



## Science: why is there a need to act?

The international climate regime is built upon a clear understanding of the threats posed by, and the causes of climate change. More than a century and a half of industrialization, along with the clear-felling of forests and certain farming methods, has led to increased quantities of greenhouse gases (GHGs) in the atmosphere. There are some basic well-established scientific links:

- The concentration of GHGs in the earth's atmosphere is directly linked to the average global temperature on earth;
- The concentration has been rising steadily, and mean global temperatures along with it, since the time of the Industrial Revolution as a result from human activity, primarily the burning of fossil fuels and changes in land use;
- As a consequence, there is need to take action to reduce greenhouse gas emissions and enhance sinks, and to adapt to the impacts from climate change.

This knowledge and understanding of climate change, its causes and effects, has been constantly growing in breadth and depth over the last decades. It is based on the work of the [Intergovernmental Panel on Climate Change](#) (IPCC) as well as on research findings of many other organizations. The IPCC now has a well-established role as the leading international body for the assessment of climate change. It reviews worldwide research, issues regular assessment reports and compiles special reports and technical papers. The findings of the IPCC reflect global scientific consensus and are apolitical in character. Its assessment reports reflect the work and observations of thousands of scientists from around the world.

The recent years provided more clarity about human-generated (anthropogenic) climate change than ever before. The IPCC released its [Fifth Assessment Report](#) (AR5), with its three Working Group (WG) reports and a synthesis report in 2014. The WG I contribution looks at the science of climate change. It is categorical in its conclusion: climate change is real and human activities are the main cause. For the first time, WG I could provide a comprehensive assessment of sea level rise, and its causes, over the past few decades. It was also able to estimate cumulative carbon dioxide (CO<sub>2</sub>) emissions since pre-industrial times – (CO<sub>2</sub> being the most abundant GHG that has resulted, in particular, from burning fossil fuels) – and provide a CO<sub>2</sub> budget for future emissions to limit warming to less than 2 °C. About half of this CO<sub>2</sub> budget was already emitted by 2011. Thanks to the IPCC, this is what we know:

From 1880 to 2012, the average global temperature increased by 0.85 °C.

Oceans have warmed, the amounts of snow and ice have diminished and the sea level has risen. From 1901 to 2010, the global average sea level rose by 19 cm as oceans expanded due to warming and ice melted. The sea ice extent in the Arctic has shrunk in every successive decade since 1979.

Given current concentrations and ongoing emissions of GHGs, it is likely that the end of this century will see a 1–2 °C increase in global mean temperature above the 1990 level (about 1.5–2.5 °C above the pre-industrial level). The world's oceans will warm and ice melt will continue. Average sea level rise is predicted to be 24–30 cm by 2065 and 40–63 cm by 2100 relative to the reference period of 1986–2005. Most aspects of climate change will persist for many centuries, even if emissions are stopped.

In addition, the contributions of the other two Working Groups contain comprehensive in-depth consideration on adaptation (WG II) and mitigation (WG III).

## Science: The State of the Climate

The [World Meteorological Organization](#) (WMO) issues a statement on the state of the global climate every year. It is based on multiple international datasets maintained independently by global climate analysis centres and information submitted by WMO Members' National Meteorological and Hydrological Services and Research Institutes and is an authoritative source of reference. Because the social and economic impacts of climate change have become so important, WMO partnered with other United Nations organizations for the first time in 2016 to include information on these impacts. Since 2016, the WMO provide an annual statement on the state of the global climate at the COP.