EGU22-4459
https://doi.org/10.5194/egusphere-egu22-4459
EGU General Assembly 2022

Climate change driven flood modelling predictions within Southern Thailand

Raymond Ward[1,2], Jerome Curoy[1], David Martin[3], Elena Puch[3], Jose Tenedor[3], Yi Wang[4], Netsanet Almirew[4], Jimy Dudhia[5], John Barlow[4], Cherith Moses[6], and Kanchana Nakhapakorn[7]

[1]University of Brighton, Centre for Aquatic Environments, Environment and Technology, Brighton, United Kingdom of Great Britain – England, Scotland, Wales (r.d.ward@brighton.ac.uk)

[2]Department of Landscape Management, Estonian University of Life Sciences, Fr. R. Kreutzwaldi 1, 51014 Tartu, Estonia.

[3]Ambiental, Science Park Square, Brighton, BN1 9SB, UK.

[4]Department of Geography, University of Sussex, Brighton, BN1 9QJ, UK.

[5]National Centre for Atmospheric Research, 3090 Center Green Dr., Boulder, Colorado 80301, USA.

[6]Department of Geography and Geology, Edgehill University, Ormskirk, L39 4QP, UK.

[7]Faculty of Environment and Resource Studies, Mahidol University, Nakhon Pathom, 73170, Thailand.

Globally, flooding is one of the most commonly occurring natural disasters and their frequency of occurrence and intensity is predicted to increase as a result of climate change and associated influences on rainfall intensity, duration and timing. The impact of floods can be exacerbated by associated damage to transport infrastructure, which can impede disaster relief activities, often where needed most. Thailand, and especially Southern Thailand suffers greatly every year and sometimes multiple times a year from flooding causing dramatic human and economic losses. In 2020 for example, after six days of heavy rains, 351 villages were affected by flooding representing a total of 16,709 households and almost 50,000 people.

Flood risk assessments are increasingly considered vital for societies across the world and as a result, flood modelling has considerably improved in recent decades with new formulations, the acquisition of extremely accurate geodesic data and powerful computers able to handle data processing.

This study used a bespoke software Flowroute for the flood risk assessment and flood modelling. This modelling software uses meteorological data and detailed GIS data to produce flood maps with return periods of 20, 50 and 100 years within the six largest catchments of the Krabi and Nakhon Si Thammarat provinces in Southern Thailand. Flood forecast models were run using downscaled regional (3km resolution) predictions under the AR6 RCP6.0 scenario, based on 20 year, 50 year and 100 year return period events.

Results showed a 16-17% increase in flooded area by 2100 compared with 2020 for the 100 year return period events in the Krabi province and a 22-38% increase in flooded area for the 100 year return period events in Nakhon Si Thammarat over the same time period.

The greatest impacts are likely to occur in the middle and lower parts of the catchments. These areas are flatter with a low angled slope in comparison to the higher parts of the catchments running into the valleys of the mountain chains. The sudden topographical changes between the upper part of the catchments and their lower parts means that during heavy rainfall, large amounts of water are very quickly drained towards a main stream that is not able to cope with it, hence water spreading over the river banks and settling more easily on those flat coastal plains. These areas are generally densely populated, used for industrial purposes and farming representing valuable assets for the economy of both provinces and the country. . Anthropic activities such as dam/weir construction or channel realignment are common in these areas and those changes exacerbate the stress on the river system created by the natural setting of these areas.

Based on the information provided by these models, authorities and managers can undertake flood mitigation measures by adapting, improving or creating new flood defences within the catchments. A variety of methodologies have been used in the UK from re-establishing the natural flow of the rivers and streams to developing retention basins along the streams.