

Impact Forecasting for Severe Wind Events

Research advisory forum / **2018**

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Australian Government
Geoscience Australia



Australian Government
Bureau of Meteorology



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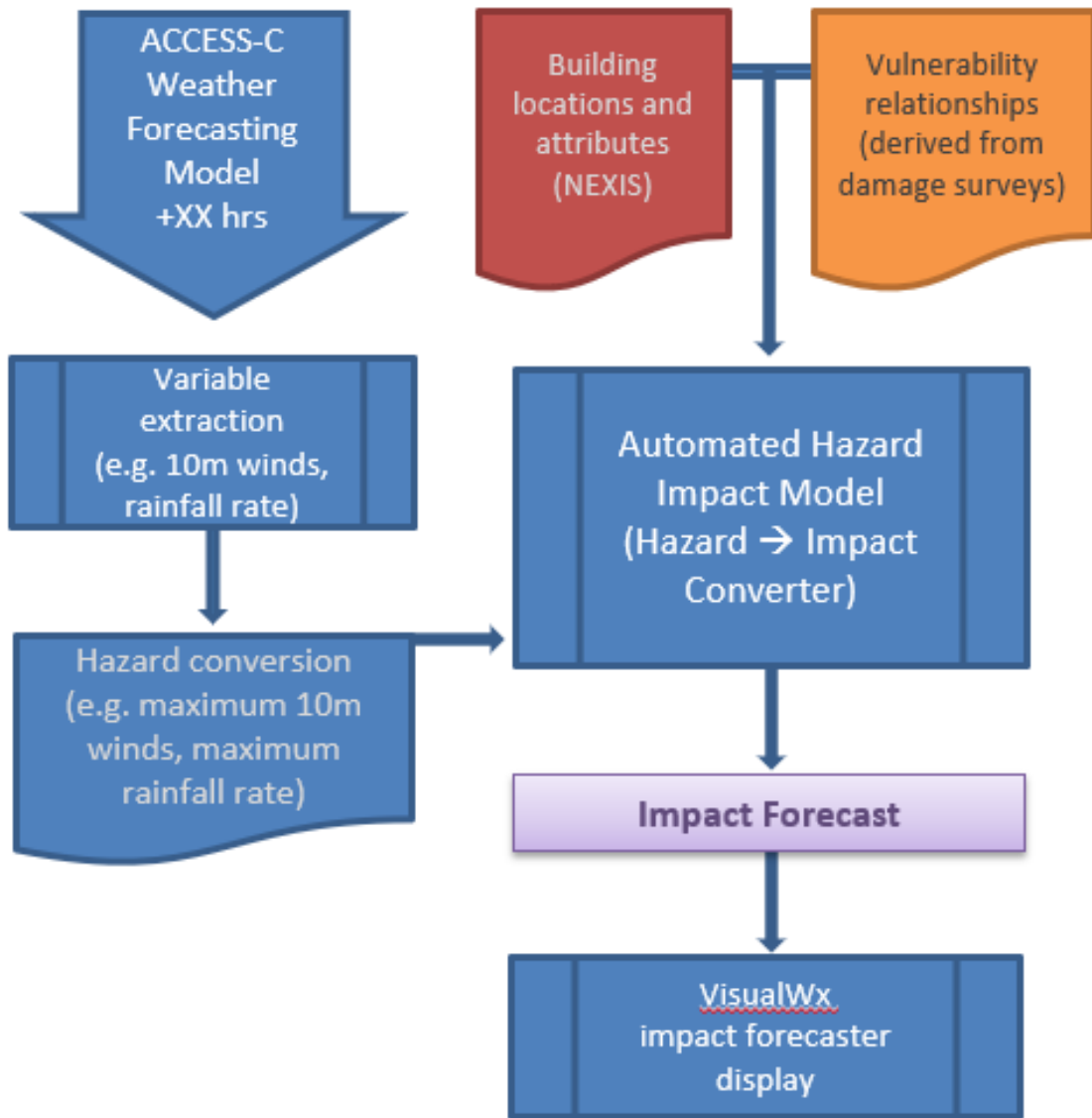
Australian Government
Department of Industry,
Innovation and Science

Business
Cooperative Research
Centres Programme

- . To develop a pilot capability that will make useful predictions of community impacts of extreme wind & rain with the goal of improving timely mitigating actions by a range of stakeholders.

