Regional Infrastructure Vulnerability Studies

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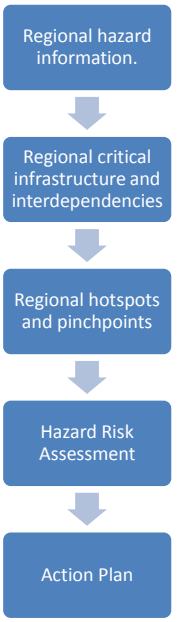
NZLC's three themes

- *Robust assets, or satisfactory alternative service continuity arrangements*
- *Effective coordination, pre and post-event, at national and local levels*
- *Realistic end-user expectations, so that users are risk-aware and better able to consider options*

Lifelines Vulnerability Studies

- To assess the potential impacts of hazards on the region's lifelines infrastructure and identify mitigation strategies to reduce that risk.'



Lifelines Vulnerability Studies in NZ

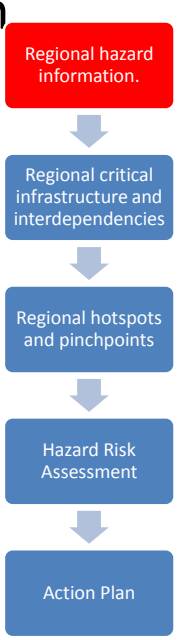
4: Completed in last 3 years

6: Underway in this financial year (5 are updates)

5: Multi-hazard vulnerability assessment not undertaken (3 focussed on single hazard)

Regional Hazard Information

- Collation of regional GIS hazard layers (if they don't exist). Typical layers include:
- Tsunami – 'red, orange, yellow' plus more detailed local modelling.
- Flooding – wide range of data sources and methodologies.
  - River / urban modelling.
  - Rain induced slope instability.
  - Historic flooding areas
- Earthquake
  - Faults
  - Liquefaction prone (soil type, etc)
  - Land instability (slope, geology)
- Volcano
  - Destruction zones.
  - Ashfall areas/depths (scenario specific)



Regional Hazard Information – Challenges to be managed

- Importance of communicating appropriate use of information
- Determining paramaters for hazard use
- Equivalent probabilities of hazard information (and consistency across regions).

Regional critical community sites and infrastructure and inter dependencies

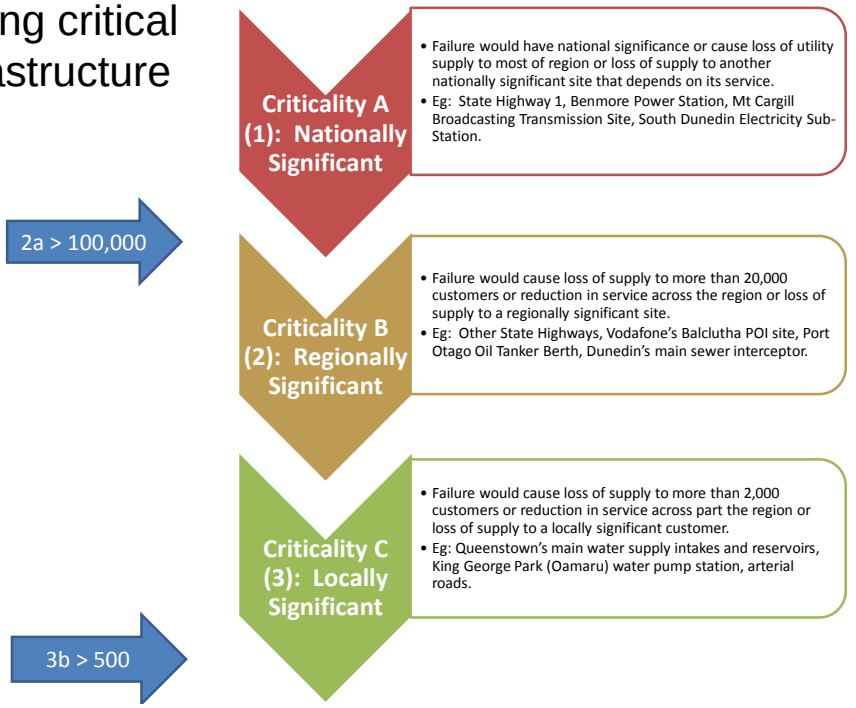
Determine scope of sectors covered:

- CDEM Act lifelines – transport (land, sea, air), water supply, wastewater, electricity, fuel, gas, telecommunications, broadcasting.
- 'CDEM-Critical Customers:
  - Police
  - Fire
  - Ambulance
  - Health – hospitals
  - Fast Moving Consumer Goods
  - Banking
  - Education
  - Corrections
  - Large industrial customers.

Rating asset criticality

- Initial assessment by utilities of importance within their own network
- Review dependency by other critical customers / sites on their network and revise criticality rating.
- Asset criticality is based on CONSEQUENCE of failure, not PROBABILITY (eg: condition).
- Trying to use existing criticality information where possible

Rating critical infrastructure



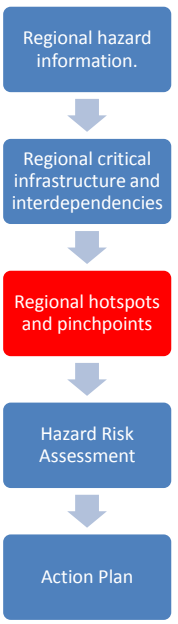
Rating asset criticality

- Standardised criticality rating systems versus allowing each organisation to assess what's critical to their organisaiton.
- Balancing getting a regionally prioritised picture versus engagement of less critical organisations
- Regional scope projects need to have common approach.
- Asset criticality is based on CONSEQUENCE of failure, not PROBABILITY (eg: condition).
- Trying to use existing criticality information where possible

Analysing Interdependencies – site and sector level

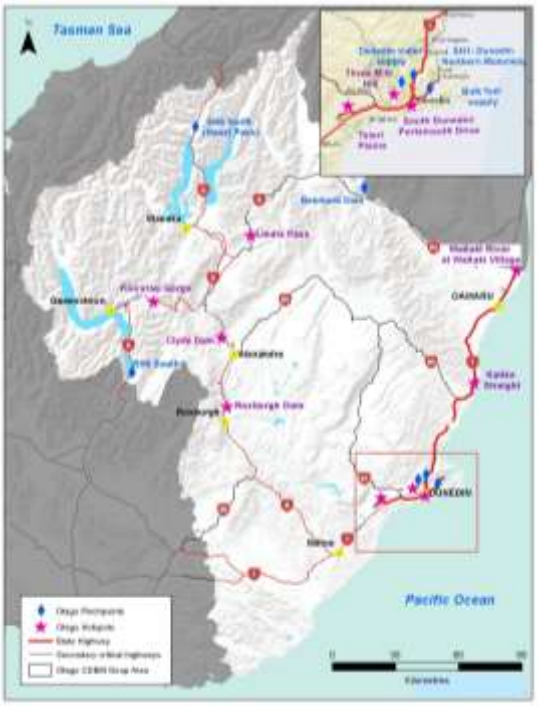
Hotspots & pinchpoints

- **Hotspots:** where a number of critical infrastructure assets from different sectors converge in a single area.
- **Pinchpoint:** significant single points of failure for a network or organisation
- Manual versus GIS analysis.
- Hazard versus non-hazard approach.



In Otago:

- 9 hotspots
- 6 pinchpoints



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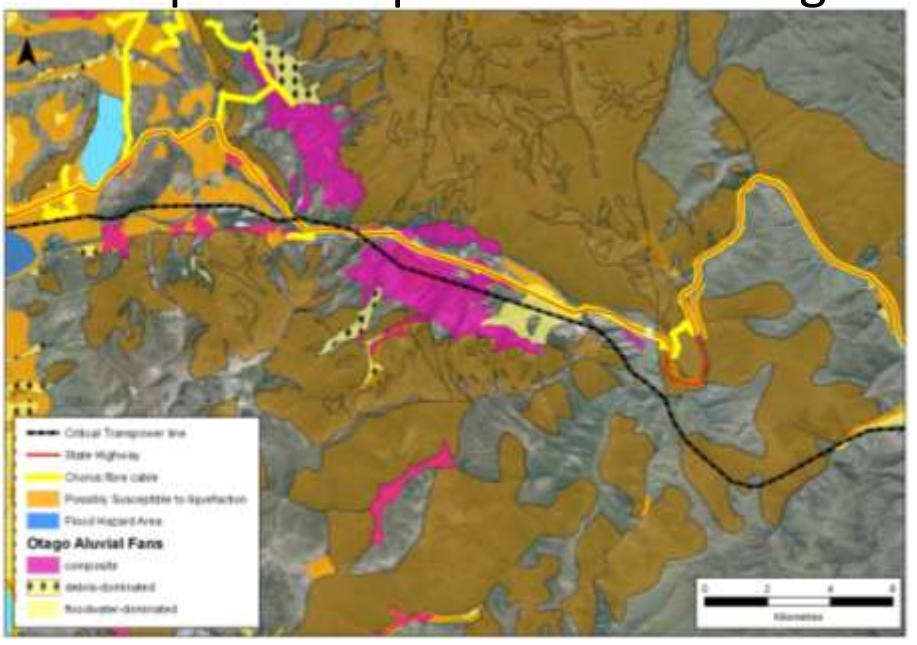
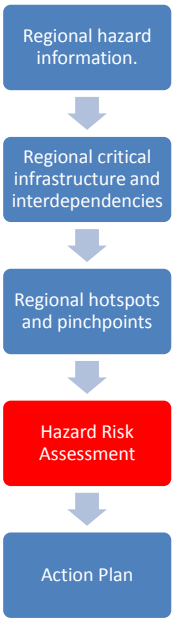
Hotspot Example: Kawarau Gorge



Hazard Risk Assessment

- Variety of methodologies applied over the years.
  - Spreadsheet based 'MCA' risk rating approaches.
  - GIS/hazard overlay supported by qualitative analysis (SMEs).
  - Fragility / economic modelling.



