Toolkit for Youth on Adaptation & Leadership

MODULE 1

UNDERSTANDING CLIMATE CHANGE

GLOBAL CENTER ON ADAPTATION

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Acknowledgments

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Acronyms

ASAP	The Adaptation for Smallholder Agriculture Programme
CBA	Community based adaptation
CCA	Climate change adaptation
CIS	Climate Information Services
COP	Conference of the Parties
COY	Conference of Youth
CRA	Community Risk Assessment
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EAC	East Africa community
ECOWAS	Economic Community of West African States
GCF	Green Climate Fund
GHGs	Greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
JPA	Joint Principles for Adaptation
LAP	Local Adaptation Plans
LDCF	Least Developed Countries Fund
LLA	Locally Led Adaptation
MDGs	Millennium Development Goals
NAP	National Adaptation Plan
NAPA	National Adaptation Programs of Action
NDC	Nationally determined contribution
NGOs	Non-Governmental Organizations
PPCR	Pilot Program for Climate Resilience
PSP	Participatory Scenario Planning
SCCF	The Special Climate Change Fund
SDG	Sustainable Development Goal
SIDS	Small Islands Developing States
SMART	Specific, Measurable, Achievable, Relevant and Time-bound
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

WELCOME TO THE TOOLKIT FOR YOUTH ON ADAPTATION & LEADERSHIP!

Who is this toolkit for?

Climate change is reshaping the world young people have inherited and they will bear the costs in the coming decades. However, young people are often excluded from taking on leadership roles and engaging in decision-making activities related to climate change adaptation. This Toolkit for Youth on Adaptation & Leadership equips young people with the knowledge and skills to engage in climate adaptation policy, advocacy and action. This toolkit uses the terms "youth" and "young people" to refer to people between 15 and 35 years old.

What you will learn

The toolkit covers essential materials and offers practical guidance for how you, as a young person, can take part in adaptation policy processes, lead advocacy campaigns, and approach adaptation with an entrepreneurial mindset. It provides tools for designing and implementing your own climate change adaptation actions so that you can be part of the solution to the climate crisis.

The "Toolkit for Youth on Adaptation & Leadership" is a project under the Global Center on Adaptation Youth Leadership Program, developed by the CARE Climate Justice Center with the financial support of Norad. It came together with input from young people who, like you, are concerned about the impacts of climate change and have faced challenges when advocating and taking adaptation action.

How to use the toolkit

The toolkit includes eight modules:

1 Understanding climate change

2 The basics of vulnerability and climate change adaptation

3 Vulnerable groups and climate adaptation planning

4 Learning from youth-led climate adaptation solutions: African case studies

5 Developing soft skills for youth leadership in adaptation

6 Engaging in climate adaptation policies: local, national, and international

7 Designing and implementing your adaptation advocacy strategy

8 Designing your adaptation action

Each module contains four sections:

Warm Up is the place to start. This provides an overview of the module's key concepts, based on the latest research and best practices. It highlights tools you can use to apply what you have learned, and develop your leadership skills.

Heat Wave will deepen your understanding. Find links to supporting scientific research, important publications, and tools for exploring and applying key concepts.

Bright spark is the place to get inspired. Read case studies, watch videos, and listen to podcasts about young climate leaders to get fired up for your own climate change actions!

Cool Down is your last stop. Here, you have space to test your knowledge (with a short quiz) and consider how you can apply what you have learned to your own climate action.

MODULE 1
UNDERSTANDING CLIMATE CHANGE

Climate change is one of the greatest threats and injustices of our time. It threatens the existence of all humans and living things. While climate change affects everyone, it does not affect everyone equally. There is so much to learn about climate change. This module provides you with key information about the causes of climate change, the impact it is having globally, and the responses needed to address the climate crisis. It sets the scene for the subsequent modules in this toolkit.

What will I learn?

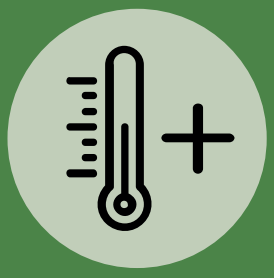
By the end of the module, you will:

- Have gained an understanding of what causes climate change.
- Understand and be able to explain the impacts of climate change globally.
- Know what responses are needed to address the climate crisis.

Glossary

Term	Definition	Source
Climate	Climate refers to how the atmosphere "behaves" over relatively long periods of time (e.g. an average of the past 30 years).	CARE (2022). Introduction to climate change #1: Understanding the climate crisis.
Climate change	Climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties that persist for an extended period, typically decades or longer. The term "climate change" often refers specifically to anthropogenic climate change (also known as global warming). Anthropogenic climate change is caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes.	IPCC(2021). Glossary of terms.
Climate change adaptation	In human systems, climate change adaptation refers to the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, it refers to the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. In practical terms, adaptation refers to the changes people and institutions make to adjust to observed or projected changes in climate. It is an ongoing process that aims to reduce vulnerability to climate change. Retrieved from: CARE (2019). Climate Vulnerability and Capacity Analysis Handbook: careclimatechange.org/cvca/	IPCC(2021). Glossary of terms.
Climate change mitigation	Climate change mitigation refers to human interventions to reduce emissions or enhance the sinks of greenhouse gases (such as forests or wetlands).	IPCC(2021). Glossary of terms.
Climate justice	Climate Justice is about a future in which the poorest and most marginalized people have significantly improved their wellbeing and can enjoy their human rights due to increased resilience to climate change, increased equality and a global temperature rise that is limited to 1.5°C.	CARE (2020). Climate Justice Strategy 2030.
Climate crisis	Climate crisis is a term increasingly being used by UN agencies, scientists, media and civil society organizations to better reflect the urgency and the severity of the emergency we are facing. It reflects the fact that the climate is changing as a result of human behavior, and that it has and will have dramatic effects on women, men, girls and boys and their environment.	CARE (2022). Introduction to climate change #1: Understanding the climate crisis.

Term	Definition	Source
Effects of climate change	The direct effects of climate change that can be observed by rising maximum and/or minimum temperatures, rising sea levels, ocean temperature, changing rainfall patterns, increase in (heavy) precipitation, glacier melting, heatwaves, cyclones, drought, etc. and that in return lead to more climate related hazards. The effects of these changes on humans and natural environment can be seen in e.g. increased hunger and poverty as a result from failed harvest due to droughts/extreme rain; Health risks as a result from heatwaves; Increased pests from change in temperature; Loss of biodiversity, as flora and fauna cannot adapt to a new climate reality; Reduction in fish from coral bleaching as a result from ocean acidification.	CARE Vision 2030 Core Global Indicators for Measuring Change
Greenhouse gases (GHGs)	GHGs are the atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N20). Less prevalent --but very powerful -- greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).	UNFCCC Glossary
Intergovernmental Panel on Climate Change (IPCC)	IPCC is the United Nations body for assessing the science related to climate change. The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options	IPCC
Loss and damage	Loss and damage is a general term used in UN climate negotiations to refer to the consequences of climate change that go beyond what people can adapt to, or when options exist but a community doesn't have the resources to access or make use of them	World Resources Institute
Net zero	Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, by oceans and forests for instance	United Nations Net-Zero Coalition.
Weather	Weather describes short term natural events - such as fog, rain, snow, blizzards, wind and thunder storms, tropical cyclones, etc. - in a specific place and time.	Definition from World Meteorological Organization (WMO)



Warm Up

The difference between weather and climate

Earth is getting hotter, largely because of human activities like burning coal, oil and gas. As temperatures rise, the climate is changing. While many people think climate change mainly means warmer temperatures, it's much more than that. The Earth is a system, where everything is connected. A warming planet has consequences that reach across the globe, including intense droughts, water scarcity, catastrophic storms and severe flooding.[1]

To understand climate change, it's important to distinguish between weather and climate.

