

Aberdeenshire Coastal Change Adaptation Plan

Buchan East

Draft

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Aberdeenshire Council**

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Executive Summary

The report documents the Coastal Change Adaptation Plan (CCAP) for the Buchan East Community Area (CA) in Aberdeenshire.

The CCAP provides an overview of the coastal flood and erosion risks to Buchan East, 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 Aberdeenshire's coast.

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

- Classification of coastal landform type.
- Risk associated with coastal flooding and erosion.
- A total of three CMUs were identified, and two associated Adaptation Pathways.

To support delivery, an economic impact assessment was undertaken. This, in conjunction with the risk assessment, was used to establish initial outcome policies for each CMU.

These are set as either:

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

Delivery of these outcome policies is described by an 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 actions that deliver the desired policy Outcomes can be set. To date the Plans and pathways have been developed using available national and regional data. At this local level however, certain Trigger realisation may require improvements to data sources to support decisions and a robust outcome.

A set of Phase 0 Actions have been identified, that require immediate attention because of Triggers being met in this iteration of the Buchan East Local Plan. 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 Buchan East.

The current iteration of the Aberdeenshire CA local plan is at Phase 0. The Triggers met in Phase 0 of the Adaptation Pathway and associated Actions for each CMU are summarised.

Phase 0 Triggers and Actions for each CMU in Buchan East.

CMU	Trigger	Action
1	No current Triggers	No current Actions
2	Erosion Trigger met (Level 2)	Undertake assessment and plan for intervention
3	No current Triggers	No current Actions

As well as Triggers and Actions that correspond directly to the Adaptation Pathway and specified CMUs, Proactive Actions, which should be ongoing to support coastal change adaptation for the whole of Buchan East are summarised below:

1. Investigate dune enhancement in CMU 1 and CMU 2 and locations with vulnerable core paths
2. Identify, define and adopt suitable CCMA's.
3. Establish coordinated and consistent beach monitoring plan for Natural CMUs
4. Adaptation and resilience workshop with local community and stakeholders
5. Identify landownership and opportunities to support Make Space outcome policies

1 Introduction

1.1 Coastal Change Adaptation Planning in Aberdeenshire

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

In a changing climate, traditional coastal risk management approaches will become a less sustainable means of managing and protecting communities against these risks. Rather, we need to 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 we respond to the current and future risks can help to reduce costs and negative impacts such as assets eroding into the sea or suffering repeat frequent 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 Aberdeenshire the coast has been subdivided into Community Areas (CAs) (Figure 1-1). Buchan East is one of the CAs identified as being a priority for a CCAP. The coast of the Buchan East CA is primarily soft, natural coast, defended with extensive fixed and shifting dune systems. This provides primary motivations for a more detailed, local, CCAP which is contained in this document.



Figure 1-1: Extent and location of CAs within Aberdeenshire.

1.2 What is a Local CCAP?

A Local CCAP follows the same principle as the Regional CCAP¹ 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 Aberdeenshire Coastal Change Adaption Plan - Regional Plan

1.3 What are adaptation pathways?

Adaptation Pathways offer flexible tools for local authorities, politicians, businesses, and residents to make informed decisions about coastal change and uncertainty. Beyond traditional management, these pathways highlight the value of working with natural processes, enhancing the environment, and implementing supportive steps like land safeguarding to prepare for rising sea levels, erosion, and flooding.

Their goal is to identify climate-resilient risk management and development options for each CMU, allowing decisions to be adjusted dynamically over time. Triggers within Adaptation Pathways indicate when current approaches should be reviewed and possibly changed based on new information or shifting risks.

1.4 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 land-based will result in a sustainable adaptation journey for Aberdeenshire. 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.

1.5 Where are we on the adaptation journey?

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 Buchan East. It then identifies and promotes a process that, when implemented by Aberdeenshire 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. Rather initial and end outcome policies are defined. Through the process these will be implemented through identified actions for delivery.

1.6 What is the Phase 0 Adaptation Framework?

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

Guide Aberdeenshire Council towards development of detailed Adaptation Pathways and associated Action Plans for the Buchan East 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 future Adaptation Pathways.
- Present coastal flood and erosion risk for each CMU.
- Develop an Implementation Plan to be used by Aberdeenshire 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 Plan² and Local Planning Policy. These should be implemented in parallel to avoid future risk by making space for change.

1.7 How has this framework been developed?

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

² [Aberdeenshire Council Local Development Plan 2023](#)

³ [Coastal Change Adaption Plan Guidance - Scottish Government](#)

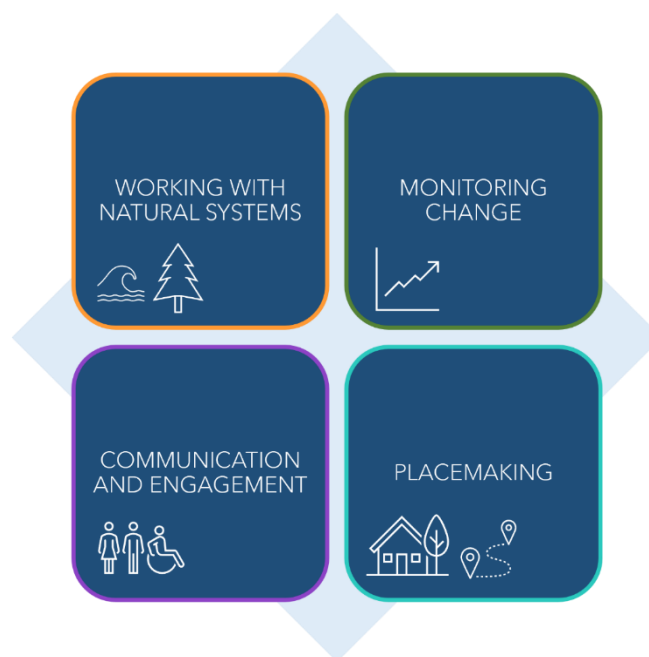


Figure 1-2: Four pillars of coastal adaptation for Aberdeenshire.

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

The Regional CCAP links to the Local CCAP by:

1. Defining the prioritisation of Local CCAP with risk, development, management, and socio-economic Influence Factors (see Regional Plan for more details).
2. Setting wide Proactive Actions that, when implemented, should be used to support Local CCAP Action Plans.
3. Providing 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 Buchan East CA covers an area of ca.85 km² and is located between Invercairn and Fraserburgh CA and Boddam and Peterhead CA. The CA coast is dominated by sand beach and dune environments and a variety of land use areas (Figure 2-1).

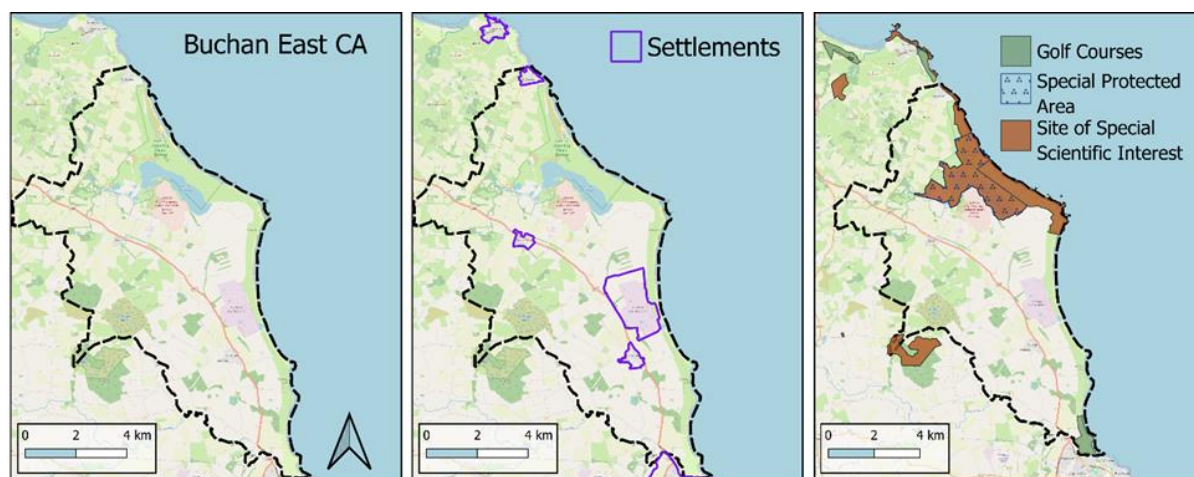


Figure 2-1: Buchan East CA, showing settlements, greenspace and environment and special consideration areas.

Settlements:

The Buchan East CA includes the coastal settlement of St. Combs in the North, and similarly sized inland settlements Crimond and St. Fergus further south. Of those, St Combs, with a population of ca. 620⁴, is at most risk from coastal erosion and flooding.

Greenspace and Environment:

The coast of the Buchan East CA from St. Combs to Rattray Head is a Nature Scot designated Site of Special Scientific Interest (SSSI). Loch of Strathbeg Nature Reserve is a designated Special Protected Area from its inland location at the loch to where the Burn of Savocho enters the sea to the east. Peterhead Golf Club at the southernmost extent of the CA provides valuable recreational and tourist amenity for the town of Peterhead and surrounding area.

Habitats:

There are three key habitat types along the coastal extent of Buchan East as identified by NatureScot (Figure 2-2). These habitats include buildings/town (St. Combs), shifting dunes, unvegetated sand beaches and fixed dunes.

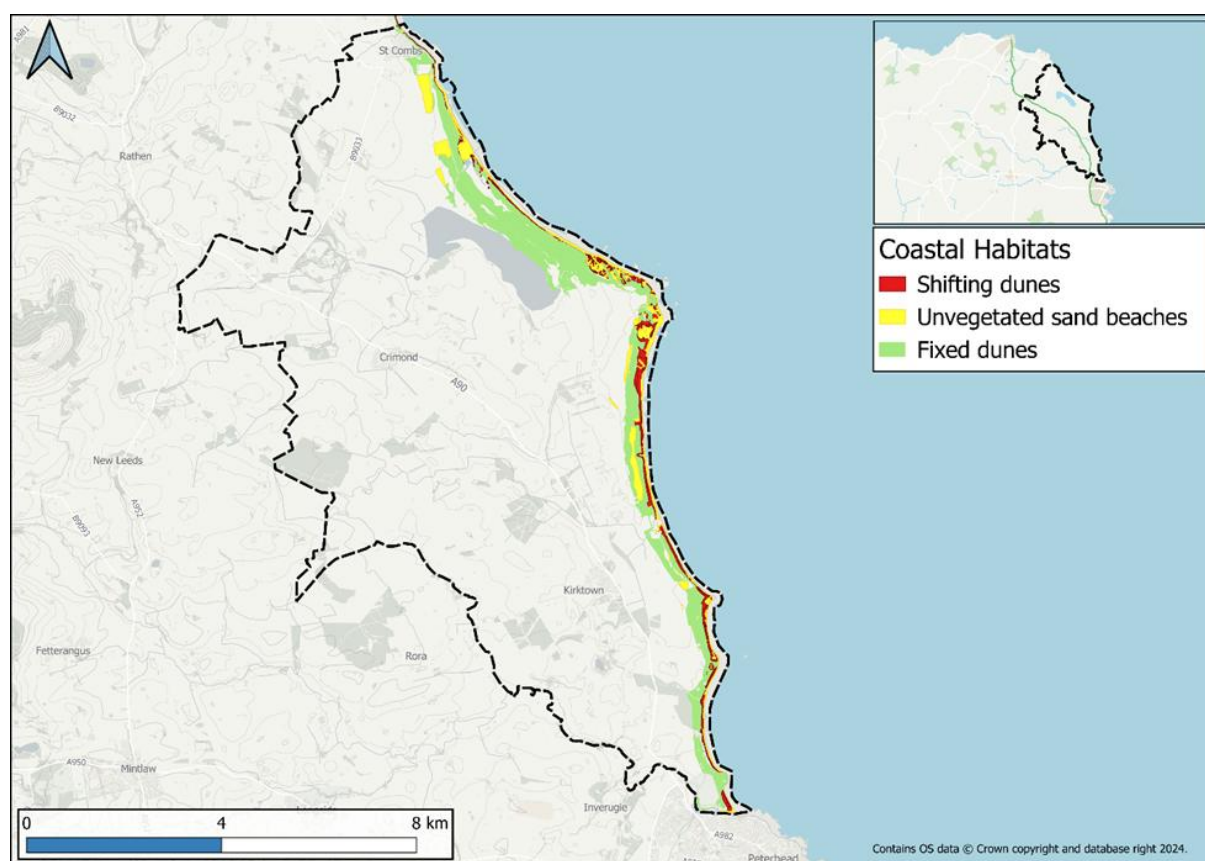


Figure 2-2: Coastal habitats at Buchan East as identified by NatureScot.

⁴ [National Records of Scotland - Population estimates for settlements and localities in Scotland: mid-2020](#)

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.
 - Natural – beaches, cliffs, dunes, saltmarshes, etc.
 - Defended – formal engineered structures.
 - Hybrid – combination of a and b
2. Risk associated with coastal flooding and erosion.
 - Risk and Hazard
Assets present in CMU, which are at risk of flooding/erosion hazard.
 - Risk and Unknown Hazard
Assets present in CMU, no data on flood/erosion risk available.
 - No Risk and Hazard
No assets present in CMU, but there is still a flooding/erosion hazard.
 - No Risk and No Hazard
No assets present in CMU, no flooding/erosion hazard.

Following this, the Buchan East CA coast has been subdivided into three CMUs (Figure 2-3). These are described below including a summary of the coastal change and flood risk.

