

Moray Coastal Change Adaptation Plan

Roseisle to Burghead (South) Coast

Final Report

April 2024

www.jbaconsulting.com



JBA Project Manager

Doug Pender Meng PhD MCIWEM C.WEM
 Unit 2.1 Quantum Court
 Heriot Watt Research Park
 Research Avenue South
 Edinburgh
 EH14 4AP

Revision History

Revision Ref/Date	Amendments	Issued to
March 2024 – P01	Draft Report	Will Burnish Leigh Moreton
April 2024 – P02	Final report after Moray Council comments	Will Burnish Leigh Moreton

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.

Prepared by William Mortimer BSc (Hons) MSc PhD
 Coastal Engineer

Prepared by Katie Corbett BSc (Hons) MSc
 Coastal Engineer

Reviewed by Doug Pender MEng PhD MCIWEM C.WEM
 Technical Director

Purpose

This document has been prepared as a Draft Report for Moray Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Moray Council.

Acknowledgements

JBA and Moray Council would like to acknowledge the contributions of Steve McFarland (SEPA) and Dr Alistair Rennie (Nature Scot and Dynamic Coast) for provision of data and advice during the project planning phase.

Thanks also go to Prof Larissa Naylor and Dr Martin Hurst of the University of Glasgow for their valuable input throughout, and peer review of previous reports.

Copyright

© Jeremy Benn Associates Limited 2024.

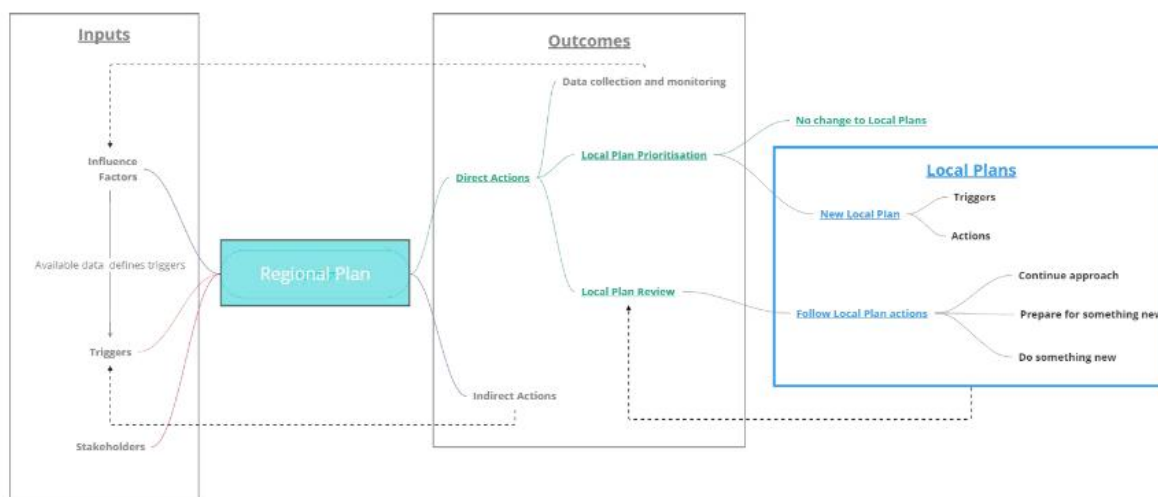
Carbon Footprint

A printed copy of the main text in this document will result in a carbon footprint of 157g if 100% post-consumer recycled paper is used and 199g if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex. JBA is aiming to reduce its per capita carbon emissions.

Executive summary

The report documents the Coastal Change Adaptation Plan (CCAP) for the Roseisle to Burghead (South) 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 at Roseisle to Burghead 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 one CMU was identified, and associated Adaptation Pathways were developed for this.

¹ Moray Coastal Change Adaptation Plans: Regional Plan -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 Roseisle to Burghead 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 Roseisle to Burghead (South) Coast.

The current iteration of the Roseisle to Burghead (South) 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

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

- 1 Establish, with the landowners, coordinated and consistent beach monitoring plan for Roseisle Beach.
- 2 Coastal Change Adaptation workshop and planning with Forestry and Land Scotland.
- 3 Identify landownership and safeguarding space. This should link with Regional Proactive Action 6 to identify and define local opportunities.

Again, these will be delivered during this first cycle.

Contents

1	Introduction	1
1.1	Coastal Change Adaptation Planning in Moray	1
1.2	What is a Local CCAP?	2
1.3	What are adaptation pathways?	2
1.4	What do adaptation pathways do?	2
1.5	What is the focus of the Local CCAP?	2
1.6	Where are we on the adaptation journey?	3
1.7	What is the Phase 0 Adaptation Framework?	3
1.8	How has this framework been developed?	3
1.9	How does the Local CCAP link to the Regional CCAP?	4
2	Plan Overview	5
2.1	Plan Area and Characteristics	5
2.2	Coastal Management Units	6
2.2.1	CMU 1: Roseisle Beach - Natural	7
2.3	CMU categorisation for local adaptation plan	8
3	Adaptation Pathways	9
3.1	CMU 1 Adaptation Pathway	9
4	Adaptation Process	11
4.1	Implementation Plan	11
4.2	Monitoring and Triggers	12
4.2.1	Monitoring	12
4.2.2	Trigger Classification	12
4.2.3	CMU-specific flooding trigger	12
4.2.4	CMU-specific erosion trigger	12
4.2.5	New information trigger	15
4.2.6	Moray Coastal Trail	15
4.3	Actions	15
4.4	Phase 0 Actions	16
4.5	Supporting Steps and Proactive Actions	17
4.6	Outcomes	17
4.7	Example application	20
5	Summary and Next Steps	21
5.1	Approach	21
5.2	Coastal Management Units and Risks	21
5.3	Adaptation Pathways	21
5.4	Implementation Plan	22
5.5	Next Steps	22
A	CMU Risk Assessment	23
B	Proactive Actions	26
C	Trigger and Action Database	27

List of Figures

Figure 1-1: Extent and location of CAs within Moray	2
Figure 1-2: Four pillars of coastal adaptation for Moray	4
Figure 2-1: Roseisle to Burghead (South) Coast CA, showing settlements, greenspace and environment and special consideration areas.	5
Figure 2-2: Coastal habitats at Roseisle to Burghead (South) Coast as identified by NatureScot.	6
Figure 2-3: Roseisle to Burghead (South) Coast CMU divided coastal extents.	7
Figure 3-1: Adaptation Pathway for CMU 1 (Natural coast). Grey lines represent possible future pathways.	10
Figure 4-1: High-level Implementation Plan.	11
Figure 4-2: Roseisle to Burghead (South) Coast erosion trigger location for non-residential property (NR property).	14
Figure 4-3: Complete Implementation Plan for Roseisle to Burghead (South) Coast CA.	19
Figure 4-4: Example application of Phase 0 to Phase 1 of the adaptation process and how the Implementation Plan works with Adaptation Pathways and Action Plans.	20

List of Tables

Table 2-1: Roseisle to Burghead (South) Coast CMU categorisation.	8
Table 4-1: CMU-specific erosion triggers for Roseisle to Burghead (South) Coast. Cells shaded red indicate that the erosion trigger has been met.	13
Table 4-2: Roseisle to Burghead (South) Coast erosion triggers	14
Table 4-3: Triggers, trigger categories and associated actions for the Roseisle to Burghead (South) Coast CMU.	16
Table 4-4: Local Proactive Actions.	17
Table 4-5: Roseisle to Burghead (South) Coast CA possible outcomes.	18

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). Roseisle to Burghead (South) Coast is one of eleven CAs recognised in the Regional Coastal Change Adaptation Plan (CCAP). The Roseisle to Burghead (South) CA comprises a 3.3 km section of un-populated sandy beach at Burghead Bay, backed by Roseisle Forest. The beach is likely susceptible to coastal erosion and retreat. For example, the Dynamic Coast has projected as much as 173 m of shoreline retreat could be realised by 2100 here. 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.

