



**Ten years on:**  
**A Review of the Lifelines Lessons  
Learnt from the 1994 Northridge and  
1995 Kobe Earthquakes**

**Dave Brunsdon & Peter Leslie**  
**Wellington Lifelines Group**



**Overview of Presentation**

- **The events**
- **Earthquake impacts on infrastructure**
- **The NZ study tours**
- **The reports and their recommendations**
- **How do those recommendations look now? What has been taken up, and what hasn't?**

## Summary of the Events

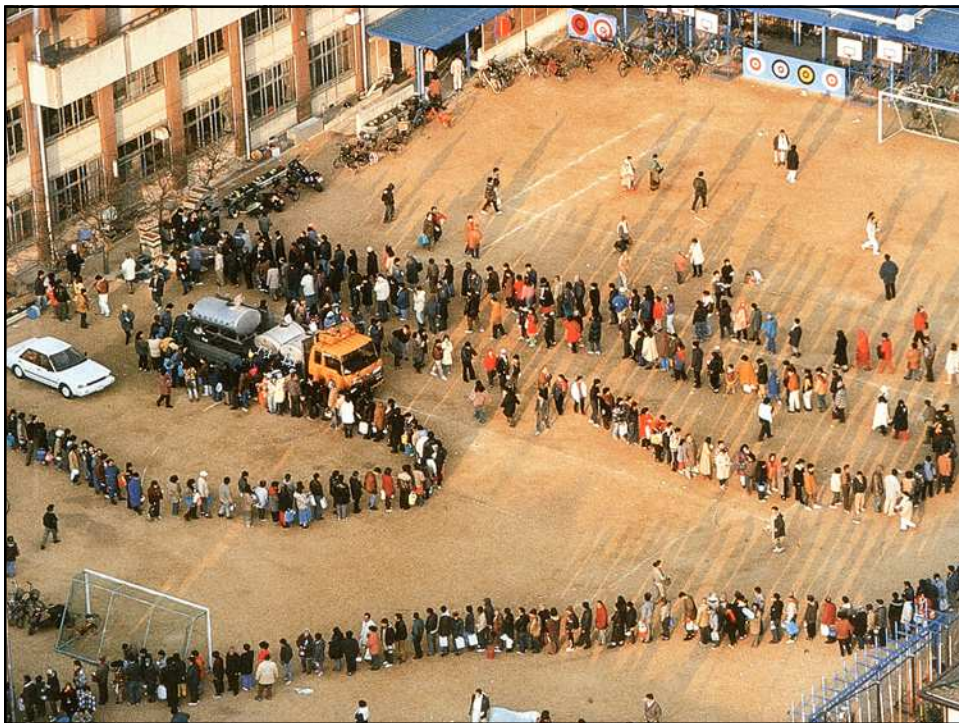
### Northridge, Los Angeles 17 January 1994

- Magnitude 6.7
- 57 deaths and 1,600 seriously injured
- 22,000 homeless
- Damage > US\$20 billion

