

Moray Coastal Change Adaptation Plan

Burghead to Cummington Coast

Final Report

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Contract

This report describes work commissioned by Will Burnish, on behalf of Moray Council, by a letter dated 9 August 2022. Moray Council’s representative for the contract was Will Burnish. William Mortimer, Katie Corbett, and Doug Pender of JBA Consulting carried out this work.

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Purpose

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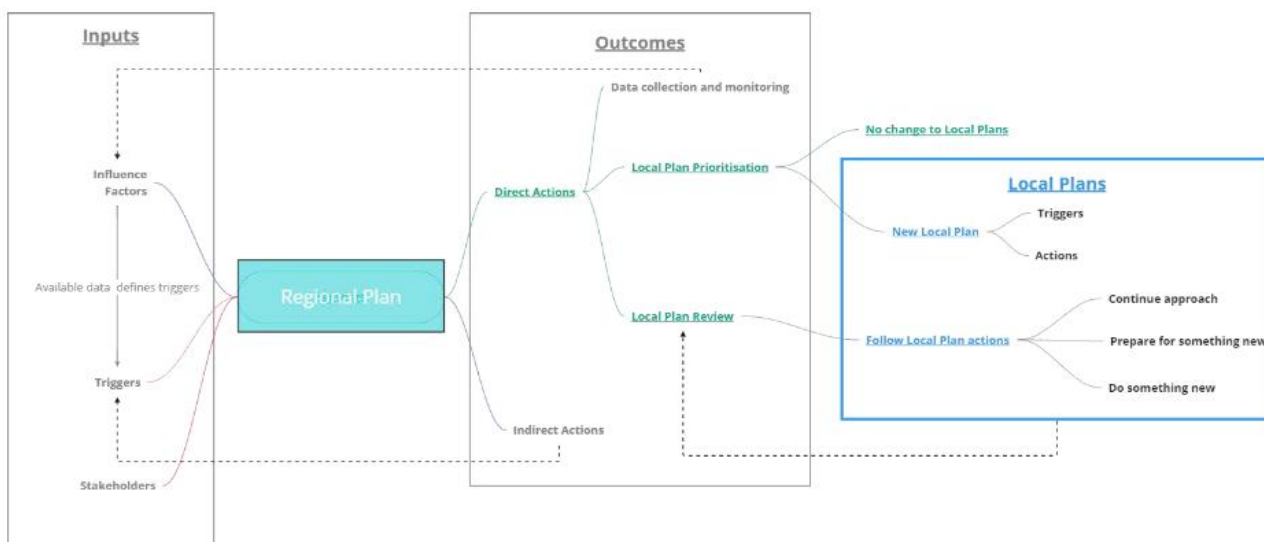
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Executive summary

The report documents the Coastal Change Adaptation Plan (CCAP) for the Burghead to Cummington Coast Community Area (CA) in Moray. It forms one of the eleven Local Plans, for the Moray Council region.

It aligns with the wider Regional Plan¹ and forms the highest level of detail of the overall Coastal Change Adaptation Planning process adopted by Moray Council.



The CCAP provides an overview of the coastal flood and erosion risks to Burghead to Cummington Coast CA, which are used to underpin development of possible Adaptation Pathways for this community. These are presented, along with a framework to support proactive coastal risk management, enable implementation of climate change adaptation actions, and link with climate resilient development planning along Moray’s coast.

The Plan has been developed using available datasets from Moray Council, SEPA, and the Dynamic Coast Project. It aims to directly support statutory and non-statutory Moray Council policies, plans, and strategies and aligns with key coastal climate change adaptation guidance and resources within and beyond Moray Council.

This Plan documents the Phase 0 starting point of adaptation, meaning that no definitive preferred Adaptation Pathway and associated Action Plan have been developed. Rather this Plan sets out a framework and process for Moray Council to implement to effectively plan and support sustainable adaptation.

To develop Adaptation Pathways, the coast of the CA was classified into Coastal Management Units (CMUs) defined by 1) classification of coastal landform type, and 2) risk associated with coastal flooding and erosion. A total of seven CMUs were identified, and associated Adaptation Pathways were developed for each CMU.

¹ IRR-JBAU-XX-XX-RP-MO-0001-S4-P03-Regional_Plan



The framework is to be delivered through the defined Implementation Plan by defining Triggers and setting associated Actions against these. A single Implementation Plan is applied to the entire CA, where the outcome of the process determines what direction will be followed within the Adaptation Pathway. The Implementation Plan has three key stages:

- 1) Monitoring and Triggers
- 2) Actions
- 3) Outcomes

Trigger points are identified, and set following a risk-based approach and will be identified through repeat monitoring of available data that informs coastal flood and erosion risk.

Realisation of Triggers signal a need for review or change of the Adaptation Pathway. Actions bridge the gap between Triggers and Outcomes and define what processes need to be implemented before an appropriate Outcome is identified. Adaptation interventions are potential measures that can be applied. There are four possible categories:

- 1) No intervention
- 2) Enhance natural features
- 3) Protect
- 4) Create Space

A set of Phase 0 Actions have been identified, that require immediate attention because of Triggers being met in this iteration of the Burghead to Cummington Coast CCAP. Furthermore, this initial stage of the adaptation planning process has identified several knowledge gaps and opportunities for activities to be undertaken upfront to support coastal change adaptation at Burghead to Cummington Coast.

The current iteration of the Burghead to Cummington Coast CA plan is at Phase 0. Triggers met in Phase 0 and associated Actions for each CMU are summarised in the table below. These will be delivered during the first cycle.

Full details of the Phase 0 Actions are included in Appendix C and documented in Section 4.4.

CMU	Trigger	Action
1	No current Triggers	No current Actions
2	No current Triggers	No current Actions
3	No current Triggers	No current Actions
4	No current Triggers	No current Actions
5	No current Triggers	No current Actions
6	Flooding threshold exceeded	Increase monitoring and plan for assessment.
7	No current Triggers	No current Actions

As well as Triggers and Actions that correspond directly to the Adaptation Pathway and specified CMUs, Proactive Actions that support the whole of the Burghead to Cummington Coast are summarised below:

- 1) Work with landowners to ensure responsible management of Roseisle Dunes and Forest.
- 2) Establish coordinated and consistent monitoring plan for Natural coast (CMU 4 and 7).
- 3) Develop modelling framework to better understand unknown hazards.
- 4) Adaptation and resilience workshop with local community and stakeholders.
- 5) Identify landownership and safeguarding space. This should link with Regional Proactive Action to identify and define local opportunities.

Again, these will be delivered during this first cycle.

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Abbreviations

CCAP	Coastal Change Adaptation plan
CA	Community Area
CMU	Coastal Management Unit
DC	Dynamic Coast
mAOD	meters Above Ordinance Datum
MHWS	Mean High Water Spring
NFRA	National Flood Risk Assessment
NRP	Non-residential Property
RCP	Representative Concentration Pathways
RP	Residential Property
SEPA	Scottish Environment Protection Agency
SLR	Sea Level Rise

Glossary

Accretion*	The build-up of sediment resulting in the seaward movement of the coast/ Mean High Water Springs.
Actions*	A plan or policy option that promotes an adaptive approach to coastal change that makes use of long term or resilient solutions such as preserving natural features.
Action Plan*	The proposed strategy or course of action to be taken depending on trigger point reached.
Adaptation*	The adjustment in economic, social or natural systems in response to actual or expected climate change, to limit harmful consequences and exploit beneficial opportunities.
Adaptation Pathways*	A flexible way of managing future uncertainty by planning for multiple scenarios without rigid timelines responding to the nature of future changes as they unfold.
Asset*	An item, such as a building, that is deemed to have an economic, social, or cultural value (or combination of).
Decision point*	A management action based on a trigger being reached.
Erosion*	The removal of sediment resulting in the landward movement of the coast (Mean High Water Springs)
Hard coast*	Coast that is comprised mainly of materials resistant to erosion such as hard rock types or artificial structures.
Implementation Plan	The framework developed in this first iteration, or Phase 0 of the Adaptation Pathway to support Moray Council in the development of Action Plans for each CMU.
Implementation Plan Actions	Actions that Moray Council will deliver in response to a Trigger being met and will determine the Outcome of the phase of the Adaptation pathway.
Outcomes	Outcomes of the Implementation Plan determine the current path of the Adaptation Pathway.
Soft coast*	A coast composed of unconsolidated sediments, which is not inherently resilient to erosion, but relies on the balance of natural processes to maintain its shape in response to storms and everyday processes.
Triggers*	Either a physical process or an enabler/inhibitor that when reached or a threshold crossed.

*Term definitions from Scottish Government Coastal Change Adaptation Plan Guidance².

² https://www.dynamiccoast.com/files/ccapg_2023feb.pdf

1 Introduction

1.1 Coastal Change Adaptation Planning in Moray

Our climate is changing and throughout history, our coast has responded to changes in sea level, storms, and other climate parameters. This means that the current position of Moray's coast is not fixed but is dynamic and will continue to evolve as our climate changes.

We can no longer use traditional, engineered, coastal risk management approaches in isolation to protect society against these risks. Instead, we must, as a society, become more resilient and adapt to our changing coast through combined coastal risk management with climate resilient development planning on land near the coast. To enable this, we must be proactive in making combined coastal risk and land management decisions which provide long-term space for the coast to naturally respond to coastal climate change risks.

Developing and implementing an Adaptive Framework now to address how society responds to the current and future risks can help to reduce costs and negative impacts such as assets eroding into the sea or suffering repeat, frequency flooding. More positively, a proactive approach to adaptation and climate resilient development planning now can generate wider benefits and opportunities for coastal communities and the ecosystems which sustain and support them.

The Coastal Change Adaptation Plans (CCAPs) provide a key first step in this process; they are a practical mechanism to enable proactive engagement with and involvement of communities to co-develop a shared vision for long-term societal resilience to coastal climate change risk and impacts.

To support this adaptation journey in Moray the coast has been subdivided into Community Areas (CAs) (Figure 1-1). Burghead to Cummington is one of eleven CAs recognised in the Regional Coastal Change Adaptation Plan (CCAP). The geological make-up of the Burghead to Cummington coast is varied, the bedrock comprises of the new red sandstone supergroup, with superfacials overlain being a combination of blown sand and till. The coastal types span sand beach, urban, and rock cliffs classifications. The coastline is likely susceptible to erosion and into the future, the Dynamic Coast has projected as much as 100 m of shoreline retreat could be realised by 2100 at the north end of Burghead Bay. In addition, Burghead Harbour is at risk from coastal flooding, which will increase in the future with the addition of climate change pressures on storm frequency and water levels.

This provides the justification for a more detailed, local, CCAP which is contained in this document.

The entire Coastal Change Adaptation Plan for Moray is contained within a series of documents, the following should be consulted alongside this CCAP to provide context on the overall process.

- IRR-JBAU-XX-XX-RP-MO-0001-S4-P03-Regional_Plan
 - Provides the region wide plan and process to deliver coastal adaptation across Moray.
- IRR-JBAU-XX-XX-RP-MO-0007-S4-P03-Coastal_Change_Adaptation
 - Provides information on the concept of coastal change adaptation and how this has been applied to the Moray Coastal Change Adaption Plan.

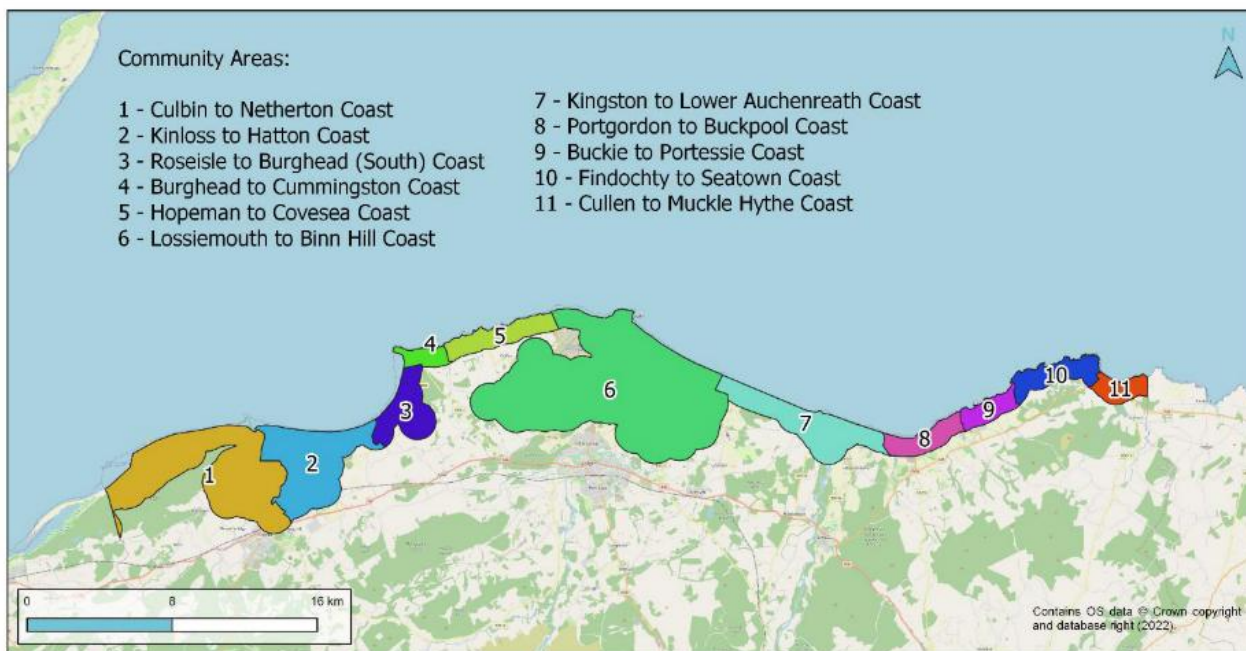


Figure 1-1: Extent and location of CAs within Moray

1.2 What is a Local CCAP?

A Local CCAP follows the same principle as the Regional CCAP but is assessed and developed at a finer level of detail for a specified CA. A local CCAP is developed where a CA has been identified as a high priority, based on risk, development, management, and socio-economic Influence Factors (see Regional Plan for more details). It divides the coast of the CA into individual Coastal Management Units (CMUs) and presents Adaptation Pathways for each. See section 2.2 for more details on CMUs and CMU classification.

1.3 What are adaptation pathways?

Adaptation Pathways are flexible tools that can be used by local authorities, politicians, local businesses, and residents to make current and future decisions across all involved sectors to accommodate coastal change and associated uncertainty.

As well as the traditional management, they should identify opportunities to work with natural processes, enhance the environment and include necessary supportive steps to **create space** (e.g. accommodate erosion through land safeguarding) in preparation for inevitable future sea level rise and associated increases in erosion and flooding.

1.4 What do adaptation pathways do?

Adaptation Pathways aim to identify climate resilient risk management and development pathways for each or CMU; the phases in the pathways, provide flexibility for decisions at various points on the pathway to be modified dynamically through time.

