Impact-based Forecasting in the Coastal Zone: East Coast Lows

Research advisory forum / **2018**

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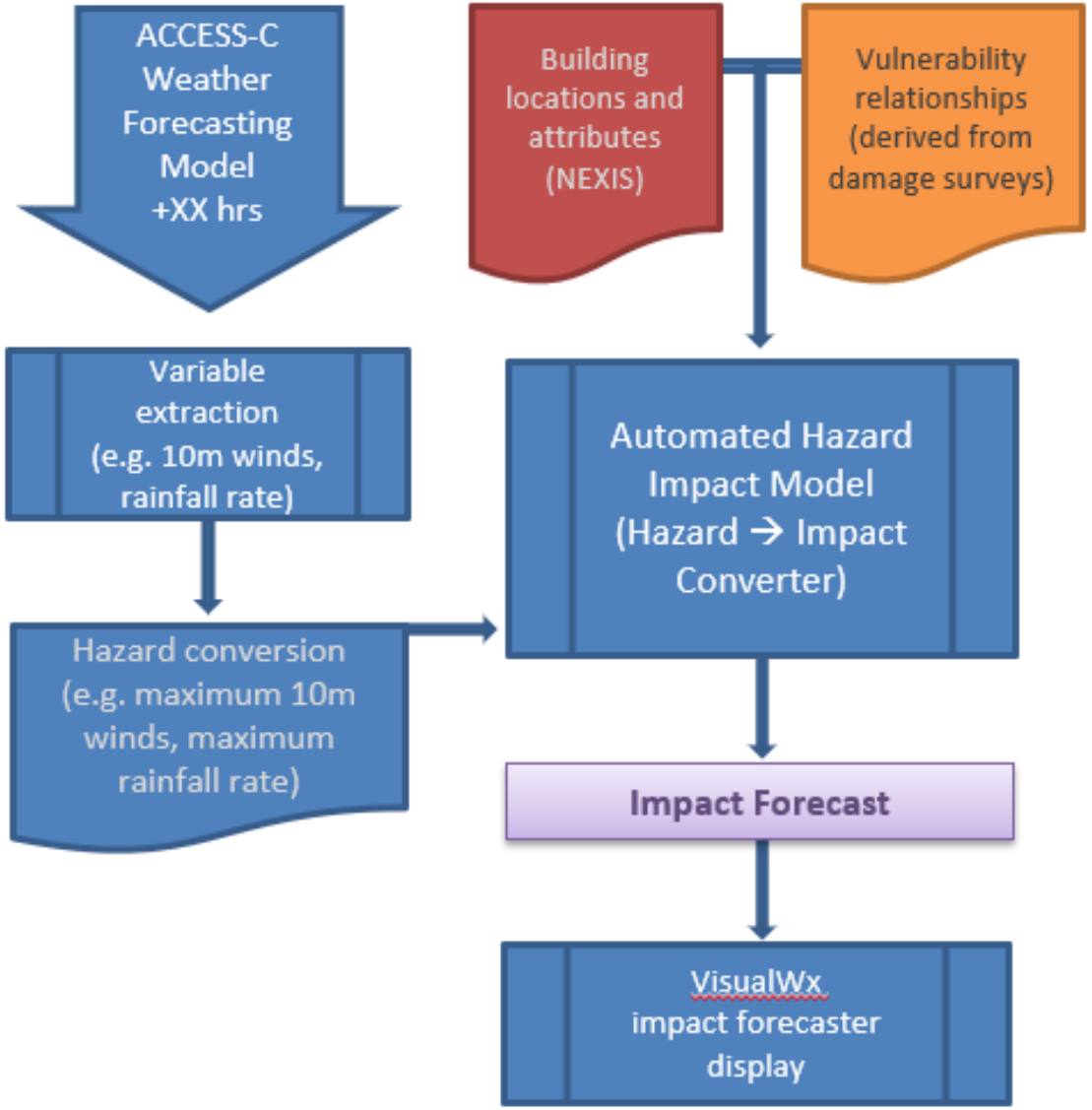
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

