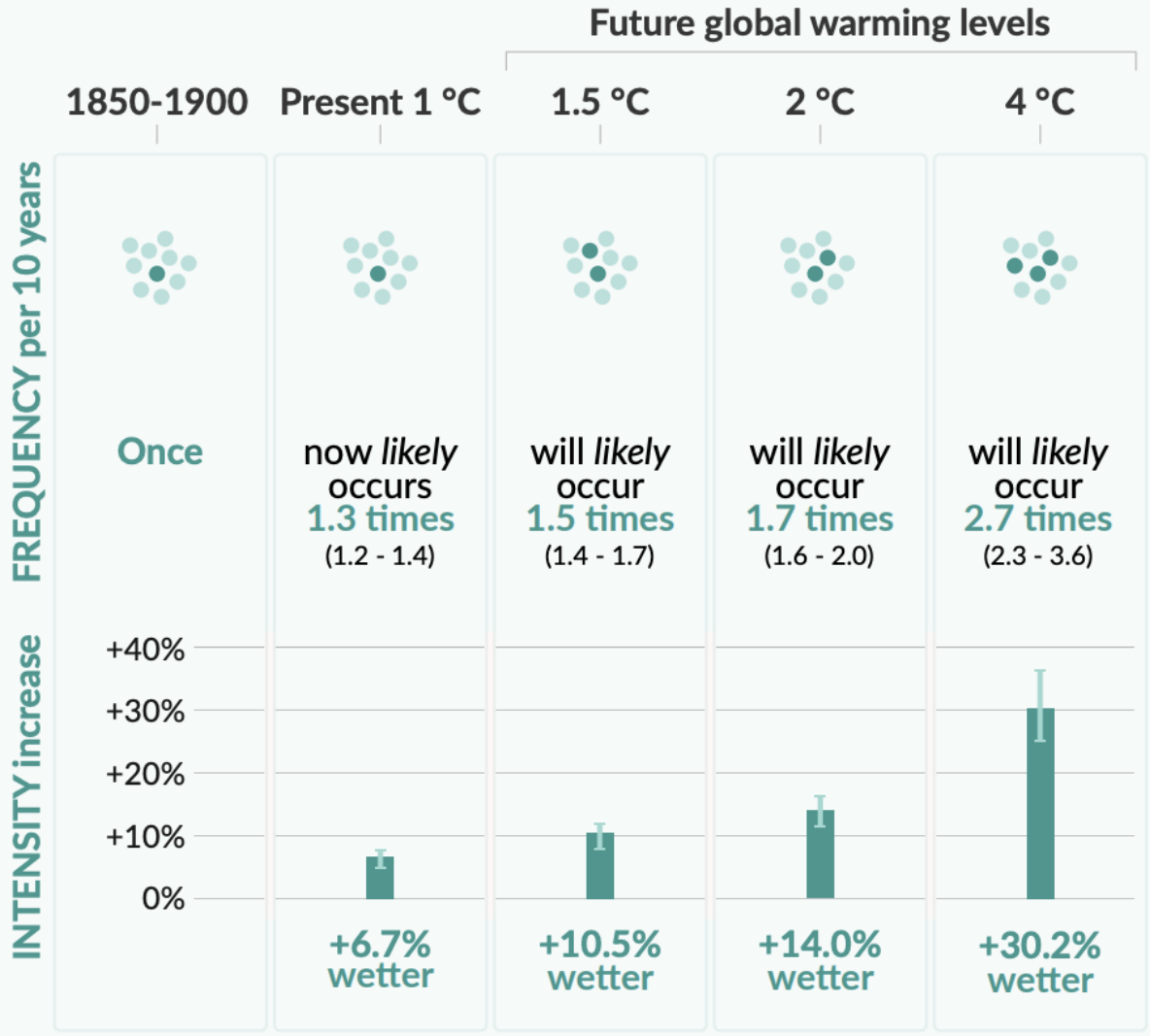
IPCC AR6 predicts precipitation changes with respect to increase in global warming. This prediction is displayed as a heatmap below -



Heavy precipitation over land

10-year event

Frequency and increase in intensity of heavy 1-day precipitation event that occurred **once in 10 years** on average **in a climate without human influence**



