Quantifying historic erosion rates along Victoria's Coastline

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Introduction

Climate change may accelerate erosion of many Australian coastlines. Although Australia has strong science capability to assess the risks associated with sea-level rise, waves, and storm surge, there remains significant uncertainty around the amount and rate of coastal erosion under climate change, particularly where changes from depositional to erosional shorelines are likely to occur, and at scales relevant to management (i.e., smaller than coastal compartment scales).

We need: (i) a greater understanding of historical coastal erosion over decadal time scales and the influence of coastal vegetation and human infrastructure on this process, and (ii) improved linkages between models of coastal erosion and hazards under climate change, to improve predictions of future change and to guide on-ground climate adaptation actions

Forming part of the National Centre for Coasts and Climate and supported through funding from the Earth Systems and Climate Change Hub of the Australian Government's National Environmental Science Program, and the Victorian Coastal Monitoring Program (VCMP), this research uses existing datasets (e.g. aerial photos, storm-surge frequency, vegetation maps) to improve our understanding of past erosion on the Victorian coastline.

Aims and Methods

- *Quantify decadal beach change (2007-2019).* Using 2007 LiDAR survey dataset for the Victorian coast as the benchmark for change, surveys will be repeated using RTK GPS system and UAV/Drone surveys to quantify the degree of shoreline movement over the past decade.

- *Quantify centennial beach change (1940-2015).* Aerial photography and published literature to determine the precise nature of coastal change since acceleration in the rate of sea level rise.

- *Identify causes of coastal change*

Shoreline change will be analysed with respect to instrumented records of climate and sea level change and other interventions that have modified the natural coastal dynamics.

Sites of Interest

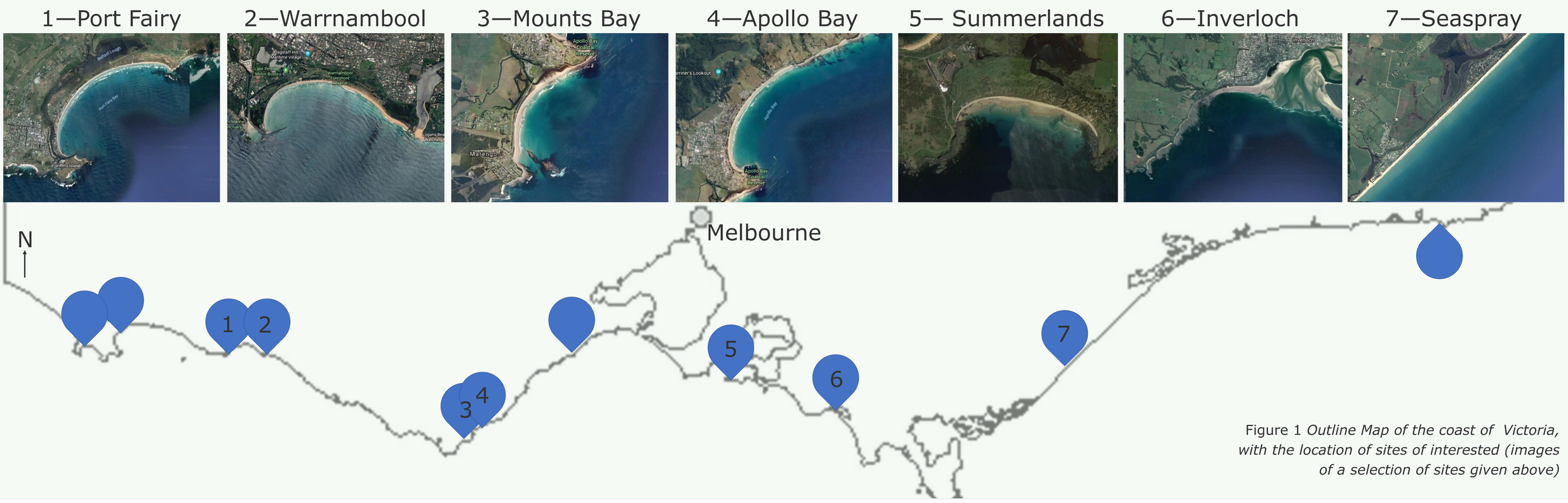

Figure 1 *Outline Map of the coast of Victoria, with the location of sites of interested (images of a selection of sites given above)*

