MODELLING LARGE-SCALE FLOOD RISK IN THE NEPEAN VALLEY DURING EAST COAST LOW STORMS

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THE HAWKESBURY-NEPEAN RIVER IS ONE OF THE LARGEST COASTAL RIVER CATCHMENTS IN NSW AND HOME TO OVER ONE MILLION PEOPLE. THIS PROJECT AIMS TO ASSIST EMERGENCY MANAGERS VISUALIZE THE EVOLUTION OF FLOOD RISK IN THE NEPEAN VALLEY DURING HEAVY RAINFALL EVENTS ASSOCIATED WITH EAST COAST LOW STORMS.

BACKGROUND

East Coast Low (ECL) storms are a major cause of river flooding in NSW. Despite improvements to flood defences, population growth has increased exposure to flooding.

Figure 1. Flooding in the Upper Nepean during the June 2016 ECL. Image: Camden Advertiser (2016).

Emergency managers often need to spread resources over a wide area during a flood event. Despite this, **there is a lack of flood hazard modelling aimed at helping managers plan for flood resource allocation**.

Figure 2. Sub-catchments of the Hawkesbury-Nepean River (Warragamba sub-catchment is hatched) (NSW Office of Water, 2014).

AIM

This project, developed in consultation with NSW State Emergency Service, aims to use flood modelling to **visualize the evolution of flood risk in the Nepean Valley during heavy rainfall events** associated with ECLs.

STUDY AREA

The Hawkesbury-Nepean in Western Sydney is one of the largest coastal basins in NSW (Figure 2). The major towns of Windsor, Richmond, Penrith and Picton are all located within the Nepean Valley floodplain.

MODELLING APPROACH

3 – 9 August 1986 was used as a template of typical synoptic evolution and rainfall during an ECL (Figure 3).

