

Delivering (geoinformation about) risk

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Overview

- Who are Risk Frontiers & what we do?
- Where are the risks?
 - Address based risk rating
 - National Flood Information Database
 - Our risk & catastrophe loss models
- Disseminating the knowledge
 - Risk
 - Loss
- Web & Mobile



Introducing Risk Frontiers

- Help insurers and reinsurers better understand and price natural hazard risks in the Asia-Pacific region
- Develop Probabilistic Catastrophe Models
- Provide an independent view on catastrophe risks
- Undertake research in natural hazards
- Perform post-event reconnaissance
- Increase public awareness of natural perils & aid policy development

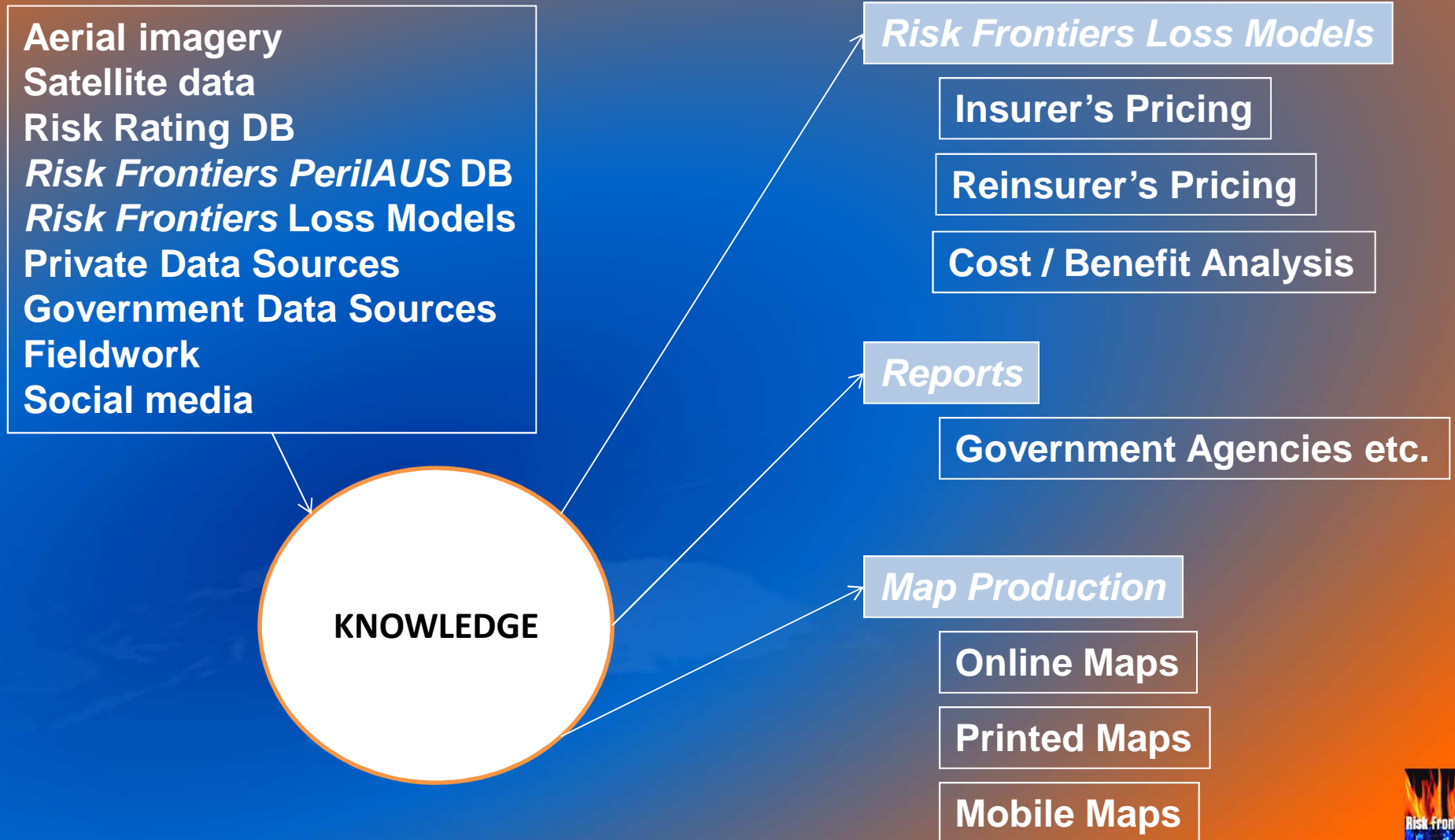


What Do We Have To Share?

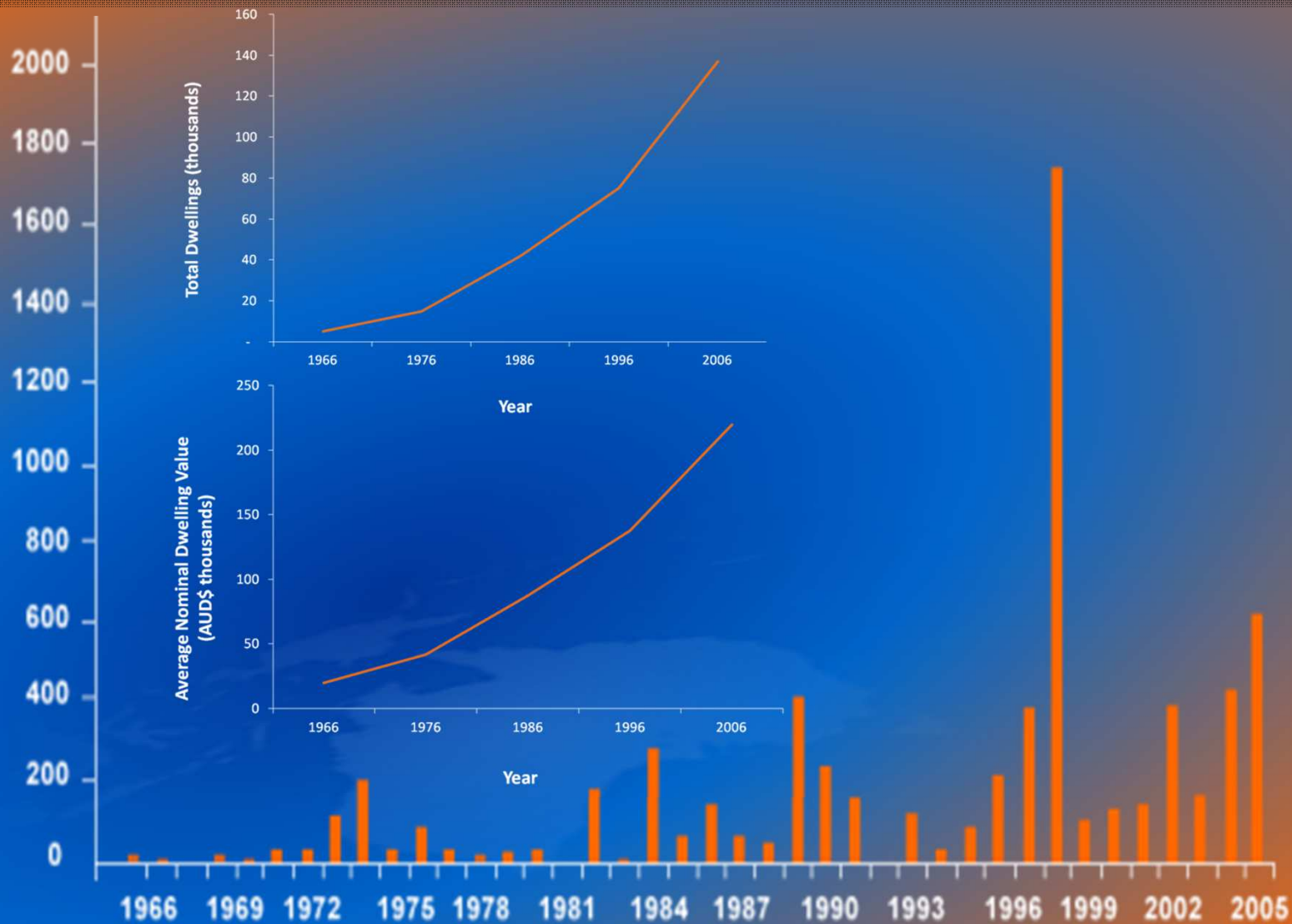
- Multi-Peril Workbench version 3 and beyond
- Flood Exclusion Zones (FEZ™)
- National Flood Information Database (NFID)
- Earthquake and volcanic loss models for New Zealand and Japan
- Tropical cyclone loss model for South Korea
- Developing Flood models for SE Asia
- Post-Event reconnaissance of Christchurch Earthquakes, Queensland Floods, Tropical Cyclone Yasi, Tasmanian & Victorian fires
- Normalisation of ICA loss data (2011/2012)
- Invited submission to the Royal Commission on the 2009 Victorian fires
- Invited submission to the 2011 National Disaster Insurance Review



