Full details

All details held on the selected case study are shown below.

Went live on	Title	Reference
2 Jun 2009	Climate-carbon cycle feedbacks affect greenhouse gas policies globally	SID0179

Synopsis
Quantifying the feedbacks between climate and carbon emissions, and forging a better understanding of the processes affecting CO2 absorption and emissions from land and oceans, has led to a call for long-term global carbon emissions cuts.

Description
A climate analysis has underlined the necessity for global cuts of up to 90 per cent to carbon dioxide emission levels over the next three centuries. Dr Jo House and colleagues from other organisations carried out the analysis as part of the NERC's Quantifying and Understanding the Earth System (QUEST) programme, based at the University of Bristol.

Once emitted through human activities, carbon dioxide (CO2) remains in the atmosphere for many thousands of years. Carbon cycle processes in the ocean and on land control CO2 levels, and are in turn affected by the climate. Through the QUEST programme, this feedback between the carbon cycle and the climate has been quantified and better understood. But political leaders have not yet assessed the implications for long-term climate policy.

The analysis suggests that a non-binding target to halve global emissions of CO2 by 2050, set by the G8 group of leading industrialised nations, could be insufficient. It asserts that if no further actions are taken beyond this date, CO2 concentrations will continue to rise rapidly. They will approach 1,000 parts per million (ppm) by 2300, compared with current levels of 386 ppm, and there will be an accompanying rise in temperature of almost 6°C.

"Using a scheme to copy state-of-the-art model results for climate feedback strength, we considered the recent G8 global targets," said Dr Jo House, lead author of the paper describing the analysis. "Our calculations demonstrate the emissions reductions that should be achieved to limit climate change below levels that are currently considered dangerous."

The analysis takes into account the fact that as the oceans become warmer, the water absorbs less CO2. In addition, the warmer water does not mix well with colder levels below. Reduction in churn makes the water at the top even more carbon rich. This further restricts the water's ability to absorb CO2 from the air.

Meanwhile on land, warmer conditions speed up decay of plants and soil, which release higher levels of CO2 than in cooler conditions. Rainfall decreases and drought in some areas, hampers plant growth and the ability of vegetation to absorb CO2 from the air.

These processes form a vicious circle - enhancing change.

"Although the UK's overall carbon emission from our human activities are quite small when compared with global emissions, we have a leadership role to play in promoting policies that will sustain long-term CO2 reductions," said Jo House. "Without these, the level of climate stability our on-going analysis calls for will not be achieved."

References and links	
Hyperlinks	1. Centre for Ecology & Hydrology - Home 2. Planet Earth Online - Stabilising carbon dioxide levels gets tougher (28/10/08) 3. QUEST - How are climate and atmospheric composition regulated on time scales up to a million years? 4. The University of Bristol - Earth System Science Research Group 5. The University of Bristol - Dr Joanna House, Research Fellow

Impacts	
Actual impacts	Policy
Impact evidence	The analysis was submitted to the government's Committee on Climate Change.
Key outputs	Policy change

Research and funding	
Funding type	Research Programme

Research and Collaborative Centres	
Centre	Centre for Ecology and Hydrology

Classification	
Science themes	Climate system, Environment, pollution and human health
Science areas	Atmospheric, Earth, Marine
Policy areas	Climate/environmental change and impacts

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