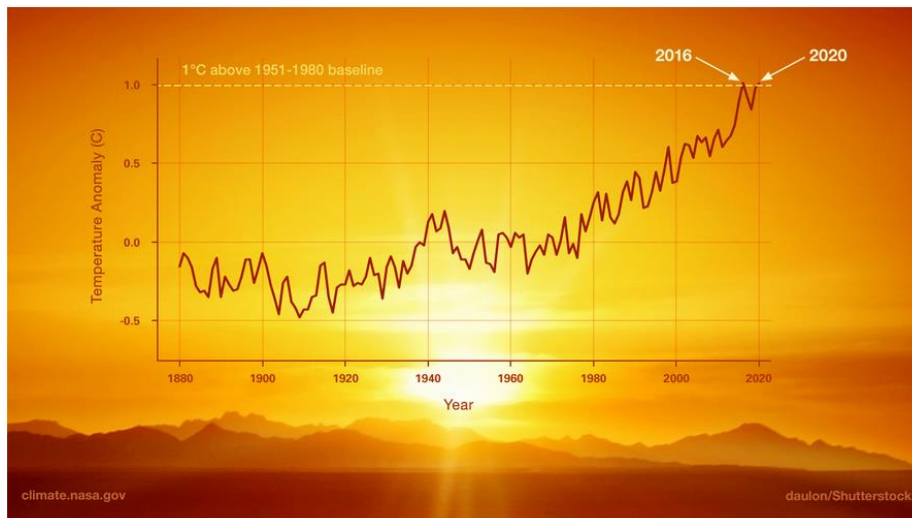


Topic 9: Economics of Climate Change

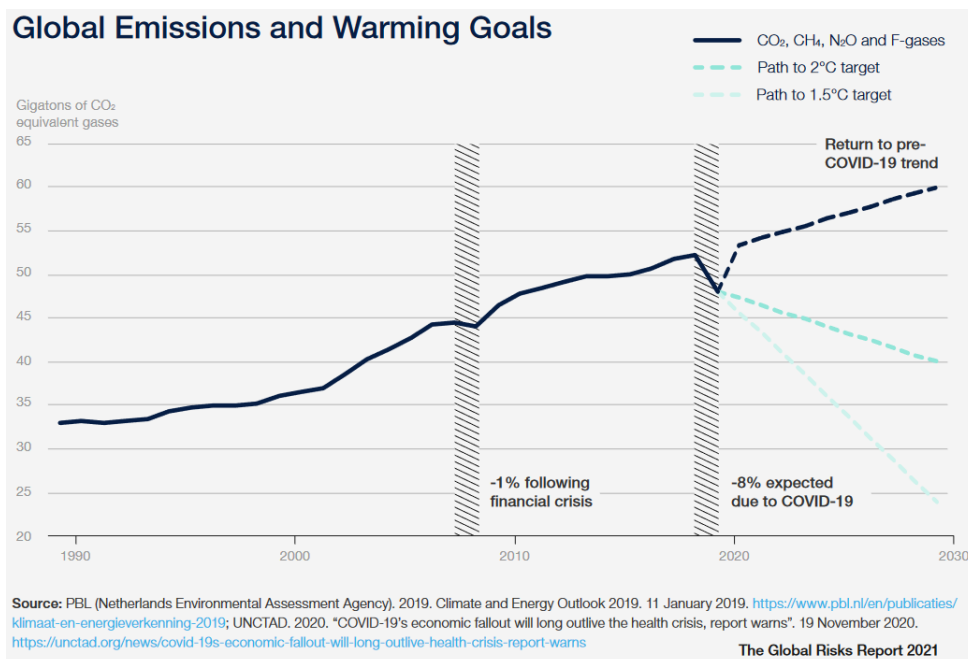
What is climate change?

“Climate change means a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.” (a definition by the United Nations Framework Convention on Climate Change (UNFCCC). Global warming, a term that is used interchangeably with climate change, is one aspect of climate change that refers to the rise in global temperatures due mainly to the increasing concentrations of greenhouse gases in the atmosphere.



This graph illustrates the change in global surface temperature relative to 1951-1980 average temperatures, with the year 2020 tying with 2016 for warmest on record (Source: [NASA's Goddard Institute for Space Studies](https://climate.nasa.gov/resources/global-warming-vs-climate-change/)). Learn more about global surface temperature [here](https://climate.nasa.gov/resources/global-warming-vs-climate-change/). Credit: NASA/JPL-Caltech

Source: <https://climate.nasa.gov/resources/global-warming-vs-climate-change/>



Source: PBL (Netherlands Environmental Assessment Agency), 2019. Climate and Energy Outlook 2019, 11 January 2019. <https://www.pbl.nl/en/publicaties/klimaat-en-energieverkenning-2019>; UNCTAD, 2020. "COVID-19's economic fallout will long outlive the health crisis, report warns", 19 November 2020. <https://unctad.org/news/covid-19s-economic-fallout-will-long-outlive-health-crisis-report-warns>

The Global Risks Report 2021

Source: WEF (2021). [The Global Risks Report 2021](https://www.weforum.org/reports/the-global-risks-report-2021)

According to the World Economic Forum’s Global risk report (2021), climate action failure and extreme weather events were identified as high likelihood to occur and high impact on economy.