Weather involves short-term changes. If it's raining on Friday morning but the sun is out by lunchtime - that's a change in the weather. In technical terms, weather is the atmospheric conditions experienced over short periods of time (such as hours or days) at a particular location.[2]

Climate involves long-term changes. If an older person tells you that 40 years ago there was a lot more rain in a particular month where they live than today, they could be talking about a change in climate. Climate is how the atmosphere "behaves" over longer periods of time (an average of the past 30 years), which in turn affects how the rest of the climate system behaves.[3]

Climate change refers to the long-term changes in the Earth's climate. It causes weather patterns to be less predictable, affecting the balance of Earth's precious ecosystems. These changes persist for long periods of time, typically decades or more.[4]

Climate change can be due to natural processes, such as changes in how much energy the sun produces and volcanic eruptions. However, humans are changing the climate by pumping heat-trapping gases from burning fossil fuels into the atmosphere. This is called human-induced or **anthropogenic climate change**[5]. This impact has been so big, and the consequences so dire, that organizations like the United Nations say we are facing a "climate emergency."[6]

The greenhouse effect: making our planet a livable home

Life on Earth is an incredible thing. And it's made possible by the interplay between two key elements: the Sun, which produces heat from 150 million kilometers away, and our atmosphere, the band of air around our planet.

The atmosphere contains several gases. Together, the oxygen we breath and nitrogen make up 99% of the atmosphere. A small portion (0.04%) of the atmosphere is made up of other gases, some of which are known as **greenhouse gases (GHGs)**.

These GHGs allow the Sun's energy to enter the atmosphere but prevent it from leaving, by trapping it close to the Earth's surface. Think of them as a blanket wrapped around the Earth, keeping the planet warmer than it would be without the gases. This is called the **greenhouse effect** (explained in Figure 1).

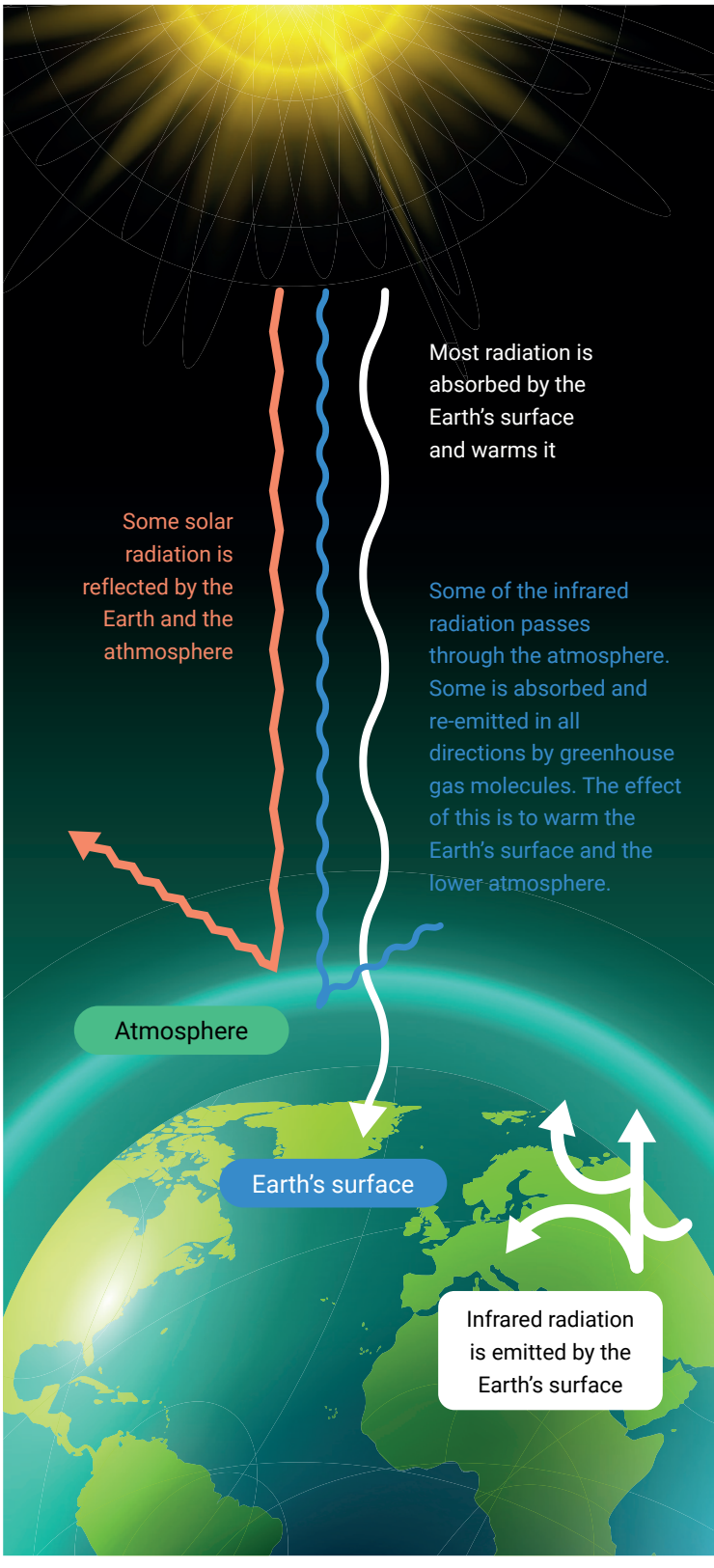


Figure 1: The natural greenhouse effect. The Earth absorbs some of the energy it receives from the sun and radiates the rest back toward space. However, greenhouse gases absorb some of the energy radiated from the Earth and trap it in the atmosphere. These gases essentially act as a blanket, making the Earth's surface warmer than it otherwise would be. Source: EPA, 2012.

The greenhouse effect keeps the planet at a comfortable temperature for us to live. Without it, Earth would be too cold for humans to survive, with an estimated average temperature of –18 °C. Freezing! (Figure 2).

Humans are changing the climate

The greenhouse effect occurs naturally. However, human activities are changing the Earth's climate. As we burn fossil fuels, like coal and oil, we are putting more GHGs into the atmosphere. Too many of these gases cause Earth's atmosphere to trap more and more heat. The Earth is warming up. Research shows that each of the last four decades has been warmer than any previous decade since 1850. The world is warming faster than at any time in at least the last two thousand years.[8]

How the concentrations of key GHGs have been increasing

Since the Industrial Revolution, which saw the introduction of machinery for manufacturing in the 1800s, humans have been putting an increasing amount of GHGs into the atmosphere. Let's look at some of the main GHGs and how they have been increasing.