Project Objective

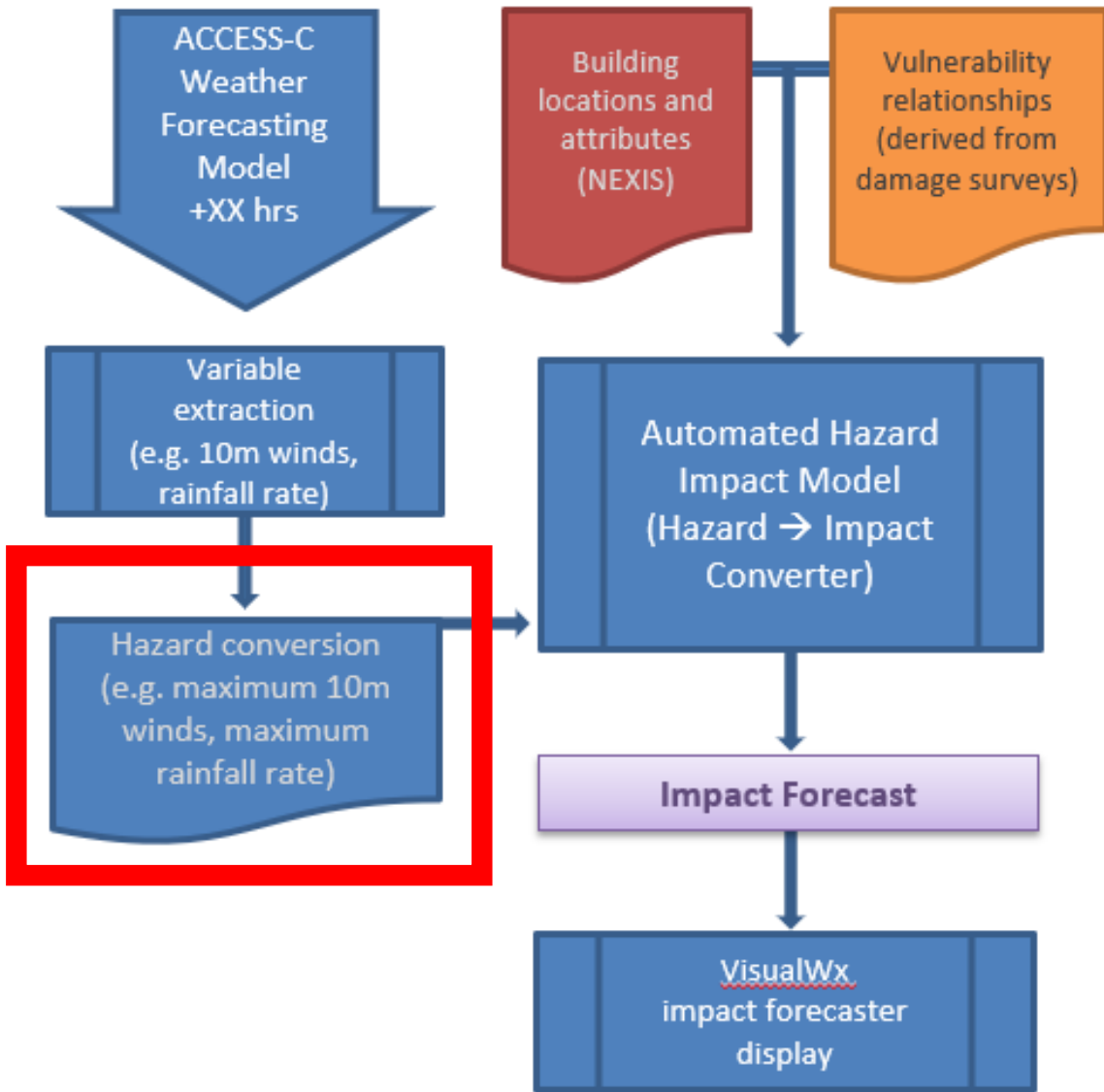




Data & Methods

WORKFLOW





Hazard Derivation

Wind Output → Wind Hazard

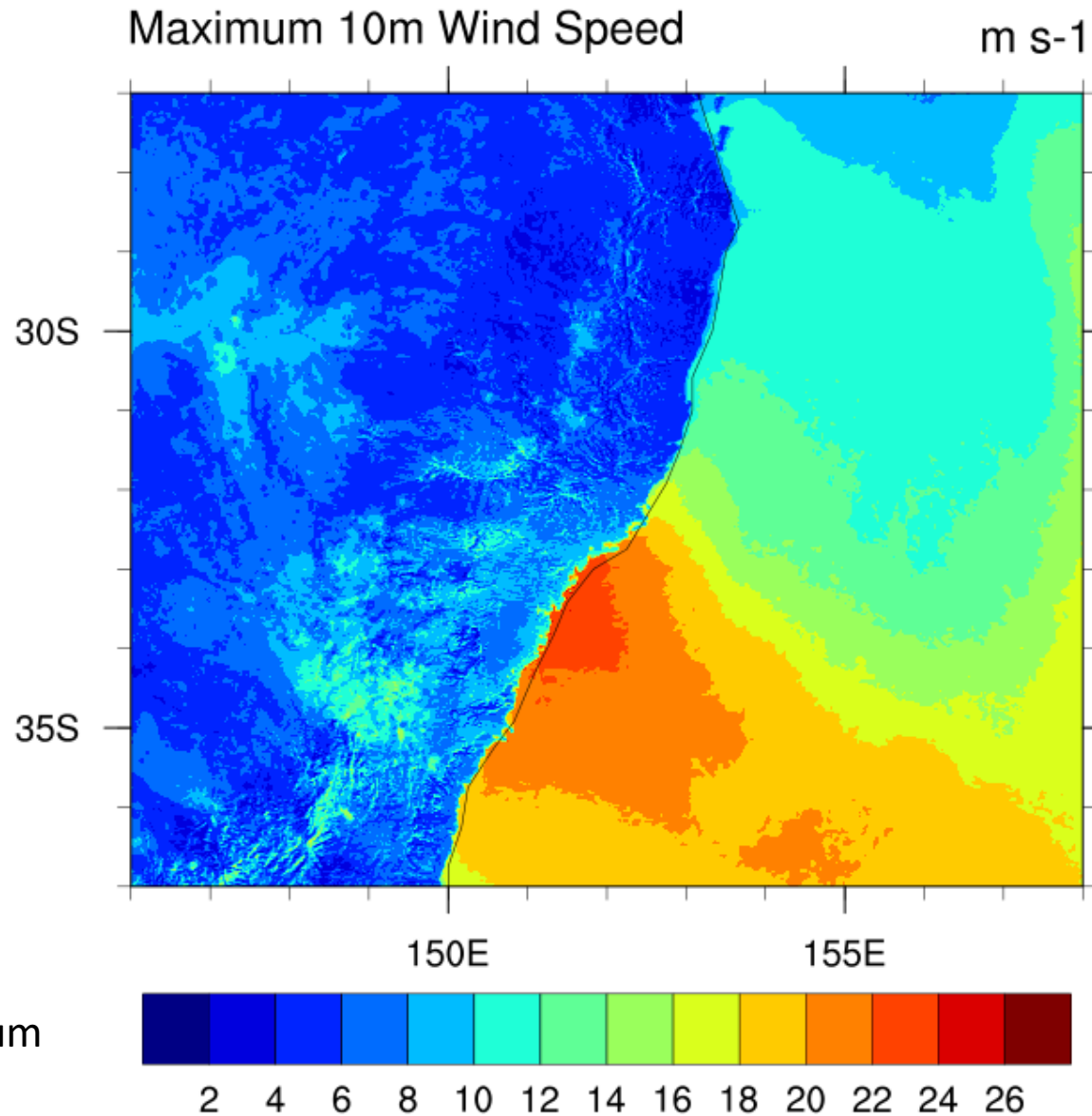
Most likely damage creator (= “the hazard”) is a derived field:
Looking for the maximum gust over a period of time →