Climate action failure

Failure of governments and businesses to enforce, enact or invest in effective climate-change adaptation and mitigation measures, preserve ecosystems, protect populations and transition to a carbon-neutral economy

Extreme weather events

Loss of human life, damage to ecosystems, destruction of property and/or financial loss at a global scale as a result of extreme weather events: cold fronts, fires, floods, heat waves, windstorms etc.



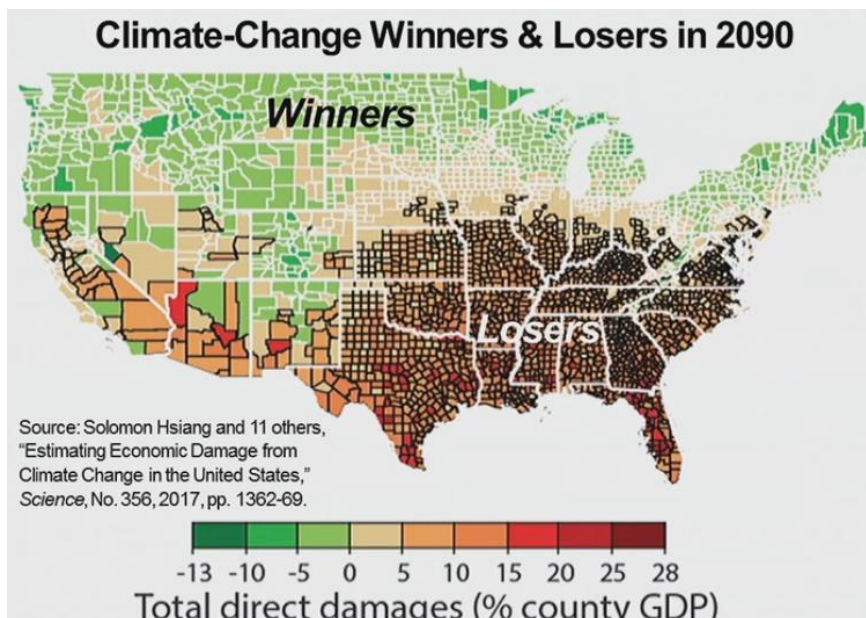
Source: WEF (2021). [The Global Risks Report 2021](#)

The economic impacts of climate change:



The potential future effects of global climate change include more frequent wildfires, longer periods of drought in some regions and an increase in the number, duration and intensity of tropical storms. Credit: Left - Mellimage/Shutterstock.com, center - Montree Hanlue/Shutterstock.com.

Source: <https://climate.nasa.gov/effects/>



Source: [Emmons \(2018\)](#)

To assess the economic impacts of on-going and future climate change scenarios, it requires the integration of natural science disciplines into economic analysis, including:

- Climate change modelling (e.g., current projections on estimated CO₂ emissions, ranges of climate variation such as temperature, rain, wind, air humidity)
- Biophysical impact models (e.g., hydrological models that stimulate river floods, agriculture yields, transport infrastructure losses)
- Economic models (e.g., economic burden/costs of potential climate scenarios)
 - Include sector-specific impact models on sectors such as agriculture, coastal systems, river floods, droughts, tourism, human health, energy, transport infrastructure and forest fires.

See the video of insights from economic impacts of climate change in Europe:

<https://ec.europa.eu/jrc/en/research-topic/impacts-climate-change>

Potential long-term damages from climate change include the following:

- Increased mortality
- Reduced work in exposed environments
- Reduced yields for grains, cotton, oilseeds
- Increased violent and property crime
- Coastal impacts

The economic costs of climate change impacts would trigger countries to take serious actions or implement policies to combat climate change. There are two main climate change policies:

- **Adaptation policies** = efforts to modify natural or human systems in order to minimize harm from climate change impacts. Examples include modifying development planning to increase the resilience of damage-prone areas, such as moving transportation systems and waste treatment facilities away from areas vulnerable to sea-level rise, and preparing public health facilities to handle the larger burdens resulting from the changing disease impacts of a warmer climate.
- **Mitigation policies** = to moderate the temperature rise by using strategies designed to reduce emissions or increase the planet's natural capacity to absorb greenhouse gases.

