A tale of three cities and three earthquake disasters

Descrizione

Introduction

The purpose of this article is to present the results of a brief analysis of the short and medium-term aftermaths of three earthquakes that have occurred in different parts of the world: at L'Aquila, central Italy, on April 6 2009; at Padang, Indonesia, on September 30 2009; and at Christchurch, New Zealand, on September 4 2009 and February 22 2011 (these will be considered as two events, but as one disaster). All three were medium-power seismic events (Table 1). Much research on the consequences of earthquakes has been concentrated on the largest and most tragic events, such as the disasters in Pakistan in 2005, in Haiti in 2010, and in Japan in 2011. However, there are good reasons for paying further attention to the second-level events, as these may cause disproportionate high levels of damage and suffering as a result of high degrees of seismic vulnerability. The second aim of this paper is to consider what general lessons these three disasters can furnish. The lessons are likely to be in the fields of vulnerability reduction, risk transfer, decision-making and recovery planning. They may also refer to the connection—or lack of it—between short- and long-term recovery goals and strategies.

Magnitude	Location	Date	Deaths	Injuries	D/I	Buildings destroyed/ damaged
6.3	L'Aquila, Italy	06-04-2009	308	1,500	0.21	100,000
7.9	Padang, Indonesia	30-09-2009	1,115	4,400	0.30	135,000/279,000
6.3	Christchurch, New Zealand	11-02-2011	185	6,800	0.03	10,000/100,000

Table 1. Selected summary data for the three earthquakes

The disasters will be treated in chronological order and then general conclusions will be derived from their separate analyses.

L’Aquila, Central Italy

On Monday, April 6 2009, an earthquake measuring 3.4 on the Richter scale occurred with epicentre 3.4 km away from the historical core of L’Aquila (population 72,800), a city located in a mountain basin in the Abruzzo Region, central Italy: 308 people were killed, 202 were seriously injured, and about 1,300 suffered less significant injuries; 100,000 buildings were seriously damaged, including 11 of the 12 churches in L’Aquila (Liel and Lynch, 2012). Some 67,000 people were left homeless and interdictions were imposed on areas of L’Aquila city and 15 other town centres out of the 49 that were officially listed as severely damaged. The earthquake was part of a swarm of tremors that began in October 2008 and continued well throughout the following summer. The main shock, at 3.32 am, was preceded by a significant foreshock at 12.30 am on the same day.

The conjunction between aggregate patterns of human behaviour and the timing of the earthquake appears to have limited mortality: the disaster happened when many families and students – L’Aquila is a university city – were still away for the weekend. Nevertheless, 56 of the 61 fatalities in the 20-29 years-old age group were students, a mortality profile not seen since the 1990 Manila, Philippines, earthquake which caused a medical school dormitory to collapse (Schiff, 1991). Moreover, disproportionate numbers of women were killed in the 30-39 and 70+ years-old age groups. Normalising for population profiles and the dominant mortality rate of 5:10,000 of the population (which is judged legitimate, as most of the victims were of local origin) still leaves a surplus of 140 deaths, or 45 per cent of the total (Alexander, 2012a), and a preponderance of women. The explanation for the victimisation of women is not entirely clear, but behavioural analysis (as yet unpublished) suggests that it may be that women had a more fatalistic attitude that caused them to react in a less self-protective manner after the foreshock earlier that night (cf. Marincioni et al., 2012). There is no evidence that women were more protective of children than were men.

The victimisation of women continued in the medium-term aftermath, as described below. First, however, it is necessary to explain how the Italian government's recovery strategy differed from its own established practice in previous national disasters and, in part, contributed to that situation. In fact, the transitional shelter strategy involved a fairly radical departure from earlier events. Transitional shelter has a long and complex history in Italian disasters. It usually involves a collection of container homes and light-walled prefabricated dwellings that guarantee families living spaces between 20 and 40 m2. With design lives of up to ten years, the prefabs have lasted, in exceptional cases, for 60 years or more, although generally not in the absence of an eventual reconstruction of permanent living spaces. Studies in the areas of Irpinia and Basilicata affected by the magnitude 6.8 earthquake of November 23rd 1980 showed that there was a highly complex interaction between the use of transitional shelter and a plentiful number of models of permanent recovery and reconstruction (Mazzoleni and Sepe, 2005).

