Role of dams in reducing global flood exposure under climate change

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The Roman dam at Cornalvo in Spain has been in use for almost two millennia. Credit: Wikipedia/ CC BY-SA 2.0

A new collaborative study led by researchers at the National Institute for Environmental Studies, the University of Tokyo, and Michigan State

University exposes the role of dams for mitigating flood risk under climate change.

Flood is amongst the costliest natural disasters. Globally, flood risk is projected to increase in the future, driven by climate change and population growth. The role of dams in flood mitigation, previously unaccounted for, was found to decrease by approximately 15% the number of people globally exposed to historical once-in-100-year floods, downstream of dams during the 21st century.

Currently, about half of major river systems worldwide are regulated by dams and more than 3,700 major dams are planned or under construction. Consequently, to realistically assess population exposure to present and future floods, current and future dam landscapes must be integrated into existing flood modeling frameworks.

Accounting for dams in river flood simulations, the number of people exposed to the historical once-in-100-year flood below dams were 7.2 and 13.4 million on average over 2006-2099 given a low and a medium-high greenhouse gas emission trajectory (RCP2.6 and RCP6.0, respectively). The populations exposed to flooding below dams decreased on average by 16.3% and 12.8% for the two trajectories compared to simulations not accounting for the flow regulations produced by dams. At the end of the 21st century, the decrease was further extended to 20.6% and 12.9% respectively.

To maintain the levels of flood protection that dams have provided, new dam operations will be required to offset the effect of climate change, possibly negatively affecting energy production and water storage. In addition, precise and reliable hydro-meteorological forecasts will be invaluable for enhancing flood protection and avoid excessive outflows. Given the many negative environmental and social impacts of dams, comprehensive assessments that consider both potential benefits and

adverse effects are necessary for the sustainable development of water resources.

More information: Julien Boulange et al, Role of dams in reducing global flood exposure under climate change, *Nature Communications* (2021). DOI: 10.1038/s41467-020-20704-0

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