

Coastal Hazards Plan Change

Flooding and erosion risk classification fact sheet

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Christchurch
City Council 

The Christchurch City Council needs to make changes to its District Plan to avoid new developments being exposed to coastal hazards to ensure Council meets its legal obligations under the Resource Management Act. A risk-based approach to the coastal hazards plan change has been proposed in the Issues and Options paper. This factsheet supports the Issues and Options paper and provides more information on how risks were classified in the proposed risk-based approach.

What is a risk-based approach and why was risk classification needed?

Using a risk-based approach allows us to manage activities according to the level of risk in that location. This approach recognises that the level of risk is not the same in every location and that a range of restrictions should therefore apply to reflect the circumstances in different areas.

A hazard assessment provides the base information about the magnitude and likelihood of different hazard scenarios, but doesn't consider the impact on communities that live in these areas and the level of risk these hazards pose. In order to inform this risk-based approach, further analysis of risk classification was required to identify what thresholds would be appropriate for defining the coastal hazard categories for land use planning. This work was undertaken by Jacobs on behalf of Council and is outlined in detail in the technical report: [Risk Based Coastal Hazard Analysis for Land-use Planning, 2021](http://www.ccc.govt.nz/plan-change-12) (www.ccc.govt.nz/plan-change-12)

Maps of these areas can be found at www.ccc.govt.nz/plan-change-12

What data was used for the risk classification?

The 2021 Coastal Hazards Assessment by Tonkin + Taylor provided the base information about the potential effects of coastal erosion and flooding, and how this might change over time with sea level rise. A multi-disciplinary team at Jacobs conducted further analysis on the data from this assessment for the purpose of identifying how this could be classified into different areas of risk for the plan change.

How much sea-level rise is assumed in the risk classification?

Council has a requirement to plan for coastal hazards over at least a 100-year timeframe¹. It is also important that we understand the more immediate (and therefore certain) impacts of sea-level rise. For this reason two key sea-level rise scenarios were selected from those available in the Coastal Hazards Assessment for the purpose of the plan change:

- 60cm of sea-level rise (could occur by 2080, and even in most optimistic scenarios is expected by 2130), and
- 1.2m of sea level rise (could occur by 2130)

These scenarios reflect the closest sea level rise to the more conservative global projections as recommended by the Ministry for the Environment for the management of new development².

Council acknowledges it is important to understand the risk posed by both increments of SLR and to ensure the proposed management of these risks adequately considers the relative certainty of the scenario.

Coastal flooding risk classification

Three factors of coastal flood risk were used in the development of potential flood risk zones:

- **The likelihood of flooding.**

A 1 in 100 year flood event (1% chance of it occurring in any year) has been used as this is likely to occur over the lifetime of a building and likely to occur over the planning timeframe set out in the New Zealand Coastal Policy Statement³.

- **The consequence of flooding.**

The depth and velocity of flooding that has the potential to cause damage, injury or harm were considered. The depth thresholds used are based upon international guidance and include consideration of the safety of people in and around exposed buildings⁴. Water velocity was determined to not be a major factor based upon the relatively low (<0.5m/s) speed of water generally observed in Christchurch, therefore a 'still water' threshold has been used.

- **The change in likelihood and consequence as sea levels rise.**

Two scenarios have been considered in the plan change, 60cm of sea-level rise by 2080 and 1.2m of sea-level rise by 2130. These scenarios are most aligned with MfE projections over 50 and 100 year timeframes. From this, four risk categories of coastal flooding risk have been identified:

In areas where there is a higher degree of confidence that the hazard will occur and that the effects will be of a high consequence (such as over 1.1m of flooding with 60cm of sea level rise), this poses a high risk. Areas which could be impacted by similar depths of flooding, but only if sea levels rise much higher, is a less certain outcome, so at this stage it may only pose a medium risk.