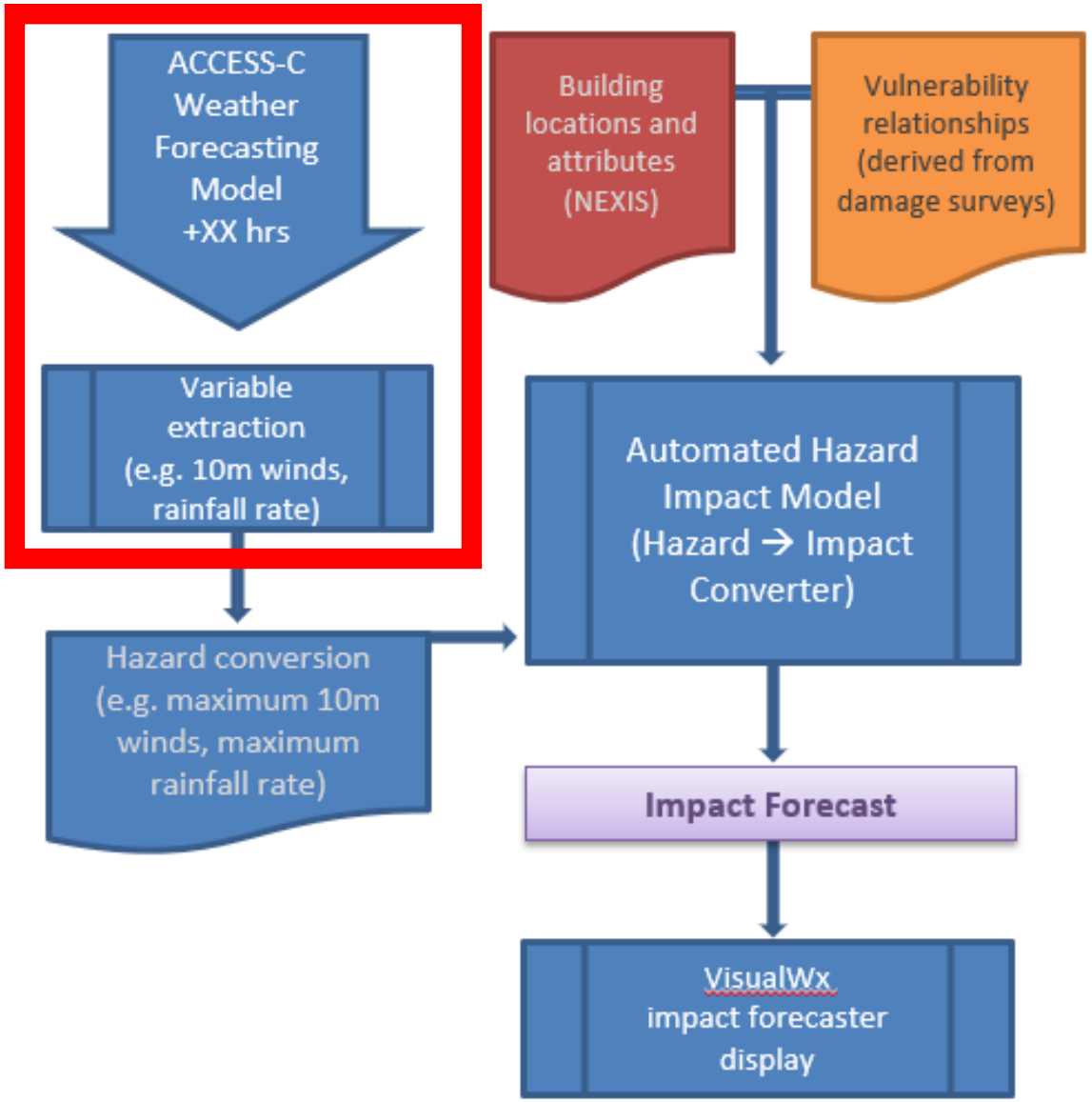
Project Objective

- 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.



