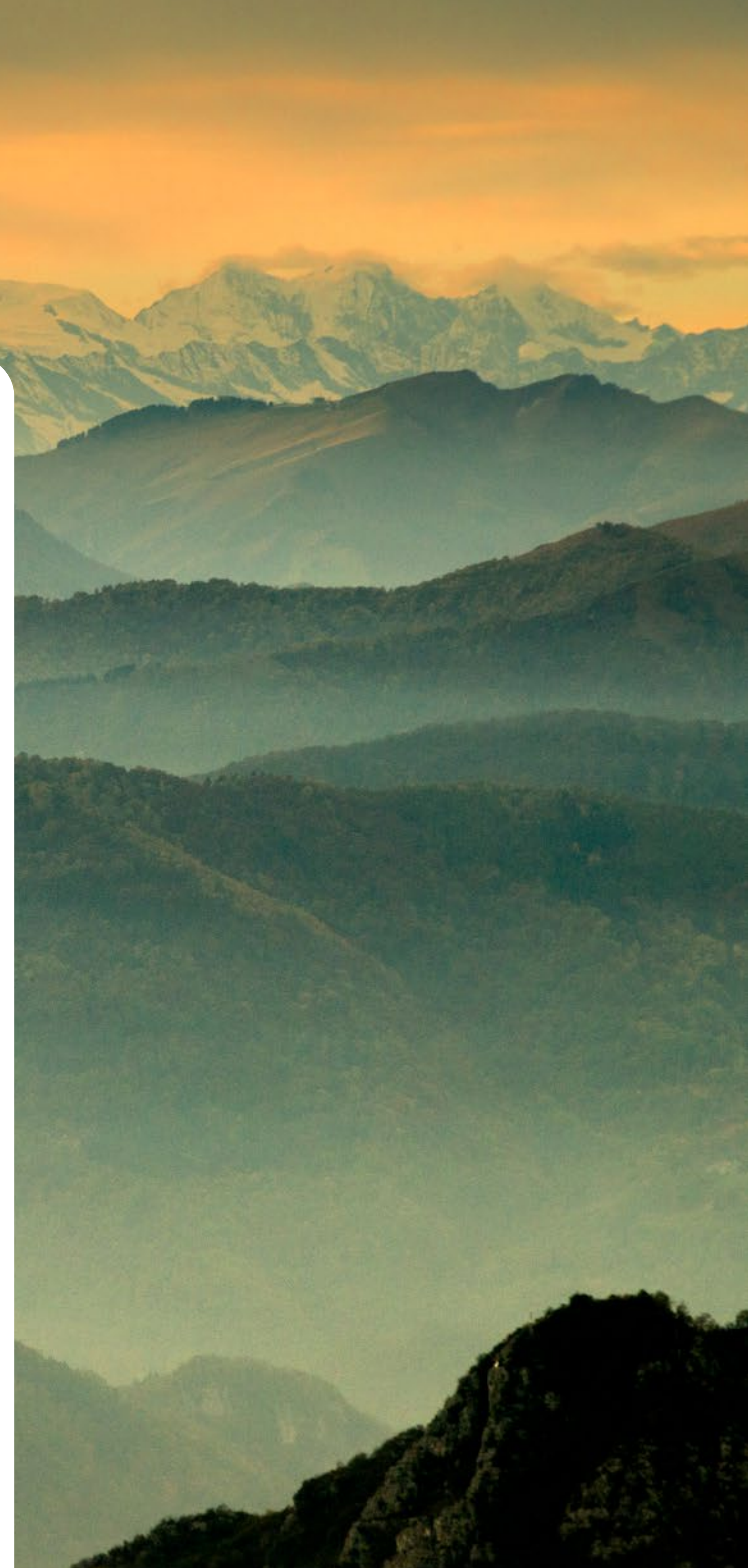
The missing link in effective climate action

The roadmap for reducing global heat starts with measuring what matters



GLOBAL HEAT REDUCTION INITIATIVE™

Nearly half of all current global warming is caused by factors other than carbon dioxide, but current climate accounting practices systematically undervalue or overlook them.

The Global Heat Reduction Initiative aims to change that. By accounting for all climate change drivers, we can balance short- and long-term mitigation measures and begin to stabilize, and ultimately restore, our climate.

