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Speed or deliberation – a comparison of post-disaster recovery in Japan, Turkey and Chile

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This paper compares recovery after three recent earthquakes – one fast, one slow and one just right. A key challenge in post-disaster recovery planning is balancing speed and deliberation. Recovering from a disaster involves many kinds of development and planning activities – land use plans, building norms and transport plans. What is unique in post-disaster situations is that these activities happen in a compressed period of time. Communities must rebuild as quickly as possible to maintain existing social networks and get the economy back on its feet. But they must also be deliberate in trying to maximise the opportunities disasters provide for improvement (Olshansky and Johnson, 2010).

Three earthquakes bring this dilemma of balancing speed with deliberation into stark relief – the Great East Japan Earthquake (2011), the Van earthquake in Eastern Turkey (2011) and the Maule earthquake in Chile (2010). The authors visited all three places about a year after the event and interviewed earthquake specialists, disaster managers, urban planners and local authorities.

In Japan after the Tōhoku earthquake and tsunami the government adopted a deliberate approach to recovery and reconstruction. In contrast, in Turkey after the Van earthquake speed was of the essence.

These two patterns of recovery are compared with recovery in Chile after the Maule earthquake and tsunami of 2010 where there was a more effective balance of speed and deliberation. But the really distinctive thing about recovery in Chile was the quality of the participation process that involved communities in decision-making and kept people informed about progress.

Keywords: earthquake, tsunami, resilience, recovery, urban planning

Introduction

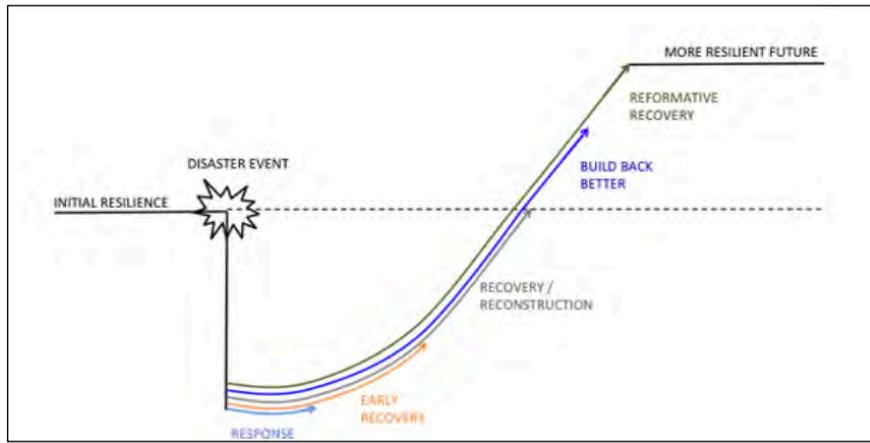
Alexander (2013) suggests that post-disaster planning has three main aims: the timely restoration of normal activities and living conditions, protecting the community against the future impact of hazards, and the formulation and achievement of common objectives between the parties involved. But following disasters, governments often clamour to reduce risk quickly, rebuild communities and restore permanence (Comfort, 2005). This urgent pressure to address complex, difficult decisions can result in reactive policies that may increase long-term vulnerability of affected populations (Ingram et al., 2006). Professor Robert Olshansky (2006) has drawn our attention to the issue of balancing speed and deliberation and the importance of planning in disaster recovery. Post-disaster recovery inevitably involves tension between speed and deliberation. Speed is important in order to keep businesses alive, rebuild infrastructure, and provide temporary and permanent housing for disaster victims but there is also a 'window of opportunity' to introduce change.

In Sri Lanka, after the 2004 Indian Ocean tsunami, Ingram et al. (2006) found that a hastily designed coastal buffer zone policy resulted in massive relocation of the affected population and in social, economic and environmental problems that threaten the well-being of these coastal communities. A similar point was made by Lloyd-Jones (2007) commenting on post-tsunami recovery in Tamil Nadu, Southern India. Families who traditionally depended on fishing were opposed to being relocated to new villages set back some distance from the coast and some of the newly-reconstructed houses remained unoccupied because they failed to meet basic needs and cultural practices, or because they just happened to be in the wrong place. There were similar issues in Thailand (Brown, Platt and Bevington, 2010). In Ban Nam Khem, people whose livelihood depended on fishing had been moved inland to unpopular government and NGO-sponsored housing developments. Some families were, however, returning to the old centre and rebuilding. The urge to resettle people away from the coast has created tensions between immediate concerns of another tsunami, a relatively rare event for the Indian Ocean, and long-term well being, threatening coastal livelihoods and exposing people to other more persistent hazards, such as flooding.

Building back better

Disasters leave huge scars in people's lives, the economy and infrastructure. Yet despite the damage, there are opportunities to do some good – to 'build back better' (Gunewadena and Schuller, 2008). Reconstruction following an earthquake is a complex process involving political, economic and social issues as well as geotechnical considerations. But it is also an opportunity to change how things are done. All thriving cities constantly face decisions about change, but what characterises post-disaster planning is the urgency and seriousness of the situation (Olshansky and Johnson, 2010).

