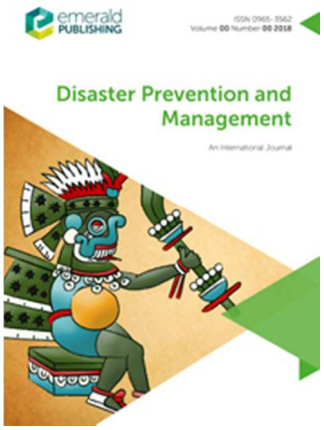

L'Aquila, Central Italy, and the 'Disaster Cycle', 2009-2017

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L'Aquila, Central Italy, and the 'Disaster Cycle', 2009-2017

Abstract

Purpose – This article offers a critical examination of the aftermath of the L'Aquila earthquake of 6th April 2009. It considers the elements of the recovery process that are unique or exceptional and endeavours to explain them.

Design/methodology/approach – The analysis is based on a survey and synthesis of the abundant literature on the disaster, coupled with observations from the author's many visits to L'Aquila and personal involvement in the debates on the questions raised during the aftermath.

Findings – Several aspects of the disaster are unique. These include the use of large, well appointed buildings as temporary accommodation and the efforts to use legal processes to obtain justice for alleged mismanagement of both the early emergency situation and faults in the recovery process.

Research limitations/implications – Politics, history, economics and geography have conspired to make the L'Aquila disaster and its aftermath a multi-layered event that poses considerable challenges of interpretation.

Practical implications – The L'Aquila case teaches first that moderate seismic events can entail a long and difficult process of recovery if the initial vulnerability is high. Secondly, for processes of recovery to be rational, they need to be safeguarded against the effects of political expediency and bureaucratic delay.

Social implications – Many survivors of the L'Aquila disaster have been hostages to fortune, victims as much of broader political and socio-economic forces than of the earthquake itself.

Originality/value – Although are now many published analyses of the L'Aquila disaster, as the better part of a decade has elapsed since the event, there is value in taking stock and making a critical assessment of developments. The context of this disaster is dynamic and extraordinarily sophisticated, and it provides the key to interpretation of developments that otherwise would probably seem illogical.

Keywords Earthquake disaster, L'Aquila (Italy), Disaster cycle, Recovery from disaster, Post-disaster reconstruction; Shelter after disaster; Legal implications of disaster

Paper type Research paper

Introduction

The magnitude 6.3 tremors that struck the city of L'Aquila (Figure 1) on 6 April 2009 killed 308 people, seriously injured 202 and left 67,500 homeless by damaging at least 30,000 dwellings (Alexander 2010). The disaster offers a good example of what a medium power earthquake can do in an area of high vulnerability. It also provides a useful case history to examine the processes of recovery in an area that is not economically vibrant or strategically of great importance.

Figure 1. L'Aquila and Abruzzo Region: location map.

L'Aquila (population 69,600[1]) is a historic city and university centre situated in a mountain basin about 100 km northeast of Rome. It is the administrative capital of Abruzzo, a predominantly rural region 10,763 sq. km in size. Hence, the principal functions of L'Aquila are in learning, public administration and the provision of services to a province and region that are largely composed of mountains. The coast-lands of Abruzzo are more economically vibrant, but are separated from L'Aquila by Gran Sasso, the highest mountain in peninsular Italy: they tend to derive their connections from coastal metropolises, not the internal hinterland.

This article will follow the progress of the L'Aquila earthquake disaster using as a frame of reference the 'disaster cycle': mitigation, preparedness, emergency intervention, recovery and reconstruction.

The origin of the ‘disaster cycle’ appears to lie in the theoretical work of Carr (1932) and his use of a ‘sequence-pattern concept’ to classify the phases of early 20th century disasters. The cycle is widely appreciated for its ability to put concepts and actions into a time sequence in relation to each other. Indeed, Drabek (1986) used the cycle as the basis for his well-known compendium of sociological findings about disaster. Neal (1997) re-evaluated the concept and provided both an academic and a practical critique. Not all disasters are cyclical, and not all phases occur strictly in sequence, he noted. Moreover, perception of the duration and strength of the phases could vary considerably among the participants. Finally, Richardson (2005) showed that in many disasters there are multiple interpretations of what the phases actually mean. Despite this, the disaster cycle model is still widely used, probably because it is a convenient and robust model, even though it clearly has limitations.