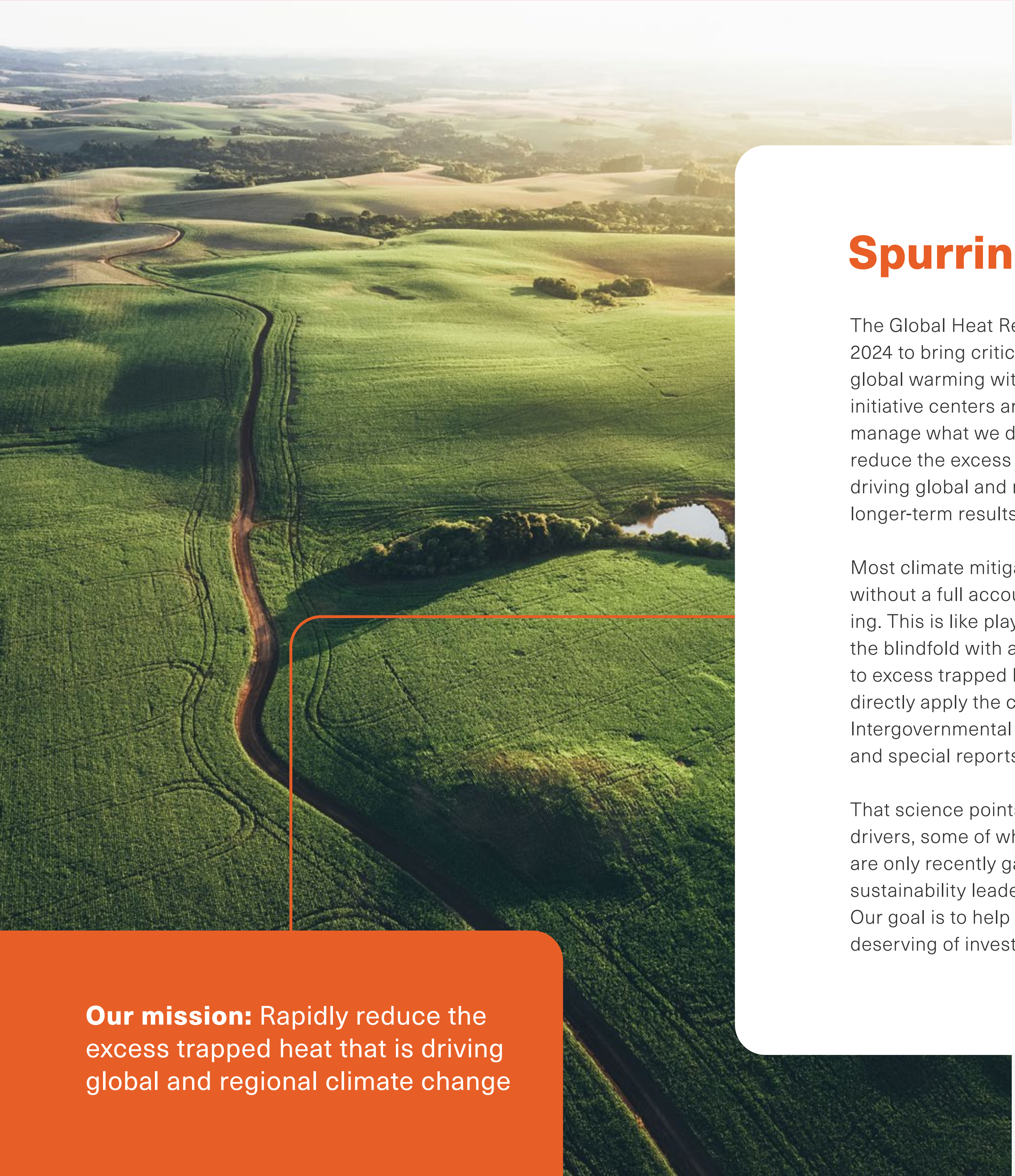
The climate crisis heats up

2023 was the hottest year on record. It included Earth's **hottest five days**, **hottest month**, and **hottest summer**. In September of that year, the average global surface temperature reached 1.8°C above the pre-industrial average, smashing the previous record by a whopping 0.5°C. And if that wasn't enough to alarm climate scientists, on November 17, the average global surface temperature temporarily **surpassed 2.0°C** above pre-industrial levels for the first time. It was a harbinger of how rapidly we could reach this upper temperature threshold established under the Paris Climate Agreement on a sustained basis.

> We can measurably lower global temperatures, including significant progress in this decade, but it will require a new approach.

The heat triggered record-breaking droughts, fires, heatwaves, and storms around the world. Places including Dubai, Miami, Karachi, and Shanghai saw temperatures that, combined with smothering humidity levels, can be deadly within hours. Wildfires and their accompanying air pollution blanketed vast swaths of land, from North America to Australia. Antarctic sea ice kept retreating even in the winter months — a one-in-every-7.5-million-year event. In the Hawaiian town of Lahaina, a fast-moving wildfire killed 100 people and drove hundreds more into the sea amid a terrifying rain of embers. Off the west coast of Mexico, Category 5 Hurricane Otis spun up seemingly out of nowhere, devastating a region that rarely, if ever, sees such weather.

