DUNEDIN CITY COUNCIL
Kaunihera-a-rohe o Otepoti

Report

TO: Planning and Regulatory Committee

FROM: Corporate Policy Team Leader

MEETING DATE: 24 July 2014

SUBJECT: **CLIMATE CHANGE ADAPTATION – HARBOURSIDE AND SOUTH CITY (FORMERLY 'SOUTH DUNEDIN') UPDATE**

SUMMARY

This report provides the Planning and Regulatory Committee with an update on the long-term climate change adaptation work programme, which is currently focused on climate change adaptation for the Harbourside and South City (formerly 'South Dunedin') area (see Map 1). Two key pieces of work have now been carried out:

- an assessment of protection options for the Harbourside and South City area; and,
- an initial valuation of the Harbourside and South City replacement cost.

This report sets out the main points from this work and attaches the full protection options for information. The report also outlines the next steps in this work programme, namely: developing the metrics to enable cost-benefit analysis and beginning community engagement around the key issues and work to date.

IMPLICATIONS FOR:

(i) **Policy:**	No
(ii) **Approved Annual Budget:**	No
(iii) **LTP/Funding Policy:**	No, however, the protection options over the long-term are unbudgeted.
(iv) **Activity Management Plans:**	No
(v) **Community Boards:**	No
(vi) **Sustainability:**	Yes – exploring options for adapting to climate change impacts will enable the city to prepare effectively for climate change, both realising opportunities and responding to threats.

RECOMMENDATIONS

That the Committee notes:

1 the work completed so far on the climate change adaptation work programme;

2 that as part of the development of the Long Term Plan 2015-25, a proposed programme and required resourcing for more detailed investigative work on the options for the Harbourside and South City area from 2015/16 will be put forward; and,

3 that the Council will work collaboratively with the Otago Regional Council on the climate change adaptation work programme.

INTRODUCTION

This report updates the Council on progress with the long-term climate change adaptation work programme, which is currently focused on the Harbourside and South City area (see Map 1).

BACKGROUND

In 2006, the Council adopted a Climate Change Predictions Policy[1] for the Dunedin City Council. In 2010, the Council commissioned a report[2] (the Fitzharris Report) from IPCC author and University of Otago's Professor Blair Fitzharris to specifically examine the climate change impacts for Dunedin. Following this report, the Council adopted an updated Climate Change Predictions Policy in 2011 (attached as Attachment 1).

On the basis of this work, the Council approved a plan to progress climate change adaption for Dunedin. This work has been underway since early 2011. The work is led by the Corporate Policy team, with a wide group of staff involved from Water and Waste Services, City Development, Parks and Reserves, Community Development, Economic Development, Property, Business Information Services, Transportation, Civil Defence and Communications.

The Fitzharris Report identified 'the South Dunedin urban area, including St Clair and St Kilda shorelines' and the 'harbourside shoreline, including the mouth of Otago Harbour' as two of five[3] city 'hotspots' where vulnerability to climate change is expected to be high between 2040 and 2090. The five hotspots were identified based on the following criteria:

- Large impacts
- Low adaptive capacity
- Substantial population
- Economically important
- Substantial exposed infrastructure
- Subject to other major stresses (e.g. continued population growth, ongoing development, ongoing habitat loss, threats from rising sea level)

The areas covered by the two hotspots already had high groundwater levels (which are correlated to some degree to sea level), considerable exposed coastline and current state of coastline. 'The South Dunedin urban area, including St Clair and St Kilda shorelines' hotspot is the largest area affected in the Otago region, with many residential properties and commercial properties at current mean sea level. The significant number of residents, businesses and critical infrastructure at risk led to the Council agreeing that it was appropriate to focus on this area first.

After receiving this information, the Council decided to explore climate change impacts and potential adaptation options on an area that was generally referred to as 'South Dunedin,' with the intention of developing an approach to climate change impacts that could then be rolled out to other affected areas.

[1] Dunedin City Council, *Climate Change Predictions Policy*, 2006 http://www.dunedin.govt.nz/__data/assets/pdf_file/0011/225866/Climate-Change-Predictions-Policy-Report-to-Planning-and-Environment-Committee-2006_10_02.pdf

[2] Blair Fitzharris, *Climate Change Impacts on Dunedin*, 2010

[3] The other three areas identified were; 'the lower Taieri Plain, especially Dunedin Airport;' 'populated estuaries along the Pacific coast;' and, 'conservation lands of upland regions.'

DISCUSSION

From 'South Dunedin' to 'Harbourside and South City'

Following confusion over what part of the city was covered by 'South Dunedin' for the purposes of the climate change adaptation pilot, the study area is now referred to as 'Harbourside and South City' (see Map 1) and includes all of 'the South Dunedin urban area' hotspot and some of the 'harbourside shoreline.'