Knowledge / Data Flow



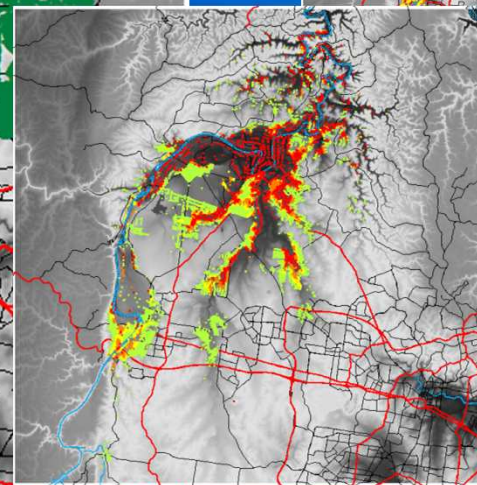
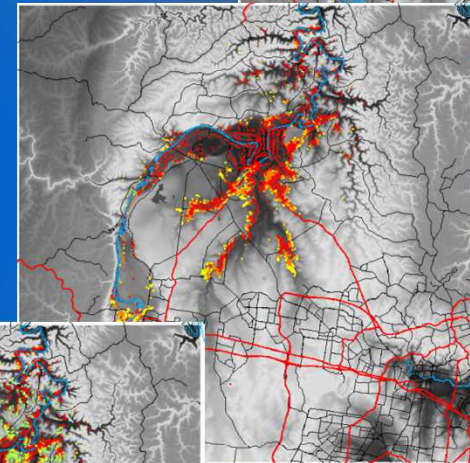
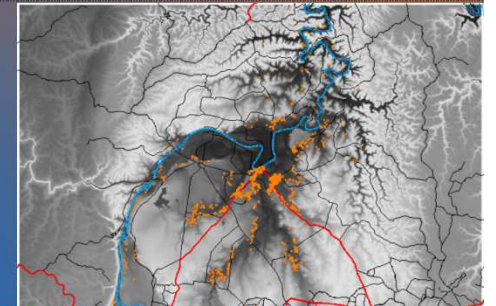
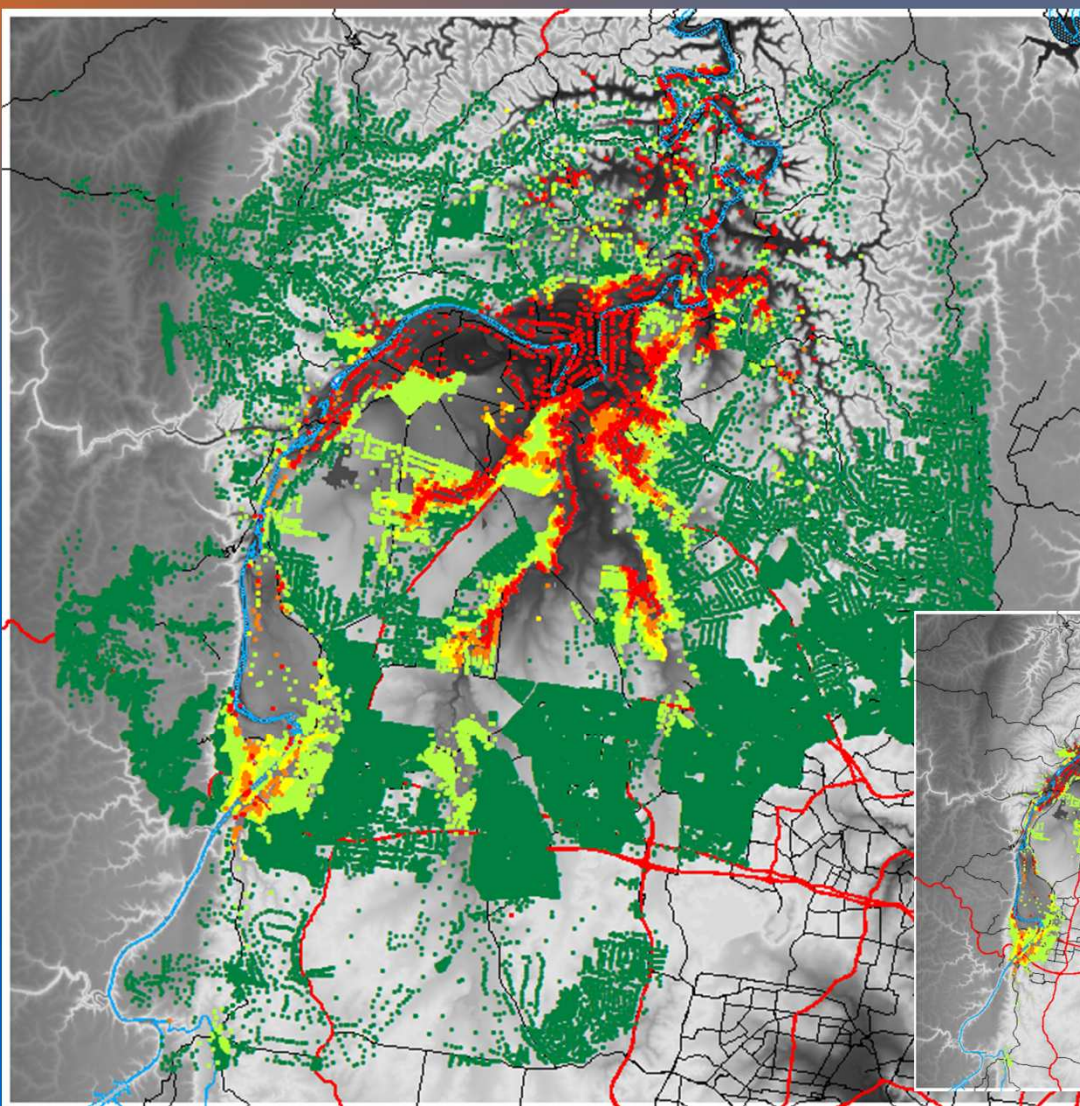
Finding the Risks : Looking Back



Source: PerilAUS; Crompton & McAneney, 2008. *Environ. Science & Policy*)



Finding the Risks : Looking Forward

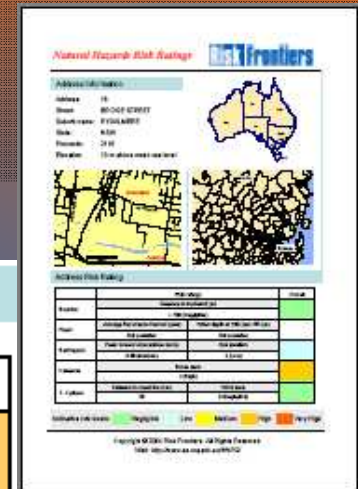


Risk Rated Address Tool

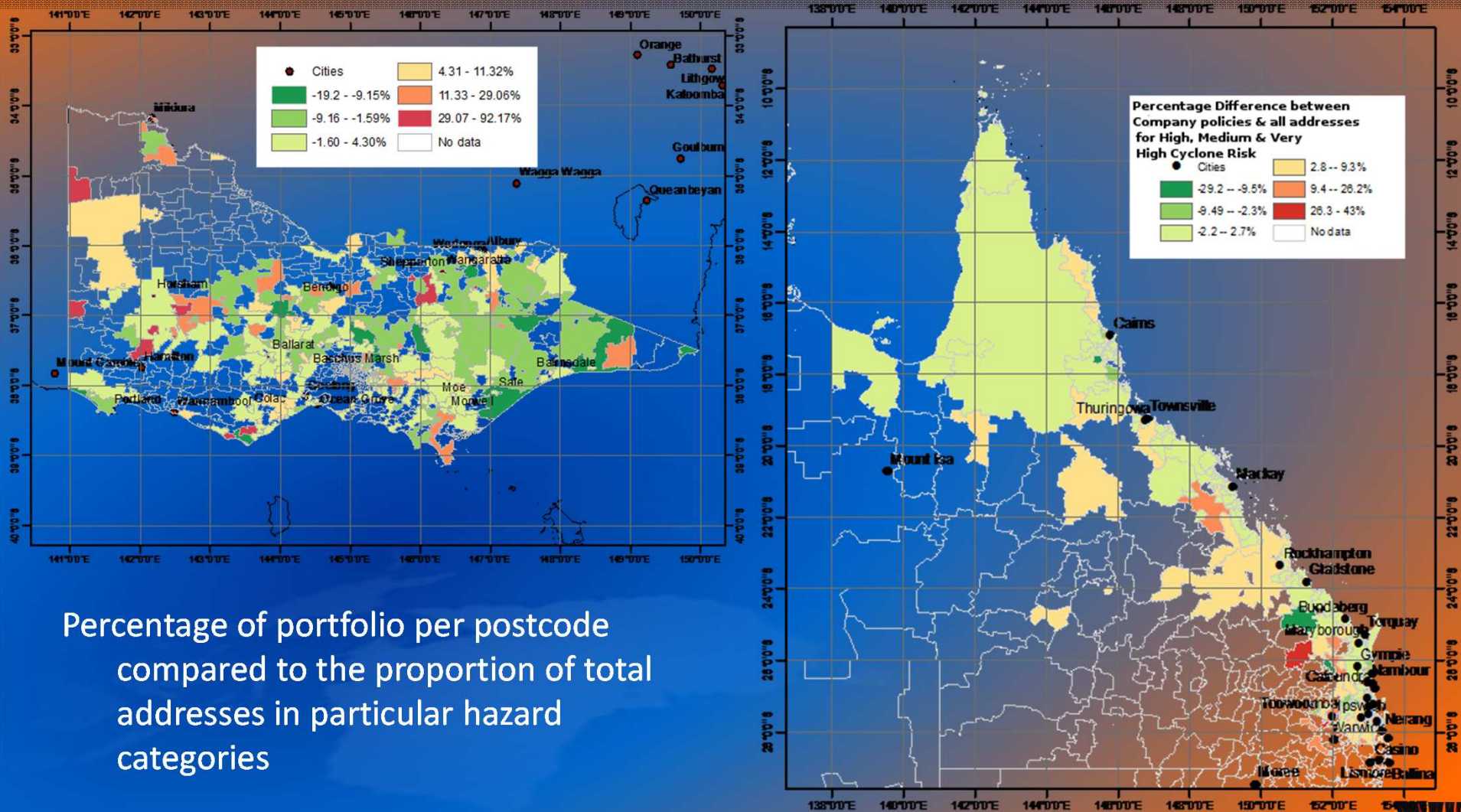
Address Risk Rating

	Risk ratings		Overall
Bushfire	Distance to bushland (m)		3
	200-400 (Medium)		
Flood	Average Recurrence Interval (year)	Water depth at 100-year ARI (m)	2
	Above 100	None	
Earthquake	Peak Ground Acceleration (m/s ²)	Ground zonation	2
	0.62 (Low)	2 (Low)	
Hailstorm	Storm zone		4
	4 (High)		
T. Cyclone	Distance to coast line (km)	Wind zone	2
	30	2 (Low)	

Indicative risk levels: 1 Negligible 2 Low 3 Medium 4 High 5 Very High



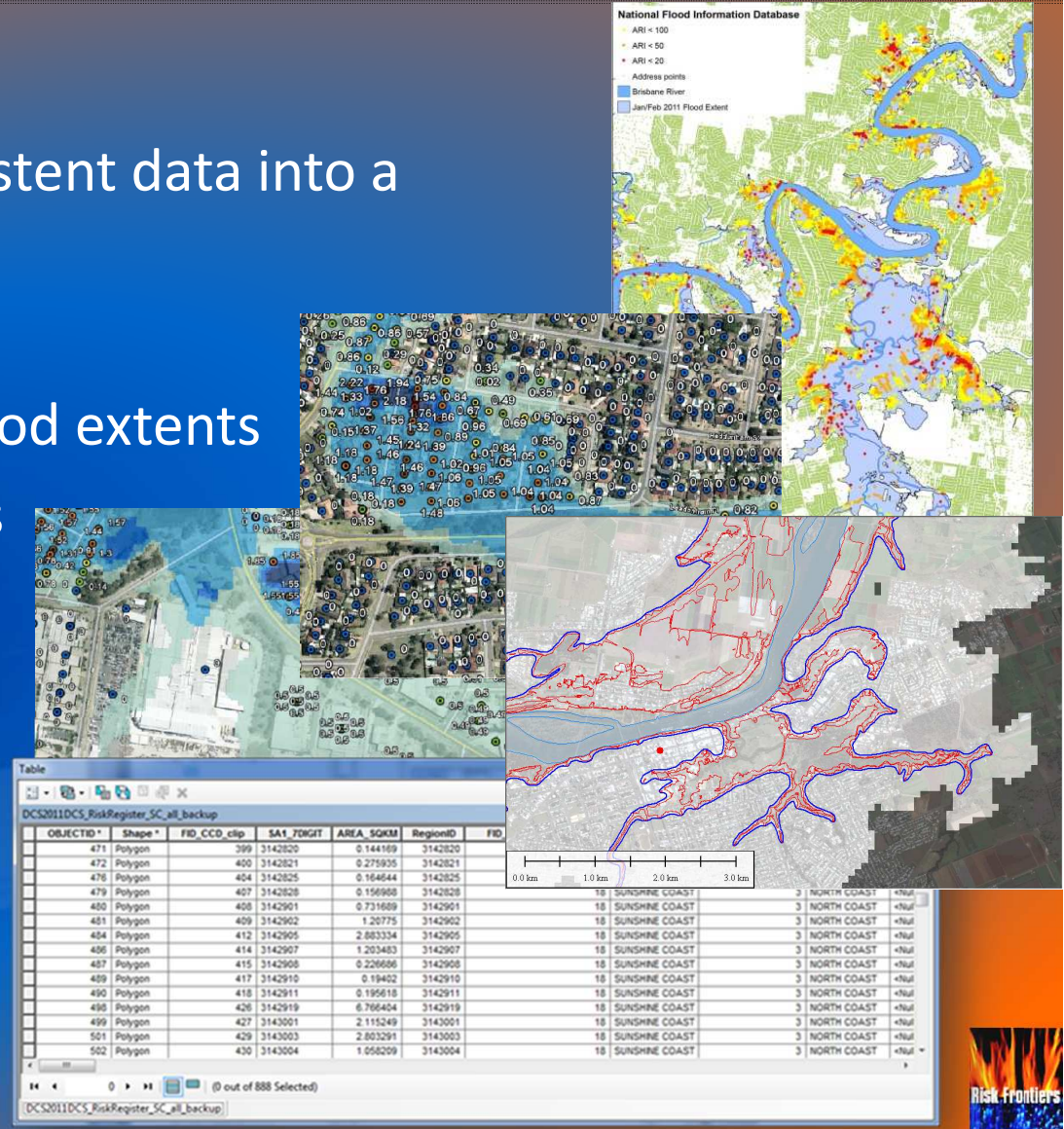
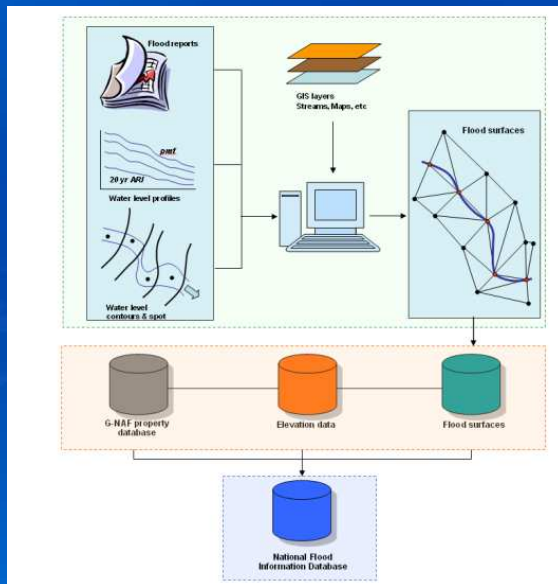
Risk Rated Addresses **Applied**



Percentage of portfolio per postcode compared to the proportion of total addresses in particular hazard categories


National Flood Information DB

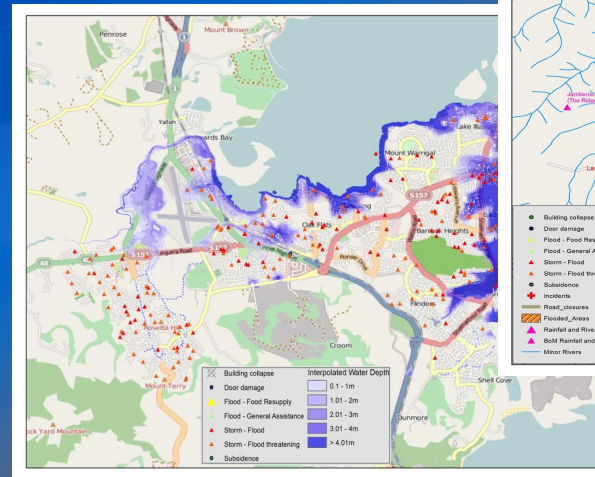
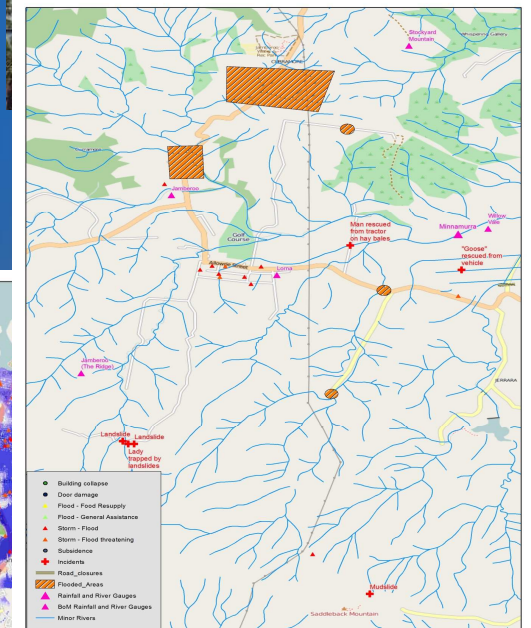
- 12M addresses
- Aggregation of inconsistent data into a common format
- 60+ study areas
- 1-5 flood surfaces / flood extents
- Metadata & QA checks



Risk Communication : Flood Intelligence

State Emergency Service required
a review of flooding in a region

- Flood depth / extent data collection
- Examine behavioural factors 
- Review Flood Response Plans
- Develop mobile apps for first responders