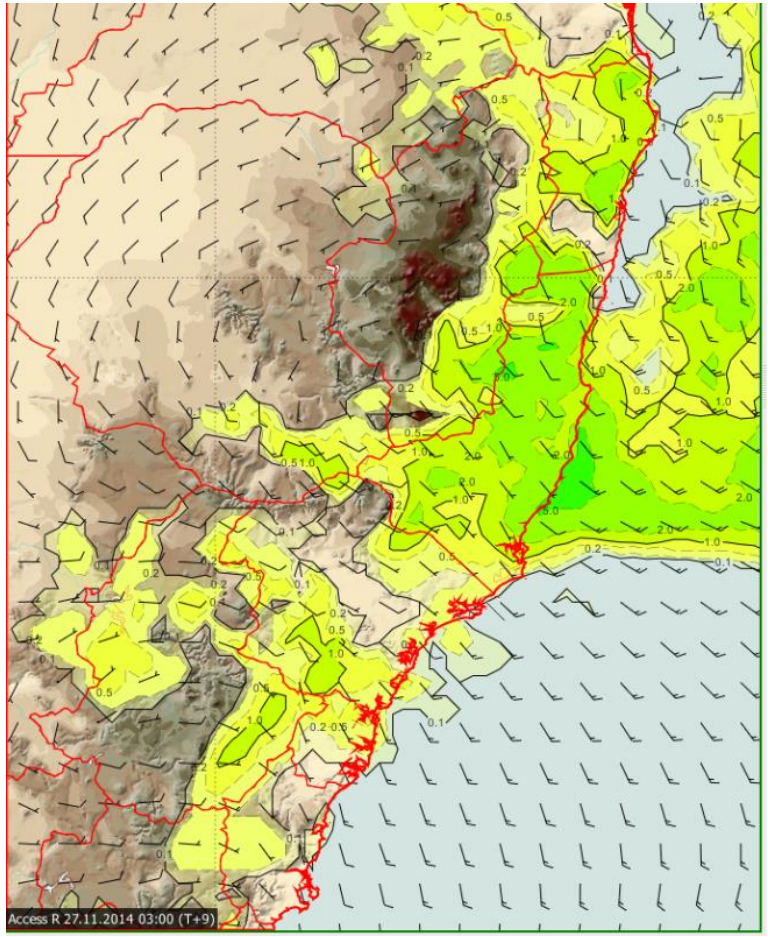
Data & Methods

WORKFLOW

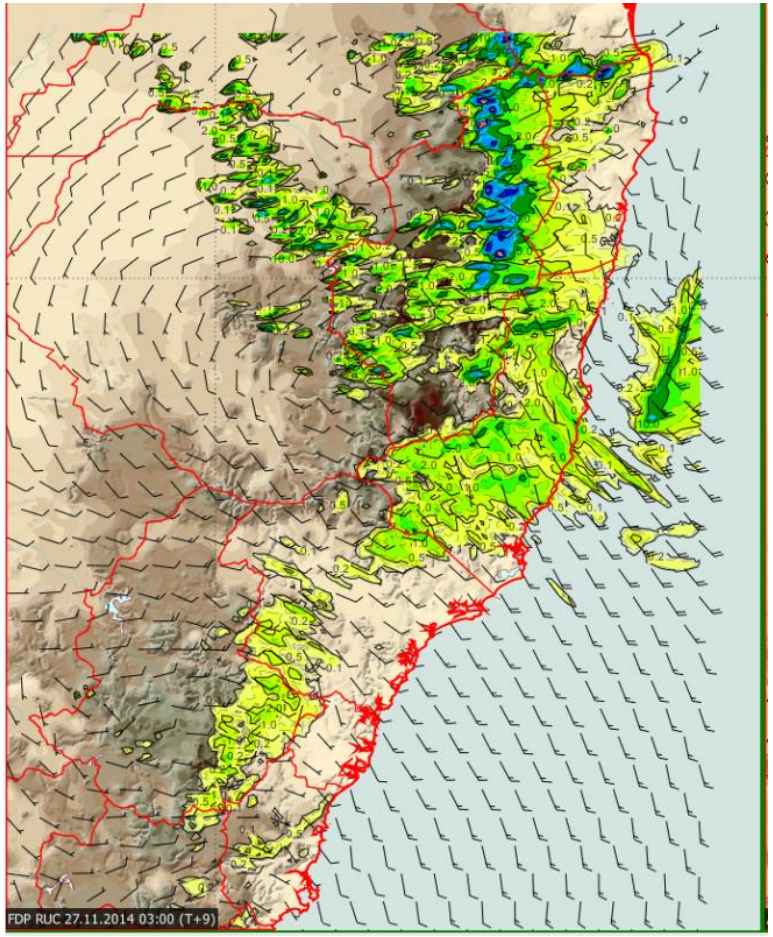


Raw Model Output

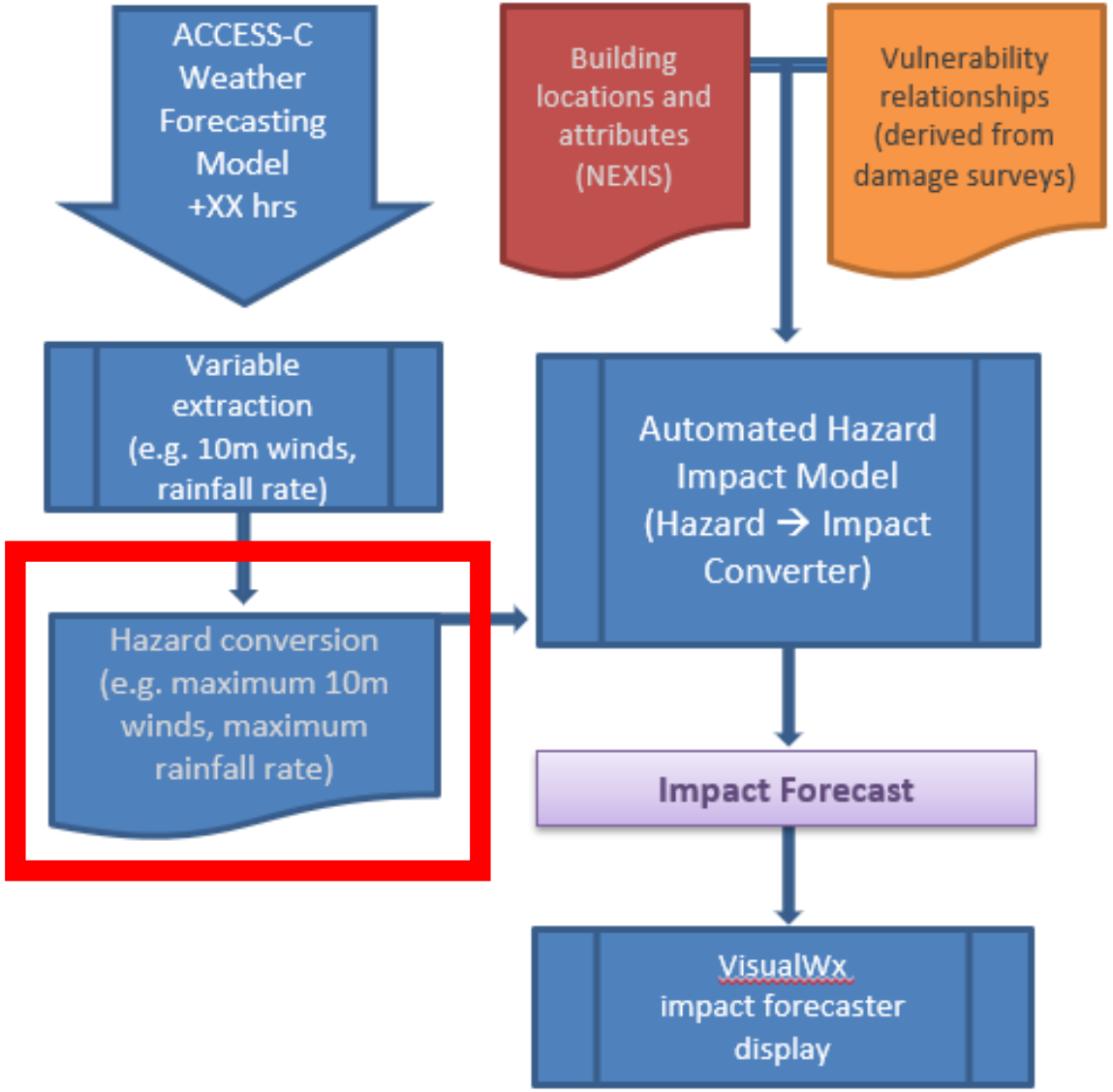
Rain Output – 12.5 km & 1.5 km Models



Parameterised Precipitation (ACCESS-R)



Explicit Precipitation (ACCESS-C)