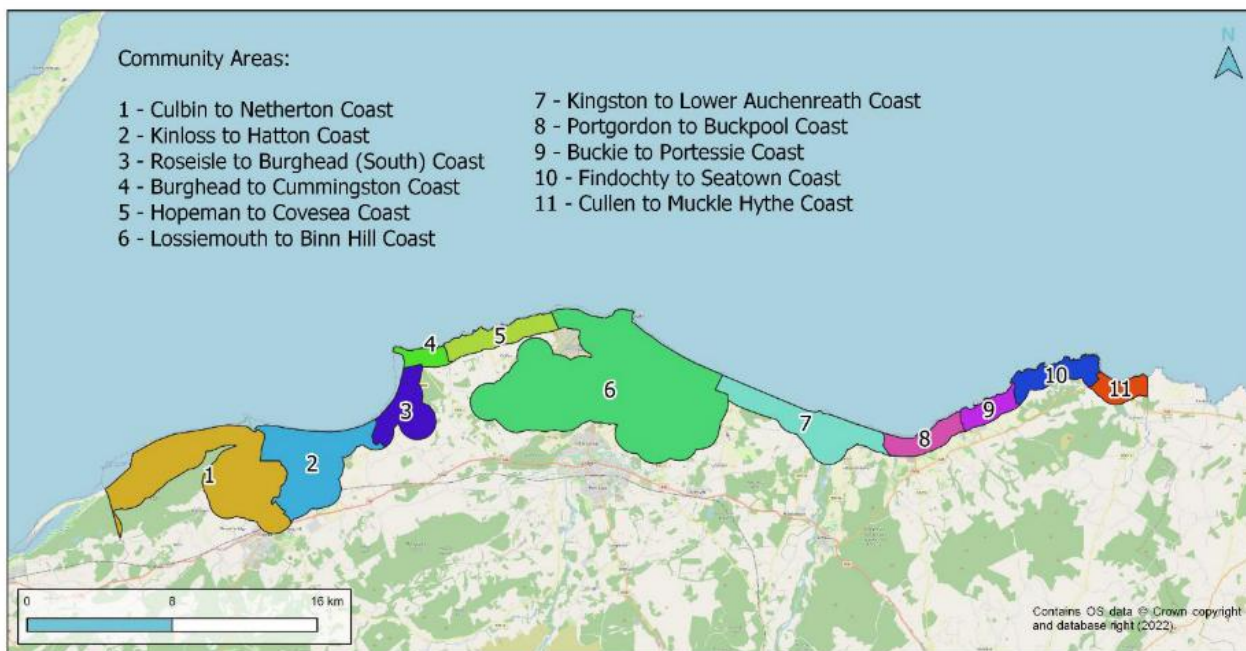


Figure 1-1: Extent and location of CAs within Moray

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 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 Roseisle to Burghead (South) Coast. 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 Roseisle to Burghead Coast 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 Plan³ 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 guidance⁴ 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

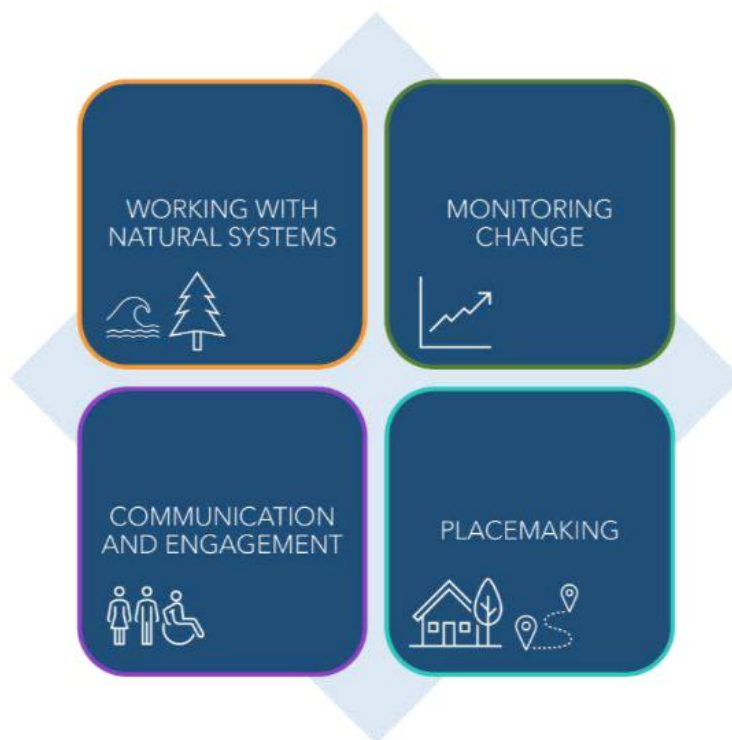


Figure 1-2: Four pillars of coastal adaptation for Moray

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 Roseisle to Burghead Coast (South) CA covers an area of ca. 8.3 km² and is located between the Kinloss to Hatton Coast CA and Burghead to Cummington Coast CA (Figure 1-1). The CA includes a range of coastal environments and land use areas. The northern section of the CA sits within a SEPA Potentially Vulnerable Area (PVA) due to the flood risk identified in the Flood Risk Management Plan⁵ (Figure 2-1).