Hazard / Asset Overlay

Hazard / Asset Intersections

Liquefaction			
OBJECTID *	Description	Asset owner	Criticality_Rating
42	Green Island Substation	Aurora	3
44	King Edward St, Dunedin, Substation	Aurora	3
49	Neville St Substation, Duendin	Aurora	3
53	Andersons Bay Substation, Dunedin	Aurora	3
59	Zone Substation6 Quarry Rd	Aurora	3
62	Grid Exit Point 28 Orari St	Aurora	3
68	Zone Substation 17 Crawford St	Aurora	3
96	Zone Substation 822 Great King St	Aurora	3
130	Alexandra zone substation	Aurora	3
168	Queenstown Zone substation	Aurora	3
176	Frankton Zone substation	Aurora	3
80	Chevron fuel storage terminal	Chevron	1
116	Roxburgh Pump Station	CODC	2
122	Alexandra Pump Station	CODC	2
123	Alexandra Pump Station	CODC	3

Hazard Risk Assessment

	1	*Unlikely to cause damage post event*				
	2	*Possible damage, short term repair (days)*				
	3	*Possible damage, long term repair (weeks/months)*				
	4	*Complete failure - full reconstruction required.*				
	Flooding	**Landslip**	**Winds**	**Equake**	**Tsunami**	**Snow**
Electricity						
Electricity transmission lines - overhead	1	3	2	2	1	2
Electricity distribution lines - overhead	2	2	3	3	3	3
Electricity Substations / Switchyards	3	3	1	2	3	1
Underground electricity cables	1	3	1	3	1	1
Fuel						
Storage Tanks	2	1	1	3	2	1
Pipelines	1	1	1	3	2	1
Transport						
Roads	2	3	1	3	2	1
Bridges	2	4	1	4	3	1
Wharves	1	1	1	3	3	1
Airport	3	1	1	3	2	1
Rail lines	3	4	1	3	3	2
Water Supply						
Pipelines	1	4	1	3	1	1
Pump stations	1	4	1	3	3	1
Water treatment plant	1	1	1	3	4	1
Wastewater						
Pipelines	2	4	1	3	1	1
Pump stations	3	4	1	3	3	1
Water treatment plant	3	1	1	3	4	1
Gas						
Pipelines	1	2	1	2	1	1
Storage Tanks	2	1	1	3	2	1
Telecommunications						
Transmission tower	2	3	3	3	3	3
Cell sites	2	2	2	3	2	2
Roadside cabinets	2	2	2	2	2	1
Exchanges	2	2	3	3	2	3
Fibre cable	2	2	1	2	2	1

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Action Planning

- Specific lifelines mitigation projects
- Sector-specific Regional Contingency Plans (fuel, electricity)
- Hazard-specific Regional Lifelines Contingency Plans.
- Regional Reconnaissance Plan
- Regional Emergency Generator Management Plan
- Lifelines – CDEM Sector Communication Protocols
- Monitoring of lifeline utilities mitigation actions.
- Resilience assessment and benchmarking.
- Detailed hotspots risk analysis

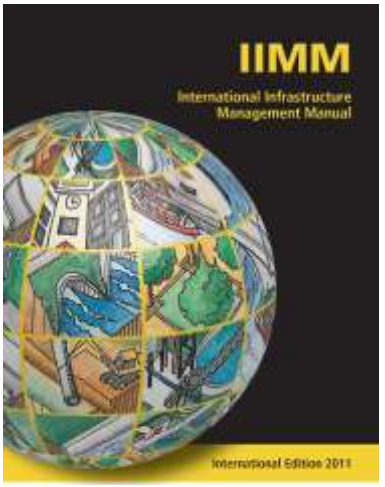
Reflecting on changes to latest vulnerability studies

- Hazard mitigation programmes in place, particularly national utilities.
- Resilience building as part of renewal programmes.
- Driving more operational than mitigation projects.
- Identifying and scoping mitigation projects more clearly the mandate of utility organisations.
- GIS-based asset and hazard information.
- Increased recognition of cross-boundary issues and nationally managed resources and infrastructure.
- Stronger integration with asset management planning and infrastructure strategies

The Next Phase

- Potential to incorporate summary of resilience approach by each sector / agency.
- Defining regional levels of service relating to performance following hazard events.
- Use of strategic lifelines project outputs to prioritise more focussed detailed modelling efforts.
- Inclusion of technical / cyber hazards.

Risk, Resilience and the IIMM



Any Questions?