

Our Vanishing World: Melting Glaciers

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In-depth Report: [Climate Change](#)

Something is causing the world's glaciers and mountain ice fields to melt. And, despite your first thought, it is not the ongoing climate catastrophe.

It does not matter where on Earth the glaciers and mountain ice fields are located, they are all melting. Moreover, the projected timeframe for some of them to disappear altogether is 'imminently'; that is, within years. And for the rest: a few decades (although that projection is being routinely revised downwards, depending on the glacier).

Why? Because the most recent research suggests that beneath the ocean surface glaciers may be melting ten to 100 times faster than previously believed. This is because, until now, scientists had a limited understanding of what happens underwater at the point where glaciers meet the sea. By using a combination of radar, sonar and time-lapse photography, a team of researchers has now provided the first detailed measurements of the underwater changes over time. Their findings suggest that the theories currently used to gauge glacier change are underestimating glacier ice loss. 'The overall trend of glacier retreat around the world is due to both warming air and warming oceans', observed [Professor David Sutherland](#), an oceanographer at the University of Oregon and lead author of the new study. Glaciers are getting 'eaten away on both ends'.

According to [Professor Rebecca Jackson](#), an oceanographer at Rutgers University and co-author of the study:

'The theory we've been relying on for these melt rates is wrong. We should be able to predict melt rates based on ocean conditions... [but] they're not at all related in the way we expected.'

Beyond air and water temperatures, 'ocean salinity, currents and the glacier's shape can all play a role in influencing tidewater glacier melt'. See '[Direct observations of submarine melt and subsurface geometry at a tidewater glacier](#)' and '[Oceans Are Melting Glaciers from Below Much Faster than Predicted, Study Finds](#)'. These findings of rapid glacier melt confirm earlier research, touched on below, although the variables melting high mountain glaciers are different to those melting ones that terminate at sea level.

So how many glaciers are there and what is their status?

According to the Randolph Glacier Inventory (RGI), the most reliable estimate of the number of glaciers in the world is 198,000. These glaciers cover 726,000 square kilometres, that is, 0.5% of the Earth's land surface. See the [Randolph Glacier Inventory](#) and '[Mapping the World's Glaciers](#)'.

The [Global Land Ice Measurements from Space](#) (GLIMS) project is designed to monitor the

world's glaciers primarily using data from optical satellite instruments. Glacier inventories are a specific technique for mapping glacier attributes, such as area, length, slope, aspect, terminal environment (calving into the sea or a lake, or terminating on dry land), elevation, and glacier classification. See ['Mapping the World's Glaciers'](#). There are many types of glacier. For an extensive (and stunning) selection of photos of glaciers, illustrating many aspects of these majestic ice formations, see the ['Glaciers online Photoglossary'](#).

So, from north to south, what is the status of the world's glaciers?

Glaciers in the North

As you would expect, the vast ice masses in the Arctic – which consists of the Arctic Ocean, adjacent seas, and parts of Alaska (United States), Finland, Greenland (Denmark), Iceland, Northern Canada, Norway, Russia and Sweden – include many glaciers.

While there are no glaciers in the Arctic Ocean itself (because it has no landmass), the glaciers in places like Greenland, North America, Russia and western Europe are melting rapidly.

A recent study, for example, confirmed the rapid melting of Greenland's glaciers: 'The recent deglaciation of Greenland is a response to both oceanic and atmospheric forcings. From 2000 to 2010, ice loss was concentrated in the southeast and northwest margins of the ice sheet, in large part due to the increasing discharge of marine-terminating outlet glaciers, emphasizing the importance of oceanic forcing.' See ['Accelerating changes in ice mass within Greenland, and the ice sheet's sensitivity to atmospheric forcing'](#) and ['The Greenland Ice Sheet Is Melting at Astonishing Rate'](#).

But Greenland is not the only place in the far north where glaciers are melting rapidly. For a snapshot of glacier melt in other regions, see ['Melting glaciers threaten to inundate Russia's Far North and Siberia'](#), ['Glaciers in the Canadian High Arctic are melting at an unprecedented rate'](#), ['Graphic: Dramatic glacier melt \[in Alaska\]'](#), ['Sweden's Highest Peak, a Melting Glacier, Is No Longer the Nation's Tallest'](#) and ['The Devdoraki Glacier in the Georgian Caucasus Keeps Collapsing'](#).