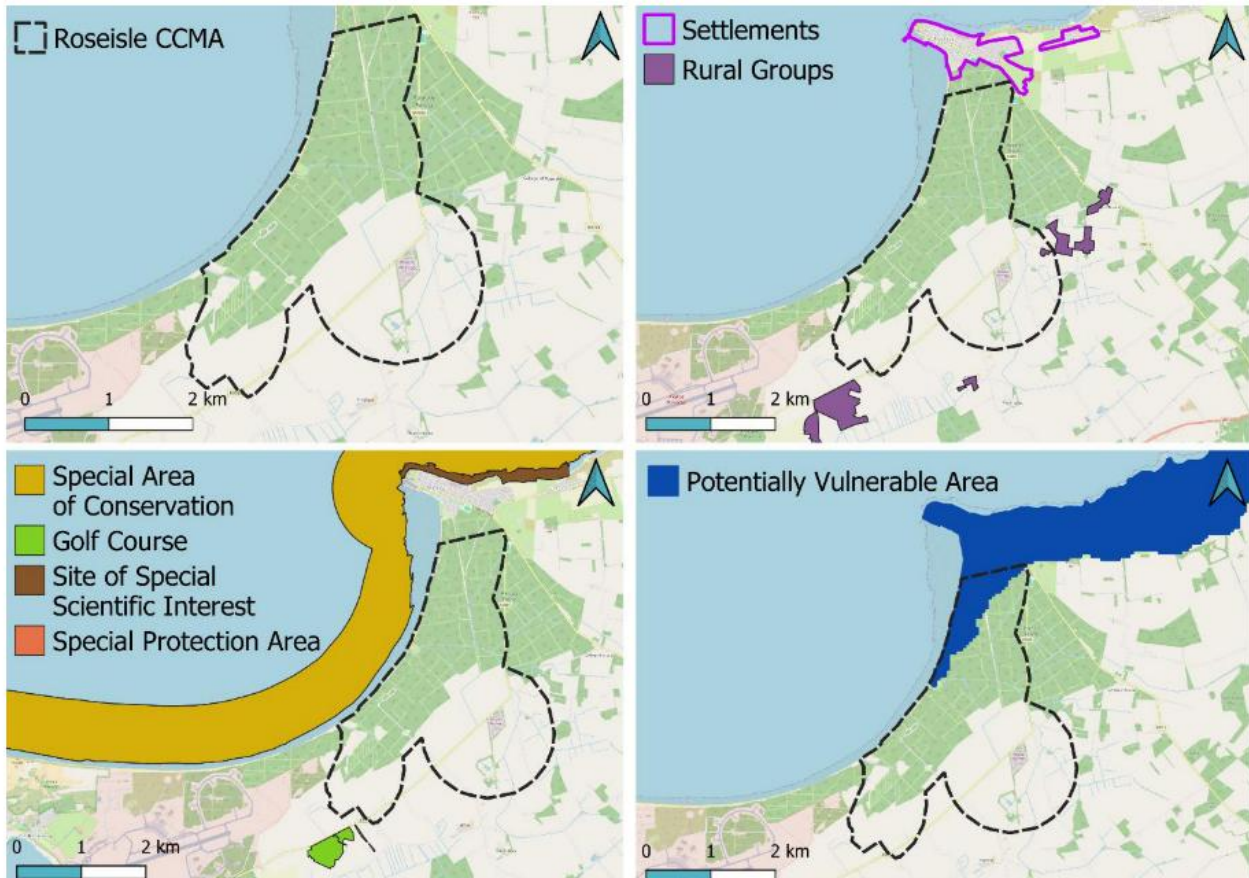


Figure 2-1: Roseisle to Burghead (South) Coast CA, showing settlements, greenspace and environment and special consideration areas.

Settlements:

The Roseisle to Burghead (South) Coast CA does not include any settlements and there are no rural groups identified near the coast.

Greenspace and Environment:

The entire coast of the CA is a NatureScot designated Special Area of Conservation (SAC) and the coastal waters offshore of the CA are a NatureScot designated Special Protection Area (SPA). There are no areas designated as Sites of Special Scientific Interest (SSSI) or golf courses within the CA.

⁵ Moray Council. 2016. Findhorn, Nairn and Speyside Local Flood Risk Management Plan. Section 2.4.4. <http://www.moray.gov.uk/downloads/file105636.pdf>

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)⁶. This PVA includes Burghead, and Cummington and continues eastwards to include Hopeman and the northwest part of Lossiemouth.

Habitats:

There are two key habitats along the coastal extent identified by Nature Scot (Figure 2-2). These include coastal unvegetated sands and dunes.

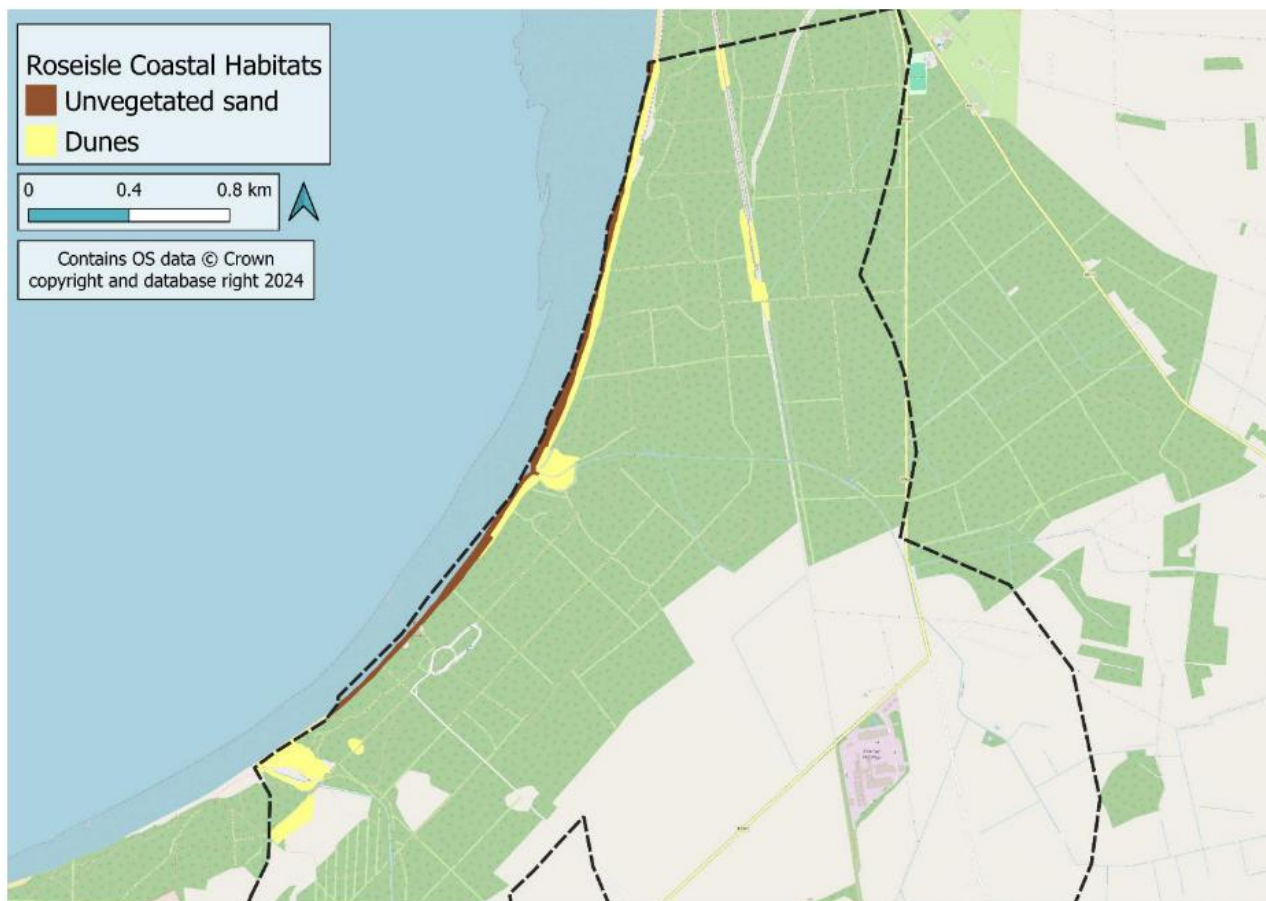


Figure 2-2: Coastal habitats at Roseisle to Burghead (South) Coast as identified by NatureScot.

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

⁶ Moray Council. 2016. Findhorn, Nairn and Speyside Local Flood Risk Management Plan. <http://www.moray.gov.uk/downloads/file105636.pdf>

- 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

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

Unlike other CAs, the Roseisle to Burghead (South) Coast CA coast comprises of just one CMU (Figure 2-3). The CMU is described below including a summary of the coastal change and flood risk. Full details of the CMU are provided in Appendix A.

