

Planning for tsunami evacuations: the case of the Marine Education Centre, Wellington, New Zealand

Ruth Garside, David Johnston, Wendy Saunders and Graham Leonard outline and explore the legal implications of a 2007 Environment Court of New Zealand ruling on the proposed Marine Education Centre, Wellington, with respect to tsunami evacuation planning.

Abstract

In 2007, the New Zealand Environment Court (W 082/2007) decided to uphold appeals relating to the effects of a Marine Education Centre proposed to be built on an exposed coastal site, susceptible to tsunami risk, south of Wellington city. This resulted in a significant ruling that applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards should not overlook evacuation planning in their application.

Introduction

Recent research on tsunami warnings emphasises the need for development of an effective tsunami warning system for both residents and transient populations, including visitors and tourists (Johnston et al, 2007). The difficulty in preparing visitors to effectively respond to warning messages has been highlighted by social science research exploring a range of hazard contexts, such as hurricanes, tsunamis, and volcanic eruptions (Drabek 1994, 1996, 2000; Johnston et al., 2005; Gregg et al., 2007; Leonard et al., 2008; Sorensen, 2000).

The need to understand and improve tsunami warnings and response capacity was identified in many countries in the Pacific region including Australia and New Zealand following the 2004 Indian Ocean tragedy (Webb, 2005) and subsequent research has explored a range of issues around warnings (Leonard, Johnston, & Saunders, 2007), evacuation planning (MCDEM, 2008) and their links to land-use planning (Saunders, Forsyth, Johnston, & Becker, 2007).

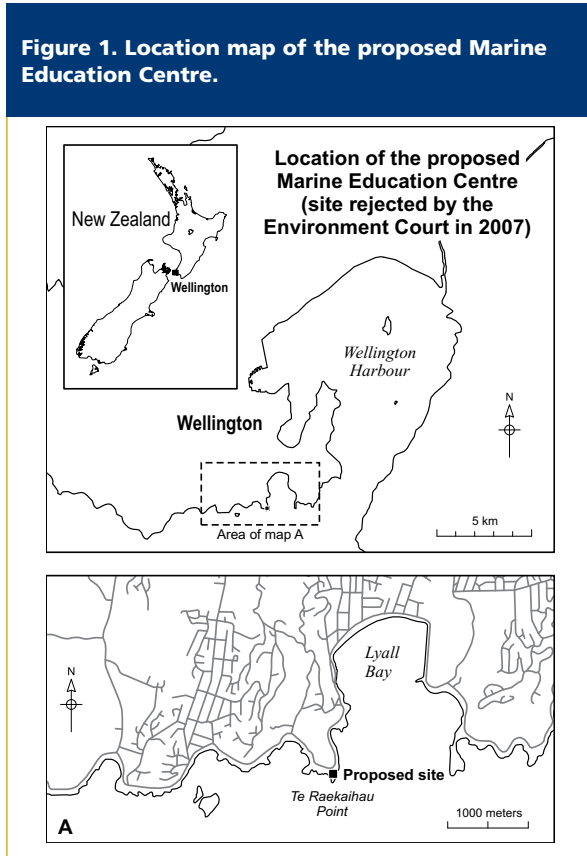
In theory, all tsunami risk can be mitigated through land-use planning and Eisner (2005) proposes a range of land use planning tools. However, regulations and land-use planning have rarely been used in New Zealand for tsunami risk mitigation, due to a strong public desire for coastal development and the long return period of damaging tsunami events. An effective integrated warning system is therefore required to address the residual risk created by human activity in the coastal margin and this requires considerations for evacuating at-risk populations following warnings.

A recent example of the consideration of tsunami evacuation requirements can be seen in the plans for the Tora coastal development in the Wairarapa district. In the proposed subdivision, a public path will be built up the hillside behind the development with educational material and evacuation signage to help mitigate the risk (Saunders, 2008).

This paper outlines and explores the legal implications of a 2007 Environment Court of New Zealand ruling on the proposed Marine Education Centre, Wellington, with respect to tsunami evacuation planning.

The case of the proposed Wellington Marine Education Centre

Resource consents and permits had been granted (26 October, 2006) for a Marine Education Centre (MEC) to be built on undeveloped land owned by the Wellington City Council at Te Raekaihau Point on the western side of Lyall Bay, which, due to its location on the South coast is exposed to extremes of weather and sea conditions (Figure 1 and 2). The proposed development, comprising of a three-level building, fenced open area and car park was estimated to modify approximately 1.3ha of the site.



The subsequent appeals under s120 of the Resource Management Act 1991 (RMA) in *Save The Point Inc & Chris Webster v The Wellington City Council & The Wellington Regional Council*, 20 September 2007, related primarily to s104 of the Act which has regard to the actual and potential effects of a proposed activity on the environment. The appellants were supportive of the concept of a Marine Centre but opposed the building of the Centre on this Open Space B zone site.