At L'Aquila, the central government took over the medium-term recovery strategy that was managed by the national Department of Civil Protection (a rather anomalous move in international terms). Of the homeless, roughly one third were accommodated in tents for the summer, one third went into hotels, and one third were left to their own devices. In the meantime, the government constructed 19 new towns composed of two-and three-storey apartment buildings with pendulum base isolation and 24 villages or enclaves of smaller prefabs without base isolation. The cost of this exercise was astronomical: the base isolated housing cost an average of €280,607 per 40m2 unit, roughly one third of which pertained to the building and the rest to the acquisition and urbanisation of the site. The base isolators alone cost €55,000 per building, and there is some doubt whether they would function properly during an earthquake given that these are generally not protected against corrosion and seizure(1).

Government largesse extended only to housing. Surveys conducted up to 20 months after the earthquake (Marincioni et al., 2012) showed that most of the 'new towns' and many of the prefab clusters were utterly devoid of essential services (including waste-water purification). The Italian government's designation of the base-isolated

transitional housing as ‘eco-compatible and sustainable’ referred to the use of solar panels and economical building materials. What it did instead was to induce a massive dependency on the private car for essential transport, yet without any improvement of the local transportation infrastructure, which remained poor. Moreover, psychological surveys of the plight of residents in the new complexes revealed that, at 26.5 per cent, post-traumatic stress disorder in women was twice as high as values encountered after other earthquakes. Social fragmentation was rife. In children, studies showed that those in the hotels were less affected than those in the tent camps, as, for almost random reasons, the social fabric seemed to have survived better in the former than the latter. In the transitional shelter that followed the hotel and tent phase, domestic violence, substance abuse, and other social pathologies increased significantly (Camillan Task Force, 2010).

The concept of ‘urban’ is dependent, not so much on the quantity of housing, but more on the presence and quality of services. The first questionable policy decision in the L’Aquila case was to do nothing to protect livelihoods and foster employment in the area. As a consequence, in 2009 some 16,000 jobs were lost in the L’Aquila province, and these were not recouped in the following two years. The transitional shelter led to substantial break-up of the social fabric, and yet it was clearly designed for longevity. Lack of funds and gradual accretion of bureaucracy have led to absolute stagnation in the process of rebuilding the town centres and regaining the *genius loci*, or sense of place, of L’Aquila and its satellite towns. In this respect, the L’Aquila disaster is more similar to the Val Belice earthquake aftermath in western Sicily, 1968-85, in which the status of the area as an economic backwater was heavily reinforced by government policy. Moreover, in the Belice and L’Aquila cases, local *governance*, or direct democratic participation in decision-making on the recovery, were virtually suppressed by the central government with its stop-start paternalism. Economic stagnation is thus at the root of the lack of reconstruction and is a product of both central government policies and a general lack of stimulus to local employment (Alexander, 2012b).

The obvious conclusions about the Italian government’s transitional shelter policy are first that it was an opportunity to experiment with housing (and the European Union’s Structural Funds paid for it), and secondly that it is intended to last for a very long

time. Yet, it is not a solution to the problems of the disaster area. In the historical centres of towns in the L'Aquila province, widespread and lavish buttressing fails to mask the decay of the damaged urban fabrics. It is also a further testimony to the stasis that dominates the reconstruction situation. Indeed, in the first year after the disaster, virtually no attempt was even made to remove the 4 million tonnes of rubble that laid in the damaged urban zones.