### Kobe, Japan 17 January 1995

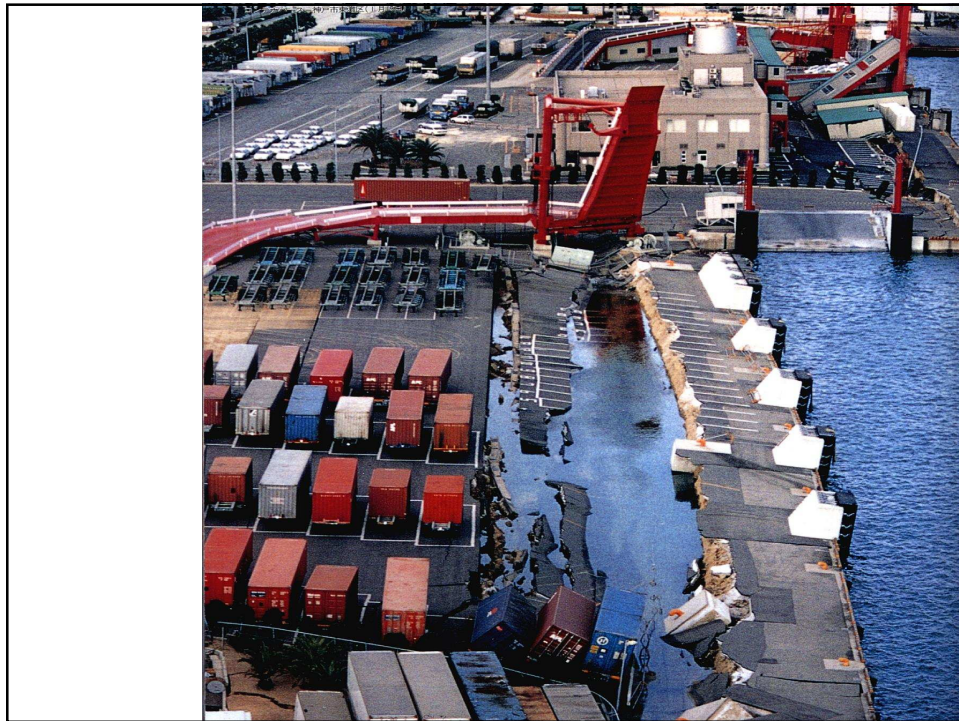
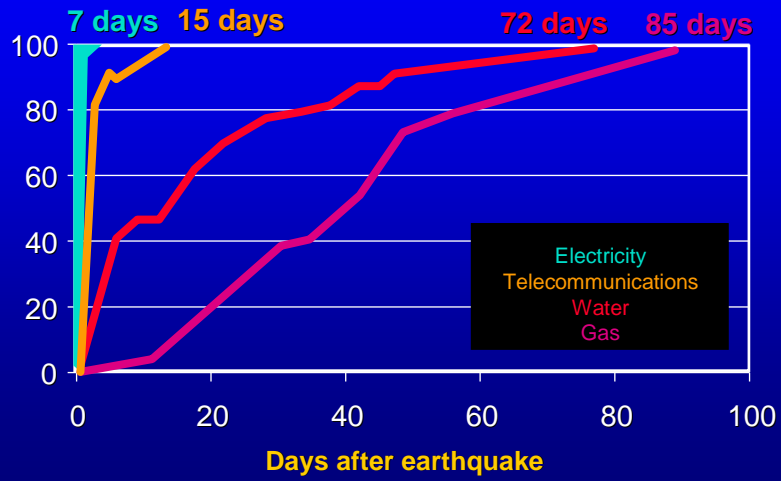
- Magnitude 7.2
- 5,470 deaths and 26,800 seriously injured
- 300,000 people homeless
- Damage > US\$200 billion





## The Restoration Curves For Kobe

Rate of restored households (%)





## The Study Tours

- **NZ Society for Earthquake Engineering reconnaissance within two weeks**
- **Wellington and Christchurch Lifelines Groups organised study tours six months after the event**
- **The Lifelines Study Tours featured 6 to 8 utility asset managers from Wellington and Christchurch Lifelines organisations**

## Study Tour Members

### Northridge team names

- **John Norton** Hutt City
- **David Hopkins** Kingston Morrison
- **Peter Leslie** Wellington Regional Council
- **John Lamb** Christchurch Engineering Lifelines Group
- **Brian Hasell** Canterbury Regional Council
- **Alan Watson** Christchurch City Council
- **Bill Smith** Enerco Gas
- **Nick Coad** Transpower
- **Rachael Hughes** Capital Power
- **David Bell** UofC Geology Dept
- **John Lumsden** Centre for Advanced Engineering
- **Roger Crimp** Telecom

### Kobe team names

- **Peter Leslie** Wellington Regional Council
- **Cr Ernie Gates** Wellington Regional Council
- **Dave Brunsdon** Wellington Lifelines Group
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- **Graeme Hughson** Wellington City Council
- **Dick Carter** Port of Wellington
- **Guenter Wabnitz** GasDirect