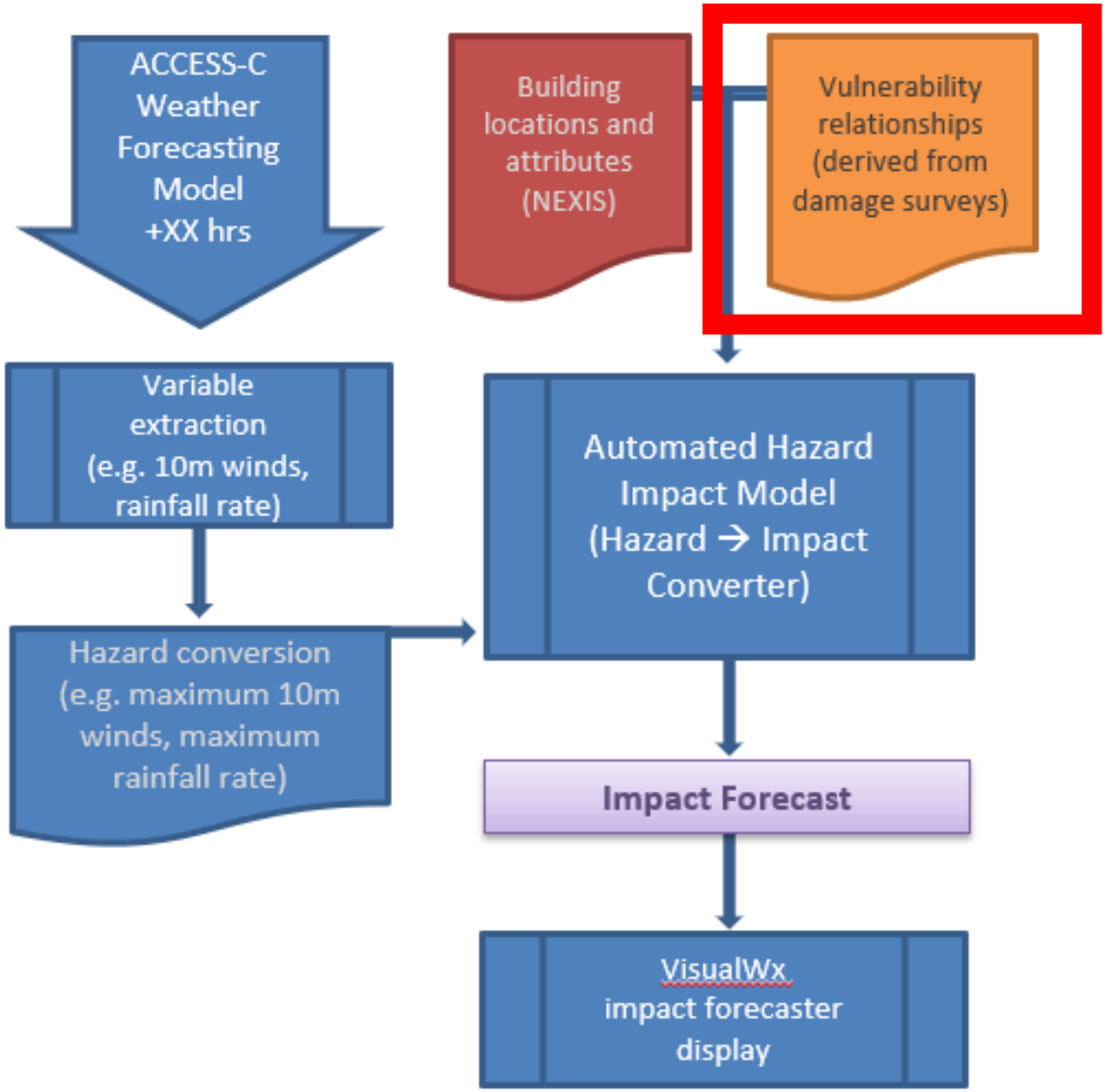
Hazard Derivation

Wind Output –> Wind Hazard

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

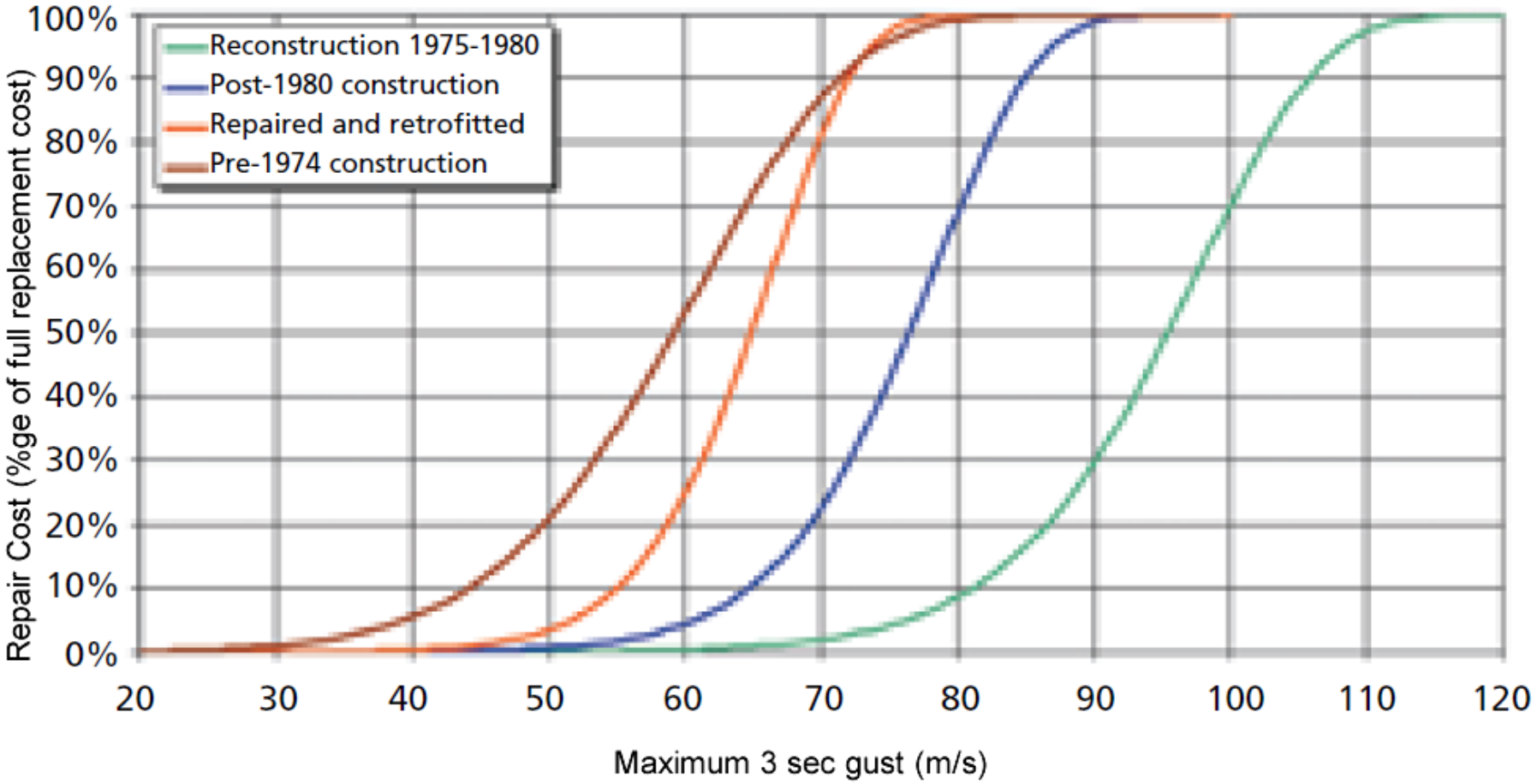
Experiment with maximum wind speeds / gust duration:

- 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

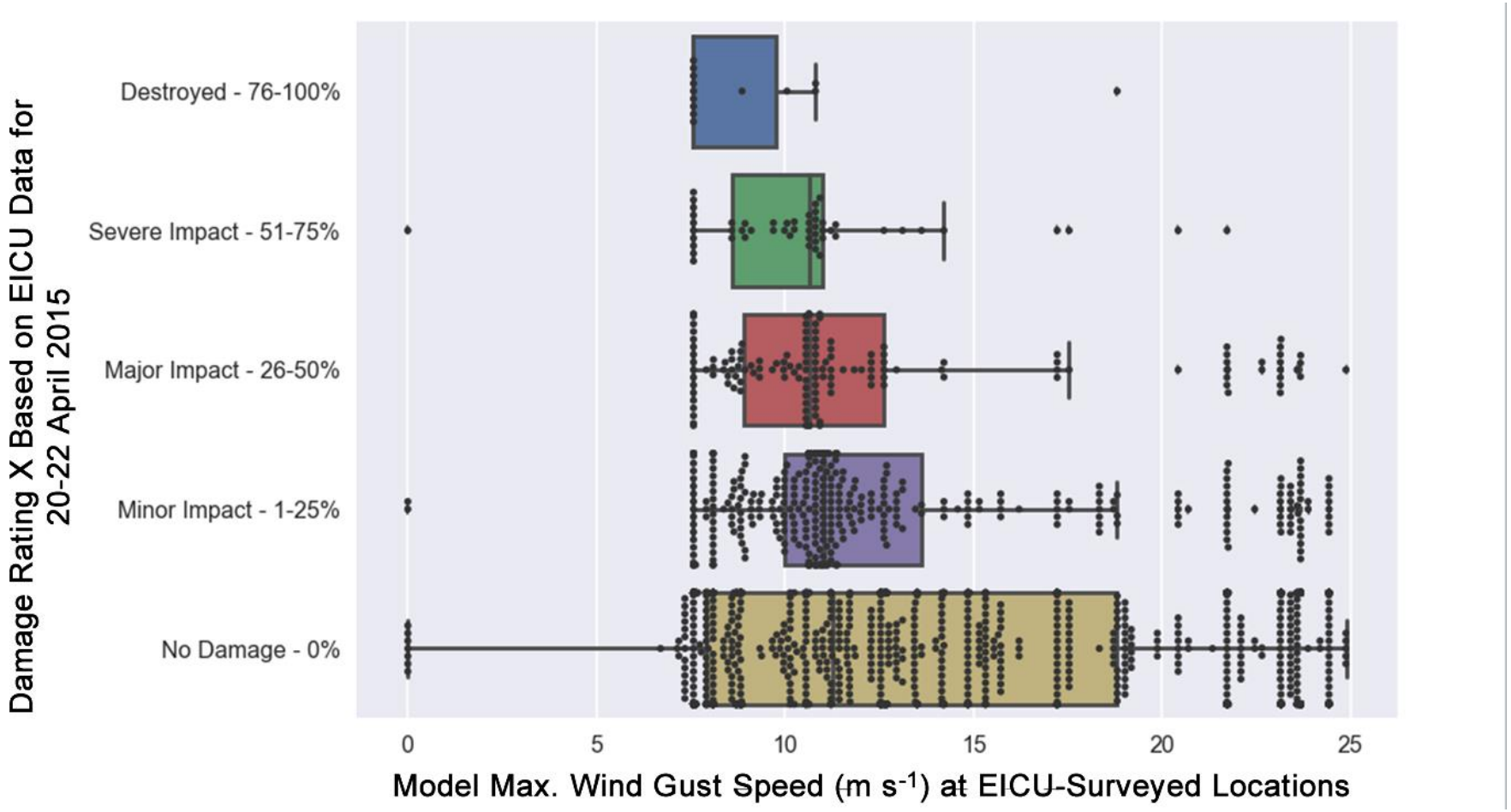


Vulnerability Relations

Wind Hazard –> Damage Potential: In Theory …



For April 2015 Dungog Case



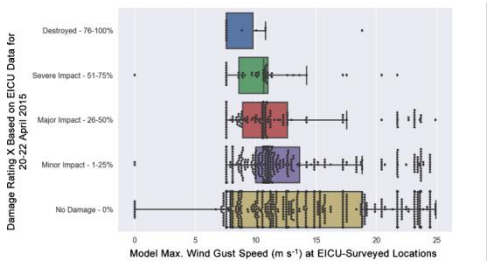
Dungog Case: What happened?

