

Climate Change 2007: Synthesis Report

Summary for Policymakers

An Assessment of the Intergovernmental Panel on Climate Change

This summary, approved in detail at IPCC Plenary XXVII (Valencia, Spain, 12-17 November 2007), represents the formally agreed statement of the IPCC concerning key findings and uncertainties contained in the Working Group contributions to the Fourth Assessment Report.

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2. Causes of change

Changes in atmospheric concentrations of greenhouse gases (GHGs) and aerosols, land cover and solar radiation alter the energy balance of the climate system. {2.2}

Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004 (Figure SPM.3).⁵ {2.1}

Carbon dioxide (CO₂) is the most important anthropogenic GHG. Its annual emissions grew by about 80% between 1970 and 2004. The long-term trend of declining CO₂ emissions per unit of energy supplied reversed after 2000. {2.1}

Global atmospheric concentrations of CO₂, methane (CH₄) and nitrous oxide (N₂O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. {2.2}

Atmospheric concentrations of CO₂ (379ppm) and CH₄ (1774ppb) in 2005 exceed by far the natural range over the last 650,000 years. Global increases in CO₂ concentrations

are due primarily to fossil fuel use, with land-use change providing another significant but smaller contribution. It is *very likely* that the observed increase in CH₄ concentration is predominantly due to agriculture and fossil fuel use. CH₄ growth rates have declined since the early 1990s, consistent with total emissions (sum of anthropogenic and natural sources) being nearly constant during this period. The increase in N₂O concentration is primarily due to agriculture. {2.2}

There is *very high confidence* that the net effect of human activities since 1750 has been one of warming.⁶ {2.2}

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.⁷ It is *likely* that there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica) (Figure SPM.4). {2.4}

During the past 50 years, the sum of solar and volcanic forcings would *likely* have produced cooling. Observed patterns of warming and their changes are simulated only by models that include anthropogenic forcings. Difficulties remain in simulating and attributing observed temperature changes at smaller than continental scales. {2.4}

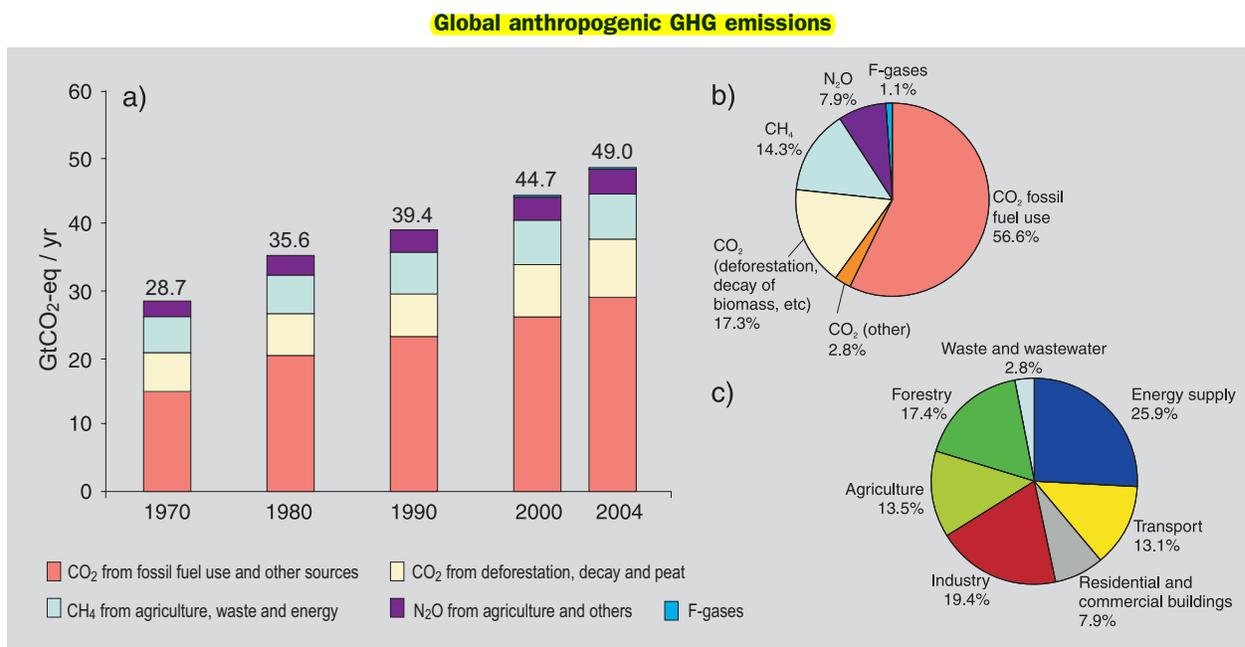


Figure SPM.3. (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004.⁵ (b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of carbon dioxide equivalents (CO₂-eq). (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO₂-eq. (Forestry includes deforestation.) {Figure 2.1}

⁵ Includes only carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF₆), whose emissions are covered by the United Nations Framework Convention on Climate Change (UNFCCC). These GHGs are weighted by their 100-year Global Warming Potentials, using values consistent with reporting under the UNFCCC.

⁶ Increases in GHGs tend to warm the surface while the net effect of increases in aerosols tends to cool it. The net effect due to human activities since the pre-industrial era is one of warming (+1.6 [+0.6 to +2.4] W/m²). In comparison, changes in solar irradiance are estimated to have caused a small warming effect (+0.12 [+0.06 to +0.30] W/m²).

⁷ Consideration of remaining uncertainty is based on current methodologies.