These events prompted United Nations Secretary General, Antonio Guterres to **claim**, "humanity has opened the gates to hell." However, humanity can still measurably lower global temperatures, including making significant progress in this decade. But doing so will require a new approach.



Our mission: Rapidly reduce the excess trapped heat that is driving global and regional climate change

Spurring targeted action

The Global Heat Reduction Initiative (GHRi) was launched in 2024 to bring critical new tools to bear in the battle to slow global warming within the next decade and beyond. The initiative centers around the time-tested idea that we can't manage what we don't measure. Our mission is to rapidly reduce the excess trapped heat in the atmosphere that is driving global and regional climate change, for near-term and longer-term results.

Most climate mitigation activities today are undertaken without a full accounting of the core drivers of global warming. This is like playing darts while blindfolded. GHRi removes the blindfold with an approach that reveals all contributors to excess trapped heat in the atmosphere. In doing so, we directly apply the consensus science summarized in the Intergovernmental Panel on Climate Change (IPCC) synthesis and special reports of the past decade.

That science points to a wide range of climate change drivers, some of which are widely recognized, while others are only recently gaining serious attention among corporate sustainability leaders, policy makers, and climate financiers. Our goal is to help prioritize mitigation activities that are most deserving of investment in the immediate term.

Not all greenhouse gases are equal

During its first year of emission, a ton of methane is up to 150 times more potent than a ton of CO_2.

The most widely recognized climate change driver is carbon dioxide (CO_2). Today, **40 billion tons of CO_2 are released annually** by human activities. Because it takes centuries for CO_2 to dissipate, **more than one trillion metric tons have accumulated in the atmosphere** since the Industrial Revolution.

While CO_2 is the most ubiquitous of all greenhouse gases (GHGs), on a ton-for-ton basis, it has the weakest global warming effect among them. Based on these properties, CO_2 has traditionally served as the base reference against which we measure the potency of other GHGs, expressed as their carbon dioxide equivalency, or CO_2e.

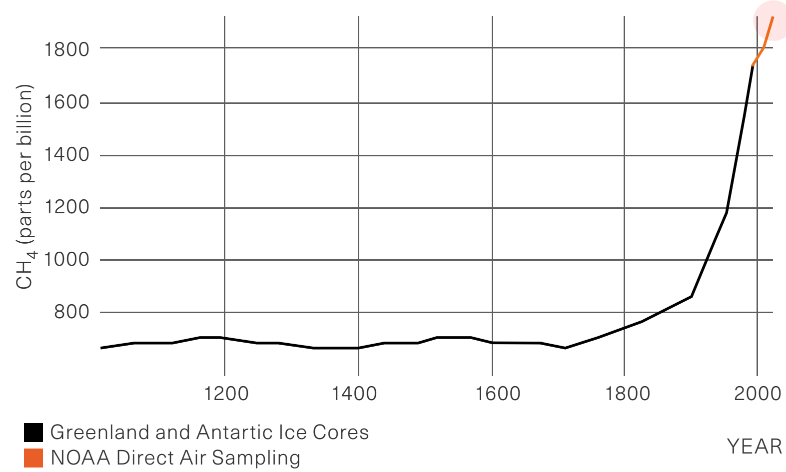
Because every GHG degrades at a different rate in the atmosphere, this relative potency, or "global warming potential" (GWP), must be calculated over a specific timeframe. Since most GHGs last for a century or longer in the atmosphere, the convention has been to default to a 100-year period when calculating the GWP ("GWP-100").

This convention is far less applicable, however, when considering methane. A ton of methane typically breaks down within 8-20 years. Compared over 100 years, **a ton of methane** is considered about 27-30 times more potent than CO_2. But its GWP over 20 years is 80-82 times more than CO_2. And if you consider that same ton of methane during its initial year of emission, it is up to 150 times more potent.

Therefore, when the warming effect of a ton of methane is compared to that of a ton of carbon dioxide over 100 years, the resulting equivalency significantly understates the actual potency of methane over its atmospheric lifetime. Yet, from a near-term atmospheric warming perspective, methane requires greater emphasis.