When earthquakes occur, the shaking is often over within one minute. However, this article will show how the disaster can extend over years or decades. The epochs before 2009 hold the key to the question of why the L'Aquila area manifests very high vulnerability to earthquakes. The case of L'Aquila underlines the centrality of time as the 'backbone of disaster' and once again highlights the need to study context and history, including current developing history, if one is to understand why moderate seismic shaking can lead to immoderate suffering.

Before the event: L'Aquila and the creation of vulnerability to earthquakes

There is a strong relationship between the strength of anti-seismic building codes and the cost of measures designed to ensure that buildings resist earthquakes (Stucchi et al. 2011). Consistently since 1915, the city and municipality of L'Aquila have been placed in the 'moderate seismicity' category, despite the fact that the core of the central Apennines is recognised to be highly seismic. Either this has represented the failure of probabilistic seismic hazard analysis to portray the situation accurately (Castaños and Lomnitz 2002) or, quite possibly, it betokens a deliberate move to reduce the costs of construction in L'Aquila city by imposing a lighter regime--and thus putting residents at risk of structural collapse in earthquakes. In either case, it represents legislative inertia with respect to scientific knowledge of hazard (Meletti and Stucchi 2009). The main building boom that led to the expansion of the urban area of L'Aquila occurred from the 1960s to the 1980s. Building codes were less stringent in this period than they are now, and especially so as building in L'Aquila was not subject to the highest category of restrictions.

One important question is the extent to which damage may have been offset by good preparedness for emergency response, at least in terms of saving lives and reducing injuries. Following the passing of a national law (no. 225 of 1992) which set up the Italian civil protection system, Abruzzo Regional Law no. 72 of 1993 obliged the region to produce an emergency plan and organise civil protection services. In this legal instrument there is no direct reference to the need for municipalities to have plans, and, indeed, a fully fledged emergency plan did not emerge in L'Aquila city until February 2015 (Comune dell'Aquila 2015). Although the Italian civil protection system is well developed (OECD 2010) it is very top-down and in the 2009

earthquake it had to compensate for the weakness of the local, provincial and regional systems.

Where planning is weak or absent, procedures are invoked. In L'Aquila the promptness of the nationally co-ordinated convergence reaction effectively saved the day during the early emergency. Medivac, or helicopter evacuation of the injured (mostly to hospitals in towns on the Adriatic coast, compensated for severe damage to the regional hospital in L'Aquila (Casarotti et al. 2009). Two field hospitals were set up, one in a record 23½ hours, but as with field hospitals in other disasters (Von Schreeb et al. 2008), they provided continuity of routine care rather than emergency medical surge capacity, as the surge had been dealt with once they were operational.

I now turn to the immediate and short-term post-impact phases and their consequences during the years after the earthquake

From Disaster Response to Early Resettlement

In the 2009 L'Aquila earthquake, more people died in the collapse of reinforced concrete buildings than died in stone masonry ones, including buildings that predated the 20th century (Alexander and Magni 2013). Many of the buildings that suffered total or partial collapse were condominia four to six storeys high constructed in the 1960s or early 1970s. The prevalence of poor quality concrete, smooth reinforcing bars and bad design of column-beam junctions was evident. As a result, these buildings tended to have weak frames. The combination of basal acceleration and inertia at the top of the structure meant that mid-floor failure, either in total or incipient form, was prevalent wherever such buildings were concentrated (Figure 2). A historical building stock is vulnerable to earthquake damage almost by

definition: that its vulnerability should be exceeded by that of a modern reinforced concrete building stock is exceptional.

Figure 2. An example of incipient mid-floor failure in L'Aquila city (photo: author).

One fundamental problem that was hardly tackled at all during the recovery phase was that of employment and livelihoods. During the year of the earthquake, some 16,000 jobs were lost in the Province of L'Aquila, many of them as a result of the disaster (Miraudo 2010). Women were affected more than men were. Little was done to restore activities. The commercial life of the city depended to a certain extent on the activities of small enterprises, such as the offices of dentists, tax consultants, architects and so on, as well as on small independently owned shops and restaurants. After the earthquake such activities were moribund because of the lack of accommodation. Much of the commerce of L'Aquila depended on large

enterprises, such as supermarkets and hypermarkets, located in the hinterland. L'Aquila is an economic backwater with very little industry and restricted commerce, but the post-earthquake situation was not used as an opportunity to relaunch its flagging economy. It has, however, slowly rebounded in terms of employment, although not in terms of rising incomes (Cellini et al. 2017).

