

## Future Domestic Water Demand, Surface Water Availability and Vulnerability Across Rapidly Growing Asian Megacities

Manas Ranjan Panda\* and Yeonjoo Kim\*\*

.....  
**Abstract**

The rapid urbanization in many Asian countries has taken millions of people from the rural countryside to concentrated megacities, which eventually putting pressure on the existing water resources. The over-growing population and increasing living standard of people in the urban region of developed as well as developing countries such as Korea, China, Japan and India have witnessed a drastic change in terms of domestic water demand for the past few decades. In this study, we used the concept of potential surface water availability in the form of surface runoff for future vulnerability assessment. We focused on 42 megacities having population more than 5 million as per the United Nations (UN) census data 2020. The study shows that 30 out of 42 cities having more than 180L/p/d demand for domestic use based on various references. We have predicted the domestic water demand for all the cities on the basis of current per capita demand up to 2035 using UN projected population data. We found that the projected water demand in megacities such as Seoul, Busan, Shanghai, Ghuanzhou are increasing because of high population as well as GDP growth rate. On the contrary, megacities of Japan considered in our stud shows less water demand in future due to decreasing trend of population. As per the past records provided by the local municipalities/ authorities, we projected different scenarios based on the future supply for various megacities such as Chennai, Delhi, Karachi, Mumbai, Shanghai, Wuhan, etc. We found that the supply to demand ratio of these cities would be below 75% for future period and if such trend continues then the inhabitants will face serious water stress conditions. Outcomes of this study would help the local policy makers to adopt sustainable initiatives on urban water governance to avoid the severe water stress conditions in the vulnerable megacities.

**Keywords:** Supply and demand, Forecast, Vulnerability assessment, Surface runoff

**Acknowledgement:**

This work was supported by the Basic Science Research Program through the National Research Foundation of Korea, which was funded by the Ministry of Science, ICT & Future Planning (No. 2020R1A2C2007670)

---

\*Ph.D. Student, Department of Civil & Environmental Engineering Yonsei University. Email: [manas@yonsei.ac.kr](mailto:manas@yonsei.ac.kr)

\*\*Associate Professor, Department of Civil & Environmental Engineering Yonsei University. Email: [yeonjoo.kim@yonsei.ac.kr](mailto:yeonjoo.kim@yonsei.ac.kr)