Triggers are used in Adaptation Pathways to signal when the current management approach should be reviewed, and possibly changed, in response to updated information or change of circumstance i.e., risk has increased.

1.5 What is the focus of the Local CCAP?

Adapting to coastal and climate change requires two parallel streams:

1. Land-based initiatives to **prevent** new future risk.
2. Management initiatives to **reduce** current and future risk.

The Local CCAP presented here **focuses only the management initiatives** but, only by considering these in parallel with those that are land-based will result in a sustainable adaptation journey for Moray. This should identify both the need and practical steps required to safeguard land to support where areas of retreat may be considered in the future.

1.6 Where are we on the adaptation journey?

The Local CCAP presented here focuses only the management initiatives but, only by considering these in parallel with those land-based will result in a sustainable adaptation journey for Moray. This should identify both the need and practical steps required to safeguard land to support where areas of retreat may be considered in the future.

The aim of this first CCAP is to consolidate our understanding of the physical risks and how these interact with communities and their assets to identify the present day and future hazards of our changing coast for Burghead to Cummington. It then identifies and promotes a process that, when implemented by Moray Council, will support community adaptation to coastal change.

The adaptation journey is a multiphase, multiyear process and aims to transition communities into a more sustainable and resilient future. We are currently at **Phase 0**, meaning that no definitive preferred Adaptation Pathway and associated Action Plan have been developed.

1.7 What is the Phase 0 Adaptation Framework?

The overall aim of the framework set out in this Local CCAPs is to:

Guide Moray Council towards development of detailed Adaptation Pathways and associated Action Plans for the Burghead to Cummington CA.

To achieve this goal the following objectives have been set for Phase 0:

- Identify and characterise local CMUs within the CA suitable for development of future Adaptation Pathways.
- Present coastal flood and erosion risk for each CMU.
- Develop an Implementation Plan to be used by Moray Council to support adaptive decision making, future action planning and evaluation of adaptation options.
- Identify CA and CMU specific Triggers that will influence adaptation decision making.
- Identify and set Proactive Actions that will support delivery of the CCAP in each CMU.
- Inform and support the Local Development Plan⁵ and Local Planning Policy. These should be implemented in parallel to avoid future risk by making space for change.

1.8 How has this framework been developed?

The approach to coastal change adaptation in Moray is presented in the Regional Plan which distils the Scottish Government guidance³ into **four key pillars of adaptation** (Figure 1-2). Development and implementation of the CCAP Implementation Plan should align with these principles.

³ Scottish Government (2023) Coastal Change Adaptation Plan Guidance – Interim
https://www.dynamiccoast.com/files/ccapg_2023feb.pdf

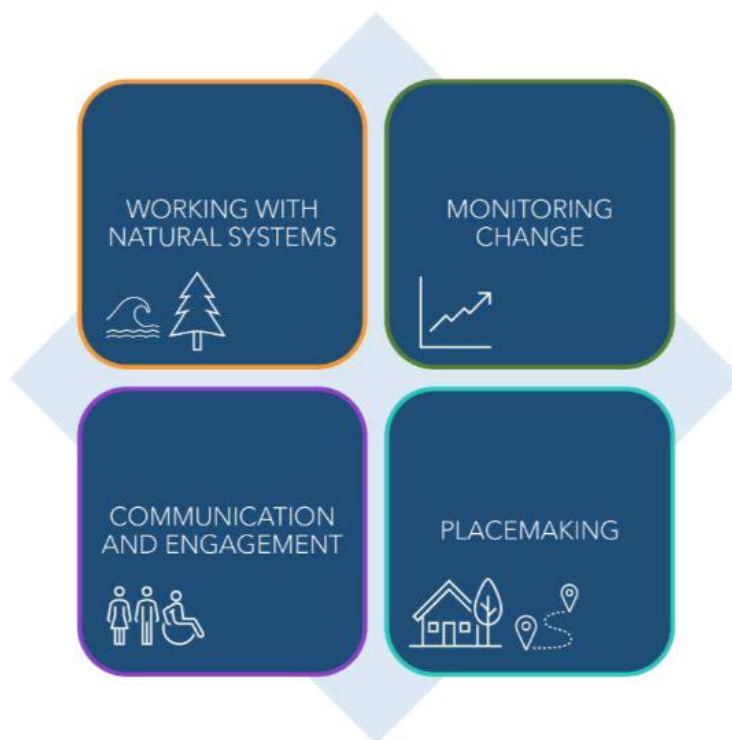


Figure 1-2: Four pillars of coastal adaptation for Moray

1.9 How does the Local CCAP link to the Regional CCAP?

The Regional CCAP links to the Local CCAP in the following ways:

1. Defines the **prioritisation** of Local CCAP with risk, development, management, and socio-economic Influence Factors (see Regional Plan for more details).
2. Sets wide **Proactive Actions** that, when implemented, should be used to support Local CCAP Action Plans.
3. Provides the links between the **land-based** components of the Adaptation Planning process. This includes links with the LDP, and delivery of necessary regional actions required to effectively support and plan for adaptation at a local level e.g. land safeguarding.

2 Plan Overview

2.1 Plan Area and Characteristics

The Burghead to Cummington Coast CA covers an area of ca. 2.6 km² and is located between the Roseisle to Burghead CA and Hopeman to Covesea CA (Figure 1-1). The CA is predominantly made up of the town of Burghead, with a section of sandy beach to the south and rock cliff to the east. The CA sits within a SEPA Potentially Vulnerable Area (PVA⁴ (Figure 2-1).

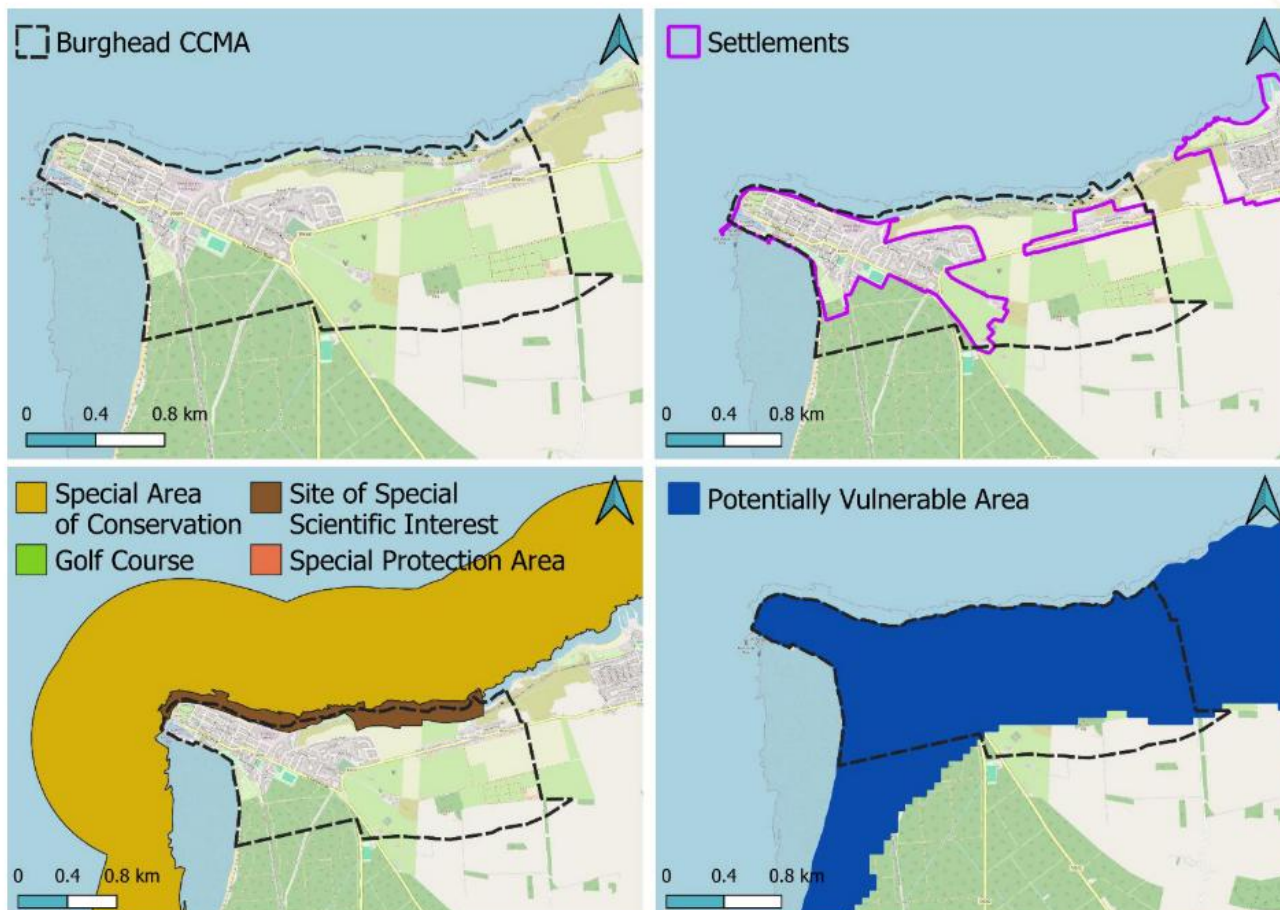


Figure 2-1: Burghead to Cummington Coast CA, showing the CCMA, settlements, the potentially vulnerable area, and special consideration areas (clockwise from top left)

Settlements:

The Burghead to Cummington Coast CA includes the settlements of Burghead and Cummington. Burghead has a population of approximately 1,945 with 835 households and Cummington has a population of approximately 180 with 75 households⁵. The Moray Council Local Development Plan⁶ has identified designation areas for specific land use in these settlements and there are no rural groups.

4 Moray Council. 2016. Findhorn, Nairn and Speyside Local Flood Risk Management Plan. Section 2.4.4. <http://www.moray.gov.uk/downloads/file105636.pdf>

5 Moray Council. 2020. Moray Local Development Plan. Volume 2: Settlement Statements. http://www.moray.gov.uk/moray_standard/page_133431.html

6 Moray Council. 2020. Moray Local Development Plan. Volume 3: Rural Groupings.

Greenspace and Environment:

The entire coast of the CA is a designated Special Area of Conservation (SAC) and the north facing coastline of Burghead town is a Site of Special Scientific Interest (SSSI).

Special consideration areas:

The CA contains part of the Burghead to Lossiemouth Potentially Vulnerable Area 05/01 (PVA) as identified in the Nairn and Speyside Local Flood Risk Management Plan (LPD05)⁷. This PVA includes Burghead, and Cummington and continues eastwards to include Hopeman and the northwest part of Lossiemouth. The A941, B9040, B9135 and B9013 all pass through the area.

Habitats:

There are three key habitats within the Burghead to Cummington CA identified by Nature Scot (Figure 2-2). These include unvegetated mobile shingle, unvegetated sand, and Dunes.



Figure 2-2: Coastal habitats at Burghead to Cummington Coast as identified by NatureScot.

7 Moray Council. 2016. Findhorn, Nairn and Speyside Local Flood Risk Management Plan. <http://www.moray.gov.uk/downloads/file105636.pdf>

2.2 Coastal Management Units

To facilitate the development of this Local CCAP, the coast of the CA is classified into Coastal Management Units (CMUs) defined by:

1. Classification of coast type.
 - a. Natural – beaches, cliffs, dunes, saltmarshes, etc.
 - b. Built Structures – formal engineered structures.
 - c. Hybrid – combination of a and b.
2. Risk associated with coastal flooding and erosion.
 - a. Risk and Hazard
Assets present in CMU, which are at risk of flooding/erosion hazard.
 - b. Risk and unknown Hazard
Assets present in CMU, no data on flood/erosion risk available.
 - c. No Risk and Hazard
No assets present in CMU, but there is a flooding/erosion hazard.
 - d. No risk and no Hazard
No assets present in CMU, no flooding/erosion hazard.

Assets referred to in the risk classification include residential properties, key roads, and infrastructure.

The Burghead to Cummington Coast CA coast has been subdivided into seven CMUs (Figure 2-3). The CMUs are described below including a summary of the coastal change and flood risk. Full details of with each CMU are provided in Appendix A.



Figure 2-3: Burghead to Cummington Coast CMU divided coastal extents.

2.2.1 CMU 1: North Roseisle Beach - Natural

This unit is classified as natural coast and covers the the northern 350 m of Roseisle Beach, facing west into Burghead Bay. Here, the coastline is made up of a large sandy beach backed by established sand dunes which are themselves backed by Roseisle Forest. Along the toe of the dunes, at the head of the beach, are a series of large concrete blocks, relics from the wartime, intended as defences against beach landings alongside several pill boxes. Subsequent coastal retreat has left these blocks, and pillboxes, standing directly on the beach.

There is substantial retreat predicted by Dynamic Coast for this unit. The historical rate of retreat is estimated to have been 0.3 m/yr (from ca. 2003 to 2011). This rate is expected to increase up to 0.96 m/yr by 2050 and up to 1.76 m/yr by 2100. This will lead to an estimated retreat of 23 m by 2050 and 100 m by 2100.

There is no coastal flooding predicted by the SEPA flood maps for a 1-in-200-year and 1-in-200-year plus climate change events within this CMU.

2.2.2 CMU 2: Burghead Caravan Park - Built Structures

This unit is classified as defended by built structures due to the rock armour revetment that stretches along the unit frontage. In addition to the rock armour there is a continuation of the concrete block wartime defences present in CMU 1. The unit is approximately 300 m in length and encompasses the coastline in front of the Burghead Holiday Park and the residential area of Bridge Street in south Burghead. In front of the Holiday Park is a concrete slipway that extends from the coastline and provides access from Bridge Street to the beach.

There is no coastal erosion predicted by Dynamic Coast for this unit due to the coastal defence structures. Moreover, there is no apparent risk of coastal flooding predicted by SEPA for a 1-in-200-year and 1-in-200-year plus climate change events within this CMU.

2.2.3 CMU 3: Burghead Harbour - Built Structures

This unit is classified as defended by built structures due to a combination of vertical seawalls and a rock armour revetment which stretches along sections of the unit frontage. In total this unit comprises approximately 700 m of coastal frontage.

The unit consists of the south-southwest facing coastline of Burghead, including the frontage of the Old Railway Station Park, Burghead Harbour and outer seawall and the west facing wall of Burghead Harbour. The harbour entrance has a large groyne constructed to reduce siltation and maintain operational use of the harbour.

There is no coastal erosion forecast by Dynamic Coast for this unit due to the presence of built structures.

SEPA flood maps show that there is a current risk of flooding from 1-in-200-year and 1-in-200-year event plus climate change to assets within Burghead Harbour, including the carpark on Burghead Harbour Road and the minor road of Old Railway Station Park.

2.2.4 CMU 4: Burghead Museum - Natural

This unit is approximately 140 m of natural coastline along the west facing end of the Burghead peninsula. The coastline of this unit is predominantly rocky cliffs of the new red sandstone supergroup, with blown sand and till superfacials. Atop the cliff is the Burghead Fort and Museum as well as a hamlet of cottages.