The overwhelming emphasis in the recovery phase was on the provision of temporary housing, at the expense of supporting employment and livelihoods. An exception can possibly be made for the University of L'Aquila, the city's leading enterprise. The university was housed in a wide variety of ancient, old and modern buildings distributed across the city and its environs. Suspension of tuition fees and the ingenious use of temporary accommodation (from tents to warehouses) saved the institution from closure and ensured continuity of its activities. Magni et al. (2017) have listed and explained the measures taken by the university to restore its activities after the earthquake. In addition, academics from the university have carried out much research on the situation in L'Aquila, in fields ranging from geology and seismology to psychology and public health (e.g. Cofini et al. 2015). Similar measures have been applied to ensure the survival and health of the school system.

Emergency response: the trial of the 'L'Aquila seven' - a retrospection

Italian Law 225 of 1992, which established the national civil protection system, also created the *Commissione Nazionale per la Previsione e la Prevenzione dei Grandi Rischi* (National Commission for the Prediction and Prevention of Major Risks). The Commission was intended to link the scientific community to the Department of Civil Protection. Its role was to provide advice and guidance on scientific matters.

In late March 2009, Giampaolo Giuliani, an amateur earthquake scientist, observed large increases in radon emissions in the L'Aquila area. He informed the authorities that a major earthquake was possible, perhaps in the vicinity of Sulmona, 50 km southeast of L'Aquila, in the last week of March 2009. The information was leaked to the public and caused widespread disquiet. As a result of the unrest, and of a magnitude 4 tremor that occurred on 30 March, the Major Risks Commission was convened in L'Aquila on 31 March. At this meeting it was stated categorically that there was no reason to become alarmed at the progress of the prevailing earthquake swarm, as seismic energy was being released in small increments. A major tremor was not possible. Six days later, the devastating earthquake occurred (Giuliani 2009).

On 2 June 2010 seven members of the national Major Risks Commission were indicted for multiple manslaughter on the basis of statements made and disseminated to the Abruzzan public. The trial lasted three months and led, in October 2012, to the condemnation of all seven defendants, but three years later they were, with one exception, exonerated at the second stage of appeal.

The case for the prosecution was prepared meticulously (Billi 2017), but it inevitably had weaknesses. The greatest of these was the need to prove that the statements made by the Commission led directly to the death of local citizens. Close relatives of 29 people who died in the earthquake constituted the plaintiffs and the circumstances of the deaths of their family members were very carefully investigated. The Commission had an advisory role, but its advice carried enough weight to form the basis of policy. Categorical statements about the absence of a main shock could be regarded as somewhat reckless in the light of local precedents: the earthquake

swarm of 1703 included a main shock that killed 6,000 people in L'Aquila and surrounding towns. Although only three of 23 historical seismic sequences in the area involved a damaging or devastating main shock, such an event could not be ruled out (Amato and Ciaccio 2011).

Much has been written and published about the L'Aquila trial (e.g. Scolobig et al. 2014, Alemanno and Lauta 2014), including books by the amateur earthquake scientist (Giuliani 2009), the leading magistrate for the prosecution, avv. Marco Billi (Billi 2017) and his scientific adviser, Dr Antonello Ciccozzi, an anthropologist from the University of L'Aquila (Ciccozzi 2013). The L'Aquila trial, notorious as it was, became one of the most talked about events in science for decades. In the welter of claim and counter claim, the first casualty was probably the truth of the matter. Many misconceptions appeared, in some instances because the writers had a cause to further (Boschi 2014, Stucchi 2014) and in others because of a failure to understand the context in which the trial occurred (Yeo 2014).

The L'Aquila trial was a bold attempt to create accountability out of a vacuum. It was also a manifestation of the independence of the judiciary, which at the time was greatly under attack by Prime Minister Berlusconi, whose personal affairs were the subject of much legal activity (Alexander 2014, Dallara 2015). The success or failure of the trial was probably secondary to its symbolic value in endeavouring to demonstrate to the Italian establishment that it could not operate with impunity in conditions of questionable legality. In this respect, the trial should probably not be analysed without bearing in mind some of the other legal initiatives connected with civil protection (Alexander 2013, p. 66), and the prevailing level of public indignation

over scandals associated with the misappropriation of funds (Sargiacomo et al. 2015).

The National Major Risks Commission continued to operate during and after the trial, although initially the Italian Government had to use legal powers of coercion to induce anyone to be part of it. In 2012 it gave advice during an earthquake swarm in the Pollino, an area of the southern Apennines, and in August 2017 it was active during a volcanically induced earthquake on the Neapolitan island of Ischia. It also met repeatedly during the train of seismic events that occurred in the central Apennines from August 2016 to January 2017 (DPC 2017). In all such cases the Commission has behaved impeccably, with prudence and due regard for the facts, which demonstrates that this could have been the case in March 2009.

The trial, and the intense debate that surrounded it, formed a constant backdrop to events at L'Aquila after the 2009 earthquake. There were other developments that were also very unusual, compared to recovery from previous disasters in Italy and elsewhere, as the following section shows.

Recovery: CASE - the permanence of the temporary

One element that makes the L'Aquila earthquake quite unique is the programme to rehouse 14,462 homeless Aquilani in the *Complessi Antisismici Sostenibili ed Ecocompatibili* (*CASE* - Calandra 2012). These involved 19 new settlements that varied in size from a handful of dwellings to housing for 2,500 people. Only one of these so-called 'new towns' was located in L'Aquila itself, while the others were constructed on farmland and conservation land within a 17km radius of the city. Hence, the accessibility of the settlements varied substantially. The CASE buildings

are three storeys high and each one is built upon an 18 by 54-metre concrete raft half a metre thick, located on 40 steel columns topped with ball-and-cushion ('pendulum') seismic base isolators. Hence, the superstructure, of steel frame and wood infill, is not designed to be anti-seismic, given that it should be isolated from severe displacement by the arrangements beneath the base plate (Marioni 2009).

The 185 buildings that comprised the CASE project were built to seven pre-prepared designs and collectively house 4,600 small apartments. According to Italian Government data, the average cost per apartment was €280,607, of which about one third pertained to the structure while the remaining two thirds covered the urbanisation and logistics (Calvi and Spazianti 2009). Some 43 per cent of the funding came from European Union structural funds, and a report by the European Court of Auditors in Strasbourg was severely critical of the way that the money was used, although it failed to uncover evidence of fraud (European Court of Auditors 2012).

Fraud was nevertheless identified. Alga SpA of Milan furnished 4,896 isolators (two thirds of the total) to 14 of the 19 CASE sites. Approximately 200 isolators were judged to be defective, owing to the substitution of an inferior polyethylene coating called 'Hotslide', which was also missing legally required certification. Moreover, the required protection of the seismic cushions against dust and humidity was lacking. Testing at laboratories in Alessandria and Turin in Italy and San Diego in the USA confirmed that the performance of isolators coated with Hotslide was unacceptable. This led to the prosecution of two public officials responsible for the CASE project and the managing director of Alga (which went into receivership in 2013). After the initial success of the prosecution, in 2016 one official was cleared of responsibility and the other two defendants were later absolved by statute of limitations. The outcome of

this unfortunate episode is that the seismic performance of the CASE buildings cannot be guaranteed and the occupants are therefore threatened by possible structural collapse.

In retrospect, the CASE project was a grandiose failure, and destined to be so right from its conception. Excessively expensive, the 19 extensive housing complexes had no planned long-term future, nor were they built to last. They were isolated and deprived of services, and, as a result, psychological problems abounded among their inhabitants (Cofini et al. 2015). Clearly, accommodation had to be found for tens of thousands of homeless survivors, but how? A parallel project denominated MAP (*Moduli Abitativi Provvisori* - "temporary living modules") furnished accommodation for 7,500 residents and embodied the evolution of the Italian conception of post-disaster shelter (Félix et al. 2015). Smaller dwellings could be built in enclaves as well as major urbanised parks and hence the deployment of the MAP units was more flexible.

Reconstruction: delays upon delays

Besides the issue of temporary shelter, the process of reconstructing L'Aquila and its satellite towns was characterised by inertia and delay. Some of the tardiness can be explained by the fact that L'Aquila is an economic backwater and thus of little strategic importance to the national economy. Moreover, other earthquakes supervened, notably in Emilia-Romagna in 2012, and distracted the national consciousness. Constraints upon the exchequer associated with the banking crisis and national debt took the impetus away from reconstruction, and the slowness of legislative and bureaucratic measures probably accounted for the rest of the delay.

