

Estimating the impacts of climate change and human activity on streamflow variability in Han River basin, South Korea

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(a) Purpose of study or research hypothesis

The streamflow is influenced by climate change and human activity. Currently, a lot of research is ongoing on this critical issue, accurate quantification of the effect of these factors on streamflow is necessary to understand the major driving factors involved in the variability of streamflow.

(b) Key issue(s) or problem(s) addressed

The core objective of this study is to identify the change point in the hydro-meteorological time series and quantify the influence of variability in climate change and human activities on streamflow in Han River basin, South Korea.

(c) Methodology or approach used

We perform hydrological modeling for long-term streamflow time series in conjunction with change point detection and trend analysis. To separate the effects, the Pettitt test and non-parametric Mann-Kendall tests are employed to detect the change point and magnitude of trend in the streamflow time series. Initially, long-term streamflow time series are divided into two parts based on the change point; natural period (1978-1997, pre-change) and human-induced period (1998-2014, post-change). The two-parameter hydrological model is first calibrated with hydro-meteorological data in the natural period and used for simulation in human-induced period. The impact of both climate change variability and human activities are estimated separately.

(d) Results or conclusions derived from the project

This study exhibits an increasing trend in both precipitation and streamflow. The change point is detected in 1997 and then human activities influence the variation of streamflow. The human activities are the main driving forces affecting streamflow with contribution of 62.4% and climate change variability contributes 37.6% in the human induced period.

(e) Implications of the project relevant to congress themes

The findings suggest that human activities intensified in the whole basin, the consequences of these activities may result in extreme natural disasters. This information is effective for engineers and decision-makers for planning the disasters preventing projects in the basin.

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