Impact-based forecasting for the coastal zone

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Developing a pilot capability to estimate the impacts of East Coast Low hazards on the built environment, enabling more timely mitigation action by a range of stakeholders.

PROJECT GOAL

The project aims to quantitatively estimate the impacts of a severe wind and rain event on the built environment to enhance the Bureau's Severe Weather Warning information delivered to stakeholders in the emergency management sector (see Fig. 1 for an example).

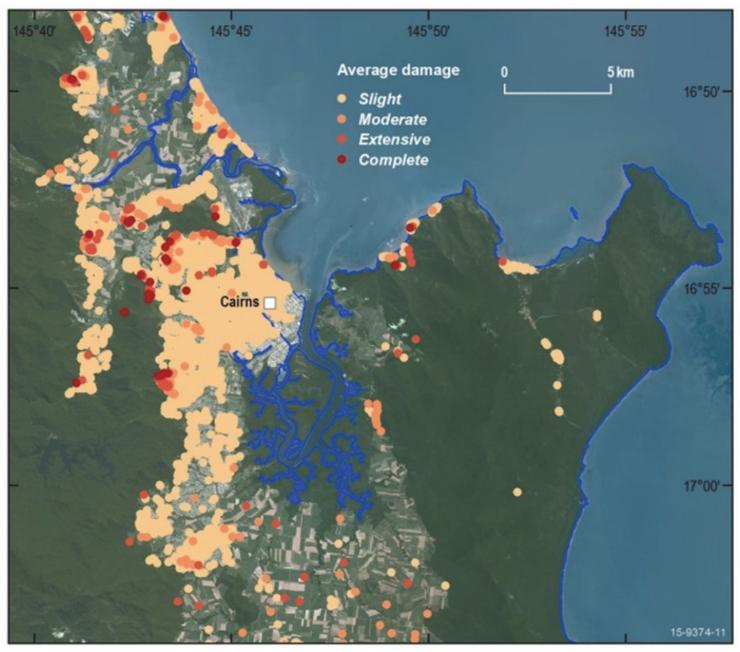

Figure 1: Indicative severity of building damage from impact model output.

PROJECT RESULT 1:

Spatial scale of accurate NEXIS exposure data: A desktop survey of residential building attributes for Dungog NSW has revealed that the statistically sampled house types within NEXIS do not provide an accurate estimate of actual house types at the single town scale (Fig. 3). The conclusion is that the project's impact forecasts should be delivered at scales larger than the single town scale.

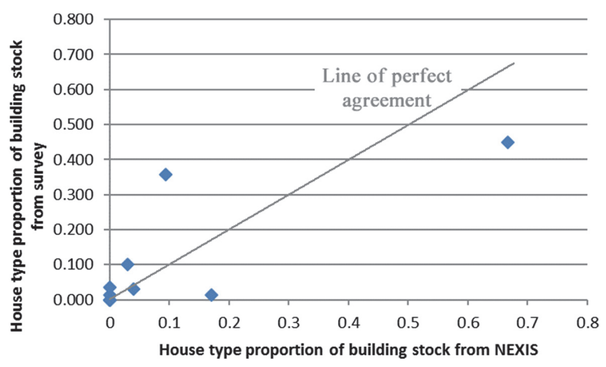

Figure 3: Relationship of NEXIS-extracted and surveyed house types for 856 Dungog post-1982 houses. A "house type" is defined as a combination of wall material (10 categories) and roof material (6 categories).

PROJECT METHODOLOGY

We combine wind and rain hazard information from the Bureau's high-resolution weather forecast models with building exposure data from the National Exposure Information System (NEXIS) and vulnerability measures derived from emergency services damage assessment survey data from past severe weather events.

Geoscience Australia's impact modelling capability then produces a prognostic estimate of damage to the built environment based on the forecast model output (Fig. 2). The impact information is primarily intended to flow into Visual Weather, the Bureau's primary operational data display system.

