

Europe, climate change and ENSEMBLES

Briefing note No. 1

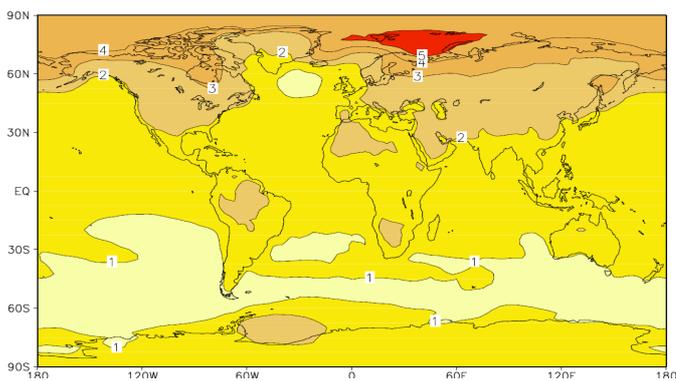
The Met Office has led a five-year EC-funded research project into the likely effects of climate change on Europe. This study, involving 66 partners across Europe and beyond, is the biggest ever integrated climate change research project. The study will report its key findings in November 2009 at a final symposium at the Met Office.

The E1 mitigation scenario

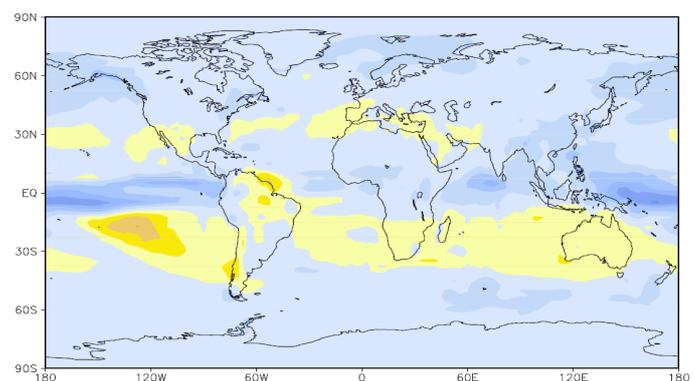
The E1 mitigation scenario, developed in ENSEMBLES, is the first of its kind to run an ensemble of Global Climate Models (GCMs). It stabilises atmospheric CO₂ at 450 ppm equivalent by 2140, while emissions peak at about 12 GtC in 2010.

E1 has been constructed using the methodology from the next IPCC assessment review (AR5) using greenhouse gas concentrations and forcings (the warming influence of GHGs on the atmosphere) as a starting point. Modellers are then able to establish what level of emissions would relate to the stated concentrations, which, in turn, lets climate scientists calculate what the likely temperature change might be. Realistic socio-economic scenarios, such as what level of development of renewable energy sources, population growth etc., are then determined to match.

Ten European GCMs were run using E1, five of which include carbon cycle feedbacks. Regional variability is clear from the figures below showing spatial patterns of temperature and rainfall anomaly. For example, even within an average global temperature rise of 2 °C there is a much higher increase in the Arctic, with only a small rise across the Southern Ocean. Some parts of Northern Europe may see temperature rises of up to 4 °C.



Annual mean temperature anomaly 2070-99 in E1 w.r.t 1961-90 as an average of 10 GCMs.



Annual precipitation anomaly 2070-99 in E1 w.r.t 1961-90 as an average of 10 GCMs.

In addition, the 5 GCMs which model carbon cycle feedbacks were used to work backwards to calculate anthropogenic CO₂ emissions from land, ocean and atmosphere carbon fluxes. They show that, to limit global mean temperature to below 2 °C, implied emissions of CO₂ to the atmosphere at the end of the century fall close to zero in most cases. In one model — HadCM3C — the implied emissions fall below zero, indicating carbon sequestration exceeding emissions. The results of these 5 projections are shown below:

