

# Disaster risk reduction and empowering local government – a case comparison between Sri Lanka and New Zealand

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## Abstract

**Purpose** – This paper examines the role of government in New Zealand in facilitating the development of resilience in the built environment, with reference to the post-earthquake recovery of Christchurch. A cross-case comparison of the institutional structures and arrangements for disaster risk management (DRM) between Sri Lanka and New Zealand provides a useful basis to consider the broader implications of the findings from both countries. Particular consideration is given to the role of community participation in DRM decisions.

**Design/methodology/approach** – Malalgoda and Amaratunga (2015) recently published an article on empowering local governments to develop resilience in the built environment in Sri Lanka. This paper provides a response to their discussion in conjunction with a New Zealand case study.

**Findings** – Despite being one of the most advanced countries in the world with regards to DRM, New Zealand faces significant challenges in implementation, chief amongst which is that local governments have yet to truly prioritize DRM in urban development. While community consultation is embedded in the legislative framework, requirements for consultation were somewhat misjudged by the local government in Christchurch's recovery. A lesson to be learnt from Christchurch's experience is that even if the Sri Lankan authorities follow Malalgoda and Amaratunga's recommendations for greater devolution of powers to local government, there will be tensions if community expectations over consultation are not met.

**Originality/value** – The cross-case analysis offers a helpful lens through which it is possible to examine DRM. It is useful for informing governments and other stakeholders, helping them to understand the challenges their institutions may face in facilitating DRM and building resilience.

**Keywords** New Zealand, Disaster risk reduction, Post-disaster reconstruction, Local government, Christchurch, Community consultation

**Paper type** Research paper

## 1. Introduction

Disaster risk reduction (DRR) was in limelight of the global political agenda in 2015 with the creation of the United Nations' Sendai Framework to advance DRR globally. DRR is officially defined by the United Nations as:

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The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (United Nations Office for Disaster Reduction (UNISDR, 2009, pp. 10-11).

Risk reduction in the built environment can be facilitated through land-use planning, infrastructure planning and infrastructure design to reduce exposure and increase resilience to hazards. The Sendai Framework's predecessor, the Hyogo Framework for Action, was created to set goals for DRR and coordinate effort towards DRR – engendering greater focus and investment to the cause (UNISDR, 2015). Ten years since the Hyogo Framework for Action was established, we can now reflect on progress with regards to frameworks for disaster risk management (DRM) and what we should expect from governments and associated agencies[1].

This paper reflects on the recommendations presented in a recent article published in this journal by [Malalagoda and Amaratunga \(2015\)](#) on empowering local governments to support the development of resilience in the built environment. The article focused on Sri Lanka, and the authors suggested that their findings would benefit from input from experiences in cities from developed countries. Our response is to present a comparative case study from New Zealand. In particular, we will look at what can be learnt from the post-earthquake recovery currently underway in Christchurch, where recovery can create “decision windows” through reframing issues and providing stimulus for action ([Stigt et al., 2013](#) provides further discussion on decision windows). The different development contexts of Sri Lanka and New Zealand provide an interesting basis to reflect on the bearing of Malalagoda and Amaratunga's recommendations for Sri Lanka. We are not advocating that the New Zealand framework is *the* solution for Sri Lanka's progression in DRR. However, it does provide us with a useful point for comparison and for considering what Sri Lankans might expect of their government as the country develops.

A recent joint report published by the International Federation of Red Cross and Red Crescent Societies (IFRC) and the United Nations Development Programme (UNDP) presents a helpful summary of institutional frameworks for DRM across 31 nations, with supporting case study evidence addressing law, institutional frameworks and broader stakeholder participation in DRR. In this report, New Zealand's hazard management framework is assessed as one of the most advanced approaches in the world for DRM ([IFRC and UNDP, 2014a](#)). While Sri Lanka is not included as a case study, we infer from Malalagoda and Amaratunga's analysis that Sri Lanka's DRM framework currently sits at the lower end of the scale in terms of prioritizing the objectives of DRM. What is significant for this discussion is that many of the challenges outlined by Malalagoda and Amaratunga (which we will discuss later) do not apply to New Zealand. Without many of the constraints in decision-making that local government faces in Sri Lanka, how much progress could be made towards developing resilience in the built environment?