Experiment with maximum wind speeds / gust duration:

- Wind maximum over several vertical model levels (2.5; 13.3; 33.3; 60.0 .. m)
- Wind maximum over every dynamical model time step (“HMF” concept)
- 3 sec gust encapsulated in the “gust” parameter U_g



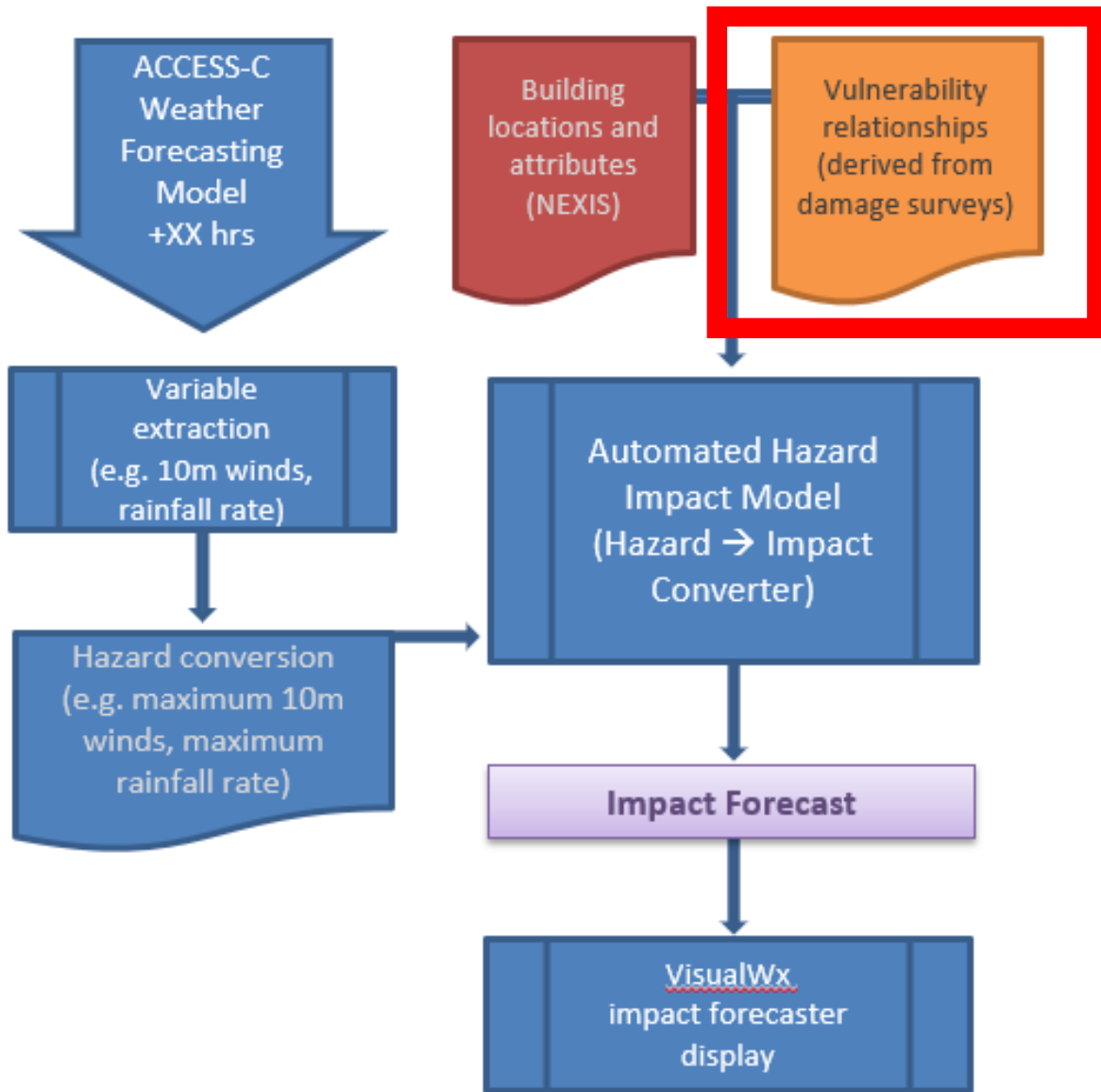
Surface Wind Hazard



21 April 2015

24-hr 10 m AGL wind maximum