There is no coastal erosion forecast by Dynamic Coast for this unit and there is no apparent risk of coastal flooding predicted by SEPA for a 1-in-200-year and 1-in-200-year plus climate change events within this CMU.

2.2.5 CMU 5: North Burghead - Built Structures

This unit is classified as defended by built structures due to the rock armour revetment along the frontage. The unit stretches for approximately 1 km along the northern coastline of

Burghead peninsula and is backed by residential housing, parkland, and the Burghead Malting Brewery site. Above the rock armour revetment is the Moray Coastal Trail, an important tourist amenity for the region.

There is no coastal erosion forecast by Dynamic Coast for this unit and there is no apparent risk of coastal flooding predicted by SEPA for a 1-in-200-year and 1-in-200-year plus climate change events within this CMU.

It should be noted however, that these maps do not include any representation of wave overtopping. This should be reviewed and considered to provide a more complete picture of coastal flood risk.

2.2.6 CMU 6: Seawall - Built Structures

This unit encompasses approximately 150 m of defended coastline by built structures. There is a vertical seawall along this unit frontage, at the top of a rocky shoreline. Behind the seawall is a residential cul-de-sac and the Moray Coastal Trail.

Despite the seawall being present, there is significant retreat predicted by Dynamic Coast for this unit. Information on how the structure has been incorporated into the Dynamic Coast analysis is not available. However, what this demonstrates is the beach is changing and the existence and condition of this structure is the main control on erosion risk in the CMU.

The historical rate of retreat is estimated to have been stable at 0 m/yr (from ca. 2003 to 2011). However, this rate is expected to increase to 0.4 m/yr by 2050 and up to 1 m/yr by 2100. This will lead to an estimated retreat of 7 m by 2050 and 44 m by 2100.

There is no apparent risk of coastal flooding predicted by SEPA for a 1-in-200-year and 1-in-200-year plus climate change events within this CMU. Again, these maps do not include any representation of wave overtopping.

2.2.7 CMU 7: Cummington Coast – Natural

This unit is classified as natural. It extends approximately 1.8 km in length, of complex natural coastline. Rock cliffs are fronted by several rocky platforms with numerous sandy pocket beaches interspersed along the unit. Behind the sandy pocket beaches are established sand dunes. Along the top of the cliff edge runs the Moray Coastal Trail. The village of Cummington is set-back from the cliff top by approximately 200 m.

There is substantial retreat predicted by Dynamic Coast at the pocket beaches. The historical rate of retreat along is estimated to have been 0.4 m/yr (from ca. 2003 to 2011). This rate is expected to increase up to 0.8 m/yr by 2050 and up to 1.4 m/yr by 2100, which could lead to an estimated retreat of 20 m by 2050 and 78 m by 2100.

SEPA flood maps show there is currently no identified risk from flooding to assets within this unit and this is not expected to increase when factoring for climate change.

2.2.8 CMU categorisation for local adaptation plan

Review of the characteristics and risk associated with each CMU led to the classifications summarised in Table 2-1. These were used to develop initial Adaptation Pathways, Triggers, and an associated Implementation Plan.

Table 2-1: Burghead to Cummington Coast CMU categorisation.

CMU	Coastal Type Classification	Risk Classification
1	Natural	No Risk with Hazard
2	Built Structures	Risk with Unknown Hazard
3	Built Structures	Risk and Hazard
4	Natural	Risk with Unknown Hazard
5	Built Structures	Risk with Unknown Hazard

6	Built Structures	Risk and Hazard
7	Natural	Risk and Hazard



3 Adaptation Pathways

Development of Adaptation Pathways for each CMU are based on the classification presented in Table 2-1. This aims to provide a flexible approach to adaptation that works towards a defined and desirable end outcome for the CMU and CA.

Details of this outcome are however, not defined at this stage, and will ultimately be dependent on monitoring changes to the following factors at the coast and on land adjacent to the coast:

- **Natural systems**
 - Habitat.
 - Greenspace.
- **Climate**
 - Climate change guidance.
 - SEPA flood maps or risk assessments.
 - Coastal flood occurrence.
 - Coastal erosion risk.
- **Risk exposure**
 - Change in defence condition.
 - Update to SEPA flood warning system.
 - Erosion risk buffer exceeded.
 - Flood risk threshold exceeded.
- **Socio-economics**
 - Changes of asset ownership.
 - Changes of land ownership.
 - Community pressures.
 - Tourism.

Adaptation Pathways for each CMU are presented in the following sections.

3.1 CMU 1, 4, and 7 Adaptation Pathways

CMU 1, 4, and 7 are all classified as natural coasts and have been assigned an adaptation pathway for natural coastlines with risk from erosion, flooding, or both (Figure 3-1):

- **CMU 1 = Natural with No Risk but with Hazard**
- **CMU 4 = Natural with Risk and unknown Hazard**
- **CMU 7 = Natural with Risk and Hazard**

Phase 0 of the adaptation pathway (1st column) is the current action undertaken by Moray Council in respect of these CMUs. Here this is **No Intervention**. This means that there will be no coastal and/or erosion risk management interventions during this phase.

For the adaptation pathway to move to Phase 1 (2nd column of potential actions) a pre-defined Trigger must be realised. Then, depending on the outcome of any Implementation Plan Actions, this may or may not result in a change to the management approach adopted for the CMU.

Consultation of the CCAP Implementation Plan (Section 4.1) will guide the process and ultimately the pathway to adaptation.

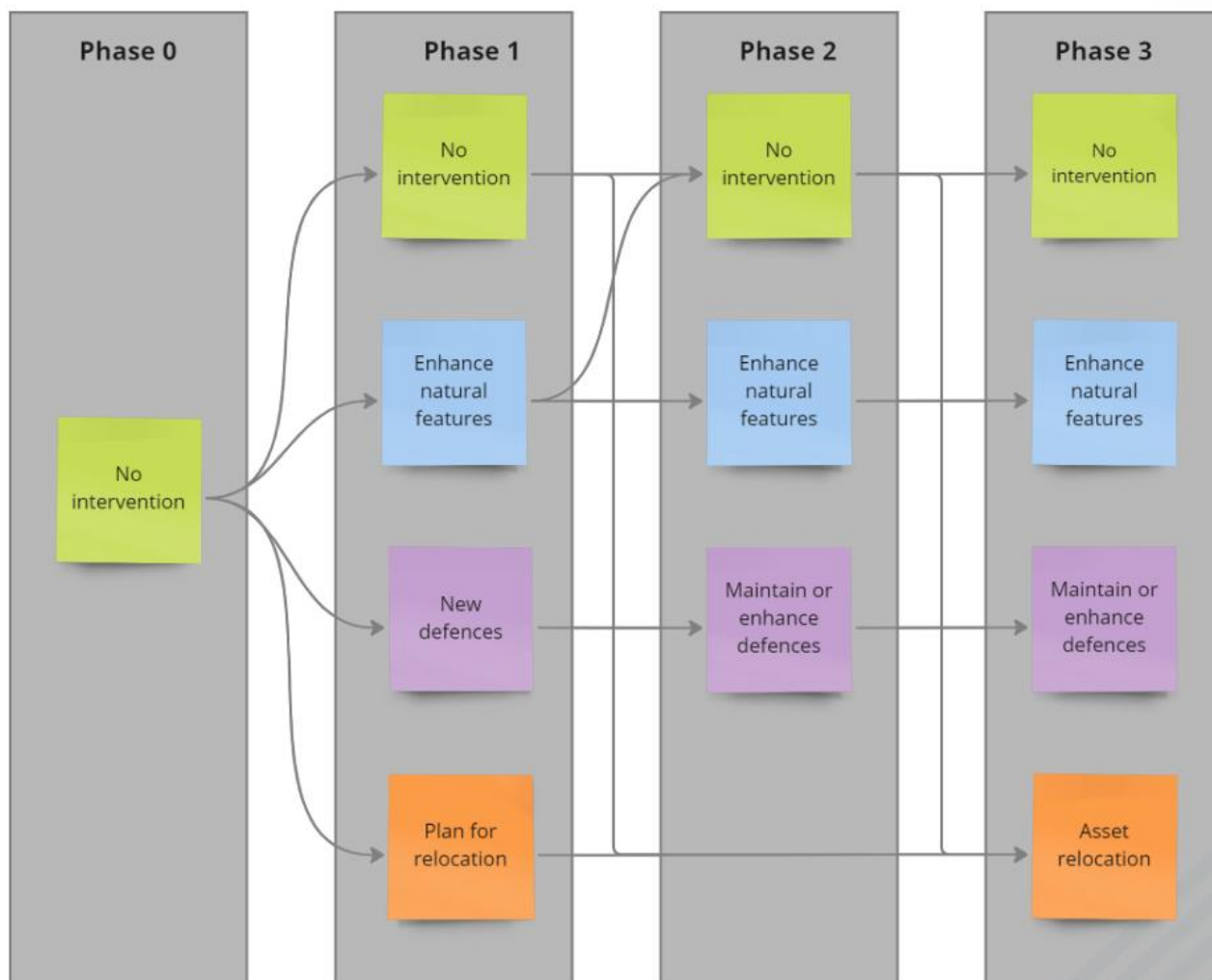


Figure 3-1: Adaptation Pathway for CMUs 1, 4, and 7 (natural coast). Grey lines represent possible future pathways.

3.2 CMU 2, 3, 5, and 6 Adaptation Pathway

CMU 2, a section of CMU 3 and CMU 5 are defended by rock armour. The remaining section of CMU 3 and CMU 6 are defended by vertical seawalls. All four CMUs are classified as built structures and have therefore been assigned the adaptive pathway for built structures with risk from erosion, flooding, or both (Figure 3-2).

- **CMU 2 = Built Structures with Risk and unknown Hazard**
- **CMU 3 = Built Structures with Risk and Hazard**
- **CMU 5 = Built Structures with Risk and unknown Hazard**
- **CMU 6 = Built Structures with Risk and Hazard**

Phase 0 of the adaptation pathway (1st column) is the current actions undertaken by Moray Council in respect to these CMUs. In CMU 3 this is assigned as **Maintain Structures** as Moray Council are obligated to maintain the Harbour structures. This means that there will be coastal and/or erosion risk management interventions and maintenance of existing structures during this phase⁸.

⁸ http://www.moray.gov.uk/moray_standard/page_103367.html

For the adaptation pathway to move to Phase 1 (2nd column containing potential actions) a pre-defined trigger must be realised. Then, depending on the outcome of any Implementation Plan Actions, this may or may not result in a change to the management approach adopted for the CMU.

Consultation of the CCAP Implementation Plan (Section 4.1) will guide the process and ultimately the pathway to adaptation.

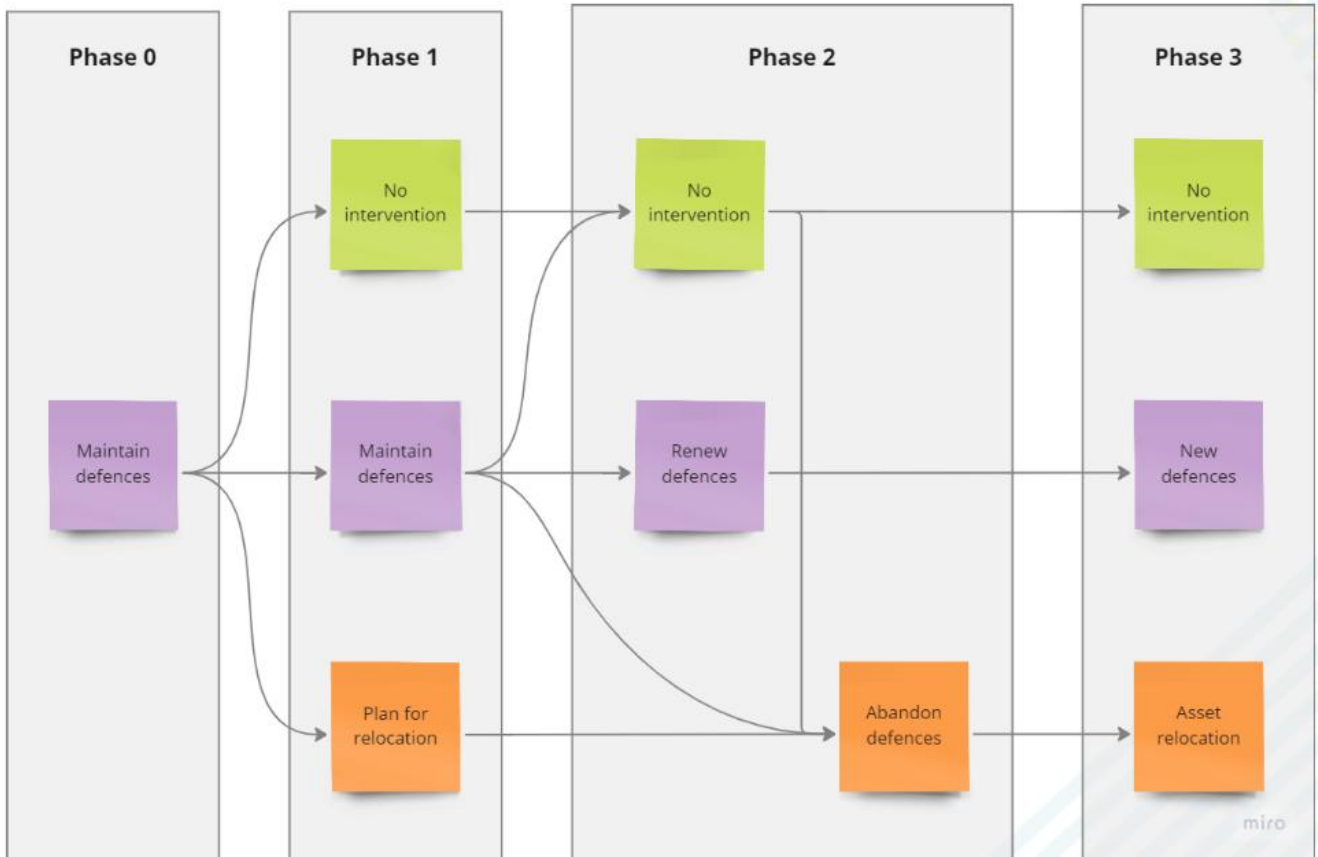


Figure 3-2: Adaptation Pathway for CMU 2, 3, 5, and 6 (built structures). Grey lines represent possible future pathways.

4 Adaptation Process

4.1 Implementation Plan

To support the delivery of the Adaptation Framework, a single Implementation Plan is applied to the entire Burghead to Cummingston Coast CA with generic triggers and actions set that are relevant across the CA. Specific triggers and actions are then assigned to each CMU based on the Risk Assessment. Outcomes of the Implementation Plan link to the Adaptation Pathway specific to each CMU.