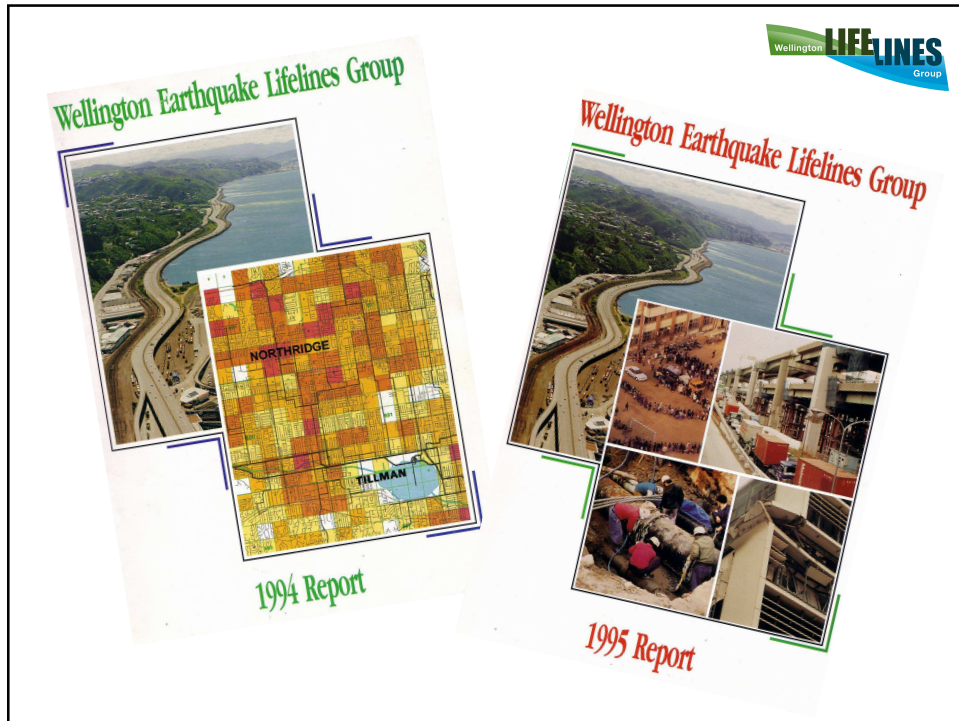
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## Recommendations and Lessons

### Northridge

- 11 Recommendations

### Kobe

- 10 Recommendations
- Plus a total of 75 Lessons for NZ from both events

## Recap: Project Process

1. Extract recommendations and key lessons
2. Undertake a broad assessment of the level of uptake and implementation of the recommendations
3. Workshop with Lifelines Sector groups to refine assessments and identify specific future activities
4. Final project report

## Analysis & Integration of Recommendations

- There are 16 recommendations from the two events, grouped under:
  - Response Plans and Arrangements
  - Emergency Communications
  - Communications Generally
  - Seismic Performance Assessment
  - Collaborative Planning Arrangements
  - Use of GIS



## Assessment Ratings: Level of Implementation/ Uptake

**High** = Good actions taken/ good uptake

**Med** = Some action/ partial uptake or awareness

**Low** = Not acted upon/ low uptake or awareness

## Response Plans & Arrangements

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**Med**

*Adopted by Gas and Water sectors, but not fully implemented (water) or maintained (gas). Some electricity lines companies have agreements in place*

## Response Plans & Arrangements

**2. All response plans must include provisions for obtaining resources and materials. Such provisions should be *in addition to* mutual aid agreements, and must take into account the concurrent demands of other utilities.**

**Low**

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<b><i>Plans have been developed. But commitment to training in specific response arrangements is often not sufficiently regular or organisation-wide to be fully effective.</i></b>	

## Response Plans & Arrangements

<p><b>3b.</b> There should be an associated commitment to participating in annual exercises to be organised on a regional basis to evaluate the effectiveness of response plans.</p>	