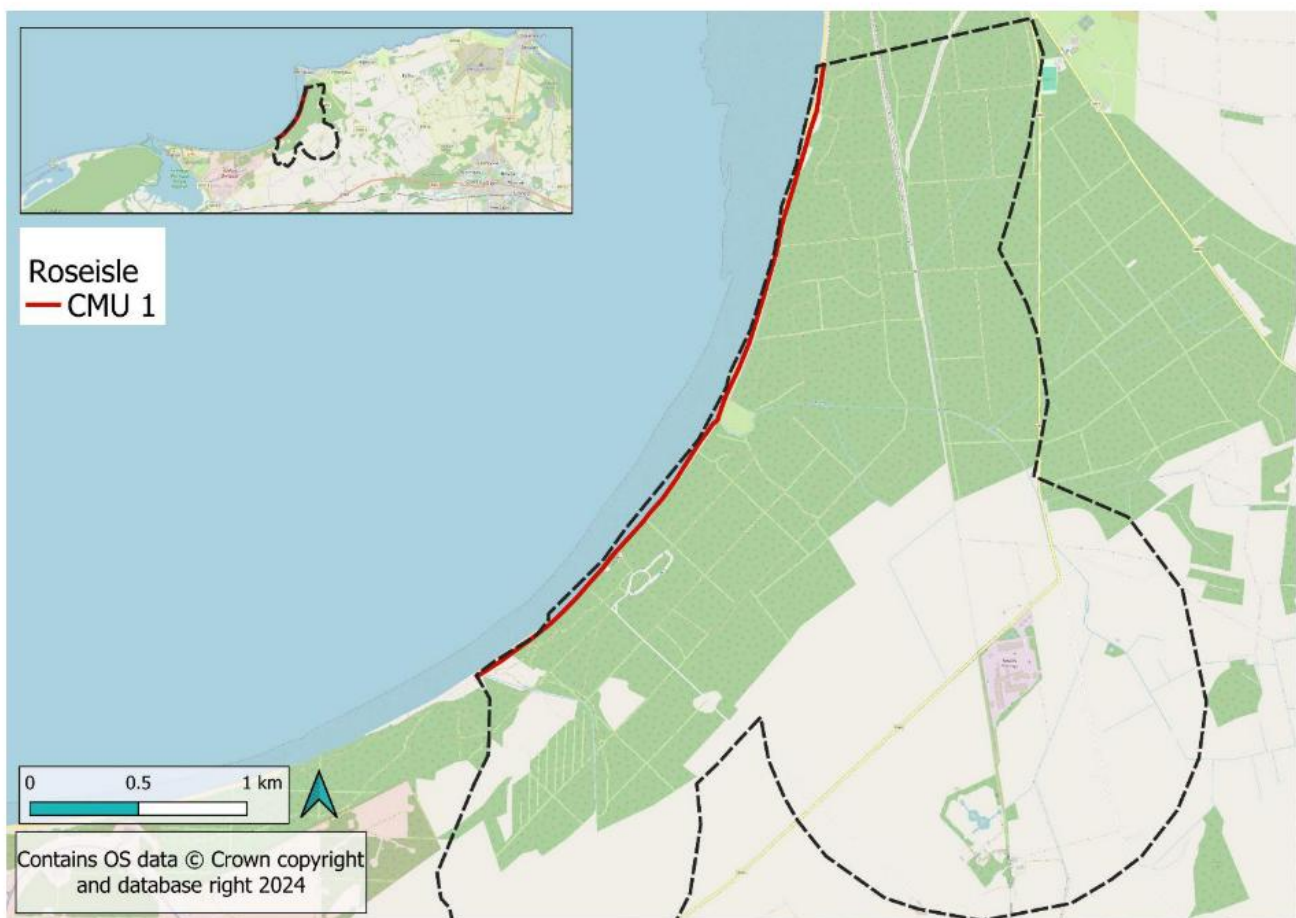


Figure 2-3: Roseisle to Burghead (South) Coast CMU divided coastal extents.

2.2.1 CMU 1: Roseisle Beach - Natural

This unit is classified as natural. The unit encompasses a 3.3 km stretch of Roseisle Beach, which faces northwest 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 Country Park, managed by Forestry and Land Scotland.

Along the toe of the dunes, and at the head of the beach, are a series of large concrete blocks at roughly 1 to 2 m spacing. The concrete blocks are relics from the wartime, intended as

defences against beach landings. Subsequent coastal retreat has left these blocks 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 0.4 m/yr (from ca. 2003 to 2011). This rate is expected to increase up to 1.6 m/yr by 2050 and up to 3.4 m/yr by 2100. This will lead to an estimated retreat of 34 m by 2050 and 173 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.

2.3 CMU categorisation for local adaptation plan

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

Table 2-1: Roseisle to Burghead (South) Coast CMU categorisation.

CMU	Coastal Type Classification	Risk Classification
1	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.
 - Erosion risk buffer 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 Adaptation Pathway

CMU 1 has been classified as a natural coastline and has therefore been assigned an adaptive pathway for natural coasts (Figure 3-1).

- **CMU 1 = Natural with Risk and Hazard**

Phase 0 of the adaptation pathway (1st column) is the current actions undertaken by Moray Council in respect of these CMUs. Here this is **No Intervention** as there are no defences within this CMU that Moray Council are obligated to maintain. This means that there will be no coastal and/or erosion risk management interventions, nor maintenance of existing structures 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.

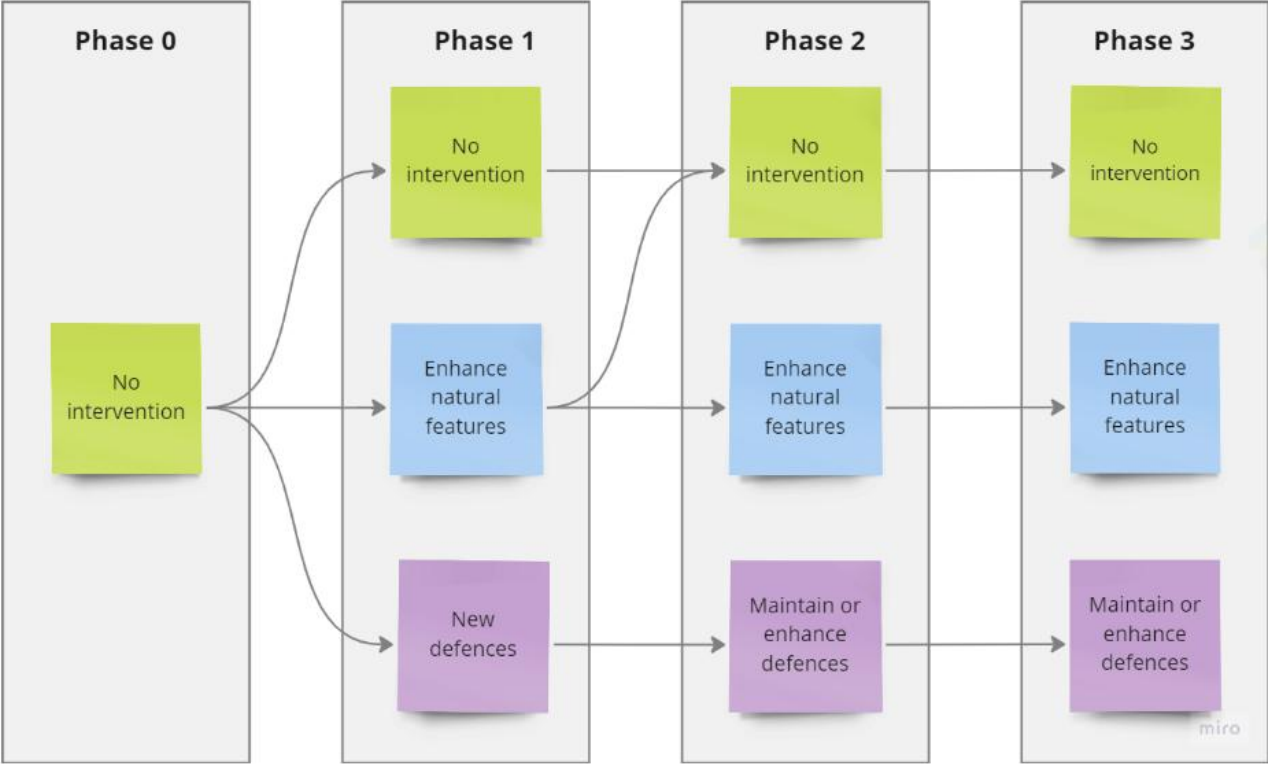


Figure 3-1: Adaptation Pathway for CMU 1 (Natural coast). Grey lines represent possible future pathways.