Delivery of the Implementation Plan has three stages (Figure 4-1):

- 1) Monitoring and Triggers (Section 4.2)
- 2) Actions (Section 4.3)
- 3) Outcomes (Section 4.6)

The outcome of the Implementation Plan determines what path will be followed within the Adaptation Pathway when moving to a new phase.

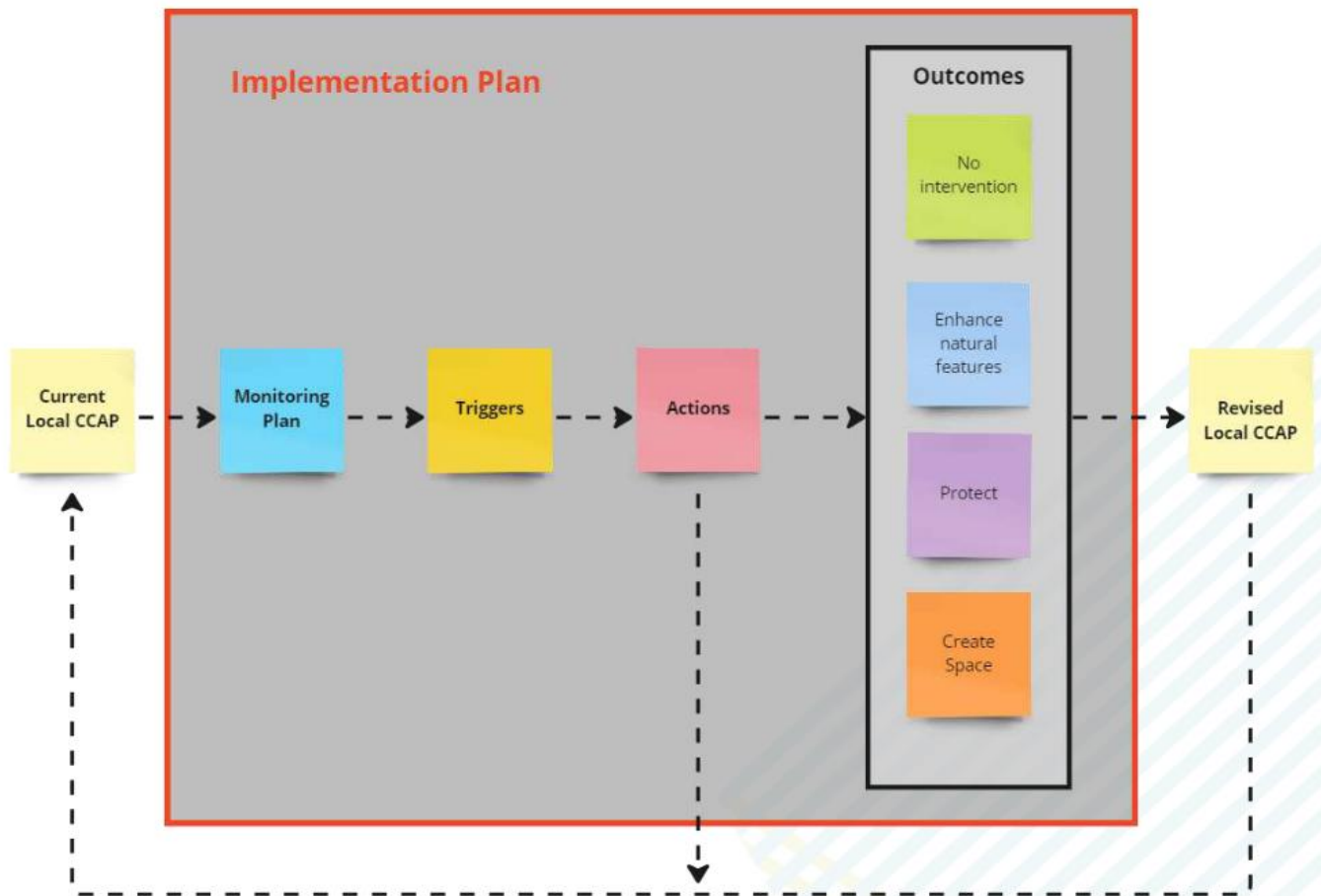


Figure 4-1: High-level Implementation Plan.

4.2 Monitoring and Triggers

4.2.1 Monitoring

Triggers are realised through monitoring of available data that informs risk of flooding and erosion. Triggers signal the requirement to deliver the Implementation Plan, which may lead to a review of the Risk Assessment and potential change to the Adaptation Pathway.

Triggers are categorised as:

- Natural systems triggers.
- Climate triggers.
- Risk exposure triggers.
- Socio-economic triggers.

These are subsequently grouped into categories with each requiring a plan for monitoring within the CA:

- Third party data and information.
- Moray Council data and information.
- Moray Council monitoring.
- External pressure.

4.2.2 Trigger Classification

Classification of the triggers falls into two parts.

1. Generic triggers applicable to the entire CA.
2. Bespoke triggers applicable to individual CMUs.

Climate, natural system, and socio-economic triggers are generic for the whole CA (Table 4-4), but risk exposure triggers related to physical flooding, erosion and overtopping thresholds are specific to each CMU. For the Burghead to Cummington Coast CA these are summarised in Table 4-4.

Effective review of these requires development of a monitoring plan of risk for each CMU as follows:

- CMU 1: Monitoring of erosion hazard
- CMU 2: Monitoring of potential future flood or erosion hazards
- CMU 3: Monitoring of flood hazard
- CMU 4: No monitoring required
- CMU 5: Monitoring of potential future flood
- CMU 6: Monitoring of flood and erosion hazard
- CMU 7: Monitoring of erosion hazard

4.2.3 CMU-specific flooding trigger

Based on SEPA's NFRA data, where there is risk of flooding, the elevation of assets at risk are compared to sea levels taken from the SEPA tide gauge at Buckie. Assets considered at risk from flooding include:

- Residential properties.
- Key roads.

Where flood risk is present in a CMU, the lowest elevation of a residential property (minus 300mm freeboard) or key road is used to determine a frequency of exceedance using observed tide levels (Table 4-1).

At Burghead to Cummington Coast, current SEPA maps indicate a flood risk at CMU 3.

Exceedance Frequency is defined currently as, the number of events that exceed the asset threshold in a 10-year period.

The CMU-specific flooding trigger is realised if the exceedance frequency increases beyond specified criteria. There are two levels to this Trigger realisation that result in different actions. These also vary depending on the type of asset at risk of flooding:

- **Residential properties**
 1. Exceedance frequency of **two** or more in a **ten-year window**.
 - Increase monitoring and plan for assessment.
 2. Exceedance frequency of **five** or more in a **ten-year window**.
 - Undertake assessment and plan for intervention.
- **Key Roads**
 1. Exceedance frequency of **five** or more in a **ten-year window**.
 - Increase monitoring and plan for assessment.
 2. Exceedance frequency of **ten** or more in a **ten-year window**.
 - Undertake assessment and plan for intervention.

Locations of these assets used to define the flooding triggers are shown in Figure 4-3. Currently, no flooding triggers have been met (Table 4-1).

It is important to note that the elevation of the asset compared to the sea level exceedance frequency is not a true representation of the actual risk of flooding. The risk of flooding is also associated with the elevation of the land surrounding the asset at risk.

Table 4-1: CMU-specific flooding triggers for Burghead to Cummington Coast properties and roads. Cells shaded red indicate that the flooding trigger has already been met.

CMU	Lowest level of Property (mOD)		Property – Freeboard (mOD)	Current 10-year frequency	Flooding trigger level 1 Exceedance Frequency:	Flooding trigger level 2 Exceedance Frequency:
3	Property	3.6	3.3	0	2.0	5.0
CMU	Lowest level of Road (mOD)			Current 10-year frequency	Flooding trigger level 1 Exceedance Frequency:	Flooding trigger level 2 Exceedance Frequency:
3	Church Street		3.3	0	5.0	10.0

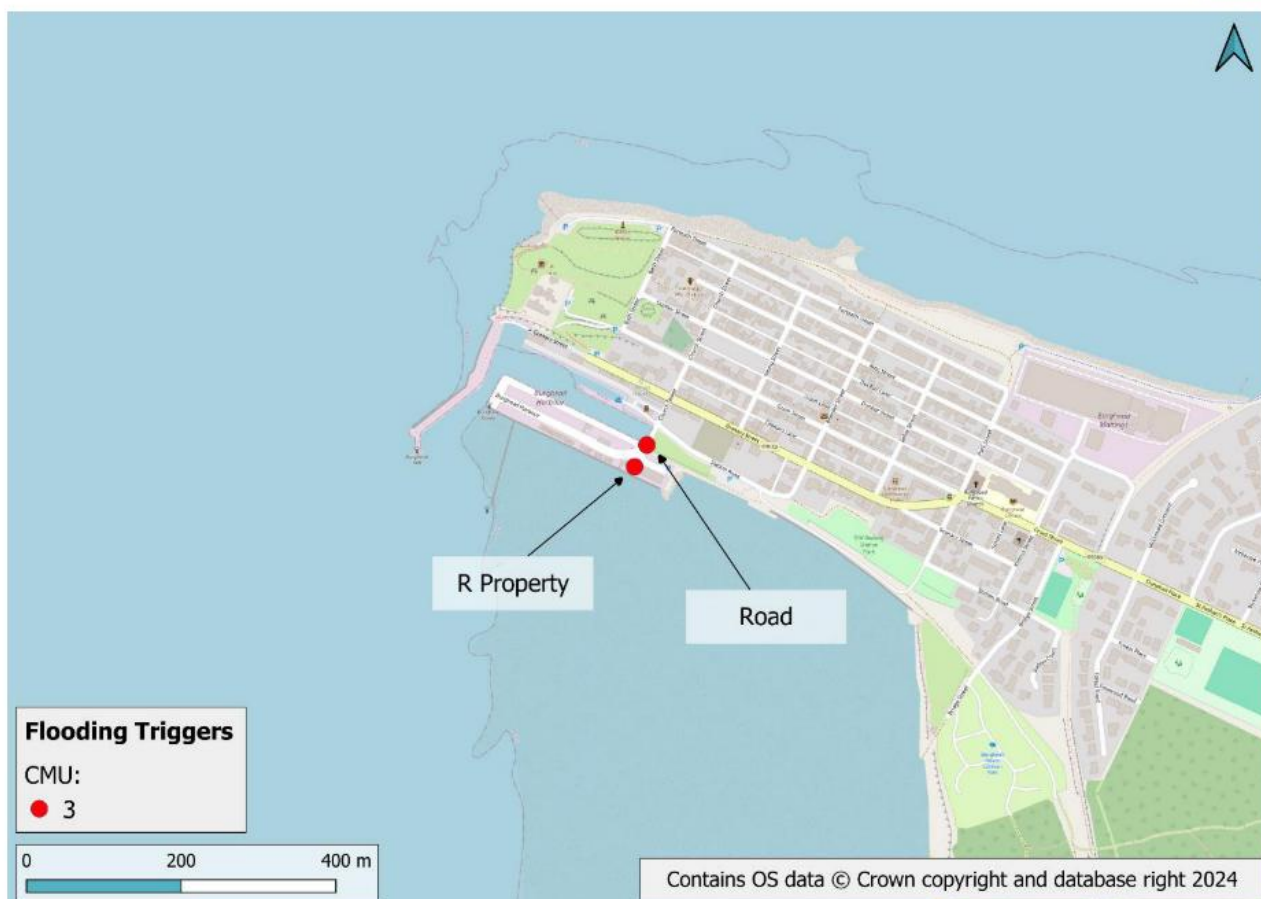


Figure 4-2: Burghead to Cummingston Coast flooding trigger locations.

As the SEPA flood maps used to inform the risk assessment do not include an allowance for overtopping, flood risk triggers for CMU5 and 6 should be established based on wave overtopping frequency and incorporated into the ongoing monitoring of the CCAP (Proactive Action 3).

4.2.4 CMU-specific erosion trigger

Where there is risk of erosion, the distance from the asset at risk to the coast is used to define the Trigger. For properties, roads and other features, the coast is defined by the landward extent of the natural feature e.g. beach, barrier, spit, or cliff. Assets considered at risk from erosion include:

- Residential properties.
- Key roads.
- Other features, such as carparks, harbours, and leisure parks.

To note, if two assets are in the same location (e.g. a road and property) only the most seaward asset is used to define the Trigger for that CMU.

As with the other CMU-specific triggers, a two-level approach is defined using buffers around the asset at risk. The associated action is dependent on the consequence and asset at risk.

Erosion buffer distances (metres) for each level are defined as follows:

- **Residential properties**
 1. Maximum of historic erosion rate multiplied by 20 or 20m.
 - Increase monitoring and plan for assessment.
 2. Maximum of historic erosion rate multiplied by 10 or 10m.
 - Undertake assessment and plan for intervention.

- **Roads and other features**

1. Maximum of historic erosion rate multiplied by 5 or 5m.
 - Increase monitoring and plan for assessment.
2. Maximum of historic erosion rate multiplied by 2 or 2m.
 - Undertake assessment and plan for intervention.

Level 1 erosion trigger has been met for the property in CMU 6 (Table 4-2). Location of all assets used for erosion triggers are shown in Figure 4-3 and Table 4-3.

Table 4-2: CMU-specific erosion triggers for Burghead to Cummington Coast properties. Cells shaded red indicate that the erosion trigger has been met.

CMU	Maximum historical change rate (m/year)	Present-day distance of Property to coast (m)		Erosion trigger level 1: Coast X m from property	Erosion trigger level 2: Coast X m from property
6*	0.0	RP	16.5	20	10

*Note that the erosion specific trigger criteria (level 1) has been met at CMU 6. However, at this unit there is a recognised sea defence along the frontage. Any monitoring therefore should be focussed on the condition of the sea defence and the vulnerability to erosion. The condition of this defence plays a crucial role in the protection of assets within this unit and mitigating retreat of the coastline.



Figure 4-3: Burghead to Cummington Coast erosion trigger locations.

Table 4-3: Burghead to Cummington Coast erosion triggers.

CMU	Asset	Trigger Met	Erosion Trigger
6	Residential Property	Yes - Level 1	

The proximity of the Burghead Holiday Park to the coastline would likely result in a level 1 erosion trigger being realised should this be incorporated in the same way as other residential properties. The risk here should be determined through a local assessment (Proactive Action 3), with engagement with the Park owners to establish a suitable approach to adaptation (Proactive Action 4).

4.2.5 CMU-specific condition triggers

Where a Moray Council coastal defence is present in a CMU, a CMU-specific trigger will be applied to the condition of the coastal defence. Currently, coastal defences are present in:

- CMU 2
- CMU 3
- CMU 5
- CMU 6

As with the other CMU-specific triggers, a two-level condition trigger approach and associated action is defined using the Grades of coastal defence condition according to the EA and Defra condition assessments⁹:

- **Condition trigger level 1:**
 1. Defence condition Grade 4
 - Increase monitoring and plan for assessment.
- **Condition trigger level 2:**
 1. Defence condition Grade 5:
 - Undertake assessment and plan for intervention.