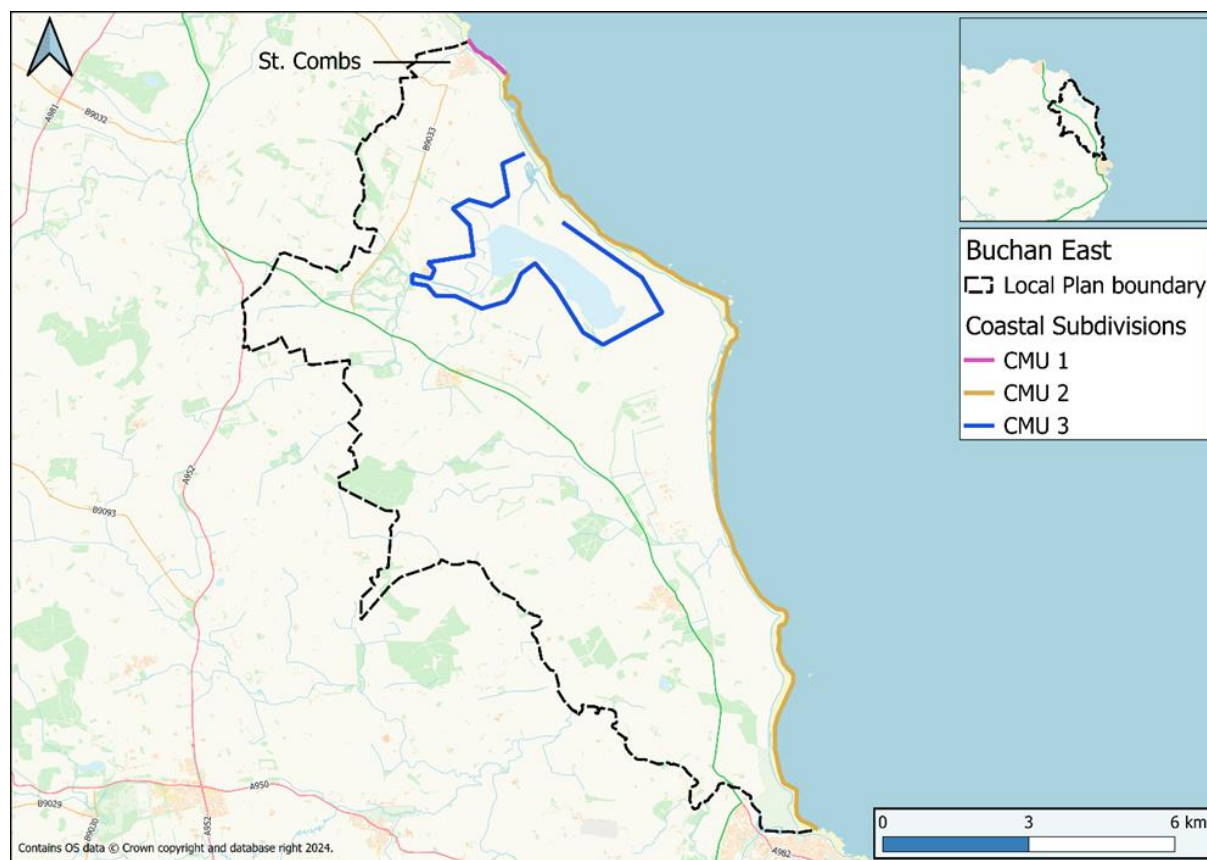


Figure 2-3: CMUs within the Buchan East CA.

2.2.1 CMU 1: St Combs Dunes

CMU 1 is predominantly the dynamic natural features of the sand beach and dune system stretching from the village of St. Combs to the northern extent of the Loch of Strathbeg Nature Reserve. Currently, the dunes in CMU offer a natural protection to the land and settlements from erosion and flooding. The beach and dune system at CMU 1 has experienced low levels of erosion historically, with Dynamic Coast 2 data showing only 5% of this coastal section has eroded historically, with a maximum rate of 0.1 m/yr. Those areas that have eroded are to the south of the CMU, away from any properties, but within the vicinity of core coastal paths. However, the full length of CMU 1 is expected to suffer land loss from coastal erosion in the future, reaching a maximum of 44 m by 2100 (Table 2-1). No properties are predicted to be at risk from erosion by 2100.

No properties are predicted to be at risk from coastal flooding under a 1 in 200-year flood event, even under future climate (Figure 2-4).

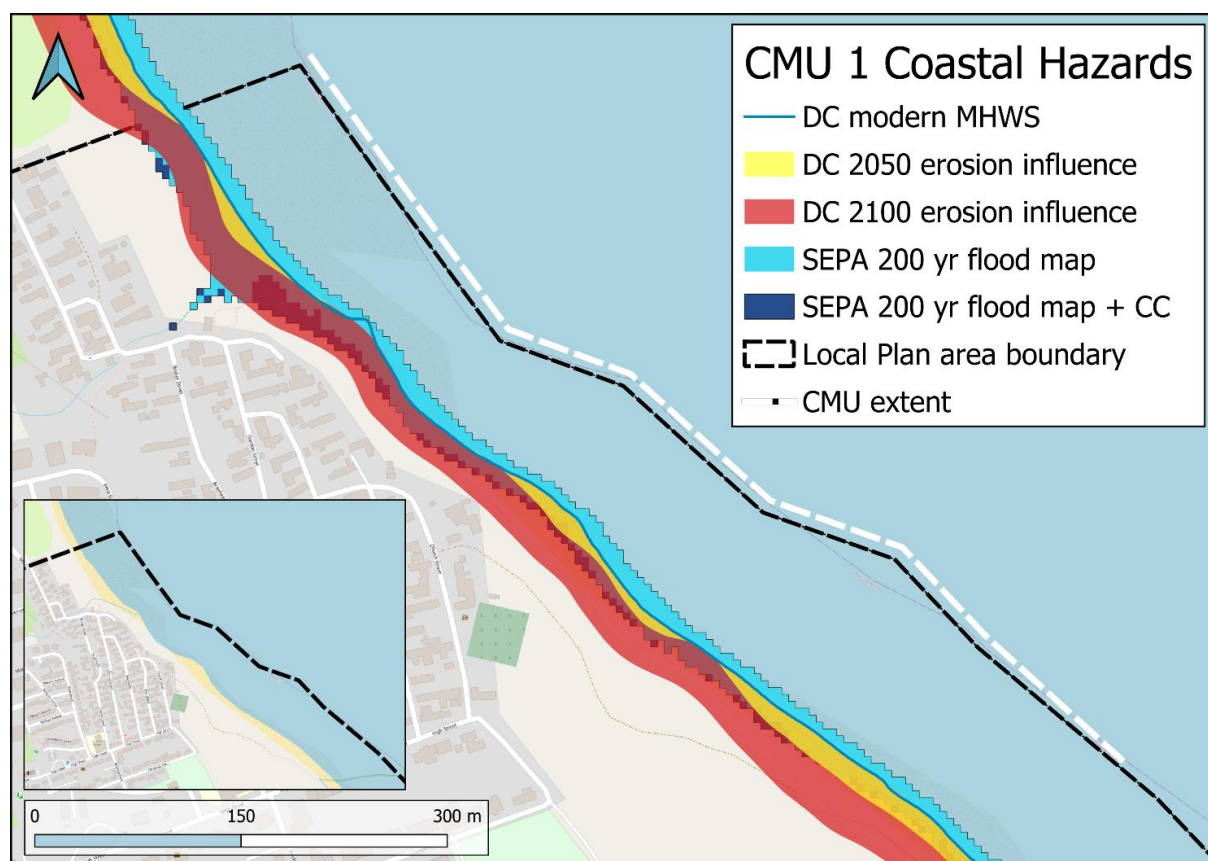


Figure 2-4: CMU 1: Beach north natural coastal hazards map showing SEPA flooding extents and Dynamic Coast (DC) future erosion. Inset shows CMU without coastal hazards.

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

Dynamic Coast calculation	Results	
Historical rate	0.1 m/yr	Maximum
	+0.1 m/yr (accretion)	Median
2050 rate	0.4 m/yr	Maximum
	0.2 m/yr	Median
2050 distance	9.2 m	Maximum
	3.6 m	Median
2100 rate	0.8 m/yr	Maximum
	0.7 m/yr	Median
2100 distance	43.9 m	Maximum
	30.8 m	Median

2.2.2 CMU 2: St Fergus to Peterhead Dunes

CMU 2 is dominated by the sand beach and dune system from the northern extent of the Loch of Strathbeg Nature Reserve to the left bank of the River Ugle where it enters the sea at Peterhead. Currently, this system protects the land from erosion and flooding. The beach and dune system at CMU 2 has experienced high levels of erosion historically, with Dynamic Coast 2 data showing a maximum rate of 1.7 m/yr. No properties are however currently predicted to be at risk from erosion, but an extensive 1,870 m extent of core path is at risk by 2050. CMU 2 is expected to suffer substantial land loss to coastal erosion, reaching a maximum of approximately 220 m by 2100. However, the median historic erosion rate shows accretion, as does the median of the maximum predicted erosion distance for 2050. This may, in part, be due to erosion hotspots, such as south of Rattray Head and in contrast large areas of coastline where accretion has occurred from south of the coastal outflow of the Loch of Strathbeg to Rattray Head.

