



Enhancing Resilience

The role of Earth Observation

Fiona Shaw, Willis

Willis Research
Network

WRN, The Worlds Largest Science & Insurance Network (>50)



WRN Mission

- Identify, evaluate, share, and minimize the costs of natural and man-made hazards;
- Increase the efficiency and penetration of insurance;
- Enhance resilience of societies in both the developed and developing world.

Resilience

Resilience is the enduring power of a body or bodies for transformation, renewal and recovery through the flux of interactions and flow of events.

Source: Institute of Security and Resilience Studies, UCL



Disaster management

- Mitigation activities aimed at reducing the occurrence of emergency situations.
- Preparedness preparation for emergency situations
- Response acute phase occurring immediately after the event
- Recovery removing the detriments and providing resources and supplies to deal with the irreversible damage.



Risk management





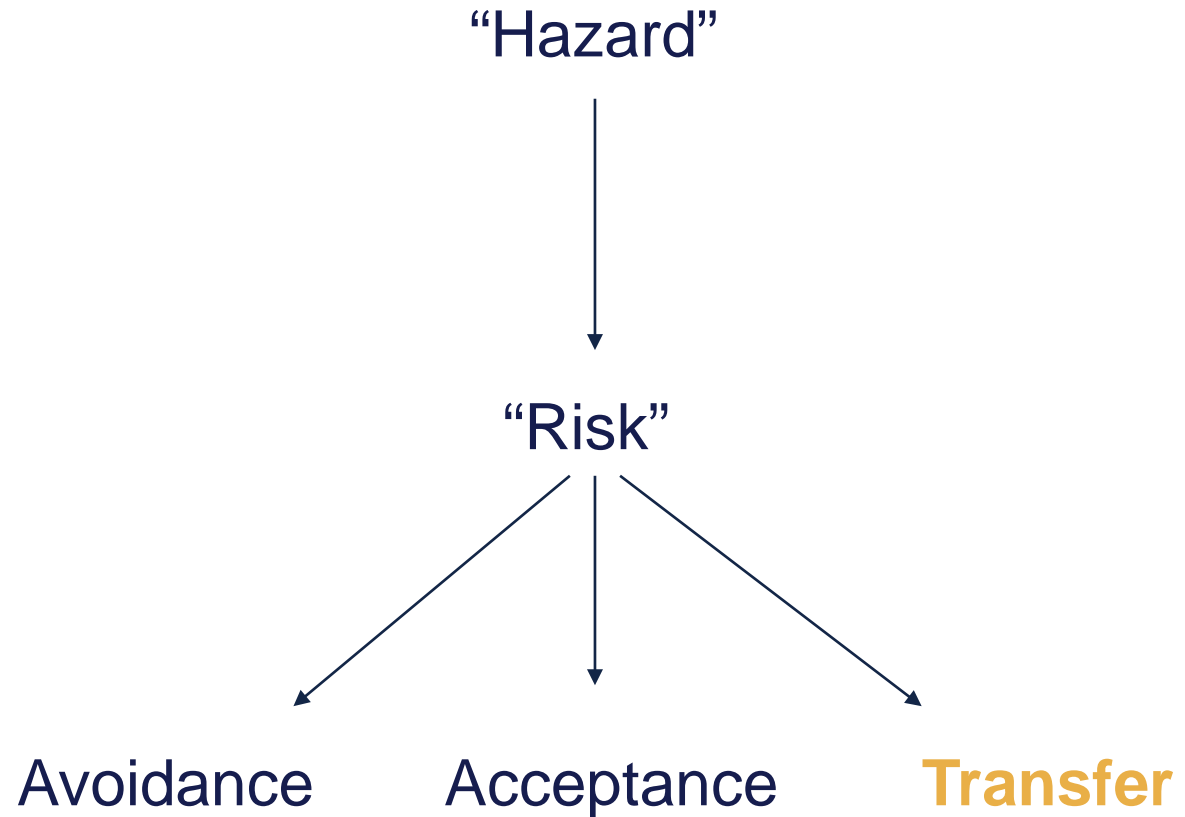
Risk management

Risk identification

Risk assessment

Risk quantification

➤ Risk transfer



Risk and Resilience

Risk and Resilience are common themes for the Public,
Insurance and Commercial Companies alike:

**Ability to Assess, Plan, Share & Mitigate Costs for the
expected and unexpected**

**Manage consequences ex-ante efficiently rather than in
turmoil ex-post**

Protect and sustain:

- The Public
- Financial institutions
- Retail
- Infrastructure &
- Supply chains
- Culture and Heritage



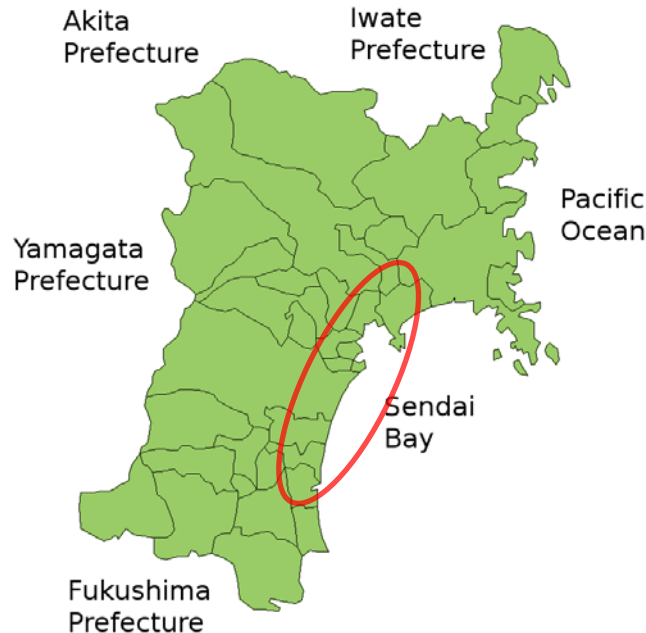


The key questions for insurers

- Where is my risk located ?
- What is my Probable Maximum Loss within a [250] year return period?
- What loss scenarios and events should concern me?
- How can my portfolio of risks be optimised?

Geospatial analysis - Japan

In Japan, insurances for people and property often captured at prefecture-level or coarse postcodes only.

