Geophysical Research Abstracts
Vol. 21, EGU2019-9021, 2019
EGU General Assembly 2019

Climate versus demographic controls on water availability across India at 1.5°C, 2.0°C and 3.0°C global warming levels

Riddhi Singh (1) and Rohini Kumar (2)

(1) Department of Civil Engineering, Indian Institute of Technology Bombay, Powai, Mumbai, India (riddhi@civil.iitb.ac.in), (2) UFZ-Helmholtz Centre for Environmental Research, Leipzig, 04318, Germany (rohini.kumar@ufz.de)

Water availability for human use in a region depends upon hydro-climatic as well as socio-economic factors such as population, lifestyles, etc. It is thus useful to understand how these factors affect water availability and how their relative importance varies across different regions. This information may help guide prioritization of policy level interventions. Here, we quantify the changes in mean annual per capita water availability (PCWA) across India under 1.5°C, 2.0°C, and 3.0°C levels of global warming. We utilize projections of future climate from several general circulation models (GCMs) under three different representative concentration pathways (RCPs) along with projections of future population from five socio-economic pathways (SSPs). Using the estimated mean annual PCWA from these GCM–RCP–SSP combinations, we perform a sensitivity analysis to ascertain the relative importance of climatic (precipitation and temperature change) and demographic (population change) factors in affecting per capita freshwater availability in a region. Our analysis shows that a transition from the 1.5°C warmer world to the 2.0°C warmer world leads to a reduction in mean annual PCWA for a majority (92.8%) of regions across India. The number of people likely to face severe water stress (mean annual PCWA < 500 m^3/year/capita) under 1.5°C, 2.0°C, and 3.0°C warming scenarios, are 354, 421, and 380 million, respectively. Sensitivity analysis indicated that changes in both population and mean annual precipitation are dominating factors controlling mean annual PCWA, depending upon the historical setting of the region. Regions with historically lower populations and lower aridity indices tend to be more sensitive to population changes. On the other hand, as historical population of a region increases, sensitivity to changing climate (mainly mean annual precipitation) increases. These results indicate the complex interactions between demographic and climatic changes that need to be accounted for in policies that aim to manage water security by either controlling global warming or via socio-economic interventions.