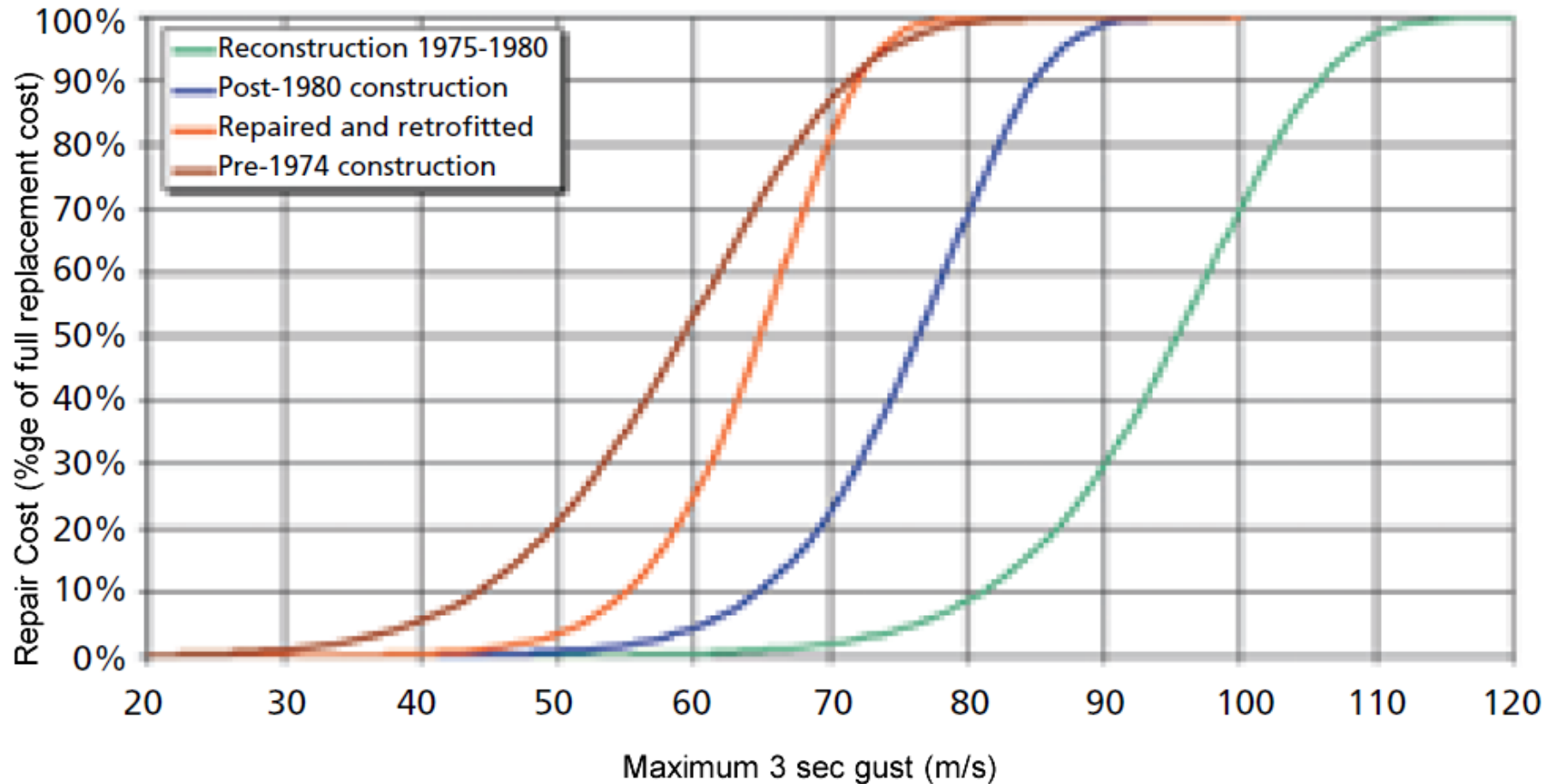




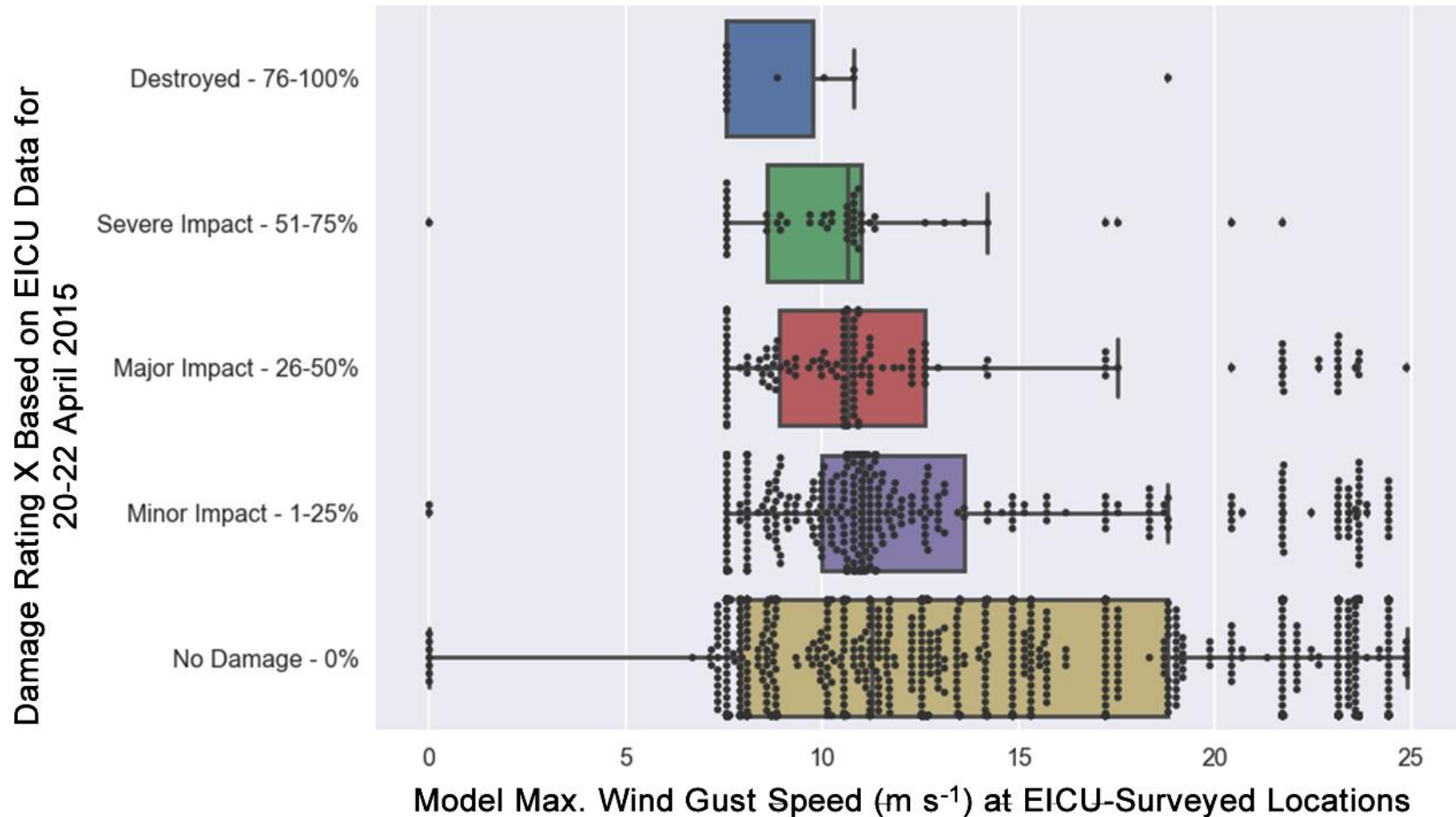
Vulnerability Relations



Wind Hazard → Damage Potential: Heuristic Vulnerability Relations to set up Workflow



First attempt of a Damage Data-driven Vulnerability: April 2015 Dungog Case



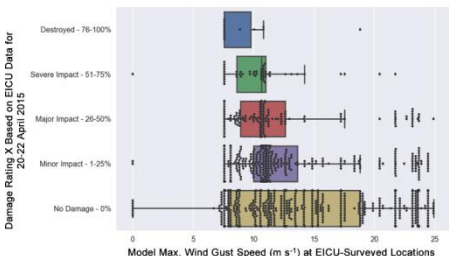
Dungog Case: What happened?

