



# Managing Water as China Warms: New Insights from Regional Models

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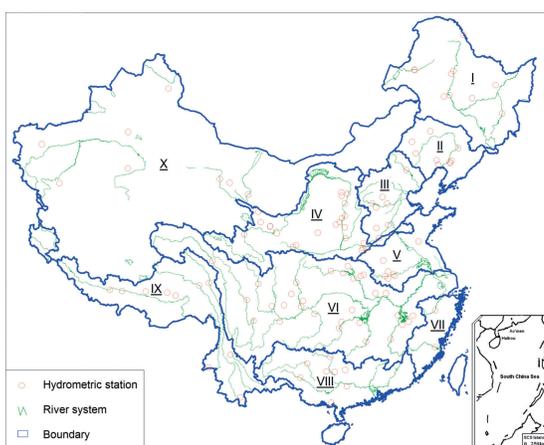
## Overview

China's influence on global climate has received growing international attention. However, the impact of climate change on China's own economy, resources and people remains under-researched. An innovative research project funded by the UK's Department for International Development (DFID) and the Swiss Agency for Development and Cooperation (SDC) – *Adapting to Climate Change in China (ACCC)* – shows how the latest climate modelling can be linked with impact assessment and decision-making across different sectors, including water.

The ACCC project is being implemented with China's National Development and Reform Commission (NDRC). The NDRC is responsible for formulating China's Five Year Plans, and also coordinates climate change adaptation and mitigation policy.

## The impact of climate change on water resources

Climate change is one of a number of pressures affecting water resources in China. Water use is increasing because of population growth, urbanisation and industrialisation. At the same time, climate change is introducing greater variability in water systems across China's major river basins (Figure 1).



**Figure 1** Major river basins in China. Note: I – Songhuajiang; II – Liao; III – Hai; IV – Huang (Yellow); V – Huai; VI – Yangzi; VII – Southeast; VIII – Zhujiang; IX – Southwest; X – Northwest. Source: Wang et al 2012.

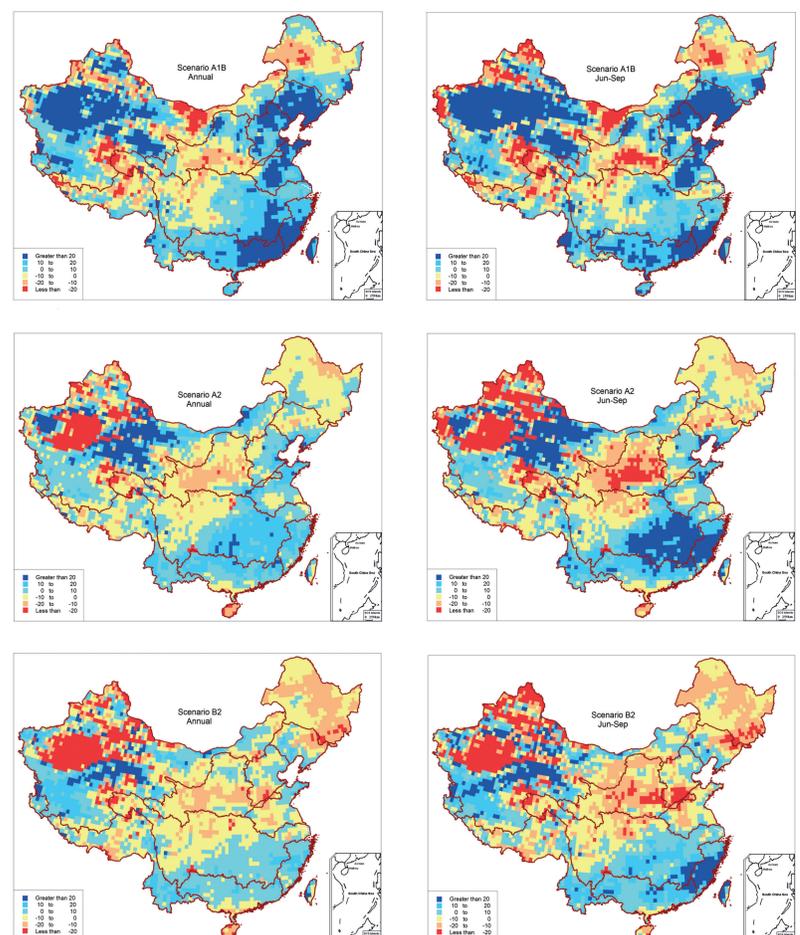
Global Climate Models (GCMs) suggest that, under a medium-level greenhouse gas emission scenario (A1B), the air temperature in China will continue to rise over the 21st century, by up to 3.7°C by 2100. Nationally, precipitation is also projected to increase by an average of 13% by 2100, associated with an increase in extreme rainfall events.

Multi-model averages conceal significant variation, and higher resolution models are needed for decision-making. ACCC is therefore developing detailed scenarios using a multi-model data set based on two regional climate models – RegCM3 and PRECIS. Preliminary results indicate major differences in rainfall projections between models, although both indicate a decrease in rainfall in central China. ◻



Photo: Roger Calow, 2008

A Variable Infiltration Capacity (VIC) model with a 50x50km<sup>2</sup> resolution using data from 125 gauged catchments has been used to assess impacts on water resources (Wang et al, 2012). The model has been run with PRECIS data under A1B, A2 & B2 scenarios to produce runoff projections for the period 2021–2050 (Figure 2), compared with simulated runoff for the baseline period 1961–1990. Model findings indicate that annual runoff over China as a whole will probably increase by 3–11% by 2050, but with uneven spatial and temporal distribution. Under all three scenarios, however, annual runoff in the water-stressed Yellow River Basin declines by roughly 2–6%, with significant reductions between June and September. In this key grain producing area, we might therefore see more 'agricultural' drought.



**Figure 2** Spatial changes in flood season and annual runoff, 2021–2050, compared with the 1961–1990 baseline. Note: based on PRECIS data for A1B, A2 & B2 emission scenarios. Source: Wang et al (2012)

## Implications for water planning

As China's economy grows and competition for water increases, China will need to develop robust systems for managing water in an uncertain but increasingly volatile climate, particularly in the water-scarce north. Although changes in projected runoff remain uncertain for most basins, regional water shortages and regional flooding remain key issues that are likely to grow in importance as climate change amplifies existing patterns of shortage and excess. These pressures and uncertainties may require a new style of adaptive water management, combining use of non-traditional sources such as urban waste water with better management of existing storage, and much more emphasis on water conservation and reallocation.

For further information, including policy briefs on climate science, vulnerability assessment, health and agriculture, visit: [www.ccadaptation.org.cn](http://www.ccadaptation.org.cn)

## References

Wang G Q, Zhang J Y, Jin J L, Pagano T C, Calow R, Bao Z X, Liu Y L and Yan X L (2012). Assessing water resources in China using PRECIS projections and a VIC model. *Hydrology and Earth System Sciences*, 16, 231–240, 2012.

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