These CMU-specific condition triggers assume coastal defences are currently Grade 3 but this should be reviewed upon completion of the Regional Proactive Actions for defence condition.

4.2.6 New information trigger

New information on hazards, vulnerability, built structures, and infrastructure assets etc will become available as the CCAP is implemented. The new information trigger acknowledges

⁹ Environment Agency (2013) Practical guidance on determining asset deterioration and the use of condition grade deterioration curves: Revision 1.

this and accounts for changes to the datasets on properties, roads, key features, or assets available from Dynamic Coast or the NFRA.

This new information may be provided by a Council/ stakeholder member or local resident of the CA and would trigger a review of the relevant part of the CCAP.

- **New Information trigger:**
 1. New information received of asset at risk:
 - Understand risk and, if relevant, set adaptation triggers and actions.
 - Incorporate into monitoring plan.

4.2.7 Moray Coastal Trail

Impact of flooding and erosion on the Moray Coastal Trail¹⁰ (MCT) is yet to be quantified but it will likely become badly affected by coastal change and flooding in both the short and long-term.

As part of delivery of the Regional Plan a more detailed assessment will be undertaken to understand the impacts of climate change on the MCT (Regional Proactive Action). This will provide opportunities for investigation options to enhance and retain the amenity.

4.3 Actions

Actions, like Triggers, are also applied to the entire CA, or to specific CMUs where the risk of flooding and/or erosion is identified. Actions will be specific to CMUs where, for example, a coastal defence is present; a natural protective feature is present; the risk of flooding/erosion is localised; assets are at risk of flooding/erosion.

Actions applicable on the Burghead to Cummington Coast CA have been identified in Table 4-4. These are based on the Phase 0 Triggers only and it is possible that more will be required as a reactive response to change. Delivery of the Regional Plan¹¹ Proactive actions are also required.

Review risk assessment:

- Involves a review of available data and associated risk assessment. Increased monitoring, planning, and implementing an assessment, and planning for intervention because of the erosion and flooding triggers are included in the review risk assessment action.

Community engagement:

- **Places:** Involves local groups, such as Councillors and community groups.
- **Practice:** Involves third party stakeholders, such as SEPA, Scot Gov, Nature Scot etc.
- **Asset:** Includes private defences and harbours and utilities specific to each built structures or hybrid CMUs.

Post flood data collection:

- Involve community engagement, surveys, photographs etc.

New risk assessment:

- Following a review of the current risk assessment and/or community engagement, a new risk assessment may be required. Should a new assessment be deemed necessary this should follow appropriate guidance¹² and include all necessary components to

¹⁰ <https://www.morayways.org.uk/routes/the-moray-coast-trail/>

¹¹ IRR-JBAU-XX-XX-RP-MO-0001-S4-P03-Regional_Plan

¹² Scottish Government. 2016. Flood protection appraisals: guidance for SEPA and responsible authorities <https://www.gov.scot/publications/guidance-support-sepa-responsible-authorities/pages/2/>

develop a preferred Adaptation Pathway and associated Action Plan for delivery. E.g. risk, economics, social, environment, engineering, land use planning etc.

Actions bridge the gap between Triggers and Outcomes and define what processes need to be implemented before the most appropriate Outcome is recognised and delivered for each CMU. Actions linked to specific triggers and relevant to Burghead to Cummingston Coast CMU is included in Table 4-4. These highlight what may be delivered during the Phase 0 cycle and are dependent on the associated Trigger being realised.

Table 4-4: Triggers, trigger categories and associated actions for each Burghead to Cummingston Coast CMU.

Category	Trigger	Action	CMU
Natural Systems	Changes to habitat	Community engagement (places)	All
	Changes to greenspace	Community engagement (places)	All
Climate	Update to climate guidance	Review risk assessment Community engagement (practice)	All
	Update to SEPA flood maps	Review risk assessment Community engagement (practice)	All
	Coastal flood occurrence	Review risk assessment Community engagement (places, asset) Post flood survey	All
Risk exposure	Defence condition	Community engagement (asset)	CMU 2 CMU 3 CMU 4 CMU 6
	Update to SEPA flood warning	Review risk assessment Community engagement (places, practice)	All
	Erosion buffer exceeded	Review risk assessment Community engagement (places)	CMU 1 CMU 6 CMU 7
	Flood risk threshold exceeded	Review risk assessment Community engagement (places)	CMU 3 CMU 5 CMU 6
	Update to Dynamic Coast	Review risk assessment Community engagement (practice)	All
Socio-economic	Changes of asset use	Community engagement (asset)	CMU 2 CMU 3 CMU 4 CMU 5 CMU 6

	Changes of asset owner	Community engagement (asset)	CMU 2 CMU 3 CMU 4 CMU 5 CMU 6
	Community pressure	Review risk assessment Community engagement (places)	All

4.4 Phase 0 Actions

Phase 0 Actions require immediate attention and have been identified by triggers realised through the development process of this initial CCAP for Burghead to Cummington Coast . These are outlined below:

- CMU 6:
 - Trigger 1: Erosion buffer exceeded (level 1)
 - **Action 1:** Increase monitoring and plan for assessment. Where trigger is realised behind an existing defence, then the condition of the defence should be assessed, and monitoring planned accordingly.

An overall summary of all CMUs, Triggers, buffers, and Phase 0 Actions is provided as a standalone record in Appendix C for clarity.

4.5 Supporting Steps and Proactive Actions


The nature of adaptation means that future decisions and directions are unknown and will be affected by external changes not necessarily under Moray Council’s influence. It is critical that proactive supporting steps and Proactive Actions are undertaken to enable effective decision making in the future.





Proactive Actions are defined as those whereby there should only be benefit. Undertaking these can therefore only have a positive impact on supporting adaptation or increasing resilience.

At this stage in the adaptation planning process, five such actions have been identified. These have been developed focusing on the key pillar identified previously and through review and understanding of key knowledge gaps. They therefore aim to close these knowledge gaps at this stage and support alignment with wider aspects of the adaptation plan for the region.

A summary of these actions is provided in Table 4-5, with further details on each included in Appendix B. These are designed to complement the wider Proactive Actions identified in the Regional CCAP.

Table 4-5: Local Proactive Actions.

Action	Details	Pillars
1	Engage with landowners to understand management of Roseisle Beach and Forest	Working with Natural Processes 

2	Establish coordinated and consistent monitoring plan for Natural coast (CMU 1, 4 and 7).	Monitoring Change 
3	Develop modelling framework to better understand unknown hazards. Specifically: CMU2 – Erosion CMU5 and 6 - Overtopping	Working with Natural Processes 
4	Adaptation and resilience workshop with local community and stakeholders	Community and Engagement 
5	Identify landownership and safeguarding space. This should link with Regional Proactive Action to identify and define local opportunities.	Place Making 

4.6 Outcomes

Outcomes are the potential intervention measures that will be implemented after a trigger is realised and the associated actions, defined in the Implementation Plan, have been undertaken. There are four possible outcome categories:

- 1) No intervention.
- 2) Enhance natural features.
- 3) Protect.
- 4) Create Space.

These categories however are general, and nuances and variations may result upon completion of any more detailed study.

As the Implementation Plan is applied at CMU level, the ultimate outcome is dependent on the CMU and the associated Adaptation Pathway. Table 4-6 summarises the general and specific CMU outcomes for the Burghead to Cummington Coast CA.

Table 4-6: Burghead to Cummington Coast CA possible outcomes.

Category	Outcome	Burghead to Cummington Coast CMU
No intervention	No intervention	All
Enhance natural features	Enhance natural features	All
Protect	Maintain defences	CMU 3 CMU 6
	Sustain* defences	CMU 2 CMU 3 CMU 5 CMU 6
	Improve** defences	All
Create space	Set back defences	CMU 2 CMU 5
	Relocate assets	CMU 2 CMU 3 CMU 4 CMU 5 CMU 6
*standard of performance is sustained into the future in response to climate change **standard of performance is improved beyond the current and then maintained in response to climate change		

The complete Implementation Plan for Burghead to Cummington Coast is shown in (Figure 4-5); structured using the three stages: 1) Monitoring and Triggers, 2) Actions, and 3) Outcomes.

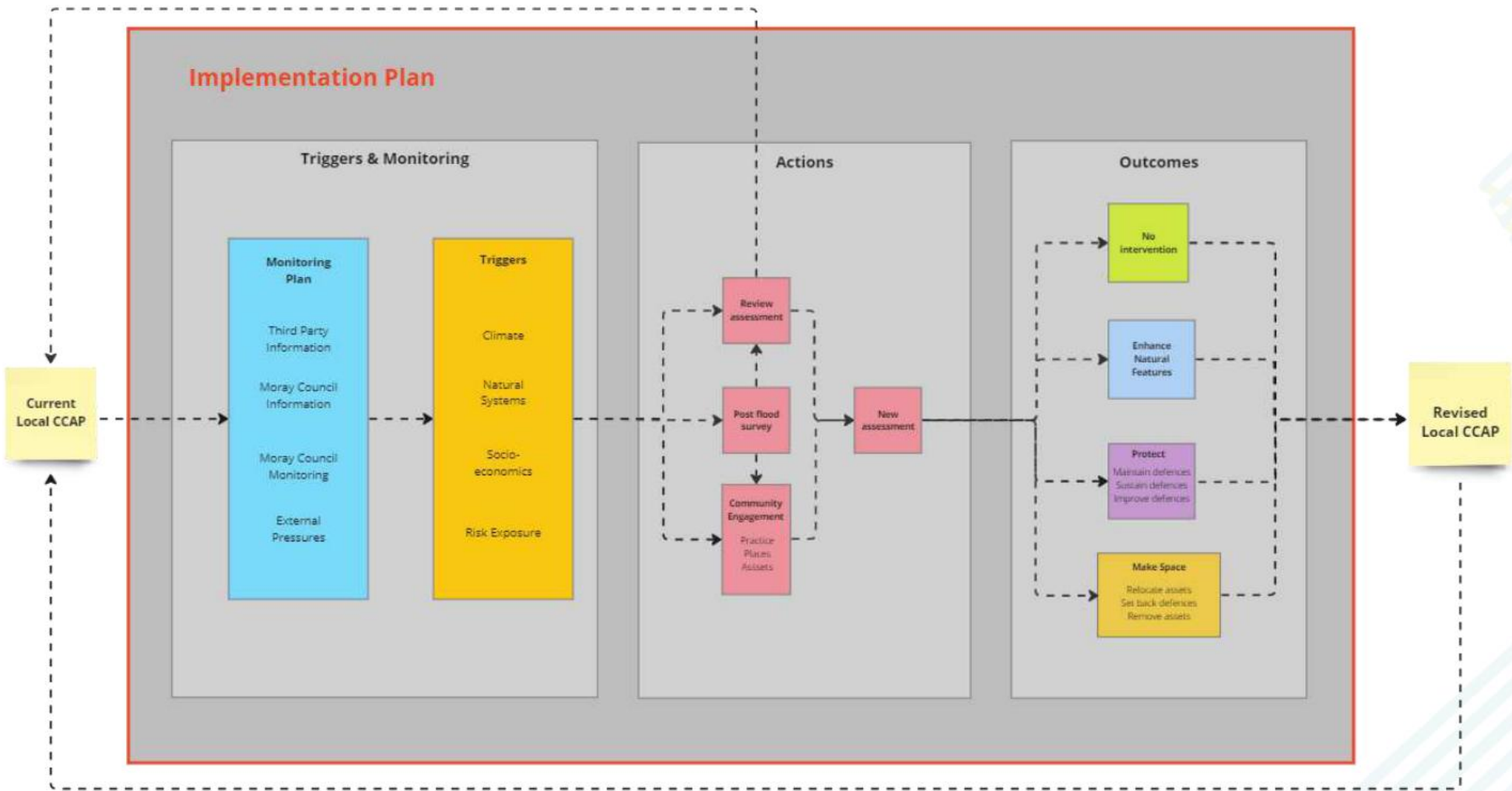


Figure 4-4: Complete Implementation Plan for Burghead to Cummington Coast CA.

4.7 Example application

Figure 4-5 provides a schematic describing an example application of the Implementation Plan and how it fits in with the wider Adaptation Framework for Burghead to Cummingston Coast. The red box highlights the processes described in this iteration of the CCAP.

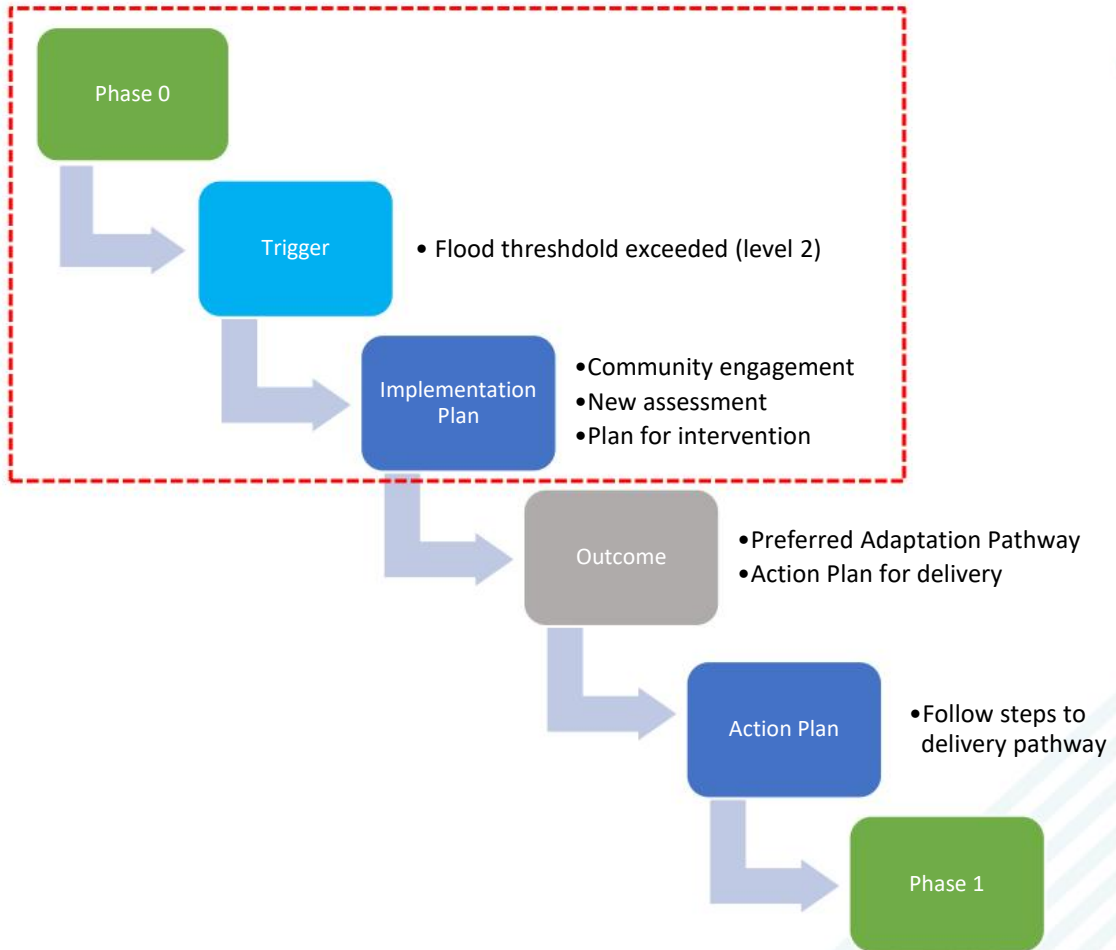


Figure 4-5: Example application of Phase 0 to Phase 1 of the adaptation process and how the Implementation Plan works with Adaptation Pathways and Action Plans.

