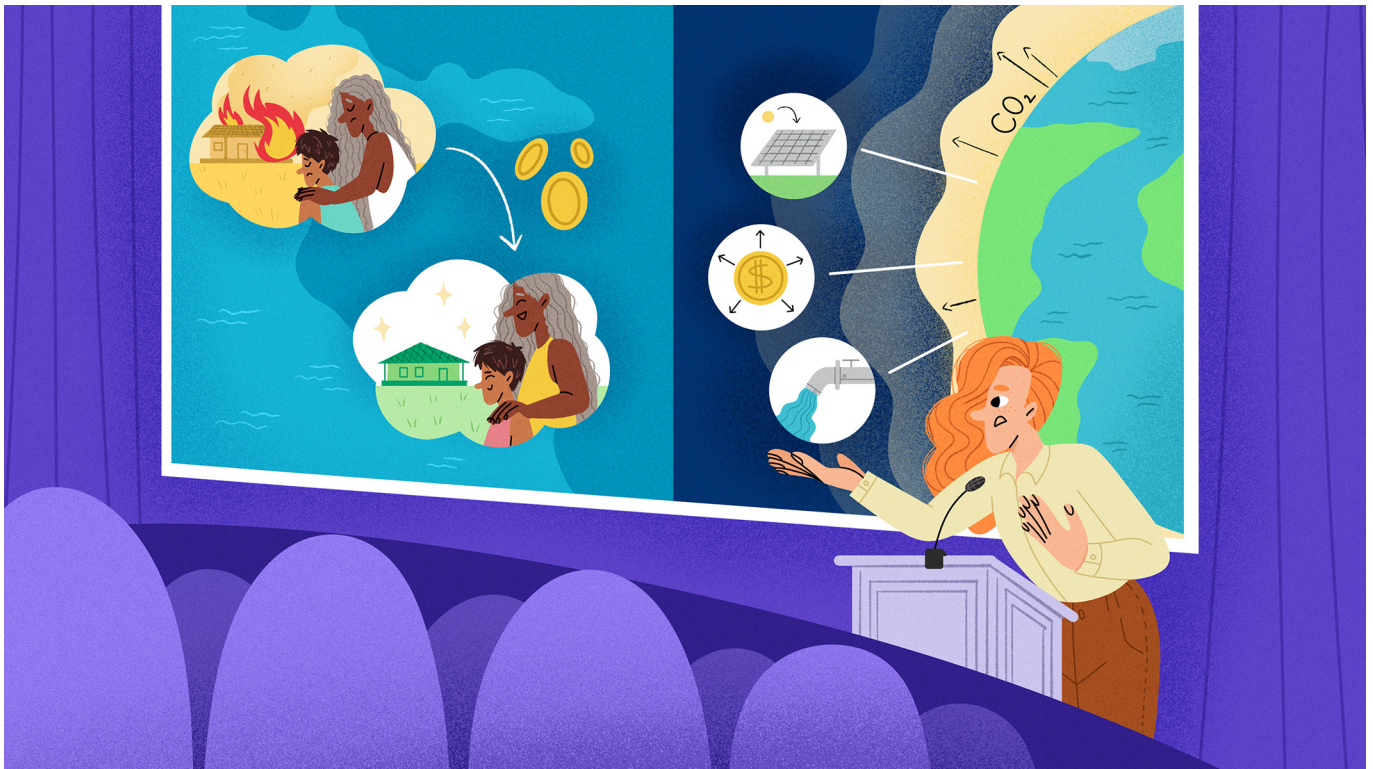




THE MONEY CHALLENGE OF CLIMATE CHANGE

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YOUNG REVIEWERS:



CALEB

AGE: 11



ELAINE

AGE: 14

Climate change is a pressing challenge to human wellbeing and the health of our planet. As global temperatures rise, so will the climate impacts and risks faced by all of us. Not all regions and people will face these climate risks equally. Poorer countries and small islands will face much bigger climate risks and disasters. People in these vulnerable regions have contributed the least to climate change. We must make huge changes to the way we live to ensure a just and sustainable future for all. These changes will need trillions of dollars each year that is fairly distributed. This article examines the goals of fair global climate finance in building a safer future. We discuss why global climate finance is still only a trickle and how governments, big companies, and others can come together to deliver on climate action.