Glaciers in the Himalaya

Substantial glacial melt in the Himalaya has been evident for a long time. By 2011, glacier melt in the Nepalese Himalaya, for example, had already created a 'spattering' of 1,600 high altitude glacier lakes that threatened communities living 'downstream'. For example, if the Imja glacier lake 'breaks through its walls of glacial debris, known as moraine, it could release a deluge of water, mud and rock up to 60 miles away. This would swamp homes and fields with a layer of rubble up to 15m thick, leading to the loss of the land for a generation. But the question is when, rather than if.' See ['Watching a glacier die at Imja Lake'](#) and ['Glacier lakes: Growing danger zones in the Himalayas'](#).

A 2013 study by a University of Milan team led by a Nepali scientist found that 'some glaciers on or around Mount Everest had shrunk by 13% in the last 50 years with the snow line 180 metres higher than it was 50 years ago. The glaciers are disappearing faster every year', the report noted, 'with some smaller glaciers now only half the size they were in the 1960s'. See ['Glacier response to climate trend and climate variability in Mt. Everest region \(Nepal\)'](#) and ['Most glaciers in Mount Everest area will disappear with climate change -](#)

[study](#)'.

And a study done in 2015 concluded that the estimated 5,500 glaciers in the Hindu Kush-Himalayan (HKH) region will likely experience 'continued and possibly accelerated mass loss from glaciers... given the projected increase in temperatures,' according to Joseph Shea, a glacier hydrologist at the [International Centre for Integrated Mountain Development](#) in Nepal, and leader of the study published in [The Cryosphere](#), the journal of the European Geosciences Union (EGU). See ['Most glaciers in Mount Everest area will disappear with climate change – study](#)'.

But the latest word comes from the comprehensive and authoritative 2019 report [The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People](#), requested by the eight nations – Afghanistan, Pakistan, China, India, Nepal, Bhutan, Bangladesh and Myanmar – the mountains span, and involving more than 200 scientists working on the report over five years (with another 125 experts peer reviewing their work). The scientists examined the hyper-complex 3,500 kilometres-long Hindu Kush Himalayan system where glaciers feed the Ganges, the Indus, the Yellow River, the Mekong and the Irrawaddy, among ten major river systems. Directly and indirectly, these glaciers supply 1.65 billion people with clean air, food, energy and work. See ['Himalayan glaciers on the eve of destruction](#)'.

Summarizing the report, Pepe Escobar explains:

'The path towards environmental disaster is eerily straightforward. Melting glaciers flow into rivers and lakes. Bursting lakes inevitably translate into more floods. And that means extra glacier runoff into major rivers, more flooding and inevitable destruction of crops.' See ['Himalayan glaciers on the eve of destruction](#)'.

The conclusion to be drawn from this report is simple: 'Even radical climate change action won't save glaciers, endangering 2 billion people.' See ['A third of Himalayan ice cap doomed, finds report](#)'.

Glaciers at the Equator

At the Equator, glaciers are under siege. Glaciers at the Equator? you might ask.

Yes indeed. Mt. Kilimanjaro, which has three distinct volcanic cones – Kibo at 5,895 metres (19,340 ft), Mawenzi at 5,149 metres (16,893 ft) and Shira at 4,005 metres (13,140 ft) of which the latter two are extinct with Kibo dormant – is the highest mountain in Africa and the highest free-standing mountain in the world. It rises out of the Great Plains of East Africa almost on the Equator. At over 19,000 feet, this mountain was once covered in glaciers, proving an awe-inspiring sight to those who saw it.

However, glacial melt on Kilimanjaro is accelerating and a 2013 report noted that Kilimanjaro's shrinking northern glaciers, thought to be 10,000 years old, could disappear by 2030. The entire northern ice field, which holds most of Kilimanjaro's remaining glacial ice, lost more than 4 million cubic meters of ice between 2000 and 2013, representing a volume loss of approximately 29 percent during that period with a loss in total surface area of 32 percent. In 2012, the ice field split in two, revealing ancient lava that may not have seen the

sun for millennia. See [‘Kilimanjaro’s Shrinking Glaciers Could Vanish by 2030’](#). The southside glaciers should last a little longer.

The latest report, based largely on an analysis of NASA Earth Observatory satellite data in 2019, conducted by scientists at the University of Massachusetts, simply confirms earlier documented irregular trends: ‘The long rains (Masika) of 2019 are concluding with virtually no snow accumulation on Kilimanjaro glaciers.’

More ominously, ‘Absent a major event bringing sufficient snow (e.g. 30-50 cm) to reduce solar radiation penetration, the forthcoming extended dry season will probably begin with a snow-free crater. As a result, *ablation of both horizontal and vertical glacier surfaces is likely to be dramatic in the months ahead.*’ See [‘Kilimanjaro Climate & Glaciers’](#).