Map 1 – Harbourside and South City study area

Assessing the available protection options for Harbourside and South City

Last year, the Council commissioned consultants Beca to identify potential solutions to protecting South Dunedin from the impact of sea-level rise. This work is now complete and the full report is attached (Attachment 2).

The study looked at four potential sea-level rise scenarios (using the Mean Sea Level in 1990 as a base level) – three taken directly from the Council's Climate Change Predictions Policy and one outlier scenario:

- Scenario A: +0.3m (approximately 2040)
- Scenario B: +0.8m (minimum forecast for approximately 2090)
- Scenario C: +1.6m (maximum forecast for approximately 2090)
- Scenario D: +2m (outlier)

At the beginning of this work in 2013, the current Council sea-level rise scenarios were tested against the latest thinking from the Intergovernmental Panel on Climate Change (IPCC) and were found to be consistent with that thinking. The scenarios will need to be updated to reflect the findings of the IPCC's Fifth Assessment Report once the Ministry for the Environment (MfE) updates its guidance. MfE's update will be based upon work currently being undertaken by the National Institute of Water and Atmospheric Research (NIWA) downscaling the global climate models to get projections for the New Zealand region.

Different options to defend the Harbourside and South City were explored as part of this work, and more detail is provided in the full report. The principal initial threat to the area is rising groundwater, forced up by rising sea level. In response to this, the solutions investigated to defend the area principally involve the management or control of groundwater levels to maintain the current status quo. It should be noted that this would not solve existing issues known to be the result of high ground water.

The recommended strategy identified by Beca is to incrementally install engineered protection solutions as the sea-level rises:

- By the time the mean sea level has risen 0.3m above 1990 levels, localised pumped drainage systems would be required to protect low-lying areas in Tainui and two other locations in the South City. The rough order capital costs for these works is assessed to be $10.3m.

- By the time the mean sea level has risen 0.8m above 1990 levels, it would be necessary to intercept incoming water at the coastal and harbour perimeter of the South Dunedin Aquifer before it reaches the aquifer and forces its level up. The recommended pumped well system would maintain the current drainage flow from the aquifer to the coastal and harbour fringes. Stormwater drainage at the lowest point in the Harbourside area (Lower St Andrew Street) is likely to require a pumped solution at this stage. Areas on the harbour fringe either side of the Harbour Basin will also become susceptible to direct inundation and require ground levels to be raised in a number of locations including along Portsmouth Drive. The rough order capital costs for these works are $65.1m.

In order to have the necessary defences in place in time, the protection works outlined would need to be planned and implemented before the associated sea-level is reached. The protection system as a whole would need to be progressively augmented as sea-level continues to rise – at a continually increasing cost.

The work set out in the report is based on some significant assumptions, including:

- groundwater is at a constant level across the aquifer and will rise in a linear manner in-line with sea-level rise;
- the Middle Beach dune system will remain intact – the cost of maintaining the dunes is not included in the rough order costs; and,
- the majority of the required protection infrastructure would be located in road reserve - as such, no allowance has been made for land purchase.

The report does not include any costs that might occur following settlement and land consolidation as a result of the protection work to dewater the area.

Further work will be required to move forward from this high-level 'in principle' stage. The report specifically identified the need for further information on the nature and behaviour, including the hydraulic conductivity of the South Dunedin aquifer. The Otago Regional Council (ORC) is continuing monitoring of the exact relationship between groundwater level and sea level in the Harbourside and South City area, and has installed a new monitoring bore in the area this year.