CLIMATE CHANGE AND US

Over the past several years, most of us have experienced or heard of a nearby extreme climate event—floods, storms, fires, and droughts (see [this paper](#)). The impacts of these events can differ widely, including missed school and play, disrupted work and travel, social and emotional distress, and physical damage to our homes and neighborhoods. Some damages are catastrophic, while others are slow and long lasting.

In May 2023, the Intergovernmental Panel on Climate Change (IPCC) concluded its latest assessment, the Sixth Assessment (AR6) [1]. The IPCC is a United Nations (UN) group established in 1988, tasked with assessing the science related to climate change. The IPCC reviews all available published scientific literature to arrive at this assessment. The IPCC's work has led it to receive the Nobel Prize in 2007 and the Gulbenkian Prize for Humanity in 2022. The IPCC's assessments clearly show that global warming will increase the frequency and intensity of extreme climate events. Even the wealthiest nations will not be safe from climate change. However, developing countries and the least-developed countries with large poor populations are more vulnerable. When we look at where fossil fuel emissions happen [2], we see nearly half of the world's 8 billion people, who have contributed the least to climate change, stand to suffer the most losses and damages (Figure 1).

LOTS OF MONEY MUST BE INVESTED FOR A CLIMATE-RESILIENT, JUST TOMORROW

The science and the evidence are clear: all of us need to come together to make some fundamental changes in how we live, to ensure a **sustainable and just** future for all adults and young people (see [this paper](#) for details). The top 10% of all households globally cause some 35%–40% of global greenhouse gas emissions that lead to global warming and climate change, while the bottom 50% of households contribute only 13%–15% of emissions. Lifestyle changes will take time. We have some urgent tasks immediately ahead, especially in finding the large amounts of money needed to drive this change.

What is climate finance? Climate finance is all of the public and private money required to be invested to address climate change goals (see below). This includes government budgets and investments in renewable energy and **climate-resilient infrastructure**. Without enough money, we cannot hope to reach the goal of limiting future global warming to 1.5°C or well below 2°C, which was agreed on by all countries in the Paris Climate Agreement of 2015. We will also not be able to address the rising costs of climate change, especially for poorer communities and countries.

SUSTAINABLE AND JUST

Caring for the planet in ways that protect nature and people today, while also being fair so everyone now and in the future can live well.

CLIMATE-RESILIENT INFRASTRUCTURE

Buildings, roads, and other systems that people depend on, designed to keep working and protect communities even as climate change brings floods, heat, or storms.

Figure 1

(A) Map showing where fossil fuel CO₂ emissions come from. (B) Map showing where most of the expected impacts from climate change will occur. You can see that the countries that face the biggest challenges from climate change have generally released the least CO₂, and thus contributed the least to causing it. Therefore, climate finance is required to help to spread the cost of climate change more fairly (Data are sourced from <https://explore.globalcarbonbudgetdata.org/timeseries.html> and <https://gain.nd.edu/our-work/country-index/> respectively).

CLIMATE RESILIENT DEVELOPMENT (CRD)