In order to plan, consult, legislate, and carry out the necessary studies that underlie the recovery process, time is technically and socially necessary in post-disaster reconstruction. The recovery plan for L'Aquila is a very worthy document. It estimates the cost of reconstruction for the city and its satellites as €5.1 billion. On the one hand, it will be very difficult to find such a sum for a peripheral city, but on the other, 1000 years of history cannot be abandoned or swept away. All in all, L'Aquila conforms to the conclusion of Hogg (1980) who studied the recovery from the Friuli earthquakes of 1976 and found that it was easiest, best and quickest among communities that were both geographically and politically well-connected. L'Aquila is neither. As a final note, it is striking that the 'fiscal federalism' so energetically promoted by elements of the government of the day destroyed equalising mechanisms and led to the enrichment of Cremona, Italy's richest province, and, more than anywhere else, the impoverishment of L'Aquila, the country's most heavily compromised province, which lost two-thirds of its fiscal support grant.

Padang, Western Sumatra, Indonesia

The city of Padang, Indonesia, is the capital of Western Sumatra province. It has about 1 million inhabitants and is the third largest city on the island. The city is widely regarded as bearing one of the highest levels of disaster risk in the world. In fact, a mega-thrust earthquake in the Sunda trench could reach magnitude 8.5, as did the tremors of 1797, with considerable damage throughout the urban area, along 800 km of coast and in the offshore Mentawai Islands. Moreover, about two-thirds of the city could be inundated by a tsunami comparable to the historic events of 1797 and 1833.

On Wednesday, September 30 2009, an earthquake occurred with magnitude 7.6, hypo-central depth 87 km, and epicentre 45 km WNW of Padang. Some 1,115 people were killed (60 per cent of them in Padang-Pariaman District), 1,214 were seriously injured, and 1,688 were lightly wounded. Of 379,200 buildings that were damaged (three-quarters of which were houses), 35 per cent were severely affected, 44 per cent were moderately damaged, and 21 per cent were less severely compromised. In total, 1.25 million people were directly affected by the disaster. Ten hospitals and 288 clinics and other healthcare structures were damaged. Moreover, 75 public buildings collapsed. Many of these had moment-resisting frames but suffered soft-storey failure accompanied by extensive shearing at column-beam interfaces. In all, 80 buildings collapsed in the central business district of Padang and several large hotels were damaged beyond repair. A total of 4,749 schools were damaged, 45 per cent of them seriously and 30 per cent moderately. Most were located in Padang Pariaman and Agam Districts, especially in Padang City (Sengara et al., 2010).

Patterns of damage involved some common factors (such as the soft-storey failure in engineered buildings), but much heterogeneity due in part to highly variable soil conditions. The 2002 revision of the building code was deemed adequate, although design peak ground acceleration (PGA) will probably be increased in Padang from 0.4g to 0.5g in future revisions. However, there were questions about its application to some recent buildings and there are even greater doubts about the seismic resistance of buildings constructed before the last revision (Wilkinson, 2009).

Some 170 NGOs (two-thirds of them international) were involved in the disaster response. About 100,000 people who had lost their houses were settled in tent-camp sites distributed across Padang and Pariaman. Many people found temporary accommodation with relatives and members of their extended families. Mainly by means of international donations, 13,778 temporary dwellings were constructed. Besides shelter, water supply, sanitation and psychological care were important challenges. Despite some social unrest over prolonged lack of access to clean water, the health status of survivors was more or less guaranteed by strong preventative programmes and the institution of best practices in welfare, disease prevention and sanitation. The emergency phase lasted one month and reconstruction started after one year, backed by modest government subsidies. Most reconstruction took place in

situ, with little or no relocation of buildings.