Year after year the centre of the historic city remained an interdicted zone, initially presided over by soldiers and paramilitary forestry police, and later enclosed by locked gates. As weeds grew on the rubble and abandoned buildings, so it emerged that there were three main problems with the process of reconstruction. The first was one of bureaucratic delay, occasioned in part by the reluctance of central government to fund the recovery process. It seemed that the available momentum was expended on the temporary settlements, rather than what was to follow them. A tour of the city and surrounding towns and villages eight years after the disaster confirms this sensation, as there is a marked absence of life and vitality. In part this reflected a desire to avoid the involvement of organised crime in the process. As has been widely noted, concrete is the basis of criminal syndicates (Savona 2010). The construction industry is often the first to be infiltrated and co-opted and the most susceptible to corrupt influences.

Government in Italy is routinely beset by economic problems and is usually in a fiscal straitjacket. This alone furnishes a good excuse for slowing down expenditure on earthquake aftermaths, of which there have been many. An allied reason is the sheer complexity of the process of bringing a wide zone of interconnected urban areas back to functionality and health.

Reconstruction: the source of complexity

There remains a problem about what would be the best way to reconstruct a complex urban environment characterised by a mixture of modern, old and ancient buildings, multiple ownership, a variety of different functions and uses, and heretogeneous states of damage and maintenance. The solution employed in L'Aquila does involve

comprehensive planning, but has led to a piecemeal result, which was described by Contreras et al. (2014) as 'deflated' but not 'stagnated'.

A tour of central L'Aquila seven years after the earthquake showed healthy signs of reconstruction activity, but it also revealed how moribund the city had become. The same was true of the satellite towns such as San Gregorio, Villa Sant'Angelo and Poggio Picenze. A typical street would contain a mixture of reconstructed and reoccupied buildings, reconstructed buildings that had not yet been reoccupied, buildings under repair, buildings that had been shored up, and possibly covered with scaffolding, for which there was no sign of activity, buildings left in a state of ruin, and plots that had been cleared of the rubble of collapsed buildings (Figure 3). In order to restrict access to construction sites, the street would be partly cordoned off by fencing. However, in many cases it was difficult to tell on which side of the fence the interdiction zone lay.

Figure 3. A street in L'Aquila city, October 2016 (photo: author).

A related problem was the quality of the infrastructure. L'Aquila is served by a cross-Apennine motorway that was built robustly enough to survive the earthquake fairly well and remain operational. It has a minor branch railway line that follows the Aterno River valley and has a station at the bottom of the hill outside the limits of the city proper. The main road along the valley proved to be a hindrance to the movement of people and goods and was not upgraded for some years after the earthquake. Shortly before the earthquake, attempts to give the city a light railway metro system failed on technical grounds and were abandoned (Baglioni 2016). Moreover, the regional hospital was severely damaged and was taken out of service immediately

after the earthquake and only reoccupied on a piecemeal basis months later as it was gradually rehabilitated.

The reconstruction process in L'Aquila was not a very participatory one (Özerdem and Rufini 2012). Indeed, it was largely dictated by the various levels of government, starting with the national one which provided the basic funding. An alternative approach might have been to compartmentalise the process by concentrating resources on strategically chosen areas and restoring them to integral functionality. This could have been done in a capillary manner such that the process spread out from the first neighbourhoods to be dealt with and thus progressively enlarged the area that was operational. It could also have been done with more citizen participation and hence a greater accession of local democracy. Above all, it would have stimulated the economy of the city and breathed life into areas that remained moribund for years.

On the eighth anniversary of the L'Aquila earthquake, reconstruction was underway or completed to the extent of 54 per cent of the funds requested for the centre of the city and 84 per cent those requested for the area around it, with a completion date set for 2020 (Santilli 2017). USRA, the Government's Special Office for the Reconstruction of L'Aquila, had authorised nearly 70 per cent of the expenditure to subsidise private reconstruction, amounting to nearly 25,000 projects out of 29,500 presented (see www.usra.it). The target date for completing reconstruction of L'Aquila's 24 satellite villages was set for 2022, 13 years after the earthquake, although the state of Paganica, the largest of these settlements, did not bode well for achieving this goal, as only 16 buildings were under reconstruction. For the other 53 municipalities damaged by the 2009 earthquake, the target date for

completing reconstruction was 2025, but in 2017 only 40 per cent of the necessary funds had been committed (Santilli 2017).

