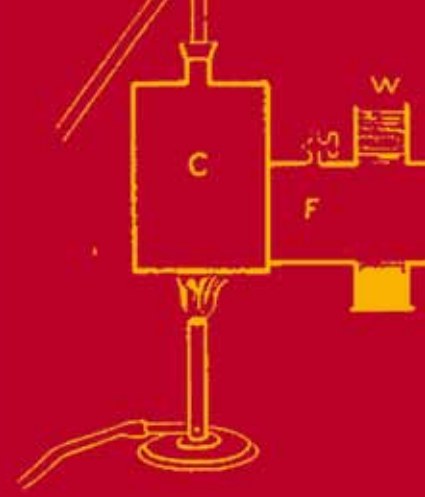


# Preventing dangerous climate change

The need for a global agreement

December 2009



In December 2009 the world's nations will gather in Copenhagen in an attempt to reach agreement over how to prevent dangerous interference with the climate, the stated aim of the United Nations Framework Convention on Climate Change (UNFCCC).

There is no such thing as 'safe' climate change. Even the global temperature increase to date (about 0.75°C) is contributing to effects that are impossible to adapt to in some regions, notably small low-lying islands and coastal areas. As the temperature rises further, so will the risk of more widespread and dangerous climate impacts; from sea level rise, from increasing frequency and intensity of climate extremes such as heat waves, floods and droughts, especially in vulnerable areas.

A maximum global temperature increase of 2°C since pre-industrial times has been adopted by many nations as a goal to prevent dangerous climate change. If global greenhouse gas (GHG) emissions are reduced at 3-4% per year after 2020, it has been estimated that there is a fifty-fifty chance of limiting global temperature increase to roughly 2°C; but only if GHG emissions begin to decline within the next decade. By 2050, emissions would need to be down to near 50% of their 1990 levels, with continuing reductions in the second half of this century.

It is not only the rate of GHG emissions that matters, but also their accumulation over time, particularly for the long-lived gases such as carbon dioxide (CO<sub>2</sub>). Once our actions have raised concentrations of CO<sub>2</sub> in the atmosphere, levels will remain elevated for more than a thousand years. The crucial role played by the cumulative emissions of CO<sub>2</sub> means that the later global emissions peak, the more rapid the eventual decline would have to be, which would likely cause economic and social disruption across the globe.

Developed countries are responsible for the vast majority of emissions to date, and have the highest per capita emissions. So it is incumbent on them to show leadership with early achievement of substantial rates of reduction in GHG emissions. However, the atmosphere is indifferent to the origin of emissions. And so, while developing countries must be able to raise their standards of living, they too will need to curb their increasing GHG emissions, consistent

with the required global trajectory. This action will also reduce air pollution, which will have immediate benefits for human health.

## Science of climate change

It is certain that GHG emissions from the burning of fossil fuels and from land use change lead to a warming of climate, and it is very likely that these GHGs are the dominant cause of the global warming that has been taking place over the last 50 years.

Whilst the extent of climate change is often expressed in a single figure – global temperature – the effects of climate change (such as temperature, precipitation and the frequency of extreme weather events) will vary greatly from place to place.

Increasing atmospheric CO<sub>2</sub> also leads to ocean acidification which risks profound impacts on many marine ecosystems and in turn the societies which depend on them. In the last 250 years ocean acidity has increased by 30%, and the oceans are now probably more acidic than for the last several million years.

Many of the impacts of increasing GHGs will be irreversible on timescales of more than a thousand years.

The Intergovernmental Panel on Climate Change (IPCC) assessment in 2007, which involved a large number of the most eminent climate change scientists in the world, highlighted the severe climate effects that could result from a 'business as usual' approach to global GHG emissions. The balance of scientific research since the IPCC report broadly confirms and strengthens its key findings. Major observational findings since the IPCC report include:

- Global CO<sub>2</sub> emissions since 2000, before the recession, have been near the upper limits projected. Levels of CO<sub>2</sub> in the atmosphere continue to rise.
- The trend in global average temperature within the last decade has been small but this is very likely to be largely due to natural variability masking the long term trend. Such a masking effect has occurred in the past. Nevertheless, the decade 2000-2009 has been warmer, on average, than any other decade in the previous 150 years.

