

Global climate change impacts on freshwater availability – an overview of recent assessments

DIETER GERTEN

Potsdam Institute for Climate Impact Research, Telegraphenberg A62, 14473 Potsdam, Germany

gerten@pik-potsdam.de

Abstract Global climate change will affect freshwater resources in manifold ways, requiring comprehensive assessments of key components of the water cycle – optimally in conjunction with vegetation and carbon dynamics intrinsically coupled to water dynamics. Here, some recent quantitative assessments of global climate change impacts on water availability and scarcity are presented, focusing on: (i) irrigation demand and (ii) “green” and “blue” water availability *versus* demand for producing a given diet. The reviewed studies are based on simulations with a dynamic global vegetation and water balance model, driven by climate change scenarios from 17–19 CMIP3 general circulation models. Moreover, outlooks are presented on CMIP5 projections and findings from the recently launched Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP), which makes use of a large suite of global hydrological and land surface models. It is shown that climate change will affect blue and green water demand and availability around the world, with countries especially in Africa and Asia likely to be affected so severely that they may no longer be able (or may remain unable) to produce certain diets on their own. More systematic studies are proposed that address both climate- and water-model structural uncertainty at the same time. They should be complemented by studies that investigate systematically the options to solve existing or emerging water scarcity problems.

Key words global hydrology; climate change; climate impacts; vegetation; food production; CO₂ effects; uncertainty; water scarcity