Analysis of recent climate change research on water resources in the Korean Peninsula

Jiheun Kim YP[1]*, Jae Kyoung Lee[2], Young-Oh Kim[1]

1 Dept. of Civil and Environmental Engineering, Seoul National University, Seoul, Korea;
2 Innovation Center for Engineering, Daejin University, Pochoen-si, Gyeonggi-do, Korea
*Correspondence YP: wlgms94@snu.ac.kr

Abstract With a significant role of uncertainty in future climate change projection, the results may vary according to the choice of General Circulation Models, Regional Circulation Models and downscaling methods. Thus, analyzing the ensembles of climate change simulation results is essential to make an inclusive decision. In this study 161 research published in 13 Korean domestic journals from 2014 to 2019 were analyzed. Both precipitation and runoff on the Korean Peninsula were expected to increase over time. Moreover, the future flooding and drought vulnerability on the Korean peninsula were projected to increase as temperature rises and the precipitation patterns changes.

Keywords: climate change, flood, drought, adaptation, Korea climate change assessment report

Methods

In order to establish a climate change adaptation and response strategy, it is necessary to summarize the results of climate change research on the Korean Peninsula. Hence, research published in 13 Korean domestic journals from 2014 to 2019 were used to take account of the recent research. By filtering the keywords and titles including “climate change“ and hydrologic variables (flooding, drought, etc.) a total of 161 pieces of research were chosen. Then the results of the findings were classified into four chapters, ‘Observed Changes and their Causes’, ‘Future Climate Change, Risks and Impacts’, ‘Primary Causes of Future Vulnerability’, and ‘Adaptation Options’.

The level of the results agreement was evaluated by three criteria, ‘Substantial Agreement’, ‘Moderate Agreement’, and ‘Restricted Agreement’. Detailed classification of the level is given in the following table 1.

Table 1: A depiction of evidence and agreement

Agreement Level	Level of evidence (amount, quality) and degree of agreement
Substantial Agreement (SA)	Findings with high agreement and robust evidence
Moderate Agreement (MA)	Findings with medium agreement or high agreement with low evidence
Restricted Agreement (RA)	Findings with low agreement and limited evidence

Results

Common results of the gathered research are presented below with agreement levels in parentheses:
Annual precipitation has generally increased; summer rainfall has clearly increased, along with the frequency of extreme rainfall over the past thirty years (SA). The maximum rainfall, probable rainfall, design rainfall, and extreme rainfall were projected to increase (SA). Future discharge tends to increase in general, particularly in summer (MA) where evaporation is also expected to increase (MA). Both the frequency and intensity of the future flooding were likely to grow (MA). The frequency and scale of drought will generally increase in the future, in particular, drought damage was projected to exacerbate in the Han River and the southern part of the country as in Figure 1 (MA). In the meantime, the uncertainty increased as the projection time period increased, hence the variation of the results increased (SA).

Conclusions

Climate change is also affecting the Korean peninsula, and this study drew conclusions and levels of agreement by synthesizing the studies of 13 domestic journals. Both precipitation and runoff on the Korean Peninsula were expected to increase over time. Furthermore, as the rainfall patterns change, both flood and drought damage are expected to increase on the Korean Peninsula. It is believed that this study can be used as useful data for adapting to climate change on the Korean Peninsula and establishing strategies.

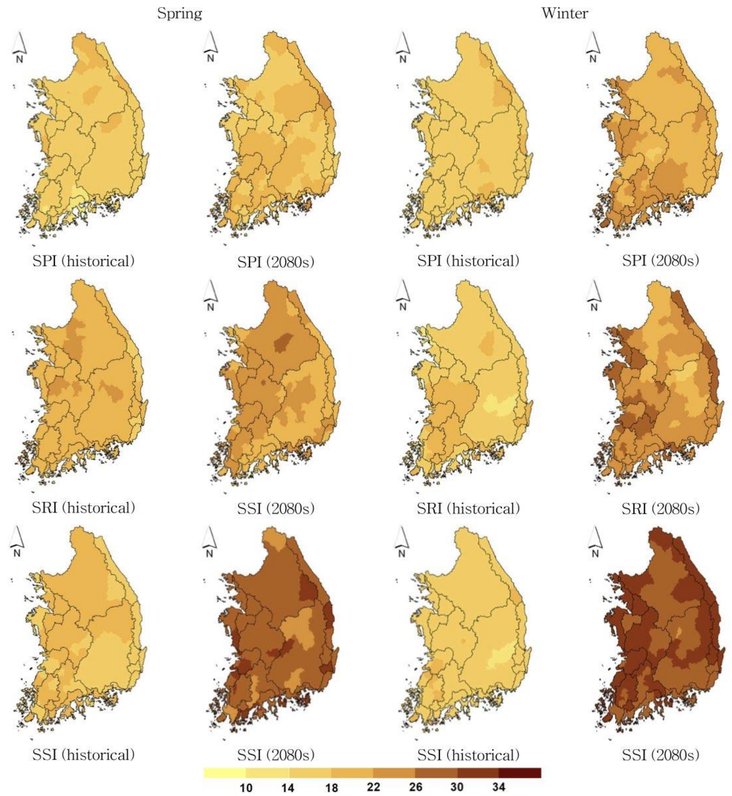

Figure 1: Spatial analysis of drought frequency in spring and winter (Sohn et al., 2014)

Bibliography

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