Figure 1 Idealised recovery curve (Lallemant, 2013)



Recovery following a disaster typically follows an S-shaped curve (Lallemant, 2013). The population of an area may drop gradually and then either recover or not, depending on the relative attractiveness of the place (Me-Bara and Valdez, 2004). Disasters can be observed in the archaeological record and recovery may last for decades. Kates and Pijawka (1977) presented estimates of the time required for full population recovery after a disaster hit an urban area in ancient times. (See Table 1) They gave estimates of the original (pre-event) population of each location and the percentage of the population that was lost in the event (through fatality and outward migration). Recovery time is defined as the time it took for the population to reach the pre-event size. The recovery times for these historic events correlates closely with the proportion of the population killed in the disaster. Nowadays, with infinitely better communication and transport, the time taken for the population to recovery to the pre-event number in contemporary major disasters is in most cases shorter and the figure that is often quoted is 20 years.

Table 1 Historic earthquakes and recovery time (Kates and Pijawka, 1977)

Date	Location	Population	Fatalities %	Years Recovery
1746	Lima, Peru	37,000	20%	40
1755	Lisbon, Portugal	213,000	5%	6
1773	Guatemala City	34,000	33%	50
1775	Kashan, Iran	40,000	75%	85
1822	Aleppo, Syria	150,000	67%	56

But population size does not tell the whole story. In the case of Bam, Iran, the population at the time of the earthquake on 26 December 2003 was about 80,000. In January 2014, when we visited Bam, it was 120,000 but most of the houses were unfinished and the rusting steel frames of the new houses stuck up like rotten teeth.

Opportunities exist in the aftermath of earthquake disaster to enhance earthquake hazard mitigation. Public awareness of the hazard is high, and the earthquake problem is of high priority on political agendas (Scholl, 1986). But experience has shown that current hazard response and mitigation practices often sustain communities as they are, and merely perpetuate the disaster-damage cycle rather than addressing the root causes of the problems (Graham, 1999). There is a natural tendency of victims to want to restore their lives and community to normal as quickly as possible (Scholl, 1986). This puts pressure on the authorities and inhibits mitigation strategies and long-term planning. Nevertheless, most communities do become safer and less vulnerable to earthquake hazard as a result of post-disaster reconstruction (Rubin et al., 1985; Haas et al., 1977).

The 'window of opportunity'

If official agencies do not act quickly, many victims will begin to rebuild where and how they choose. Although speed is necessary, it is also vital to take the time to plan the post-disaster reconstruction. Planning can create opportunities to improve land use and infrastructure, enhance safety, promote good design, involve citizens in decision-making, and seek cost-effective solutions. But if planning takes too long, it will be ineffective. Alexander (2013) cautions that reconstruction that occurs very rapidly should be treated with suspicion, for it implies that there has been a failure to consult adequately with interested parties. But time is not limitless. The worst cases, he suggests, are either those in which planners ride roughshod over local interests or those in which conflict of interest leads to stalemate.

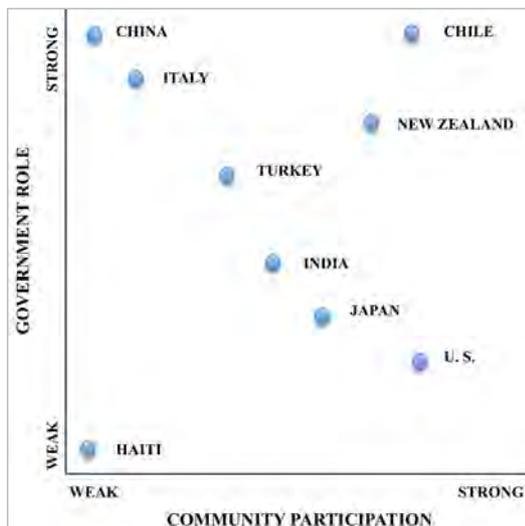
Reactive policies are understandable in the context of the urgent policy needs in post-disaster situations (Ingram, 2006). Relief has to be urgent and rapid and short-term recovery efforts must aim to minimise the time needed to rehouse people safely and re-establish livelihoods. During this 'transitional' phase it is critical that communities are informed about longer-term plans in order to reduce anxiety and frustration. Long-term recovery policies need comprehensive, site-based assessments of risk and vulnerability and effective consultation with stakeholders. Long-term multi-sector strategic planning can facilitate the sustainable management of resources, provide livelihood support, strengthen infrastructure, improve urban planning and design, extend insurance and enhance disaster preparedness at the national, regional and community level.

Mary Comerio (2013) analysed housing recovery in Chile after the Maule earthquake of 2010. The disaster affected 75% of the population of Chile, damaging or destroying 370,000 housing units (about 10% of the housing in 6 regions). Yet within six months, the Ministry of Housing and Urban Development had published a plan to repair or rebuild, with government assistance, 220,000 units of low and middle income housing within four years. In October 2012, at the midpoint of the program, 54% were complete and occupied and a further 30% were under construction. Several factors contributed to the program's success: strong leadership at the national and local levels; the use of existing programs and

institutions; flexibility to adapt programs over time; a strong technical staff; a robust economy; and political will. She concluded that in future, countries can learn from the experience of others and attempt to find the ‘sweet spot’ that provides the best of government management for expediency and flexibility and incorporates opportunities for citizens to take some control over their own recovery, with housing choice and participation in plans for the community’s future. In this, she says, Chile’s performance stands out.

Comerio (2013) uses two key factors, government involvement and community participation, to classify housing recovery in various countries that have experienced recent disasters (Figure 2). Whilst the placement of each country is based on the author’s judgment, the aim is to represent the variety of approaches used. For example, Comerio suggests that Chile and New Zealand combined both top-down and bottom-up approaches, providing government leadership and funding along with community empowerment in decision-making. In contrast, China and Italy took strong government leadership roles in providing replacement housing but did not engage local communities in most aspects of the decision-making. By comparison, Haiti’s weak government and high levels of poverty limited recovery from both perspectives. The authors visited seven of the nine countries in Comerio’s graph (plus three others: Pakistan, Thailand and Iran) and interviewed people involved in planning recovery and found Comerio’s assessment to be broadly correct.