4 Adaptation Process

4.1 Implementation Plan

To support the delivery of the Adaptation Framework, a single Implementation Plan is applied to the entire Roseisle to Burghead (South) 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.

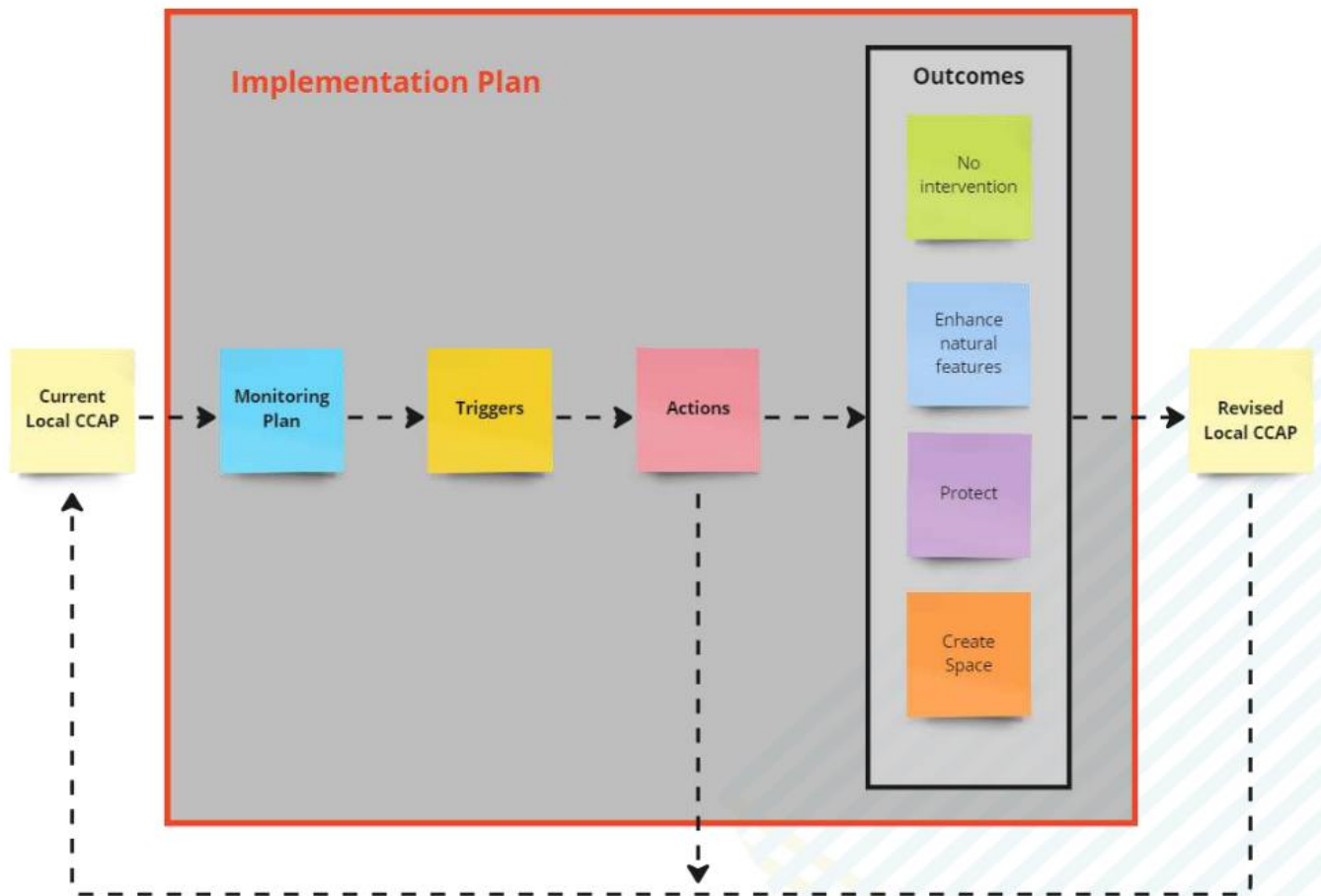


Figure 4-1: High-level Implementation Plan.

4.2 Monitoring and Triggers

4.2.1 Monitoring

Triggers are realised through monitoring of available data that inform 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 4-3), but risk exposure triggers related to physical flooding, erosion and overtopping thresholds are specific to each CMU. For the Roseisle to Burghead (South) Coast CA these are summarised in

Table 4-3.

Effective review of these requires development of a monitoring plan of risk for CMU 1 as follows:

- CMU 1: Monitoring of erosion hazard

4.2.3 CMU-specific flooding trigger

There are currently no assets at risk from flooding for the entire Roseisle to Burghead (South) Coast CA. Should future iterations of flood SEPA flood maps and NFRA data highlight assets as being at risk from flooding, a CMU-specific flooding trigger will be applied.

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 car parks and golf courses.

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, again, 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.

No erosion triggers are currently met for the property in CMU 1 (Table 4-1). Location of all assets used for erosion triggers are shown in Figure 4-2 and Table 4-2.

Table 4-1: CMU-specific erosion triggers for Roseisle to Burghead (South) Coast. Cells shaded red indicate that the erosion trigger has been met.

CMU	Maximum historical change rate (m/year)	Present-day distance of feature to coast (m)		Erosion trigger level 1: Coast X m from feature	Erosion trigger level 2: Coast X m from feature
1	0.4	Non-residential property	157	5	2



Figure 4-2: Roseisle to Burghead (South) Coast erosion trigger location for non-residential property (NR property).

Table 4-2: Roseisle to Burghead (South) Coast erosion triggers

CMU	Asset	Trigger Met	Erosion Trigger
1	Non-residential property	No	

While not currently included in the process adopted in Phase 0, the park (or components within it) could be considered an asset at risk. To establish whether other erosion Triggers should be set engagement with Forestry and Land Scotland should be undertaken (Proactive Action 2). This should aim to establish suitable approach to adaptation for future Phases 0.

4.2.5 New information trigger

New information on hazards, vulnerability, built structure and infrastructure assets etc will become available all the time as the CCAP is implemented. The new information trigger acknowledges this and accounts for changes to 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.

4.2.6 Moray Coastal Trail

Impact erosion on the Moray Coastal Trail⁷ (MCT) is yet to be quantified. 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 9) in this area. This will provide opportunities for investigation options to enhance and retain the amenity value.

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 a CMU 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 to CMU 1 in Roseisle to Burghead (South) Coast CA have been identified in

Table 4-3. 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 Plan⁸ Proactive are also required to support.

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 built structures or hybrid CMUs.

