Environment & Nature

'The Glacier of Montanvert, Chamonix', John 'Warwick' Smith, 1802, watercolour touched with body-colour, 53.5cm × 82.3cm. *(British Museum)*

ANNIE DARE

Cold Comfort on Chomolungma

Going, going, gone? Seventy years on from the first ascent of Everest, the Khumbu glacier is disappearing at an accelerating rate. *(Alex Treadway)*

Seventy years after the first ascent of Everest, some of the world's most famous climbers are backing a new campaign to save the ice and snow of Earth's tallest mountain, and the entire Hindu Kush-Himalayan region. Scientists say there's no time to waste.

This spring, Catalan athlete Kilian Jornet was training around Everest, in Nepal. This was his 10th visit to the Khumbu region, but it was the first time he and his partner Swedish athlete Emilie Forsberg were accompanied by their two youngest children. Jornet, the son of a mountain guide who reached the summit of his first 3,000m peak at the tender age of three, was hoping to plant the seed for his daughters to develop a love for the people and nature of the Himalaya to equal his own. He delighted in seeing the girls playing with people and in places he felt so connected to.

All change in the Icefall. Always dangerous, climate change is impacting on this key section on the ascent of Everest.

Kanchha Sherpa, last surviving member of the 1953 expedition that put Hillary and Tenzing on the summit. *(Tenzing Chogyal Sherpa)*

Yet the trip was bittersweet. A climate advocate who consciously limits how often he flies in order to try to drive down his personal carbon footprint, it had been 10 years since Jornet had first seen Everest, or Chomolungma, 'goddess mother of the world' in one translation of the Tibetan. 'The changes that have taken place in the snow and glaciers here, just in the space of that decade, are so immediately obvious, and so dramatic,' Kilian told me. 'It's happening so, so fast.'

The family's visit came just before dignitaries from the climbing world gathered at the base of the mountain, in Namche Bazaar, to mark the 70th anniversary of Sir Edmund Hillary and Tenzing Norgay's first ascent. The glaciologists and researchers I work with at the International Centre for Integrated Mountain Development (ICIMOD), which for 40 years has monitored the cryosphere across the entire 3,500km long expanse of the Hindu Kush Himalaya (HKH), used the moment to zero in on the specific impacts of climate change on Everest. Their data provides incontrovertible scientific evidence to corroborate climbers' increasingly alarming eyewitness accounts, such as Jornet's, or that of Lukas Furtenbach, who saw puddles on the South Col in 2022, or another climber who, when climbing Gasherbrum IV in 2021, was shocked to find water cascading down a rock at 7,000m. Worryingly, ICIMOD scientists found that the 79 glaciers around Everest had thinned by over 100m in just six decades and that the rate of thinning had almost doubled since 2009. The iconic Khumbu glacier itself is disappearing up the mountain. And the further east you go, the worse this thinning becomes.