No properties are predicted to be at risk from coastal flooding in CMU 2 under a 1 in 200-year flood event, even under future climate.

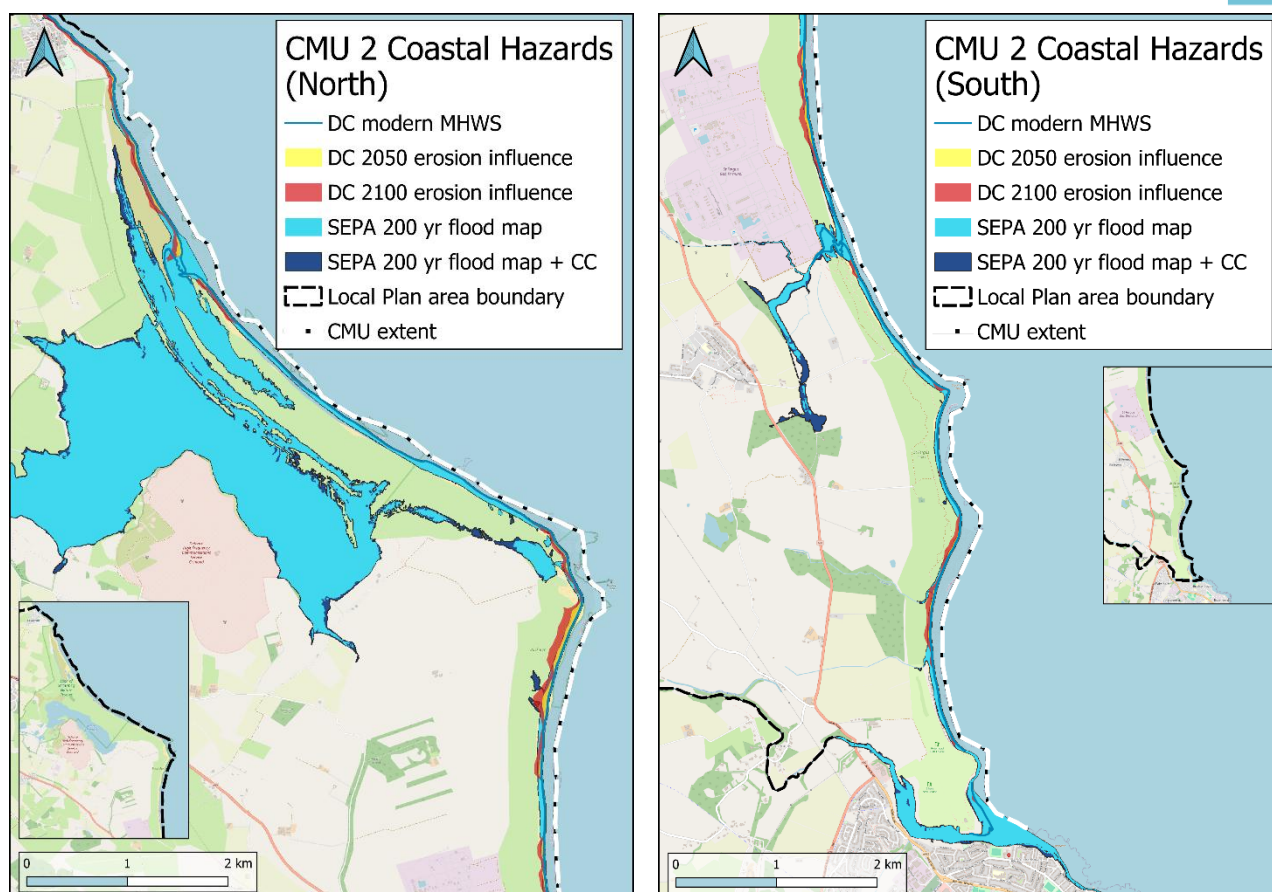


Figure 2-5: CMU 2: Beach south natural coastal hazards maps showing SEPA flooding extents and Dynamic Coast (DC) future erosion. Insets show CMU without coastal hazards.

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

Dynamic Coast calculation	Results	
Historical rate	1.7 m/yr	Maximum
	+0.3 m/yr (accretion)	Median
2050 rate	2.5 m/yr	Maximum
	0 m/yr	Median
2050 distance	70.3 m	Maximum
	+2.7 m (accretion)	Median
2100 rate	3.2 m/yr	Maximum
	0.6 m/yr	Median
2100 distance	219.4 m	Maximum
	17.2 m	Median

2.2.3 CMU 3: Inland Natural

CMU 3 covers the inland extent of the 200-year future coastal flood extents from the outfall of the Loch of Strathbeg nature reserve. As this area is further inland, no coastal erosion is present here. Flooding is predicted to affect the surrounding wetland and fixed dunes of the

Loch of Strathbeg nature reserve, but no properties or infrastructure are currently predicted to be at risk (Figure 2-6: CMU 3: Inland Natural coastal hazards map showing SEPA flooding extents. Erosion data unavailable. Inset shows CMU without coastal hazards.).