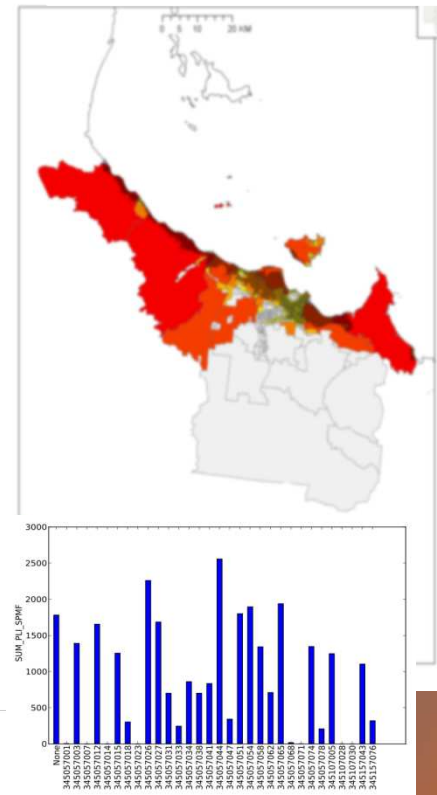
Mapping Risk **On the Fly**

Process a collection of data to rapidly produce regional risk assessments

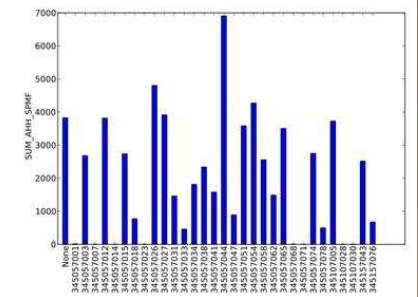
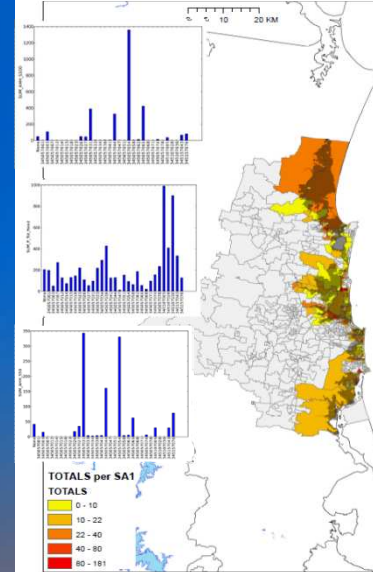
- Inconsistent (but regularly updated) data sets (e.g. updated flood modeling, changing population or infrastructure data)
- Variable client reporting requirements
- Need for summary statistics by regions
- Easily updated / modified
- Easily run by non-experts
- Minimal process supervision required
- Reproducible analysis
- 1 map/min
- Publishable to mobile & web

```
PythonWin - [DCS_RRPF - 8-11-12.py]
File Edit View Tools Window Help
https://stat.ethz.ch/pipermail/r-sig-geo/2006
93
94
95 Returns class breaks such that classes are in
96 assuring heterogeneity among classes.
97
98 ---
99
100 values.sort()
101 mat1 = []
102 for i in range(0,len(values)+1):
103     temp = []
104     for j in range(0,classes+1):
105         temp.append(0)
106     mat1.append(temp)
107 mat2 = []
108 for i in range(0,len(values)+1):
109     temp = []
110     for j in range(0,classes+1):
111         temp.append(0)
112     mat2.append(temp)
113 for i in range(1,classes+1):
114     mat1[i][1] = 1
115     mat2[i][1] = 0
116 for j in range(2,len(values)+1):
117     for i in range(0,len(values)+1):
118         mat2[i][j] = float('inf')
119     v = 0.0
120     for l in range(2,len(values)+1):
121         s1 = 0.0
122         s2 = 0.0
123         w = 0.0
124         for m in range(1,l+1):
125             i3 = l - m + 1
126             #print "value "+str(values[i3-1])
127             # Check to see if it's numeric or not.
128             try:
129                 i = float(values[i3-1])
130             except:
131                 val = 0.0
```

Sample Risk Map Data



Sample Risk Map Data

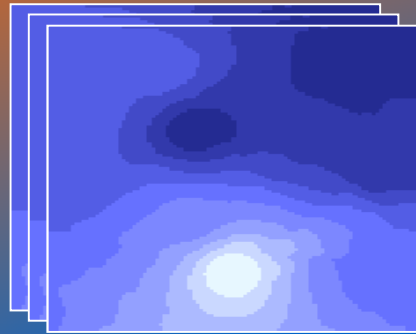


Risk Frontiers **Multi-Peril Workbench**

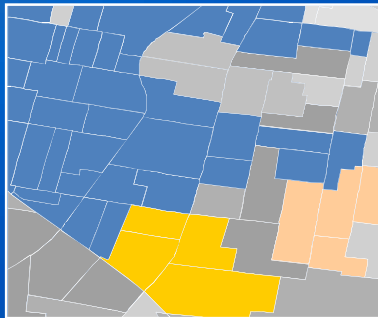
- Suite of Catastrophe loss models for Australia & selected Asia-Pacific countries
- Calculates exceedance probability curves for all major Australian catastrophe risks
- Varying Input resolutions: address, postcode or larger
- Combines curves of different perils, flexible reinsurance modelling



General Model Framework



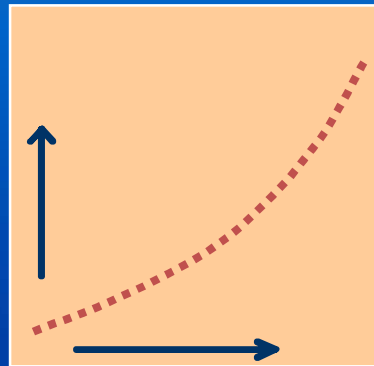
Hazard



Exposure

$$\text{Risk} = f(\text{Hazard}, \text{Exposure}, \text{Vulnerability})$$

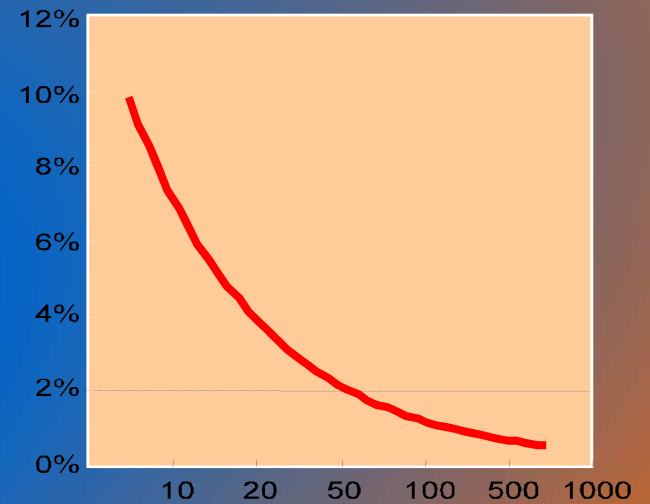
Mean damage (%)



Hazard intensity

Vulnerability

Annual Exceedance Probability



Loss (\$ Million)