Table 1: Recommended definitions for coastal flood risk mapping using the Coastal Hazards Assessment coastal flooding depth data (1% annual exceedance probability)

Possible District Plan	Flood depths with 60cm SLR	Flood hazard with 1.2m SLR
Very low	Dry No consequence	Depth is less than 50cm Low consequence, lower certainty
Low	Depth is less than 50cm Low consequence, higher certainty	Depth is between 50cm and 1.1m Moderate consequence, lower certainty
Medium	Depth is between 50cm and 1.1m Moderate consequence, higher certainty	Depth is over 1.1m High consequence, lower certainty
High	Depth is over 1.1m High consequence, higher certainty	Depth is over 1.7m Very high consequence, lower certainty

¹New Zealand Coastal Policy Statement 2010

²MfE guidance –Coastal hazards and climate change: Guidance for local government 2017

³New Zealand Coastal Policy Statement – Policy 25: In areas potentially affected by coastal hazards over at least the next 100 years.

⁴Australian Rainfall and Runoff: A Guide to Flood Estimation & Framework and Guidance for Assessing and Managing Flood Risk for New Development, UK Defra/ Environment Agency Flood and Coastal Defence R&D Programme.

Coastal erosion risk classification

The main consideration for erosion in the context of the plan change was likelihood, as the consequence will always be high, this is because as land is eroded away it becomes unusable.

The definition of appropriate erosion likelihoods requires consideration of sea-level rise, timeframes, and the probability of occurrence across areas of different coastal morphology (for more information on how coastal morphology was taken into account for the analysis of erosion, check out the 2021 Coastal Hazard Assessment). This helps us to understand: *x probability that erosion will occur within y timeframe under z sea-level rise scenario*. From this the following categories of erosion risk have been identified:

Table 2. Recommended definitions for coastal erosion risk mapping using the Coastal Hazards Assessment coastal erosion data

Ōtautahi Christchurch Urban area open coast	A) High Hazard Zone covering the whole current beach-dune width.
	B) Low Hazard Zone to a landward limit defined by the 10% probability erosion distance with 1.2 m SLR by 2130 and an additional area required for “future healthy beach factors”.
Ihutai Avon- Heathcote Estuary	A) High-Medium Hazard Zone to a landward limit defined by the 66% probability erosion distance with 0.6 m SLR by 2080, with consideration of a consistent generic width of 20 m.
	B) Low Hazard Zone to a lowland limit defined by the 10% probability erosion distance with 1.2m SLR by 2130, with consideration of a consistent generic width of 20 m
Banks Peninsula Beaches and bays	A) For Probabilistic assessment cells, the 10% probability of erosion distance for 1.2 m SLR by 2130, and
	B) For deterministic assessment cells, the limit of the areas susceptible to coastal erosion (ASCE) from the 1.5 m SLR by 2130 scenario, which has an assumed probability of 1-5%.
Banks Peninsula Coastal cliffs	For the coastal cliffs of the Banks Peninsula, Lyttelton Harbour and Akaroa Harbour; a single Banks Peninsula Cliff Erosion Zone of 20-30 m width as defined by the generic T&T cliff erosion setback
Hard-edges	For assessment cells along the southern shore of the Avon-Heathcote estuary, Sumner Beach, Lyttelton Port and Akaroa, where there are land reclamation and substantial hard protection structures; a single High Hazard Erosion Zone hazard zone with a generic width in the order of 20 m.

How will these risk zones be used?

The proposed risk zones are represented by indicative lines on maps that will be used for different district plan management areas. These are subject to further refinement. The Coastal Hazards Plan Change is about managing new development, changes of use and subdivision proposed in the future. Reducing risks to existing land use activities and development will be considered separately through the Coastal Hazards Adaptation Planning programme and will rely on the base coastal hazards data from Tonkin + Taylor.

You can find more information about the Coastal Hazards Adaptation Planning programme at ccc.govt.nz/adaptation-planning