Investigating wave runup and coastal erosion sensitivity of a sheltered cliffed coast using GIS and numerical modelling under projected sea level rise

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ABSTRACT

Keywords: cliff erosion, sea level rise, climate change, Stockdon model, wave runup, mixed sand-gravel beach

This research explores wave runup and cliff erosion trends in the presence of a vegetated foreshore and mixed sand-gravel beach at Waimangō Point, Auckland under multiple projected sea level rise scenarios.

Historical shoreline evolution trends were obtained using Digital Shoreline Analysis Systems Model where the distances from baseline and each shoreline transect modelling the coastline at a particular time are analysed to result in a rate-of-shoreline-change for a particular location. Historical data was used to understand the cliff erosion trends observed at Waimangō Point over time. Current wave runup elevations were calculated by deploying a local wave buoy that collected offshore wave characteristic data such as wave height, wave direction, wave period, wavelength etc. A numerical model, the Stockdon Equation, was used to calculate the current wave runup elevations using the data collected from the wave buoy. Future wave runup elevations and cliff erosion trends were projected using NZ SeaRise data tool and the Stockdon numerical model whereby the effect of sea level rise due to climate change was projected on future wave runup and cliff erosion trends. This site is culturally important, with a coastal marae and urupā close to the cliff top and is representative of many harbour field sites that are sheltered from erosion for long periods but exposed periodically to storm waves that can drive coastal erosion.

Results show that sections of the cliffs at Waimangō Point are historically stable, with 0.2-0.3m/yr erosion trends seen in the southern section. The Stockdon model produced runup elevations that are 1-2m below the observed elevations by the local Māori during significant storm events. Even with an underpredicting Stockdon model, a future sea level rise of 1.2m by 2100 with result in cliff erosion conditions occurring more than 280 times per decade compared with less than once per decade at present conditions.

Declaration

Topic	Coastal erosion, Sea level rise, Numerical Model
☒	Can attend in person
☒	Have permission / authority to speak on the topic
☒	Have a backup speaker if they fall ill or cannot present

Modelling Group
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Abstract Guidelines

1. Abstract Guidelines
    - Abstracts submitted must be between 300 – 500 words, excluding title and authors.
    - Abstracts must use the template above
    - Font used should be Times New Roman or Arial size 11.

2. Call for Abstracts closes 4pm, Tuesday 31st January 2023 and submitted to Katrina Guy

3. Abstract Selection
    - Wider applicability
    - Demonstrated results and conclusions
    - Relevance to the current state of the industry
    - Content, including innovation
    - Clarity and quality

4. Abstract Acceptance
    - If accepted into the programme, you will only have to submit a presentation. No paper is required.
    - Final presentation will be due by **28th February 2023**
5. Presentation
    - Powerpoint 16:9
    - Slide Pack will be attached shortley