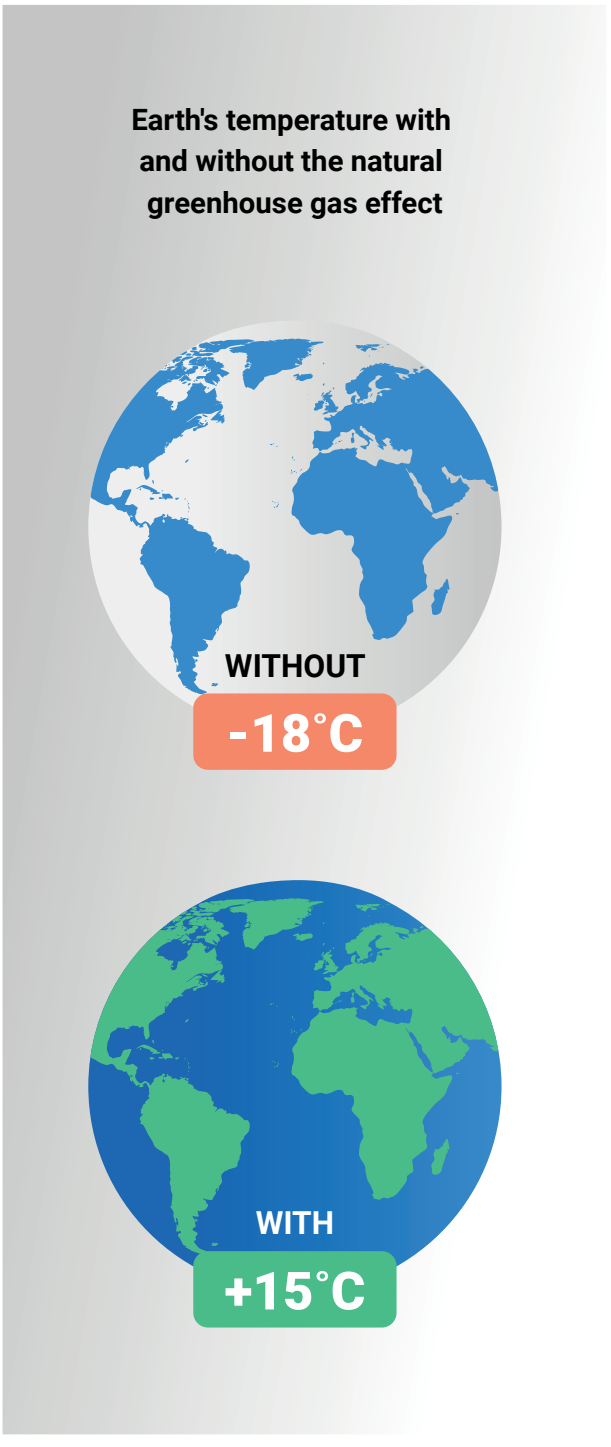


Figure 2: How the Earth's temperature would be with and without the natural greenhouse effect. 15 °C is the Earth's "normal" average temperature. Source: André, C. 2022.

EXPLAINER: Scientists measure atmospheric concentrations of GHGs **in parts per million (ppm) or parts per billion (ppb)**. For example, a concentration of 1 ppm for a particular gas means there is one molecule of that gas in every 1 million molecules of air. A concentration of 1 ppb for a gas means there is one molecule of that gas in every 1 billion molecules of air.

Carbon dioxide

Carbon dioxide (CO_2) is the main GHG emitted by human activities. It is released by burning fossil fuels like coal, natural gas and oil. It also comes from natural sources and is produced when vegetation decomposes and during wildfires. It can also be released from the oceans.

Since the Industrial Revolution, concentrations of carbon dioxide in the atmosphere have been rising rapidly. As you can see in Figure 3, which shows the global average concentrations of carbon dioxide in the atmosphere over the past 800,000 years, there has been a rapid rise in concentrations over the past few centuries, and in recent decades particularly.

Before the Industrial Revolution, atmospheric concentrations of carbon dioxide did not rise above 300 ppm. This changed when humans started burning fossil fuels. Today's concentrations are the highest they have been for at least 800,000 years. (Note: while there are fluctuations over hundreds of thousands of years, these were caused by changes in the Earth's orbit around the sun).[10]

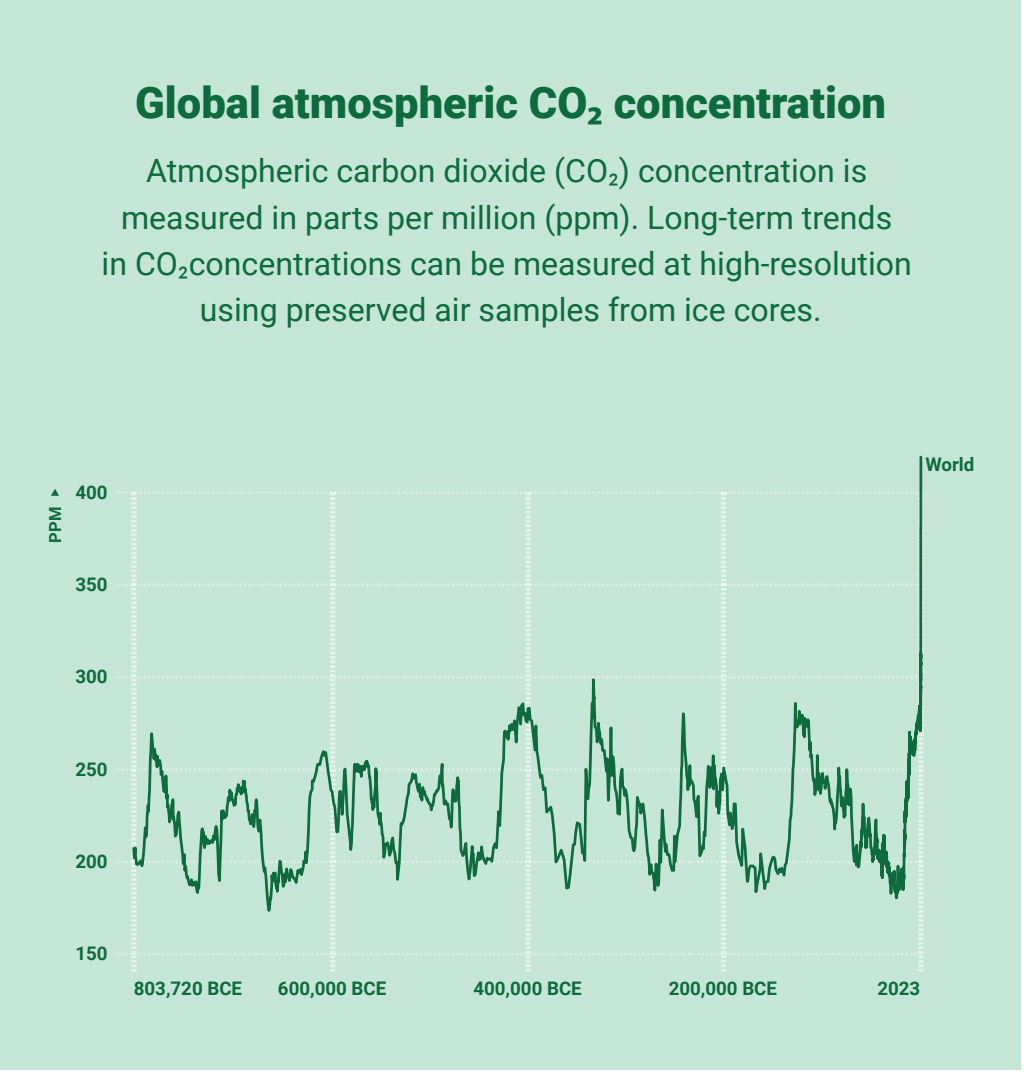


Figure 3: Concentration of carbon dioxide in the atmosphere for the past 800,000 years. (BCE stands for Before the Common Era). Source: Ritchie et al., 2020.[11]

Methane

Methane accounts for about 20 percent of global emissions and is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere.[12]

Human activities, such as agriculture, burning oil, gas and coal for energy, and increased production of waste from homes and businesses, put methane into the atmosphere. It also comes from natural sources, such as wetlands.

In Figure 4, we see how methane concentrations have more than doubled since the year 1900!