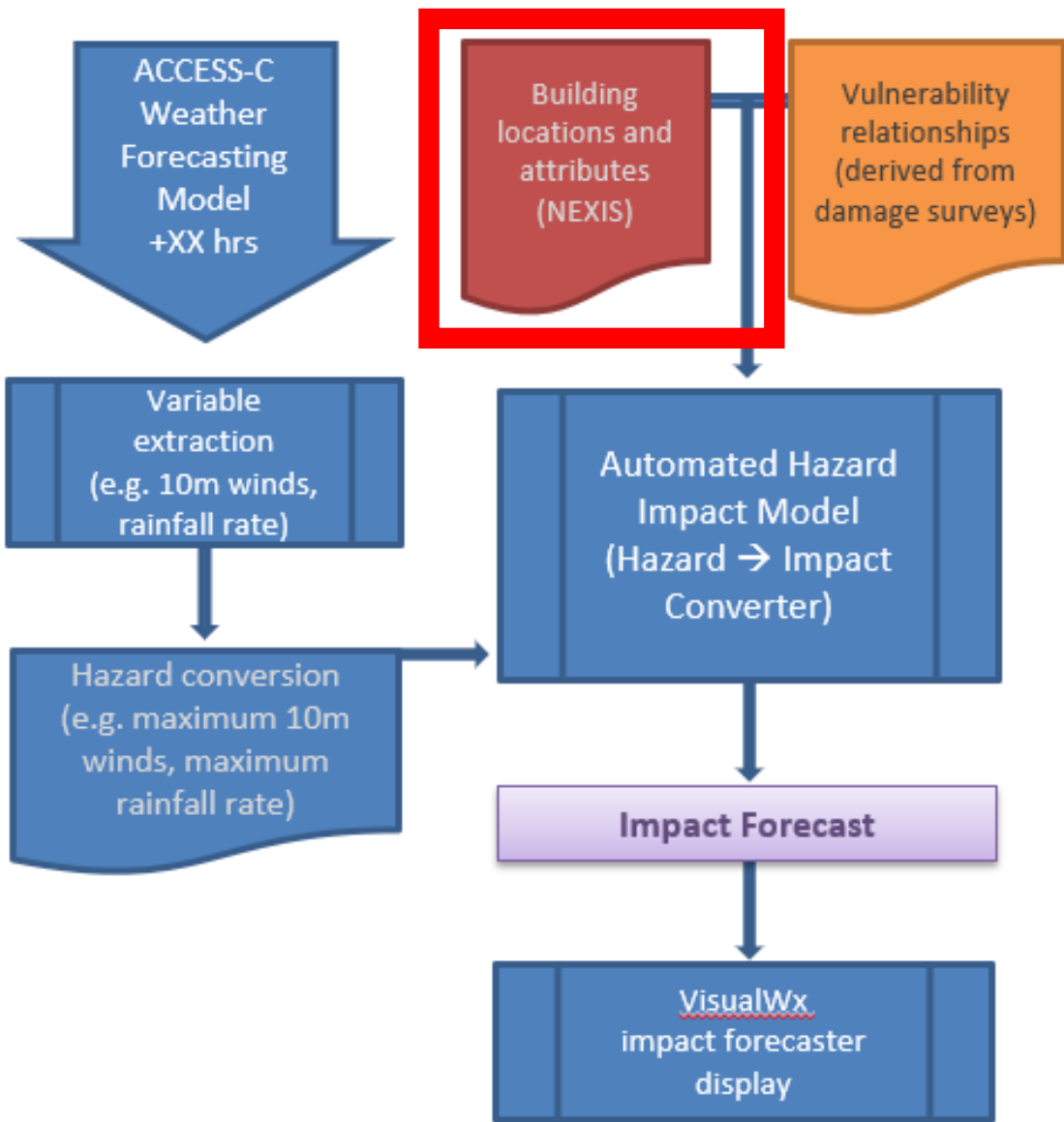
What derails a nice clean wind / house damage relationship?

[1] Building design wind speeds in the area mostly exceed 30 m s^{-1} → need an event with stronger winds

[2] Building damage seems to have been inflicted mostly in an indirect manner (impacts tend to be multi-hazard)

[3] Summative damage reporting inside the damage assessment reports does not permit establishment of clear links to individual hazards → *SES BEACON damage reporting template to update*



