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Science for Environment Policy

World's glaciers melting fast: 9.6 trillion tonnes of ice lost in last 50 years

The most comprehensive glacier assessment yet reveals that glacier melt was responsible for 27 mm of sea level rise between 1961 and 2016. Ice loss from glaciers is now the second biggest contributor to rising sea levels after warming water. If glaciers continue to melt at current rates, most — including many in central Asia, central Europe, western Canada and the USA — will vanish during the second half of this century.

Excluding the Greenland and Antarctic Ice Sheets, glaciers cover approximately 706 600 km2 worldwide, with an estimated total volume of 170 000 km³. Melting glaciers have the potential to add significantly to sea level rise, but past best estimates of their contributions have been based on data from just a few hundred glaciers. This new study provides up-to-date estimates of changes in global glacier mass from 1961 to 2016, based on data from over 19 000 glaciers — these represent 19 regions of the world and around 10% of the glaciers in existence. The data comprised both in situ observations of changing glacier mass and information from various satellite missions, including those launched by the US, Japan and Germany. The scientists also benefited from advances in glacier measurement techniques and extrapolated their results to provide global estimates.

The study reveals that glaciers lost around 9 625 gigatonnes (GT) of ice to the sea over the 55-year period, raising global sea levels by around 27 mm. Present glacier mass loss is equivalent to the contributions to sea level rise of the Greenland Ice Sheet between 2003 and 2012, and exceeds the current contributions of the Antarctic Ice Sheet.

Since 1993, glacier loss has been responsible for 25–30% of all rise in sea levels. This means that glaciers are now the second biggest contributor to sea level rise after warming seawater (which causes water to expand). The rate of this loss has accelerated since the 1980s in line with the increasing effects of climate change: glacier loss contributed around 1 mm of sea level rise per year from 2011 to 2016, compared to 0.2–0.3 mm per year before the 1980s. This loss is 18% greater than previous best assessments (such as a 2013 report published by the IPCC AR5 for the period 2003–2009).

On a regional level, the greatest contribution (one-third) to sea-level rise between 1961 and 2016 came from Alaska, followed by glaciers around the edge of the Greenland ice sheet and from those in the southern Andes, South America. South-west Asia was the only area to gain ice; here, glaciers amassed 119 gigatonnes of ice. However, neighbouring south-east Asia lost around the same amount — 112 gigatonnes.

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Science for Environment Policy

World's glaciers melting fast: 9.6 trillion tonnes of ice lost in last 50 years *(continued)*

The researchers calculate that under present ice-loss rates, most of today's glaciers will vanish during the second half of this century in regions including the Caucasus mountainous region in central Asia, central Europe, western Canada and the USA. Other heavily glacierised regions will continue to add to sea level rise beyond this century.

There is still plenty of scope to improve estimates of glacier-mass change, say the researchers, and it is necessary to do so. Such information is important to making informed future adaptation decisions. Estimates could be improved, in part, by plugging data gaps for many regions of the world, including the tropical Andes and central Asia.