Figure 2. Comparison of recovery approaches (Comerio, 2013)



The window of opportunity for accomplishing post-disaster improvements is short, lasting at most 18-36 months following a disaster. Although there is little research on this topic, Comerio (1998) suggests that basic functions should be restored within two years to ensure a successful recovery. This window varies from one event to another and Van and Tōhoku represent extremes. In Turkey, the window was extremely limited both in terms of duration and extent. Post-disaster

planning by AFAD (Prime Ministry Disaster & Emergency Management Presidency, Turkey) and the various government ministries followed strict protocols with well-defined criteria, a small number of decision-makers and little stakeholder or community involvement. The window of opportunity to do things better may have lasted at most six months.

In Japan, in contrast, there was a massive concerted effort by many sections of society to come to terms with the issues and devise safer solutions. Despite efforts of the national government to speed the process by providing resources and imposing deadlines, the effect has been to delay reconstruction. The window of opportunity is still open three years after the event. In Chile, after the 2010 Maule earthquake, the window lasted about eighteen months – the period that architects seconded from the University of Bio Bio by the regional government worked on master plans for coastal communities affected by the disaster and the time it took for transport planners in the Ministry of Transport in Santiago to devise a new master plan for Concepción, the capital of the Bio Bio Region (Platt, 2012).

Japan

The Great East Japan Earthquake, a Mw9.0 earthquake off the coast of Tōhoku in north-east Japan on 11 March 2011 is the most expensive natural disaster recorded in the world to date. The unprecedented tsunami toppled sea defences, inundating more than 500 km² of land along this coastline. There were 18,500 fatalities, 400,000 dwellings destroyed plus 773,000 damaged, and severely damaged critical infrastructure and buildings. The impact was different on the coastal plain where there was little resistance to the wave and consequently large horizontal inundation and insignificant vertical inundation. In contrast the Rias coast suffered a high vertical runup due to the amplifying effect of topography, but limited horizontal inundation.

Two years after the event, when the authors visited the area, the recovery process was still in its initial stages. Debris had been cleared, reconstruction work had started on a third of destroyed embankments, and Japan was dealing with a difficult temporary housing situation. Construction of new-permanent housing had taken longer than originally planned, but had allowed for longer a consultation process (Pomonis et al., 2013).

Lessons were learnt after Kobe (Edgington, 2010). The temporary housing the authors saw is of high quality. The containers are 25-30m² and have two rooms plus a kitchenette and bathroom. Some families have added porches and have planted flowers and painted murals. The first temporary housing units were nearing completion after four to eight weeks. Within eight months of the disaster, 75% of the 450,000 people who had sought refuge in evacuation centres had been able to move to alternative accommodation (IRP, 2012). The key issue is how long people will have to remain in temporary shelter. Twelve months after the earthquake 330,000 people were still in temporary accommodation and 500 remained in evacuation centres (BBC, 2012). We interviewed people living in Kasai Temporary Housing in Ishinamaki. The air-conditioned containers

measuring 30m² were of high quality, with two rooms, kitchenette and tiny bathroom. But they are cramped and people have to live in them four years or more.

One of the issues was the amount of debris covering urban areas and the huge scale of the clear up. Another was the extent and complexity of land use changes. In Japan the planning process is complex and relatively slow. Japan has a centralised political structure in which the national government maintains close oversight over the prefectures, cities, and other local governments (Sorensen, 2004). Following the disaster, the central government tried to speed up the process by providing guidelines, finance, human resources and know-how, but leaving it to the municipal authorities to prepare detailed plans.

The government's top priorities are economic revival and safety. The economy is fairly strong in the Sendai plain, but the Rias coast was suffering economic and demographic shrinkage before the earthquake. But it is the safety imperative that has had huge implications for urban planning. No housing will be permitted in the hazard zone and buildings can be no more than five storeys with a shop or parking space on the ground floor. The two main protection strategies are relocating homes to safe places and providing multiple layers of protection. In the Sendai plain, where there are no natural hills, the government is building barriers and concentrating housing on raised platforms. People who cannot afford to build their own homes will be moved to higher density apartment blocks. This is contentious as many families want to move far inland away from the hazard zone. Figure 3 shows a typical plan for the Sendai plain. There are three embankments: the coastal embankment and the two raised roads shown in red. All the small settlements in the hazard zone will be concentrated in a new urban centre and new evacuation routes are being created. Along the Rias coast residential areas in the hazard zone have been rezoned as non-residential and homes are being moved to higher ground. Designating new areas for housing, building embankments and terracing slopes all takes time.

The International Recovery Platform pointed out that the problems of recovery are compounded by the shrinkage confronting most rural towns in Japan where population decline, ageing and economic decline pose special planning challenges (IRP, 2012). The central government hoped that changes to land use (redefining housing areas in hazard zones as non-residential), improving transportation links and promoting urban centre regeneration projects would have a positive impact on the prospects of these places as well as making them more resilient to future disasters. But up until mid-2014, the focus was on relocating housing to higher ground and on constructing safety measures such as high levees and evacuation towers, whereas the imperative might have been to strengthen the local economy and address economic and demographic decline. Measures that would strengthen existing local businesses and city centre shops, attract new industry and encourage young people to the city might have been considered. But the lack of jobs has meant that many young people have left the area in search of work and better prospects.