## 2. Methodology

The basis of this paper is a case study comparison between Sri Lanka and New Zealand. The analysis draws on information gathered as part of a wider study on decision-making in reconstruction of Christchurch's infrastructure networks following

earthquakes in 2010 and 2011. We have not conducted extensive research in Sri Lanka; instead we rely on what is presented in Malalgoda and Amaratunga's paper, alongside a selection of other research and reports.

We first make a general comparison between the DRM frameworks employed in Sri Lanka and New Zealand. We then examine an aspect of the Christchurch recovery related to building resilience into the city's wastewater network. A court case associated with the recovery in Christchurch forms a principal focus of the analysis. Given the general challenges experienced in implementing New Zealand's DRM framework and the more specific dilemmas associated with the recovery in Christchurch, we consider what this implies for the development of DRM in Sri Lanka and the persuasiveness of Malalgoda and Amaratunga's findings.

### 3. Comparing contexts

The main arguments of Malalgoda and Amaratunga's (2015) paper are briefly summarized here to set the general basis for case study comparison with New Zealand. Malalgoda and Amaratunga outline the challenges for local governments to integrate resilience into the built environment in their constituencies. Their discussion is focused on the ability of local governments to incorporate and enforce planning and development that is cognizant of disaster risk, implying the critical role of local government decision-making in building resilience. They highlight that, of the various stakeholders involved in DRR, "local governments are expected to play a major role in developing a disaster-resilient built environment in the country" due to their local-level roots and involvement in land-use planning and control of development (Malalgoda and Amaratunga, 2015, p. 104).

Notably, Malalgoda and Amaratunga's analysis does not provide much discussion regarding community involvement – a key theme throughout the Sendai Framework and amongst the broader corpus of literature on DRR (IFRC and UNDP, 2014a; UNISDR, 2015). Their framework for empowering local government indicates "coordination" is required between communities and the government and that it "is important to interact more with the local community and to raise their awareness" (Malalgoda and Amaratunga, 2015, p. 113). However, there is no specific discussion of what form this relationship would take. There is also no reference to community participation or consultation in Sri Lanka's Disaster Management Act. Searching elsewhere, Ginige *et al.* (2010) and Oxfam (2013) reinforce that there is lack of community participation in DRR in Sri Lanka. As such, Malalgoda and Amaratunga's recommendations for devolution, development of better resourcing, standards, guidelines and improved organizational culture are likely to be required first. Such actions could be viewed as necessary to enable more meaningful engagement with communities. Uyangoda (2005, p. 351) supports this assessment in an analysis of the post-tsunami reconstruction in Sri Lanka, where the author outlines that there needs to be a shift from centralized decision-making and that "involvement and strengthening of the institutions of local governance is a better and workable option". Uyangoda emphasizes that this change is needed to support an environment where affected communities can become active participants in decisions. This is an important point to bear in mind, and we will discuss this further in the case study comparison.

We provide a brief summary of the general governance arrangements and legislative context relating to DRR for Sri Lanka and New Zealand in Table I as a starting point for