Atmospheric Methane Concentrations Since the Year 1010

Data sources: Etheridge et al., 1998 and NOAA Global Monitoring Laboratory

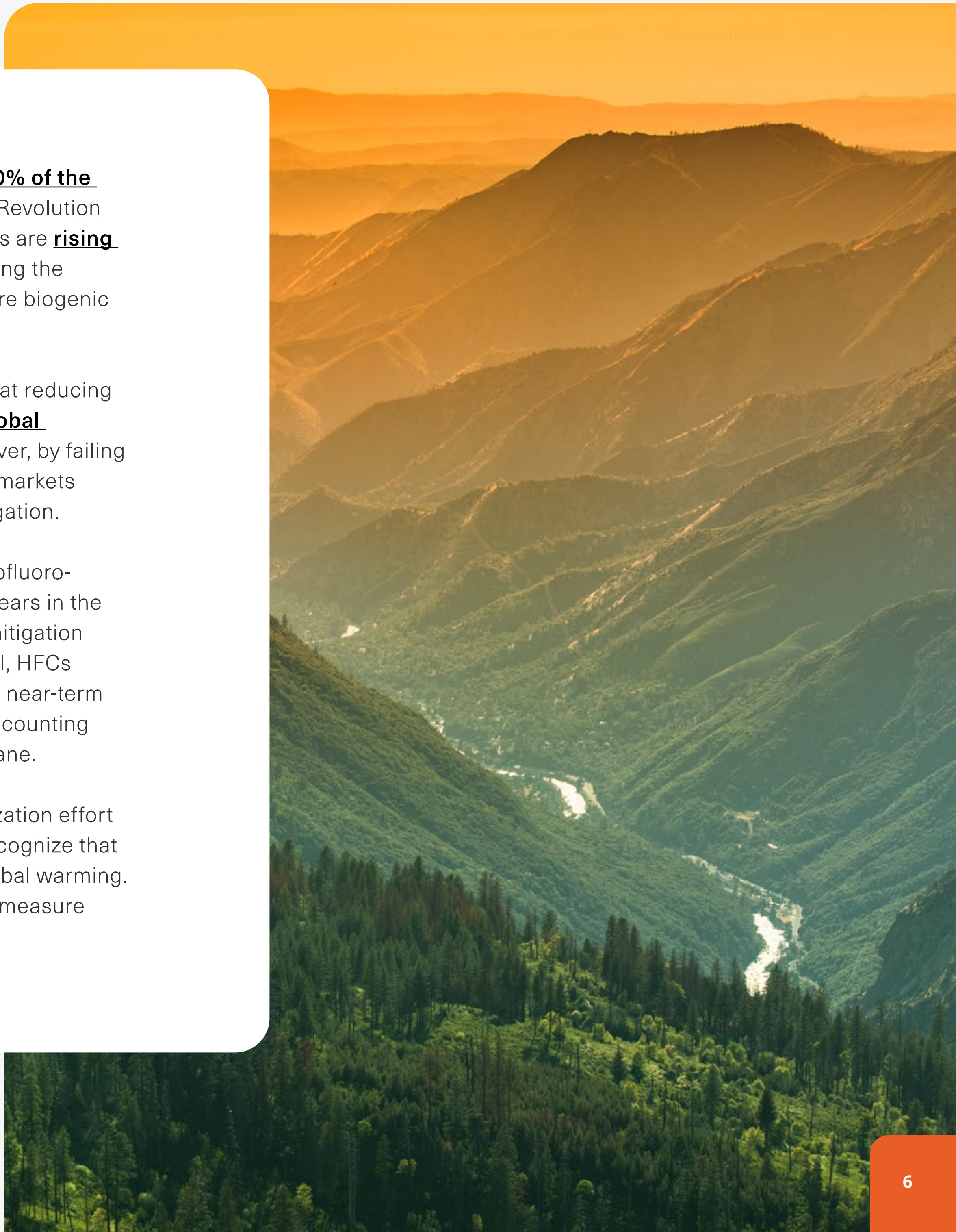


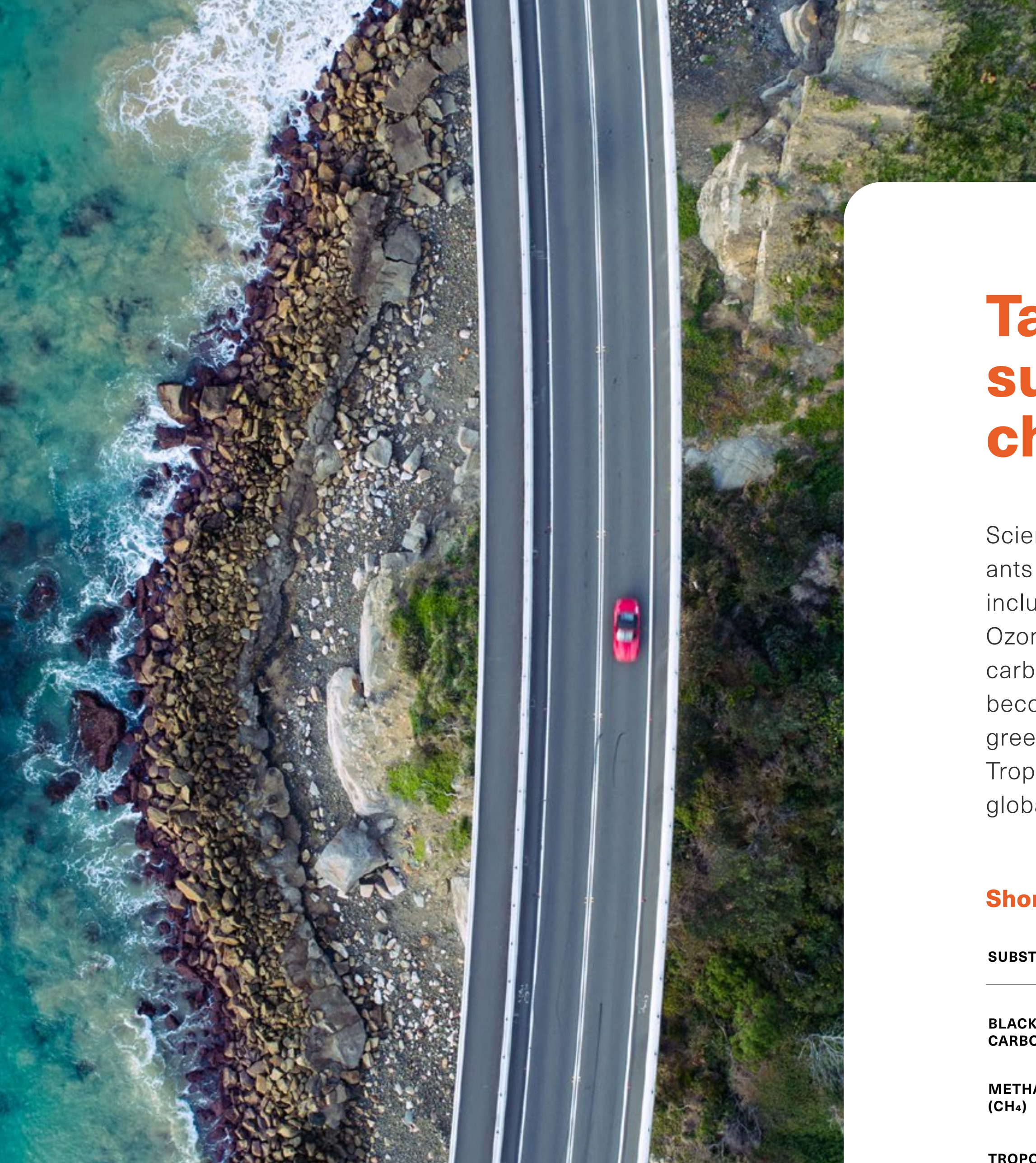
This is crucially important. NASA attributes **20-30% of the global warming** since the onset of the Industrial Revolution to methane. Atmospheric methane concentrations are **rising every year**. Meanwhile, global warming is triggering the thawing of permafrost, which in turn releases more biogenic methane.

It is not surprising that regulatory regimes aimed at reducing methane emissions and initiatives such as the **Global Methane Pledge** have gained momentum. However, by failing to account for methane's actual impacts, carbon markets systematically undermine effective methane mitigation.

The same is true for another class of GHGs, hydrofluorocarbons (HFCs). These gases last only about 15 years in the atmosphere. Like methane, the benefits of HFC mitigation are felt most acutely during that time window. Still, HFCs are **up to 14,800-times more powerful** in driving near-term atmospheric heat than CO_2, so current climate accounting practices undervalue them even more than methane.