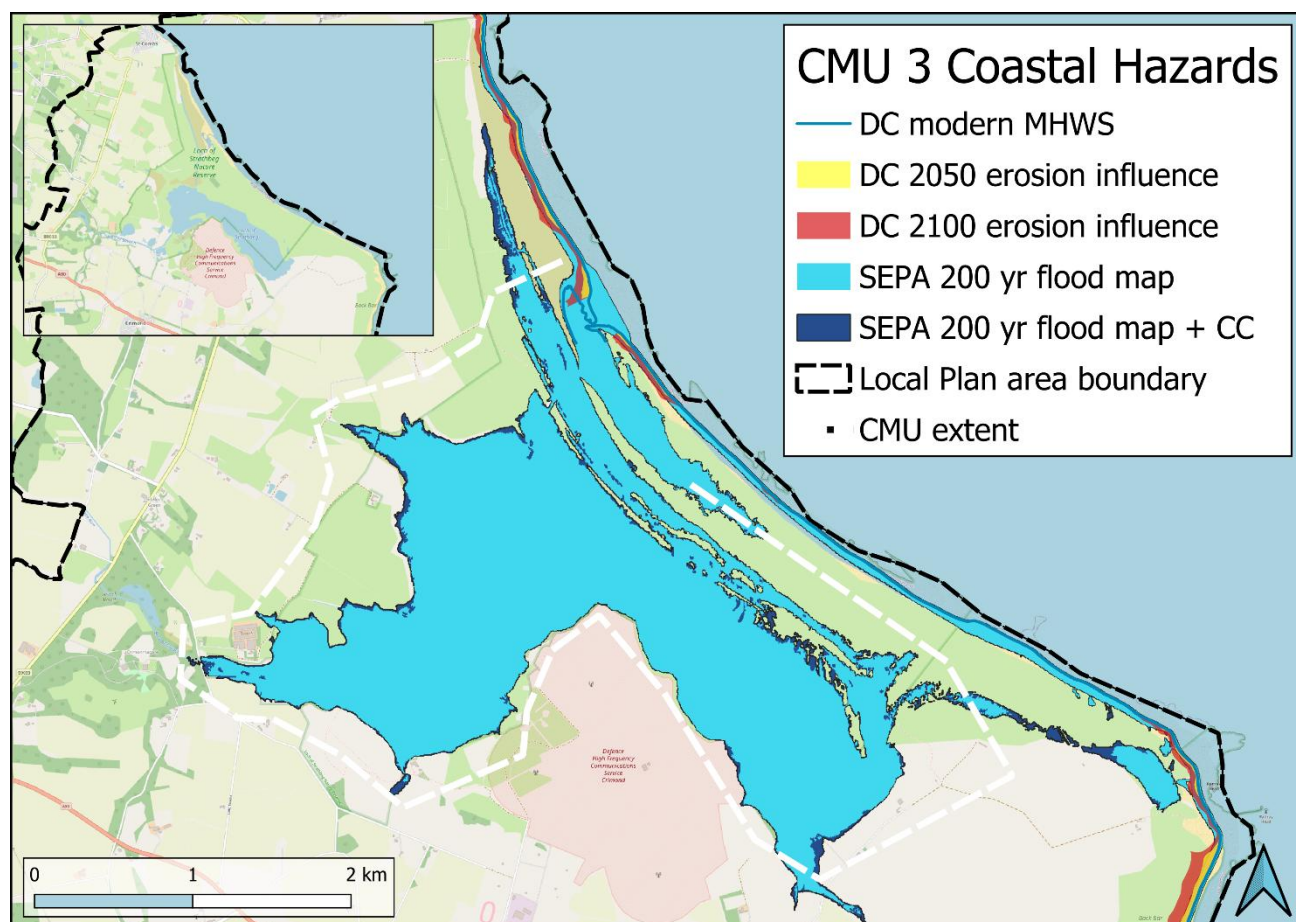


Figure 2-6: CMU 3: Inland Natural coastal hazards map showing SEPA flooding extents. Erosion data unavailable. Inset shows CMU without coastal hazards.

2.3 Core paths

Within the Buchan East CA the core paths are the most vulnerable assets to erosion and can be used to help prioritise where NBS may provide the greatest benefit. The exception being along the coastal extent of the Loch of Strathbeg Nature reserve where no core paths have been identified as being at risk.

The location and extent of core path sections predicted to be at risk are shown below (Figure 2-7).

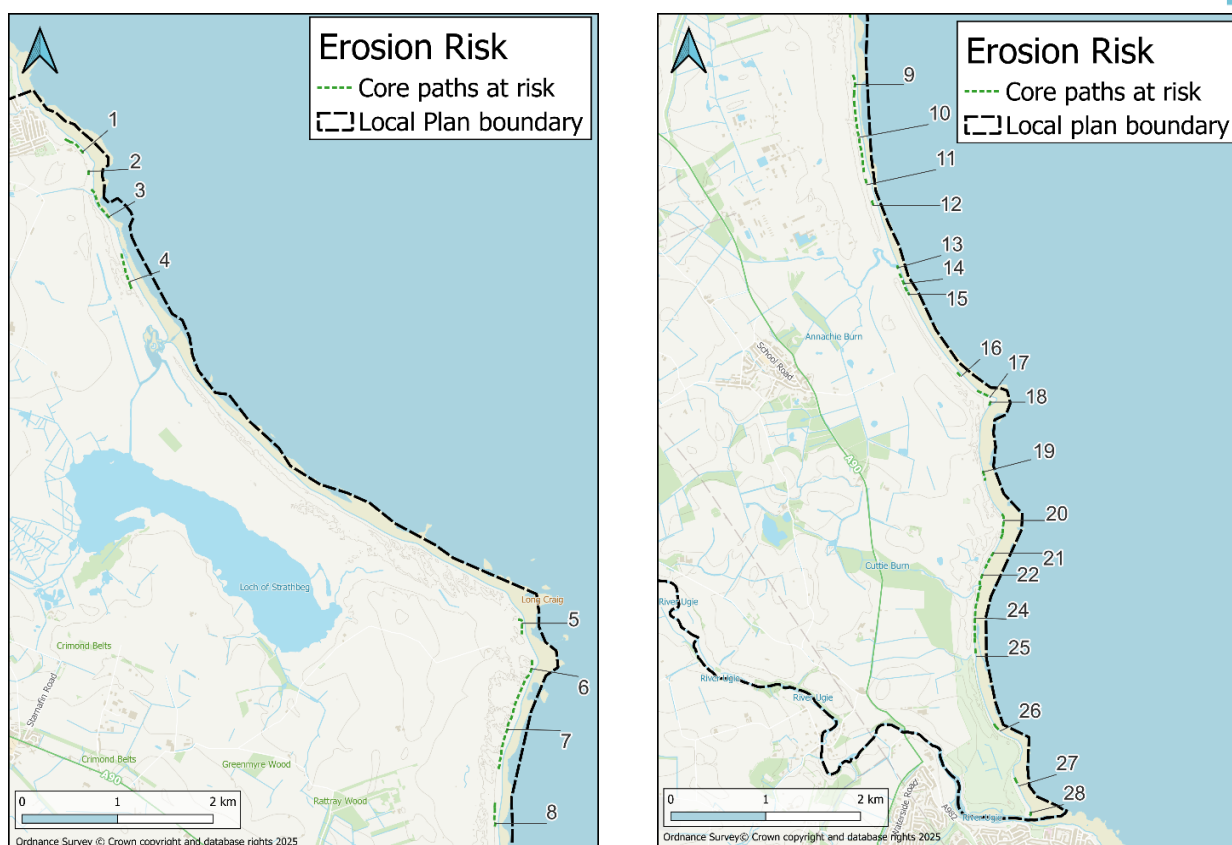


Figure 2-7: Coastal erosion risk for Buchan East core paths. Numbers refer to core path sections at risk by 2100, detailed in Appendix A.2. Within those sections, any sections at risk by 2050 are detailed in Appendix A.1.

Using Dynamic Coast projection data, a matrix was produced to highlight the sections of core path at risk from erosion by 2050 and 2100 (Appendix A). The sections have been ranked according to the approximate area of land predicted to be affected by erosion by 2050 and 2100. The ranking considers the product of path section length, and the mean predicted total erosion distance. This gives an overview of the areas of core path most at risk from future erosion and serve as an aid when targeting for intervention.

2.3.1 Maintenance of core paths

Responsibility for the maintenance of any core path lies with the land manager on whose land the path is situated. Further work is required to determine, for each at-risk section, whether Aberdeenshire Council is the land manager or whether responsibility lies with other landowners, as only those paths on Council-managed land would fall under the Council's direct responsibility. In addition, Aberdeenshire Council is not under a statutory obligation to maintain core paths, even where it is the land manager. Maintenance will only be carried out where it is considered appropriate, in line with Section 19 of the Land Reform (Scotland) Act 2003⁵.

⁵ [Part 1 Land Reform \(Scotland\) Act 2003 - Part 1 Land Reform \(Scotland\) Act 2003: Guidance for Local Authorities and National Park Authorities - gov.scot](#)

3 Nature Based Solutions

Working with natural processes forms one of the four pillars of adaptation adopted in the Aberdeenshire CCAPs. Nature based solutions (NBS) in a coastal setting focus on the use and enhancement of natural systems to reduce the impacts of erosion and flooding while maintaining resilience to climate change. This could either be through "buying time" by slowing down erosion, or from enhancement through engineering to form part of the coastal defences. An overview of potential Opportunities for NBS for each CMU are shown below (Figure 3-1).

