Geophysical Research Abstracts
Vol. 16, EGU2014-10641, 2014
EGU General Assembly 2014

Bridging the climate-induced water gap in the twenty-first century: adaptation support based on water supply, demand, adaptation and financing.

Menno Straatsma (1), Peter Droogers (2), Jaïrus Brandsma (2), Wouter Buytaert (3), Derek Karssenberg (1), Rens Van Beek (1), Yoshihide Wada (1), Edwin Sutanudjaja (1), Claudia Vitolo (3), Oliver Schmitz (1), Karen Meijer (4), Maaike Van Aalst (4), Marc Bierkens (1,4)

(1) Utrecht University, Earth surface hydrology, Department of Physical Geography, Utrecht, Netherlands (m.w.straatsma@uu.nl, +31 30 2531145), (2) FutureWater, Wageningen, The Netherlands, (3) Imperial College, London, United Kingdom, (4) Deltares, Delft, The Netherlands

Water scarcity affects large parts of the world. Over the course of the twenty-first century, water demand is likely to increase due to population growth and associated food production, and increased economic activity, while water supply is projected to decrease in many regions due to climate change. Despite recent studies that analyze the effect of climate change on water scarcity, e.g. using climate projections under representative concentration pathways (RCP) of the fifth assessment report of the IPCC (AR5), decision support for closing the water gap between now and 2100 does not exist at a meaningful scale and with a global coverage. In this study, we aimed (i) to assess the joint impact of climatic and socio-economic change on water scarcity, (ii) to integrate impact and potential adaptation in one workflow, (iii) to prioritize adaptation options to counteract water scarcity based on their financial, regional socio-economic and environmental implications, and (iv) to deliver all this information in an integrated user-friendly web-based service. To enable the combination of global coverage with local relevance, we aggregated all results for 1604 water provinces (food producing units) delineated in this study, which is five times smaller than previous food producing units.

Water supply was computed using the PCR-GLOBWB hydrological and water resources model, parameterized at 5 arcminutes for the whole globe, excluding Antarctica and Greenland. We ran PCR-GLOBWB with a daily forcing derived from five different GCM models from the CMIP5 (GFDL-ESM2M, Hadgem2-ES, IPSL-CMA5-LR, MIROC-ESM-CHEM, NorESM1-M) that were bias corrected using observation-based WATCH data between 1960-1999. For each of the models all four RCPs (RCP 2.6, 4.5, 6.0, and 8.5) were run, producing the ensemble of 20 future projections. The blue water supply was aggregated per month and per water province. Industrial, domestic and irrigation water demands were computed for a limited number of realistic combinations of a shared socio-economic pathways (SSPs) and RCPs.

Our Water And Climate Adaptation Model (WatCAM) was used to compute the water gap based on reservoir capacity, water supply, and water demand. WatCam is based on the existing ModSim (Labadie, 2010) water allocation model, and facilitated the evaluation of nine technological and infrastructural adaptation measures to assess the investments needed to bridge the future water gap. Regional environmental and socio-economic effects of these investments, such as environmental flows or downstream effects, were evaluated. A scheme was developed to evaluate the strategies on robustness and flexibility under climate change and scenario uncertainty, and each measure was linked to possibilities for investment and financing mechanisms. The WatCAM is available as a web modeling service from www.water2invest.com, and enables user specified adaptation measures and the creation of an ensemble of water gap forecasts.