5 Summary and Next Steps

5.1 Approach

This document presents the local CCAP for Burghead to Cummington Coast. It is the first iteration and will be subject to ongoing review and update to effectively guide the adaptation process. The approach for developing the Plan makes use of available, national information, on coastal flood and erosion risk, and combines these with relevant local datasets.

Adaptation in Moray has been steered by relevant published documentation and the Scottish Governments interim guidance on CCAPs. These have been used to develop a CCAP. This has been simplified into four key pillars of adaptation:

- 1) Working with Natural Processes**
- 2) Monitoring Change**
- 3) Community and Engagement**
- 4) Climate Resilient Placemaking**

This Local Plan builds on the Regional Plan by focusing on these pillars to develop an Adaptation Framework that can effectively support Burghead to Cummington Coast preparing for the impact that climate change will have on the coast. This will be delivered by following the Implementation Plan, presented here, that outlines Triggers and associated actions to develop detailed Adaptation Pathways and an Action Plan for the Burghead to Cummington Coast CA. This will happen when the process moves into Phase 1.

5.2 Coastal Management Units and Risks

The Burghead to Cummington Coast CA was subdivided into seven CMUs. For each of these a refined assessment was undertaken to determine coastal type and associated current and future flood and erosion risk. These are summarised as:

- CMU 1 – Natural with no Risk but with Hazard
- CMU 2 – Built structures with Risk and unknown Hazard
- CMU 3 – Built structures with Risk and Hazard
- CMU 4 – Natural with Risk and unknown Hazard
- CMU 5 – Built structures with Risk and unknown Hazard
- CMU 6 – Built structures with Risk and Hazard
- CMU 7 – Natural with Risk and Hazard

These were then taken forward to develop Adaptation Pathways and an Implementation Plan with Triggers and Actions associated with each CMU.

5.3 Adaptation Pathways

To enable effective implementation of this CCAP across the Burghead to Cummington Coast CA, each CMU has been assigned a generic Adaptation Pathway. This is specific to the CMU classification.

The adaptation journey is a multiphase, multiyear process and aims to transition communities into a more sustainable and resilient future. We are currently at **Phase 0**, meaning that no definitive preferred Adaptation Pathway and associated Action Plan have been developed. To move to Phase 1 of the Adaptation Pathway, a trigger must be realised that results in New Assessment and a preferred pathway and associated Action Plan must be identified:

1. **Phase 0:**
 - Development of the Implementation Plan
 - Delivery of Phase 0 Actions (Appendix C)
 - Delivery of Phase 0 Proactive Actions (Appendix B)
2. **Phase 1:**
 - Implementation Plan outcomes:
 - Preferred Adaptation Pathway
 - Action Plan for delivery
 - Delivery of Phase 1 No Regrets Actions
3. **Phase 2+:**
 - Implementation Plan outcomes:
 - Preferred Adaptation Pathway (Continue or revise Phase 1)
 - Action Plan for delivery (Continue or revise Phase 1)
 - Delivery of Phase 2 No Regrets Actions

While ultimately the Adaptation Pathways have a desired outcome, what that looks like and how it will be reached cannot be defined at this stage. Effective monitoring against the set triggers will enable the CCAP to evolve through Phases and support Moray Council decision making to aim to achieve this end-outcome.

A detailed summary of Phase 0 Actions is included in Appendix C.

5.4 Implementation Plan

The Implementation Plan was developed by defining Triggers and setting Actions against these. Delivery of the Plan will result in end outcomes that will ultimately influence the direction of the Adaptation Pathways in the Burghead to Cummington Coast CA.

At this stage the pathways do not result in definitive end points. Triggers, while tangible, provide markers whereby Moray Council will undertake actions, guided by the Action Plan. The Outcomes of these, however, are unknown and the direction of the pathway in the future therefore cannot be defined.

Triggers focus on the updates to the data and documentation that has underpinned the development of the plan, and bespoke flooding or erosion thresholds being exceeded, through monitoring of physical processes.

As well as Actions that rely on Triggers being realised. This initial stage of the adaptation planning process has identified several knowledge gaps and opportunities for activities to be undertaken upfront. These are defined as Proactive Actions, whereby undertaking these will only benefit and support Moray's adaptation to coastal change.

In total, five Proactive Actions have been set.

5.5 Next Steps

Adapting to coastal change will be a continual journey and it is therefore important that the process is ongoing. Here, the following key steps require implementing by Moray Council to support this journey and follow CCAP:

- Implement internal governance processes to review and monitor Triggers.
- Deliver local Phase 0 Actions.
- Deliver local Proactive Actions.

Appendices

A CMU Risk Assessment

A.1 Data and overview

Coastal parameters and associated datasets summarising wave, tide, and sea level conditions for Burghead to Cummington Coast are summarised in Table A-1.

Table A-1: Coastal dataset summary for Burghead to Cummington Coast CA

Coastal Data		Details	Data source
Hindcast wave height	0.62 m	50th percentile	CMEMS
	0.96 m	75th percentile	
	2.69 m	99th percentile	
Tide levels	HAT	2.5 mOD	TotalTide
	MHWS	2.0 mOD	
	MHWN	1.1 mOD	
	MSL	0.1 mOD	
	MLWN	-0.5 mOD	
	MLWS	-1.5 mOD	
	LAT	-2.1 mOD	
Extreme Sea Levels	2.07 mOD	MHWS	CFB (3050)
	2.83 mOD	2-year	
	3.12 mOD	50-year	
	3.17 mOD	100-year	
	3.24 mOD	200-year	
	3.38 mOD	1000-year	
Sea level rise projections	0.14 m	2050 70th percentile	UKCP18
	0.19 m	2050 95th percentile	
	0.58 m	2100 70th percentile	
	0.82 m	2100 95th percentile	

An overview of coastal flood and erosion hazards is provided for Burghead to Cummington Coast CA (Figure A-1). This has been produced using SEPA flood mapping for 1 in 200-year and 1 in 200-year plus climate change flood events as well as Dynamic Coast erosion projections for 2020 through to 2100. The data has been analysed for each CMU individually and has been used to identify receptors at risk.

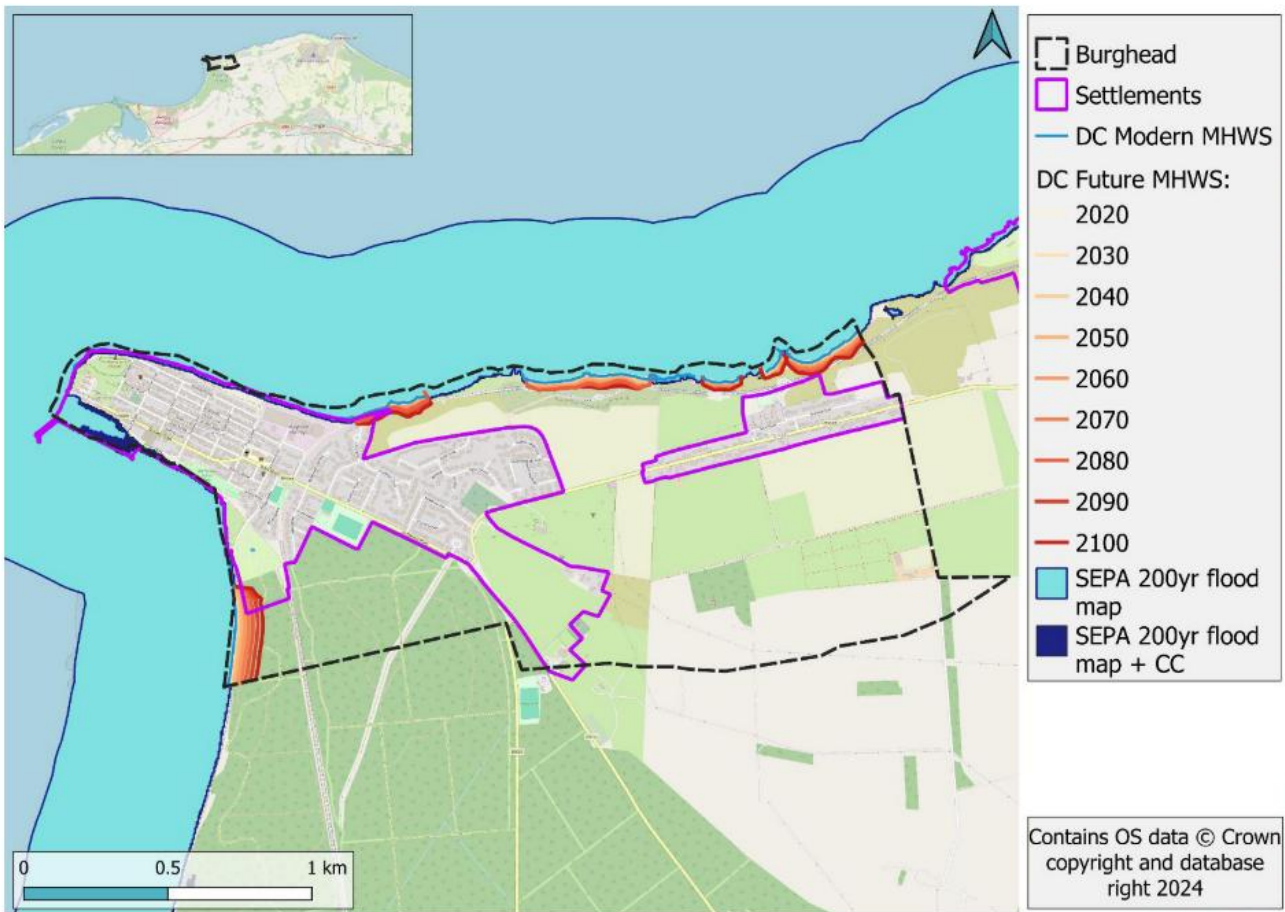


Figure A-1: Burghead to Cummington Coast CA coastal flood and erosion hazard overview

A.2 CMU 1:

This unit is classified as natural coast. The unit encompasses the coastline along the northern 350 m of Roseisle Beach, facing west into Burghead Bay. Here, the coastline is made up of a large sandy beach backed by established sand dunes which are themselves backed by the Roseisle Forest. Along the toe of the dunes, at the head of the beach, are a series of large concrete blocks at roughly from the wartime, intended as defences against beach landings alongside several pill boxes. Subsequent coastal retreat has left these blocks, and pillboxes, standing directly on the beach.

SEPA flood maps show that there is negligible flood risk from 1-in-200-year and 1-in-200-year plus climate change events.

Dynamic Coast data shows that historically the shoreline has retreated at maximum rate of 0.3 m/yr. Maximum future erosion rates are expected to increase to 1.0 m/yr by 2050 and to 1.8 m/yr by 2100. This would result in a maximum of 98.7 m of land loss caused by shoreline retreat by 2100. Table A-2 summarises Dynamic Coast data for CMU 1. The projected erosion lines under the High Emission Scenario show no assets at risk of erosion.

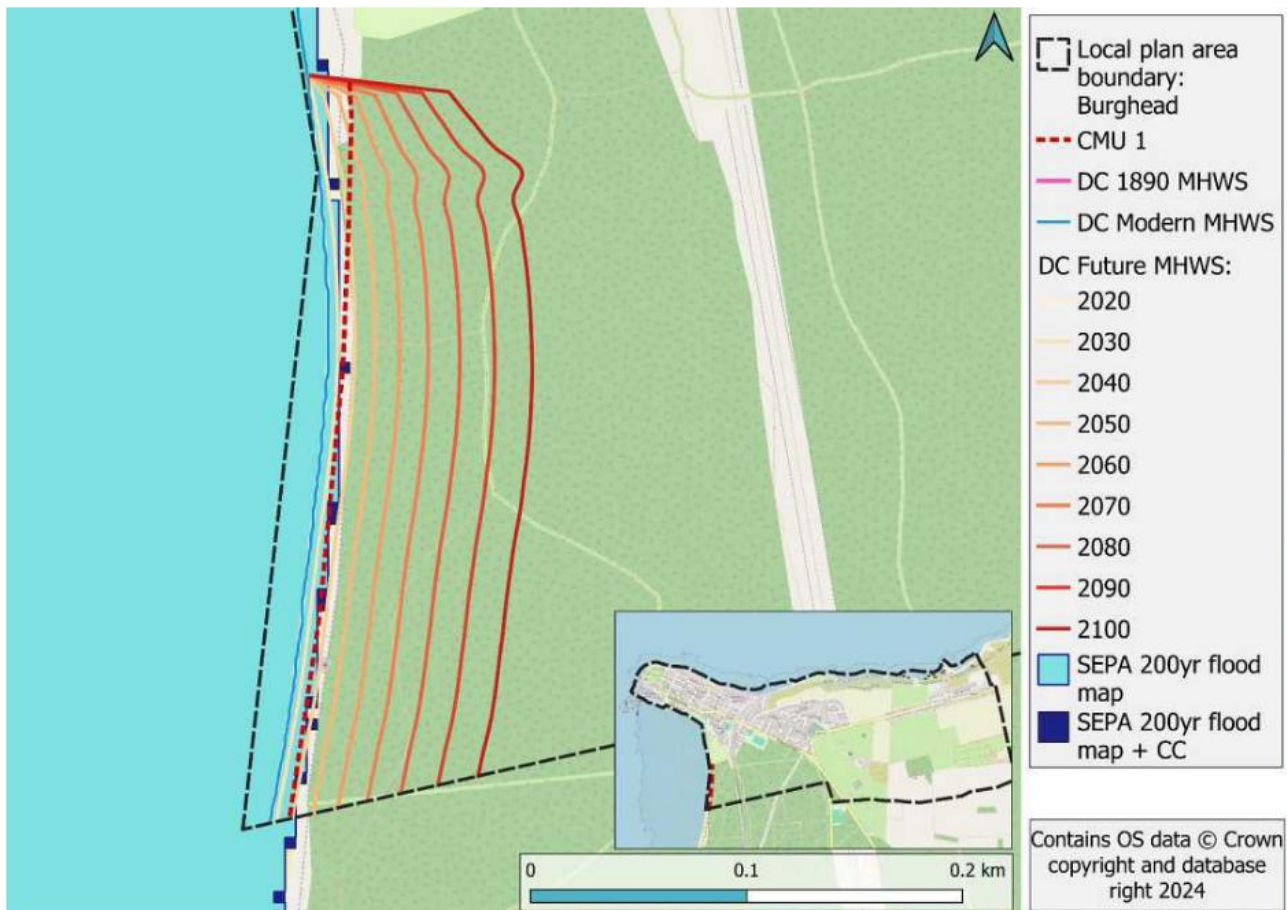


Figure A-2: CMU 1 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

Table A-2: CMU 1 Dynamic Coast erosion summary

Dynamic Coast calculation	Results	
Historical rate	0.3 m / yr	Maximum
	0.3 m / yr	Median
2050 rate	1.0 m / yr	Maximum
	0.9 m / yr	Median
2050 distance	23.2 m	Maximum
	22.3 m	Median
2100 rate	1.8 m / yr	Maximum
	1.7 m / yr	Median
2100 distance	98.7 m	Maximum
	96.8 m	Median

A.3 CMU 2:

This unit is classified as defended by built structures due to the rock armour revetment that stretches along the unit frontage. In addition to the rock armour there is a continuation of the concrete block wall defences present in CMU 1. The unit is roughly 300 m in length and encompasses the coastline in front of the Burghead Beach Caravan Park and the residential area of Bridge Street in south Burghead.