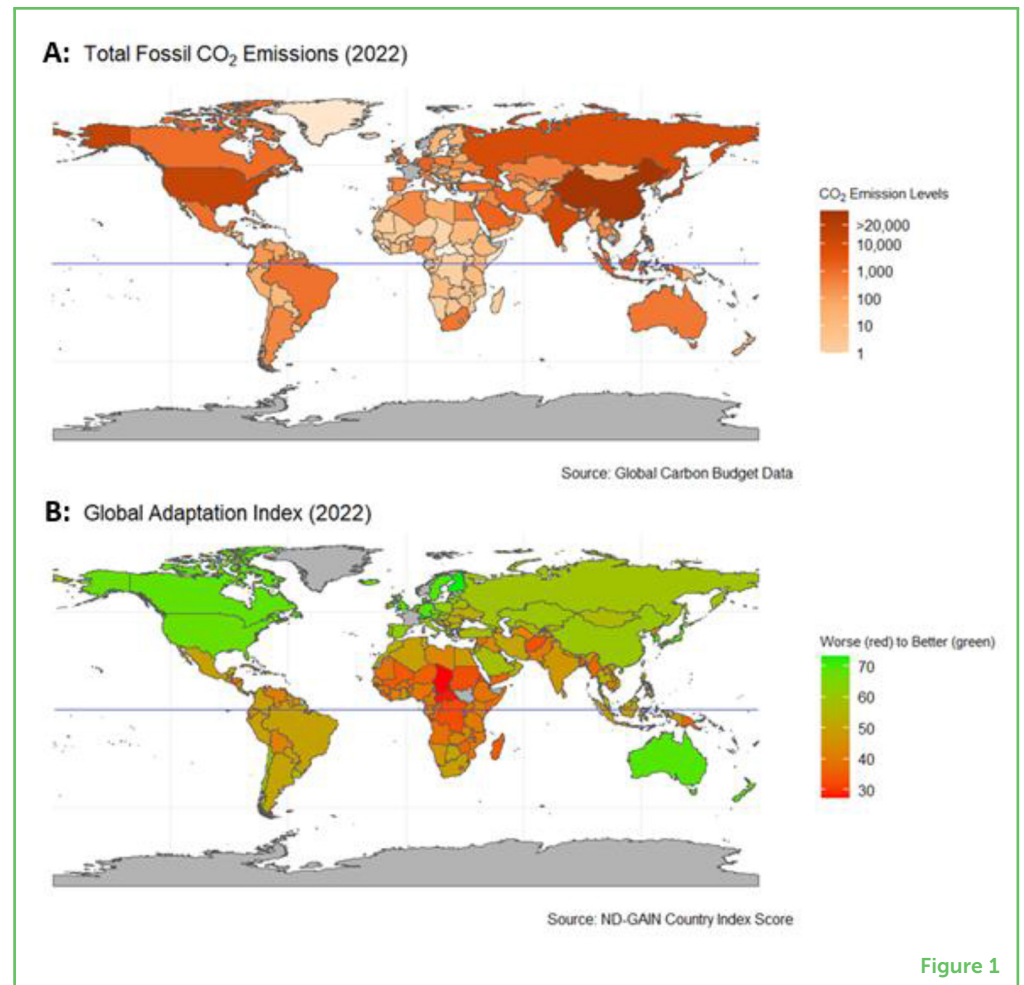
Working to both slow climate change and adjust to its effects, while making sure communities can grow in ways that are fair and sustainable for everyone.

CLIMATE CHANGE MITIGATION

Reducing greenhouse gas emissions, primarily through replacing fossil fuels with renewable energy sources.

CLIMATE CHANGE ADAPTATION

Actions people and communities take to adjust to the effects of climate change, like building flood defenses, planting drought-tolerant crops, or creating early-warning systems for storms.

**Figure 1**

This collective investment covers the financing required for **climate-resilient development (CRD)**. To enable CRD, 193 country governments agreed to speed up two kinds of climate action. The first is **climate change mitigation**, and the second is **climate change adaptation**. These climate actions go along with the UN's 2030 **sustainable development goals (SDGs)**, which call for working together to fight climate change and protect people and the planet. Climate change will require massive amounts of targeted financing over the next several decades to address CRD.

Trillions of Dollars are Needed Annually for Mitigation Investments

Other articles in *Frontiers for Young Minds* elaborate on scientifically proven reasons for global warming and climate change, especially rising greenhouse gas emissions from fossil fuels and **deforestation** (see [this collection](#) for more details). The urgent challenge is to reduce (mitigate) such emissions drastically, which requires trillions of US dollars in investment every year. We must stop using and burning fossil fuels (oil, coal, and gas) and try to power our homes, transport, and industries with low- or zero-carbon renewable energy sources such

DEFORESTATION

Cutting down large areas of trees and forests, which can harm animals, people, and the environment.

as solar, wind, geothermal, and green biomass energy. We also need to reduce deforestation (see [this paper](#)).

Billions of Dollars are Needed for Adaptation Funding

At the same time, countries need to improve their ability to deal with the impacts of ongoing global warming. We must speed up such adaptation because global warming from a past century of emissions already in the Earth's atmosphere cannot be reversed. Adaptation requires billions of US dollars annually. One method of adaptation is to design our cities and infrastructure better, to withstand the impact of rising climate risks like increased rainfall and flooding. For example, increasing storm water drainage into rivers and lakes can limit urban flooding. Another method is to protect poorer people from catastrophic climate events and shocks such as floods and droughts by providing universal access to food, basic services like clean water and energy, financial support, and affordable insurance.

Billions of Dollars are Needed for Loss and Damage

Despite our best efforts, some unavoidable risks of climate change will remain, requiring special targeted funds to be set aside to compensate poor communities for loss and damage—communities that had nothing or very little to do with causing past global warming and climate change and its future effects. Wealthier countries have recently agreed to compensate poor communities and countries for the unavoidable and irreversible risks of rising damages caused by global warming, such as storms, floods, droughts, sea-level rise, and other negative impacts. The international community has agreed to put such a fund into action, although it remains very small.