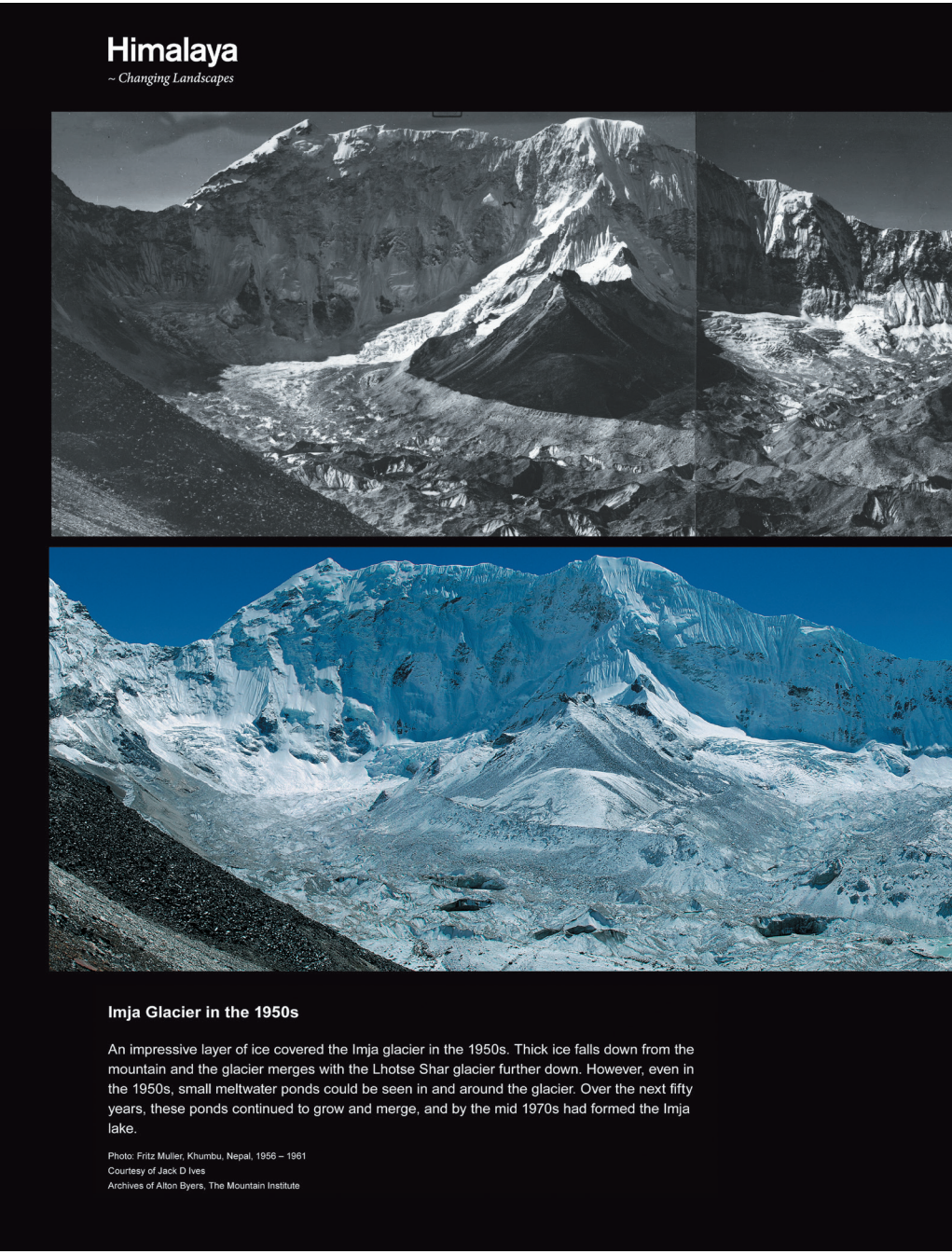
Tenzing Chogyal Sherpa, an early-career glaciologist at ICIMOD, travelled to Namche to join his grandfather, the last survivor of the first ascent, Kanchha Sherpa, and Helen Clark, the former prime minister of New Zealand,

and Hillary and Norgay's descendants for the anniversary events. Together, this group launched a campaign asking climbers to raise their voices to press for faster action to avert catastrophic, irreversible changes to Everest and other mountains under the banner of *#SaveOurSnow*. The campaign asks members of the public, but particularly climbers, scientists and mountain communities, to share stories of the climate impacts they're seeing on social media and to add their name to a declaration that asks for governments to honour their commitments to limit warming as set out in the 2015 Paris Agreement.

'The sporting community needs to step up,' Jornet, one of the signatories of the declaration, says. 'Alongside scientists studying these mountains, and the communities that live here, it is those of us who return year after year to these mountains, to work and to train, who can see with our own eyes the extraordinary pace of changes to mountain glaciers, snow and permafrost. These changes are not only aesthetic, of course. They also pose new dangers to climbers in terms of unstable terrain. But the much more profound impacts are the dangers these changes pose to the people and nature that rely on these mountains, for water, for livelihoods, for habitat.'