There is a question about how much room for adaptation there is locally in the application of the central government's template for recovery. Japan is a compliant society and there may be more flexibility than local officials or residents realise. But there seems to have been no cost-benefit analysis of the huge investment. One of the biggest areas of controversy is the building of concrete sea walls of up to nine metres high. For example, at Rikuzentakata (original population 33,000), the monetary cost of reconstruction may be about US\$200,000 per family.

Figure 3 The Iwanuma Master Plan concentrates six small settlements in the hazard zone in a new urban centre behind three embankments: the coastal embankment and the two raised roads.



By law the authorities are obliged to consult local public opinion and from the earliest stages residents' opinions were sought in public meetings, surveys and workshops. But this takes time and causes delay. The younger generation, in their forties, are opposed to large embankments and tall sea walls, but they are not the decision-makers. Community groups and municipal authorities are dominated by elderly men and they tend to be conservative and safety conscious.

Along the Rias coast the response of the majority is that the government has already decided so they cannot do anything. Some even admire the massive infrastructure. Unfortunately people will leave and the community may fragment because of the delay. Partly because of citizen opposition, reconstruction of sea embankments, which suffered extensive damage, has been considerably delayed. Local governments in devastated areas cannot decide on the details of restoration plans, as discussions continue on whether to prohibit people from returning to

coastal areas. Reconstruction work has started on only 31% of destroyed embankments.

In Ishinomaki, one of the larger towns, there are plans to revitalise the city centre. The local community were involved in community workshops a year after the disaster in which there were open discussions about the future of the place. The area of concern that is causing delay is the plan for a river protection wall. Historically the centre was located near the river because of the transportation of rice and many residents object to building a high wall. The debate is about balancing protection and historic value. The government has proposed a levee 4.5m high and the citizen's committee of stakeholders has been discussing how to make the area attractive for visitors. There are plans for a riverfront development to attract visitors including a fish market with a fish food court and a memorial to those who lost their lives. Central government has set a time limit for construction to start.

At Shibitachi on the Rias coast a banner stretched across the village indicates the height of the proposed embankments. The base will cover much of the flat area of this small fishing village. There are 270 households of elderly 'recreational' fishermen and their homes will be relocated to higher ground. At Oya East, a beach community near Kesenuma, the community group organised by Miura Tomayukin suggested that the proposed 9m high embankment be moved back. Initially the city was unhappy with idea but changed their minds after receiving a petition. The proposed municipal plan is now for a lower embankment farther back but this needs cooperation of the Department of Agriculture and Fisheries, the National Forestry Department, the Prefecture Civil Engineering Department, Japan Railways and the National Highways Agency (Tomayuki, 2013). This is a bureaucratic nightmare and will cause further delay.

In Kesenuma city Mr Akihiko, owner and CEO of Sugawara Sake Brewery, Vice President Chamber of Commerce, and Member of Strategy Committee of Municipal Government, told us that the citizens' committee oppose the planned 5m embankment that will change the character of the picturesque seaside town. Most residents were evacuated safely and they are used to living by the sea with all its attendant dangers. Above all they are concerned that delay in reconstruction will stall economic recovery. The majority of residents are against the proposal for the seawalls and because there has been so much opposition the deadline was put back six months to October 2013. Japan's first lady Akie Abe gave an interview to Mainichi Shimbun Weekly News (2014) in which she said she had recently been to Kamaishi and that she opposed the massive seawall construction project.

Local government has considerable problems with consultation, which is time-consuming. It is not easy to convince communities to relocate yet people want to be safe. Local governments want to consolidate communities to make it more efficient and economical to deliver services, since many of these places were in decline before the tsunami. The fundamental problem is that the authorities do not really know the size population needing reconstruction. If the municipal

authorities have to provide facilities and services for each community, no matter how small, the cost will be enormous (Personal communication, Bhatia, 2013).

Turkey

The Van earthquake of 7.2 magnitude (USGS, 2011) occurred at 1:41pm local time on Sunday 23 October and was felt throughout eastern Turkey and adjacent countries. The epicentre was 16 km NNE of Van near the town of Erciş. (EERI, 2012; CEDIM, 2012). Van, the provincial capital, had an official population of 526,725 and Erciş 159,450 at the time of the disaster although the actual number of inhabitants may have been as many as a million people in total. There were 604 fatalities and 4,152 casualties (AFAD, 2012). The earthquake caused significant damage in the cities of Van and Erciş, as well as in many villages. An aftershock of magnitude 5.6 on 9 November caused further damage and 40 more deaths (EERI, 2012). There was massive damage to buildings due to poor masonry construction and inadequate application of building codes (Turan, 2012). A total of 28,512 buildings were heavily damaged in the first event, including 18,424 dwelling units. This rose to over 35,000 after the second event (Erdik et al., 2012). In total, 60% of housing in the Van region suffered damage. Van is one of the poorest regions of Turkey and total economic damage is estimated in the low single digit billion US\$. This is much less than in Japan, but the economic life of Van was destroyed by the earthquake and most people did not have jobs.

At one time nearly 300,000 people were being housed in temporary shelters in Van and Erciş and perhaps as many as 200,000 left the area and went to stay with relatives or in accommodation organised by the government in other cities. As in Japan, lessons were learnt after the 1999 Marmara earthquake. Shelter was provided quickly, and people did not have to stay in containers as long as in Japan. The 21m² container houses, smaller than the Japanese versions, but housing much bigger families, comprised two rooms, bath, kitchen and toilet. We visited Van exactly one year after the earthquake and all the camps were full. They were well policed and contained shops, schools and play facilities. We went again six months later and they were nearly all empty.