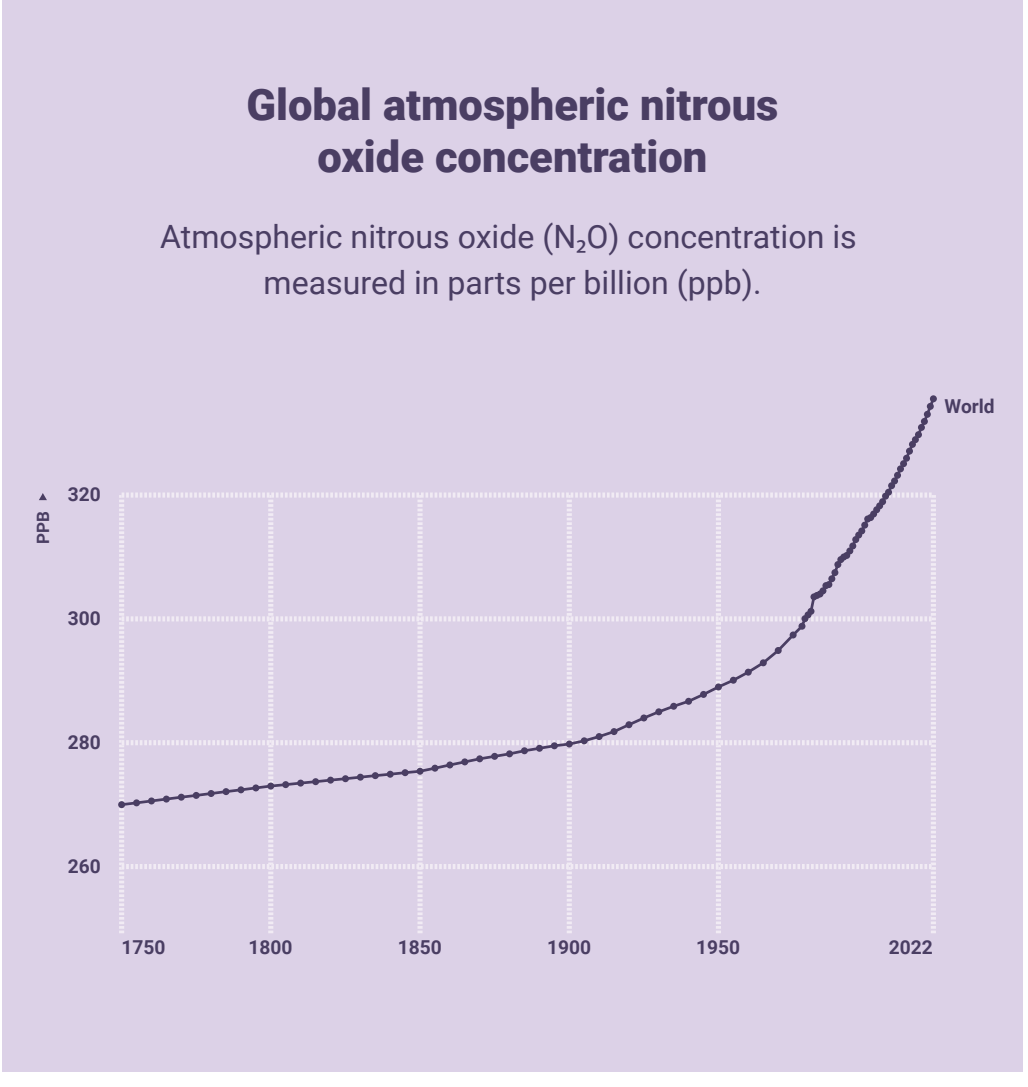


Figure 4: The change in methane concentrations in the atmosphere since 1750. Methane concentrations have been increasing rapidly in recent centuries. Source: Ritchie et al., 2020.[13]

Agriculture is the primary source of nitrous oxide emissions. Credit: Jean Beaufort/Public Domain Images.

Nitrous oxide

Carbon dioxide and methane are the largest drivers of anthropogenic climate change. But nitrous oxide also plays a role. Commonly known as "laughing gas," it is a potent GHG that is 300 times more powerful than carbon dioxide. Globally, about 40% of total nitrous oxide emissions come from human activities. Agriculture is the primary source.

How do we know climate change is linked to rising emissions?

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations body, made up of top scientists from 196 countries, that assesses the science related to climate change. It releases regular reports about climate change and its implications and future risks.
In its 2021 report on the physical science basis of climate change, the IPCC did not mince its words about the links between human activities and climate change. The report opens with these words: "It is unequivocal that human activities have heated our climate. Recent changes are rapid, intensifying, and unprecedented over centuries to thousands of years."
To learn about past temperatures and carbon dioxide concentrations, scientists have analyzed the chemistry of water molecules and air bubbles that have been trapped for centuries in ice layers in Antarctica and Greenland. They have found that carbon dioxide concentrations correlate positively with past temperatures, meaning that samples with higher carbon dioxide concentrations also date from periods when temperatures were higher.[18]

Energy is the main source of GHG emissions

Humans produce GHGs in many ways. But the main culprit is burning fossil fuels to create energy. As you can see in Figure 5, almost 75% of emissions come from energy, while close to 20% come from agriculture and land use (this proportion increases when we consider the food system as a whole and include processing, packaging, transport and retail). The remainder come from industry and waste.[19]

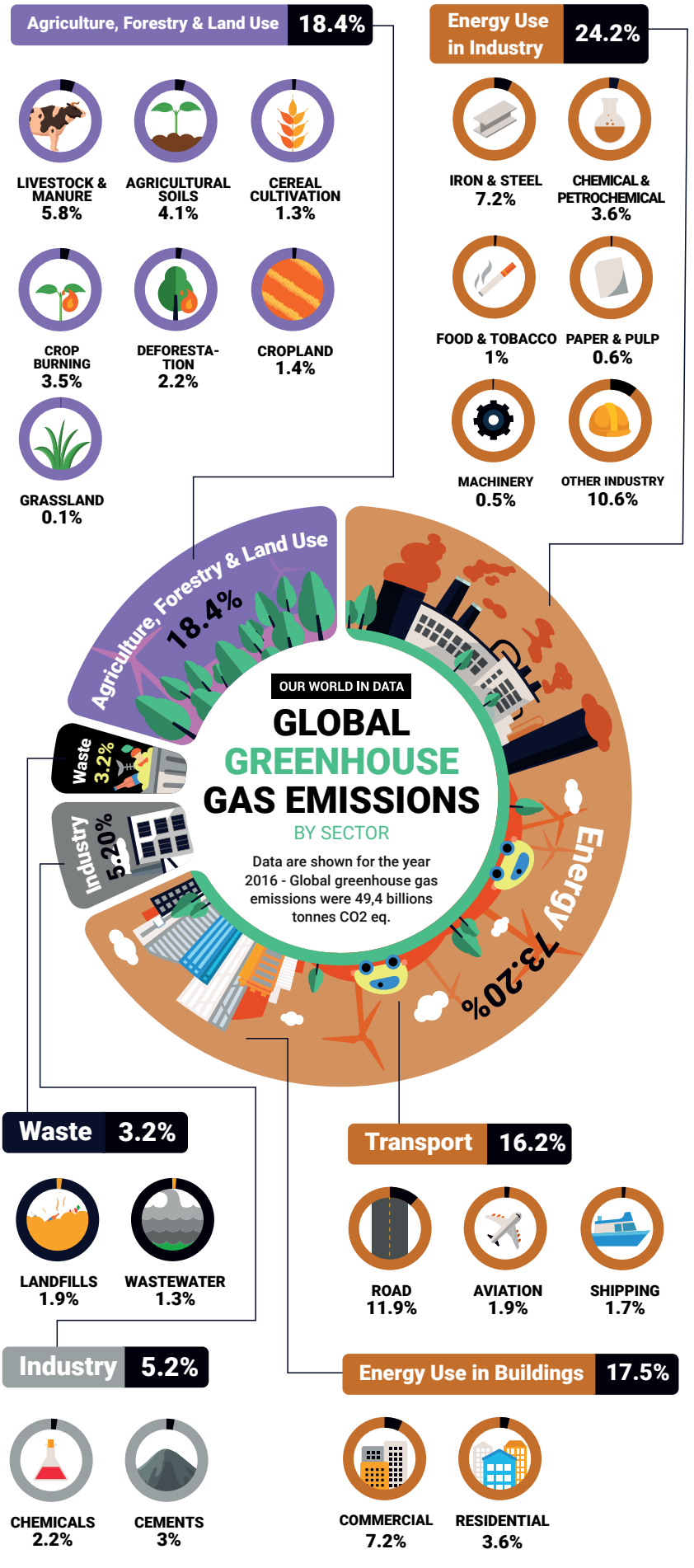


Figure 5: CARE (based on data from Our World in Data[20] and WRI).