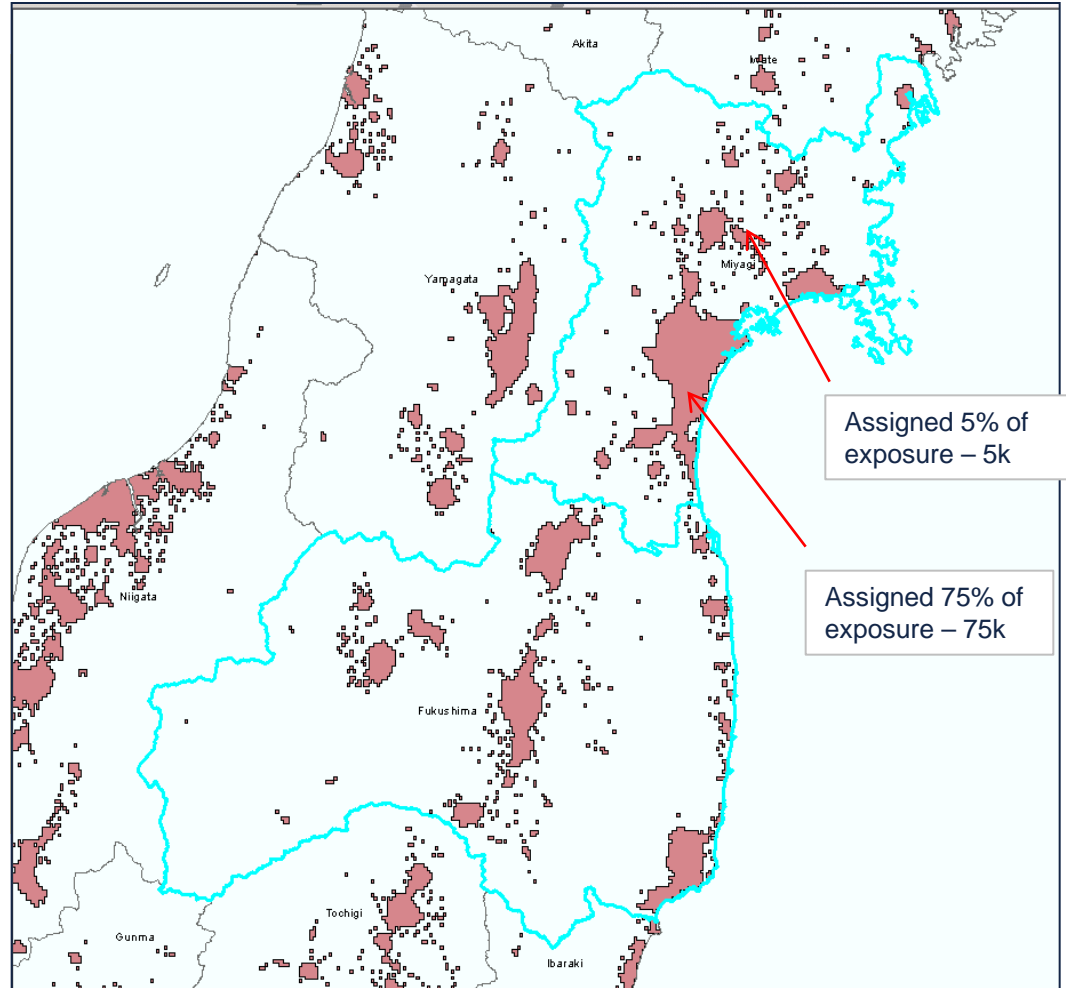


- Large spatial areas
- Poor spatial representation of exposures
- How to estimate losses in recent Japan EQ and Tsunami? Take centroids? Take percentage of area affected?
- Under-estimate or over-estimate risks and losses