Post flood data collection:

⁷ <https://www.morayways.org.uk/routes/the-moray-coast-trail/>

⁸ Moray Coastal Change Adaptation Plan: Regional Plan - IRR-JBAU-XX-XX-RP-MO-0001-S4-P03-Regional_Plan

- 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 guidance⁹ and include all necessary components to 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 Roseisle to Burghead (South) Coast CMU is included in

Table 4-3. These highlight what may be delivered during the Phase 0 cycle and are dependent on the associated Trigger being realised.

Table 4-3: Triggers, trigger categories and associated actions for the Roseisle to Burghead (South) Coast CMU.

Category	Trigger	Action	CMU
Natural Systems	Changes to habitat	Community engagement (places)	CMU 1
	Changes to greenspace	Community engagement (places)	CMU 1
Climate	Update to climate guidance	Review risk assessment Community engagement (practice)	CMU 1
	Update to SEPA flood maps	Review risk assessment Community engagement (practice)	CMU 1
	Coastal flood occurrence	Review risk assessment Community engagement (places, asset) Post flood survey	CMU 1
Risk exposure	Erosion buffer exceeded	Review risk assessment Community engagement (places)	CMU 1
	Update to Dynamic Coast	Review risk assessment Community engagement (practice)	CMU 1
Socio-economic	Changes of asset use	Community engagement (asset)	CMU 1
	Changes of asset owner	Community engagement (asset)	CMU 1
	Community pressure	Review risk assessment Community engagement (places)	CMU 1

4.4 Phase 0 Actions

Phase 0 Actions require immediate attention. Following the process of this initial CCAP for Roseisle to Burghead (South) Coast, it was found that no phase 0 actions have been triggered yet within this CA at this stage.

⁹ Scottish Government. 2016. Flood protection appraisals: guidance for SEPA and responsible authorities <https://www.gov.scot/publications/guidance-support-sepa-responsible-authorities/pages/2/>

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 three such actions have been identified. These have been developed focusing on the key pillars 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 4-4, with further details on each included in Appendix B. These are designed to complement the wider Proactive Actions identified in the Regional CCAP.

Table 4-4: Local Proactive Actions.

Action	Details	Pillars
1	Establish coordinated and consistent beach monitoring plan for Roseisle Beach.	Monitoring Change
2	Coastal Change Adaptation workshop and planning with Forestry and Land Scotland.	Community and Engagement
3	Identify landownership and safeguarding space. This should link with Regional Proactive Action 6 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 4-5 summarises the general and specific CMU outcomes for the Roseisle to Burghead (South) Coast CA.

Table 4-5: Roseisle to Burghead (South) Coast CA possible outcomes.

Category	Outcome	Roseisle to Burghead Coast CMU
No intervention	No intervention	CMU 1
Enhance natural features	Enhance natural features	CMU 1
Protect	New Defences	CMU 1
Create space	Relocate assets	CMU 1

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

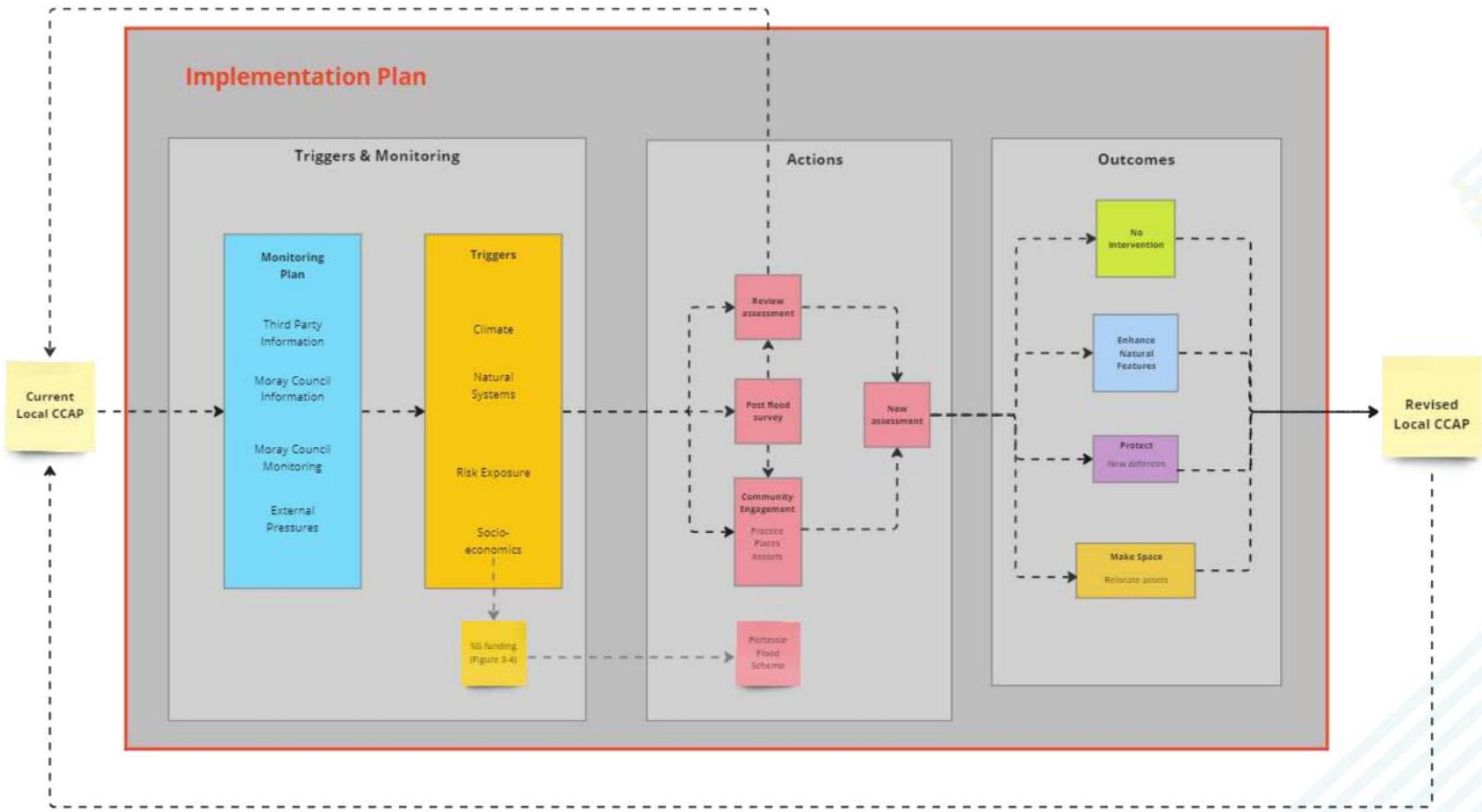


Figure 4-3: Complete Implementation Plan for Roseisle to Burghead (South) Coast CA.

