Global-Scale Impacts of climate change: QUEST-GSI

A project under the Natural Environment Research Council QUEST programme

Assessing the worldwide consequences of climate change

QUEST is a multidisciplinary £23M programme of the Natural Environment Research Council aiming to answer policy relevant questions on the global environment. QUEST-GSI is one of the projects under QUEST and its key aim is to better quantify the impacts of climate change in a consistent way across the entire globe and across various sectors such as crops and water resources.

Climate change impacts studies to date have often focussed on a particular region or sector. The climate and socio-economic futures used are often inconsistent across different impacts studies. This makes it difficult to accurately assess impacts at the global-scale and to compare the impacts for different climate change and socio-economic scenarios.

The project will consider the impacts of climate change on:

- water resources;
- flooding;
- crops and ecosystems.

It will consider how impacts in these sectors might affect each other and how they combine to affect food security and human health and well-being. Impacts will be assessed under a consistent set of climate and socio-economic scenarios and span current estimates of uncertainty.

Vulnerability to climate change is a function of the magnitude of impact and the ability of the impacted economy and society to cope. The project is therefore also examining and developing indicators of coping capacity.

Informing climate policy—mitigation and adaptation

Policymakers require information about the impacts of climate change to inform policy on the setting of targets for greenhouse gas emission reductions.

How much do we need to reduce greenhouse gas emissions to avoid "dangerous" impacts? The interpretation of dangerous is widely debated, but nonetheless needs to be informed by quantitative information about impacts across sectors and across the globe. Currently the lack of such consistent information is hampering the political debate on target setting.

Also, better quantification of both climate change impacts and ability to cope with those impacts will help to inform national and global adaptation strategies.

The QUEST-GSI project involves researchers from the following institutions:

Quantifying and Understanding the Earth System

University of Reading

Key tasks of the project:

(i) to refine and validate existing impacts models for the study sectors, and assess the effect of impact model uncertainty on estimated impacts;

(ii) to define a suite of climate, land use and socio-economic scenarios for the 21st century;

(iii) to estimate the impacts through the 21st century, across sectors, of climate and land use change under the different socio-economic scenarios;

(iv) to combine indicators of impact with socio-economic indicators to characterise vulnerability to climate change;

(v) to develop relationships between climate change forcings and impact, in order to produce climate impact response functions.

Key challenges include the *representation of uncertainty* and the *incorporation* of adaptation into estimation of impacts.

Outcomes of the project will include:

(i) an assessment of the magnitudes of the impact of defined climate change across the global domain;

(ii) the identification of impact "hot-spots";

(iii) a framework for estimating the effectiveness of defined climate policies.

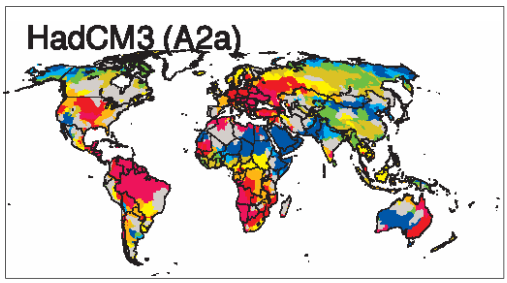
IMPACT SECTORS

Water resources
Flooding
Crops
Ecosystems
Carbon storage in soils

→ Food security
→ Hunger
→ Ill-health

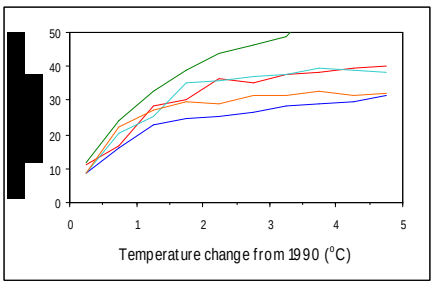
EXAMPLE OUTPUTS

Impact maps: the impact of climate change under a specific climate scenario



Change in runoff by the 2050s under one scenario

Impact response functions: how will impacts of change depend on the increase in global temperature?



Increase in exposure to water resources stress

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