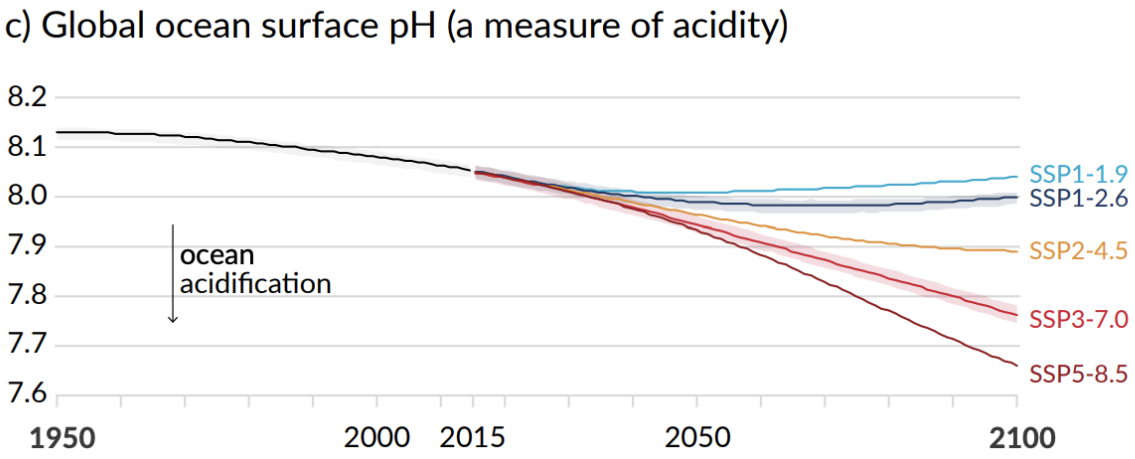
Conclusion -

It is very likely that heavy precipitation events will intensify and become more frequent in most regions with additional global warming. At the global scale, extreme daily precipitation events are projected to intensify by about 7% for each 1°C of global warming (high confidence). The proportion of intense tropical cyclones and peak wind speeds of the most intense tropical cyclones are projected to increase at the global scale with increasing global warming (high confidence).

Possible Impact of Climate Change on Ocean pH

As per the IPCC AR6 report, the amount of CO2 released in the atmosphere will increase at a larger rate in coming years.

Let's look at a graph showing the predicted ocean pH levels -



The possible impact of climate change on Ocean pH can be summarized in following points -

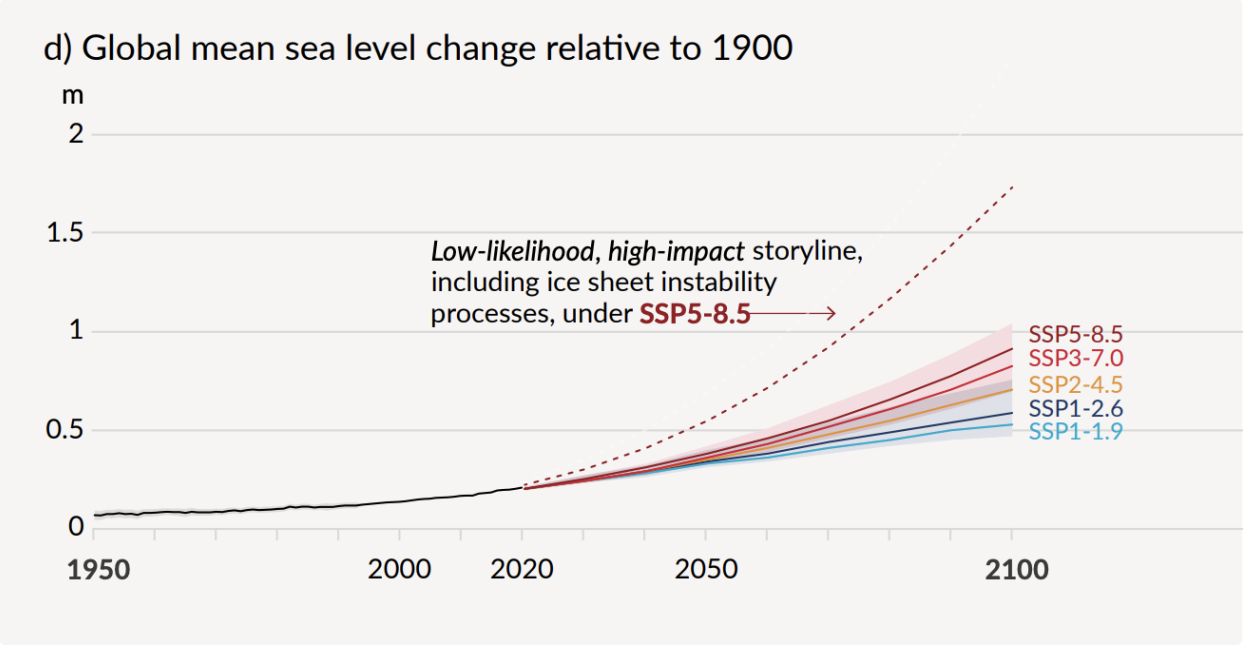
- As more carbon dioxide (CO2) dissolves in seawater, it forms carbonic acid, decreasing the ocean's pH, a process collectively known as ocean acidification.
- Present ocean acidification occurs approximately ten times faster than anything experienced during the last 300 million years, jeopardising the ability of ocean systems to adapt to changes in ocean chemistry due to CO2.