If you would like to see some spectacular photos of remaining glaciers and remnant glaciers on Mt Kilimanjaro as they were in 2016, you can see them in Ian van Coller’s limited edition art book [‘Kilimanjaro: The Last Glacier’](#) or see them in a [‘flip through’ video](#).

Glaciers in Southern Latitudes

Like glaciers elsewhere, those in southern latitudes are melting rapidly. Recent research confirms the rapid demise of glaciers in the icefields of Patagonia, located in the high Andes atop Chile and Argentina, where glacial retreat is occurring ‘at a non-glacial pace’. The North Patagonian Icefield feeds ice to 30 significant outlet glaciers, of which the San Rafael Glacier is ‘the fastest-moving glacier in Patagonia’ and ‘one of the most actively calving glaciers in the world’.

The South Patagonian Icefield, more than triple the size of its northern counterpart, includes the Jorge Montt Glacier which terminates in an ‘iceberg-choked fjord’ as a result of the glacier’s rapid disintegration and retreat. The Upsala Glacier has been retreating ever since documentation began in 1810. For photos and a video, see [‘Melting Beauty: The Icefields of Patagonia’](#).

One extensive study revealed that 90.2% of Patagonian glaciers shrank between 1870 and 2011 with all regions suffering extensive glacier loss. Notably, however, annual rates of shrinkage across the Patagonian Andes ‘increased in each time segment analysed (1870-1986, 1986-2001, 2001-2011), with annual rates of shrinkage twice as rapid from 2001-2011 as from 1870-1986’. See [‘Shrinking Patagonian Glaciers’](#).

Elsewhere in the southern hemisphere, glaciers in New Zealand, including the famous Fox, Franz Josef and Tasman glaciers, are also in retreat. See [‘New Zealand’s glaciers are shrinking’](#).

Glaciers in Antarctica

As with the Antarctic itself, glaciers are melting at an accelerating rate generating a near-endless sequence of dramatic news headlines, as one glacier after another attracts attention due to the extraordinary nature of the changes, with the latest research showing affected areas losing ice five times faster than in the 1990s, with more than 100m of thickness gone in some places. See [“‘Extraordinary thinning’ of ice sheets revealed deep inside Antarctica’](#).

One recent analysis of satellite data has found ‘extreme’ changes are underway at eight of

Antarctica's major glaciers as 'unusually warm ocean water slips in under their ice shelves'. The warmer water is 'eating away at the glaciers' icy grasp on the seafloor. As a result, the grounding line - where the ice last touches bedrock - has been receding by as much as 600 feet per year'. See ['Net retreat of Antarctic glacier grounding lines'](#) and ["'Extreme" Changes Underway in Some of Antarctica's Biggest Glaciers'](#).

For example, Pine Island Glacier is an immense glacier on the West Antarctic Ice Sheet. It is one of the least stable of glaciers - quickly retreating and losing massive amounts of ice - accounting for about 20 percent of the ice sheet's total ice flow to the ocean. Every year Pine Island Glacier loses 45 billion tons (40.8 billion metric tons) of ice. See ['Photo Gallery: Antarctica's Pine Island Glacier Cracks'](#).

Since 2001, Pine Island Glacier has calved six huge icebergs but, ominously, the rate of calving is increasing. Following major calvings in January 2001, November 2007, December 2011 and August 2015, in September 2017 it calved an iceberg 4.5 times the size of Manhattan and, just one year later, was poised for another - and even larger - calving as a 30 kilometre rift appeared in its centre 'where the ice shelf touches warmer ocean waters that are melting it from underneath'. See ['Huge Iceberg Poised to Break Off Antarctica's Pine Island Glacier'](#).

Meanwhile, the Thwaites Glacier, also in West Antarctica, is disintegrating. According to a recent NASA-led study 'A gigantic cavity - two-thirds the area of Manhattan and almost 1,000 feet (300 meters) tall - growing at the bottom of Thwaites Glacier in West Antarctica is one of several disturbing discoveries.' See ['Huge Cavity in Antarctic Glacier Signals Rapid Decay'](#).

While the ongoing destruction of Antarctic glaciers already guarantees sea level rise of considerable magnitude, even if emissions of carbon dioxide, methane and nitrous oxide were halted today, there will be other climate feedback effects. Oceanographers have detected a trend of decreasing salinity in Antarctic waters fed by ice sheet melt: This affects the density of the deep, very cold waters that drive key ocean currents that affect climate at the surface. Moreover, increasing freshwater at the edge of the ice sheet 'could also disrupt the timing of biological cycles... starting with phytoplankton - the critical base of the Antarctic food web'. See ["'Extreme" Changes Underway in Some of Antarctica's Biggest Glaciers'](#).

Can We Save the Glaciers?