SOURCE: http://en.wikipedia.org/wiki/Miyagi_Prefecture#Townships_and_villages

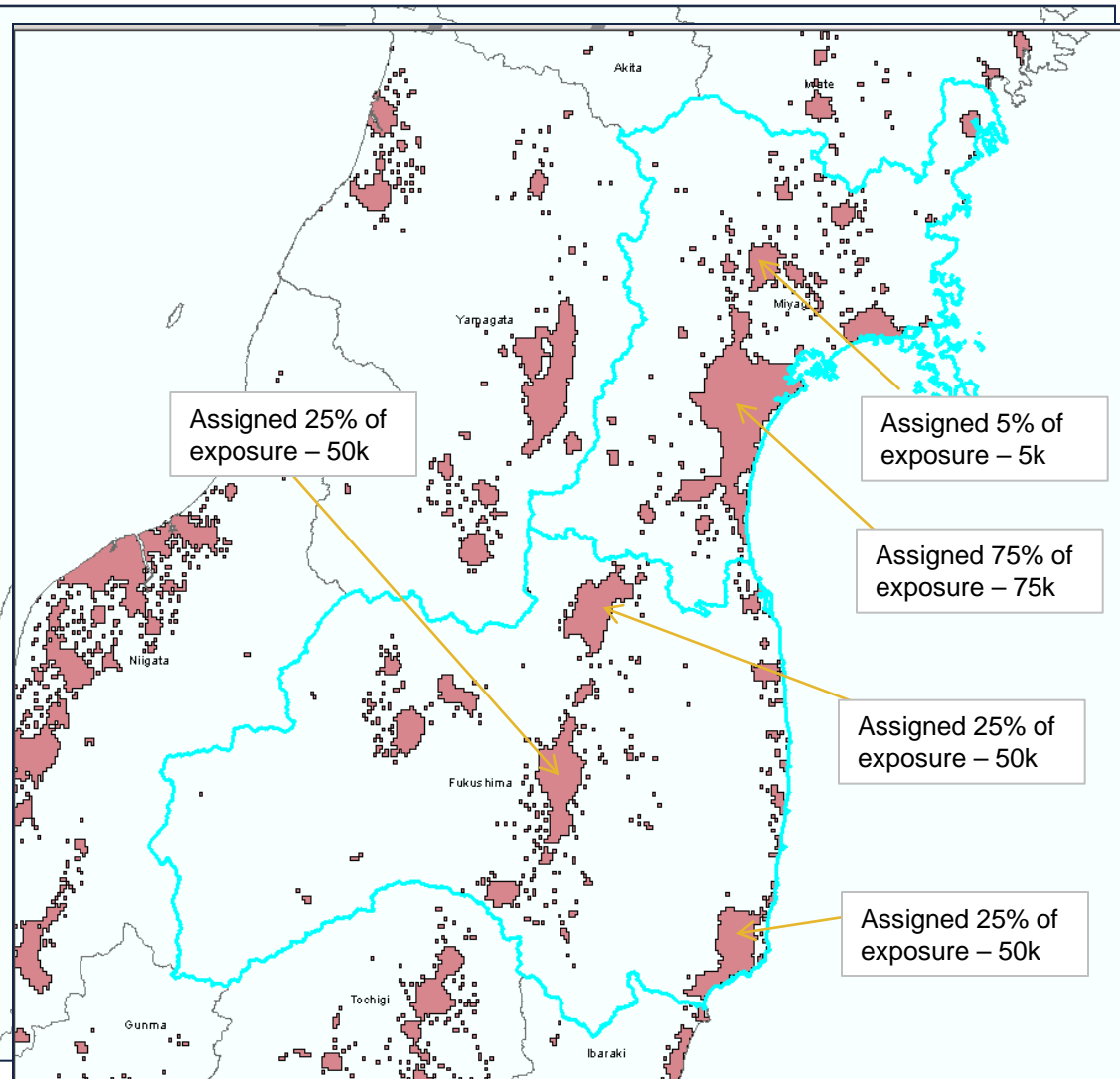
Geospatial analysis - Japan

- Impervious Surface Analysis (ISA) is approx. 1km resolution raster. The dataset represents the spatial distribution and density of constructed impervious surface area i.e. roads, buildings, car parks, etc.
- ISA used for extraction of urban areas using the reclassify method
- Extracted area calibrated against imagery data
- Disaggregation to these urban areas