Developed countries are responsible for most emissions

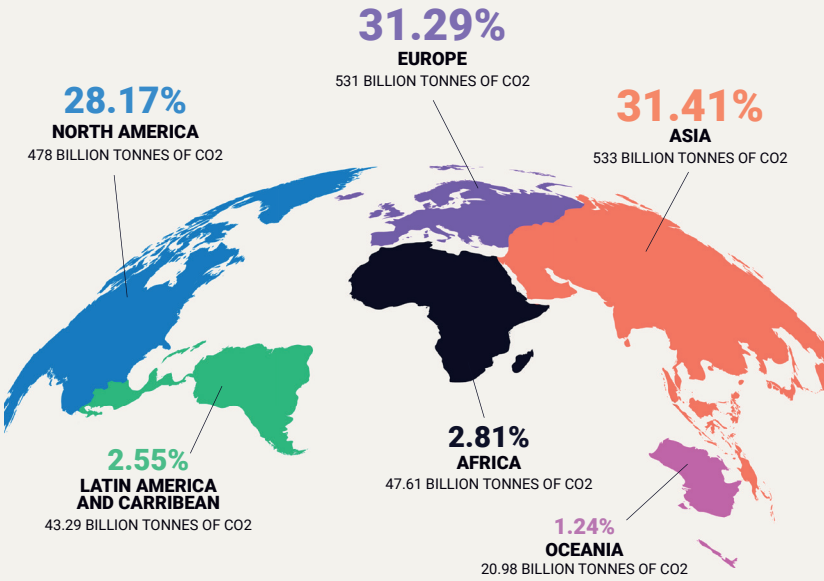
Countries in Europe, Asia and North America are responsible for the largest contribution of GHGs in the atmosphere. Regions with developing countries, such as Africa, Latin America and large parts of Asia, are only responsible for a small proportion of these emissions (Figure 6).

CUMULATIVE CO2 EMISSIONS

FROM 1751 TO 2020 BY REGIONS

This graph presents the cumulative carbon dioxide emissions (CO2) over the period 1751 to 2020 per region detailing emissions of the largest emitters.

It only includes the emissions of countries that have emitted more than 1% except for Africa and Latin America where the 2 largest emitters have been included to give an idea of their cumulative emissions.



ASIA	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
China	235.56	13.88%
Japan	65.63	3.87%
India	54.42	3.21%
South Korea	18.34	1.085%
Iran	18.91	1.11%
Others	140.14	8.26%

NORTH AMERICA	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
USA	416.72	24.56%
Canada	33.58	1.98%
Mexico	20.08	1.18%
Others	7.62	0.45%

AFRICA	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
South Africa	21.16	1.25%
Nigeria	3.91	0.23%
Others	22.54	1.33%

EUROPE	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
EU-27	290	17.09%
Russia	115.34	6.80%
Ukraine	30.56	1.80%
United Kingdom	78.16	4.61%
Others	16.94	1.00%

LATIN AMERICA AND CARRIBEAN	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
Brazil	14.2	0.84%
Argentina	8.43	0.50%
Others	20.66	1.22%

OCEANIA	Billion Tonnes of CO2 (1751-2020)	Share of global cumulative emissions
Australia	17.4	1.03%

Source: Our World in Data, Cumulative CO_2 emissions, 2020
https://ourworldindata.org/grapher/cumulative-co-emissions

Figure 6: Cumulative carbon dioxide emissions by countries from 1751 to 2020. Source: CARE International (using data from Ritchie et al., 2022).

Since carbon dioxide added to the atmosphere can stay there for centuries, historical emissions are just as important as – or even more important than – current emissions. This means that although China is the biggest emitter today, historically the United States and Europe are responsible for half of the carbon dioxide emitted since pre-industrial times.

The richest 10% of the world's population are responsible for more than half of global carbon emissions, according to Oxfam. And the richest 1% is responsible for twice the emissions of 3.1 billion people (measured between 1990 and 2015).[21]

Increasing emissions are changing our climate

We are living in a changing climate. Already, the world is witnessing widespread changes as temperatures rise, glaciers melt, and droughts and floods intensify. The impacts of climate change are expected to worsen, which makes it crucial to take climate action now.

Flooding in Bangladesh. Credit: Moniruzzaman Sazal/Climate Visuals Countdown.

The severity of climate change impacts depends on how much and how quickly the world warms. For example, climate-related risks are higher if the world warms by another 1.5 °C above pre-industrial levels by the end of the century. However, they will be even worse if the temperature rises by 2 °C. Climate change also affects regions differently. For example, Africa is warming faster than the global average over both land and oceans.[23]

The climate is changing, and more change is on the way

Scientists with the IPCC have studied how climate change is already affecting the world. They use sophisticated computer models to predict how climate change will impact the planet in future. Below, we look at some of the main changes.

Rising temperatures

The IPCC estimates that human activities have caused the Earth to warm by approximately 1.1 °C above pre-industrial levels by 2020.[24] Figure 7 shows how the temperature has been rising since 1880.

