



Clarence's adaptation journey

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ABSTRACT

The coastal communities of Clarence were increasingly concerned at the continual foreshore erosion and flooding which was occurring in their communities. Uncertainty surrounding the impacts of climate change through rising sea levels and severe storm events was of most concern to local residents. Council embarked on a program to assess these vulnerable locations and the resultant Integrated Assessment Report has provided Council with direction to act upon these concerns. Erosion hazard mapping based on 5 scenarios (present day, 2050 high & low and 2 100 high & low) and inundation mapping indicating the impact of rising sea levels for present day, 2050 and 2100 have been embedded into Council's Planning Scheme. This provides a framework for developers and Council to account for potential impacts of climate change when planning development. The Integrated Assessment Report also provides recommended adaptive actions for Council to assess and consider for implementation. The Report identified 4 highly vulnerable locations and these have been Council's focus over past years when implementing the recommendations. This paper describes the journey taken by Clarence City Council from the initial community concerns through to implementation of adaptation treatments.

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1. Introduction

The City of Clarence is situated on the eastern shore of the River Derwent in Hobart, Tasmania, Australia. There is 191 km of coastline, with many coastal communities that are low lying and built on soft sediment foreshores. The coastal communities have experienced frequent inundation and storm surge events in recent decades.

Clarence City Council received community concerns about the erosion of beaches and flooding events in these coastal communities. Uncertainty about the impacts of sea level rise and sustainable coastal management led Council to seek funding to undertake an assessment of its coastline to address these community concerns.

In 2007 the Clarence City Council received funding from the Integrated Assessment of Human Settlements Sub-Program of the Australian Greenhouse Office (AGO) now Department of Climate Change and Energy Efficiency (DCCEE) Climate Change Adaptation Program to undertake a coastal vulnerability assessment of its coastline. Council also received funding from the Tasmanian Risk Mitigation Fund through the State Emergency Service.

The purpose of the vulnerability assessment was to provide an integrated assessment of risks derived from the impacts of climate change and to begin the process of selecting and implementing

effective adaptation strategies for priority areas of Clarence's most vulnerable coastal locations.

2. The Integrated Assessment Report

The Integrated Assessment Report began in mid 2007, this project was one of 5 climate change impact assessments funded through the AGO/DCCEE Climate Change Adaptation Program: Integrated Assessment of Human Settlements Sub-Program.

Approximately \$130,000 was awarded in grants from the AGO/DCCEE and the Tasmanian Risk Mitigation Fund for the Integrated Assessment. The Council itself contributed approximately \$300,000 and a further in-kind contribution of \$200,000 bringing a total project cost of approximately \$630,000.

The purpose of the study was to provide an integrated assessment of climate change risk on coastal areas, which included;

- An investigation into community concerns at present day vulnerability to storm events at the beginning of the project;
- Consultation with community groups, real estate and insurance institutions and State Government agencies concerning their awareness and response to climate change issues;
- A review of literature covering experiences of similar issues relating to the impacts of climate change elsewhere throughout the world;
- An assessment of 18 localities and infrastructure within the City of Clarence which may be vulnerable to coastal hazards both at

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present and due to sea level rise and climate change into the future. Coastal hazards were assessed for the present day scenario, mid-range of 20 cm by 2050 and 50 cm by 2 100 scenarios and high range of 30 cm by 2050 and 90 cm by 2 100 scenarios;

- Investigation of adaptive management options in response to present and future coastal hazards; and
- Preparation of a communication plan to inform the community of the findings; initiate discussion about the preferred response and report on the community response.

The Integrated Assessment Report consisted of 2 components, one being a socio-economic component and the other being a technical component. Project briefs were developed and tenders called for both components of the Integrated Assessment Report.

The Water Research Laboratory (WRL) from the University of New South Wales was awarded the technical component and **SGS Economics and Planning was awarded the socio-economic component of the Integrated Assessment Report.**

Both a Steering Committee and a Technical Reference Group were appointed to oversee the project. The Steering Committee comprised of representatives from Clarence City Council, WRL, SGS Economics and Planning, AGO/DCCEE, the Local Government Association of Tasmania (LGAT), and the Tasmanian Government's Department of Primary Industries Parks, Water and the Environment (DPIPWE) and the State Emergency Service.