This accounting problem in the global decarbonization effort must be addressed. To do so, it is important to recognize that greenhouse gasses are not the only drivers of global warming. A more effective climate accounting model must measure more than GHGs.

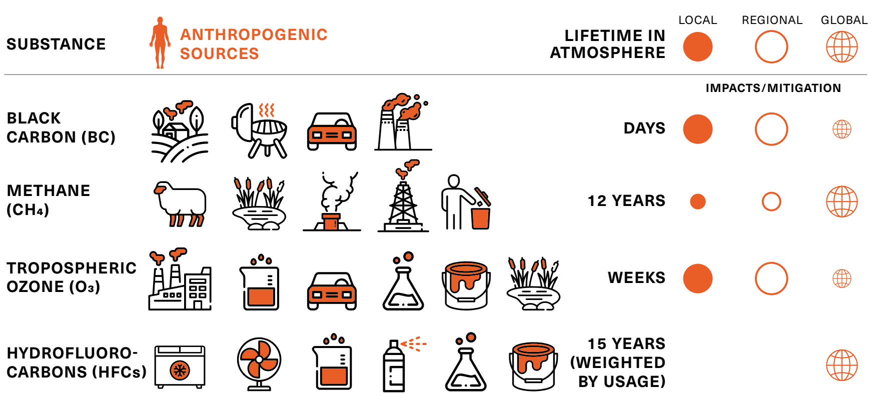




Tackling ever-present, supercharged climate change accelerants

Scientists have identified other anthropogenic climate pollutants with even shorter atmospheric lifetimes than methane, including tropospheric ozone (O_3) and black carbon (BC). Ozone lasts in the lower atmosphere for just a few weeks. Black carbon stays aloft only for days. Neither of these pollutants become well-mixed in the atmosphere the way long-lived greenhouse gases do, but they can pack a powerful punch, Tropospheric ozone can be up to 3,000-times more potent as a global warming agent than CO_2, and BC up to 52,000-times.