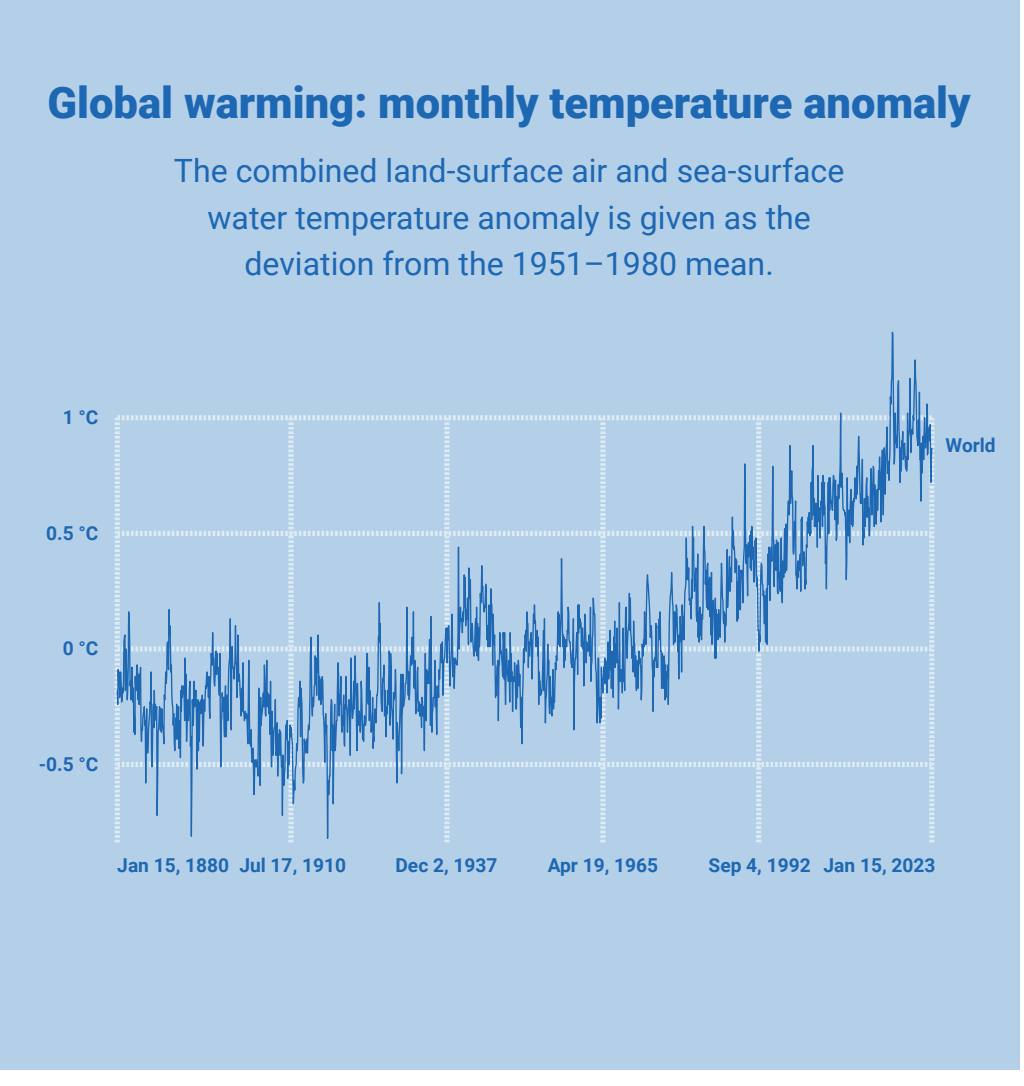


Figure 7: Global warming monthly temperature anomaly from 1880, showing a rapid increase in the Earth's average temperature. Source: Ritchie et al., 2020.[25]

EXPLAINER: A **temperature anomaly** is the difference between an observed temperature and an average, or baseline, temperature. The **baseline temperature** is typically calculated by averaging 30 or more years of temperature data. A **positive anomaly** is when the observed temperature is warmer than the baseline. A **negative anomaly** is when the observed temperature is cooler than the baseline.[26]

Different parts of the world are warming at different rates. The polar regions have experienced the largest increase in temperature (in relation to the global average) while North Africa has experienced the greatest increase in Africa.

Different scenarios are expected to play out depending on how the world deals with emissions.[27] These include situations where carbon dioxide emissions:

(a) Are reduced to a level that allows global warming to be kept to 1.5 °C by 2050 (optimistic scenario).
(b) Are cut rapidly, but not fast enough to limit warming to 1.5 °C by 2050. Temperature is only stabilized at 1.8 °C.
(c) Remain the same as they are now but start to decrease after 2050 and **net zero emissions** are not reached until 2100. This results in global warming of 2.7 °C (middle-of-the-road scenario).
(d) Reach double those of current levels in 2100. This results in a temperature increase of 3.6 °C above pre-industrial levels (dangerous scenario).
(e) Double current levels by 2050. This results in global warming of 4.4 °C above pre-industrial levels ("taking the highway" scenario).

EXPLAINER: Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, by oceans and forests for example.[28]

These different scenarios for temperature rise result in different levels of warming across different parts of the world. As you can see from Figure 8, warming by 1.5 °C keeps temperature rise low in most parts of the world, even though the polar regions experience the largest change in average temperature.

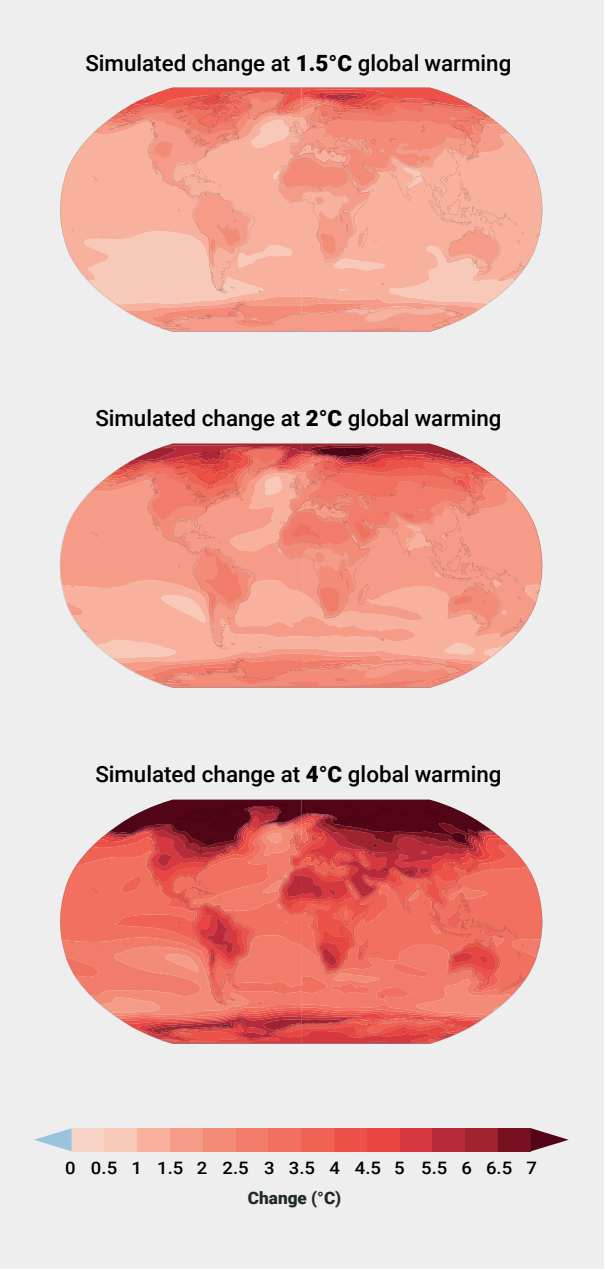


Figure 8: Annual mean temperature change (°C) relative to 1850–1900. Polar regions will experience an even higher increase in average temperature. Source: IPCC, 2021.[29]

If we do nothing to curb emissions, we are on a dangerous path. If the global community does not decrease emissions and follow current climate change policies, global warming is expected to reach 2.6 °C to 2.9 °C above pre-industrial temperature levels by the end of the century.

As it stands, the world needs stronger commitments to climate action. Current policy commitments are unlikely to keep emissions at a level required to limit warming to 1.5°C and will also make it harder after 2030 to limit warming to below 2°C (Figure 9).

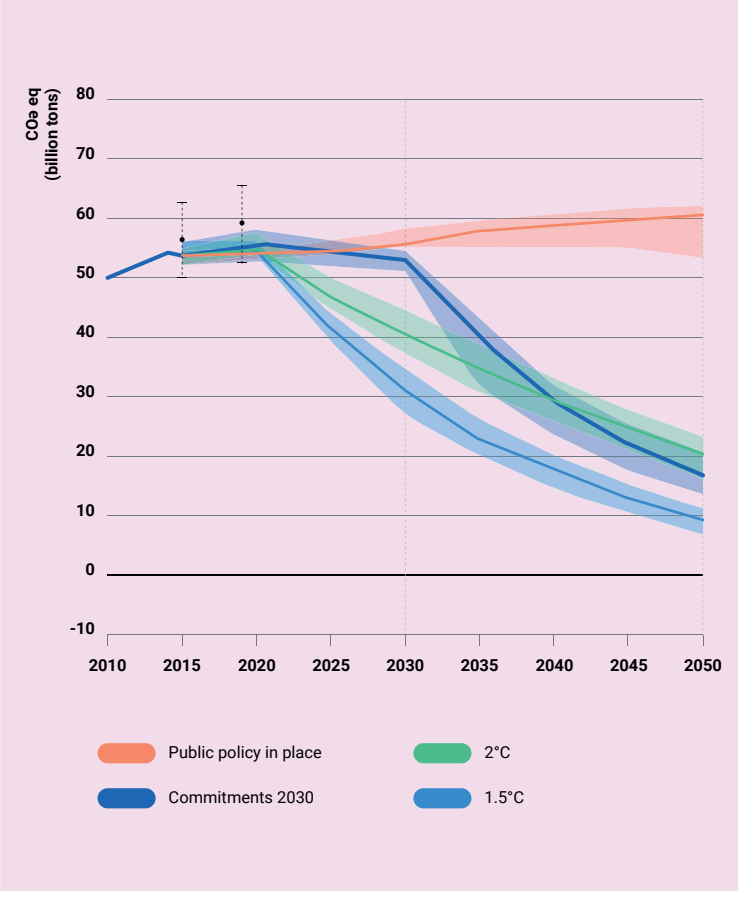


Figure 9: Projected global GHG emissions over 2015-2050 based on current policies and commitments by countries. Source: Adapted from chart produced by Dr. Valérie Masson-Delmotte.[30]

Changing rainfall patterns

With changing rainfall patterns, dry areas are expected to become drier. In future, the Mediterranean, Southern Africa, Southwest Australia, Southern Chile, the West Coast of Mexico, and much of the tropical and subtropical Atlantic Ocean are likely to have less precipitation.