	Sri Lanka Key sources: Malalgoda and Amaratunga (2015), Disaster Management Centre (2005)	New Zealand Key sources: IFRC and UNDP (2014b), Local Government New Zealand (2014), Department of Internal Affairs (2016)
Development status	Developing – lower-middle income Population: 20.4 million	Developed – high income Population: 4.5 million
Key natural hazards <sup>a</sup>	Floods, landslides, droughts, cyclones, lightning, coastal erosion, tsunami	Severe weather, floods, earthquake, tsunami, volcanic eruption
Governance system and structure of local government (number of councils in brackets)	Democratic republic with three layers of government: central, provincial (9) and local (335). Provincial councils have some devolved powers from central government and provide oversight of development in the provinces Local government is divided into: municipal councils (23) generally for cities and large towns; urban councils (40) generally for less urbanized areas; Pradehshiya Sabhas (272), which are rural authorities	Parliamentary representative democratic monarchy with two layers of government: central and local Local government has two tiers: regional councils (11) and territorial authorities (66). Territorial authorities are split into city (12) and district councils (54). There are six territorial authorities that perform the functions of both regional and territorial authorities
General role/responsibility of local government	Local government addresses matters of public health and sanitation, public utility services, public thoroughfare and general welfare of communities. It is the primary agency for planning approval and land-use changes. However, it does not administer development functions – this is done through central government agencies and provincial councils	Regional councils: responsible for environmental management, regional civil defence, regional transport planning and contracting public transport. Regional government is the lead agency for providing information on natural hazards Territorial authorities: responsible for provision of local infrastructure, environmental health and safety, building control, district civil defence, land-use control (including controlling land use to mitigate or avoid natural hazards)
Disaster management legislation	Disaster Management Act (2005) – provides for the establishment of the: National Council for Disaster Management; the Disaster Management Centre; Technical Advisory Committees; the preparation of disaster management plans; declaration of a state of a disaster; the award of compensation and connected matters	Civil Defence Emergency Management Act 2002 – promotes an all-hazards approach to hazard management, grounded in risk management principles. The overarching governance philosophy is structured around the “4R’s: reduction, readiness, response and recovery”
National disaster agency	The Disaster Management Centre (DMC) sits alongside other ministries in government. Most functions are carried out centrally at the DMC, coordinating districts and divisions. There is “poor” coordination with local government (an observation made by Malalgoda and Amaratunga, 2015)	Regional efforts are coordinated at a national level through the Ministry of Civil Defence and Emergency Management. Regional groups are formed as committees involving each local council in the region

(continued)

**Table I.**  
Governance for  
DRM – a comparison  
between Sri Lanka  
and New Zealand

	Sri Lanka Key sources: Malalgoda and Amaratunga (2015), Disaster Management Centre (2005)	New Zealand Key sources: IFRC and UNDP (2014b), Local Government New Zealand (2014), Department of Internal Affairs (2016)
Local Government authority in disaster management	No local government statute makes reference to disaster management. However, a more recent National Policy (2009) has made some reference	Responsibility for managing natural hazards is generally devolved to local government
Requirement to consult the community	There is little acknowledgement of community participation (as discussed in the body of this paper)	Local councils have general power to act on behalf of their communities. Guiding principles for consultation are set out in the Local Government Act 2002. This essentially requires councils to provide potential affected parties with reasonable access to information and to give people reasonable opportunity to express their views on “significant decisions” <sup>b</sup>
Availability of hazard information and technical knowledge	Risk maps are under development. There is a lack of staff with technical knowledge	Some hazard data is available but is mapping continuing development. There is a lack of technical capacity at smaller councils

**Notes:** <sup>a</sup> Excludes climate change; <sup>b</sup> A “significant decision” is a decision that will have high impact on the district or region, on individuals affected by the decision, or on the ability of council to perform its role

**Table I.**

making a general comparison between the two cases. Despite some clear distinctions in governance and social context, both countries are island nations with significant exposure to natural hazards. Both are also governed by democratic governments and have a local government each that is responsible for providing local public services and supporting community well-being. Both countries effectively have three levels of governance: central, provincial/regional and local – although the mid-level tier varies in function. In New Zealand, the regional government is considered to be a local government authority, with oversight on issues that benefit from a regional focus such as environment and water management. Provincial government in Sri Lanka is not considered to be a local authority; it is a mid-tier level of government that oversees local authorities.

In terms of institutional frameworks, Malalgoda and Amaratunga (2015) identify that a major constraint in the Sri Lankan system is the lack of authority local governments have over key aspects of the disaster management process. Most disaster management functions sit with the Disaster Management Centre (at a national level under the Ministry of Disaster Management) and district-level coordinators with poor coordination with local-level government Malalgoda and Amaratunga (2015, p. 109) suggest that as a result of this the concerns of the local community are not adequately represented in planning and budgetary allocations”[2]. Risk maps are under development but are yet to be integrated into policy and are not integrated into local planning regulations. Malalgoda and Amaratunga (2015) also highlight that a challenge

for local governments in Sri Lanka is the lack of qualified staff. Most local governments have a strong reliance on the central and provincial government in the administration of development decisions. Local government's focus is on post-disaster activities rather than pre-planning, where they are limited by budget and resourcing. There are also political issues in terms of corruption, short-term focus in decisions and uneven support leading to neglect of some local authorities. Given these problems, Malalgoda and Amaratunga call for devolution of authority to local government to effectively engage in building resilience. This includes a need for clearer jurisdictions for decision-making across multiple organizations, the need to establish better lines of communication between central and local government and better integration of hazard management tools, such as risk mapping, into the regulatory process.