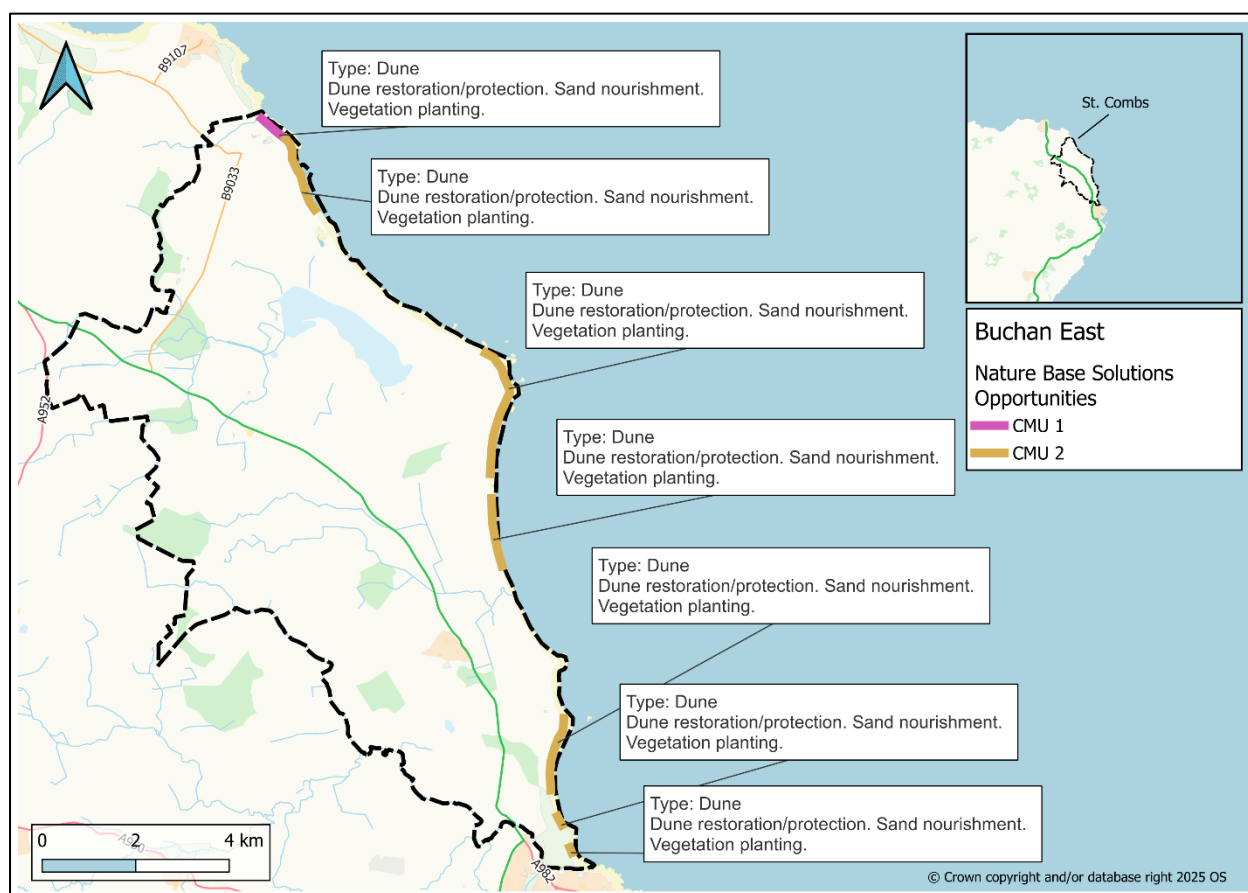


Figure 3-1: Suggested NBS locations and extent, with associated CMU

3.1 NBS Opportunities

Healthy dune systems can help slow down or prevent the loss of land from erosion and flooding or storm events.

Well established vegetation can help trap and accumulate wind-blown sediment, with root systems acting to support stabilisation of the overall dune. Additional benefits from increasing biodiversity, creation of habitat and social well-being can also be attributed to healthy dunes and beaches.

Given the extent of predicted erosion risk to the core path network in the Buchan East CA a complete review of the impacts of erosion is recommended to make sure that NBS opportunities are developed where appropriate and future realignment or re-development of the core paths consider these future risks. Section 2.3 provides details of areas most likely to be impacted, to aid the decision-making process.

CMU 1 and CMU 2 comprise of ca 0.8km and 20km of sand beach respectively, with extensive stretches of fixed and shifting dunes, and unvegetated sand beaches. Here opportunities for natural nourishment could potentially be explored, by taking advantage of the regular south to north drift, through offshore placement of sediment in the surf zone. Such an exercise however is unlikely to be economically viable in isolation and would likely require exploration of available material potentially through port or harbour dredgings. In addition, the planting of native dune vegetation to help stabilise the dunes, enhance resilience, and slow down or prevent future erosion is worth considering. Any addition of dune vegetation should consist of locally native plant species.

4 Land based Opportunities

With no current estimated risk to properties or key infrastructure from coastal erosion or flooding in Buchan East CA no direct Land Based Opportunities (e.g. relocation or safeguarding) have been identified in Phase 0. Instead focus must be on the establishment of defined Coastal Change Management Areas (CCMAs) to restrict future development. Integration of these into the LDP and local planning policies is critical at this stage to avoid future risk from coastal erosion.

5 Adaptation Pathways

5.1 CMU Policies

Management policies have been classified based on the Scottish Government guidance into five categories. These will form the basis for development and delivery of the adaptation pathways.

1. **No Active Intervention** - Do nothing.
2. **Maintain** - Where existing structures, owned by the Council exist.
3. **Protect** - Where existing structures exist, residential properties are at risk and there is potential for a positive cost benefit to be achieved.
4. **Enhance Natural Features** - Where realistic opportunities exist for NBS to serve as risk mitigation.
5. **Make Space** - Where land use opportunities mapping has identified areas for safeguarding or offsetting loss.

Policies have been set based on the information available, and presented above, to outline both the current approach and idealistic end outcome for each CMU. It should be noted that, at this stage in the CCAP process, Idealistic Outcome Policies are not definitive and, depending on future Triggers, Actions and investigations may change. They do, however, provide an initial starting point for Adaptation Pathways to work towards.

Review of the characteristics and risk associated with each CMU led to the classifications and policies in Table 5-1. These were used to develop initial Adaptation Pathways, Triggers, and an associated Implementation Plan.

Table 5-1: Buchan East CMU categorisation.

CMU	Coastal Type	Risk	Initial Policy	Idealistic Outcome Policy
1	Natural	Risk	Enhance Natural Features	Make Space
2	Natural	Risk	Enhance Natural Features	Make Space

5.2 Adaptation Pathways

Development of Adaptation Pathways for each CMU are based on the classification presented above. 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 at the coast, or implementation or improvements in other areas that influence climate resilience e.g.

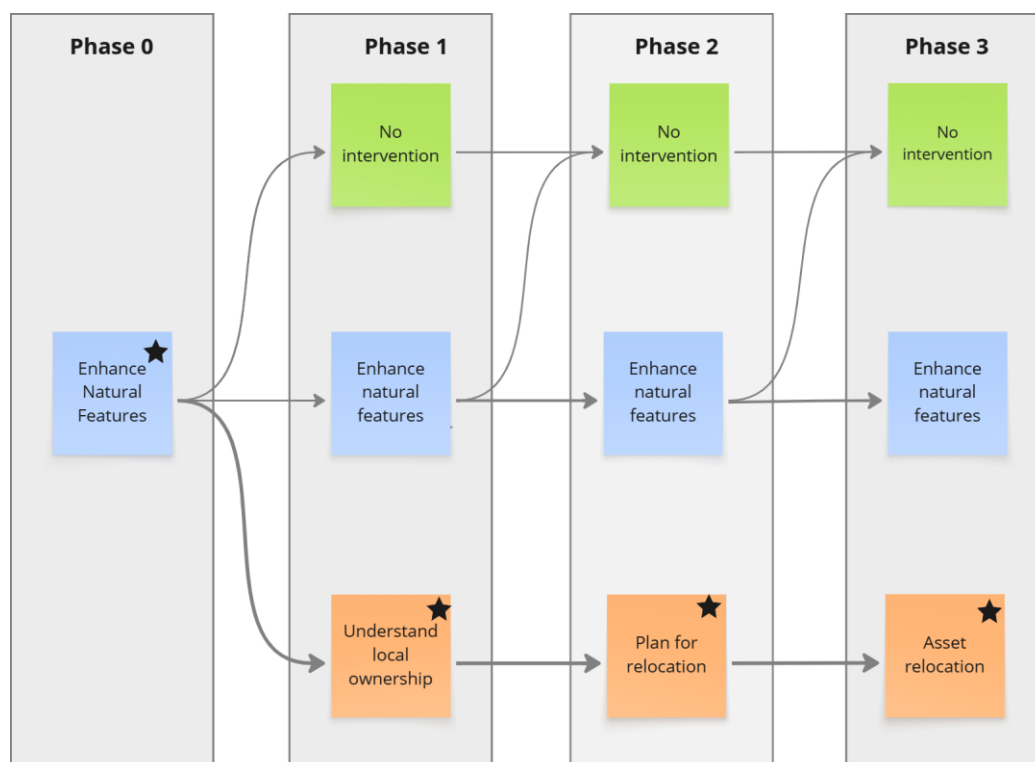
- Natural systems
 - Habitat.
 - Greenspace.
- Climate
 - Climate change guidance.
 - SEPA flood maps or risk assessments.
 - Coastal flood occurrence.
- Risk exposure
 - Change in defence condition.
 - Update to SEPA flood warning system
 - Erosion risk buffer exceeded.
 - Flood risk threshold exceeded.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