Centennial shoreline change - Apollo Bay

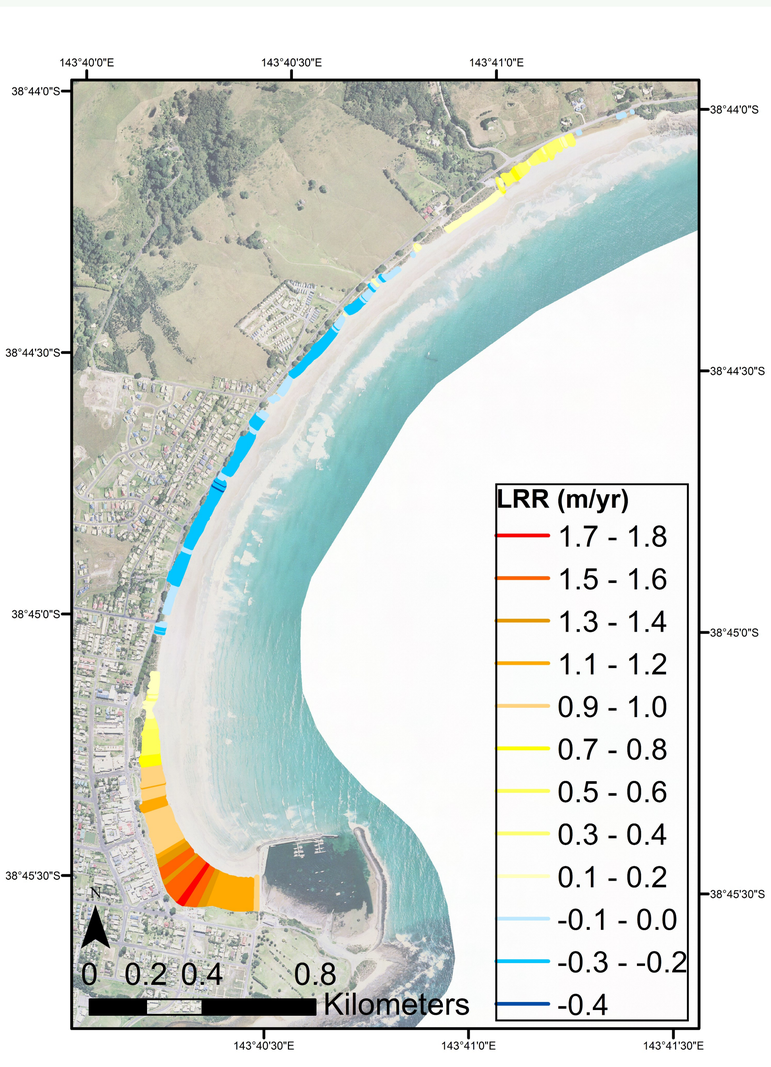

Figure 2 *Shoreline change rates (linear regression rate) for Apollo Bay calculated from a 72 year time series of aerial imagery. Only rates of change significant at P<0.05 are shown.*

Analysis of the change in shoreline position since 1946 to present shows a significant accretionary trend adjacent to the breakwater and an erosional trend through the centre of the bay (Figure 2). Progradation was most rapid between 1946—1965, but slowed in recent years (Figure 3). Erosion occurred in all time periods, but was most pronounced between 2007—2010.

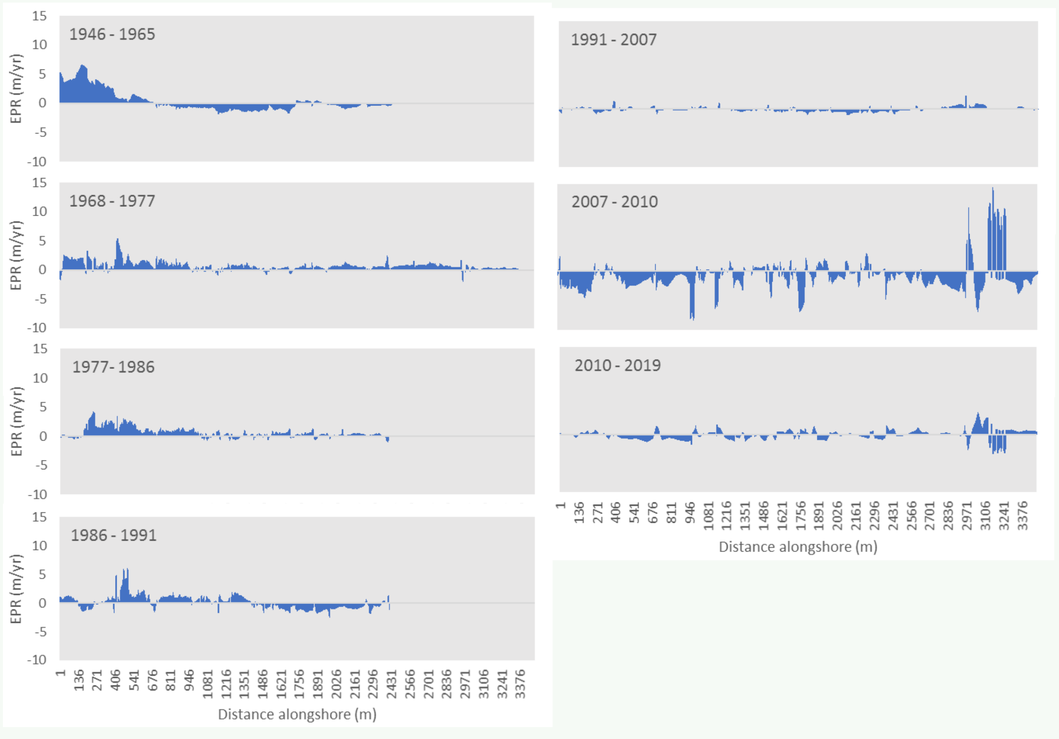

Figure 3 *Comparison of erosion/accretion rates through time (EPR, m yr^{-1}), Apollo Bay*

Conclusion

This study will explore past patterns of shoreline change. The project will focus on a number of key sites of interest (Figure 1) to decipher specific evolutionary behaviours associated with particular coastal characteristics.

The identification of spatial and temporal erosional hotspots, combined with analysis of wave, wind and sediment characteristics driving the change will provide a framework by which future predicted changes in sea-level and climate can be examined.

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