One year after the earthquake huge progress had been made in rehousing people and boosting the economy. 30,000 people had been re-housed in the city and 70,000 people were moving to the new suburbs. (Personal communication Altay Usly, Deputy Governor Van). People are moving to houses built by TOKI, the government housing agency, on five sites around Van.

Figure 4 Temporary camp and new housing in Van, Turkey



Temporary camp, Van

New TOKI housing 12 months after earthquake, Van

TOKI has been active in the construction of social housing since the 1980s, and currently operates both as regulator and as a provider of social housing. Initially TOKI provided financial support to social housing, but since 2003 it has been the direct provider of social housing. However, TOKI has little understanding or expertise in urban planning or new settlement creation.

Political stability of the last decade has delivered economic development and there has been massive state investment in the region in roads, infrastructure and new settlements (Üngör and Kalafatçılar, 2014). But the economic bounce from construction is only temporary and long-term recovery is less certain (Personal communication, Polat Gülken, Chair, Civil Engineering, Çankaya University, Ankara).

Although emergency response and relief by AFAD was well organised and effective, in other ways Turkey was ill-prepared for this earthquake. Disaster crisis management is highly organised in Turkey, but the focus has been on disaster response and early recovery phases and not enough attention has been paid to mitigation or long-term recovery (Caymaza, Akyonb and Erenelc, 2013). “It is difficult to recover quickly, the earthquake left us with a big economic problem, but slowly the city is returning to normal” (Personal communication Barboros Baran, Mayor of Erciş). Schools and shops have reopened; there is traffic in the streets and a great deal of construction. More fortunate families have a family member, such as a schoolteacher or taxi driver, who is back to work. It will be a long time before full recovery occurs and for some people this may never happen (Beam, 2012).

In 2001 the Turkish government introduced compulsory earthquake insurance and threatened to cut off electricity and water if people had no insurance. But the law was only enforced for one year and people now only buy insurance when they sell the house. In Van, insurance penetration is much lower than in Istanbul or Ankara. People were treated to the same level of government compensation whether they had insurance or not. The decision was political as the situation in Kurdish dominated Van was fragile after the disaster and the government used the extraordinary situation to improve their popularity in the upcoming elections. The simple fact is people who were not insured should not have been rehoused in the same way as those with insurance, but this would have been politically unacceptable to the government.

Since the turn of the twenty-first century, Turkish cities have undergone large-scale change through a process referred to as urban transformation (Elicin, 2014). This has involved the demolition of inner-city low-income settlements and one of the justifications for the policy is to protect people from earthquakes (Saraçoğlu and Demirtaş-Milz, 2014). The new 2012 Urban Transformation Law aims to increase the safety of the existing stock by defining earthquake hazard zones and obliging people living in these zones to get professional help to analyse the earthquake risk of their building. The law is new and in the process of being applied (Personal communication Necmettin Şahin, Director, Disaster Management Center, AFAD, Izmir).

We visited a number of these new estates in the Van area. They are well built and most have a central play area for children. There are new cars parked outside and people are getting on with their lives. The housing is government subsidised; each house costs about US\$35,000 and is free of charge for the first 2 years, then subject to monthly interest-free payments of US\$160 over 18 years. One issue is that these apartments are typically 100m² and the average family size is ten (Personal communication, Nuray Karanci, Department of Clinical Psychology, METU).

AFAD defined the location for new housing based on geological considerations and land ownership and legal issues. Largely because of the intense imperative for speed this invariably meant government-owned land. TOKI then managed all aspects of the construction and built 15,000 apartments in Van and 5,000 in Erciş in less than 12 months from the date of the earthquake. This rate of reconstruction is unprecedented. The reason it was so fast was that planning decisions were made by AFAD geologists on the basis of distance from a known fault and whether the land was government-owned. There was no public consultation of any kind.

The engineers in AFAD maintain that the impressive speed was due to taking the right decisions and, in the main, choosing good sites. This strategy of moving people to new peripheral settlements has meant that the city is expanding, particularly towards the south and east and the planners have focused on new roads and new connections to these sub-centres. But the new homes are isolated

from the town centre and various experienced earthquake engineers are critical of scientific advice overriding logical urban planning criteria.

Despite talk of rebuilding a better Van we did not see much sign of urban planning, either in the existing town centres or in the new TOKI housing estates. Neither AFAD nor TOKI did any urban planning for the new settlements and although they completed 20,000 new homes within one year of the disaster these should have been planned better (Personal communication, Altay Erdugay, Earthquake Research Institute, Gazi University and former President of TOKI).

We visited the Ministry of Environment and Urban Planning team in Ankara responsible for Van. They were busy mapping existing land uses rather than planning how the city might be made 'more liveable'. It has been almost impossible for the urban planners to produce radical plans to improve the city centres of Van or Erciş because of land ownership issues. It is complex and expensive to 'expropriate' private land in Turkey and owners do not want to give up land for street widening, parks or any enhancement of the public realm (Personal communication, Funda Tolman, Ministry of Environment and Urban Affairs).

As after all disasters, one of the key questions facing the authorities and building owners in Van is whether to repair or rebuild. The answer is influenced by a number of factors:

- The science and engineering assessment of ground conditions and structural integrity of the building and its vulnerability to future hazards.
- The application of building codes and rigour in the inspection process.
- Whether the building is insured and for how much.
- The relative cost of repair and rebuild.
- The possibility of developing the site by increasing the number of storeys or improving the planning or functionality of the building.
- The availability of funds, either in terms of capital or low interest loans.
- Multiple ownership or legal issues and the owners' personal preferences.