The benefits of the technical reference group and peer review panel provided assurance to the integrity, robustness and legitimacy of the research and created strong branding to build community confidence in the project. This aspect of the project has been again utilised when implementing the recommendations of the report.

2.1. Socio-economic component

The initial community consultation was based on two principles. Firstly early engagement with the community was seen as essential to create ownership and involvement in the project whilst the second principle focused on what was the community's knowledge and interests in climate change. The main tools used were 3 focus groups with key stakeholders, being Clarence residents living in coastal areas, Clarence residents living in non-coastal areas and local business owners in coastal areas and a phone survey for the broader community. The focus groups and key stakeholder interviews were conducted first and their responses helped form the questions for the phone survey. The phone survey participants were categorised by the proximity of their house to the coast, to provide differentiation between those that will be potentially more or less affected by the impacts of Climate Change. The phone survey obtained responses from 150 coastal residents and 150 non-coastal residents, with a further 20 local business owners interviewed.

A key output of the Socio-economic component was the communities preferred outcomes and goals as can be seen in [Table 1](#). In response to the survey question *What do you think Council should do to address the issue of sea level rise and its likely impacts?* Residents provided responses over a range from 5-yes definitely to 0 – don't know for 11 prompted questions covering issues such as future development/planning controls, shoreline protection, information, compensation and cutting greenhouse gas emissions.

The above results have guided Council in responding to climate change events in the foreshore areas. The strong community support (>80%) identified the top 6 outcomes and goals to be mitigate greenhouse gas emissions, provide information (maps), provide shoreline protection, introduce planning controls that protect from the impacts of climate change and limit development in high risk areas.

Table 1
Preferred outcomes and goals (SGS, 2007).

Rank	Type	Measure	Yes % ^a	No % ^a
1	Mitig.	Take further action to reduce the rate of sea level rise by attempting to cut greenhouse gas emissions	94	2
2	I	Publish and promote maps etc. showing areas at risk from storm surges and flooding	91	3
3/4/5	A	Set up warning systems to alert residents about potential storm events, including evacuation plans	87	5
3/4/5	P	Put shoreline protection in vulnerable areas	86	6
3/4/5	A	Introduce additional planning controls to protect property from the effects of storm surges and flooding	87	8
6	R	Limit housing development in areas at risk from sea level rise	81	8
7	A/R	Make development in risk areas at the owner's risk – with limited community liability	57	29
8	A	Compensate house owners for property damage or loss due to sea level rise	47	26
9	Anti- R	Continue to develop services, such as roads, water, sewage, in areas that are at risk	48	34
10	R	Remove existing housing in high risk areas	37	38
11	A	Compensate house owners for property depreciation to being located in defined risk areas	35	38

I – Inform, A – Accommodate, P – Protect, R – Retreat (all are adaptation measures).

^a The values do not add up to 100 because some respondents provided a response of 'don't know'.

2.2. Technical component

The study identified the various coastal processes that were impacting on the Clarence Coastline:

- Astronomical tides;
- Tidal anomalies caused by barometric setup, wind setup and coastal trapped waves;
- Ocean swell waves;
- Local wind waves;
- Wave setup;
- Wave run up and overtopping;
- Long shore sand transportation; and
- On shore and off shore sand transport.

As a result of those processes, the following coastal hazards were considered:

- Beach erosion and dune stability;
- Shoreline recession;
- Beach rotation;
- Unstable creek or lake entrances;
- Wind blown sand;
- Coastal inundation;
- Stormwater erosion;
- Climate change including sea level rise, changes to waves, wind and rainfall; and
- Sea water increasing into ground water table causing displacement of fresh water.

A scientific and technical analysis of the above coastal hazards found that the majority of these did not pose a significant risk and as such, the majority of the report focused on 3 main hazards;

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