- Ocean acidification has the potential to change marine ecosystems and impact many ocean-related benefits to society such as coastal protection or provision of food and income.
- Increased ocean temperatures and oxygen loss act concurrently with ocean acidification and constitute the ‘deadly trio’ of climate change pressures on the marine environment.
- To combat the worst effects of the deadly trio, CO2 emissions need to be cut significantly and immediately at the source.

Possible Impact of Climate Change on Sea Level

By combining multi-model projections with observational constraints based on past simulated warming, IPCC AR6 report has assessed future changes in sea level

Let's look at a graph showing the predicted sea levels -



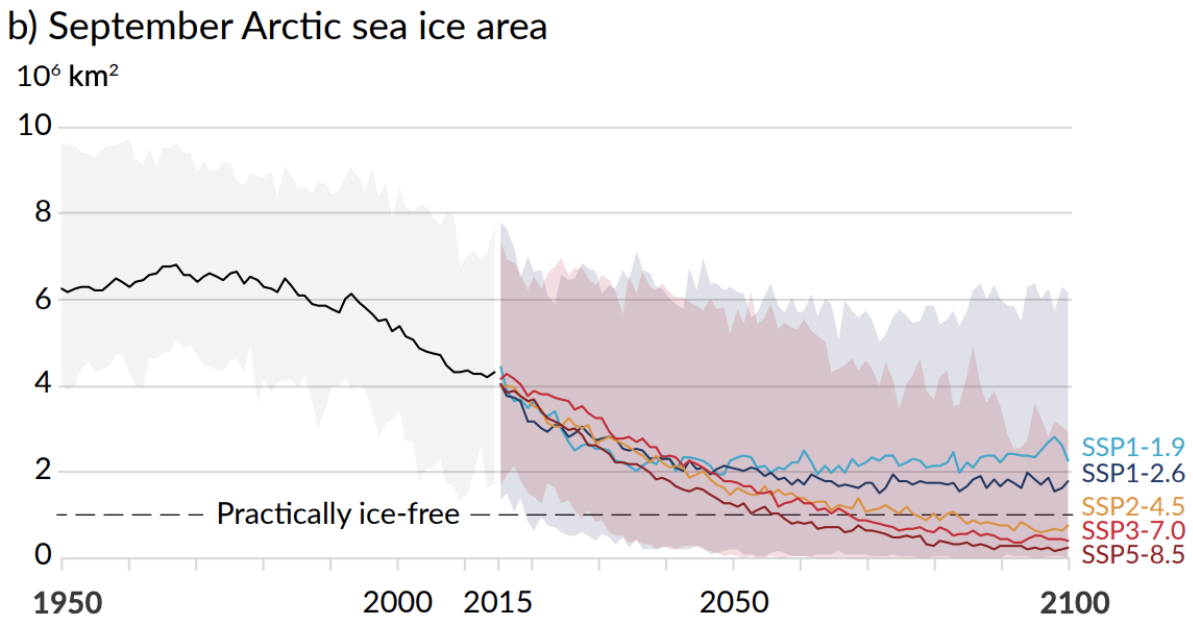
Conclusion -

1. Short term consequences - It is virtually certain that global mean sea level will continue to rise over the 21st century. Relative to 1995-2014, the likely global mean sea level rise by 2100 is 0.28-0.55 m. Global mean sea level rise above the likely range – approaching 2 m by 2100 and 5 m by 2150 under a very high GHG emissions scenario (SSP5-8.5) (low confidence) – cannot be ruled out due to deep uncertainty in ice sheet processes.

2. Long term consequences - In the longer term, sea level is committed to rise for centuries to millennia due to continuing deep ocean warming and ice sheet melt, and will remain elevated for thousands of years (high confidence). Over the next 2000 years, global mean sea level will rise by about 2 to 3 m if warming is limited to 1.5°C, 2 to 6 m if limited to 2°C and 19 to 22 m with 5°C of warming, and it will continue to rise over subsequent millennia (low confidence).

Possible Impact of Climate Change on Arctic sea-ice extent

Climate change is very likely the main driver of the global retreat of glaciers since the 1990s and the decrease in Arctic sea ice area between 1979–1988 and 2010–2019 (about 40% in September and about 10% in March).



Conclusion -

1. In 2011–2020, annual average Arctic sea ice area reached its lowest level since at least 1850 (high confidence)
2. September Arctic sea ice area is 106 km2 based on CMIP6 model simulations. Very likely ranges are shown for SSP1-2.6 and SSP3-7.0. The Arctic is projected to be practically ice-free near mid-century under mid and high GHG emissions scenarios.

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