In the course of a number of views brought before the Court concerning the suitability of the site, the consideration of hazards and risks arising from storm surges, wave run-up, sea level rise and tsunami waves were discussed at length to establish whether precautions could be set in place “which mitigate the risk of a high potential impact actually occurring to such a level of danger that is acceptable” (at para123).

It was understood that the RMA does not require the elimination of risk but that precautions should be in place to minimise the risk to an acceptable level, and that it was the duty of the Court (on appeal) to assess the evidence placed before it in this regard.

The decision of the Environment Court (W 082/2007) that upheld the appeals, raised a significant ruling that applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards should not overlook evacuation planning in their application.

Natural hazard issues

Expert evidence was presented on the risk, impact and mitigation of the rising sea level and inundation of the site, and it was concluded that if the facility could be closed when an extreme storm-related event occurs, the level of risk is acceptable. However, in the event of a tsunami, the timeframe of warning will vary depending on the tsunami source, with the worst case scenario of a local source from a strongly-felt earthquake giving only minutes of warning.

The Court heard that a tsunami is a long period wave caused by the displacement of the sea floor that may be triggered by an earthquake, or an undersea or coastal landslide. The proposed site is at risk from tsunami generated from distal, regional and local sources (Berryman, 2005). For example, Te Raekaihau Point would have been inundated by the 1855 Wairarapa earthquake, magnitude 8.2, that produced a tsunami wave around 4-5 m high in nearby Lyall Bay.

Discussion ensued about the size of such an event, its probability, consequences and possible avoidance measures. It was projected that there would be considerable loss of life dependent on assumptions about the number of people at the Centre, the degree of warning and the effectiveness of evacuation to high ground. Although the Court held that the level of risk from a tsunami in itself was not enough to decline a consent, the risk needs to be reduced either by protection of the site and structure, or by adequate



Figure 2. Ta Raekaihau Point, western side of Lyall Bay, on the exposed Wellington South coast. Photo by Lloyd Homer, GNS Science.

warning and evacuation. A detailed evaluation of the tsunami risk was centred on the likely mean wave height and inundation onshore. It concluded that the protection afforded by the 3m high coastal berm would be inadequate for a tsunami wave greater than 1.5m when allowing for wave run-up, and that risk of fatalities in the Wellington region can be expected for wave heights above about 2.2m (Berryman, 2005).

Hazard warning and evacuation

Adequate warning of a tsunami event in the region is considered problematic since only tsunamis generated from a distant source (> 3hours travel time from the source) will currently receive an official warning. Tsunamis from regional sources (1-3 hours travel time from the source) may in the next few years have warnings from official channels, while those generated from local sources (< 1 hour travel time from the source) will not receive any official warning in the foreseeable future and rely on natural warnings such as strong ground shaking, observation of ocean disturbance, noises and/or a receding level (Webb, 2005). Warning time is a critical factor in the available time to reach a suitable emergency assembly point.

It was agreed by the experts that given the estimated wave height at this location, evacuation would be needed to a site at least 20m above sea level to reduce the risk to acceptable levels. Although there are possible assembly sites high enough in the vicinity, there was no consideration for their development in the resource consent application.

Conclusion

When coming to its conclusion, the Court found that (at para147) “the inundation risk from a tsunami is significant for events with a return period of 50 years and greater, and that measures are required to reduce the risk to an acceptable level”. The Court criticised the fact that it was unknown whether safe evacuation sites could be developed, nor if such sites would allow timely and practical evacuation. The Court concluded that such matters were “a prerequisite for an evacuation plan and possibly even for the granting of a consent” (at para147, emphasis added). It acknowledged that some tsunami risks had been considered but “without any firm measures to deal with an emergency situation” (at para182). The Court accepted the expert opinion that “if it is not possible to have an effective tsunami warning system and evacuation plan then the risk should be avoided” (at para135).

The implication of this conclusion that contributed to the appeals being upheld by a majority decision of the Court is significant for future applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards, in that an evacuation plan is a necessary consideration of public safety. Indeed, it is also a statutory obligation under s6(e) of the New Zealand Health and Safety in Employment Act 1992 and part of the risk mitigation requirements of the Wellington Regional Policy Statement (Policy 2).

In the light of this judgement, **what is an effective evacuation plan?** All at-risk facilities should have appropriate emergency response planning which would include:

- Warning notification protocols and systems;
- Evaluation and mapping of evacuation routes, with signage to designated assembly points (Figure 3);
- Consideration of evacuation timing; and
- Staff training and evacuation plan exercising.

Not only should the availability of suitable evacuation sites be identified, it is recommended that consideration be made of the practicality of reaching them in a short timeframe under difficult conditions such as darkness and adverse weather by evacuees with different ability and fitness levels (MCDEM, 2008).

Figure 3. Tsunami evacuation sign from the standards developed by the Tsunami Working Group Signage Subcommittee in 2007.



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