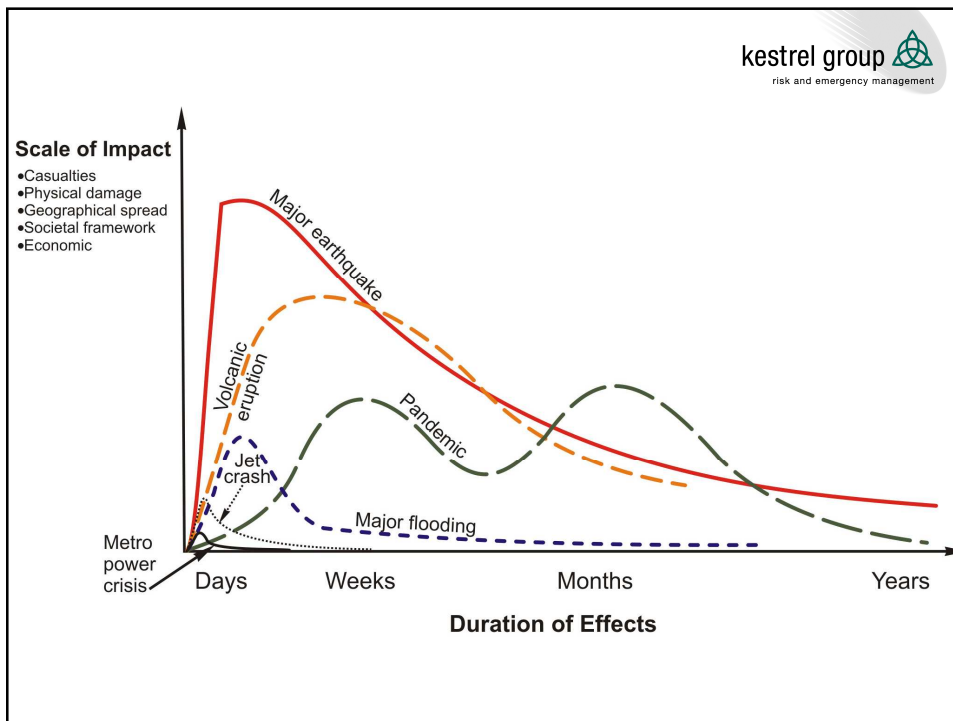
## Response Plans & Arrangements

<p><b>3b.</b> There should be an associated commitment to participating in annual exercises to be organised on a regional basis to evaluate the effectiveness of response plans.</p>	<p><b>Med</b></p>
<p><i>The willingness to participate in exercises is increasing as more opportunities present themselves.</i></p>	

## Response Plans & Arrangements

**4. Central and Local Government agencies must develop plans which outline their response to a major earthquake.**

**These plans should include provision for compiling a restoration strategy at an early stage following the event.**



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**These plans should include provision for compiling a restoration strategy at an early stage following the event.**

**Low-Med**

*Few CDEM groups have plans capable of dealing with a major earthquake; a Major Natural Hazard Contingency Plan is to be prepared by MCDEM and CDEM Groups*

## Response Plans & Arrangements

**5. Councils in conjunction with Transit New Zealand should develop plans for traffic control immediately after earthquakes. Ensuring appropriately prioritised access to affected areas is extremely important.**

**Med**

## Response Plans & Arrangements

<p><b>6. Organisations need to be prepared to look after their personnel in the immediate post-earthquake phase; adequate food, potable water, shelter and hygiene facilities must be fully considered before the event.</b></p>	

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<p><i>Organisations are much more aware of the need for this aspect. However many have yet to fully address this at a practical level.</i></p>	

## Response Plans & Arrangements

<p><b>7. A national schedule of key resources such as truck-mounted generators and temporary housing units should be compiled.</b></p>	

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<p><i>The emphasis has more appropriately been placed on regional resource schedules now that regional CDEM Groups have been established.</i></p>	

## Response Plans & Arrangements



## Emergency Communications

<p><b>8a. All utilities should review their post-earthquake communication arrangements, and consider backup mechanisms in the event of failure of the frontline system.</b></p>	

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<p><i>Has been the subject of work by Auckland and Wellington Lifelines Groups and others, but there is still an absence of common communications frameworks.</i></p>	

## Emergency Communications

<b>8b. Communication systems should be carefully reviewed for robustness in a major earthquake.</b>	

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<b><i>Robustness assessments are (or at least should be) part of ongoing risk management. However more independent assessments should be undertaken.</i></b>	

## Emergency Communications

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<b>8c. Cellular networks should have reserve space for priority calls.</b>	

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<i>Priority call arrangements have been investigated but not (able to be?) implemented.</i>	

## Emergency Communications

## Communications Generally

**9. All lifeline organisations should consider carefully how best to involve the news media to advantage during a response.**

**Med**

**10. Lifeline organisations should be conservative in before-the-event predictions of recovery**

## Communications Generally

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**10. Lifeline organisations should be conservative in before-the-event predictions of recovery**

**Med**

*Commercial and political pressures often lead to overly optimistic expectations, along with a lack of full appreciation of interdependency implications.*

## Seismic Performance Assessment

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**Med**

*There has been a good focus on control facilities, but office facilities (from where strategic co-ordination is often undertaken from) are typically not as rigorously addressed. Refer to the recommendations in the Exercise Capital Quake report*

## Seismic Performance Assessment

**12. Lifeline organisations should use *pre-event* damage assessments to manage risk, evaluate insurance approaches, and identify mitigation measures. They can also be used to identify “hot spots”.**