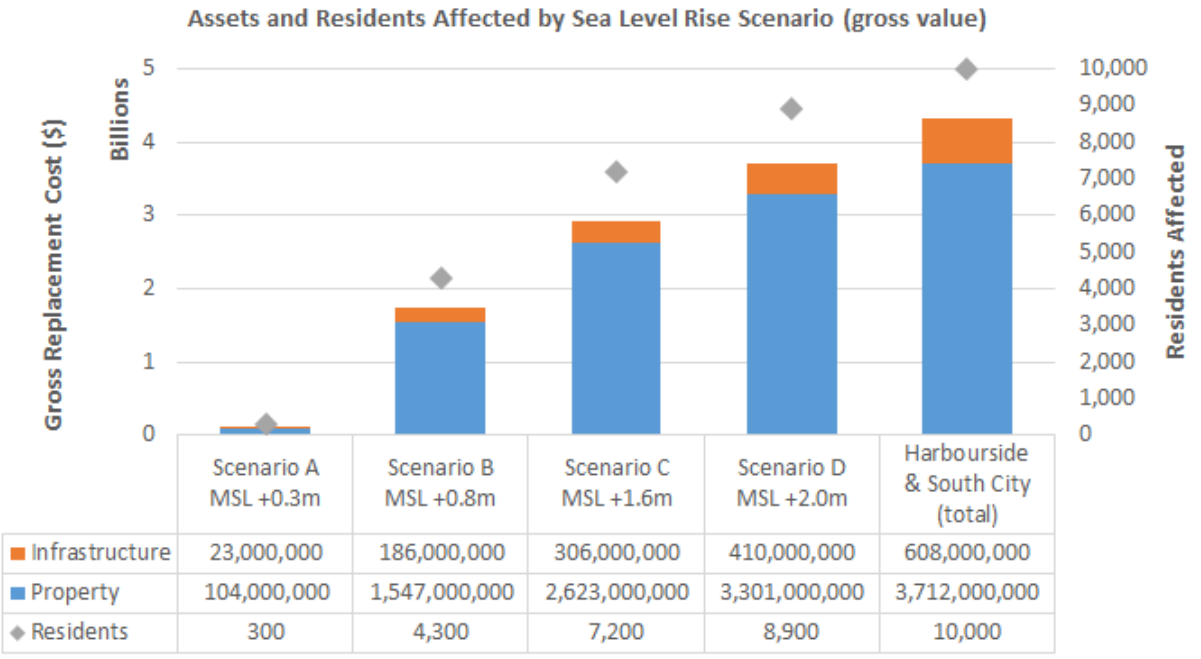
The existence of the Beca report will be included in the Land Information Memorandum for any property within the Harbourside and South City study area as shown in Map 1 from Friday 18 July 2014.

Placing a value on the Harbourside and South City 'asset'

The Council also commissioned consultants Rationale Ltd (Rationale) to place a value on the Harbourside and South City 'asset' by estimating the total value of key assets in the area (whether privately owned or owned by the Council). The purpose of the valuation is to better enable conversations with the community about the options for climate change adaptation and inform certain aspects of any future cost-benefit evaluation. The valuation also highlights the magnitude of the challenge presented by sea-level rise. An overview of the results can be seen in Figure 1 below.

To undertake the valuation of Harbourside and South City, Rationale Ltd: defined the asset types to include in the valuation; identified the specific datasets and asset attributes required for the valuation; collected the datasets and calculated the rough value of the Harbourside and South City asset, establishing the proportion of assets under threat from the same four sea-level rise scenarios as were used for the work undertaken by Beca (set out above).

The valuation includes the following asset types: water supply, wastewater and stormwater, roading, property (including private property), sport, recreation and leisure (excluding beaches), power, rail and telecommunications.



	Scenario A MSL +0.3m	Scenario B MSL +0.8m	Scenario C MSL +1.6m	Scenario D MSL +2.0m	Harbourside & South City (total)
Infrastructure	23,000,000	186,000,000	306,000,000	410,000,000	608,000,000
Property	104,000,000	1,547,000,000	2,623,000,000	3,301,000,000	3,712,000,000
Residents	300	4,300	7,200	8,900	10,000

Figure 1 – Gross Replacement Cost ($) at different sea-level rise scenarios for the Harbourside and South City area

Rationale's work also involved developing the metrics needed to carry out a rapid cost-benefit analysis of the suite of available options for climate change adaptation. This is still being worked through by Council staff and will be presented to the Council once it is more developed.

National work

The Council is collaborating at the national level on climate change adaptation where possible. This includes both informally sharing approaches and insights with a number of other New Zealand councils, and more formally through interactions with central Government and with research institutions. Three of these are outlined in more detail in Attachment 3.

Other Council activity in the climate change adaptation space

This report does not cover other work on climate change adaptation being led by other teams within the Council. This includes work by:

- Water and Waste Services – the implications of climate change are considered in all project planning;
- Parks and Reserves – particularly in relation to beach and coastal reserve management in light of climate change; and,
- City Development – consulting on the approach to natural hazards in the Second Generation District Plan.

NEXT STEPS

Technical work

There is key technical work that now needs to be completed for Harbourside and South City over the next year, including:

- further development of the metrics needed to enable a robust cost-benefit analysis of potential options; and,
- exploring the available non-protection options.

The ORC is committed to working collaboratively with the Council on matters to do with Harbourside and South City and the area's vulnerability to natural hazards. This will include further monitoring of the exact relationship between groundwater and sea level.

Community engagement

There is a strong evidence base supporting the need to engage with the community when it comes to climate change adaptation. The decisions made to manage the effects of sea-level rise in Harbourside and South City are likely to be some of the most significant the city will make in adapting to climate change over the next hundred years. These decisions will affect not only the residents and property-owners in the Harbourside and South City area but the city as a whole.