In Van and Erciş about half the damaged residential property will be repaired. A higher proportion of commercial property is likely to be repaired rather than rebuilt, because most owners will rebuild on the same site rather than moving and there is less financial support for commercial property. But there are issues with the building inspection system. There are several layers of control and architects or construction managers need to get approval from several different institutions (Özden, 2014). After the earthquake new legislation suggested this system would be reviewed. From what we saw, however, the system does not seem to be working. We inspected a seven-storey building in Erciş next to the District Governor's Palace where all the columns had been sheared at the base. The owners have permission to shutter and repair the columns in situ. We interviewed the District Governor. He did not know about the building next door

but said that building control was much better than it had been 7-8 years ago and that qualified engineers decided about repair or demolition.

Chile

The Maule, Chile earthquake of 8.8Mw occurred at dawn (3:34am) on 27 February 2010 at a depth of 35 km (USGS, 2010). The event was centred 200 miles southwest of Santiago with a rupture zone of 500-600 km. It was the fifth most powerful earthquake since seismic records began and triggered a tsunami which caused severe damage to many coastal settlements (Lubkowski et al., 2010). By most standards, the Maule earthquake was a catastrophe for Chile and affected more than 2 million people. Most buildings performed as they had been designed – to protect life, but economic losses were huge – totalling US\$30 billion or 17% of the GDP (Franco and Siembieda, 2010). Chileans reported being surprised that they were not as ready for this event as they thought they were. But despite the magnitude of the event, there were few major structural collapses and a relatively low death toll of 500-600. The standard of construction in Chile is generally good (Booth and Taylor, 1988). The majority of deaths, as in Japan, were from the tsunami rather than the earthquake.

Several factors contributed overall to the low casualty rate and rapid recovery, in particular the strong building code and its comprehensive enforcement. In particular, Chile has a law that holds building owners accountable for losses in a new building for 10 years. There were few fires after the earthquake, because the electricity grid was shut down immediately. In many areas, the emergency response was very effective and there was close local coordination between emergency managers, fire, and police without a need for communication with the capital. Finally, the high level of awareness meant most people evacuated in good time and were able to manage living in temporary accommodation.

Pablo Allard, Dean of Architecture at the Universidad de Desarrollo in Santiago, was appointed national coordinator of the reconstruction program. The national reconstruction plan (MINVU, 2010) has as its slogan: “*Our Challenge: Turn a catastrophe into an opportunity... for better cities, better life*”. The plan defines the scale of the damage: “the earthquake affected severely the second biggest urban area in the country – Grand Concepción – and partially devastated five cities with more than 100,000 inhabitants, 45 cities with over 5,000 inhabitants and more than 900 towns and villages on the coast or in rural areas”. It states that the state is unable reconstruct everything or even control the process of recovery centrally from Santiago. With the support of the state, it is the responsibility of each region, town council and community to develop its own plans. It also says that although the authorities in each locality will be faced with huge problems that they will want to address immediately, it is important that they have a long-term strategic vision and that they proceed methodically if important issues of cultural identity, the environment and citizen engagement are to be protected and opportunities to build back better realised.

Almost immediately after the earthquake a group of 10 architects/planners was seconded to the regional government to assist the local authorities from the two main universities in Concepción, Universidad Bio-Bio and Universidad Católica de Chile. Of the 36 coastal settlements in the region, 18 were severely damaged and the team decided to concentrate their efforts on these. They divided into three groups, costa norte, led by Ivan Cartes, costa centro led by Waldo Martinez and costa sur by Carolina Arriagada (Cartes, 2011). These academics worked closely both with the planners in the various municipal authorities and with local residents and business people in the affected settlements to develop a master plan for each hamlet called the Plan de Reconstrucción del Borde Costero. The outputs from this process were master plans and zone maps. The zone maps show recommended zones for housing, commerce, amenities, industry and infrastructure. Three levels of housing risk were defined based on the wave level (Level 1: No risk; Level 2: Low risk–Houses have a reinforced concrete ground floor; and Level 3: High risk–Tsunami-resistant housing with an unoccupied ground floor).

A fifth of the population in Maule was made homeless and along the coastal margin a concrete toilet block is often all that is left of most homes. Displaced persons were given two options: stay on their property, or move to an *Aldea*, or temporary housing village. In both, displaced persons were housed in *Media Aguas*, or temporary timber housing. Grants for tools and supplies were distributed to those working on repairing their homes (Hinrichs et al., 2011). Temporary housing was constructed from local timber and some families incorporated the temporary shelter into their rebuilt homes. The homes are one-room 18m² timber chalets, smaller than either the Japanese or Turkish equivalents, and the camps comprised 250-500 units plus sanitary blocks. But many of the 80,000 displaced families were still living in temporary camps like the ones we visited on the hillside above Dichato and Talcahuano eighteen months after the disaster.

The plan was to build 70,000 dwellings and the goal was to have everyone back in permanent housing by the end of 2012. Pablo Allard, the national reconstruction coordinator was quoted as saying, “This is one of the most complex reconstruction efforts anyone has ever undertaken ... we can’t just build short-term ghettos. We have to rebuild these cities to mitigate the risk and exposure to earthquake and tsunami hazards” (Padgett, 2011).