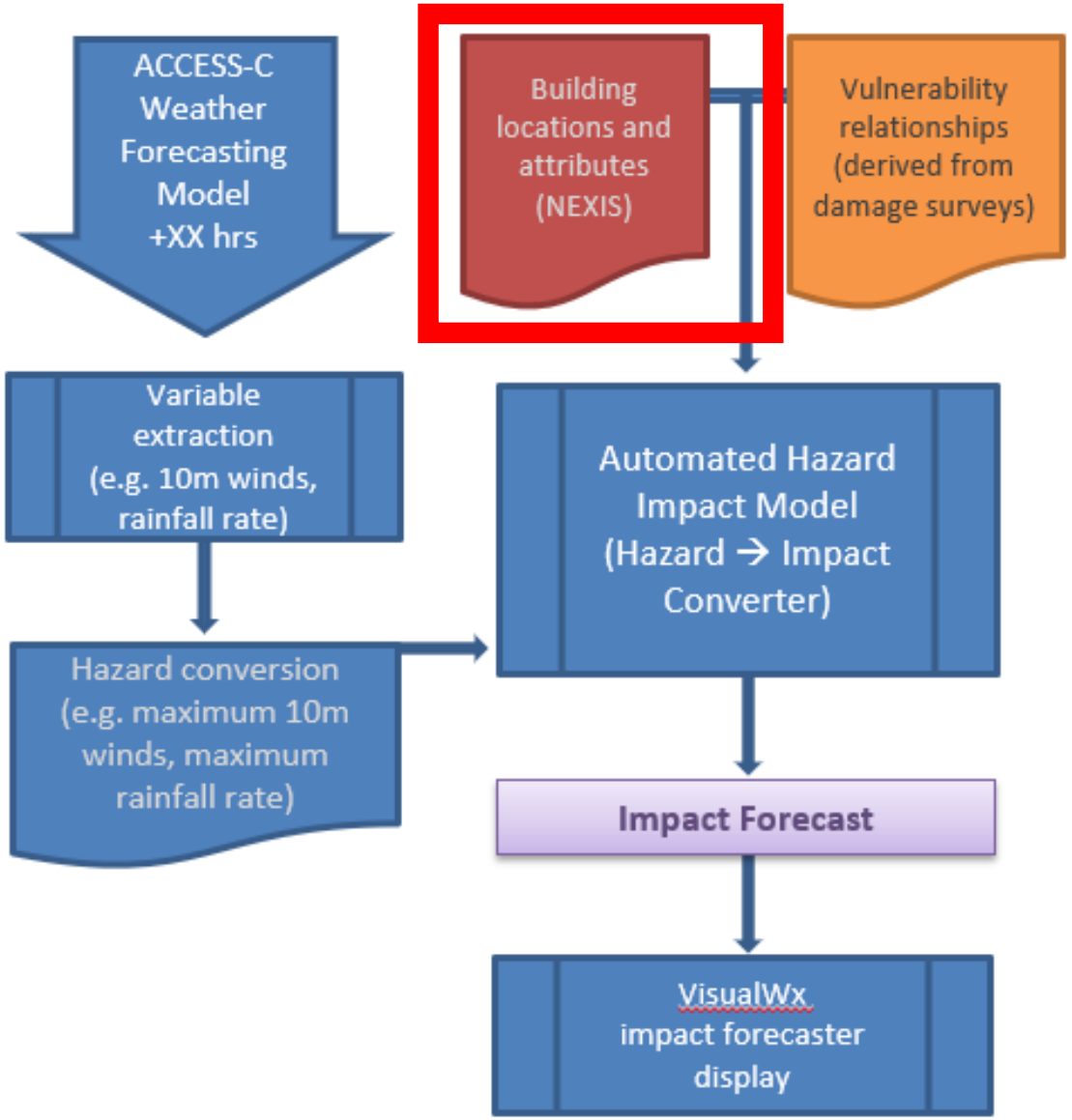
What derails a nice clean wind / house damage relationship?

[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*

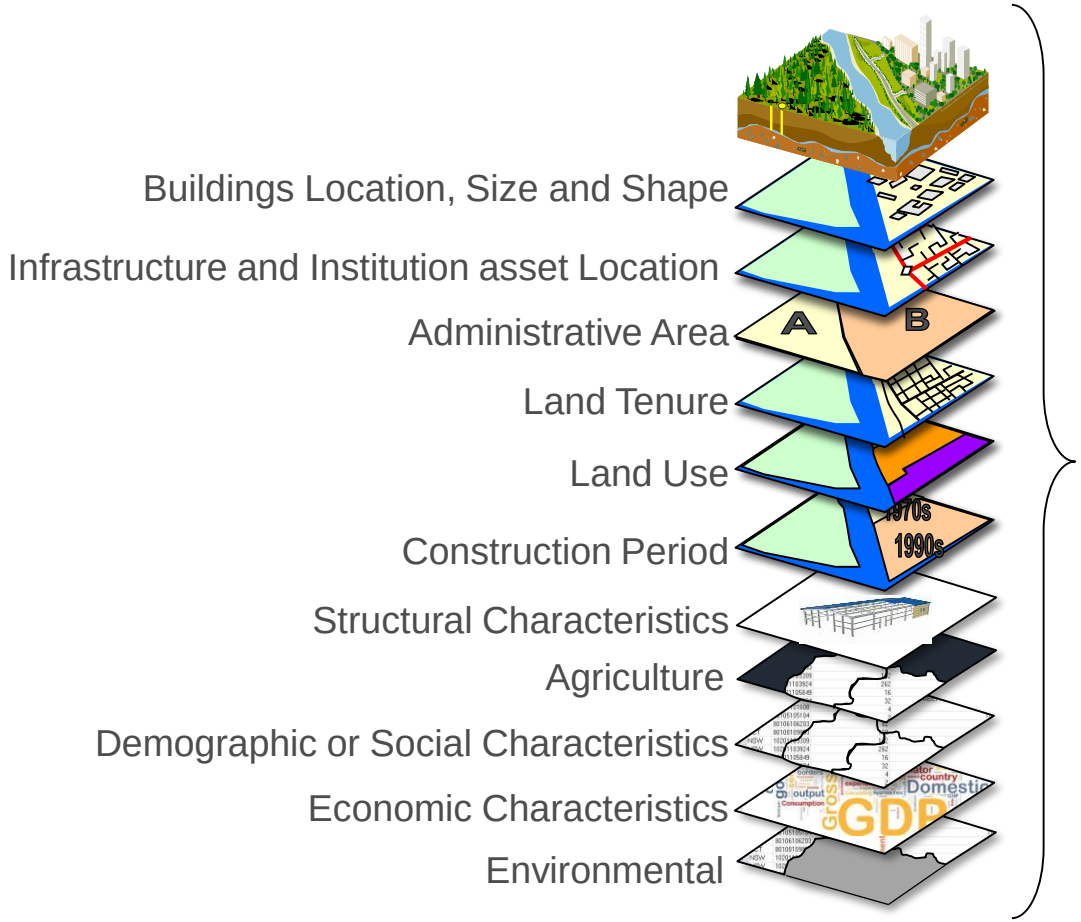



ACCESS-C Weather Forecasting Model +XX hrs
Building locations and attributes (NEXIS)
Vulnerability relationships (derived from damage surveys)
Variable extraction (e.g. 10m winds, rainfall rate)
Automated Hazard Impact Model (Hazard → Impact Converter)
Hazard conversion (e.g. maximum 10m winds, maximum rainfall rate)
Impact Forecast
VisualWx impact forecaster display