Impact

Catastrophe Loss Models

FireAUS
1.0

FloodAUS
2.0

HailAUS
6.0

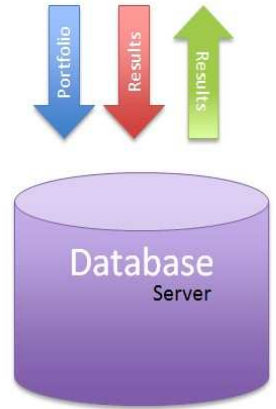
CyclAUS
3.0

QuakeAUS
3.0

Multi-Peril Workbench 2.0



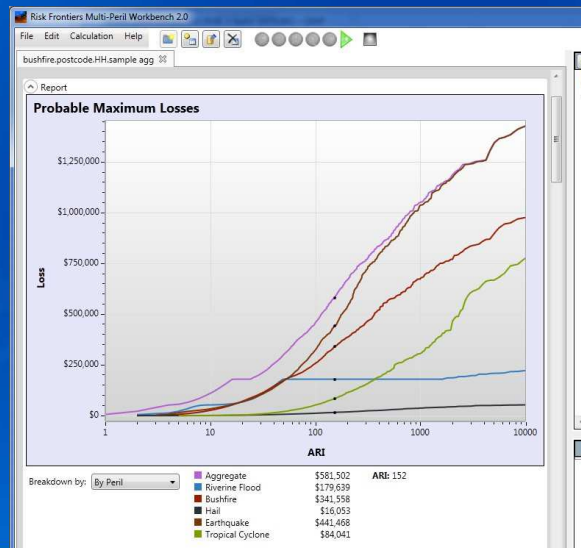
1. Import Portfolios to the database
2. Calculate losses for Flood, Hail, Bushfire, Cyclone, Earthquake
3. View & Export results
 - Summary Report
 - EP curve / Std ARIs
 - Excel (.csv and .xlsx)



The screenshot shows the software interface with a data table and a summary table.

Postcode	Count	Value	Region	Loss	ARI
623707	3	16754	Australia	\$931,010	85
49143	1	37102	Australia	\$926,491	86
623601	3	16655	Australia	\$921,634	87
627144	3	19956	Australia	\$915,890	88
626832	3	19665	Australia	\$915,122	89
625869	3	18768	Australia	\$913,148	90
624824	3	17795	Australia	\$908,282	91
60539	4	8165	Australia	\$900,856	92
627471	3	20261	Australia	\$899,413	93
48247	1	36453	Australia	\$898,748	94
627118	3	19932	Australia	\$894,057	95
626873	3	19704	Australia	\$886,458	96
625730	3	18639	Australia	\$883,894	97
624217	3	17229	Australia	\$883,624	98
624212	3	17224	Australia	\$881,668	99
627063	3	19881	Australia	\$881,593	100

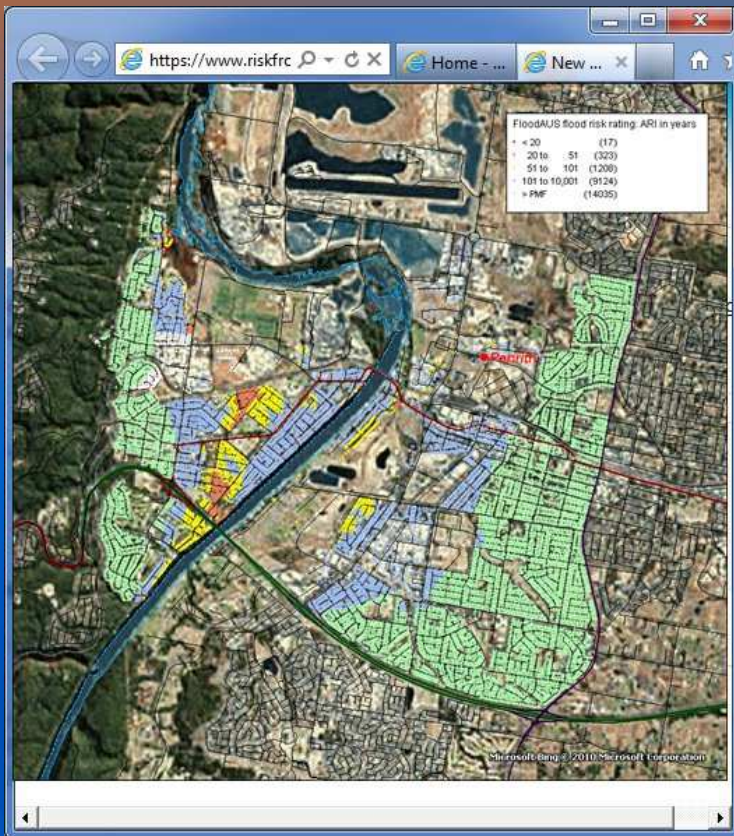
Region	bushfire.postcode.HH...	Revised ICA Zone
NSW		State
VIC	\$14,113	\$14,113
ACT	\$339	\$339
QLD	\$263	\$263
SA	\$366	\$366
TAS	\$1,143	\$1,143
WA	\$6,922	\$6,922



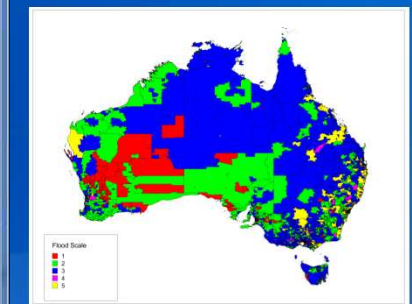
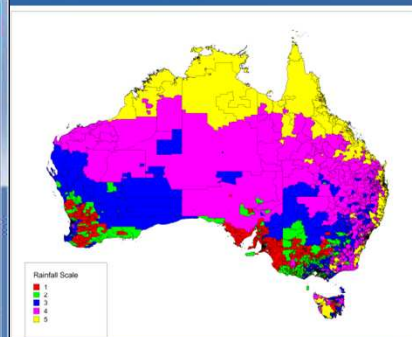
Loss Visualisation : Google Earth



What About The Web?



Portfolio risk visualisation



Hazard / Risk / Exposure Maps

Natural Hazards Risk Ratings

Risk Frontiers

Address Information

Address: XX
 Street: LATHER ROAD
 Suburb name: BELLBOWRIE
 State: QLD
 Postcode: 4070
 Elevation: 13 m above mean sea level

Address Risk Rating

	Risk ratings		Overall
	200-400 (Medium)		
Dunfire	Distance to bushland (m)		
Flood	Average Recurrence Interval (year)	Water depth at 100-year ARI (m)	
	Above 100	None	
Earthquake	Peak Ground Acceleration (m/s ²)	Soil zonation	
	0.02 (Low)	2 (Low)	
Hailstorm	Storm zone		
	4 (High)		
T. Cyclone	Distance to coast line (km)	WIRC zone	
	20	2 (Low)	

Indicative risk levels: Negligible Low Medium High Very High

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 Web: <http://www.es.mq.edu.au/NHRC/>

Automated Reporting



What About The Web?