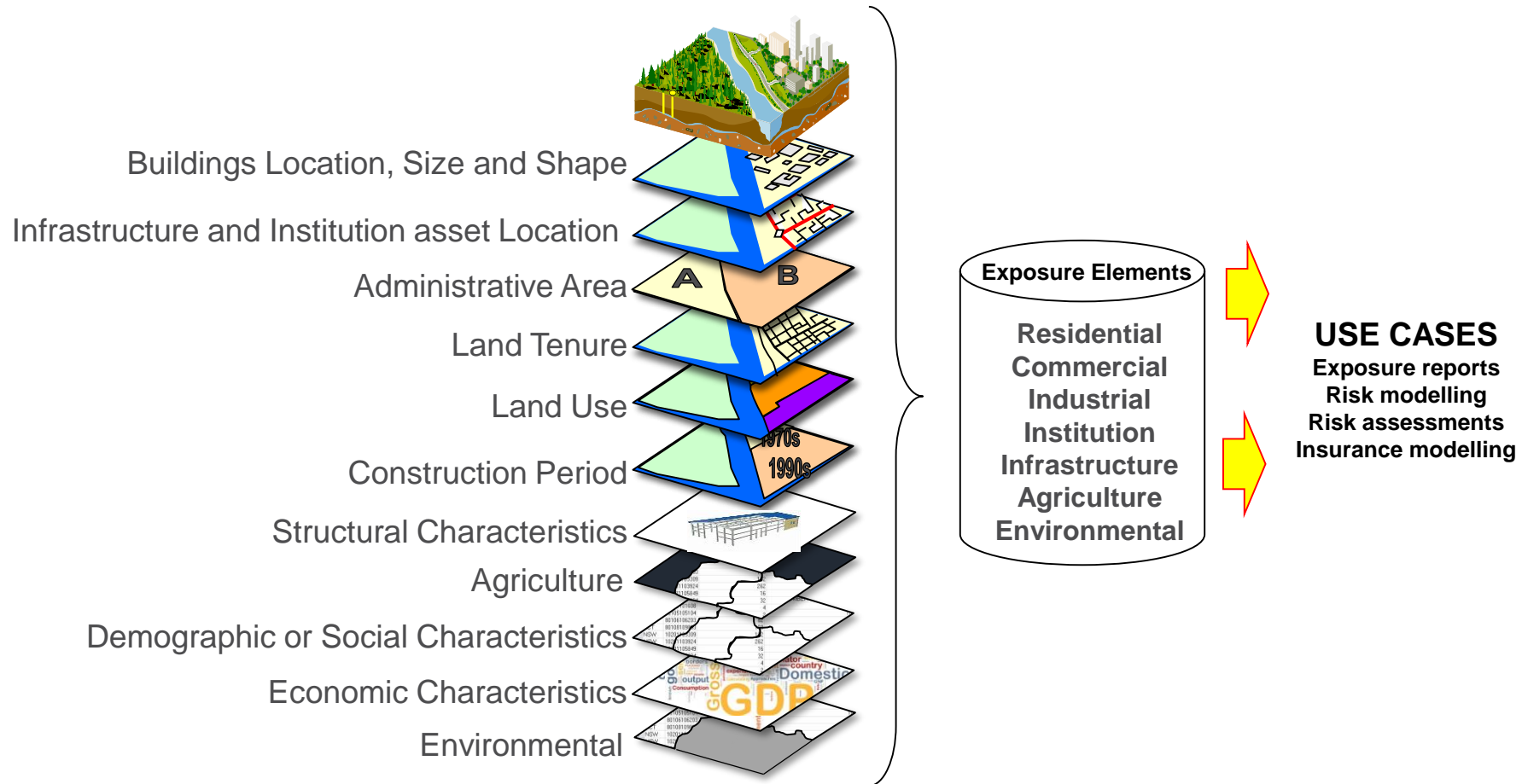


Exposure

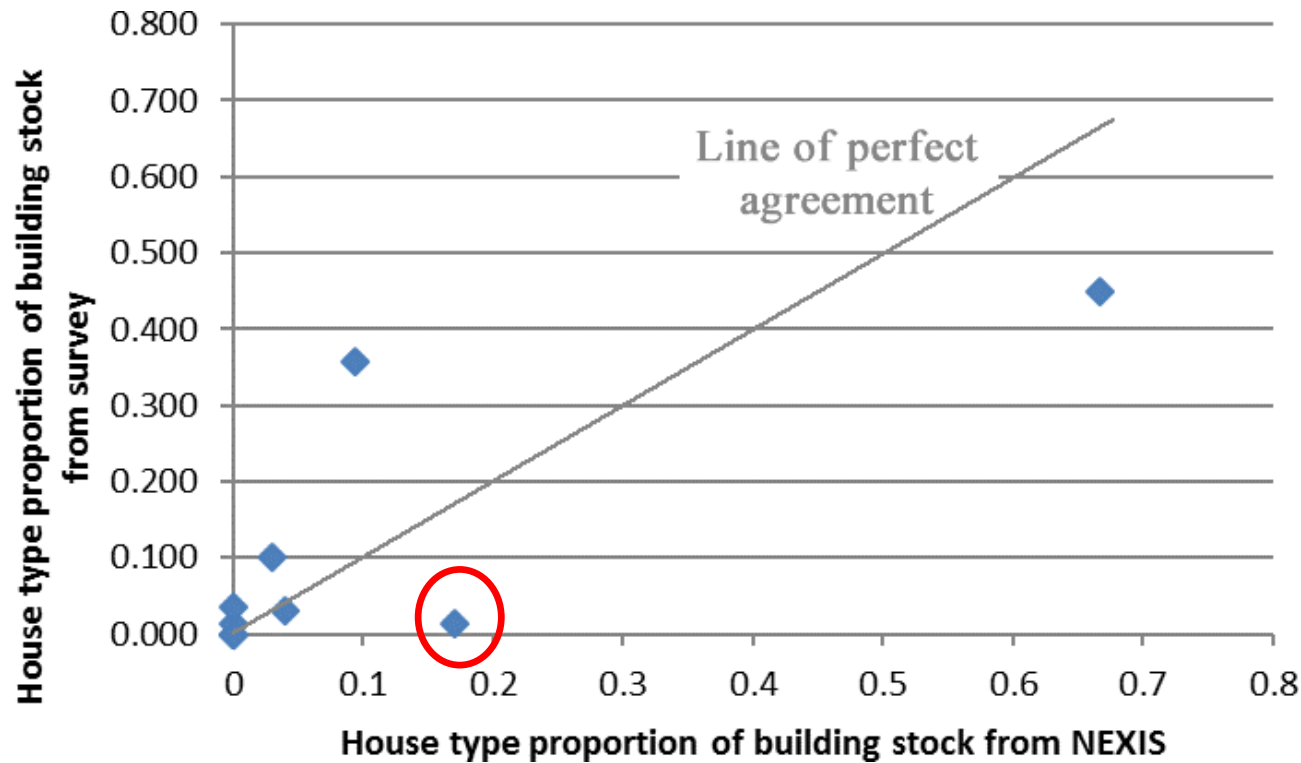


Data on Asset Types & Locations

National Exposure Information System (NEXIS)