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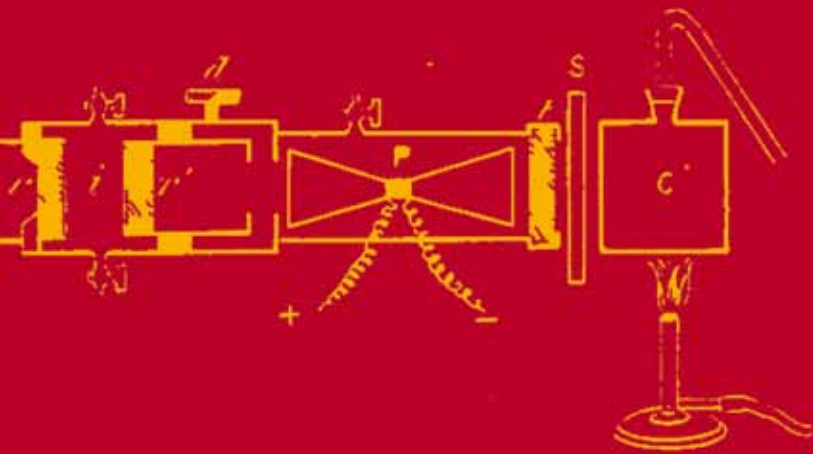


Diagram of John Tyndall's experiment demonstrating the effects of greenhouse gases; Proceedings of the Royal Society of London, 1 January 1879

- Estimates of current sea level rise are generally larger than those previously projected.
- Arctic sea ice is now younger and thinner than at any point in the observed record and its summer minimum extent has, in recent years, been at record low levels.

Continuing climate change, even at the current rate, will lead to very significant impacts. Some feedbacks raise concerns that this change will accelerate as the Earth warms further. These feedbacks include reduced CO<sub>2</sub> absorption by the ocean and land, emissions of methane from melting tundra, and the impact of changing sea ice on the reflection of solar radiation and the heat transfer from the ocean. The circulation of the atmosphere or ocean may also undergo rapid changes leading to major shifts in regional climate. Possible examples include big changes in the Indian Summer Monsoon rainfall (e.g. more severe reductions as in 2006 and 2009), summers with almost permanent high pressure systems over Europe (as in the record warmth of 2003), and the weakening of the overturning circulation in the North Atlantic with associated changes in regional temperature and storms.

### Inclusion of emissions

It is important that all substances that are released due to human activity and that can cause climate change or acidification are considered in any agreement. This includes the GHG emissions under the existing Kyoto Protocol and additional GHG, aerosols and precursor gases.

All sources of emissions need to be incorporated in an agreement, including emissions from international aviation, shipping and deforestation. Deforestation alone accounts for approximately 10-20% of current CO<sub>2</sub> emissions and is taking place predominantly in the developing world. To be effective, any climate agreement must address the emissions of deforestation, while ensuring minimal loss of biodiversity, encouraging good governance and addressing the needs and knowledge of local and indigenous communities.

### Adaptation

Any level of climate change will be dangerous somewhere and the impacts will vary significantly by region. Countries must be prepared to adapt to climate change by using scientific and technological expertise allied to local knowledge.

As climate change will have the greatest impacts on the poor, any global agreement should properly support the adaptation and development of vulnerable countries and communities through sufficient finance, technology transfers and capacity building.

Critical adaptation considerations include agriculture and forestry, which will require substantial investment to maintain or increase productivity as air temperatures increase, rainfall patterns change and the frequency of extreme weather events alter.

A continuing effort in monitoring and understanding climate change, reducing uncertainty, particularly of regional impacts of climate change, is essential for the underpinning of effective adaptation policy.

### Negative emissions

The deliberate removal of GHGs from the atmosphere (negative emissions) may eventually be necessary to help reduce atmospheric GHG concentrations towards pre-industrial levels or to counteract residual emissions from, for example, agricultural activity, which may be impossible to eliminate. However, no technologies for doing so have yet been demonstrated to be effective and economically, socially and environmentally sustainable at the scale likely to be required. Such technologies cannot be considered as alternatives to emissions reductions.

### Evidence-based policy

The UNFCCC and its delivery bodies must ensure that evidence-based decisions are at the core of its implementation strategy, including the flexible mechanisms and the allocation of any existing or new funds. It is also vitally important for nations and regions to use evidence-based policy when deciding upon responses for both mitigation and adaptation.



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