The causes of climate change from economic activities (Review global warming case)



FOSSIL FUELS

The massive use of fossil fuels is obviously the first source of global warming, as burning coal, oil and gas produces carbon dioxide - the most important greenhouse gas in the atmosphere - as well as nitrous oxide.



DEFORESTATION

The exploitation of forests has a major role in climate change. Trees help regulate the climate by absorbing CO₂ from the atmosphere. When they are cut down, this positive effect is lost and the carbon stored in the trees is released into the atmosphere.



INTENSIVE FARMING

Another cause of global warming is intensive farming, not only with the ever-increasing livestock, but also with plant protection products and fertilizers. In fact, cattle and sheep produce large amounts of methane when digesting their food, while fertilizers produce nitrous oxide emissions.



WASTE DISPOSAL

Waste management methods like landfills and incineration emit greenhouse and toxic gases - including methane - that are released into the atmosphere, soil and waterways, contributing to the increase of the greenhouse effect.



MINING

Modern life is highly dependent on the mining and metallurgical industry. Metals and minerals are the raw materials used in the construction, transportation and manufacturing of goods. From extraction to delivery, this market accounts for 5% of all greenhouse gas emissions.



OVERCONSUMPTION

Finally, overconsumption also plays a major role in climate change. In fact, it is responsible for the overexploitation of natural resources and emissions from international freight transport, which both contribute to global warming.

Source: <https://solarimpulse.com/global-warming-solutions#>

Climate change actions through international coordination – a global effort to combat climate change.



Source: UNFCCC

Paris Agreement: The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 -- for the first time -- this agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

- **Goal:** To limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.
- **Climate-neutral target by 2050:** To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a **binding agreement** brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects. It requires all Parties to submit put forward their best efforts through “**nationally determined contributions**” ([NDCs](#)) to strengthen implementation efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the agreement and to inform further individual actions by Parties.

See video: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/key-aspects-of-the-paris-agreement>

Note: Global economy shift on climate: <https://unfccc.int/news/15-sectors-of-global-economy-shift-the-dial-on-climate>

Some key Aspects of the Paris Agreement include the following:

- **Long-term temperature goal** (Art. 2) – The Paris Agreement, in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees.
- **Global peaking and 'climate neutrality'** (Art. 4) – To achieve this temperature goal, Parties aim to reach global peaking of greenhouse gas emissions (GHGs) as soon as possible, recognizing peaking will take longer for developing country Parties.
- **Mitigation** (Art. 4) – The Paris Agreement establishes binding commitments by all Parties to prepare, communicate and maintain an NDC and to pursue domestic measures to achieve them. Developed countries should continue to take the lead by undertaking absolute economy-wide reduction targets, while developing countries should continue enhancing their mitigation efforts, and are encouraged to move toward economy-wide targets over time in the light of different national circumstances.
- **Sinks and reservoirs** (Art.5) – The Paris Agreement also encourages Parties to conserve and enhance, as appropriate, sinks and reservoirs of GHGs as referred to in Article 4, paragraph 1(d) of the Convention, including forests.
- **Voluntary cooperation/Market- and non-market-based approaches** (Art. 6) – The Paris Agreement recognizes the possibility of voluntary cooperation among Parties to allow for higher ambition and sets out principles for any cooperation that involves internationally transferal of mitigation outcomes. It establishes a mechanism to contribute to the mitigation of GHG emissions and support sustainable development, and defines a framework for non-market approaches to sustainable development.
- **Adaptation** (Art. 7) – The Paris Agreement establishes a global goal on adaptation – of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal of the Agreement. It aims to significantly strengthen national adaptation efforts, including through support and international cooperation. It recognizes that adaptation is a global challenge faced by all. All Parties should engage in adaptation, including by formulating and implementing National Adaptation Plans, and should submit and periodically update an adaptation communication describing their priorities, needs, plans and actions. The adaptation efforts of developing countries should be recognized
- **Loss and damage** (Art. 8) – The Paris Agreement recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. Parties are to enhance understanding, action and support, including through the Warsaw International Mechanism, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change.
- **Finance, technology and capacity-building support** (Art. 9, 10 and 11) – The Paris Agreement reaffirms the obligations of developed countries to support the efforts of developing country Parties to build clean, climate-resilient futures, while for the first time encouraging voluntary contributions by other Parties. Provision of resources should also aim to achieve a balance between adaptation and mitigation. The agreement also provides that the Financial Mechanism of the Convention, including the Green Climate Fund (GCF), shall serve the Agreement. International cooperation on climate-safe technology development and transfer and building capacity in the developing world are also strengthened

Source: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/key-aspects-of-the-paris-agreement>)