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**Med**

*Many organisations have had specific damage assessments undertaken.*

*However the information gained from those assessments is often not used or linked in with response processes and arrangements.*

## Seismic Performance Assessment

**13.** There is support for the initiatives of the Building Industry Authority and the New Zealand Society for Earthquake Engineering in addressing seismically vulnerable buildings designed prior to modern design standards

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**13.** There is support for the initiatives of the Building Industry Authority and the New Zealand Society for Earthquake Engineering in addressing seismically vulnerable buildings designed prior to modern design standards

**High**

*This aspect was specifically addressed in the revised Building Act in 2004, which widened the previous narrow definition of earthquake prone buildings.*

## Collaborative Planning Arrangements

**14.** The focus of the Wellington and Christchurch Lifelines Groups in terms of *Co-ordinating hazard information and mitigation measures, and facilitating response planning* is appropriate, and should be strongly continued.



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**High**

*The Wellington and Christchurch Lifelines Groups have continued their work in this area, and there are now Engineering Lifelines Groups in virtually all regions of NZ*

## Collaborative Planning Arrangements

**15a.** New Zealand Lifeline groups should maintain contact with ASCE/TCLEE, California Office of Emergency Services, California Utilities Emergency Association on a regular basis.

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**Med**

*NZ has been represented at subsequent 4 yearly US TCLEE conferences, and Tom O'Rourke and other US specialists has been a frequent visitor to NZ to pass on latest knowledge.*

## Collaborative Planning Arrangements

**15b.** NZ/ US Lifelines workshops should be held every two to three years.

Individual Lifeline organisations should foster relationships with Californian counterparts to share information and knowledge.

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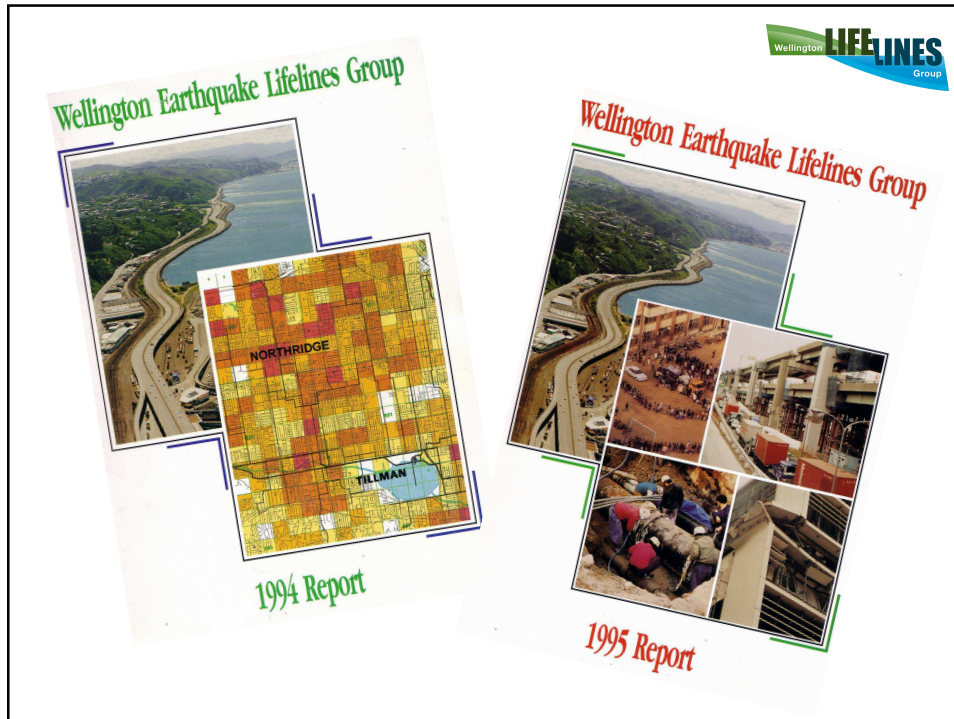
**Individual Lifeline organisations should foster relationships with Californian counterparts to share information and knowledge.**

**Med**

*A US/ NZ workshop was held in NZ in 2001, and there has been reasonable ongoing interaction.*

## Use of GIS

**16. GIS has an increasing role to play in both damage assessment before the event and in reviewing damage after an earthquake, and should be developed and used on a more widespread basis by lifelines systems in New Zealand**