In comparison, New Zealand is a high-income country that is one of the least corrupt in the world (Transparency International, 2014). It has a relatively well-established framework for DRM that pre-dates the Hyogo Framework For Action. The Civil Defence Emergency Management (CDEM) Act 2002 is New Zealand's core piece of legislation concerning hazard management, and other legislation regarding management of development and the environment define important supporting requirements. A key concept is that the New Zealand system is based on enabling legislation that sets high-level objectives rather than providing a prescriptive set of rules as to how local governments are to perform their duties. For example, the CDEM Act does not provide a guide to recovery; it only requires councils and CDEM groups to carry out recovery. Similarly, the Local Government Act 2002 outlines when a local council should consult the community, but judgement – to be exercised by council decision makers – is required as to when and how this consultation should take place. This is an important point that we will expand on later in the discussion on Christchurch.

#### 4. Creating a resilient built environment – local government in New Zealand

In New Zealand, the local government plays a critical role in DRR and significant decision-making responsibility is devolved to a local level. Many other government, civil society, research- and market-based organisations have an interest, requiring a cooperative process (Glavovic *et al.*, 2010; Mamula-Seadon and McLean, 2015). Integrating DRR measures into local government decisions in New Zealand is sometimes constrained by a lack of resources, particularly for smaller, rural councils (IFRC and UNDP, 2014b). This is a pervasive issue for DRR efforts across the world (IFRC and UNDP, 2014a), and Malalgoda and Amaratunga also identified this as a problem in Sri Lanka. However, we will focus on Christchurch, where the Christchurch City Council (a territorial authority, hereupon referred to as the “Council”), supporting New Zealand's second largest city, has a relatively large resource base. The Council itself is well resourced with professionally qualified and knowledgeable staff. In terms of infrastructure networks, for example, some senior engineers have been at the Council for many years and have an in-depth understanding of the infrastructure networks, geology and hydrology of the city.

In this section, we address some of the challenges in New Zealand in incorporating hazard-risk knowledge into local decisions that shape development of the built environment. In the first part, we look at this in terms of land use planning and development in Christchurch in recent decades. We then go on to consider building



resilience of infrastructure networks, using an example from Christchurch's post-earthquake reconstruction.

To provide brief context: from 2010 to 2011, Christchurch and the surrounding Canterbury region experienced a series of earthquakes. Amongst thousands of earthquakes recorded, there were several major events that caused significant damage. While many of the buildings in the central business district survived the most damaging earthquake in February 2011, they were beyond economical repair and have subsequently been deconstructed. There was also extensive damage in residential areas and infrastructure services across the city. The extent of damage led to creation of the Canterbury Earthquake Recovery Authority (CERA) through the Canterbury Earthquake Recovery (CER) Act 2011. CERA appropriated some decision-making authority from the Council and the CER Act gave CERA power to suspend existing laws and regulations to help facilitate the recovery process. However, the Council maintained much of its responsibilities with regards to networked infrastructure assets (such as roads, wastewater and water supply), albeit with oversight from CERA as to how central government funds were spent.

#### *4.1 Development and land-use planning*

Prior to the earthquakes that occurred over 2010 to 2011, knowledge of natural-hazard risk was relatively advanced in Christchurch. In the 1990s, a project on *Risks and Realities* produced a report outlining the nature of the risk to engineering lifeline assets (Centre for Advanced Engineering, 1997). Yet such knowledge has not always translated into priority concerns in development decisions. For example, a suburb called Bexley was developed in the 1990s on an old landfill site in an area vulnerable to liquefaction[3]. This area suffered significant damage during recent earthquakes, to the point where the area was "red zoned", and CERA offered residents a buy-out package.

Another example is associated with newer development north of the city near Pegasus Bay. During the planning process, the regional council raised concerns over liquefaction risk in the area, although this was treated as a secondary issue and the prevailing concern was on transport and growth management (Enfocus, 2011). The development ultimately went ahead and construction on Pegasus Town began in 2006, although the developer was required to include ground improvements (compaction of soils) to reduce liquefaction risk.