Source: http://www.ngdc.noaa.gov/dmsp/download_global_isa.html

Representing exposure

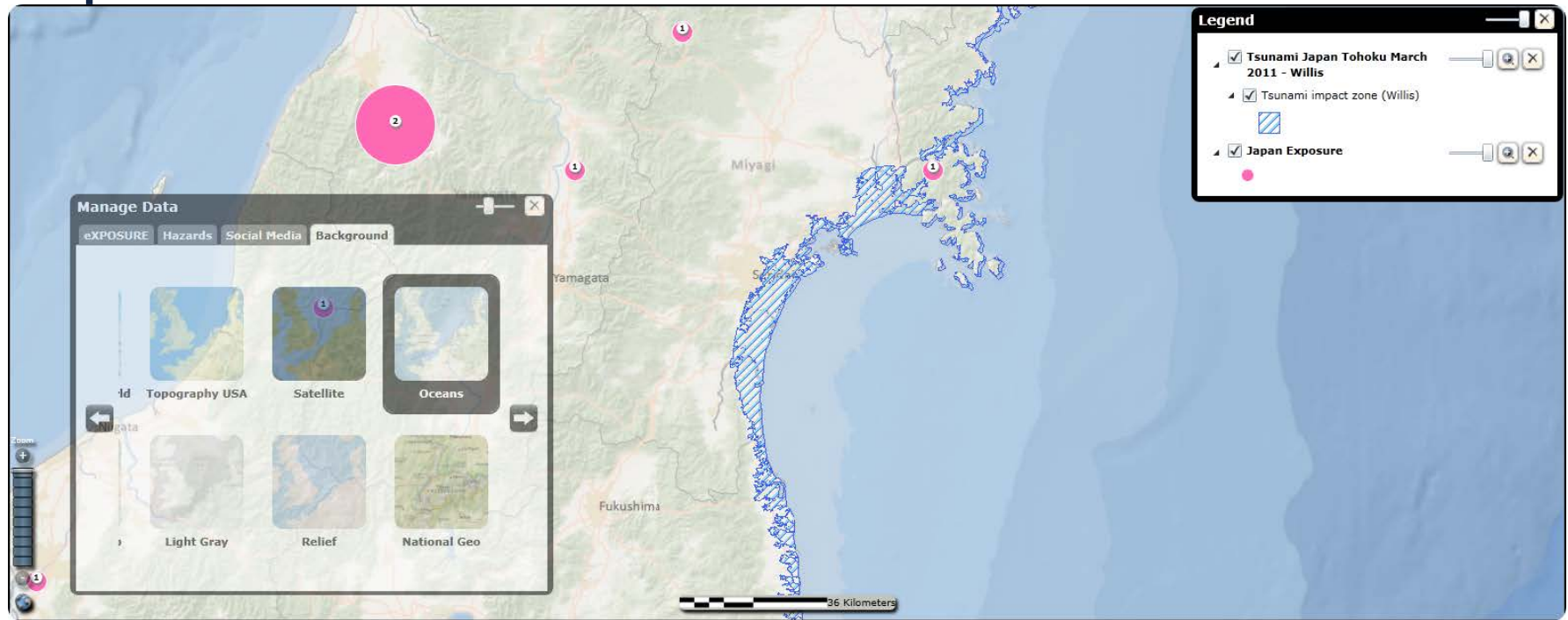


Miyagi TSI = 100k
Fukushima TSI = 200k

Disaggregate exposure
to urban areas
(based on % of area)

Geospatial delivery - Japan

Used within visualisation software for impact assessment





Property exposure - building characteristics



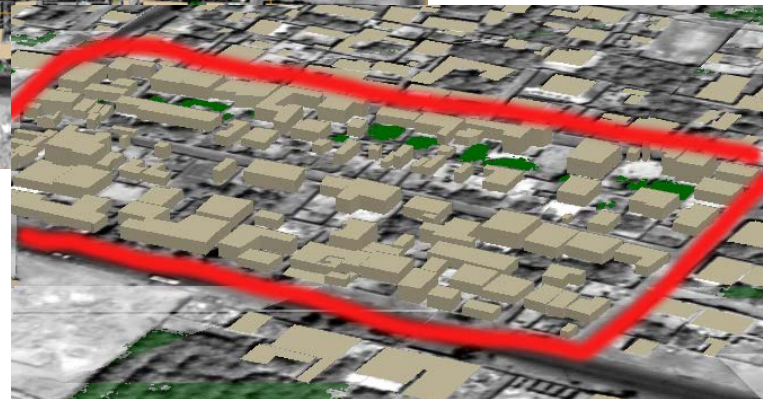
Section of the city of Bam, Iran. (high-resolution optical image).
Grid cell size=100m x 100m



Extract building footprints

Height classification for earthquake modelling

| | |
|--------|------------|
| Low | 1-3 floors |
| Medium | 4-8 floors |
| High | 8 + floors |



Add height

Bushfire risk mapping in Australia



Based on the main
determinants of bushfire risk;