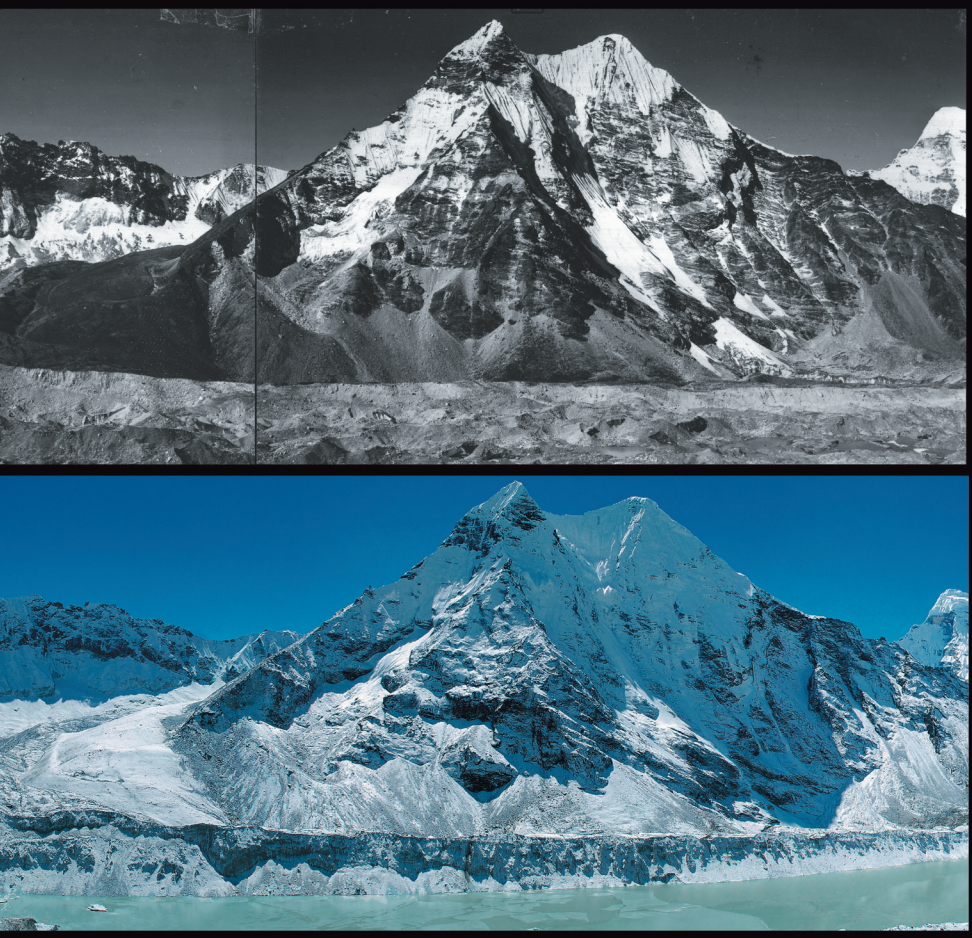
Climate impacts across the world's cryosphere are fast outpacing scientists' previous projections, with the fight to save summer ice in the Arctic declared essentially lost earlier this year, and revised forecasts suggesting Antarctica is vulnerable to devastating and permanent impacts at just 1.5°C of temperature rise. At 2°C of warming, glaciers in the Alps, the Andes, Patagonia, Iceland, Scandinavia, the North American Rockies and New Zealand are all set to disappear completely, while according to ICIMOD's latest report *Water, Ice Society, and Ecosystems in the Hindu Kush Himalaya* around half of glaciers in the Hindu Kush Himalaya would be gone. That even just half might remain is unlikely: our current emissions trajectory sets us on course to smash through the 'safe' 1.5°C ceiling. At the currently plausible 4°C of warming, 80% of glaciers in the HKH will vanish by the end of the century. While glacier loss worldwide will devastate local communities and result in sea-level rise, the consensus is that the consequences of glacier loss, more erratic snowfall and permafrost thawing for people and nature in the hugely populated and bio-diverse HKH region, where 12 of the world's major rivers originate, will be nothing short of catastrophic.

'Nowhere is safe from climate impacts,' says ICIMOD's deputy director general Izabella Koziell. 'But the Hindu Kush Himalaya holds the third largest frozen body of water on the planet, which provides freshwater services to a quarter of humanity. A staggering half of that population already suffer malnutrition. In the past two years alone we've already seen devastating climate-driven humanitarian disasters unfold in this region – in Afghanistan's droughts, and Pakistan's floods: a chilling illustration of what our scientists say will be one of the key climate impacts in our region – the issue of 'too much water, too little water.' The magnitude of the humanitarian catastrophe that will unfold should the reliable water supply that flows from these mountains be lost – undermining the food and water



The Imja glacier in the 1950s and 2007, illustrating the formation of the glacial lake near Ama Dablam. The rate of glacial thinning has doubled since then. *(ICIMOD)*