The 2009 Western Sumatra earthquake came on the back of the much larger and more catastrophic tremors and tsunami in Banda Aceh 1,300 km further up the coast five years previously. Awareness remained high in Sumatra during the intervening period. Hence, many lives were saved in Padang by enacting precautions engendered by repeated disaster drills. On September 20 2009 the regional Yodarso Hospital was in part severely damaged, but it was successfully evacuated without loss of life, and subsequently reactivated by shifting intensive care, obstetrics, paediatric wards, admissions services, and the emergency room procedures to tents. Overall, community-level preparedness paid off. It has since been reinforced by substantial attention to the tsunami risk and the opportunities for preventive evacuation. However, despite high visibility programmes, much scientific work, and the use of technology, the level of risk remains very high, as some of the poorest neighbourhoods of Padang are at or below sea level and very close to the coast, with limited opportunities for rapid evacuation during the very short time frame engendered by a near-field tsunami alert.

Quite correctly, disaster risk reduction (DRR) is one of the top priorities of the Indonesian government. However, the process of creating resilience is complicated by political-ideological reactions in both national and regional administrations. For instance, the 2004 earthquake and tsunami in Banda Aceh were followed by a rash of legislation that mandated Islamic restrictions on society, including punishment of adultery by the death penalty by stoning (BBC News, September 14 2009). Shortly after the Western Sumatra earthquake, the Indonesian Communications and Information Minister, Mr Tifatul Sembiring, told the people of Padang that “immorality causes disasters” (BBC News, November 28 2009). This led one student of Indonesian DRR to comment that:

“Faith-based civil society organisations in Indonesia […] did not adequately play roles as agents of disaster management policy change, simply because religious discourse may discourage rational views and scientific explanations of human-nature relations.” (Lassa, 2010)

In a country that sets much store by a faith-based interpretation of social relations, this has serious implications for the progress of community-based disaster risk reduction.

Among a total population of 235 million, on average 1.15 million Indonesians are affected by disaster each year. Recently, deaths have averaged 18,000 per annum. Losses have exceeded US$500 million, showing a rising trend. Despite the national emphasis on disaster risk reduction, the Indonesian National Disaster Mitigation Agency's budget for 2010 was only 3.4 per cent of the direct cost of losses in disaster. Private insurance against natural disaster risks has proliferated, backed by reinsurance consortia in Singapore, but premiums are likely to rise in the wake of high claims for reimbursement. Given this situation, Indonesia has begun to organise a national system of both catastrophe insurance and micro-insurance. The prospects are mixed. Rohregger and Rompel (2010) showed that there is potential for public-private partnerships in providing insurance and micro-insurance in Indonesia. However, Wilhelm's (2010) investigations in the slums of Jakarta suggested that micro-insurance could destroy traditional resilience at the level of poor communities unless it is used in ways that specifically reinforce it.

There are several conclusions to be derived from the Indonesian case. First, patterns of damage, loss, and casualties are complex and may vary considerably in magnitude in future events, which, however, may include very large disasters – the 'fat-tailed distribution' problem of Taleb (2007) and others. Second, Indonesia is rich in social capital, which can be used to reduce the risks of disaster in the emergency and early recovery phases. It is an essential adjunct to the technical and logistical preparations for tsunami warnings. It is also essential that future insurance and micro-insurance schemes take account of the social capital and accompanying indigenous knowledge and coping mechanisms. Finally, political outlook can have a profound – indeed a severe – effect on disaster risk reduction and recovery from catastrophes. It can potentially introduce arbitrary elements or condition policies in ways that lead to approaches that represent particular ideologies more than they betoken good DRR.

Christchurch, Canterbury, New Zealand

At 4.35 am on Saturday, September 4 2010, the Canterbury Region of New Zealand's South Island was struck by an earthquake of magnitude 7.1. It had a hypo-central depth of 10 km and epicentre at Darfield, approximately 48 km west of the city of Christchurch (population 380,000). Damage was widespread, but casualties were limited to two seriously injured and one heart-attack death. However, almost six months later, on Tuesday, February 22 2011, a 6.3 magnitude earthquake occurred with a hypo-central depth of 5 km and epicentre at Lyttelton, 10 km southeast of Christchurch. Despite the lower magnitude of the second event, buildings and infrastructure that had been weakened by the Darfield earthquake were very seriously damaged. As the second earthquake occurred at 12.51 pm, when the centre of Christchurch was busy, 185 people were killed and 4,400 were injured.

