








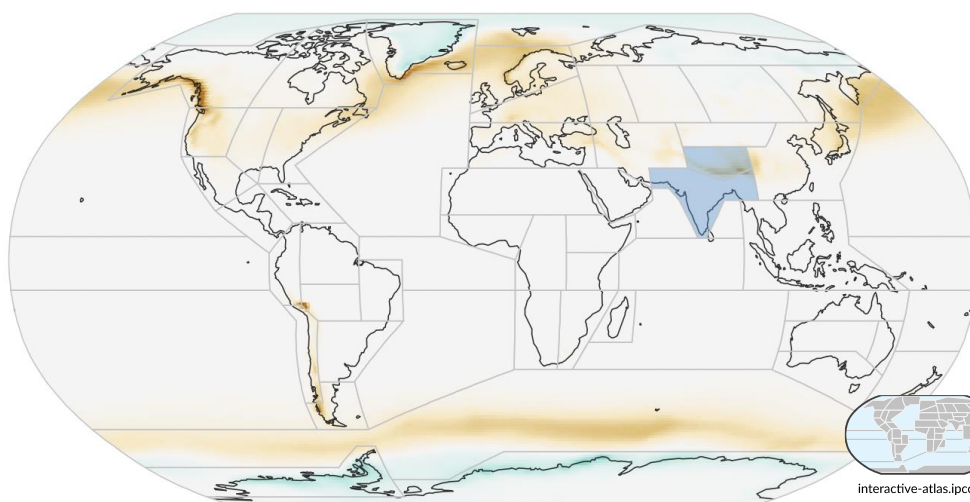
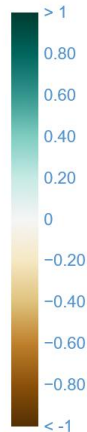


Regional fact sheet - Mountains

Common regional changes

-  The freezing level height in mountain areas is **projected** to rise and **will alter** snow and ice conditions (*high confidence*).
-  Warming **has occurred** in the Himalayas, the Swiss Alps, and the central Andes and has increased with altitude. Such elevation-dependent warming **could lead** to faster changes in the snowline, the glacier equilibrium-line altitude and the snow/rain transition height (*high confidence*).
-  With few exceptions, mountain glaciers **have retreated** since the second half of the 19th century (*very high confidence*). This retreat **has occurred** at increased rates since the 1990s, with **human influence** *very likely* being the main driver. This behaviour is **unprecedented** in at least the last 2000 years (*medium confidence*). Furthermore, glaciers **will continue** to lose mass at least for several decades even if global temperature is stabilized (*very high confidence*).
-  The global warming-induced earlier onset of spring snowmelt and increased melting of glaciers **have already contributed** to seasonal changes in streamflow in low-elevation mountain catchments (*high confidence*).
-  Mountain glaciers **will continue** to shrink and permafrost to thaw in all regions where they are present (*high confidence*). Mountain glaciers **are projected** to lose more mass in higher greenhouse gas emissions scenario over the 21st century (*medium confidence*).
-  It is *virtually certain* that snow cover **will decline** over most land regions during the 21st century, in terms of water equivalent, extent and annual duration.
-  Extreme precipitation **is projected** to increase in major mountainous regions (*medium to high confidence*, depending on location), with potential cascading consequences of floods, landslides and lake outbursts in all scenarios (*medium confidence*).
-  **Projected** runoff is typically decreased by contributions from small glaciers because of glacier mass loss, while runoff from larger glaciers **will generally increase** with increasing global warming levels until their mass becomes depleted (*high confidence*).
-  All the above-mentioned changes will pose challenges for water supply, energy production, ecosystems integrity, agricultural and forestry production, disaster preparedness, and ecotourism (*high confidence*) that are assessed in the IPCC Working Group II report.