A joint research project conducted by scientists at the Universities of Bremen and Innsbruck concluded that 'contemporary glacier mass is in disequilibrium with the current climate, and $36 \pm 8\%$ mass loss is already committed in response to past greenhouse gas emissions. Consequently, mitigating future emissions will have only very limited influence on glacier mass change in the twenty-first century. No significant differences between 1.5 and 2K warming scenarios are detectable in the sea-level contribution of glaciers accumulated within the twenty-first century.'

In other words: 'more than a third of the glacier ice that still exists today in mountain glaciers can no longer be saved, even with the most ambitious measures'. Calculated on the basis of a new, average car, one kilogram of glacier ice is lost every five hundred meters traveled by that single car. See ['Limited influence of climate change mitigation on short-term glacier mass loss'](#) and ['Glacier mass loss passes the point of no return, researchers](#)

[report'](#).

So can we save what will be left of the remaining glaciers? Obviously, not without a monumental effort. But before inviting your involvement in an effort to do this, let me explain a point I made in the opening paragraph: it is not the ongoing climate catastrophe that is destroying Earth's glaciers. It is human behaviour. The climate catastrophe, including the melting of the glaciers, is being generated by our behaviour.

And we have control of that behaviour. Or, more accurately, we can each control our own behaviour. And that means you have some choices to make that will make a huge difference, for good or bad, depending on what you decide.

If you wish to fight powerfully to save the remaining glaciers, consider joining those participating in ['The Flame Tree Project to Save Life on Earth'](#) which outlines a simple program to systematically reduce your consumption and increase your self-reliance over a period of years.

Given the fear-driven violence in our world which also generates the addiction of most people in industrialized countries to the over-consumption that is destroying Earth's biosphere – see ['Love Denied: The Psychology of Materialism, Violence and War'](#) – then consider addressing this directly starting with yourself – see ['Putting Feelings First'](#) – and by reviewing your relationship with children. See ['My Promise to Children'](#) and ['Nisteling: The Art of Deep Listening'](#). For fuller explanations, see ['Why Violence?'](#) and ['Fearless Psychology and Fearful Psychology: Principles and Practice'](#).

If you wish to campaign strategically to defend the glaciers then consider joining those working to halt the climate catastrophe and end military activities of all kinds, including war, as well. See [Nonviolent Campaign Strategy](#) which includes a comprehensive list of the strategic goals necessary to achieve these outcomes in ['Strategic Aims'](#).

In those cases where corrupt or even electorally unresponsive governments are leading the destruction of the biosphere – by supporting, sponsoring and/or engaging in environmentally destructive practices – it might be necessary to remove these governments as part of the effort. See [Nonviolent Defense/Liberation Strategy](#).

You might also consider joining the global network of people resisting violence in all contexts, including against the biosphere, by signing the online pledge of ['The People's Charter to Create a Nonviolent World'](#).

Or, if none of the above options appeal or they seem too complicated, consider committing to:

The Earth Pledge

Out of love for the Earth and all of its creatures, and my respect for their needs, from this day onwards I pledge that:

- 1. I will listen deeply to children (see explanation above)*
- 2. I will not travel by plane*
- 3. I will not travel by car*
- 4. I will not eat meat and fish*
- 5. I will only eat organically/biodynamically grown food*

6. *I will minimize the amount of fresh water I use, including by minimizing my ownership and use of electronic devices*
7. *I will not buy rainforest timber*
8. *I will not buy or use single-use plastic, such as bags, bottles, containers, cups and straws*
9. *I will not use banks, superannuation (pension) funds or insurance companies that provide any service to corporations involved in fossil fuels, nuclear power and/or weapons*
10. *I will not accept employment from, or invest in, any organization that supports or participates in the exploitation of fellow human beings or profits from killing and/or destruction of the biosphere*
11. *I will not get news from the corporate media (mainstream newspapers, television, radio, Google, Facebook, Twitter...)*
12. *I will make the effort to learn a skill, such as food gardening or sewing, that makes me more self-reliant*
13. *I will gently encourage my family and friends to consider signing this pledge.*

Do all these options sound unpalatable? Prefer something requiring less commitment? You can, if you like, do as most sources suggest: nothing (or its many tokenistic equivalents). I admit that the options I offer are for those powerful enough to comprehend and act on the truth. Why? Because there is so little time left and I have no interest in deceiving people or treating them as unintelligent and powerless. See [‘Human Extinction by 2026? A Last Ditch Strategy to Fight for Human Survival’](#).

So, in a nutshell: Are you willing to fight to save the glaciers (and preserve the biosphere)? Then remember this: The only way to fight is for you to reduce your consumption and to help persuade others, one way or another, to do so as well. Nothing else can work.

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