The collapse of the multi-storey Canterbury Television building accounted for 115 of the deaths, while another 18 died in the collapse of the Pyne Gould Corporation building, and eight were killed when a much smaller edifice fell over a bus. The collapse of the stairs from the 14th floor downwards in the Forsyth Barr building (a 19-storey reinforced concrete structure built in 1988-9) left 30 of its 200 workers trapped until a complex rescue could be completed. All but ten of the deaths in the Lyttleton earthquake were the direct result of collapsed buildings, and 23 deaths were related to unreinforced masonry buildings (URMBs).

Throughout the area, damage was exacerbated by the poor seismic response of soils and sediments on the Canterbury Plain. Some 85 km2 of land suffered liquefaction or lateral spreading, which caused 400,000 tonnes of sand to be ejected from saturated layers and lenses below the surface. Loss of foundation bearing capacity was thus a major problem for buildings and infrastructure throughout the region. This led to massive damage to roads and bridges, and enormous effects upon underground infrastructure. In addition, the Port Hills area southeast of Christchurch suffered rock falls and slope collapses that killed two people and caused extensive damage to suburban property. A national state of emergency was declared for the period from February 22 to April 30 2011.

The central business district of Christchurch occupies an area of about 3 km2. It had to be cordoned off immediately after the earthquake, as some buildings had collapsed and others were at risk. For about a week, search-and-rescue operations were conducted by New Zealand, Queensland, Chinese and Japanese teams under the co-ordination of New Zealand's Ministry of Civil Defence and Emergency Management. Building assessment and preliminary demolition occupied the rest of the ten-week emergency period. In addition, vast quantities of aggregate had to be removed from urban sand boils and other manifestations of liquefaction. Coupled with lateral spreading, the liquefaction caused subsidence that was widespread across the Avon and Heathcote River plains, thus exacerbating flood risks.

Liquefaction and lateral spreading were mapped in detail and it was determined that 120,000 properties had escaped damage due to these phenomena, 20,000 were moderately affected and 15,000 were severely damaged. The last group constituted the 'red zone'. As it included large tracts of suburban land with low-density housing, not all of it remained cordoned off, but the central business district was still interdicted more than a year later. About 2,000 properties in the volcanic hills south of Christchurch were identified as being at risk of rock falls.

The New Zealand Government set up the Canterbury Earthquake Recovery Authority (CERA) to manage the recovery process. Detailed structural assessment was carried out to determine which buildings would be demolished and which rehabilitated. Essentially, timber-framed buildings performed the best. These were mostly single-family dwellings, which weighed one third as much as equivalent structures in brick and were thus better adapted to the liquefaction and lateral spreading zones. However, timber-framed churches also performed well, although in some cases they lost most of their brick cladding.

It is difficult to say whether unreinforced masonry buildings or reinforced concrete (RC) ones performed the worst. Many URMBs were severely damaged and perhaps fewer RC buildings were compromised. However, the latter tended to be larger

structures and their loss had a disproportionate effect on the urban landscape. It should be added that very modern frame structures suffered relatively little damage, thanks to the gradual improvement over time of anti-seismic building codes. Nonetheless, the University of Canterbury, which over the period 1961-74 relocated to a campus of modern RC buildings, suffered many serious structural failures that required some of its buildings to be demolished. Its original campus, a group of URMBs in the city centre now used as the Christchurch Arts Centre, was also severely damaged.

The New Zealand government purchased some 7,000 properties, in most cases for demolition, which began in earnest, especially in Christchurch central business district. Demolition tariffs were about US$120-140 per square metre, which meant that some of the larger multi-storey buildings cost in the region of US$1 million to demolish. This had to be accomplished using highly specialised ‘nibbler’ cranes, as explosives were deemed too risky to be used. At the time of writing (May 2012) it seemed probable that at least half of the CBD will be demolished. Moreover, within ten months of the Lyttleton earthquake some 80 historic buildings had been demolished.