Multi-Peril Online

Register Log in

Home About Contact

Tephra hazard Tephra damage

Tephra Damage Tokyo

Average Annual Loss GU Residential Building

Map Sate

This screenshot shows the 'Tephra Damage Tokyo' interface. It features a map of Tokyo with a color-coded overlay representing damage levels. The map includes labels for various districts such as Asaka, Nishi-Shinjuku, and Chiyoda. A sidebar on the right shows a file tree with folders for 'demo', 'Tokyo Analysis', 'building', and 'residential'.

Multi-Peril Online

Register Log in

Home About Contact

Tephra hazard Tephra damage

Tephra Hazard Tokyo

ARI Tephra Load > 1 kg/m²

Map Satellite

Tephra Hazard 52405190

Average Resonance Interval (years)

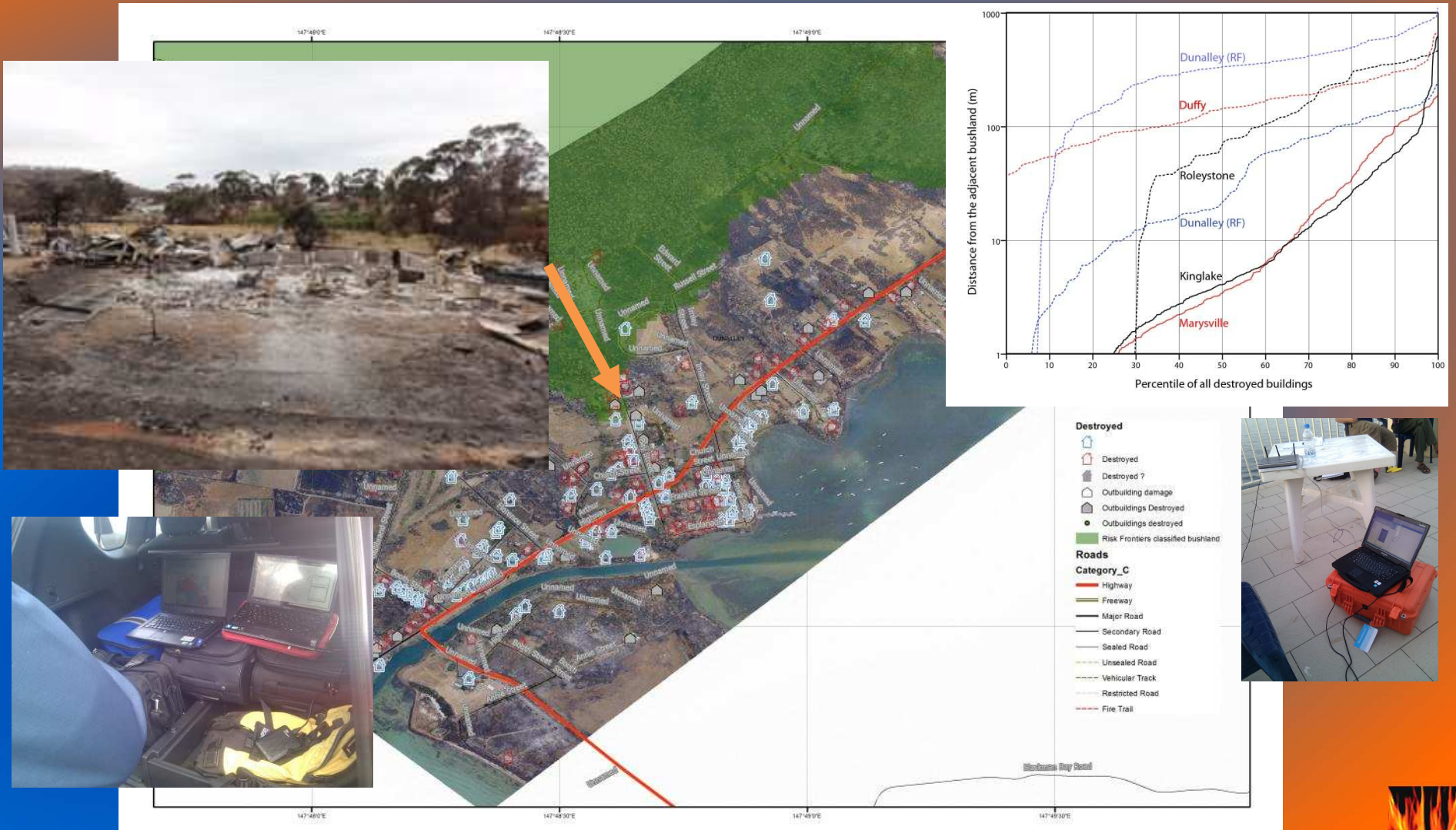
Tephra Calculation Complete for agriculture

Tephra Calculation Complete for building - residential

This screenshot shows the 'Tephra Hazard Tokyo' interface. It features a map of the Kanto region with a color-coded overlay representing hazard levels. A graph overlay titled 'Tephra Hazard 52405190' shows a curve of Tephra Load (kg/m²) versus Average Resonance Interval (years). The graph shows a sharp increase in load as the interval increases. A sidebar on the right shows a file tree with folders for 'demo', 'Tokyo Analysis', 'building', 'residential', 'industrial', 'commercial', 'cleanup', 'road', 'agriculture', and 'crop'. At the bottom, there are two status boxes: 'Tephra Calculation Complete for agriculture' and 'Tephra Calculation Complete for building - residential'.



Tasmanian Fires – Aerial Photography & Field Survey



Conclusions

- Access to high quality data is important
- Must be able to communicate the knowledge
- Web & mobile significant growth areas
- Maturing APIs make deployment faster & easier

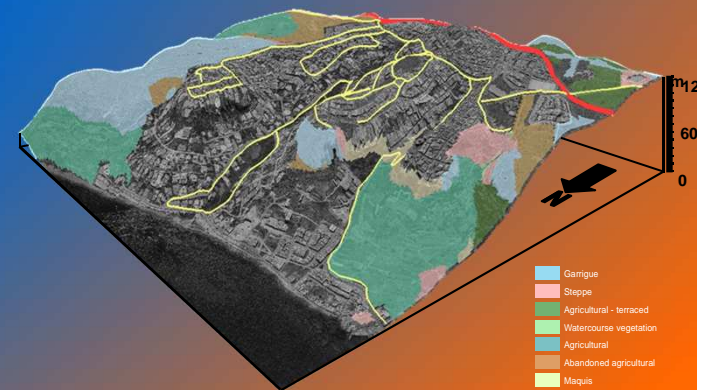
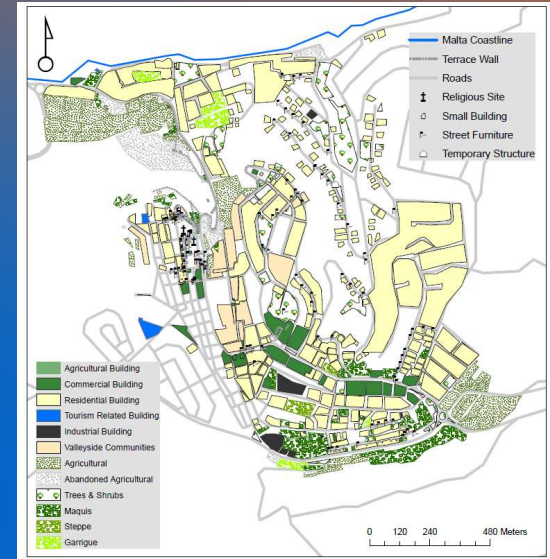
Thank you