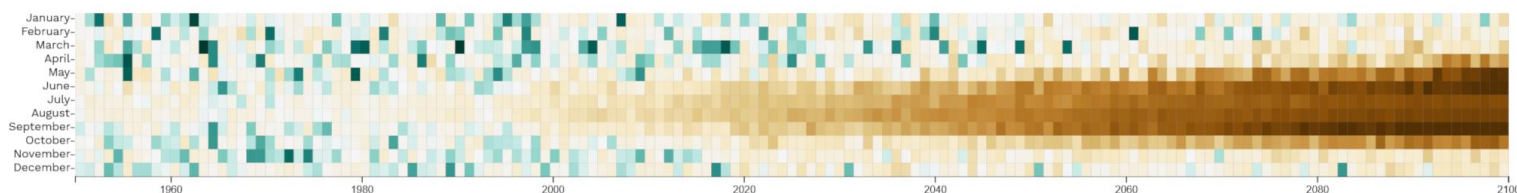
mm/day



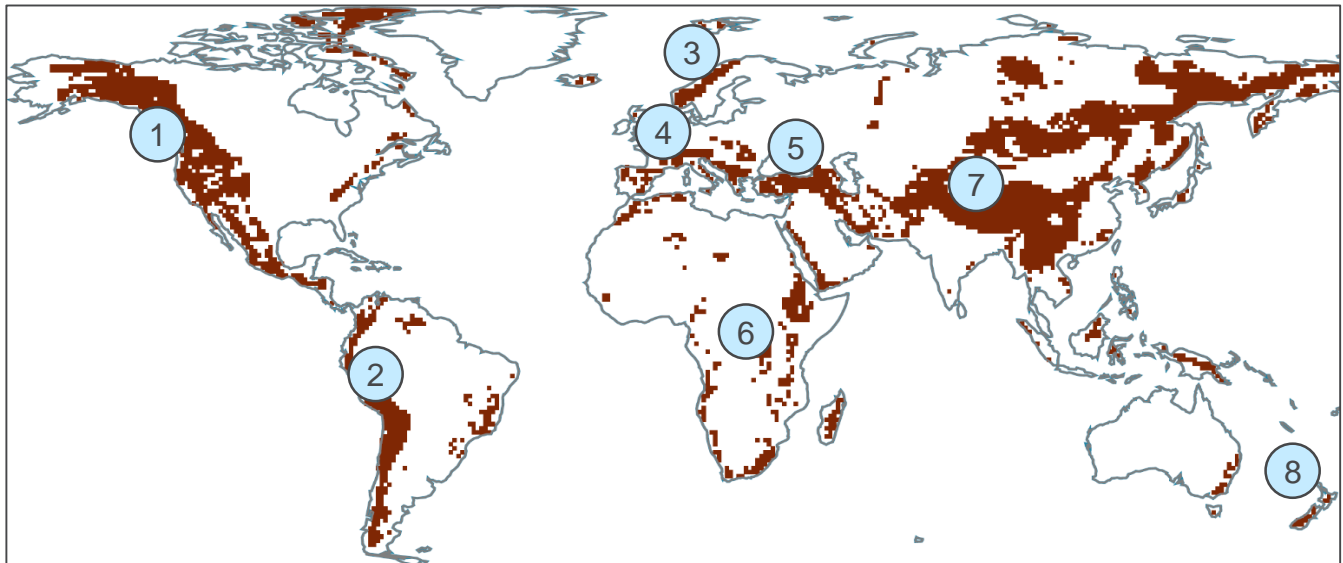
Projected annual snowfall change (mm/day) for 2°C global warming compared to 1850–1900 using the SSP5-8.5 scenario.

Results expanded in the Interactive Atlas (active links)

interactive-atlas.ipcc.ch



Projected changes in seasonal mountain snowfall (mm/day) in High Mountain Asia for GWL 2°C using the very high emissions scenario (SSP5-8.5), relative to 1850–1900.



Typological mountain regions used in the Report's Interactive Atlas. Labels correspond to the regions described below.

Rocky Mountains & Alaska ①

- Reduction in glaciers, seasonality of snow and ice formation, loss of shallow permafrost, and shifts in the rain/snow transition line **are projected** to alter the seasonal and geographic range of snow and ice conditions in the coming decades (*very high confidence*).
- Continued shrinkage of glaciers **is projected** to create further glacial lakes (*medium confidence*).

Andes ②

- Glacier volume loss and permafrost thawing **will likely continue**, causing important reductions in river flow and potentially high-magnitude glacial lake outburst floods.

Scandinavian Mountains ③

- Most periglacial debris-flow processes **are projected** to disappear by the end of 21st century, even for low-warming scenarios (*medium confidence*).

European Alps ④

- Elevation-enhanced long-term trends in maximum near-surface air temperature and diurnal temperature range were **observed** in the Swiss Alps.
- Snow cover **will decrease** below elevations of 1500–2000 m throughout the 21st century (*high confidence*). A reduction of glacier ice volume is **projected** with *high confidence*.

Caucasus & Pontic Mountains ⑤

- Mountain permafrost degradation at high altitudes **has increased** the instability of mountain slopes in the past decade (*medium confidence*).

East African Mountains ⑥

- African snow and glaciers **have very significantly decreased** in the last decades and this trend **will continue** over the 21st century (*high confidence*).

High Mountain Asia ⑦

- Snow cover **has reduced** since the early 21st century, and glaciers **have thinned, retreated, and lost** mass since the 1970s (*high confidence*), although the Karakoram glaciers have either slightly gained mass or are in an approximately balanced state (*medium confidence*).
- Snow-covered areas and snow volumes **will decrease** during the 21st century, snowline elevations **will rise** (*high confidence*) and glacier mass **is likely to decline** with greater mass loss in higher greenhouse gas emissions scenarios.
- Rising temperature and precipitation **can increase** the occurrence of glacial lake outburst floods and landslides over moraine-dammed lakes (*high confidence*).

Southern Alps ⑧

- Glacier ice volume in New Zealand **has decreased** in the last decades.

Links for further details:

Common changes: 12.4.10.4, TS.2.5, TS.4.3.1, TS.4.3.2.10, Box TS.6.

Rocky Mountains & Alaska: 12.4.6.4. **Andes:** 12.4.4.4. **Scandinavian Mountains and European Alps:** 12.4.5.4 and 12.4.10.4. **Caucasus & Pontic Mountains:** TS.4.3.2.2. **East African Mountains:** 12.4.1.4.

High Mountain Asia: 12.4.2.4. **Southern Alps:** 12.4.3.4.