In New Zealand, earthquake insurance is administered by EQC, the Earthquake Commission, which is backed by a worldwide consortium of 30 reinsurance companies. The cost of pay-outs was of US$600 million for the Darfield event and could reach US$12 billion for the Lyttleton earthquake. Although earthquake insurance is cheaper in New Zealand than in California (by a factor of about 15, largely as a result of nationwide compulsory subscription), premiums will have to increase at least 10 per cent in response to these two events, which have exhausted the pool of resources for future disasters. The earthquakes are estimated to have cost 10 per cent of New Zealand GDP (two and a half times the proportion of Japanese GDP absorbed by the T?huko earthquake and tsunami of March 2011).

In many instances, the decision about whether or not to demolish a building has been driven by insurance considerations. As managed by EQC, the New Zealand natural hazard insurance system does not require building owners to mitigate risk. Hence, certain buildings that are either damaged or at risk of future damage are deemed too

costly to insure, or are simply uninsurable. It makes therefore economic sense to demolish them, aided by the fact that for many modern structures a new building is cheaper than a retrofitting programme, often by a factor of 2-3.

Christchurch was considered a ‘garden’ city with an agreeable mixture of green spaces, historic buildings (mostly in the neo-Gothic style) and modernist structures. This defined its *genius loci*. The historic buildings are listed and supposedly protected by the NZ Historic Places Trust, a national government body headquartered in Wellington. However, this agency has been repeatedly overridden by CERA, which has proved easily amenable to being persuaded by building owners that reconstruction is too costly, is economically unjustifiable, or is technically too demanding.

Although many important buildings are at risk of disappearing forever, no structures are as symbolic – or as severely at risk – as Christchurch’s Anglican and Catholic cathedrals. The Anglican cathedral occupies the most central location in the city. Geographically, it defines the centre of the CBD (and the corresponding interdiction zone). Built over the period 1864-1904, this landmark high neo-Gothic structure was designed by George Gilbert Scott and completed by his pupil Benjamin Mountfort, who unfortunately dispensed with some of Scott’s proto-anti-seismic provisions (e.g. the wooden frame). Scott, whose Midland Grand Hotel in London was recently voted Great Britain’s second most important building, was the doyen of Gothic revival architects. Many people in New Zealand and elsewhere are horrified at the Bishop’s executive decision to demolish this building, which could – indeed, *should* – be regarded as having world heritage status.

The Catholic cathedral, on a more peripheral site, was built over the period 1901-5 in a Neoclassical style designed by the architect Francis Petrie, whom George Bernard Shaw described as “New Zealand’s Brunelleschi”. In the Lyttleton earthquake, the towers of the west end collapsed. Subsequently, the dome and apse were demolished. It was estimated that reconstruction would cost two and a half times as much as demolition and complete rebuilding to a modern design. Again, demolition is under consideration.

Despite the two earthquakes, Canterbury Region and Christchurch city have remained economically buoyant in relative terms. New Zealand will weather the storm caused by these disasters. Clear, reasonable redevelopment objectives have been defined for 2014, 2022 and 2032. The aim is to have a people-friendly, harmonious, ‘green’, and sustainable city with many fewer tall buildings than previously and much greater resistance to earthquakes and liquefaction hazards. A temporary Anglican cathedral is about to be erected on one of the reconstruction sites. A retail park has already been constructed in the accessible part of the CBD using shipping containers engagingly adapted to house shops, banks, and cafés.

Despite these encouraging signs, a very large question mark hangs over the future of the *genius loci* of Christchurch. The Minister for Reconstruction in the New Zealand Government has categorically stated that only a handful of heritage buildings will be reconstructed. Proponents of the modernisation of Christchurch argue that a greener, more attractive and “user-friendly” city will emerge. They point to the case of the 1931 Hawkes Bay earthquake on North Island, in which the devastated town of Napier was reconstructed in a splendid Art Deco style that vastly increased its attractiveness. However, there are distinct differences between Napier, 1931, and Christchurch, 2012. Napier had very little genius loci, whereas Christchurch had an enormous sense of place. It remains to see how much of that can be recovered, or reinvented, in the reconstruction over the next ten years.