Besides the issues of how recovery should occur and is taking place in L'Aquila, it is important to consider the impact of this disaster on others that have occurred since, especially as they have taken place in areas only 50-100 km from L'Aquila.

Mitigation: after the earthquake, what changed and what did not?

Seven years and five months after the L'Aquila earthquake, a series of tremors began in the area between Amatrice and Norcia, 50-80 km NNW of the Abruzzan capital. Over almost five months there were nine earthquakes with moment magnitudes in the range 5.1-6.5. These events were enormously damaging, in part because the frequencies of shaking that characterised some of the tremors were those most likely to damage vernacular housing. One is motivated to ask what had changed between the L'Aquila tremors and those that occurred seven years later. Were any lessons learned?

Some aspects remained the same. In both cases the convergence reaction put more emergency responders on the ground than there were members of the population. In 2009 the city of L'Aquila nominally had 72,700 inhabitants (see end-note 1), but the area received 94,000 rescuers. The area affected by the 24 August 2016 earthquake had a resident population of about 4,000 people and 7,500 emergency responders converged upon it.

In some of the municipalities of the central Apennines local government had been transferred to new, prefabricated buildings that were designed to be strategic

command centres and administrative hubs in the event that more formal and imposing buildings were put out of action by seismic activity. Il L'Aquila in 2009 many of the buildings that housed the regional and local administration were put out of action by damage (Bazzurro et al. 2009, Fig. 15). For the mountain communities it was vital to have at least one strategic building that, because of its location and construction type. would definitely survive a disaster. At Amatrice this proved to be invaluable.

In Italy, the effect of disasters is often cumulative rather than merely single (Alexander 2002). It may well be that multiple events are as effective as individual major disasters at provoking the adoption of safety measures because they create the sensation that impacts are a persistent problem.

One reaction to this trail of damage and destruction was to bring up for discussion the question of earthquake insurance (Insurance Europe 2018). This was first discussed in the wake of the L'Aquila earthquake during the government of Mario Monti (2011-2013). It proved to be a thorny issue, although it did stimulate the insurance industry to offer coverage. For example, comprehensive insurance against earthquake damage (including payment for alternative accommodation for a certain period of time in the event that the property becomes uninhabitable) on a family home 160 sq. metres in size in an area of moderate seismicity would involve a premium of over €1,250 ($1,500) a year, a sum that fewer than 1 per cent of Italian homeowners in such circumstances are willing to spend. Some analysts have suggested that the true economic cost of a self-sustaining earthquake insurance programme would involve premiums more than three times higher than that. Moreover, floods, storms, landslides and subsidence are equally widespread hazards and would add to the costs.

The most insuperable problem remains the high vulnerability of building stock in the hazard zones of Italy (Alexander 2018). In Italy, much of the urban fabric has several owners who live in condominium with each other. Repair or rebuilding requires agreement between all owners of the structure. Moreover, the ability to repair a structure may also be critically dependent on the state of play regarding surrounding buildings, as historic urban environments, in particular, tend to be composed of highly interconnected properties (Alexander 1989). In the wake of the 2016-7 earthquakes, the Italian Government recognised that funding only the repair of primary homes would leave the urban fabrics of the damaged towns in a precarious state, especially as in the mountains many property owners actually live elsewhere, for example in Rome. Hence, the decision was made that for the purposes of reconstruction funding all residential properties would be treated equally in the main affected towns.

The dilemma of earthquake insurance highlights a problem that is common to every country that has a high toll of natural hazards and a government that is wealthy enough to help citizens in the aftermath. Subsidies from the public purse for repairing damage could be construed as fostering moral hazard (Doherty and Smetters 2005) or potentially discouraging citizens for assuming responsibility for reducing their own vulnerability. The government is the "insurer of last resort". In these times of neoliberal individualism, this goes against the grain, as austerity measures bite into social welfare and reduce the rate of redistribution of wealth from the rich to the poor. However, in many cases the survivors of earthquakes, storms or floods are important constituencies of voters. So it has been in Italy for the last half a century.

The issues covered in this article demonstrate that the L'Aquila earthquake and its aftermath have many different facets and that each of them is redolent with the

complexity that is so often the hallmark of Italian disasters. The final section will bring out some of the regularities, lessons and conclusions from this very heterogeneous admixture.

Discussion and conclusions

I will now summarise the main conclusions to be abstracted from the L'Aquila earthquake disaster in terms of the phases of the 'disaster cycle'.