Adaptation Pathways for each CMU are presented in the following sections. How, when or if, this will be achieved is dependent on the identified Triggers being realised and the outcomes of the associated Actions.

5.3 CMU 1 and CMU 2 Natural coast with risk

CMU 1 and CMU 2 are classified as natural coast and have been assigned an adaptive pathway for natural coasts with predicted risk of erosion to receptors. CMU 2 differs from CMU 1 by having no inland properties or key infrastructure but has more extensive sections of core path at risk from erosion. It is also possible that the St Fergus Gas Terminal may become vulnerable, should erosion accelerate.

The NBS opportunities exercise developed potential to support adaption through enhancing natural features and making space. The existing policies (Phase 0) for both CMUs is therefore defined as Enhance Natural Features, with an end outcome of Make Space. Actions here in future phases may result in the re-design or relocation of the core path network in a more sustainable location, and the definition of a suitable CCMA to allow the dune system to roll back in the future.



★ Preferred pathway

Figure 5-1. Identified preferred adaptation pathway for Buchan East CMU 1 and CMU 2.

5.4 CMU 3 Natural coast with risk

CMU 3 is classified as a natural coast and has been assigned an adaptive pathway for natural coasts with no predicted risk of erosion or flooding to sensitive receptors, that would result in direct economic impact. Arable land is however at risk from flooding by 2100.

The current policy (Phase 0) for this CMU is No Active Intervention, and it is expected that, when supported by the Proactive Actions, this will also be the end outcome.

6 Adaptation Process

6.1 Implementation Plan

To support the delivery of the Adaptation Framework, a single Implementation Plan is applied to the entire 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 6-1):

1. Monitoring and Triggers (section 6.2)
2. Actions (section 6.3)
3. Outcomes (section 6.4)

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

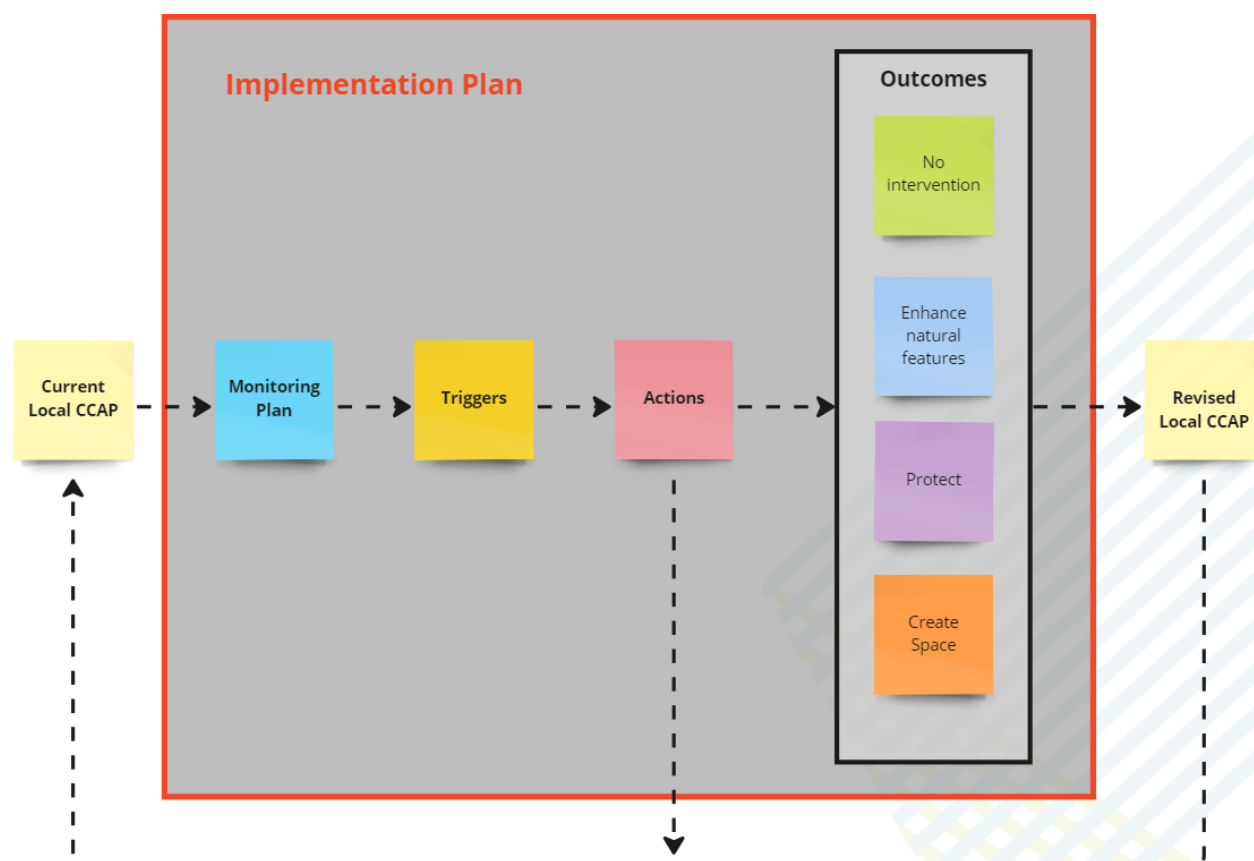


Figure 6-1: High-level Implementation Plan.

6.2 Monitoring and Triggers

6.2.1 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 potentially 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
- Aberdeenshire Council data and information
- Aberdeenshire Council monitoring
- External pressure

6.2.2 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, but risk exposure triggers related to physical flooding, erosion and overtopping thresholds are specific to each CMU. For the Buchan East CA these are summarised in Table 6-2.

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

- CMU 1: monitoring of erosion and flood risk.
- CMU 2: monitoring of erosion and flood risk.
- CMU 3: monitoring of flood risk.

6.2.3 CMU-specific flooding triggers

No properties are expected to be at risk from flooding in the Buchan East CA. No properties or key roads are at risk from a future 1 in 200-year flood event. However, should flood or erosion projections be updated then the Implementation Plan should be adapted accordingly.

6.2.4 CMU-specific erosion triggers

For Buchan East no properties or roads are predicted to be at risk from erosion by 2100. The main risk along the coastline is erosion to core coastal paths and associated dune systems.