Short-Lived Climate Pollutants



Source: Climate and Clean Air Coalition

Black carbon, tropospheric ozone, methane and HFCs, are responsible for up to 45% of current anthropogenic global warming.

[According to the Climate and Clean Air Coalition (CCAC)](), a voluntary partnership of over 160 governments, intergovernmental organizations, and NGOs convened by the United Nations Environment Program (UNEP), tropospheric ozone and black carbon, together with methane and HFCs, are responsible for up to 45% of current anthropogenic global warming.

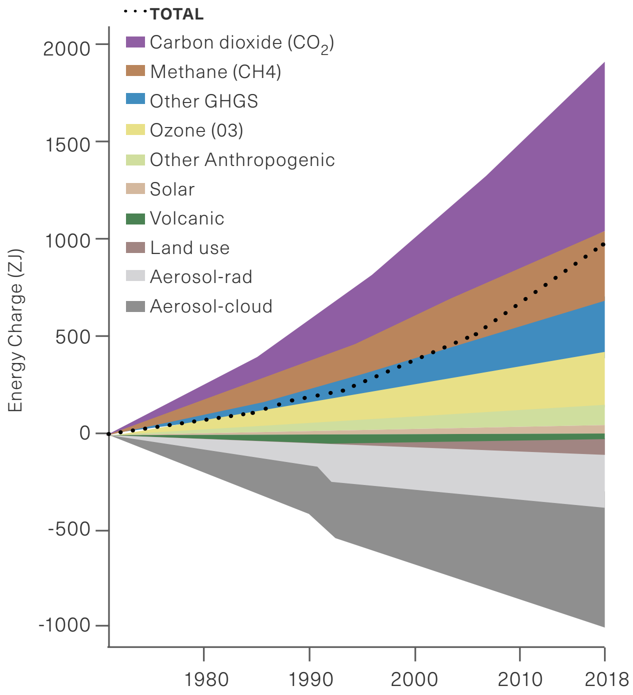
Even though they only briefly remain in the atmosphere, "short-lived climate pollutants" (SLCPs) and their precursor pollutants are emitted daily and increasingly. This creates a steadily thickening, heat-trapping blanket around the planet. SLCPs, sometimes called "super pollutants," act as supercharged heat-trapping accelerants.

A major opportunity to slow down global warming in this decade is to precipitously cut emissions of methane and SLCPs. The required technologies are widely available today, often for pennies on the dollar compared to CO_2 mitigation. Additionally, eliminating these pollutants would generate enormous co-benefits. Both ozone and black carbon are byproducts of fossil fuel use, burning organic matter, agriculture, and industrial processes. Both are associated with a host of health problems, from lung and heart diseases to cancer and millions of annual premature deaths worldwide.

Finally, it is important to keep in mind that some emissions, rather than warming the planet, actually cool it down. In particular, sulfate and nitrate aerosols, which scatter and reflect solar radiation, have masked the effects of carbon dioxide, effectively slowing the rate of global warming, even while posing serious hazards to people and the environment. As countries work to reduce harmful air pollutants, it is essential to take stock of the additional warming associated with these reductions to properly balance the climate equation.

Components of Radiative Forcing

Estimated net cumulative energy change for the period 1971–2018. The dotted line represents the central estimate.



Source: Sixth Assessment Report (AR6), Working Group 1, 2021: Technical Summary. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Reduce, Reflect, and Restore

Without full situational awareness, it is difficult to identify the most effective actions needed to mitigate global warming.

In addition to reducing pollutants, two other climate mitigation strategies missing from current climate accounting must be included: increasing the Earth's reflectivity and restoring habitats. Together, these approaches represent the three "Rs" of climate mitigation.

Climate scientists regularly point out the major role played by albedo, the Earth's overall reflectivity. Clouds and surfaces covered in snow, ice and white sand have a high albedo, meaning they reflect more of the sun's heat back into space than dark surfaces and help cool the planet. Dark surfaces like asphalt, soil, or ocean water absorb heat. Melting ice and snow in polar regions and mountain ranges expose darker rock and soil, effectively lowering the Earth's albedo and driving temperatures higher.

Likewise, ecosystems serve as part of the Earth's natural climate defense system. Displacing desert ecosystems in favor of agriculture, mining, and urban environments, for instance, usually lowers the Earth's albedo. A similar phenomenon occurs when phytoplankton is lost due to warming oceans. Phytoplankton metabolism releases gases that lead to cloud formation. Less phytoplankton means fewer clouds. Fewer clouds means less heat reflected into space, even warmer oceans, and greater loss of phytoplankton.

