Geophysical Research Abstracts
Vol. 18, EGU2016-16888, 2016
EGU General Assembly 2016

Asian water futures - Multi scenarios, models and criteria assessment -

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A better understanding of the current and future availability of water resources is essential for the implementation of the recently agreed Sustainable Development Goals (SDGs). Long-term/efficient strategies for coping with current and potential future water-related challenges are urgently required. Although Representative Concentration Pathways (RCPs) and Shared Socioeconomic Pathways (SSPs) were develop for the impact assessment of climate change, very few assessments have yet used the SSPs to assess water resources. Then the IIASA Water Futures and Solutions Initiative (WFaS), developed a set of water use scenarios consistent with RCPs and SSPs and applying the latest climate changes scenarios. Here this study focuses on results for Asian countries for the period 2010-2050.

We present three conceivable future pathways of Asian water resources, determined by feasible combinations of two RCPs and three SSPs. Such a scenario approach provides valuable insights towards identifying appropriate strategies as gaps between a “scenario world” and reality. In addition, for the assessment of future water resources a multi-criteria analysis is applied. A classification system for countries and watershed that consists of two broad dimensions: (i) economic and institutional adaptive capacity, (ii) hydrological complexity. The latter is composed of several sub-indexes including total renewable water resources per capita, the ratio of water demand to renewable water resource, variability of runoff and dependency ratio to external. Furthermore, this analysis uses a multi-model approach to estimate runoff and discharge using 5 GCMs and 5 global hydrological models (GHMs). Three of these GHMs calculate water use based on a consistent set of scenarios in addition to water availability.

As a result, we have projected hot spots of water scarcity in Asia and their spatial and temporal change. For example, in a scenario based on SSP2 and RCP6.0, by 2050, in total 2.1 billion people (46% of Asian population) are going to live in countries classified as high hydrological complexity. In particular, in Afghanistan, Azerbaijan and Pakistan, then home to 370 million people, hydrological complexity will be high while adaptation capacity is still low. On the other hand, a part of people however who live in countries with higher expected adaptive capacities may have better futures depending on policies and investment. Besides country scale, grid scale analyses clearly highlighted that a large part of population living under strong water stress in highly populated areas of Asia, such as east and coastal areas in China and large parts of India.
Our preliminary results show that a significant impact of socioeconomic scenarios on each of the indexes which is comparable to that of climate scenarios. For instance, the least timing, trend and spatial distribution of water resource per capita are highly affected by projected population. This study shows that features of time series change in each indexes are also informative particularly for decision makers because they support in optimal timing of investment for countermeasures.

In this presentation, we are showing our analysis framework and results of each integrated indexes.