THE CANTERBURY EARTHQUAKES: LESSONS LEARNT

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INTRODUCTION

At 5.43am on Saturday 4 September 2010, the Canterbury district in New Zealand was shaken by a 7.1 magnitude earthquake. The epicentre was located 40 kilometres west of Christchurch and had a focal depth of 10 km, causing widespread damage which affected the whole of the South Island with vibrations felt as far away as Auckland. No one died during this earthquake but buildings were badly damaged including many heritage buildings. On 26 December there was another big aftershock, again with no loss of life, however on 22 February 2011 at 12.55pm there was a 6.3 magnitude aftershock centred in the Port of Lyttelton that devastated central Christchurch and killed 188 people, most in the central city district in modern buildings. The severity of this quake was caused by the fact that its focal depth was only 5 km deep. It was the shallowness of the shake that caused the major wide scale destruction (Figure 1).

Figure 1 | Aftermath of the earthquake.

What causes earthquakes in New Zealand?

New Zealand is known as "the shaky isles" because minor tremors are not uncommon; however, Wellington was the city considered to be most at risk, not the Canterbury region. This unknown fault came as a complete surprise to earthquake experts around the country and overseas. Earthquakes are caused by tectonic plates scraping against each other or by a sudden jolt on a fault line. A shake occurs when stress builds up over a period of time, causing the plates to fracture. The energy waves spread out from the epicentre causing extensive ground vibration. Although the epicentre was in Lyttelton the energy waves travelled along the mountain range causing most damage to areas in the central business district. The amount of damage is dependent on the type of ground upon which the buildings sit. Soils such as sand or reclaimed land causes much more displacement of soil than rock so reacts more dramatically. Liquefaction (Figure 2) was a huge issue and occurs where there is water present in conjunction with sand and silt.

The overall effects vary depending on ground conditions, distance and construction standards. Most of the people who died were in relatively modern buildings in the central city.

PREPARATION

Disasters are sudden, unpredictable and can cause extensive damage and destruction. They can strike at any time and preparation is vital to safeguard collections

The importance of a disaster recovery plan

The preparation of a disaster recovery plan is the most effective method for ensuring the safeguarding of collections. Thinking about the issues that are unique to museum or gallery collections is vital. There is no one size fits all and coming up with a plan that incorporates fresh ways of managing any potential disaster will be of immeasurable assistance should disaster strike. Risk assessment is also a vital part of this process. Another essential tool that can be utilised is training in disaster preparedness. This can be achieved by participating in hands on workshops that can be done in conjunction with your local friendly fire training school.

Essential requirements for preparing for disaster include:

- Clear communication – this is paramount;
- A disaster plan for **all** staff;
- Allocated set roles; and
- Adequate materials in disaster bins.

RECOVERY CASE STUDY

Six months after the February 2011 aftershock, the library staff of an institution were told they could access their heritage collections, which were substantial. The institution was on the seventh floor of a building in the "red zone" of the CBD. Personnel could only enter with a certified engineer and could only be in groups of three or more.

Figure 2 | Liquefaction.

Figure 3 | Aftermath of the earthquake.

By this time, liquefaction, silt and mould were major issues as was the lack of power and damaged stairs. It was impossible to use the stairs for moving the collections so a decision was made to crane up a container to the seventh floor to salvage the objects.

There was no disaster plan and as many months had passed there were issues of extensive dirt, dust, silt penetration and mould growth. Other museums rallied around to help and the salvage began.

Some issues occurred in this salvage that a site-specific disaster plan would have alleviated. For example, there was:

1. no prioritising of the collection ensuring the most

important objects are safely removed first;

2. no location list as to where these were stored and it would have been helpful as all helpers were reliant on one member of staff who knew where they were;
3. no adequate supplies – half way through the salvage the boxes ran out and there was no opportunity to obtain more in the time allowed;
4. no specific teams set up to do specific jobs; everybody pitched in which led to duplication of tasks and confusion;
5. no labelling of objects therefore salvage took much longer than the team anticipated; and
6. limited packing materials, delaying the salvage.

Figure 4 | Recovery.