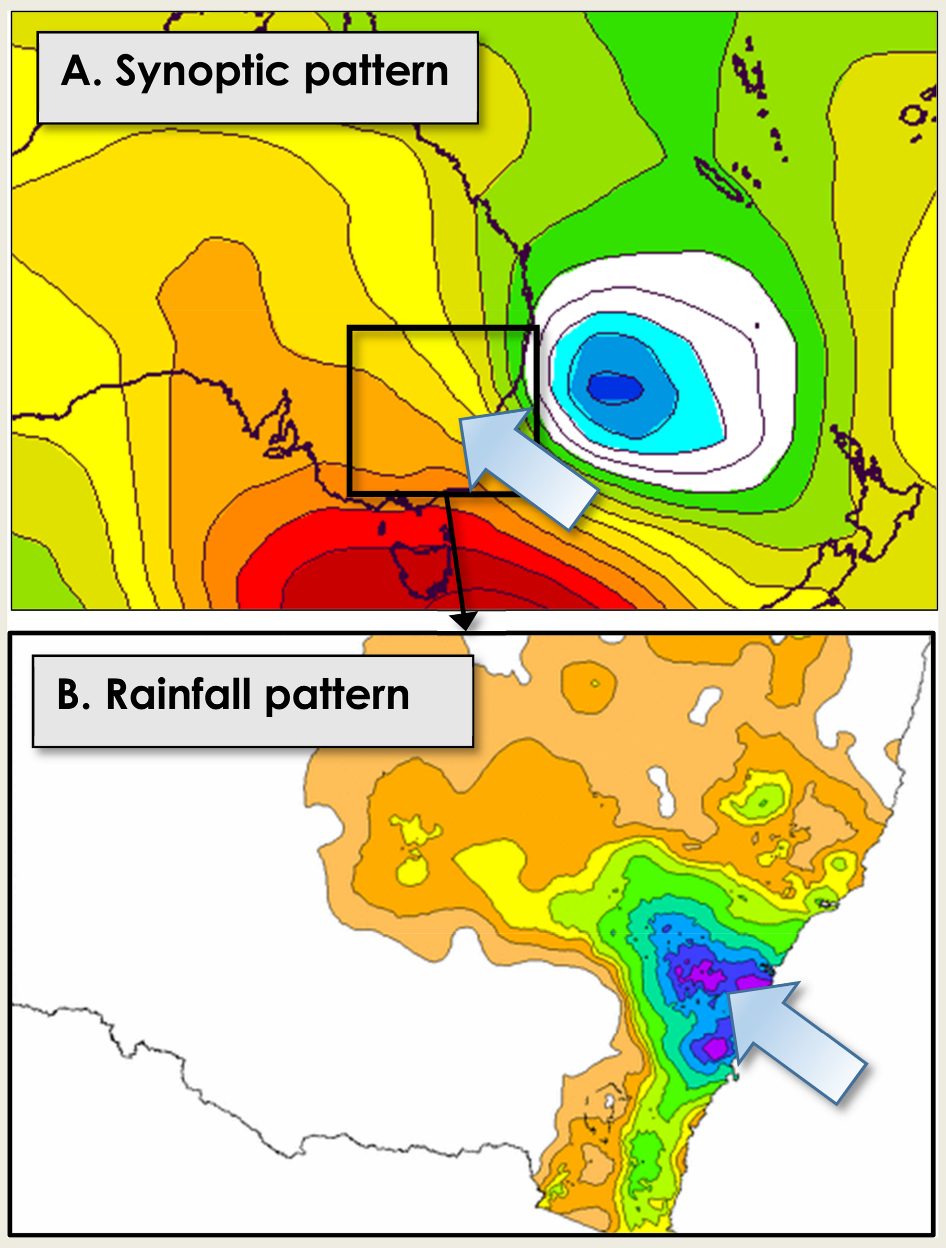

Figure 3. Synoptic (A) and rainfall (B) patterns at the peak of the 1986 event (NCEP, 2017 & BOM, 2017).

Rainfall was up-scaled from the 1986 level to a ~ 1:100 year intensity, with the spatial and pattern conserved.

A. Rainfall-Runoff Model

A distributed rainfall-runoff model was built to estimate river response across the Nepean Valley based on sub-catchment properties (Figure 4).

This **allowed spatially-varying rainfall to be incorporated** into flood modelling.

B. Flood Inundation Model

Discharge volumes were converted to river heights using synthetic rating curves for each sub-catchment.

A sloped plane was interpolated between flood heights and intersected with a high-resolution (1 m^2) lidar-derived DEM to estimate **inundation extents every 6-hrs**.

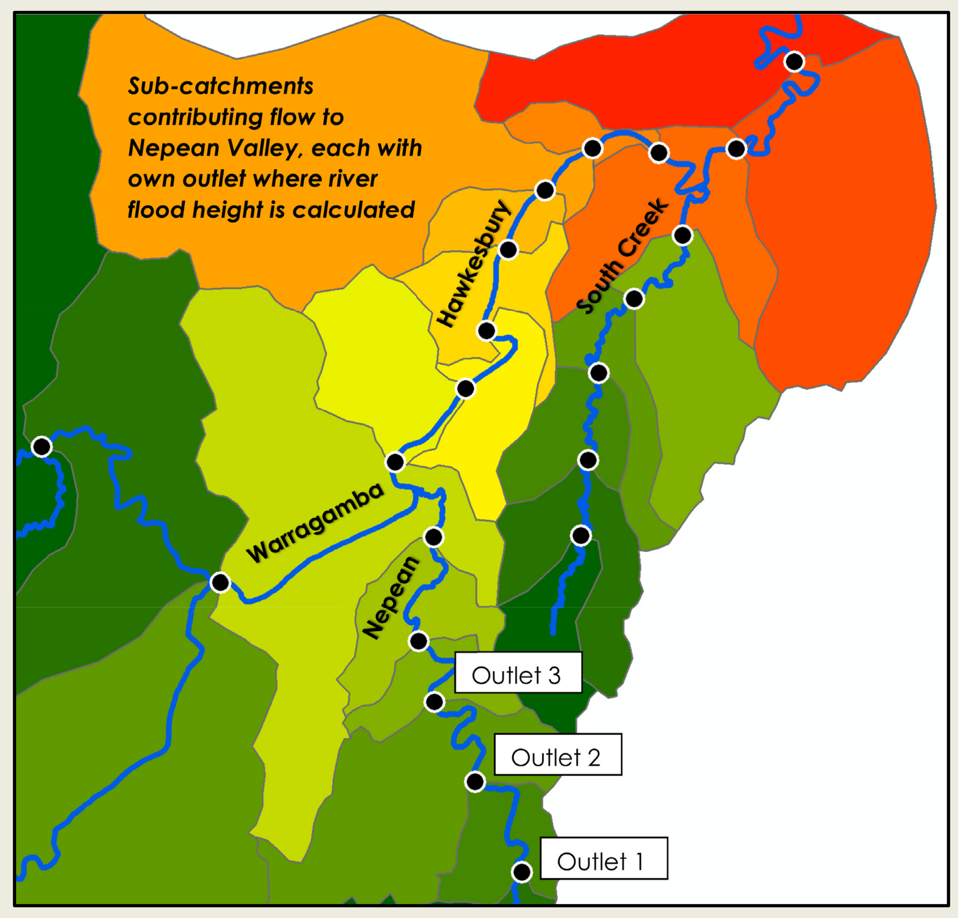

Figure 4. Conceptual basis of model where each sub-catchment has its own rainfall, catchment properties and outlet for flood height calculation.

RESEARCH UTILISATION

At the time of writing, modelling is near completion. The final report will be delivered 30 June 2017.

This model could also be expanded into **a state-wide tool to allow emergency managers rapidly visualize flood hazard for forecast rainfall events** and plan accordingly.

This would provide a pathway to research ultilisation after this project.

This project forms part of the BNHCRC's "*using realistic disaster scenario analysis to understand natural hazard impacts and emergency management requirements*".

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