Efforts to reflect more of the sun's heat into space and restore climate-positive ecosystems are underway or being contemplated. Cities are experimenting with white roofs and streets to reduce the urban heat island effect. Black carbon mitigation can reduce deposition of dark particles onto ice and snow and slow the rate of melting. Rerouting of shipping and reduced use of ice breakers in the Arctic can also help lower impacts on sea ice. Experiments in spraying sea salt over ocean surfaces to brighten clouds have been proposed to restore phytoplankton populations.

Despite their importance, the effects of short-lived climate pollutants, albedo changes and ecosystem alterations cannot be accounted for using GWP-100-based methods. Again, conventional climate accounting does not give us the full picture. And without full situational awareness, it is difficult to identify the most effective actions needed to mitigate global warming, especially in the critical near-term before longer-term decarbonization strategies can take hold.

To change this, we must move toward a more comprehensive climate accounting mechanism. The Global Heat Reduction initiative applies the latest IPCC science to do so.

The Missing Link: Full Climate Accounting

Scientists evaluate all climate drivers, whether natural or human-caused, by their relative ability to heat or cool the planet. This is their “radiative forcing” impact.

Radiative forcing is the metric used to measure the Earth’s energy balance — the difference between the amount of incoming shortwave radiation from the sun and outgoing thermal radiation from the Earth that goes back into space. It is the unit by which scientists measure the Earth’s excess trapped heat. As such, radiative forcing (measured in watts per square meter, or W/m^2) is the underlying common thread that ties together all climate accounting. This fundamental fact is embedded in all IPCC reports.

Carbon dioxide equivalencies (CO_2e) are derivative of the basic differences in radiative forcing between each GHG and CO_2. To incorporate the full spectrum of climate drivers, it is likewise possible to determine the radiative forcing equivalency between CO_2 and any climate pollutant, albedo change, or other non-emissions factor.

GHRi’s approach to climate change mitigation is based on this science. To start gaining ground in the fight against climate change, we must complement GWP-100 with an accounting method that works for all drivers of climate change. This is how we will get a clear view of the proverbial climate dartboard. The tool that allows us to do this exists today. It is the Radiative Forcing Protocol, independently peer reviewed by the UNEP’s Climate and Clean Air Coalition (CCAC) Scientific Advisory Panel.

The Radiative Forcing Protocol introduces a method to convert radiative forcing values for any climate change driver in relation to CO_2 into a new unit of measurement called carbon dioxide forcing equivalency (CO_2fe). Using CO_2fe, we can create truly comprehensive climate footprints for facilities and organizations and assess mitigative actions at their full value for any pollutant or surface condition (including CO_2 and other GHGs), as well as their changes over time.

The protocol also retains all the information required to calculate conventional CO_2e values. Thus, GHRi’s method enables companies, investors, and governments to meet their net zero goals while prioritizing the mitigation activities most likely to reduce global warming in the near term.

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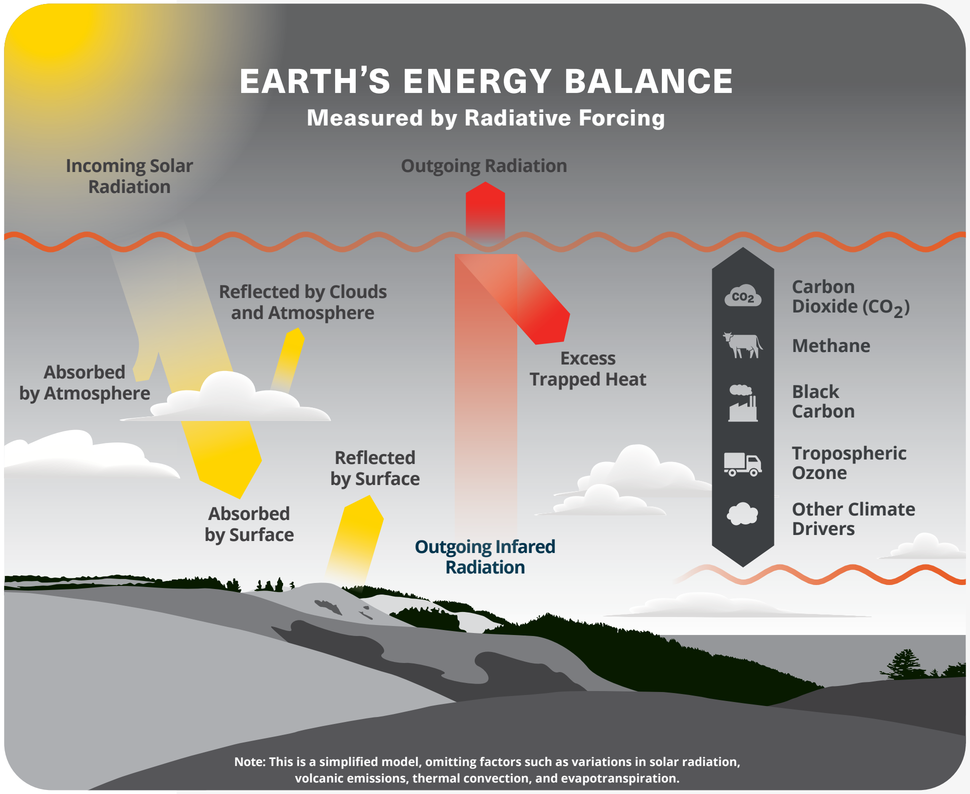
Finally, the Protocol includes co-benefit and trade-off assessments for any mitigation approach, based on thorough life-cycle analysis (LCA). Most mitigation projects self-report their health, environmental and societal impacts, often in terms of the Sustainable Development Goals (SDGs), but they lack the consistent, quantified, data-backed LCA methodology provided in our protocol.