Mitigation. A relatively modest seismic event caused a very large amount of damage. Casualties could have been much higher, but the earthquake occurred at the end of a vacation 'long weekend' when many citizens and students were absent. The provision of stringent building codes post-dated the building boom in L'Aquila city. Therefore, the highest death toll occurred in the collapse of multiple-occupancy apartment blocks that were built in the 1960s and 1970s, when the codes were inadequate both in specification and enforcement.

Preparedness. Poor planning for emergency management and response was compensated for by the strongly 'top-down' nature of the Italian civil protection system. It functioned quite well, and the emergency response was thorough to the point of being overwhelming. However, local, provincial and regional competencies were widely delegated to outside forces from the national headquarters and other regions. To some extent, this was inevitable, given the magnitude of the agent-generated demands (Dynes 1993), but it does imply excessive weakness in local response capabilities.

Emergency response. Through poor preparedness and the failure of local systems (notably the regional hospital), the bulk of the immediate response came from the

convergence reaction. If the earthquake had been stronger (for example, as strong as the 1915 Avezzano seismic disaster, which killed 32,500 in Abruzzo Region), the weakness of local emergency provisions would have been decisive as a negative factor.

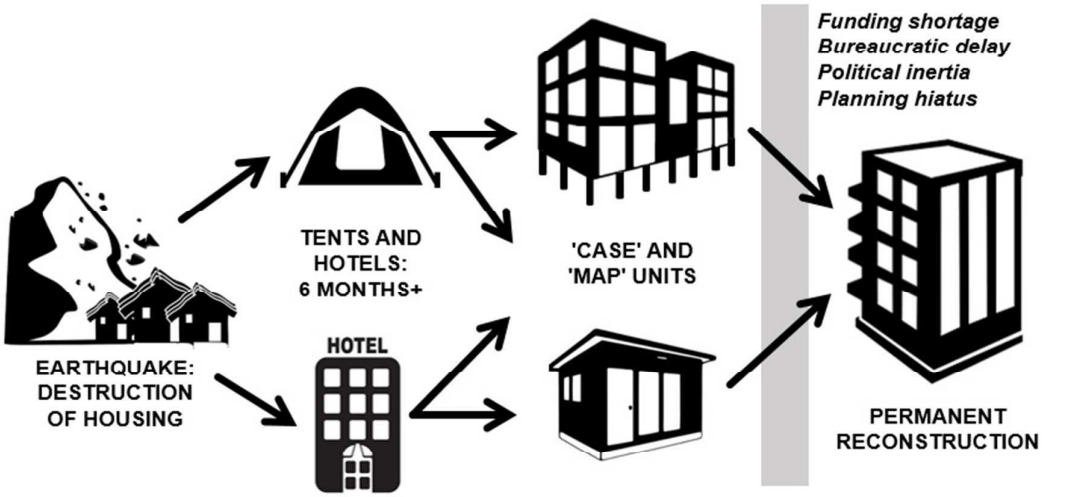
Recovery. The CASE project represented a vast social, political and architectural experiment, conducted at enormous cost. It was undermined by corruption and poor decision making. This led to the isolation of residents from social interaction and essential services, which did not help the recovery process. The trial of members of the National Major Risks Commission was one of the most controversial events in the history of modern science. Getting to the bottom of its many layers of meaning is an arduous challenge and will, I fear, long remain an unfinished task (Marincioni et al. 2012). In this process, the plaintiffs in the case, the survivors of the earthquake, have received the least consideration of all.

Reconstruction. Bureaucratic complexities, austerity and the lack of economic importance of L'Aquila, a small provincial city in a distant mountain basin, led to stagnation. It was followed, slowly, by a heterogeneous reconstruction that lacked direction and connectedness (Contreras et al. 2014, 2018). The emphasis has been on physical reconstruction more than on the restoration of functionality.

The aftermath of the L'Aquila earthquake should be viewed in the light of the constant evolution in Italian policy on managing and responding to national emergencies. However, several aspects of this disaster are exceptional by Italian and international standards. They are the elements that make the L'Aquila case unique.

