

GRF Fact Sheet on Climate Change

Definition

“Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.”¹

Drivers of Climate Change

“Changes in the atmospheric concentrations of greenhouse gasses (GHGs) and aerosols, land cover and solar radiation alter the energy balance of the climate system and are drivers of climate change. They affect the absorption, scattering and emission of radiation within the atmosphere and at the Earth’s surface. The resulting positive or negative changes in energy balance due to these factors are expressed as radiative forcing, which is used to compare warming or cooling influences on global climate.”²

Human Causes

“Since the advent of the Industrial Revolution, in the mid 18th century, intense and inefficient burning of wood, charcoal, coal, oil, and gas, accompanied by massive land use change, has resulted in increased concentrations of GHGs in the Earth’s atmosphere. The use of artificial fertilizers, made possible by techniques developed in the late 19th century, has led to practices resulting in releases of nitrous oxide, another GHG, into air. Since the 1920s, industrial activities have applied a number of manmade carbon compounds for refrigeration, fire suppression, and other purposes some of which have been found to be very powerful GHGs.”³

Climate Change Facts

- “Carbon dioxide is the dominant contributor to current climate change and its atmospheric concentration has increased from a pre-industrial value of 278 parts-per million (ppm) to 379 in 2005.”⁴
- “Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations.”²
- “CO₂ is a gas that affects climate by changing the earth’s radiation budget: an increase in its concentration leads to a rise in near-surface temperature. This has been known since the 19th Century and is well-established physics. If the concentration doubles, the resulting global mean warming will very likely be between 2 and 4°C (the most probable value is ~3°C), with the remaining uncertainty due to climatic feedback effects.”⁵
- CO₂: “Its annual emissions have grown between 1970 and 2004 by about 80%, from 21 to 38 gigatonnes (Gt), and represented 77% of total anthropogenic GHG emissions in 2004.”²
- “Global carbon dioxide emissions from fossil fuels in 2008 were nearly 40% higher than those in 1990. Even if global emission rates are stabilized at present-day levels, just 20 more years of emissions would give a 25% probability that warming exceeds 2°C, even with zero emissions after 2030. Every year of delayed action increases the chances of exceeding 2°C warming.”⁶

- “The average global temperature went up by about 0.74°C during the 20th Century with the warming affecting land more than ocean areas.”⁴
- “Confidence has increased that a 1 to 2°C increase in global mean temperature above 1990 levels (about 1.5 to 2.5°C above pre-industrial) poses significant risks to many unique and threatened systems including many biodiversity hotspots.”²
- “It is very likely that the response to anthropogenic forcing contributed to sea level rise during the latter half of the 20th century.”²
- “[...] a sea level rise of 0.09 to 0.88 m is projected for 1990 to 2100 primarily from thermal expansion and loss of mass from glaciers and ice caps.”¹
- “It is more likely than not that anthropogenic forcing has increased the risk of heat waves. Anthropogenic forcing is likely to have contributed to changes in wind patterns, affecting extra-tropical storm tracks and temperature patterns in both hemispheres.”²

Climate Change Present Impacts

- “Today more than 300 000 die due to climate change every year.”⁷
- “Weather-related disasters around the world have been on the rise for decades [...]: on average, 300 events were recorded every year in the 1980s, 480 events in the 1990s, and 620 events in the last 10 years.”⁸
- “Over the past 50 years, severe weather disasters have caused some 800 000 deaths and over a trillion dollars in economic loss – and in the present decade the damage wrought by such disasters has reached record levels.”⁹
- “An estimated 26 million of the 350 million displaced worldwide are considered climate displaced people. Of these, 1 million each year are estimated to be displaced by weather related disasters brought on by climate change.”¹⁰
- “Developing countries bear over nine-tenths of the climate change burden: 98 percent of the seriously affected and 99 percent of all deaths from weather-related disasters, along with over 90 percent of the total economic losses.”¹⁰
- “The impact on the Earth’s multi-trillion dollar ecosystems is also a key area of concern. Under a high emission scenario — the one that most closely matches current trends — 12 to 39% of the planet’s terrestrial surface could experience novel climate conditions and 10 to 48% could suffer disappearing climates by 2100.”³

Climate Change Future Impacts

- “Altered frequencies and intensities of extreme weather, together with sea level rise, are expected to have mostly adverse effects on natural and human systems.”²
- The fourth IPCC report: Heavy precipitation events will very likely be more frequent over most areas.²
- The fourth IPCC report: Intense tropical cyclone activity will likely increase.²
- 2030: “Worldwide deaths will reach 500 000 per year.”⁷
- “The warming for the next 20 years is projected to be 0.2C° per decade.”¹¹
- 2030: “People affected by climate change annually expected to rise to over 600 million.”⁷
- Climate migrants: “[...] the most widely repeated prediction being 200 million by 2050.”¹²

Kyoto Protocol

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major distinction between the Protocol and the Convention is that while the Convention encouraged industrialized countries to stabilize greenhouse gas (GHG) emissions, the Protocol commits them to do so.¹³