IMPORTANT POINTS LEARNT

These issues relate directly to the Canterbury experience and may well not apply in other countries:

- Prepare for significant aftershocks for at least up to two years. One earthquake does not mean the disaster is over. The worst loss of life and damage to buildings was caused by an aftershock six months later.
- If a city-wide disaster occurs, the museum or gallery will very likely be on its own with little outside help including staff members who will be more concerned with their family and homes.
- If a state of civil emergency is declared, museums and galleries will have no power over access or possible takeover of their buildings, as happened with the public libraries and art gallery.
- Communication is essential in the disaster recovery of collections.
- The building must be declared safe by the emergency services.
- It is vital to have up to date contact details for everyone that you need to communicate with such as a disaster telephone tree.
- Efficient preventive procedures can save your collection from major destruction and safeguard staff in the process.
- Be aware some staff may be severely traumatised by seeing the collections damaged.
- This earthquake highlighted, for many cultural institutions, the need for improvement in storage and health and safety.
- It cannot be over-emphasised how important it is to minimise risk to collections by storing safely and correctly.
- Do not leave it until a disaster occurs to think about the risks to personnel and collections. Having a disaster recovery plan in place that **all** staff have access to that has been approved by senior management is vital.

CONCLUSION

After all the big aftershocks, a state of civil emergency was declared by the NZ Government and Civil Defence. This state of emergency gave the local council and Civil Defence special powers. This included the demolition of buildings without the necessity of a building consent. In terms of heritage

buildings this has had a catastrophic effect on the historic areas of Christchurch and many heritage-listed buildings have been demolished under these new laws in the last couple of months.

Power and sewerage systems failed leaving people in complete darkness. Sewage began infecting the clean water, which could then not be used. Due to the implementation of a civil emergency directive it became clear that absolute power rested in the arms of the Civil Defence alone and therefore compromised collections were not considered a priority. In some instances museums in the area lost buildings and collections not to the earthquake but to the decisions made immediately afterwards by Civil Defence personnel with different priorities. Staff of one small museum in particular risked life and limb to save their precious collection from the bulldozer but were unfortunately unable to save the historic building from demolition.

Figure 5 | Recovery.

With hindsight, it is clear that the one issue not considered when disaster plans are written for heritage salvage is the lack of input that museum staff may have in relation to saving their collections in the event of a region-wide catastrophe such at the Canterbury earthquake. This is something to consider and negotiate for future disaster planning protocols. The aftershocks continue and many museums are now implementing procedures to safeguard their fragile collections to protect them from further damage.

For cultural heritage professionals in New Zealand, this event has proved to be a salutary lesson on what to expect should the very worst happen. Future disaster planning should take into account not just the normal disaster scenarios but also ones that may not be immediately apparent, such as a museum being taken over by Civil Defence teams and governments granting extended powers that have a severe impact on the safety of cultural heritage collections.

SOME RELEVANT WEBSITES

Archives New Zealand | Te Rua Mahara o te Kāwanatanga. [online: http://www.archives.govt.nz/advice/current-projects-and-news/disaster-recovery-archives-and-records-canterbury-region]

Cantage. [online: http://cantage.wordpress.com/]

Canterbury Disaster Salvage Team. [online: http://www.disalteam.co.nz/]

Disaster Plan templates. [online: http://cool.conservation-us.org/bytopic/disasters/plans/]

Earthquake Commission | Kōmihana Rūwhenua. [online: http://canterbury.eqc.govt.nz/]

Geonet. [online: www.geonet.org.nz]

New Zealand Civil Defence. [online: www.civildefence.govt.nz/]

New Zealand Conservators of Cultural Materials | Pu Manaaki Kahurangi (NZCCM). [online: http://www.conservators.org.nz/]

New Zealand History Online. "Disasters". [online: www.nzhistory.net.nz/category/tid/1707]

Stronger Canterbury Earthquake Recovery. [online: http://www.canterburyearthquake.govt.nz/]

TAYLOR, J (2010) "What happened to Kaiapoi Museum?" NZ Museums. [online: http://www.nzmuseums.co.nz/news/what-happened-to-kaiapoi-museum/]

AUTHOR BIOGRAPHY

Lynn Campbell is a Fine Art paper conservator who works in Christchurch, New Zealand. She obtained a B.A. Honours in Fine Art and a Post Graduate Certificate in Fine Art Conservation, coming from and training in the UK. She has worked at the Royal Scottish Museum in Edinburgh and tutored on the M.A. conservation course at Northumbria University. Lynn has also worked in Kenya, Tanzania and Zanzibar, East Africa and was one of the first conservators to go to Antarctica to travel to and work on the historic huts in the Ross Dependency as part of the New Zealand Antarctic programme.

After arriving in New Zealand in 1986 to work at the Robert McDougall Art Gallery conserving works on paper, Lynn soon realized that there was a need for more preventive conservation protocols and procedures to inhibit deterioration to many collections in New Zealand. In 1987 she started the Canterbury Disaster Salvage Team to help cultural institutions out in the event of a disaster.