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**Med**

*There has been significant uptake in the use of GIS by Lifeline Utilities individually. There is however little interoperability that would enable a direct exchange of information.*

## Summary of Assessments

1.	Mutual aid		Orange	
2.	Plans for obtaining resources	Red		
3.	Response plans & exercises		Orange	
4.	Local & Central Govt agency plans for major EQs	Red		
5.	Traffic control & priority access		Orange	
6.	Personnel welfare		Orange	
7.	Schedules of resources		Orange	
8.	Emergency comms		Orange	

## Summary of Assessments (2)

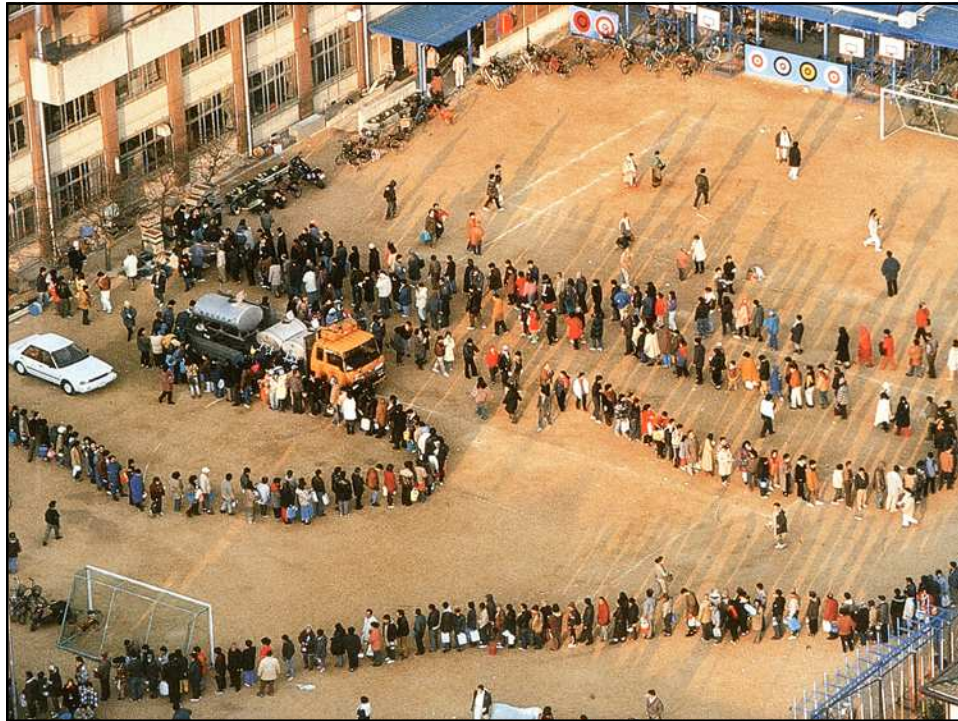
9.	Involving news media		Orange	
10.	Conservative predictions		Orange	
11.	Ensuring critical structure robustness		Orange	
12.	Using damage assessments		Orange	
13.	Addressing EQ risk bldgs			Green
14.	Lifelines Groups			Green
15.	Maintain US links		Orange	
16.	Use of GIS		Orange	

## Some Observations

- The analysis paints a reasonable picture of the achievements of the NZ Lifeline Utility sector over the past decade
  - eg. collaborative planning via Lifelines Groups
- .... and of those aspects that haven't been successfully grappled with
  - eg. matters of detail around planning for major geophysical events
- Hopefully provides encouragement for work to continue, and some focus for where efforts should be applied

## Next Steps

- Workshops with Lifelines Sector groups to refine Recommendation assessments and identify specific future activities
  - Wellington Lifelines Group
  - National Lifelines Forum
- Sectors to review Lessons
- Overall project report in 2008



## This Session to Consider

- 1. Are there any adjustments required to the assessments?**
  - What additional comments could be added?
- 2. What should the priority actions/ activities be from here?**
  - Which recommendations stand out as needing 're-promotion'?
  - What areas aren't being worked on enough?

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16.	Use of GIS		Orange	



## Alternative Assessments

Overall Effectiveness		
Collective Action		
Indiv Uptake/ Action		
Awareness		

## Alternative Assessments

Overall Effectiveness	Med	
Collective Action	Low	
Indiv Uptake/ Action	High	
Awareness	High	
Use of GIS		