Exposure

Data on Asset Types & Locations

National Exposure Information System (NEXIS)



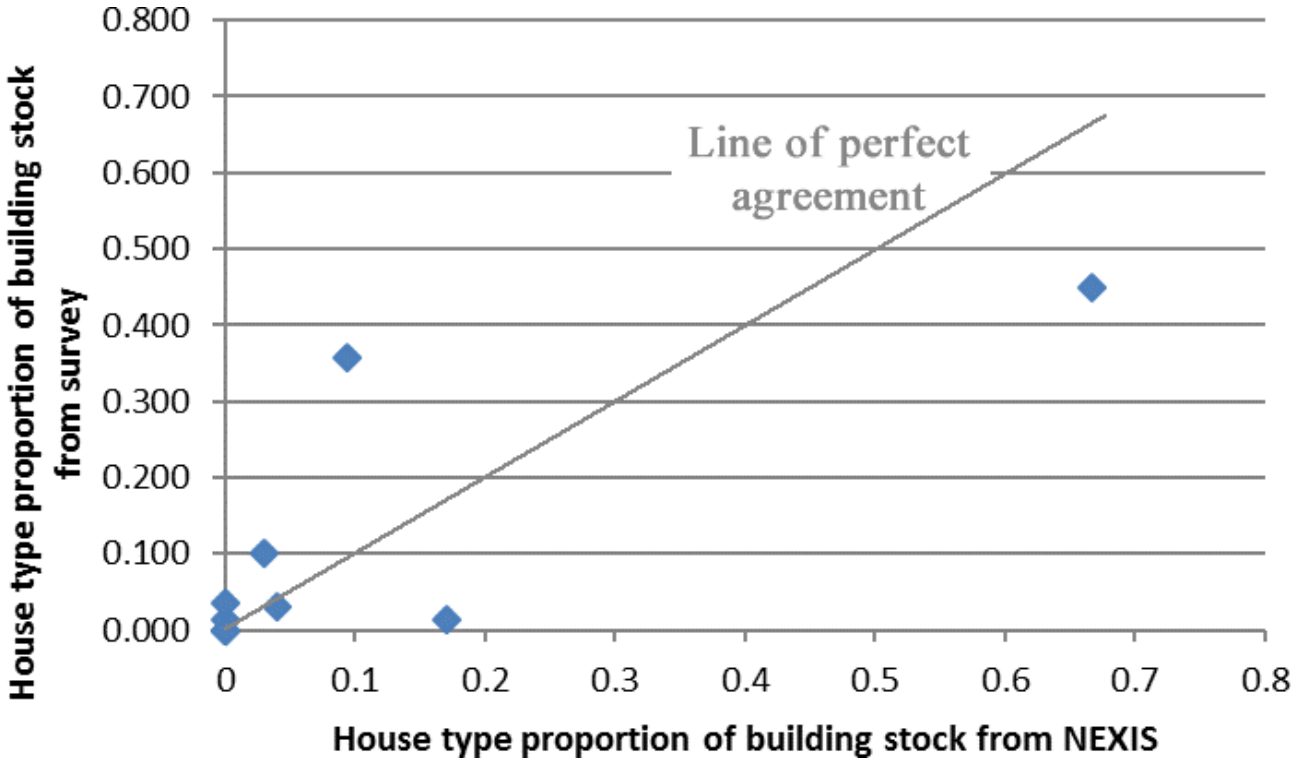
Exposure Elements

Residential
Commercial
Industrial
Institution
Infrastructure
Agriculture
Environmental

USE CASES

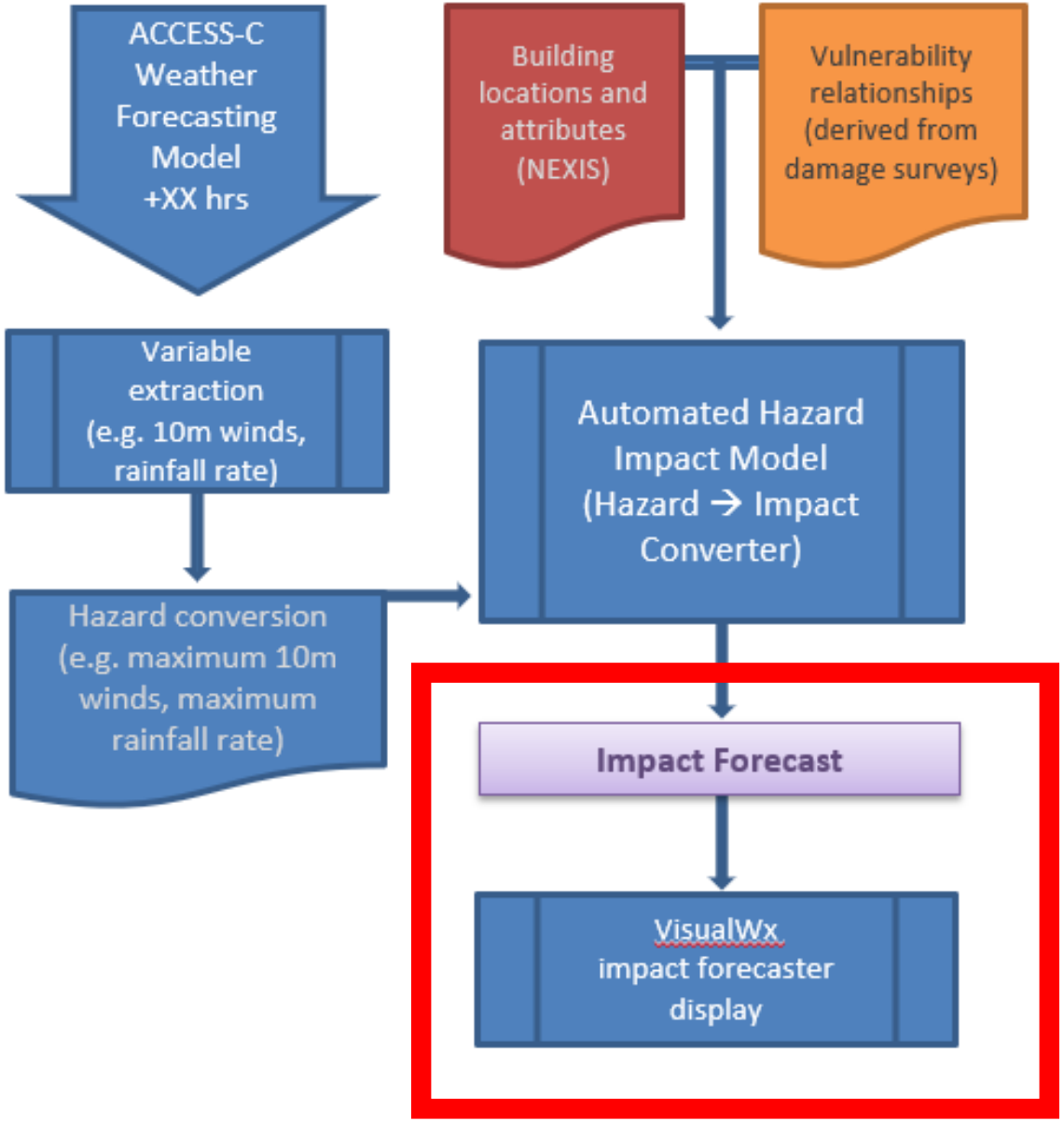
Exposure reports
Risk modelling
Risk assessments
Insurance modelling

