


Chapter 1

Climate Change: Emission Reductions to Limit Warming



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Abstract Since the beginning of the industrial era, humans have been changing the Earth's climate substantially and over a very short period of time, mainly due to the use of fossil fuels (coal, oil and gas) to generate energy, to run industrial processes, to transport people and goods, to exploit land (including agriculture and livestock) and to heat and/or cool homes. The continuous use of fossil fuels and the exploitation of the Earth have been causing an increase in greenhouse gas emissions and their accumulation in the atmosphere. Accumulation causes climate change, which is detected primarily via the increase in the average global temperature, which in turn causes ice melting and sea-level rise. Accumulation also causes an increase in the frequency and intensity of extreme weather phenomena: intense rainfall and floods, heat waves and droughts and windstorms. Extreme weather events are responsible for increasingly substantial damages to ecosystems and communities, deaths and a reduction in biodiversity. Damages affect the poorest countries the most, since they have fewer resources available to prepare and adapt to the changing climate and to cope with extreme events, although very often these have contributed less to the accumulation of greenhouse gases in the atmosphere. Responsibilities for the ongoing climate change lay mainly with the countries that have contributed most to the accumulated emissions since the pre-industrial era (say, 1850-to-date): the US, Europe and China. There is no acceptable level of global warming: the higher the warming, the more severe the impacts on populations and ecosystems, which calls for drastic and immediate greenhouse gas emission reductions to limit it. The decarbonisation roadmap involves country-specific challenges that depend on the population and economic structure—as evidenced by the time evolution of carbon dioxide (CO₂) emissions and its dependency on the gross domestic product (GDP)—the energy intensity of the production processes and the carbon intensity of energy generation. In some sectors (e.g. electricity production, or transport), these challenges have already available and cost-effective solutions, while in other sectors (e.g. aviation or high-energy intensity industrial processes) there is still a search for the most effective ways to address such problems. These are the key topics

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