Once again, the key to the interpretation of what is going on in Christchurch is political (Johnston et al., 2012). Amongst a population made weary by the privations and inconveniences of seismic damage and disruption, heritage preservation has little constituency. Moreover, New Zealand culture places considerable emphasis on personal liberty and the right of property owners to dispose of their own assets as they see fit. Many buildings and sites in Christchurch are owned by offshore companies with significant political influence but little stake in the community. Through the insurance mechanism promoted and managed by EQC and the strong relationship between CERA and the Government in Wellington, local interests are in danger of being overridden.

The wealth of neo-Gothic architecture in Christchurch has made a major contribution to the definition of its *genius loci*. So has the lesser amount of Neoclassical architecture. That richness has already been severely diminished and it is at risk of largely disappearing, especially if the two cathedrals are demolished. I believe that in 20 years' time New Zealanders will come to regret some of the decisions that have been taken now, but they will not get their buildings back. They will regret the losses because there is no technical reason why many precious historic buildings need be demolished and the financial reasons are distorted by failure to take account of the value – monetary or otherwise – of specific historic environments. Recovery from earthquake disasters in Canterbury Region is being motivated by the New Zealanders' admirable pragmatism, but that is in contrast with the neglect of intangible values that one day will be seen to have been seriously underrated.

Synthesis and conclusions

The three events described above occurred in radically different geographical, economic, social, cultural and administrative settings. They also illustrate very different approaches to the thorny problems of recovering from the devastation and disruption caused by earthquakes. Perhaps Indonesia used its social capital better than the other two examples, although not without significant obstacles and problems. New Zealand showed the greatest economic buoyancy and adaptive pragmatism. Italy evinced the greatest departure from established practice, yet at the expense of social fragmentation and lack of adequate, democratic governance. All three examples had problems with this. In each case, although in different ways, the conclusion is that any explanation of how things proceed after disaster is difficult unless it takes full account of political realities. The most extreme case of this was L'Aquila, in which local institutions, established or emergent, were side-lined by a paternalistic government determined to refresh its image by presenting the national public with a highly selective set of public works.

In each case, decisions taken soon after the disaster need to be examined in the light of their probable repercussions after the passage of decades. Christchurch may regret the loss of its heritage buildings; Padang may or may not have learned to utilise social capital and respect building codes to good effect; L'Aquila may or may not have overcome the stagnation caused by its geographical and political marginalisation. Time will tell, but the longitudinal study of earthquakes now long past suggests that the situation after decades does not necessarily vindicate the decisions taken at an early stage in the light of the short-term view.

Afterword

One last comment concerns a strange parallel between Christchurch and San Francisco after the 1906 earthquake and fire. While the Californian clergy preached that the disaster was retribution for the city's sinfulness, the poet and wit Charles Kellogg Field produced this immortal piece of doggerel:

> "If, as some say, God spanked the town
> For being over frisky,
> Why did He burn the churches down
> And save Hotaling's Whisky?"*

(*A.P. Hotaling & Co.'s whisky distillery was one of the few surviving buildings in the eastern quarter of San Francisco)

In Christchurch the city's brothel, situated two blocks away from the Anglican cathedral, was spared major damage in the earthquakes. It had no windows top weaken its resistance and was designed by a highly competent local engineer. I forbear to make comparisons with L'Aquila and Padang.

Notes

(1) "Isolatori sismici, altre verifiche del pm." Il Centro L'Aquila April 18 2012.

http://ilcentro.gelocal.it/laquila/cronaca/2012/04/18/news/isolatori-sismici-altre-verifiche-del-pm-5776112 (accessed May 11 2012).

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