All of us, from local communities to national governments, must actively choose all these options to improve the current unsustainable situation. But it is expensive—these changes need to be backed by serious global funding that is equitably distributed, so that poorer countries can meet their development needs and climate goals. For instance, nearly 500 million people in sub-Saharan Africa still have no access to clean energy. They are heavily reliant on cutting trees and burning biomass, charcoal, or fossil fuels, while it is hard for them to get private investments because lenders see them as too risky.

DO WE HAVE THE MONEY?

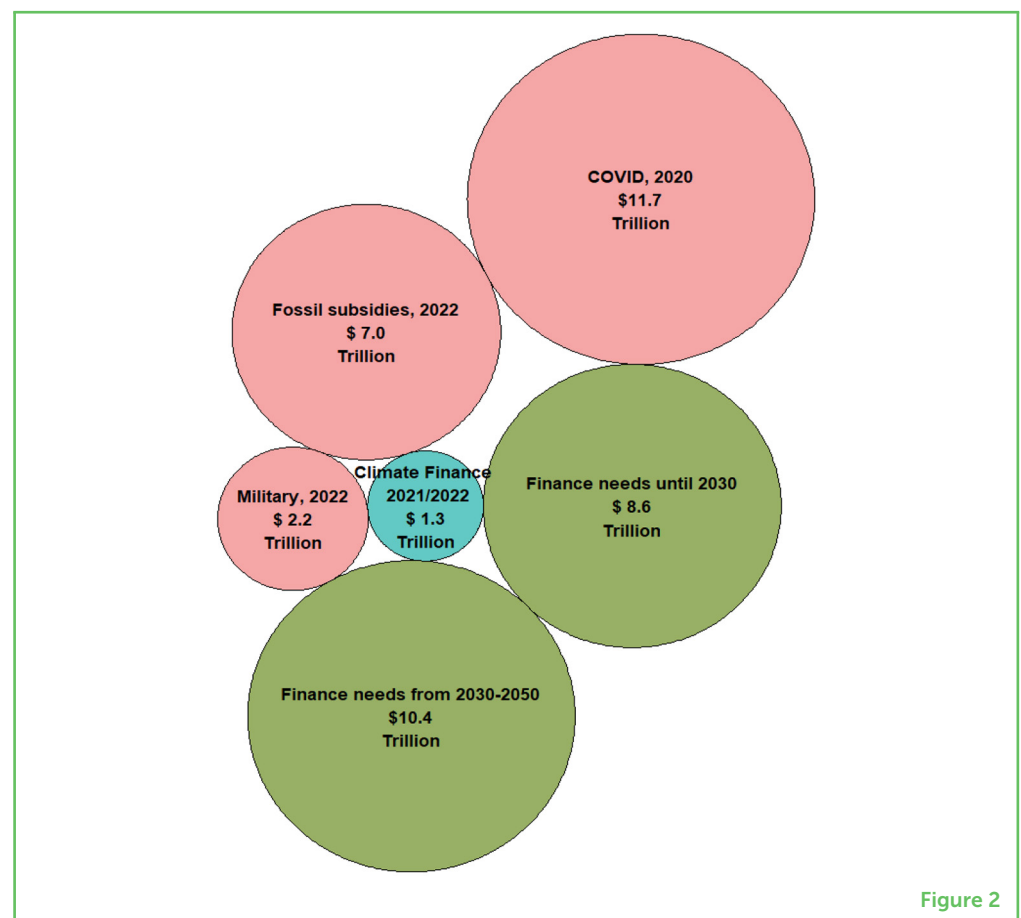
The world is running desperately short on climate finance. In 2021/2022, about \$1.3 trillion was used for climate projects, which is more than twice what was spent in 2019. But experts say we need a lot more, about \$8.6 trillion every year until 2030, and about \$10.4 trillion until 2050, adding up to about \$250 trillion in total. Right now, we are only covering one-fifth of what is needed. While adequate climate

finance is lacking everywhere, not surprisingly, its biggest shortfall is in developing countries that need it the most.

While this seems like a very large number, the world spends much more on many other things. For example, we continue to spend more on new fossil fuels projects (several trillion dollars a year) than we do on renewable energy. We also spend more on wars, and on fossil fuel infrastructures, such as cars, trucks, housing, and cities (Figure 2). The developed countries have the most money but are falling well behind their own obligations to reduce greenhouse gas emissions, and to meet their promises to help developing countries financially (a long-term target of \$1.3 trillion a year and some \$200–300 million a year in the near term).