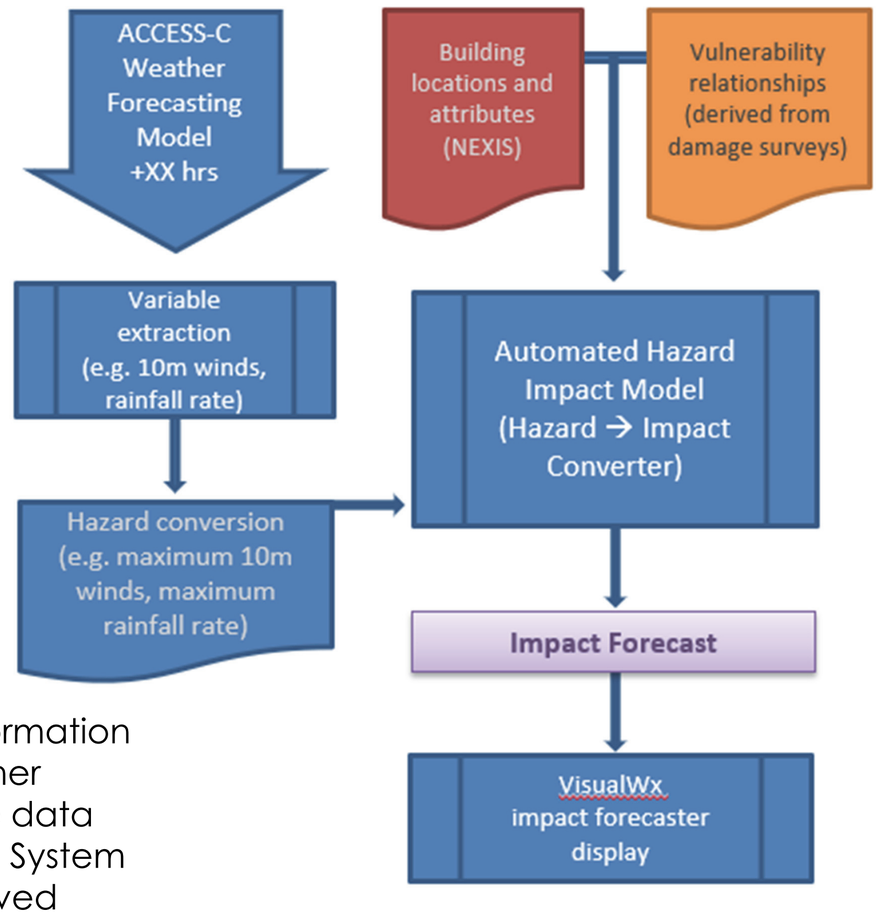

Figure 2: Idealised project workflow from high resolution model output to a spatial display of impacts.

PROJECT RESULT 2:

Need for more detail in damage survey data: Examination of damage assessment survey data from the NSW SES (Beacon) and Fire & Rescue NSW (EICU) has demonstrated the need for a categorical data field to identify the dominant hazard (i.e. wind, rainfall, hail etc.) causing the damage, and the assignment of a damage category (none, minor, major etc.). This will permit the attribution of the degree of damage to the underlying hazard or hazard combination.

PROJECT PLANS

This project intends to use multiple severe weather cases to establish more robust vulnerability relationships for wind and rain. While case data collection takes place, the project will utilise generic interim wind/rain vulnerability relationships to build a full workflow as shown in Fig. 2.

PROJECT RESULT 3:

Multi-hazard cause of building damage: Our analysis of the 20-22 April 2015 East Coast Low case shows no useful relationship between a single hazard (wind or rain) for a single case and building damage based on EICU data for Dungog NSW (Fig. 4). This result argues for vulnerability relationships to be derived across multiple severe weather events and in relation to simultaneous multiple hazards.

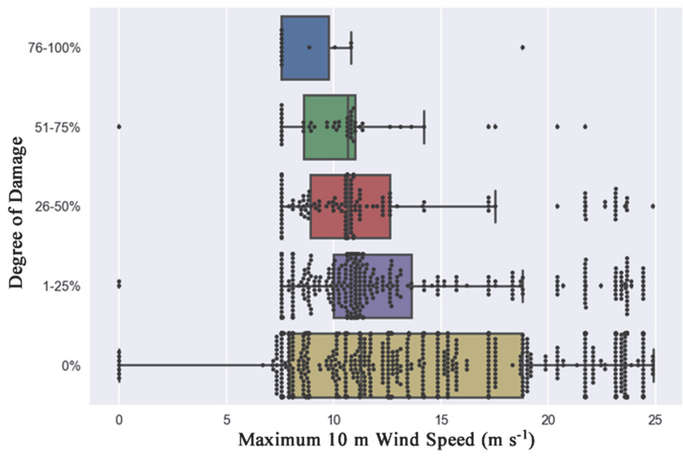

Figure 4: 20-22 April 2015 EICU damage data for the town of Dungog (NSW). The damage, categorised into five classes (none, minor, major, severe, destroyed), is shown in relation to the 48-hour maximum wind speed from the Bureau's high resolution model run on a 1.3 km grid. The coloured boxes show the inner two quartiles of the model wind distribution for each damage category.

Find out more

For more information about the project, contact Harald.Richter@bom.gov.au or visit our websites at: http://www.bnhcrc.com.au/research/hazard-resilience/3398 and http://www.bom.gov.au/research/projects/Impact-Forecasting/

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