

Climate change impacts and adaptation measures for Napier city, New Zealand

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Summary

Coastal areas are vulnerable to sea-level rise and a main area of concern for the impacts of climate change and the needs for adaptation of transportation assets and harbour infrastructures. Climate change has already caused impacts on natural and human systems. Even with strong mitigation efforts, adaptation is becoming more important than ever. Adaptation to climate change is a shared responsibility requiring integration of responses and plans to address present and future effects and costs. The success and effectiveness of adaptation action plans will depend on creating joint understanding between people, public officials, local authorities and other key stakeholders.

Keywords: Climate change, impacts, adaptation, sea-level rise

Introduction

About 40% of the world's population lives within 100km of the sea and 75% of all large cities are located on the coast [1]. These areas, highly vulnerable to climate related impacts, are dependent on effective policies and strategies for mitigating the hazards.

Napier city with a population of 66,300+ [2] was entirely rebuilt following the February 1931 earthquake which levelled all buildings in the inner city and raised land elevations more than 2 meters. Around 4,000 hectares of sea-bed became dry land now used for Hawke's Bay airport, residential and industrial development [3]. Coastal erosion has been an issue in parts of the Hawke's Bay region for many decades and has consequently shaped consciousness of coastal hazards in the region [4].

Literature Review

The increasing concentration of greenhouse gases in the Earth's atmosphere is resulting in an increase in the temperature of the Earth, causing melting of ice sheets and glaciers and rising of sea level. A significant proportion of the world's population lives in coastal areas and low-lying coastal areas are highly vulnerable to the impacts of climate change [5]. Several coastal communities have initiated work towards comprehensive coastal protection, requiring targeted responses, plans and informed action in order to address the present and future effects and costs from sea-level rise and climate change.

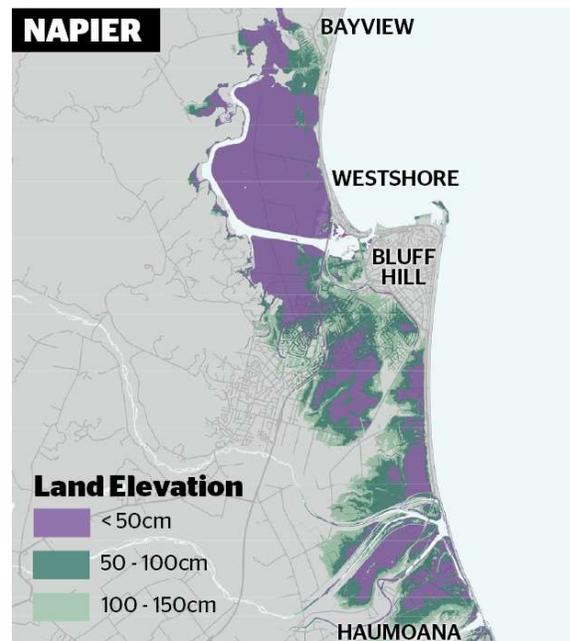


Figure 1: Land elevation of Napier city; much of Napier is low-lying and may be at risk of rising sea levels (Source: [6])

Institutional context

In New Zealand, coastal hazard risk management is governed principally through the Resource Management Act 1991 (RMA), which identifies the natural hazard risks as a matter of national significance and requires local government to have recognition of the effects of climate change. For the last three decades market-based commercial developments have sometimes overturned compliance with regulation standards. In addition, the unsettled and often confused split of responsibilities of the use of land between regional and territorial authorities has led to complications in terms of forward planning to address natural hazards.

The New Zealand Coastal Policy Statement requires Local Authorities to consider and plan for coastal hazards risks. Under Policy 24 (1), Local Authorities are required to:

“Identify areas in the coastal environment that are potentially affected by coastal hazards (including tsunami), giving priority to the identification of areas at high risk of being affected.

Hazard risks, over at least 100 years, are to be assessed...”

Material and methods

Increasing coastal hazards combined with urban development and demographic concentration mean coastal cities need to take a more collaborative approach. Throughout the 20th century, developed coastal cities around the world have been responding to the hazards of shoreline flooding and coastal erosion in several ways. Some of the action plans are as follows.

- Do nothing; nil upfront cost but also the inevitable risk of potential hazards.
- Retreat shoreline; large-scale artificial widening of a beach with sand from some outside source.
- Hardening the shoreline; with the aim to protect the sea shore by engineered structures for hardening the shoreline. This has been the most common historical approach.
- Managed realignment; managed sediment relocation and beach restoration with plants and landscape reshaping.
- Regulatory; restrictions on new development; relocation and managed realignment as a coastal management strategy are increasingly considered as an option for the adaptation planning process.

Each of these solutions comes with costs, benefits and impacts. Depending upon geographic areas, political entities, local communities, states or nations have made decisions to use one or several approaches as short to medium term responses.

Discussion

There is still a great deal of uncertainty to what extent adaptation measures will be applied in the coming years. In the context of climate change the sensible approach is to establish the nature of the coastal risks and present it to policy makers. Decisions are challenged by important technical, economic, financial and social factors and where coastal hazards are certain in low-lying areas and risks are ongoing and increasing in severity. Given the RMA reforms, this needs to be an ongoing process to remove barriers to adopting adequate adaptive planning approaches to facilitate adaptation to climate change effects. Unfortunately,

there are no simple solutions, but we need to take on-board all stakeholders in strategic planning and implementing well-thought-out policies for the uncertain future. Essential is an agreed-upon timeframe for when actions will be taken.

Conclusion

This extended abstract outlines an overview of potential mitigation measures that can provide a starting point for deeper study. Mainstreaming adequate planning and rethinking of how coastal communities plan for new development in coastal areas must be based on more detailed hazard projections in order to specify the life expectancy of the measures applied, keeping in view the geology, topography, regional climate settings and socio-economic characteristics of the region.

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