A report sponsored by the Canterbury Earthquakes Royal Commission observed that despite some evidence of earthquake risk mitigation advocacy, both the city and regional council have failed to draw *sufficient* attention to earthquake risk in planning and development (Enfocus, 2011). There was a perception amongst decision-makers that earthquake risk (and the associated impact on liquefaction-prone areas) in Christchurch was not large enough to warrant greater influence of this risk on development decisions (Enfocus, 2011). This problem was not unique to Christchurch and reflects a wider situation in which the country was not yet at a point where consideration of natural hazards had prevailing impact on development decisions. Thus, while local governments are in a position to make devolved decisions regarding development, hazard risk has historically not played a dominant role in influencing development decisions.

#### 4.2 A city in recovery – rebuilding infrastructure networks with resilience

We now move onto focusing on building resilience into infrastructure networks in post-disaster recovery. There is no space here to present a broad review of the recovery in Christchurch. Instead, we will briefly consider a specific, but important, legal decision that has a connection to principles associated with DRR in the built environment. We have chosen this example as it helps to demonstrate some of the potential dilemmas associated with local government decisions that attempt to build resilience in recovery.

The legal decision we refer to stems from a judicial review concerning the reconstruction of Christchurch's wastewater system. Most of Christchurch's network is based on conventional gravity-fed sewers through which wastewater flow is reliant on a minimum pipe gradient to deliver wastewater to the treatment plant. In 2011, the Council approved the use of alternative technologies in rebuilding damaged sewerage infrastructure; it proposed that pressurised wastewater systems (or, in some cases, vacuum sewer technology) could be a cost-effective, more structurally resilient alternative to the existing gravity-fed systems in the city. Such systems are not reliant on retaining downhill gradient on a pipe, which can be affected by differential land movement in an earthquake. The extent of damage in some areas had presented a window of opportunity to change the nature of the system to better withstand future damage.

A local resident applied to the High Court for a review of the Council's decision to install a pressure sewer system in his community, on the basis that the Council did not obtain consent from affected property owners. The Council's view was that they did not have an obligation to consult on the installation of pressure sewer systems. An underlying factor was that to do so would have introduced delays into the infrastructure reconstruction programme. The judge ruled that the Council had not adhered to the consultation requirements of the Local Government Act 2002 and directed Council to reconsider its decision to install pressure sewer systems. Note that in New Zealand, consultation with the constituency is often considered as equivalent to participation (IFRC and UNDP, 2014a). According to the judgement (*Bailey v. Christchurch City Council*[2013]NZHC 1933, 2 August 2013), the Council's decision placed emphasis on the technological advantages of the pressure sewer system without sufficiently accounting for the potential social costs of this recovery option. The primary issue arose from the need to install pumps on private property and to connect these pumps to private dwelling electricity supply.

Although the judge identified a flaw in the Council's decision-making process regarding community consultation, the actual decision to build pressure sewer systems (as a more resilient option for wastewater infrastructure) was not questioned. Ultimately, the Council could preserve its decision to build pressure sewer systems, and it did so in some areas, including the system supplying the applicant's local area. However, the Council rescinded its plans to install pressure wastewater systems in other areas of the city. A complicating dynamic is that this change was not strictly the result of the consultation process itself. A major contributing factor was that there had been a change in design guidelines since the original decision to reconstruct these assets – a reflection of the changing decision-making environment of recovery. The guidelines set threshold levels of damage required to justify full reconstruction. Adjusted criteria used in the reviewed guidelines suggested there was need for a more detailed investigation of the damage and the performance of the systems to determine the most appropriate



outcome. It was ultimately determined that the existing gravity systems would still provide an adequate level of service to communities in these areas and that investing in a more resilient system was no longer justified. Over time, there were increasing financial constraints and reduced political will to push forward with the more earthquake-resilient pressure sewer technology. The perceived need to act quickly and bypass consultation ultimately led to delays in the recovery programme. The community consultation was not necessarily required to ensure a better outcome for the city, but greater community buy-in was needed to allow the originally proposed solutions to proceed. It is worth noting here that this was one specific example in a large construction programme that received good reviews in community surveys. However, it demonstrates the challenges that can emerge through balancing a desire to quickly progress a reconstruction programme while also bringing the communities along in the process.

### 5. Implications for progressing DRM systems

We now consider what the issues experienced in New Zealand suggest for developing countries like Sri Lanka.