According to Claudia Gonzalez (2012) relocation is generally considered as a last resort because of land ownership and the key issues are: relocation, timeliness, reactivating local economies and public participation. There was extensive interaction with residents and local businesses through focus group and face-to-face meetings. Maps were used throughout this process, to communicate plans to the community. The community had problems understanding the maps so images and sketches were used to communicate and share ideas. The main objective was to get business and commerce up and running. The US recovery manuals the team consulted stressed that after the immediate relief effort it was important to reinstate livelihoods as quickly as possible, both to take people’s minds off the tragedy and to make them independent of state support. So the

Chilean team designed and built temporary restaurants set back from the beach and designated land for tree planting and a park.

Figure 5 Community engagement after Chilean earthquake



Residents Association meeting in Tubul

Tubul Master Plan (Plan Maestro Tubul, 2010)

The main components of the Dichato and Tubul master plans consist of moving buildings back from the beach, planting trees and canalising the river. The sea defences proposed involve a much lower sea wall than in Japan, a set back of 50-80m for buildings and a 20-30m band of trees. In Tubul Carolina Arriagada explained that the coastal strip where people had been living was unsafe and the plan was to move the majority of homes to higher ground at the other end of the village, which meant buying land from the *latifundista* landowner. Homes being built on the site of the existing village are tsunami-resistant. Interestingly it was the Japanese earthquake that helped convince the undecided in Chile about moving. The government expropriated existing homes and paid people the commercial value for the house and improvements, independent of the subsidy for the new housing. The new homes are 114m², slightly smaller than the existing houses and residents have been closely involved in the decision-making about planning the move and about the design of the homes. But the master plan had taken longer than predicted because of the lack of good information, especially mapped cadastral information about who lived where (Plan Maestro Tubul, 2010).

Our impression, from talking to people in the various coastal settlements we visited, was that the need to balance speed and deliberation had been managed with some skill (Platt, 2012). There was intense pressure from residents to rebuild homes, restore facilities and get the economy moving and a desire on the part of the authorities to develop new urban plans that would improve these communities and make them safer. Despite the psychological trauma of coming to terms with the disaster and the lack of cadastral data and up-to-date plans, the design teams produced the plans and got the funding within 12 months. Most impressively, they were able to involve residents and business people in the planning process and keep them informed with regular fortnightly visits and walkabouts in the community.

Conclusions

In Japan, the nation was traumatised by the unanticipated scale of the disaster. It is a matter of national pride to rebuild shattered communities and to make them safe 'at any cost'. This safety imperative means that ways of life and people's relationship to the sea will have to change and this is painful and causes dissent. By law the authorities have to consult people and it is in the nature of Japanese society to try to reach consensus rationally. All this takes time, which undermines the possibility of recovery in places that were already in economic and demographic decline.

In Turkey the imperative was speed, particularly to provide temporary accommodation and then to rehouse people in permanent housing. The new TOKI housing will be much more earthquake-proof than previous homes and new hospitals, schools and government buildings will be built to code. All buildings must be inspected before they can be repaired and in theory dangerous buildings that cannot be repaired will be demolished, but the authors witnessed many examples of inadequate and dangerous reconstruction. Nevertheless, Van will be much safer. But little urban design or planning underpins the fast-paced reconstruction.

Chile achieved a better balance of speed and deliberation. The central government recognised it would be unable to reconstruct everything or even control the process and national coordination was limited to defining the scale of the problem and allocating resources. Planning and implementation was the responsibility of regional government and specialist teams of experts. What distinguished recovery in Chile was the community consultation and the desire from the bottom up to rebuild as quickly as possible but also to build back better.

Land use change and safety

There are essentially three choices for land use planning: rebuild in the original place, move to a safer adjacent neighbourhood or relocate to a new place. The decision depends largely on the degree of damage, the willingness of the inhabitants to move, the difficulty of mitigating future risk and the economic implications of the move (Ye, 1996).

In Japan the policy was to define a hazard zone and to move people up and away. In the Sendai plain, this involved moving people out of detached houses and into apartment blocks on raised platforms some distance from the coast. On the Rias coast homes were moved to higher ground on new terraces. In Turkey between a third and a half of displaced persons were rehoused in new apartment blocks sited on land 5-6km from the city. The rest of the population plus new migrants to the city were housed on redeveloped demolition sites or in repaired houses. In Chile commercial and industrial uses were moved back from the coast behind a new promenade and a treed margin that will protect against storm surge and break the force of a tsunami. Housing in the hazard zone will be tsunami-proof.

Economic recovery

Economic recovery is quite likely the most serious issue facing most communities in the post-disaster period, and almost certainly the central issue in every major disaster. Bolton (1996) says a major disaster forces an urgency to decide many things at once.

In Japan much of the area affected by the disaster was in economic decline. Japan has been in severe recession for decades and the whole country has a low birth rate and an aging population. These problems were aggravated by the tsunami. The government is trying to support industry and commerce through financial support and improving transport links, but there is only so much it can do in the face of economic forces. In Turkey there has been major investment in new highways and infrastructure. This has produced a mini boom in construction but unemployment is high and although some are getting rich on the reconstruction, the majority of the population is struggling to make ends meet. This is a border area with Iran and much of the economy is based on trade, both legal and contraband. It is unclear whether in the longer term this area will prosper or fail. In Chile the government assessed damages and losses at US\$30 billion, and estimates total public spending for reconstruction will come to US\$12 billion. The government will most likely fund this spending through moderate tax increases, reserves, budget reallocations, the sale of assets and, most significantly, through concessionary schemes with the private sector.