ICIMOD

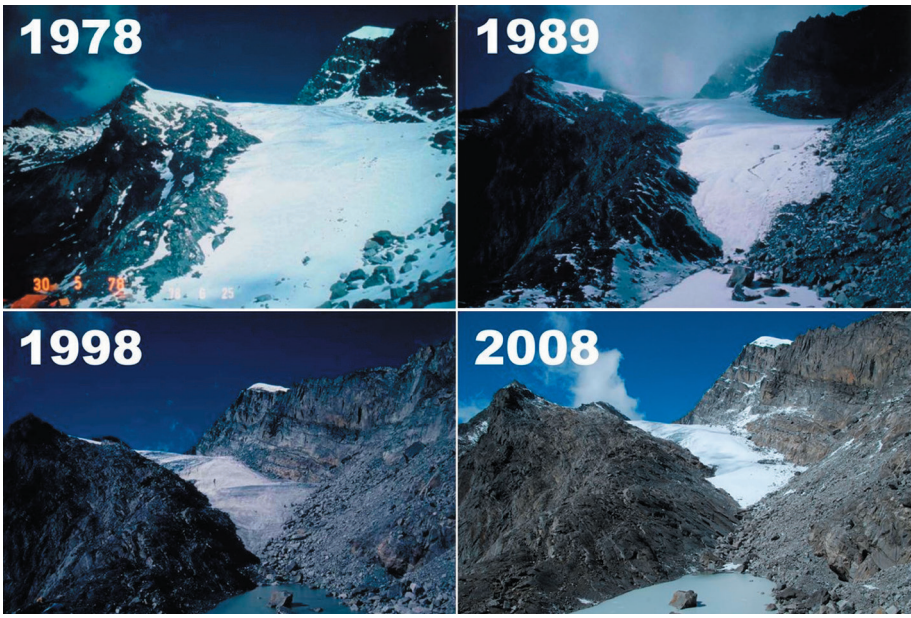


Imja Glacier in 2007

By 2006, the Imja lake had grown to around 1 km long with an average depth of 42 metres, and contained more than 35 million m³ of water. The Imja glacier is retreating at an average rate of 74 metres per year, and is thought to be the fastest retreating glacier in the Himalayas.

The thin cover of debris on this glacier may actually have accelerated surface melting, as heat is transferred to the ice below. Because of the unconsolidated nature of the lake's terminal moraine dam, the risk of a glacial lake outburst flood (GLOF) may be high.

Photo: Alton Byers, Khumbu, Nepal, 2007, The Mountain Institute



Above: Visible changes seen in the terminus of glacier AX010 from 1978 to 2008. Situated in the Shorong Himal, this glacier has lost almost half its surface area in just the last three decades. Opposite: The terminus of the Rikha Samba glacier between 1974 and 2010. The rate of loss has only accelerated since then. *(Alton Byers)*

security of two billion people in Asia – is almost beyond imagining. Yet this is what the science tells us will happen unless world leaders act decisively now.'

The case for action is compelling. With very low emissions, most glaciers and snowpack can be preserved for water resources, with scientists saying losses would begin to slow slightly around 2040, with glaciers stabilising sometime in the next century. And the support alpinists have given the campaign has been unequivocal with over 2,000 signatories in the first 48 hours, including Kenton Cool, Rebecca Stephens, Peter Hillary, Wolfgang Nairz, Reinhold Messner, the glaciologist and alpinist Patrick Wagnon, Jamling Tenzing, Gerlinde Kaltenbrunner, Lakpa Dendi Sherpa, documentary-filmmaker Craig Leeson, and Pemba Sherpa. Other backers include the Nepal Mountaineering Association, the Mountain Research Initiative, the UN Mountain Partnership, and the UIAA.

'It's amazing to have had this strong early support from the climbing community,' says Izabella Koziell. 'But it feels like we're barely scratching the surface with what might be possible, in terms of the leadership role alpinists might be able to play at this crucial moment,' says Koziell. 'Not just because of their tenacity and influence, but most of all because of their unrivalled intimacy with mountains and mountain people. Many climbers' lives have often been if not profoundly transformed then at least hugely enriched by encounters with the landscapes and cultures of the Hindu Kush Himalaya.

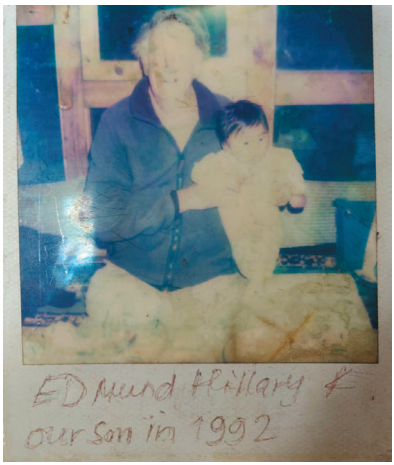
These experiences give them an intrinsic awareness of how much we stand to lose unless we check emissions that are threatening lives, livelihoods and cultures.