www.riskfrontiers.com.au

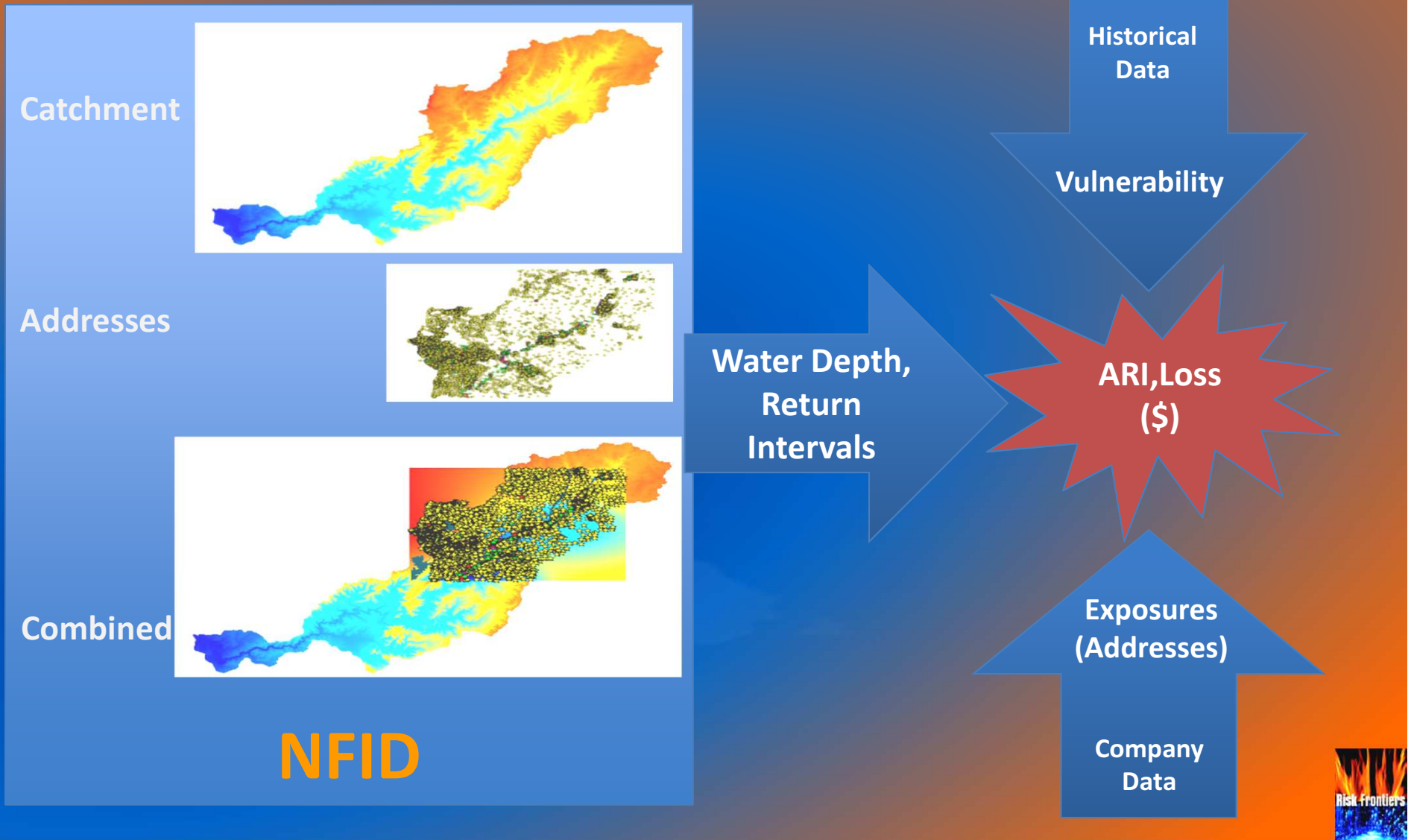
Email - james.obrien@mq.edu.au



Mobile Mapping & Dissemination

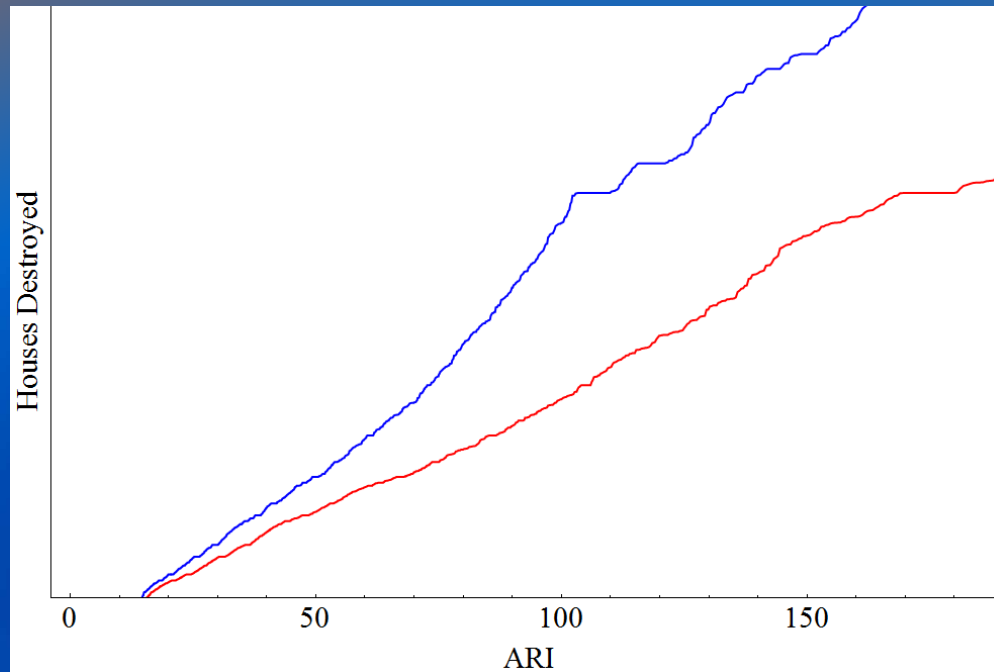


FloodAUS Loss Model – Beyond NFID



Application – Risk Selection Effect on EP-Curve

Original portfolio



Removed high risk addresses

Blue: Market-distributed portfolio EP-Curve

Red: Removed properties less than 100m of the bush