4.7 Example application

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

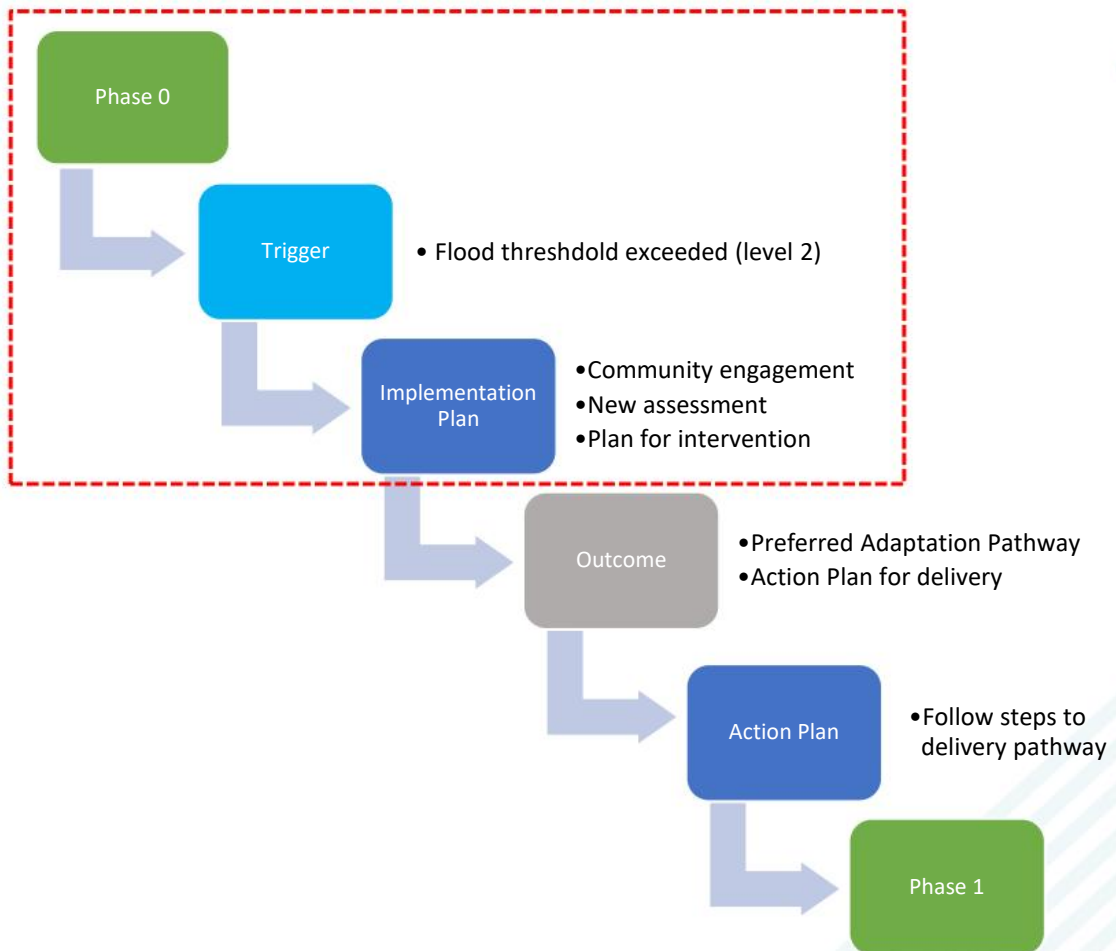


Figure 4-4: Example application of Phase 0 to Phase 1 of the adaptation process and how the Implementation Plan works with Adaptation Pathways and Action Plans.

5 Summary and Next Steps

5.1 Approach

This document presents the local CCAP for Roseisle to Burghead (South) 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 Roseisle to Burghead (South) 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 Roseisle to Burghead (South) Coast CA. This will happen when the process moves into Phase 1.

5.2 Coastal Management Units and Risks

Only one CMU makes up the Roseisle to Burghead (South) Coast CA. A refined assessment was undertaken to determine coastal type and associated current and future flood and erosion risk as summarised below:

- CMU1 – Natural with Risk and Hazard

This was taken forward to develop Adaptation Pathways and an Implementation Plan with Triggers and Actions associated with the CMU.

5.3 Adaptation Pathways

To enable effective implementation of this CCAP across the Roseisle to Burghead (South) Coast CA, the 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. Implementation of the Plan will result in end outcomes that will ultimately influence the direction of the Adaptation Pathways in the Roseisle to Burghead (South) 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, three Proactive Actions have been set.

5.5 Next Steps

Adaptation 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 Roseisle to Burghead (South) Coast are summarised in Table A-1.

Table A-1: Coastal dataset summary for Roseisle to Burghead (South) 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 (3044)
	2.86 mOD	2-year	
	3.15 mOD	50-year	
	3.21 mOD	100-year	
	3.27 mOD	200-year	
	3.41 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 Roseisle to Burghead (South) 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 to 2100. The data has been analysed for each CMU individually and has been used to identify receptors at risk. Note, there is only one CMU for the Roseisle to Burghead (South) Coast CA.

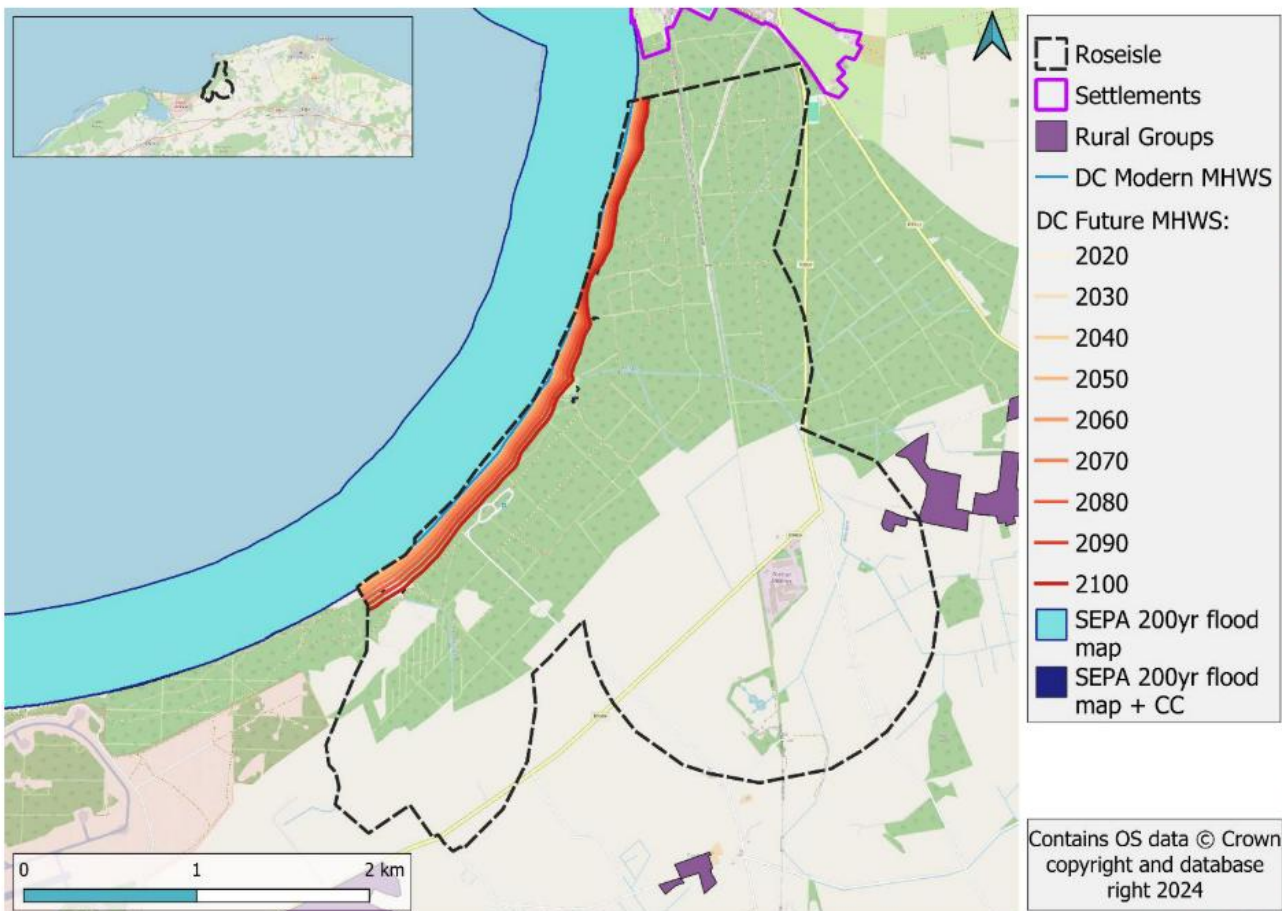


Figure A-1: Roseisle to Burghead (South) Coast CA coastal flood and erosion hazard overview.