[Malalgoda and Amaratunga \(2015\)](#) emphasize that policy changes are needed in Sri Lanka to devolve DRM decisions to local government. Providing a stronger impetus for local councils to take ownership of DRM seems to be the first logical step for enabling local government to take the lead in Sri Lanka. There is a strong international view that responsibility for action at the local-government level is good for DRM ([IFRC and UNDP, 2014a](#); [UNISDR, 2015](#)).

Such devolution has already occurred in New Zealand. However, progress with regards to implementation has faced a number of stumbling blocks, particularly in regards to prioritization of hazard risk in decisions and community engagement and participation. New Zealand's experience suggests that, despite well-intentioned policy, implementation remains constrained by lack of political will to prioritize hazard risk as a factor in decisions – as demonstrated by examples of development that have occurred in Christchurch over the past 20 years. Also, while we have not addressed it here, limitations of resources and funding (particularly where the rate-base is smaller) remain an issue in New Zealand ([IFRC and UNDP, 2014b](#)).

The earthquakes in Christchurch served to focus attention on the understanding of natural hazards and the extent to which DRR is considered in planning and development. The judicial review of the Council's decision (to install pressure sewer systems as a resilient rebuild solution in Christchurch) highlights how community consultation is a critical element in New Zealand's law and that local government did not meet expectations for community involvement. Interestingly, the IFRC – UNDP case studies on effective law and implementation in DRR suggest that community participation is provided in law in a range of countries, yet the potential "is rarely realised in lower- and middle-income countries" ([IFRC and UNDP, 2014a](#), p. 69). The Christchurch example demonstrates that consultation is not yet a completely stable provision even in the most advanced DRM systems, where, under the urgency surrounding post-disaster recovery, consultation can be considered a luxury for which there is not time. Ironically, as per the example we outlined, this can ultimately lead to delays due to the need to revisit decisions and in some cases, change them.

It is worth reiterating that we have not attempted a broad narrative of the recovery of Christchurch. Also, our discussion of the challenges surrounding local government decision-making in New Zealand presents a somewhat negative view of devolved decision-making. However, our intention is not to criticize devolution, but to highlight what the future challenges may be for countries like Sri Lanka as they advance their approach to DRM.

The broader lesson to be learnt here is that there will be tensions between local government and their communities when community expectations, regarding engagement and consultation, are not met. The need for community consultation during reconstruction is a common theme in literature. The Christchurch example provides a useful insight where the replacement of infrastructure networks in recovery – often accepted by the community in Christchurch as something that simply needs to be done – became a source of significant tension.

## 6. Conclusion

The purpose of this paper has been to present a case study of DRM in New Zealand to compare with the findings from a recent study in Sri Lanka. The recovery in Christchurch has proven to be a test of New Zealand's approach to managing and reducing disaster risk. It has highlighted that consideration of hazard management in development decisions still requires improvement. It has also tested expectations regarding community consultation, which is one of the key elements in legal frameworks for DRM (IFRC and UNDP, 2014a). Despite the pressure to rebuild quickly, there is still a need to engage the community in the process. Achieving this balance throughout Christchurch's recovery has proven to be a challenge for New Zealand – a country that has an advanced approach to DRM.

There is clearly no single solution for DRR – as demonstrated in the 31 case studies in the IFRC – UNDP report. However, the comparison between New Zealand and Sri Lanka reflects how countries may advance their DRM systems as they work towards the goals of the Sendai Framework. Given the Sri Lankan situation outlined by Malalgoda and Amaratunga (2015), it seems reasonable to suggest that improvements in policy, resourcing and the availability of tools and guidelines should be a priority. However, there is clear indication in the literature that community participation in decisions should be part of holistic DRM frameworks. A lesson to be learnt from Christchurch's experience is that even if the Sri Lankan authorities follow all of Malalgoda and Amaratunga's recommendations for greater devolution of powers to local government, how communities participate in local government decisions will ultimately be a significant factor of success.

## Notes

1. DRM is the “systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” (UNISDR, 2009, p. 10).
2. There are 25 districts that act as second-level administrative divisions within the nine provinces.
3. Liquefaction is a process that leads to loss of soil strength, commonly caused through ground shaking in an earthquake.

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