Distance to vegetation

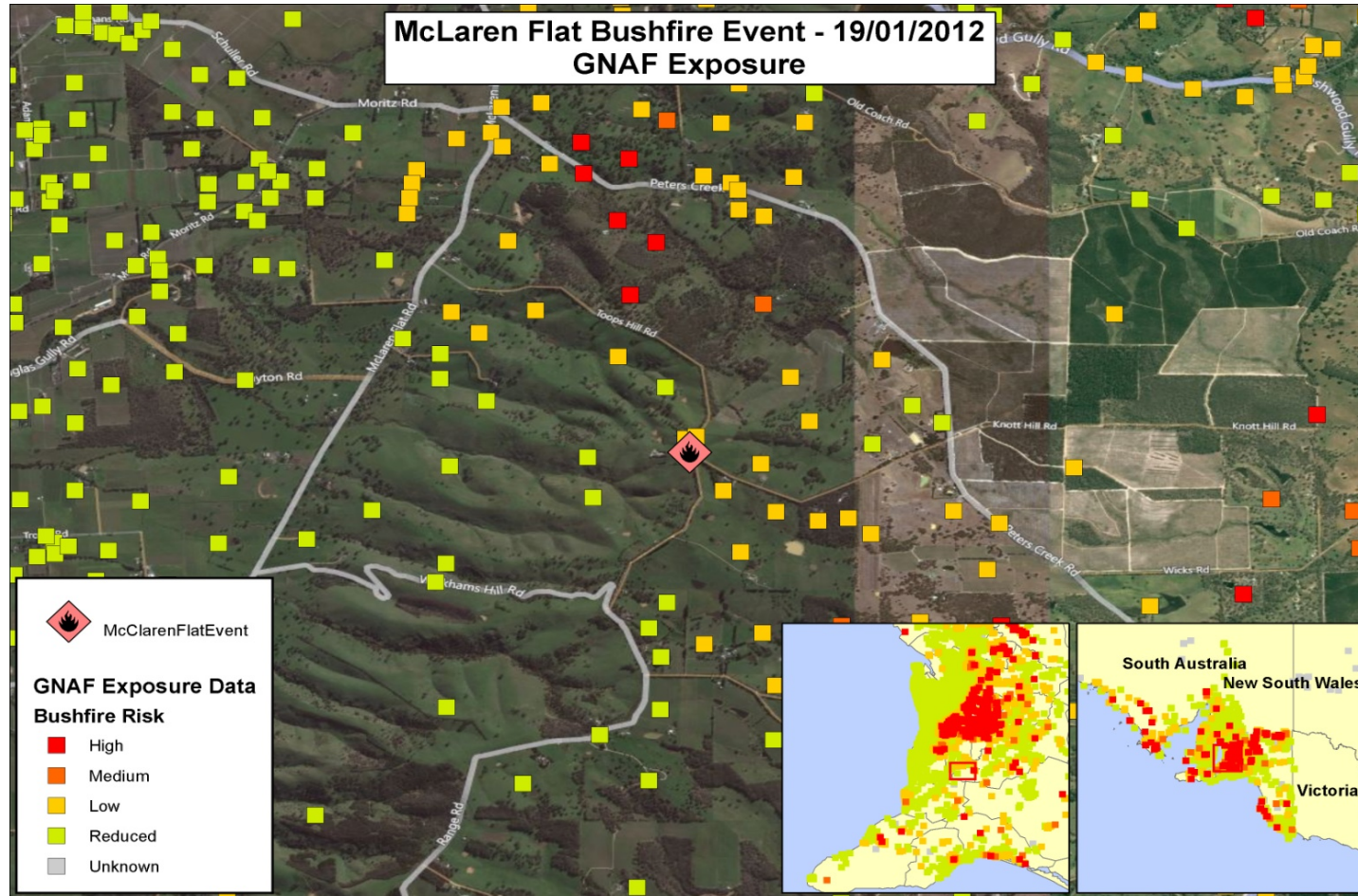
Vegetation type

Slope

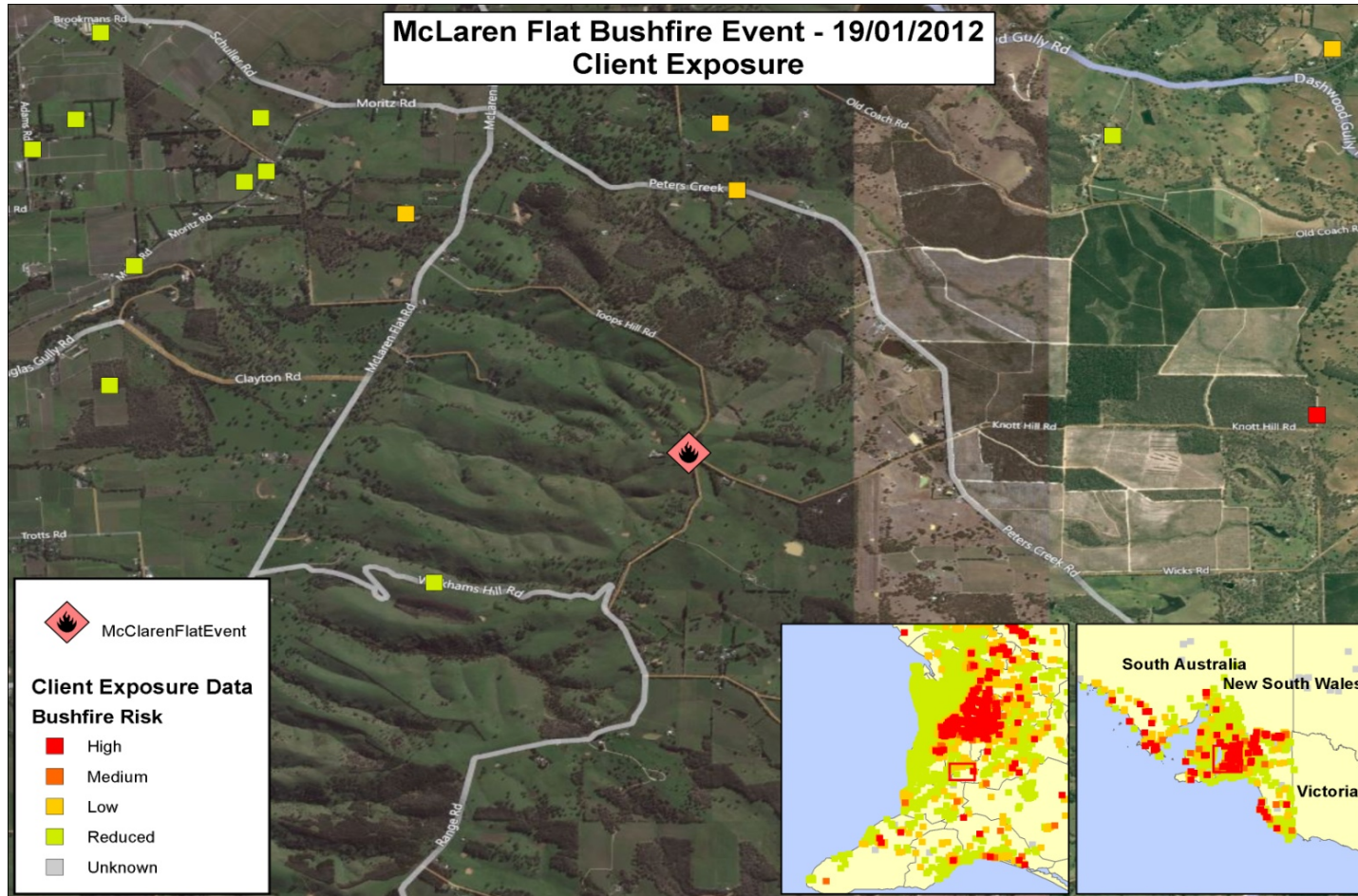
Aspect

Image kindly supplied by NSW Department of Lands

Don't wait until 'Post-Event'



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Responding to Natural Catastrophes

During and after a major event, insurers might need to:

Identify affected policy holders / claimants

Mitigate against further losses (e.g. flood sandbags)

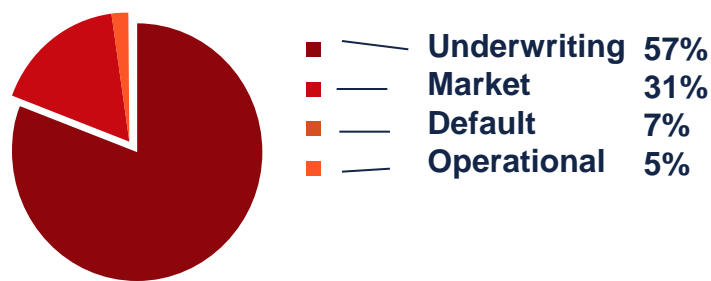
Mobilise and plan loss adjuster activities

Estimate losses (claim reinsurance?)



Linking catastrophes and capital

Insurance companies are required to carry adequate capital to cover losses arising from catastrophes (Solvency II)



| | |
|--------------|-------------|
| SCR | 362,306,041 |
| Underwriting | 329,678,231 |
| Catastrophe | 300,000,000 |
| Market | 69,468,900 |
| Default | 0 |
| Operational | 8,788,400 |

Catastrophe models & risk indices are part of the risk assessment process

Mapping, modelling, and decision making are key to managing risk:

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