'It's hard to have spent any time among such communities too and not be struck by the sheer injustice of what we're seeing unfold across this region: of the lives of peoples who have trodden so lightly on the Earth for generations being destroyed as a consequence of political and business choices being taken millions of miles away.'

ICIMOD, for its part, is reinventing itself to rise to the challenge of supporting communities and governments in the region that will confront the impacts of the changing climate. The organisation has completely reconfigured its portfolio in order to reduce the region's vulnerability to disaster risks: biodiversity loss; and water, energy and food insecurity. This work runs from installing early-warning systems to forewarn communities of floods and encouraging governments to share data across national boundaries, to advancing the rights and recognition of nomadic communities and the role of rangelands, to identifying incentives for communities to protect biodiversity and forests.

Critically, the organisation is setting out to build an advocacy voice that is commensurate with the region's importance and peril. Because, despite how much hangs in the balance in terms of human population alone, knowledge of the consequences of continued climate inaction on the Hindu Kush Himalaya globally remains low. There was no mention of mountain impacts *at all* within the draft text of this year's critical Global Stocktake process, an integral of the Paris Agreement under the framework of the United Nations Framework Convention on Climate Change.

In collaboration with and on behalf of its eight regional member countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan – the organisation is setting out to change that lobbying at global fora:



Left: ICIMOD glaciologist Tenzing Chogyal Sherpa in the lap of Ed Hillary in 1992. Right: With his grandfather Kanchha Sherpa. *(Tenzing Chogyal Sherpa)*

for faster action on mitigation globally; for the urgent scaling up of adaptation and ecosystem restoration funds; and programmes and for the mobilisation of loss and damage finance.

In seeking to strengthen its impact, ICIMOD is also looking outwards, exploring the creation of a new regional political mechanism, akin to the models used by the Alpine or Carpathian Convention, with the aim of accelerating political change through closer collaboration among countries to build greater resilience to these issues, many of which are trans-boundary, such as floods, and in securing greater prominence and negotiating power for the region.

'For 40 years, ICIMOD has acted as a knowledge centre for the region, generating and sharing evidence to our member countries to support their policy processes, and this remains our primary work,' says Koziell. 'However, with humanity standing at such a crossroads, and our cryosphere being so central to that, our board, donors, regional member countries and stakeholders were all unanimous that ICIMOD should start to take a much more assertive role.

'I believe that at this moment all of us are being called to go beyond 'business-as-usual' – and that it's for all of use whatever platform we have to urge governments and businesses to transform how we power our lives, feed ourselves, move around so that Earth can sustain life. The science is clear – there really is no time left. Perhaps this transformation will be humanity's greatest summit yet.'

- To sign the declaration go to ***www.icimod.org/SaveOurSnow*** and share your story of impacts using the hashtag *#SaveOurSnow*.

HIMALAYA IN CRISIS

- Glaciers in the region disappeared 65% faster in 2011–20 compared with the previous decade.
- The glaciers could lose up to 80% of their current volume by end of this century.
- Availability of water in the Hindu Kush Himalaya is expected to peak in mid-century, driven by accelerated glacier melt, after which it is expected to decline.
- Snow cover is expected to fall by up to a quarter under high emissions scenarios – drastically reducing freshwater for major rivers such as Amu Darya and Helmand where it contributes up to 74% and 77% of river flow respectively. Floods and landslides are projected to increase over the coming decades
- Two hundred glacier lakes across the HKH are deemed dangerous, and the region could see a significant spike in glacial lake outburst flood risk by the end of the century
- Effects of the changing cryosphere on fragile mountain habitats are particularly acute. The HKH holds four global biodiversity hotspots but cascading impacts of a changing cryosphere are already being reported in most ecosystems and most inhabitant species, with species decline and extinction already reported, along with range shift of species to higher elevations, ecosystem degradation and decrease in habitat suitability.
- Ice and snow in the Hindu Kush Himalaya are important sources of water for 12 rivers that flow through 16 countries in Asia, providing freshwater and other vital ecosystem services to 240 million people in the mountains and a further 1.65 billion people downstream.

Data drawn from ICIMOD's new report: Water, Ice, Society, and Ecosystems in the Hindu Kush Himalaya. You can download the full 'HI-WISE' report at: ***www.icimod.org/hi-wise***