Dungog – Exposure Uncertainty: Statistically Derived Asset Types



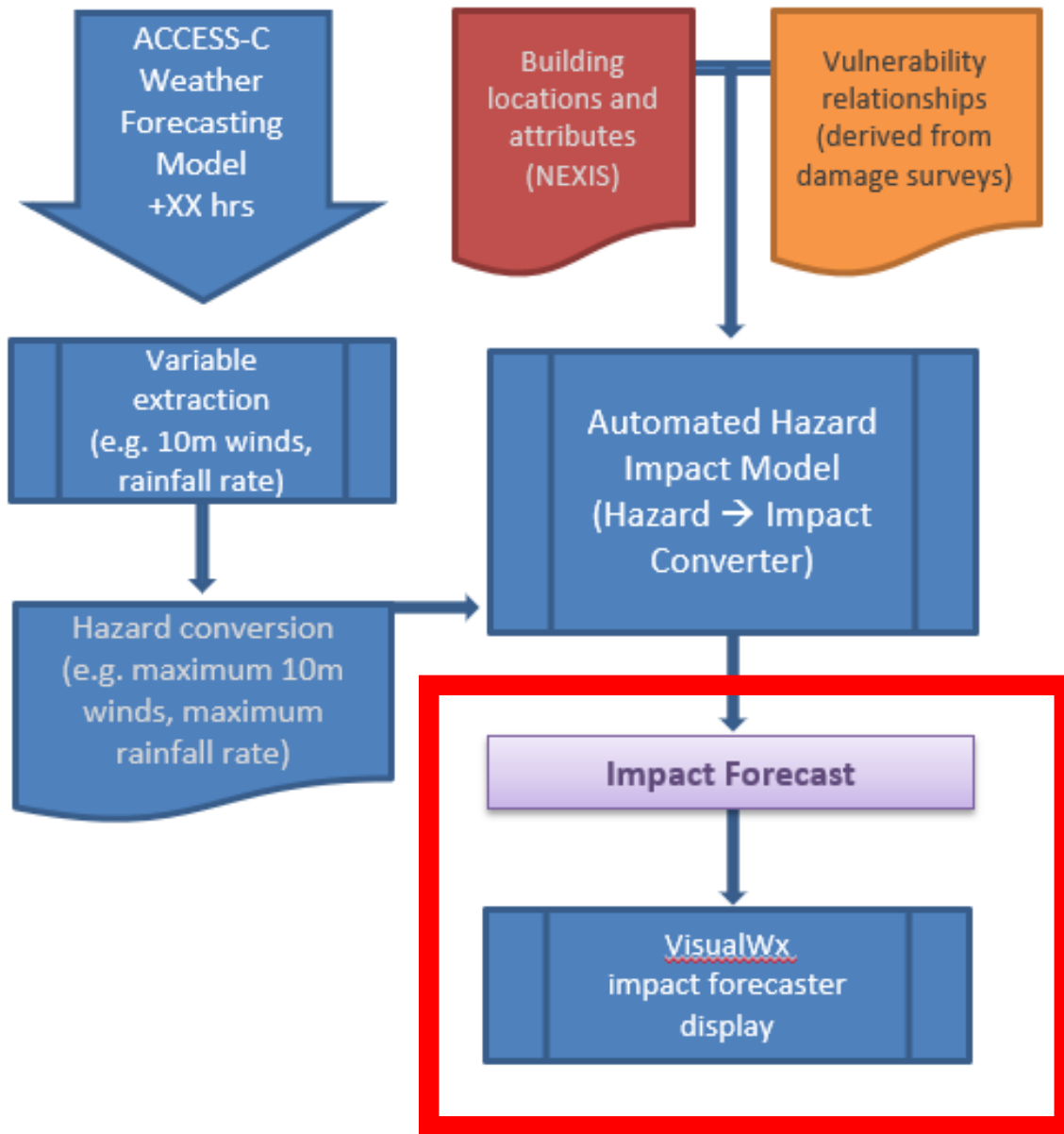
Relationship of NEXIS-extracted and surveyed house types for all of Dungog post-1982 houses.

A "house type" is defined as a specific combination of wall material (10 categories) and roof material (6 categories).