Planning system

A large number of authorities and organisations are involved in different aspects of recovery. There is a range of pre-existing and special earthquake related plans. In many countries it is unclear which agency, organisation or department is responsible for planning post-disaster recovery. There is a pressing need to coordinate decision-making, land availability, the reconstruction program and service provision. But there is often tension between local, regional and national authorities.

Japan faces a bureaucratic nightmare of many different agencies needing to coordinate decision-making. Major planning changes also need extensive public consultation and community agreement. This means planning is slow and cumbersome, but plans are carefully considered and evaluated. In Turkey in contrast, most of the important decisions were taken by officials in Ankara without much reference to local stakeholders and with little or no public consultation. This means decision-making was extremely rapid, but plans are much less likely to meet local people's aspirations, and opportunities to improve urban planning have been missed. The really distinctive thing about recovery in Chile was the quality of the participation process that involved the community in decision-making and kept them informed of progress. The architects heading the three teams visited their areas regularly, meeting resident groups and business people and just walking the streets.

Insurance and government subsidy

Insurance can be a powerful ex-ante strategy in an earthquake risk mitigation framework. Its primordial objective is to provide monetary compensation for damaged assets or lost income but, in addition, it can help achieve other important goals for society such as the establishment of safer building practices, the dissemination of risk information, and the promotion of financial responsibility (Franco, 2014). Guy Carpenter (2014) estimates that between 1980 and 2013 70% of global economic losses from natural catastrophes were uninsured. Moreover, as risk exposure grows at a faster pace than insurance, the gap keeps widening.

Political issues

In a report for the International Recovery Platform providing guidance, Ian Davis (2006) says all aspects of disaster management including longer-term recovery occur within political contexts, disaster events place immense demands on government officials, and the public, especially those affected, have high expectations of their leaders and public officials. But the brevity or superficiality of the media coverage tends to under-represent the challenges faced by governments.

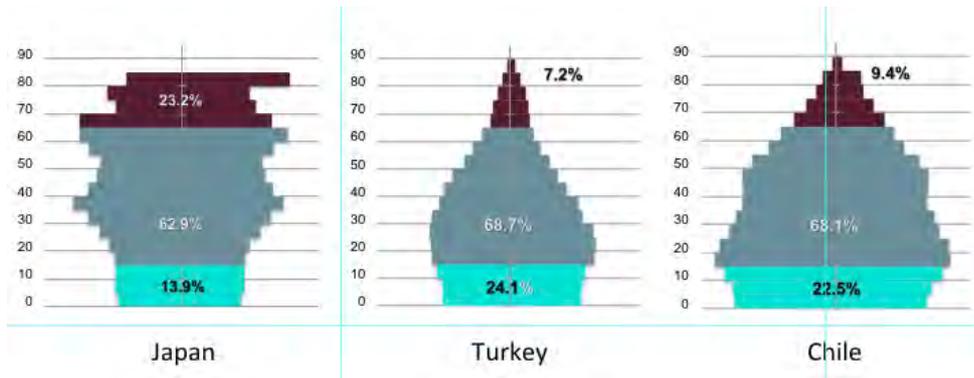
The Japanese government has been under intense pressure, aggravated by its mishandling of the Fukushima nuclear accident, to clean up and repair the damage and make places safe. In a polite and restrained way there has been intense debate about the way forward which has caused delay but may in the long-run prove beneficial. In Turkey, there was a political imperative, because of the Kurdish separatist unrest, to react quickly and decisively. The government had immense powers to act without recourse to the same level of public scrutiny and local debate as in Japan.

We are not comparing like with like of course. There are wide differences in the economies and culture of the three countries and the events were quite different in scale.

Demographics

In Japan the key issue is an aging population and economic decline. Tōhoku was already suffering shrinkage before the tsunami. It is now predicted that the population will decrease by 1/3 in the next 50 years, leaving only 2 in 5 people economically active. In contrast, Turkey has a young population and is growing both demographically and economically. The population of Van is predicted to rise from about 360,000 to 1 million in the next 20-30 years. Chile is somewhere between the two (See Figure 6).

Figure 6. Population pyramids (US Census Bureau, International Database, 2010)



Economics

Figure 7 shows GDP in blue and rebuild cost in pink. The scale of recovery in Japan is much larger both absolutely and relative to the size of the national economy. The boxes also illustrate how devastating earthquakes are when accompanied by tsunamis.

The Japanese government has allocated US\$25 trillion over the first five years of recovery, largely financed through selling reserves. But no cost benefit analysis has been done of this investment as the priority is getting the country back on its feet. This shows the size of the economy relative to the size of the population and one can see immediately how wealthy per capita Japan is compared to both Turkey and Chile.

Figure 7. Size of disaster and cost of recovery relative to GNP and population



Despite these demographic and economic differences the questions to ask are ‘Could Japan have gone quicker?’ ‘Could Turkey have recovered better if it had gone more deliberately?’ and ‘Will Chile actually be able to deliver what it promised?’ One can imagine Japan might have moved more quickly if it had been psychologically better prepared and had managed public engagement better. And Turkey might have gone more deliberately if urban planners had more influence.

In summary, recovery in Japan might be characterised as deliberate but slow and Turkey as all speed and little or no deliberation. In any disaster recovery we have to manage the balance between speed and deliberation and the only way, the authors believe, is to rehearse the issues in advance. In an ideal world recovery would be both fast and deliberate and would involve local communities in strategic decision-making. Only Chile, of the various places that have suffered recent disasters, has managed this successfully.

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