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Countermeasures against flood in the Chao Phraya River Basin, Thailand - Assessment and adaptation to combat climate change

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The countries of Southeast Asia are projected to experience severe flood damage and economic impacts from climate change, compared with the global average. Thailand is the second-largest economy in Southeast Asia and future flood damage is likely to hinder the economic growth of Thailand because Bangkok City (the commercial hub of the country) is located in the Chao Phraya River delta, where floods are frequent. Despite this fact, thus far, comparatively little research has been conducted to investigate the combined effects of climate change, human activities, and adaptation measures on flood risk reduction in the Chao Phraya River Basin (CPRB). Therefore, this study was conducted in the CPRB to examine the adaptation potential of (i) existing structural and non-structural measures that include reservoir and diversion dams, diversion canals, and water retention areas, and (ii) a combination of alterations made to the existing diversion canals and retention areas (combined adaptation) on reducing future floods using the H08 global hydrological model.

Future flood risk was analyzed using various flood risk indicators including flood frequency, number of flooding days, and annual maximum daily discharge. The results revealed that the impact of existing measures on the future flood reduction was smaller than the increase caused by warming in the upper and lower CPRB. Although the combined adaptation measures had considerable potential to reduce the magnitude and duration of future floods in the CPRB, extreme floods may continue to occur in the basin and further strategies are needed to alleviate the flood risk. Our findings emphasize that the integration of various existing structural and non-structural measures along with adaptation measures will be insufficient to completely mitigate future flood risk in the CPRB although the considered measures can greatly reduce future flooding. This study highlights the areas of the CPRB that are vulnerable to extreme flooding in the future and thus require area-based prioritization for flood management. Moreover, this study clearly indicated that GHMs can be effectively implemented for the design of regional adaptation measures.