Red circle: Proportion of house type X

NEXIS says: 18%

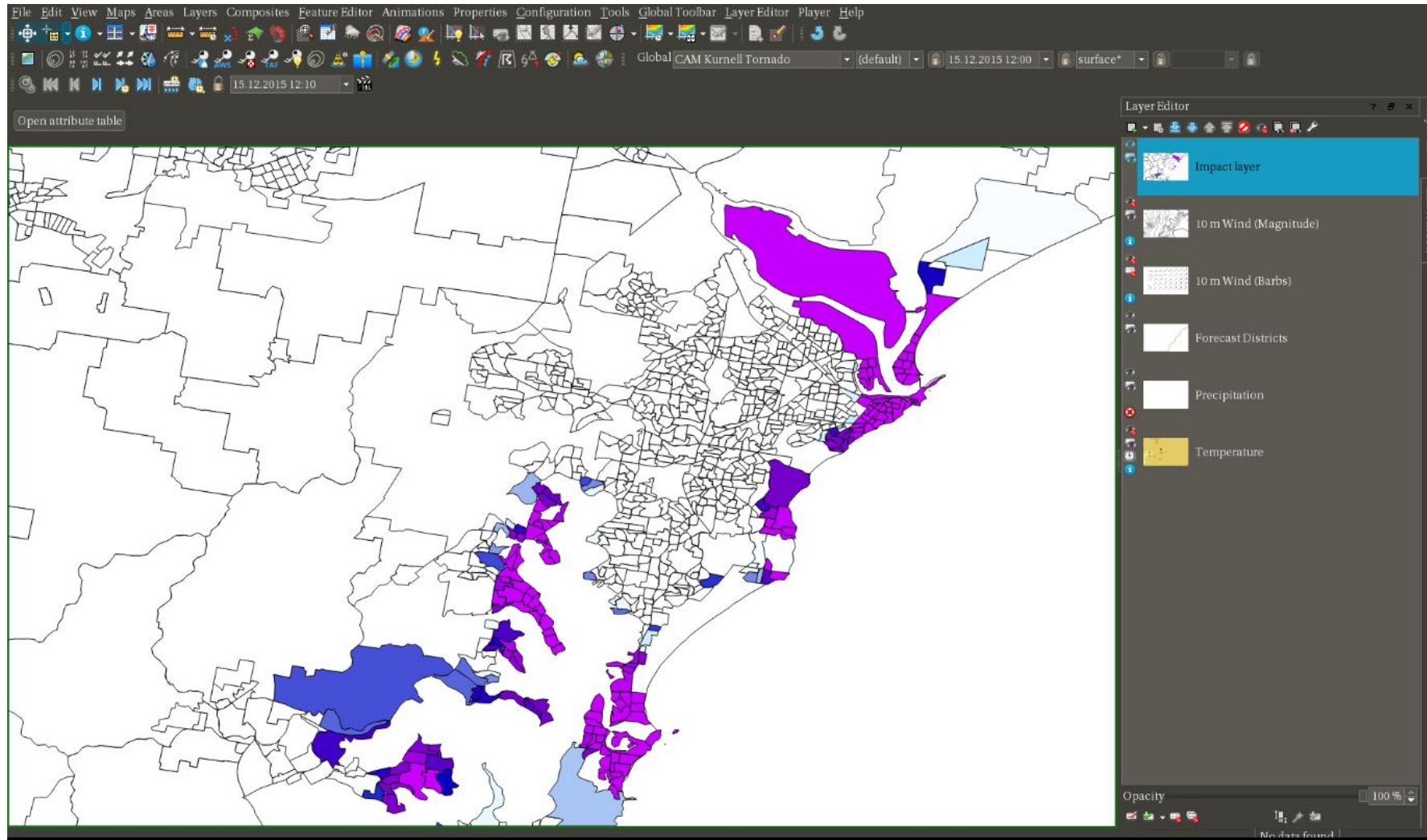
Survey says: 2%



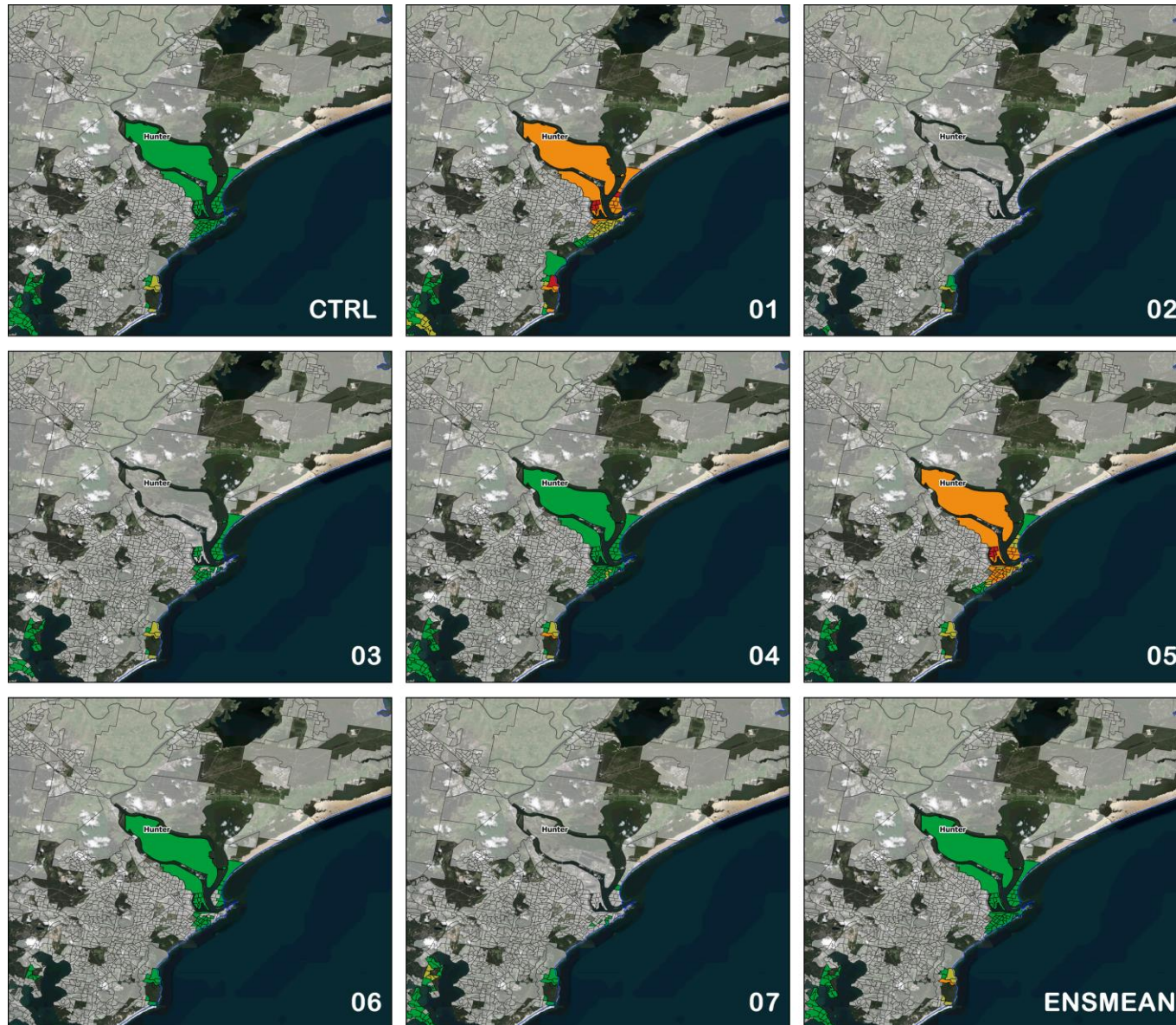
Spatial Impact Forecast



Spatial Impacts in Visual Weather



Spatial Impacts (Sensitivity to Hazard)



Legend

Forecast districts

Estimated damage state

Negligible

Slight

Moderate

Major

Severe

Forecast wind speed (m/s)

≤ 5

5 - 10

10 - 15

15 - 20

20 - 25

> 25



Next Steps

- 1) Test joint wind & rain hazard predictors for reported residential building damage
- 2) Include additional case studies with stronger winds and clean damage assessment data to derive single-hazard and joint multi-case vulnerability relationships (use BARRA reanalysis)
- 3) **Validation of predicted impacts against reported damage data – need for good data!**