This drying will make droughts more severe. At the same time, models show that when rain does fall, it will become more intense nearly everywhere, increasing the risk of flooding.

Changes in precipitation also impact soil moisture, which affects farmers' ability to grow crops. Parts of the world, such as Central Africa and East Africa, will experience increasing soil moisture levels under all warming scenarios. Others, such as Latin America, will experience drier soil.

Rising sea levels

Since 1990, the sea level has risen by about 80mm globally. The increase is not uniform across the world. The sea has risen higher in some areas than in others. This is mainly due to differences in thermal expansion and salinity (the levels of salt in ocean water) in different places.

EXPLAINER: Sea level rise is caused by several different processes, including melting ice. A big contributor is rising global temperatures, which heat seas and cause **thermal expansion** of water. Thermal expansion happens when water gets warmer, which causes the volume of the water to increase. About half of the measured global sea level rise on Earth is from warming waters and thermal expansion.[33] **Melting ice** can alter the salinity (salt levels) of seawater as freshwater is added to the ocean. Changes in salinity affect seawater density, which can change major ocean currents that transport heat through the ocean driven by the currents, stimulating more climate change.[34]

By 2100, sea levels could rise by up to 1.1 meters, according to the IPCC.[35] If we fail to properly address climate change and cut emissions, this could trigger an irreversible sea level rise of several meters by 2300.[36]

Sea level rise creates big problems for coastal areas, mainly through flooding. It has other impacts too. As the rising sea crawls farther and farther up the shore, in many places it will seep into the freshwater in the ground that many coastal areas rely on for drinking water, contaminating these.

A man salvages bricks from his house as the water encroaches. Shariatpur, Bangladesh.
Credit: Moniruzzaman Sazal/Climate Visuals Countdown.

Rising sea levels can negatively affect farmers. The intruding sea can make groundwater used for irrigation saltier and change the soil quality, making it harder to grow crops. Rising sea levels also negatively impact biodiversity in coastal areas and can make the damage from tropical cyclones worse.[37]

In Africa, sea levels are rising faster than the global average.[38] Sea level rise is likely to continue around Africa, resulting in more frequent and severe coastal flooding.

Melting glaciers

Globally, glaciers are disappearing as temperatures rise. more than 600 glaciers have disappeared over the past decades, a staggering loss.[39] Even if there is no further warming, many more glaciers will disappear. It is also likely that some mountain ranges will lose most, if not all, of their glaciers.

Africa's glaciers are melting faster than the global average. The total glacial area on Mount Kenya decreased by approximately 44% between 2004 and 2016.[40] Mount Kilimanjaro is also losing its glaciers.

The loss of glaciers has profound impacts, mainly for the people and ecosystems that rely on the rivers fed by glaciers. When glaciers disappear, there is a tremendous impact on the availability of water across the seasons and, thus, for people living along riverbanks. Melting glaciers also contribute to sea level rise.

Worsening extreme events
Climate change is impacting extreme events, unusually severe weather or climate conditions that can have devastating effects.

Heat waves
Climate change is affecting the frequency, intensity and duration of heat waves. It is likely that human influence has more than doubled the probability of the occurrence of heat waves in some places.[41]

Cyclones
In the 21st century, it is likely that the global frequency of tropical cyclones will either decrease or remain essentially unchanged. However, cyclones will likely have higher maximum wind speeds and rainfall rates, making them more destructive.[42]

Droughts
While changes in future precipitation are uncertain, the drying associated with warmer temperatures will become much more widespread. This means droughts are likely to happen more often. The frequency of droughts is expected to double in southern Africa, Southeast Asia and the Mediterranean.[43]

Part of the rapidly receding glacier on the peak of Mt. Kilimanjaro, Tanzania, Africa (2011).

We need to act now

The science shows that climate change is happening and is expected to get worse. This means we need to take action to limit climate change and deal with its consequences. The two main courses of action are called mitigation and adaptation.

Mitigation involves cutting anthropogenic emissions, through actions such as switching from coal-powered energy to renewables. It also includes actions that help natural systems absorb emissions, such as protecting forests, which naturally remove carbon dioxide from the air.

Adaptation involves managing the current and future impacts of climate change. Because emissions are still rising, and climate change is expected to get worse, we need to adapt to protect people and their livelihoods. Adaptation involves actions such as planting drought-resistant crops or implementing early warning systems to communicate about extreme weather with vulnerable communities.

Unfortunately, people in vulnerable communities do not always have the resources to adapt to climate impacts. In the face of flooding, drought and other extreme events, people may lose their homes, livelihoods and loved ones. This is called loss and damage.

EXPLAINER: Loss and damage is a general term used in UN climate negotiations to refer to the consequences of climate change that go beyond what people can adapt to, or when options exist but a community doesn't have the resources to access or make use of them.[44]

In the face of the climate crisis, innovative adaptation actions are urgently needed to limit loss and damage and protect the most vulnerable in society. In the following modules in this toolkit, you will learn about ways that you can take the lead on driving adaptation action in your community and beyond.

Heat Wave

The climate system

READ more about the climate system in this IPCC overview where you will find detailed technical explanations and deepen your scientific knowledge about the climate system.

WATCH this video, Earth's Energy Budget (3:06) to learn more about how the Earth's climate system works.

Causes and effects of climate change

WATCH the video, Why reducing our carbon emissions matters (a little story about climate change) (3:32) to better understand the links between carbon dioxide emissions and rising temperatures.

EXPLORE the Our World in Data website to learn more about current and historical emissions. You can also explore consumption-based emissions on this site.

WATCH the video What is Climate Change? (6:03). The video defines climate change and explains the greenhouse effect and the role of greenhouse gases in our atmosphere. While it explores the consequences of climate change for our environment – such as rising sea levels, more frequent extreme weather, and damage to our ecosystems – it also suggests big and small changes we can make to protect our Earth.

WATCH this short video from National Geographic, Causes and Effects of Climate Change (3:04), to understand more about the causes of climate change and its main impacts. The video describes the greenhouse effect, how it works (such as causing melting of ice caps in the Arctic regions) and the effects of greenhouse gases on the atmosphere and life on the planet.

WATCH the video What Is the Greenhouse Effect? from NASA (2:30), which further explains the greenhouse effect. It shows how energy from the Sun is integrated into the Earth's system and the role of greenhouse gases in raising the planet's average temperature. The video highlights the different sources of greenhouse gases and how researchers monitor these gases to understand how they affect the planet.

WATCH Global temperature anomalies from 1880 to 2017 (0:36). In the video, you can see how temperatures across different parts of the world have increased over a period of 137 years, with some places warming faster than others. You will notice that the Arctic regions are warming faster, which means that ice in these regions is melting, resulting in sea level rise.