Briefly summarized

- Adopted at UNFCCC COP3 in Kyoto in 1997 and entered into force on 16 February 2005. Targets apply from 2008 to 2012.
- 37 industrialized countries (“Annex I countries”) commit themselves to a reduction of four GHGs and two groups of gases produced by them, and all member countries give general commitments.
- The target is to tackle the issue of global warming and GHG emissions amongst all participants with the binding aim to achieve an average reduction of 5.2% from 1990 levels by the year 2012.
- 187 countries have accepted the Kyoto Protocol targets as of November 2009.
- Signed but not ratified by the United States and Australia.
- CO₂ is used as a standard, and the remaining GHG are converted to their CO₂ equivalents. The reduction of CO₂ emissions has to be conducted by means of national initiatives but can also be implemented by the so-called flexible mechanisms in the protocol. One essential instrument is Emissions Trading, which allows countries that emit less than their quota, to sell emissions credits to nations that exceed their target. In addition to the bilateral emissions trade between the Kyoto Protocol member states, the European Union has its own “European Union Emission Trading Scheme”, which is the first multi-national and worldwide largest trading program for greenhouse gases.

COP15 Copenhagen – the crucial conference (7 to 18 December)

- “Without additional policies, global GHG emissions are projected to increase 25-90% by 2030 relative to 2000 [...]”¹⁴
- The last chance to achieve an agreement that can be ratified in time for it to come into force after the first commitment period of the Kyoto Protocol expires in 2012.¹⁵
- “Developments in the world since the Kyoto Protocol was negotiated in 1997 show that a new agreement is needed. China has replaced the USA as the largest emitter of greenhouse gases [...]”¹⁵
- The ambition of the Danish government is that COP15 will result in an ambitious global agreement including all the countries of the world.¹⁵
- “In an interview with the Guardian, **James Hansen** the world's pre-eminent climate scientist, said any agreement likely to emerge from the negotiations would be so deeply flawed that it would be better to start again from scratch. [...] All four of the major emitters – the US, China, EU and India – have now tabled offers on emissions, although the equally vexed issue of funding for developing nations to deal with global warming remains deadlocked. [...] he is vehemently opposed to the carbon markets schemes – in which permits to pollute are bought and sold – which are seen by the EU and other governments as the most efficient way to cut emissions and move to a new clean energy economy. [...] In Hansen's view, dealing with climate change allows no room for the compromises that rule the world of elected politics.”¹⁶

- “The choice facing the present generation is an awesome one,’ said former Vice President **Al Gore** during a speech before the Society of Environmental Journalists last month. "Never before has a single generation been asked to make such difficult and consequential decisions that will have implications for all succeeding generations. Failure, Gore added, would be "catastrophic" - not only given the urgency of changes already underway, but because it challenges the efficacy of the rule of law as "an instrument of redemption."¹⁷
- “We've failed our primary task of preventing harm,’ said **Saleemul Huq**, lead author of the adaptation and mitigation chapter of the Intergovernmental Panel on Climate Change's fourth assessment report. ‘Now we are going to be tasked with protecting those most vulnerable to harm. And soon we are going to be confronted with globally catastrophic harm.’¹⁷

References:

The information provided in this fact sheet on climate change is based on the following References.

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- ² IPCC Fourth Assessment Report: Climate Change 2007 (AR4)
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- ⁴ United Nations Headquarters, New York, 24 September 2007, Fact Sheet Climate Change at a Glance
- ⁵ S. Rahmstorf Climate Change - State of the Science: <http://www.pik-potsdam.de/~stefan/>
- ⁶ The Copenhagen Diagnosis, 2009: Updating the World on the Latest Climate Science. The University of New South Wales Climate Change Research Centre (CCRC), Sydney, Australia, 60 pp
- ⁷ W. Fust (2009), What will it take? Mitigation of Climate Change, talk at Global Humanitarian Forum, October 2009, Geneva
- ⁸ P. Löw (2008), Weather-related Disasters Dominate: <http://www.worldwatch.org/node/5452>
- ⁹ Shaping climate-resilient development, Eca economics of climate adaptation: http://www.swissre.com/resources/387fd3804f928069929e92b3151d9332-ECA_Shaping_Climate_Resilient_Development.pdf
- ¹⁰ Climate Change – The Anatomy of a Silent Crisis, Global Humanitarian Forum 2009, Geneva
- ¹¹ UNFCCC Factsheet: Climate change science - Temperature development
- ¹² Brown, O. (2008): Migration and Climate Change, IOM Migration Research Series, Geneva Switzerland
- ¹³ UNFCCC: http://unfccc.int/kyoto_protocol/items/2830.php
- ¹⁴ UNFCCC Fact Sheet, Climate Change Science – Greenhouse Gases
- ¹⁵ Climate Facts of United Nations Climate Change Conference COP15: <http://en.cop15.dk>
- ¹⁶ Interview in the Guardian on 2 December 2009 with James Hansen: <http://www.guardian.co.uk/environment/2009/dec/02/copenhagen-climate-change-james-hansen>
- ¹⁷ What Would Failure at Copenhagen Mean for Climate Change? Article in Scientific American on 10 November 2009: <http://www.scientificamerican.com/article.cfm?id=copenhagen-climate-talks-consequences>

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