The first unique element of the L'Aquila earthquake aftermath was the experiment with deployment of the 'CASE' and 'MAP' temporary housing. On the

positive side, they provided mass accommodation in record time. Moreover, they kept people in the area and thus helped stem out-migration. On the negative side, they were built on prime rural land, initially without full services, including waste water treatment. Furthermore, they were excessively expensive, especially for temporary accommodation. As a result, most of the impetus went into housing and very little supported the generation and maintenance of livelihoods or the stimulation of the local economy. Hence, it could be argued that lavish provision of temporary accommodation took the momentum out of permanent recovery (Figure 4). Moreover, the eventual adaptation of the highly urbanised CASE and MAP sites for other uses is unclear. In conclusion, this situation prompts one to ask what balance should be struck between temporary and permanent accommodation? The CASE project created an anomalous "permanence of the temporary" situation. It sent a message that reconstruction, and modernisation, would be a long time in coming.



CASE: *Complessi antisismici sostenibili ed ecocompatibili* ("antiseismic, sustainable and ecocompatible units")
MAP: *Moduli abitativi provvisori* ("temporary living modules" - i.e., prefabs)

Figure 4: The shelter sequence after the L'Aquila earthquake, and its impediments.

The second unique element of the L'Aquila disaster lies in the nature of the legal proceedings that followed it. The trial of the members of the National Major Risks Commission was probably more of a symbolic act than a serious attempt to impeach authority. It was, after all, very difficult to demonstrate that the actions of the National Major Risks Committee had actually led, however indirectly, to the deaths of the relatives of the plaintiffs. Rather than succeeding in holding functionaries to account, it managed to define the limits of malpractice. It sent the message that the abuse of power would not be practised with impunity. In many parts of the world, scientists, administrators and legal experts debated the trial, but a full understanding of the initiative and its consequences could only be achieved by knowing and being able to interpret the very sophisticated context in which it took place. The L'Aquila trials reached conclusion, but they left behind unfinished business, as bereaved families have been deprived of support and closure.

In conclusion, the aftermath of the L'Aquila earthquake teaches us that the political context of disasters can overwhelm and distort any rational scientific agenda. In reconstruction, 'functionality' is an essential goal, but it is both the prisoner of history and the hostage of political expediency.

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[1] According to ISTAT (www.istat.it), the Italian national statistical agency, the registered, resident population of L’Aquila city was 72,696 on 31 December 2009 and 69.605 on 31 December 2016. It suffered a 9 per cent drop in the first two years after the earthquake, followed by a gradual and partial, but fluctuating, recovery.

Figure 1. L'Aquila and Abruzzo Region: location map.

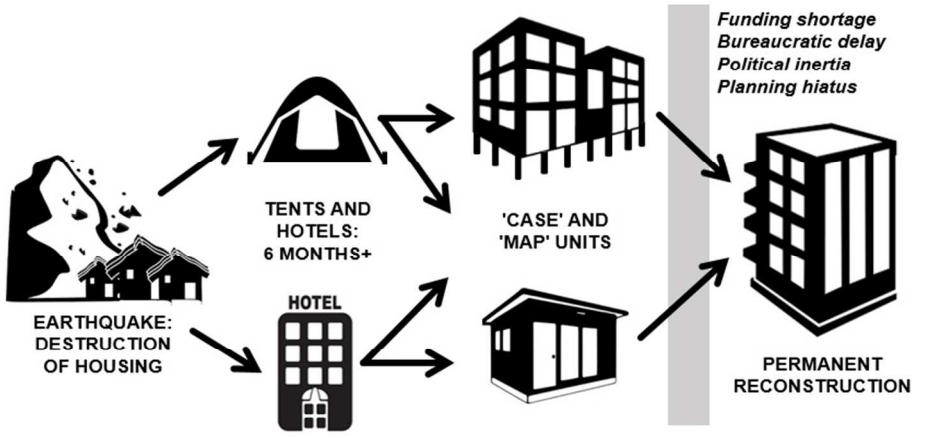
84x81mm (150 x 150 DPI)

Figure 2. An example of incipient mid-floor failure in L'Aquila city (photo: author).

207x155mm (150 x 150 DPI)

Figure 3. A street in L'Aquila city, October 2016 (photo: author).

682x914mm (72 x 72 DPI)



CASE: *Complessi antisismici sostenibili ed ecocompatibili* ("antiseismic, sustainable and ecocompatible units")
MAP: *Moduli abitativi provvisori* ("temporary living modules" - i.e., prefabs)

Figure 4: The shelter sequence after the L'Aquila earthquake, and its impediments.

242x135mm (96 x 96 DPI)