READ more about the causes and impacts of climate change and learn about key concepts with NASA's Global Climate Change website.

EXPLORE temperature graphs on the Climate Action Tracker. The IPCC's sixth assessment report says, "Global surface temperature was 1.09 [0.95 to 1.20] °C higher in 2011–2020 than 1850–1900, with larger increases over land (1.59 [1.34 to 1.83] °C) than over the ocean (0.88 [0.68 to 1.01] °C)." But this starts at relatively late values (1850–1900) and over the last 10-year average, so 1.2 °C is a more appropriate description of where we are now.

EXPLORE the UNDP Climate Box toolkit, an illustrated textbook which provides information on climate change science and impacts, as well as solutions, best practices and case studies on how to reduce your personal carbon footprint and adapt to inevitable impacts.

EXPLORE these posters and illustrative material on climate change impacts, mitigation and adaptation from UNDP's Climate Box.

LEARN how to explain climate change in simple terms with the UNDP's useful Climate Dictionary: an everyday guide to climate change.

LEARN about climate change in simple, non-technical terms by reading the IPCC's Climate Change 2021: Summary for All.

Greenhouse gas emissions

LEARN about current and historical emissions with the Our World in Data website. Here you will see information such as the amount of carbon dioxide emissions that have come from different sectors and changes in emissions.

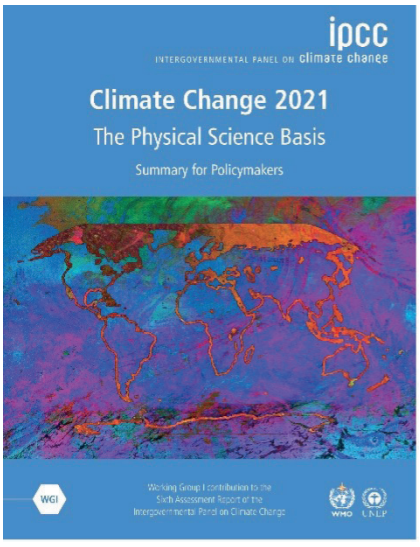
EXPLORE Did you know that there are consumption-based as well as production-based emissions? Consumption-based emissions that are generated through consumption of goods or products. In some instances, these goods or products are not made in the locations where they are consumed. Have a look at Our World in Data to learn more about consumption-based emissions.

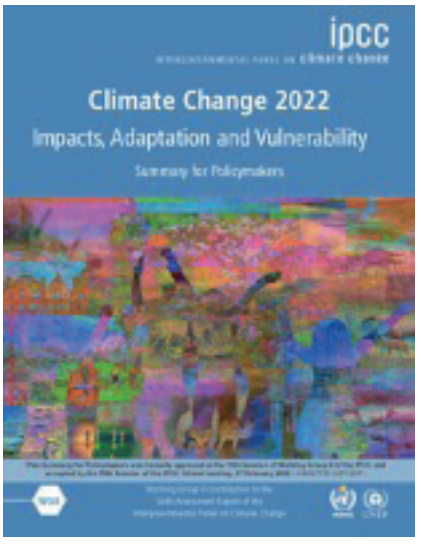
The importance of climate data

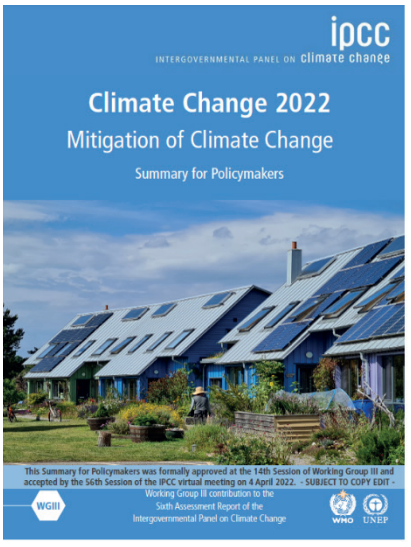
Using up-to-date climate data is key to implementing relevant adaptation projects and programs. It can also help with your advocacy efforts. The list below offers sources to find data on climate change, including current and expected impacts for different regions.

The Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. It gathers hundreds of experts from all over the world. The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options. The last assessment is available here (click on the cover to open the summary for policymakers):







The IPCC also developed a helpful tool for visualizing climate data.

World Bank Climate Change Knowledge Portal

The World Bank Climate Change Knowledge Portal provides global data on historical and future climate vulnerabilities and impacts. You can explore the data via country, region and watershed views. You can also access country profiles to gain deeper insights into climate risks and adaptation actions.

USAID Climate Risk Profiles

USAID provides regional and country climate risk profiles. These include the following information by country: an overview, its climate, projected changes and information on sector impacts, vulnerabilities to climate change, the policy context, and information regarding ongoing climate change projects. Access USAID's climate website where you can find your country's climate risk profile.

Forecast information

Climate research and meteorological institutions may also have more precise and local data for your region. You can access weather-related forecasts at the links below:

- NOAA – Climate Prediction Center (CPC). This website from the National Oceanic and Atmospheric Administration (NOAA) is used to issue information on the El Niño phenomenon every 15 days.
- NOAA – Hurricane Center provides 48-hour tropical weather outlooks.
- IPC (Integrated Food Security Phase Classification) portal regularly publishes national information on the current and expected status.

6. **What is mitigation?**
   (a) all the actions that help manage the current and future impacts of climate change
   (b) the loss and damage people experience because of climate change
   (c) actions that help reduce emissions or help natural systems absorb emissions

BONUS QUIZ: To further test your knowledge of climate change, do this online quiz developed by UNDP. It covers three topics:

- The problem of climate change
- The impacts of climate change
- Mitigating the impacts of climate change

Reflect and prepare for your climate adaptation action

Consider the following questions about climate change:

- What are the current and forecasted impacts of climate change in your country or community?
- Can you name any mitigation and adaptation activities that you have observed in your country or community?
- Do you think current action by countries globally is enough to address climate change?

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Answers

1. Correct answer: (b) a change in the state of the climate with these changes persisting for longer periods of time (e.g., decades, or longer).
EXPLANATION: Climate change refers to the long-term changes in the Earth's climate. It causes weather patterns to be less predictable, affecting the balance of Earth's precious ecosystems. These changes persist for long periods of time, typically decades or more. Climate change can be due to natural processes, such as changes in how much energy the sun produces and volcanic eruptions. However, humans are changing the climate by pumping heat-trapping gases from burning fossil fuels into the atmosphere. This is called human-induced or anthropogenic climate change.

2. Correct answer: True.
EXPLANATION: The greenhouse effect is the way through which heat is trapped close to Earth's surface by greenhouse gases. These heat-trapping gases allow the sun's energy to enter the atmosphere but prevent it from leaving. These gases can be thought of as a blanket wrapped around Earth, keeping the planet warmer than it would be without the gases.

3. Correct answer: (c) By over 1°C.
EXPLANATION: The IPCC estimates that human activities have caused the Earth to warm by approximately 1.1 °C above pre-industrial levels by 2020.

4. Correct answer: (b) 1.1 meters.
EXPLANATION: According to the IPCC, by 2100 sea levels could rise by up to 1.1 meters.

5. Correct answer: (a) wind speed and (b) rainfall rates.
EXPLANATION: In the 21st century, it is likely that the global frequency of tropical cyclones will either decrease or remain essentially unchanged. However, cyclones will likely have higher maximum wind speeds and rainfall rates, making them more destructive.

6. Correct answer: (c) actions that help reduce emissions or help natural systems absorb emissions.
EXPLANATION: Mitigation involves cutting anthropogenic emissions, through actions such as switching from coal-powered energy to renewables. It also includes actions that help natural systems absorb emissions, such as protecting forests, which naturally remove carbon dioxide from the air.

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