



## Effects of Long-Term Wetland Variations on Flood Risks in the Yangtze River Basin

Ziying Guo<sup>1</sup>, Xiaogang Shi<sup>1</sup>, and Qunshan Zhao<sup>2</sup>

<sup>1</sup>School of Social & Environmental Sustainability, University of Glasgow, Glasgow, United Kingdom

<sup>2</sup>Urban Big Data Centre, School of Social and Political Sciences, University of Glasgow, Glasgow, United Kingdom

In the Yangtze River Basin (YRB), flooding is the most frequent natural disaster with enormous socio-economic damages. As a critical component in the hydrological cycle, the wetlands along the YRB have been changing during recent decades because of urbanization, intensive farming (e.g., aquaculture and agriculture) and climate change. Due to the lack of a long-term wetland classification dataset with comprehensive wetland categories, however, there's a noticeable gap in the YRB water management regarding the relative roles of different wetland categories on flood resilience. Therefore, this study aimed to generate a long-term wetland classification dataset for the YRB and further investigate the long-term wetland variations on the YRB flood risk assessments for the period from 1985 to 2021. The dataset named Long-Term Wetland Classification Dataset for YRB (LTWCD\_YRB) was created using a Random Forest machine learning classifier on Google Earth Engine with 30m resolution Landsat 5, 7, 8 multi-spectral images. The maps of LTWCD\_YRB demonstrated the spatial distribution, annual variability, and seasonal cycle of nine wetland categories in the extent, and the total validation accuracy can reach 85%. The LTWCD\_YRB indicated that the total wetland area of the YRB in 2021 was larger than that in 1985, with constantly increased human-made wetlands and fluctuated natural wetlands. Aquaculture ponds expanded the most (4,987 km<sup>2</sup>); inland marsh in the source region was the wetland category with the most fluctuations. Seasonal changes in wetlands were prominent in the Poyang Lake Basin, Dongting Lake Basin, and YRB source region. The LTWCD\_YRB can offer a consistent agreement of wetland area variations with the other satellite-based wetland datasets in the YRB, which is valuable for researchers and stakeholders to better understand the YRB wetlands and would support sustainable wetland management practices. With the LTWCD\_YRB data as modelling inputs, a GIS-based spatial multi-index flooding risk assessment model was applied for investigating the long-term implications of wetland variations on flood risks in the YRB. The model results indicate that in the year with large floods and extremely high precipitation, flood risk level increased obviously after adding the wetland factor. For the years with normal precipitation, flood risk level decreased with wetlands expansion and increased with wetlands shrinkage in the YRB. The long-term expansion of aquaculture ponds contributed to a lower flood risk in the Taihu Lake Basin. In contrast, the Poyang Lake Basin experienced an increasing flood risk due to the long-term shrinkage in lake areas resulting from soil erosion and urbanization along the lakeside. This study would be helpful for stakeholders to develop feasible wetland management practices, and to improve flood risk resilience in the YRB.