The Protocol is the culmination of decades of work and accumulated insights at GHRi's founding organization, SCS Global Services, spearheaded by its visionary founder and CEO, Dr. Stanley P. Rhodes (1942-2023). Over four decades, the company worked with corporations, government agencies, and NGOs worldwide, analyzing industrial and biological systems, and carrying out life-cycle and environmental assessments, as well as carbon verifications for products and processes across industries.

Backed by that body of work, along with the latest IPCC science and input from international climate experts, the Protocol offers an actionable framework for next-generation climate accounting. Ready for real-world use right now, it enables the most thorough climate assessments attainable and positions government, business, and civil society leaders to make fully informed decisions and allocate resources to where they may generate the greatest positive impacts.



What we are doing

We are catalyzing efforts to drive down the excess heat trapped in the atmosphere that is fueling temperature rise and climate change, and ultimately bring the Earth's climate back into balance. This is a big goal that no single company, country, or organization can achieve by itself. That is why we will work to create positive momentum through the following steps:

Building Awareness

We will drive a sustained advocacy effort to create a greater understanding of the full breadth of climate drivers, their respective contributions to excess trapped heat, and the amount of heat reduction needed to see measurable short-term results as well as longer-term benefits.

Certification

Based on the Radiative Forcing Protocol, we will launch a new Global Heat Reduction Certification Standard that allows organizations to assess their climate footprints and opportunities more accurately and translate that knowledge into tangible measures. The standard will be broadly applicable to industry, public works, mitigation projects and other activities with notable climate impacts.

Registry

We are launching a groundbreaking climate registry to bring awareness and funding to potent atmospheric heat mitigation projects that are currently undervalued or overlooked by carbon market accounting, especially when these projects are accompanied by pollution prevention and other co-benefits.

These initial steps will enable climate finance markets to identify, measure and support mitigation measures that not only mitigate long-term climate-change, but slow the rate of global warming immediately.

We are making direct heat reduction a practical tool in the fight against climate change for private sector companies and investors, the voluntary carbon market, philanthropies, government-sponsored initiatives, international organizations, individuals and NGOs. We aspire to build partnerships to engage these players, share knowledge and best practices, and inspire the next chapter in effective climate action.

We have the necessary tools and technologies at our disposal today. It's up to us to use them.

Conclusion: Climate success is a choice

The climate crisis is accelerating, but this is no time to despair. With a fuller understanding of the science and the right methods to apply it, we can make a tangible difference by 2030 and beyond. We have the necessary tools and technologies at our disposal today. It's up to us to use them.

By doubling down on the reduction and removal of methane and SLCPs, along with steps to preserve and even increase the planet's albedo through smart choices about the built environment and vital ecosystems, we can measurably reduce excess atmospheric heat within the next decade.

Short-term and long-term measures are two sides of the same coin. Getting to net-zero on carbon dioxide remains vitally important. We must step up our efforts to slash CO_2 and other GHG emissions. In fact, the radiative forcing approach allows us to adjust for CO_2's changing radiative effects over time, not just averaged out over a 100-year period.

Complementing existing decarbonization efforts with actions aimed at direct, near-term heat reduction is the key to blunting the sharpest edges of the climate crisis and buying ourselves time to let CO_2 cuts reach their full effect over decades. This is how we can build a bridge to a net-zero future, stabilize our climate, and, in the longer term, begin to restore it to its pre-industrial equilibrium.

Climate doom is not destiny, but a choice. So is climate redemption. If we come together, act decisively, at scale, and with speed, we have everything we need to tackle runaway planetary heat and hand the generations that follow us a thriving, hospitable planet. Our ambition should be no less.

GLOBAL HEAT REDUCTION INITIATIVE™

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