Figure 2

How the current and future needs of climate finance compare with other major costs. The blue circle shows how much we spent per year on climate finance during 2021 and 2022. The pink circles show how much was spent on fossil subsidy (government financial support), military, and responding to COVID-19. The green circles show how much we need to spend each year for climate finance up to 2030, and then up to 2050. Amounts are in US dollars (Data sourced from [Climate Policy Initiative](#)).



CHALLENGES, BARRIERS, AND SOLUTIONS TO GLOBAL CLIMATE FINANCE

The challenge is to overcome these barriers through greater international cooperation. Nations do not want to move money abroad, and companies who want to make profits do not wish to invest in developing countries, which they see as a risk to their money. Many solutions are possible.

PUBLIC GUARANTEES

A promise from the government to cover some financial losses if a project fails. This safety net lowers risk so investors are more willing to fund climate projects.

GREEN LABELING

Labeling that identifies a certain product or service as less harmful to the environment than other similar products or services.

Switching investments into renewable energy instead of fossil fuels is the easiest. This does not require large public grants (government money given for free), since it can be done by creating better opportunities and by setting government rules that encourage private companies to join in. New technologies and falling costs could speed up this transition. For example, solar energy use is increasing across the world thanks to falling costs of solar panels and many incentives being provided by governments to speed up this change—from China and India, to the European Union, and US states like California. During this transition, the biggest need is for easier access to long-term finance for energy-efficient infrastructure and buildings. Lots of money is needed for this: between \$15–30 trillion over a decade. But we could fill this gap by using just 2.4 percent of global savings annually [3].

Second, we need to make it easier for money to be channeled to developing countries in creative ways, through new financial instruments, such as **public guarantees**. Nearly three-quarters of global climate finance currently stays in high-income countries [3], while low-income countries such as in sub-Saharan Africa receive less than 5 percent of global climate finance flows.

Third, poorer nations need money to rebuild after climate disasters and to protect themselves for the future. This money can come from richer countries by raising some global betterment taxes (fees on polluting industries).

To reach these solutions, the world's governments and institutions like the World Bank will have to come together. Rich nations need to deliver on their promise of \$200–300 billion of public financial assistance each year, and raise it to \$1.3 trillion a year rapidly (as was agreed after failing to meet the previous target of \$100 billion a year in the past decade). For example, creating reliable **green labels** can help everyone easily identify real climate-friendly projects. Furthermore, when governments pass strong laws supporting clean energy, investors feel confident and are more willing to fund new projects.

TURNING IDEAS INTO ACTION

We have more financial resources today than ever before in human history—enough to meet all the climate investments we need. But those funds are just not put into the right places and purposes fast enough to deal with the climate change issue in a fair way. We know what works, and we have many options to scale up climate action. Together, we must commit to serious financial and governance reforms to accelerate a transition to a low-carbon economy. Our climate is our future.

AI TOOL STATEMENT

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

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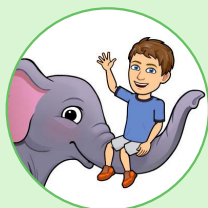
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YOUNG REVIEWERS



CALEB, AGE: 11

Caleb enjoys all things science, animals, reading, exploring the outdoors, playing the violin, and curling. When he grows up, Caleb wants to be an architect focusing on eco-friendly and animal oriented buildings. He has tried four sports and is always up for trying something new. Caleb's favorite foods are macaroni and cheese or lasagna. He enjoys traveling and would like to go to an animal reserve.



ELAINE, AGE: 14

I am Elaine, an 8th grader interested in topics that piques my curiosity. As someone who enjoys creative pursuits, I dance, but my greatest passion is writing as it allows me to share my imagination. Using facts and opinions, I can create a variety of ideas for stories. I also love asking questions, seeking answers, and sharing what I learn with others, whether it is through a conversation between friends or debates in school.

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Dipak is a distinguished fellow at TERI, India, and an economist specializing in climate change, finance, and economic development. He has contributed to major IPCC reports and the UNEP Emissions Gap Report. He was a founding board member of the Green Climate Fund and principal economic adviser to India's Ministry of Finance. He worked at the World Bank for nearly 30 years, focusing on economic policies and investments in various regions. Educated at Delhi and Cambridge Universities, he has received prestigious awards and published over 100 works on climate finance and agriculture.



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