SEPA flood maps show that there is no flood risk from 1-in-200-year and 1-in-200-year plus climate change events.

This CMU is defended; as a result, the Dynamic Coast erosion projections show no risk of erosion. However, the Dynamic Coast assessment relies on the coastal defence structure situated at this coastline being maintained. The condition of this structure therefore is an unknown hazard at present.

A local hazard assessment should be undertaken to support establishing an improved understanding of erosion risk (Proactive Action 3).

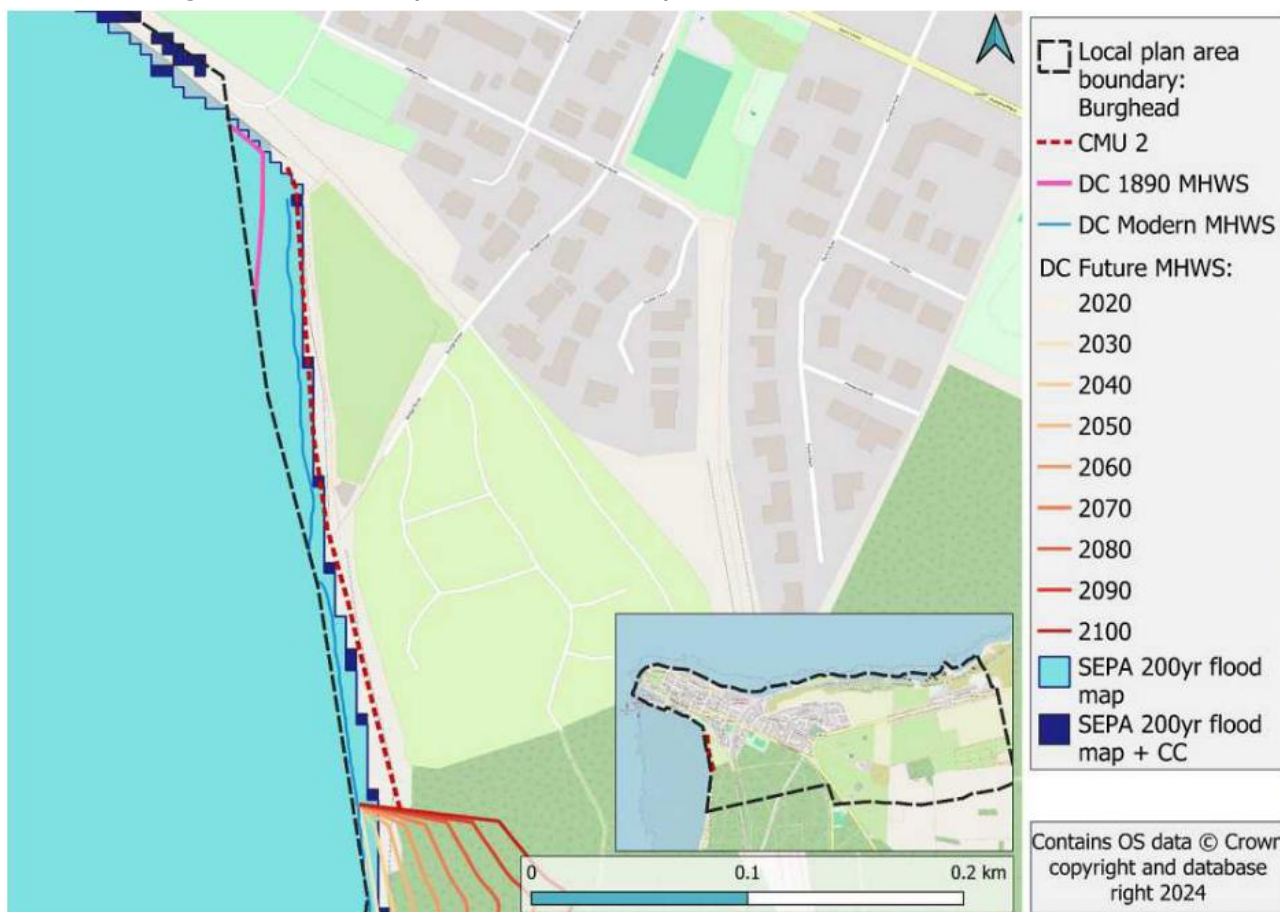


Figure A-3: CMU 2 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

A.4 CMU 3:

This unit is classified as defended by built structures due to a combination of vertical seawalls and a rock armour revetment which stretches along sections of the unit frontage. The unit comprises the south-southwest facing coastline of Burghead, including the frontage in front of the Old Railway Station Park, along to the Burghead Harbour, and the harbours outer seawall and round the headland to the west facing wall of Burghead Harbour. In total this unit stretches for approximately 700 m of coastal frontage.

CMU 3 is defended and Dynamic Coast erosion projections therefore shows that there is no erosion risk.

SEPA flood maps show that parts of this CMU are at risk from coastal flooding for a 1-in-200-year coastal flood event in the present day, and increasingly so with climate change allowances. Assets on land at risk from a 1 in 200-year flood event, according to NFRA data, are summarised below:

- 1 NRP (non-residential property)
- Church Street (~18 m section)

Assets at risk from a 1 in 200-year plus climate change flood event include assets at risk from a 1 in 200-year flooding event (shown above) plus assets summarised below:

- 3 NRPs
- 1 RP (residential property)
- Church Street (~20 m section)
- Road on the harbour (~90 m section)
- Station Road (~48 m section)
- Clavie Court (~ 165 m section)

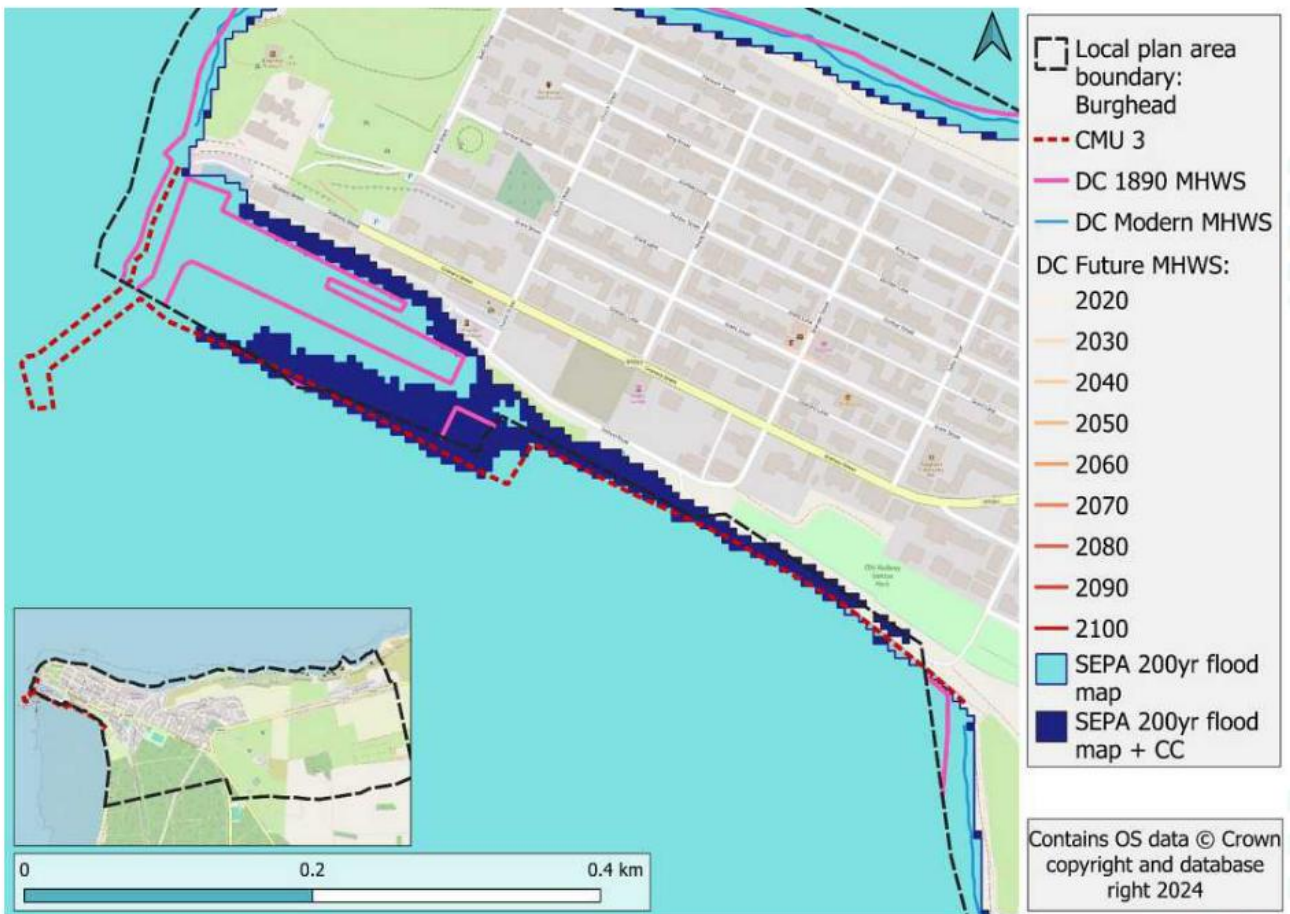


Figure A-4: CMU 3 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

A.5 CMU 4:

This unit is roughly 140 m of natural coastline along the west facing end of the Burghead peninsula. The coastline of this unit is characterised as a rocky cliff with a sloping grass and mud top section. Atop the cliff is the Burghead Fort and Museum and a hamlet of cottages.

SEPA flood maps show that there is no flood risk from 1-in-200-year and 1-in-200-year plus climate change events. Dynamic Coast erosion projections show that there is negligible erosion risk in the CMU.

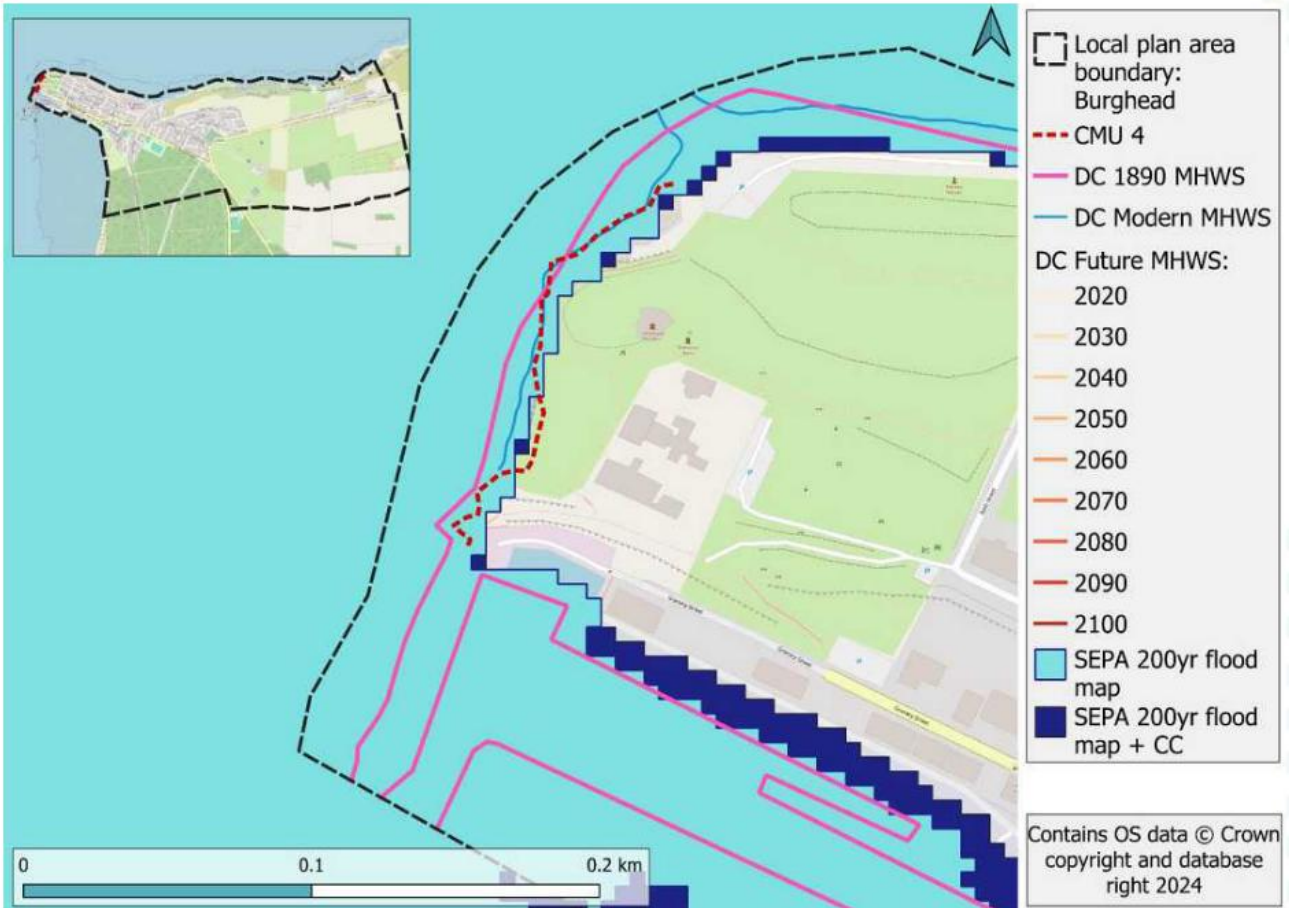


Figure A-5: CMU 4 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

A.6 CMU 5:

This unit is classified as defended by built structures due to the rock armour revetment along the frontage. The unit stretches for approximately 1 km along the northern coastline of Burghead peninsula and is backed by residential housing, parkland, and the Burghead Maltings site. Behind the rock armour revetment is the Moray Coastal Trail, an important tourist amenity for the region.