Dungog – Exposure Uncertainty: Statistically Derived Asset Types



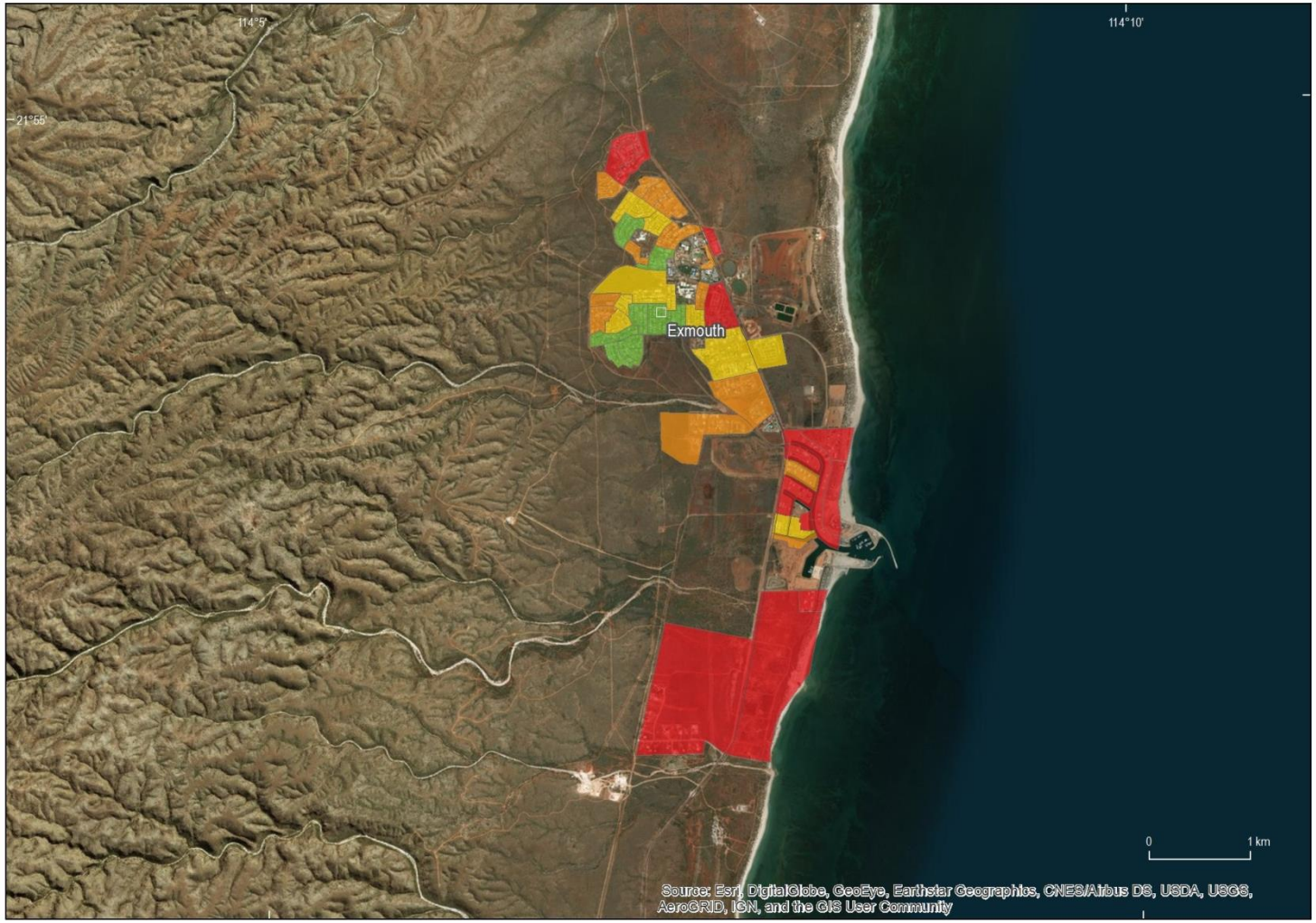
Relationship of NEXIS-extracted and surveyed house types for all of Dungog post-1982 houses.

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



Spatial Impact Forecast

Spatial Impacts (Project Goal)



Average damage state No damage Slight Moderate Extensive Complete

Next Steps

1) Set up the end-to-end project work flow using simplified *interim* vulnerability relationships

2) Test joint wind & rain hazard predictors for reported residential building damage

3) Include additional case studies with stronger winds and clean damage assessment data to derive joint multi-case vulnerability relationships (use BARRA reanalysis)