The technical work to improve the understanding of the challenges and the options will be ongoing, but the Council now has some of the information needed to begin community engagement on this issue. This engagement is likely to begin over the next year to ensure residents understand what is currently known about the climate change impacts for the Harbourside and South City area and where the Council is positioned with exploring the options. The goal of this work is to support informed discussion around the long-term plans for the city in being prepared for climate change impacts. At this point, it is planned to make use of the wide-range of existing groups and organisations around the city to enable Council staff to begin to raise awareness of what is being considered and investigated. Engagement on climate change adaptation is likely to be an ongoing process, supporting and feeding into decision-making.

Resourcing

The next steps outlined in this report are resourced through the 2014/15 budget. However, work carried out to date around the Harbourside and South City area has been necessarily high-level and investigative. To move from this point to more detailed plans and costings of the different options for mitigating the risk of sea-level rise in the study area is likely to require further resources. Staff propose to provide the Council with a report outlining the resource requests for the next ten years for consideration as part of the Long Term Plan 2015/25 process.

CONCLUSION

Climate change adaptation work is likely to be ongoing over the coming years, as the science is further refined and as approaches to climate change are developed globally. Staff will keep the Council updated as different aspects of this work are carried out and the involvement of Elected Members will become critical as community engagement on this issue ramps up.

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Date report prepared: 4 July 2014

Attachments

1 Dunedin City Council, Climate Change Predictions Policy (2011)

2 Beca Ltd, *Assessment of Options for Protecting Harbourside and South City from Direct Impacts of Sea Level Rise*, July 2014

Please note Attachment 2 has been sent out under separate cover.

3 National climate change work the council is involved with

ATTACHMENT 3 – NATIONAL CLIMATE CHANGE WORK THE COUNCIL IS INVOLVED WITH

Climate Change Impacts and Implications research programme

The Council is one of a number of councils around the country involved in a four-year, cross-disciplinary, multi-university research programme on 'Climate Change Impacts and Implications' (CCII)[4]. In December 2013, as part of this research, the Corporate Policy Team Leader participated in a workshop at Victoria University exploring local government climate-sensitive decision-making.

There are advantages in linking to this kind of research: doing so enables the Council to access cutting-edge research and best practice; and, this interaction enables the academics to discover what is currently happening in terms of climate change adaptation at the 'coal face,' focusing their research on the trickier aspects of climate change adaptation and governance.

The researchers may come to some of the Council's future meetings on this issue and it is also hoped that they will continue to present their research outcomes to the Council over the next three years of the research programme.

National Infrastructure Unit

The Council has been talking with the National Infrastructure Unit (NIU), which sits within the Treasury and which has expressed an interest in collaborating with the Council on some aspects of the climate change adaptation work going forward. The key areas the NIU and the Council have identified for further discussion and potential collaboration are:

- cost-benefit analysis of climate change adaptation options;
- work to address the difficulty of putting dimensions around the social metrics;
- Treasury's promotion of the Living Standards Framework[5] and trialling of some aspects of this; and,
- Infrastructure resilience work

Forging a closer relationship with the NIU, which is increasing its work around the resilience of critical infrastructure in New Zealand, will be useful for the Council as there will be possibilities to access their resources and networks. NIU staff have also been introduced to both our Water and Waste Services Asset Manager and our City Development Manager, as the work of the NIU may interact with some of the Council's other functions.

Ministry for the Environment

The current Ministry for the Environment (MfE) guidance manuals[6] for local government on adapting to climate change include information based on the climate projections associated with the IPCC Fourth Assessment Report (2007). This information has now been superseded by the results set out in the Fifth Assessment Report and need to be updated. NIWA is currently working to downscale these global climate models to get projections for New Zealand. This is being done as part of the CCII project already discussed above. The work is considerable and is expected to be complete toward the end of the year.

As well as the climate projections, the guidance manuals have a lot of information about planning. This year MfE is reviewing those publications and has indicated a wish to talk to stakeholders about the usefulness of the existing documents. For example, are the projections, or the planning guidelines more useful? Who has used the publications, and at what stages of the planning process? What has been most useful, and what could be changed? MfE is in touch with Council staff about a visit to Dunedin to have discussions with key people in the city including Council staff, stakeholders and other experts. A decision has

[4] More information about this research programme is available at http://ccii.org.nz/about-ccii/
[5] More information on Treasury's Living Standards work is available at http://www.treasury.govt.nz/abouttreasury/higherlivingstandards
[6] Ministry for the Environment guidance for local government on adapting to sea-level rise can be found at http://www.mfe.govt.nz/issues/climate/adaptation/sea-level-rise.html

yet to be taken about whether the guidance publications will be revised following this review and this depends on other developments around planning for natural hazards in general, which is also being worked on this year.