SEPA flood maps show that there is negligible flood risk from 1-in-200-year and 1-in-200-year plus climate change events. Here however it should be noted that there is no inclusion of risk from wave overtopping. This should be established (Proactive Action 3).

As CMU 5 is defended; Dynamic Coast erosion projections show that there is negligible erosion risk. Although this is controlled by the existence and condition of the rock armour.

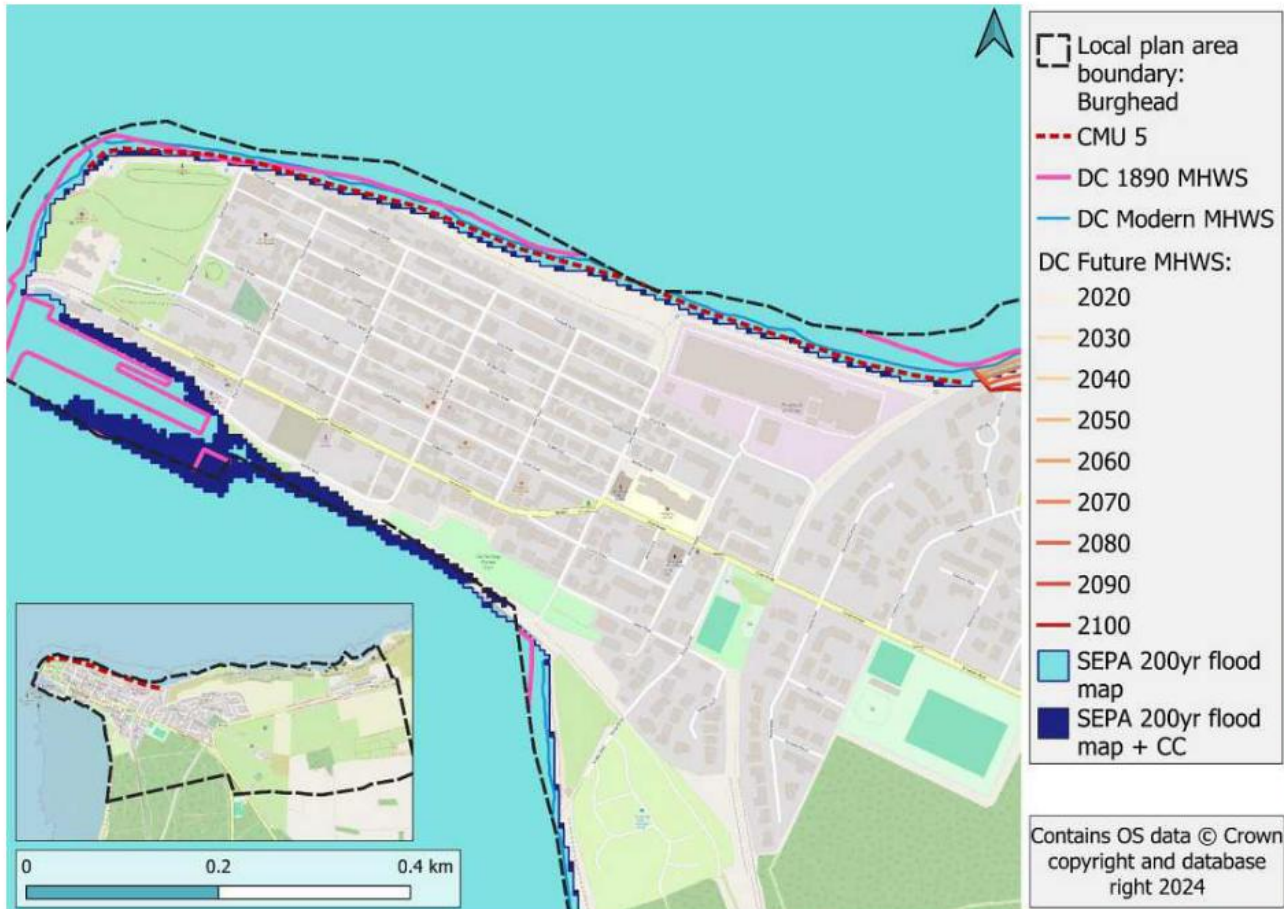


Figure A-6: CMU 5 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

A.7 CMU 6:

This unit covers approximately 150 m of defended coastline by built structures. There is a vertical seawall along the frontage, at the top of a rocky shoreline. Behind the seawall is a residential cul-de-sac and the Moray Coastal Trail.

SEPA flood maps show that there is negligible flood risk from 1-in-200-year and 1-in-200-year plus climate change events. Here however it should be noted that there is no inclusion of risk from wave overtopping. This should be established (Proactive Action 3).

Dynamic Coast data shows that the shoreline in CMU 6 has historically retreated. Erosion is predicted to occur here in the future with maximum future erosion rates of 0.4 m/yr by 2050 and 1.0 m/yr by 2100. This would result in a maximum of 43.6 m of land loss caused by shoreline retreat by 2100. This response however is not necessarily representative given the presence of the sea wall. Future erosion is contingent on the existence and condition of this structure defence.

Table A-3 summarises Dynamic Coast data for CMU 6. There are four residential properties within the Dynamic Coast projected erosion area or in the vicinity of it in 2100 under the High Emission Scenario.

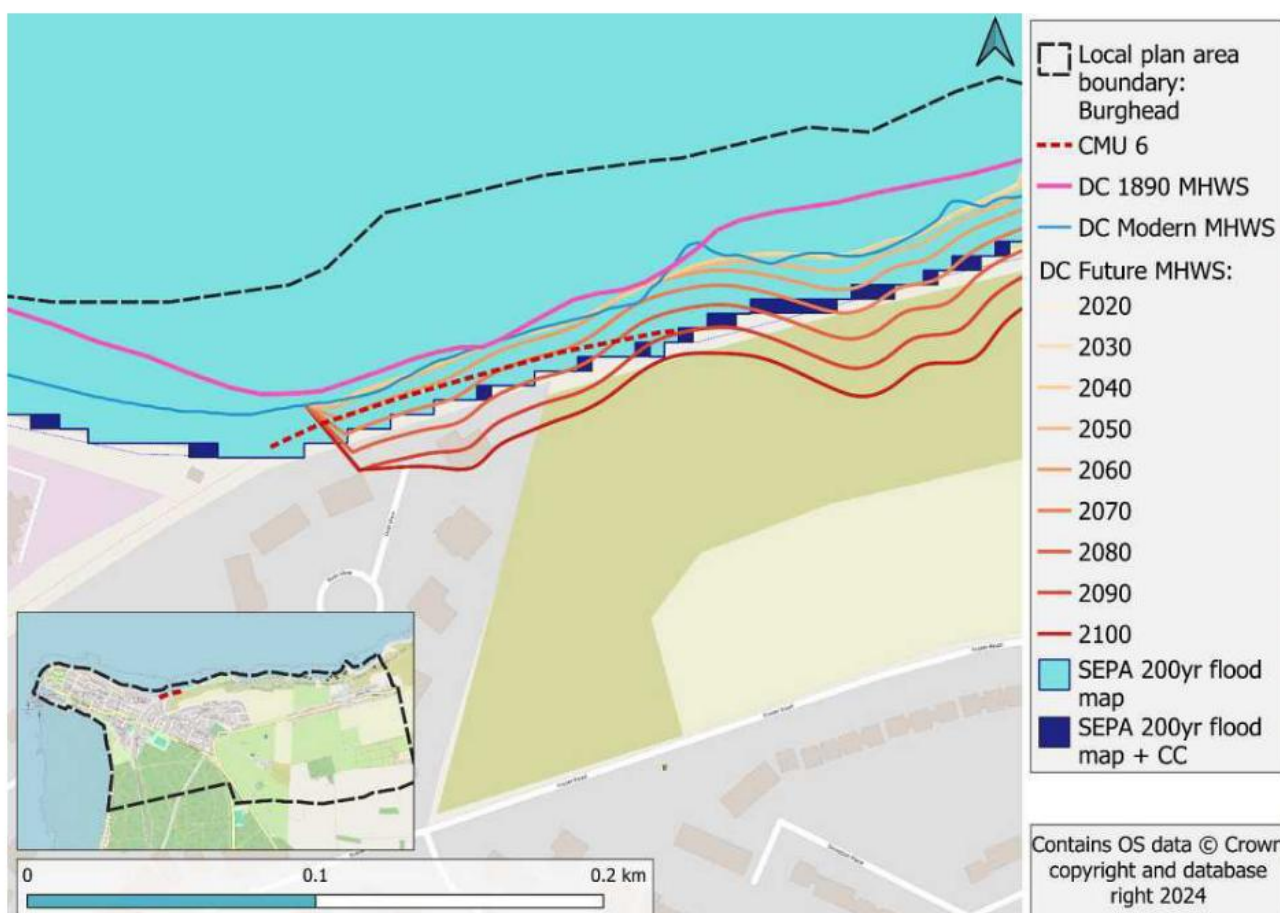


Figure A-7: CMU 6 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

Table A-3: CMU 6 Dynamic Coast erosion summary.

Dynamic Coast calculation	Results	
Historical rate	0.0 m / yr	Maximum
	0.0 m / yr	Median
2050 rate	0.4 m / yr	Maximum
	0.3 m / yr	Median
2050 distance	7.2 m	Maximum
	4.6 m	Median
2100 rate	1.0 m / yr	Maximum
	0.8 m / yr	Median
2100 distance	43.6 m	Maximum
	39.1 m	Median

A.8 CMU 7:

This unit is classified as natural. It is approximately 1.8 km in length, of natural rock cliffs with several rocky platforms and sandy pocket beaches interspersed along the coastline. Along the top of the cliff edge runs the Moray Coastal Trail hiking path. The village of Cummington is set-back from the cliff top by approximately 200 m.

SEPA flood maps show that there is negligible flood risk from 1-in-200-year and 1-in-200-year plus climate change events.

Dynamic Coast data shows that historically the shoreline has retreated at maximum rate of 0.4 m/yr. Maximum future erosion rates are expected to increase to 0.8 m/yr by 2050 and to 1.4 m/yr by 2100. This would result in a maximum of 77.6 m of land loss caused by shoreline retreat by 2100. Table A-4 summarises Dynamic Coast data for CMU 7. The projected erosion lines under the High Emission Scenario show no assets at risk of erosion.

The coastal footpath is predicted to be impacted.



Figure A-8: CMU 7 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards

Table A-4: CMU 7 Dynamic Coast erosion summary.

Dynamic Coast calculation	Results	
Historical rate	0.4 m / yr	Maximum
	0.0 m / yr	Median
2050 rate	0.8 m / yr	Maximum
	0.5 m / yr	Median
2050 distance	20.6 m	Maximum
	11.3 m	Median
2100 rate	1.4 m / yr	Maximum
	0.0 m / yr	Median
2100 distance	77.6 m	Maximum
	37.5 m	Median

B Proactive Actions

Action 1 – Work with landowners to ensure responsible management of Roseisle Beach Dunes and Roseisle Forest

Roseisle Forest will likely become increasingly important in years to come at mitigating coastal retreat behind CMU 1. Whilst coastal retreat, is unavoidable due to climate change pressures. The forest may help limit the rate of retreat through consolidating sands and soils at the coast, as well help reducing aeolian erosion of the beach and dunes by casting a wind shadow.

A proactive action that will help maintain resilience at CMU 1 will be to work with the forest managers to maintain the forest cover in a sustainable way. This can be achieved through avoiding de-forestation immediately at the coast, limiting pollutants and invasive diseases/fungi, controlling tourist pathways, and mitigating potential causes of fires.



Action 2 – Establish coordinated and consistent monitoring plan for Natural coast (CMU 4 and 7).

The requirements for monitoring the natural cliff within CMU 4 and the beaches of CMU 7 should be reviewed in the context of a wider Regional monitoring plan.

Information should be collected through monitoring that is specific to support future risk assessments and compared to CMU specific erosion triggers. It should focus across the entire CA but increase in frequency and detail for CMU 4 and 7 where predicted risk associated with erosion and coastal change is greatest.



Action 3 - Develop modelling framework to better understand unknown hazards.

Implementation of effective future risk assessments will require investment in numerical (or similar) modelling tools that can effectively and efficiently quantify flood and erosion risk.

Specific focus should be on the CMUs where there is currently risk, but the hazards are unknown and/or no data is available about them. For example, the erosion hazard in CMU 2 and 6 is not well understood when based purely on the Dynamic Coast projections, as the role of the defences in these units is not well understood or accounted for.

The overtopping hazard in CMU5 and 6 should be assessed and used to define Triggers if appropriate.



Action 4 – Adaptation and resilience workshop with local community and stakeholders

Adaptation to coastal change is not solely about physical interventions in coastal communities. Community and individual responsibility to increase resilience and adapt to coastal hazards is of paramount importance.

The outcomes of this initial phase should be presented to the community and stakeholders alongside consideration for wider support and education around climate awareness and flood resilience.

Action 5 – Identify landownership and safeguarding space. This should link with Regional Proactive Action to identify and define local opportunities.

To work with natural processes and make space for coastal change it is inevitable that existing land will be lost. To adapt effectively it is therefore important that land and asset ownership within the CA is fully understood to enable safeguarding of areas. This should feed into revisions of the wider Moray Council Local Development Plan.



C Trigger and Action Database

Table C- 1: Phase 0 Trigger and Action database for Burghead to Cummingston Coast CA

Community Area (CA)	CMU	Coast Type	Trigger Type	Asset Affected	Asset Description	Trigger Level	Trigger Exceeded?	Trigger Buffer Flooding (Freq/10 yr)	Trigger buffer erosion (m)	Action	Owner	Delivery Partners	Timescale	Cost	
Burghead to Cummingston Coast	1	Hybrid	N/A	N/A		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
	2	Built Structures	Condition	Seawall		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
			Condition	Rock Armour Revetment		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
			N/A	N/A			1	N			None	NA	NA	NA	NA
							2	N			None	NA	NA	NA	NA
	3	Built Structures	Condition	Rock Armour Revetment		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
			Flooding	Property	N/A	1	N	0		None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
			Road	Church Street		1	N	0		None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
	4	Natural	N/A	N/A		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
	5	Built Structures	Condition	Rock Armour Revetment		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
			N/A	N/A		1	N			None	NA	NA	NA	NA	
						2	N			None	NA	NA	NA	NA	
	6	Built Structures	Condition	Seawall		1	N			None	NA	NA	NA	NA	
2						N			None	NA	NA	NA	NA		
Erosion			Property	Residential property	1	Y		-3.5	Increase monitoring and plan for assessment.	Moray Council	None	Short	Low		
					2	N		6.5	None	NA	NA	NA	NA		
7	Natural	Erosion	N/A		1	N			None	NA	NA	NA	NA		
					2	N			None	NA	NA	NA	NA		

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