A.2 CMU 1:

This unit is classified as natural encompasses a 3.3 km stretch of Roseisle Beach, which faces northwest 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, and at the head of the beach, are a series of large concrete blocks at roughly 1 to 2 m spacing. The concrete blocks are relics from the wartime, intended as defences against beach landings. Subsequent coastal retreat has left these blocks 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 0.4 m/yr. Maximum future erosion rates are expected to increase to 1.6 m/yr by 2050 and to 3.4 m/yr by 2100. This would result in a maximum of 173 m of land loss caused by shoreline retreat by 2100. Table A-2 summaries Dynamic Coast data. Assets within Dynamic Coast’s projected erosion area or those in the vicinity of it in 2100 under the High Emission Scenario are summarised below:

- One NRP (non-residential property)

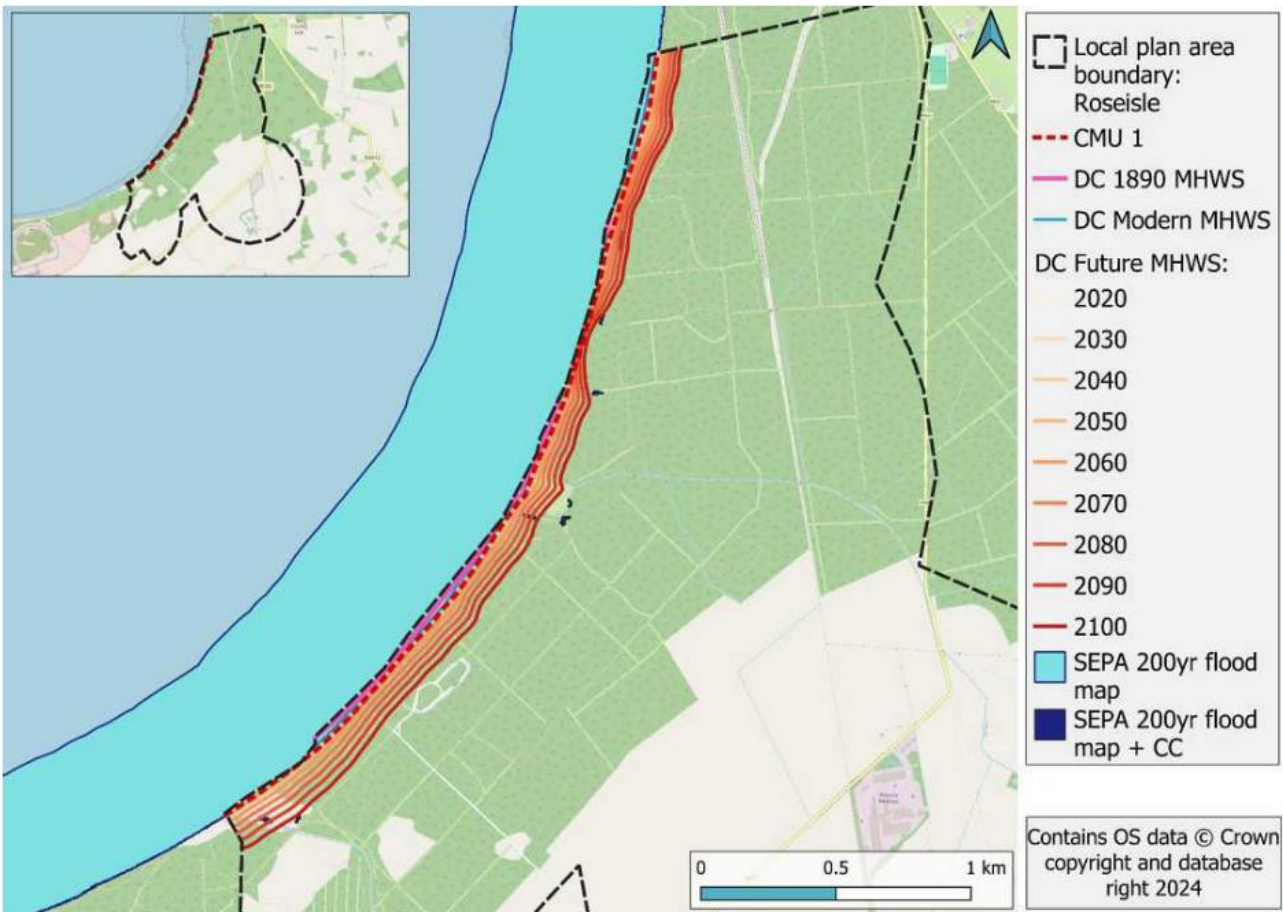


Figure A-2: CMU 1 coastal hazards map showing SEPA flood extents and Dynamic Coast (DC) past and future erosion. Inset shows unit without coastal hazards.

Table A-2: CMU 1 Dynamic Coast erosion summary.

Dynamic Coast calculation	Results	
Historical rate	0.4 m / yr	Maximum
	0.0 m / yr	Median
2050 rate	1.6 m / yr	Maximum
	1.1 m / yr	Median
2050 distance	33.7 m	Maximum
	21.9 m	Median
2100 rate	3.4 m / yr	Maximum
	2.4 m / yr	Median
2100 distance	173.0 m	Maximum
	125.2 m	Median

B Proactive Actions

Action 1 – Establish coordinated and consistent beach monitoring plan for Roseisle Beach.

The requirements for monitoring Roseisle Beach 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 specific erosion triggers. It should focus across the entire CA.



Action 2 – Coastal Change Adaptation workshop and planning with Forestry and Land Scotland.

The Roseisle Country Park is managed by Forestry and Land Scotland. Beyond the economic value of the non-residential property at risk, there are many further benefits to the local community for social and leisure activities as well as the rich biodiversity.

To capture the importance of this wider value to the local community, and evaluate the risks more specifically in this context, a detailed assessment of risk within this country park should be undertaken. The risk assessment should focus on risk to park assets (paths, trails, other).

Following the detailed risk assessment, a specific coastal change adaptation plan would be beneficial for this area, in which specific triggers are set for country park assets, designed to align with Forestry and Land Scotland strategy.



Action 3 – 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 Roseisle to Burghead Coast.

Community Area (CA)	CMU	Coast Type	Trigger Type	Asset Affected	Asset Description	Trigger Level	Trigger Exceeded?	Trigger Buffer Flooding (Freq/10 yr)	Trigger 1 buffer (m)	Action	Owner	Delivery Partners	Timescale	Cost
Roseisle to Burghead Coast	1	Natural	Erosion	Non-Residential Property		1	N		152	None	NA	NA	NA	NA
						2	N		155	None	NA	NA	NA	NA

JBA
consulting

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:  

Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
ISO 27001:2013
ISO 45001:2018