6.2.4.1 Core paths affected

Using Dynamic Coast 2 projected data, a matrix was produced to highlight the sections of core path at risk from erosion by 2050 and 2100 (Appendix A). The sections were then ranked according to the approximate amount of land predicted to be affected by erosion by the year 2050 and 2100. Each epoch ranking considers the product of path length and mean predicted total erosion distance of any associated Dynamic Coast 2 erosion transects. The location of those sections is shown in Figure 2-7.

Based on rank, the matrix should be used to make informed decisions about which sections of core path are likely to provide the greatest economic, social and environmental benefit if they are maintained in their current location for as long as practical. The final adaption policy of Make Space does however need acknowledge and that core path re-alignment is inevitable. The monitoring and delivery of the Implementation Plan should guide this transition between policies.

6.2.4.2 Core path triggers

For 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:

- **Core paths**
 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.

Using the core path matrix as a guide, the core path sections at most immediate risk from erosion in each CMU were chosen as triggers. CMU 1 has only one section of core path at risk and so was chosen as the trigger for this CMU. Given the length of coast covered by CMU 2, two triggers were chosen. One to the north and one to the south of Rattray Head. Multiple core path sections in CMU 2 reach the shoreline, so the highest ranked sections were chosen as those triggers.

Both sections' Level 2 triggers were therefore met (Table 6-1). The location of path sections used for erosion triggers are shown in Figure 6-2 and Appendix B.1.

Table 6-1: CMU-specific erosion triggers for Buchan East core paths. Cells shaded red indicate that the erosion trigger has been met.

CMU	Maximum historical change rate (m/year)	Present-day distance of Road or core path to coast (m)		Erosion trigger level 1: Coast X m from path	Erosion trigger level 2: Coast X m from road
1	0.1	Core path	23	5	2
2	0.4	Core path (N)	0	5	2
2	0	Core path (S)	0	5	2

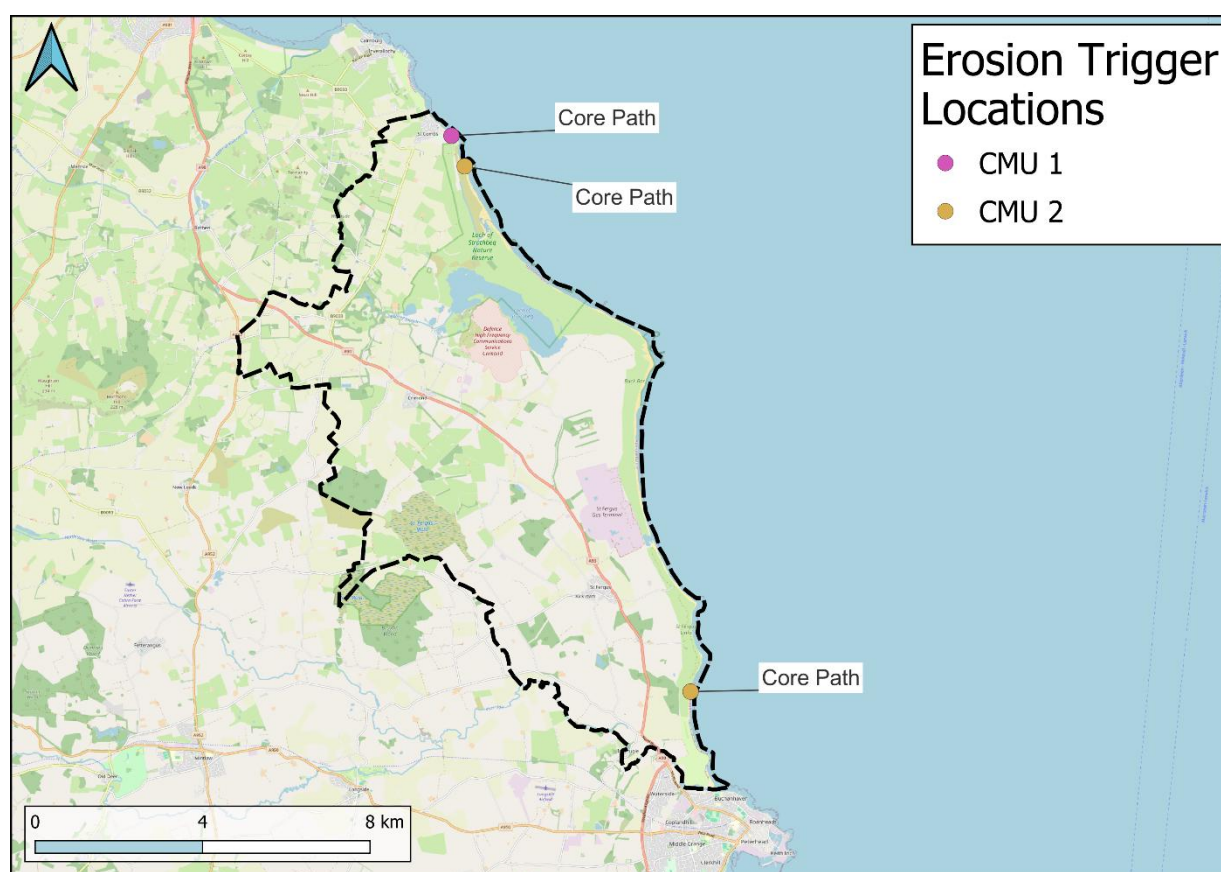


Figure 6-2: Buchan East erosion trigger locations.

6.3 Actions

Actions, like Triggers, can also be 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 to all and specific CMUs in Buchan East CA have been identified in (Table 6-2).

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, Scottish Government, Nature Scot etc.
- **Asset:** Includes private defences harbours and utilities specific to defended or hybrid CMUs.

Post flood data collection:

- Involves 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 guidance⁶ 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 Aberdeenshire CMU is included in Table 6-2.

Table 6-2: Triggers, trigger categories and associated actions for each Buchan East CMU.

Category	Trigger	Action	Buchan East 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	Review risk assessment	All

⁶ Scottish Government. 2016. Flood protection appraisals: guidance for SEPA and responsible authorities <https://www.gov.scot/publications/guidance-support-sepa-responsible-authorities/pages/2/>

	flood maps	Community engagement (practice)	
	Coastal flood occurrence	Review risk assessment Community engagement (places, asset) Post flood survey	All
Risk exposure	Defence condition	Community engagement (asset)	None
	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 2
	Flood risk threshold exceeded	Review risk assessment Community engagement (places)	None
	Update to Dynamic Coast	Review risk assessment Community engagement (practice)	CMU 1 CMU 2
Socio-economic	Changes of asset use	Community engagement (asset)	All
	Changes of asset owner	Community engagement (asset)	All
	Community pressure	Review risk assessment Community engagement (places)	All

6.4 Phase 0 Actions

Phase 0 Actions require immediate attention and have been identified by associated triggers realised through the development process of this initial CCAP for Buchan East. These are outlined below. All Triggers realised at Level 2 mean that intervention should be planned for in the short-term. While the policies developed here can help steer this, the ultimate form of the intervention (e.g. dune enhancement or relocation) requires a specific assessment in collaboration with the wider CCAG.

- CMU 2 (North):
 - Trigger: Erosion risk threshold exceeded (level 2)
 - **Action:** Undertake assessment and plan for intervention.
- CMU 2 (south):
 - Trigger: Erosion risk threshold exceeded (level 2)
 - **Action:** Undertake assessment and plan for intervention.

As the Implementation Plan is applied at CMU level, the ultimate outcome is dependent on the CMU and the associated Adaptation Pathway. Table 5-1 summarises the general and specific CMU outcomes for the Buchan East CA.

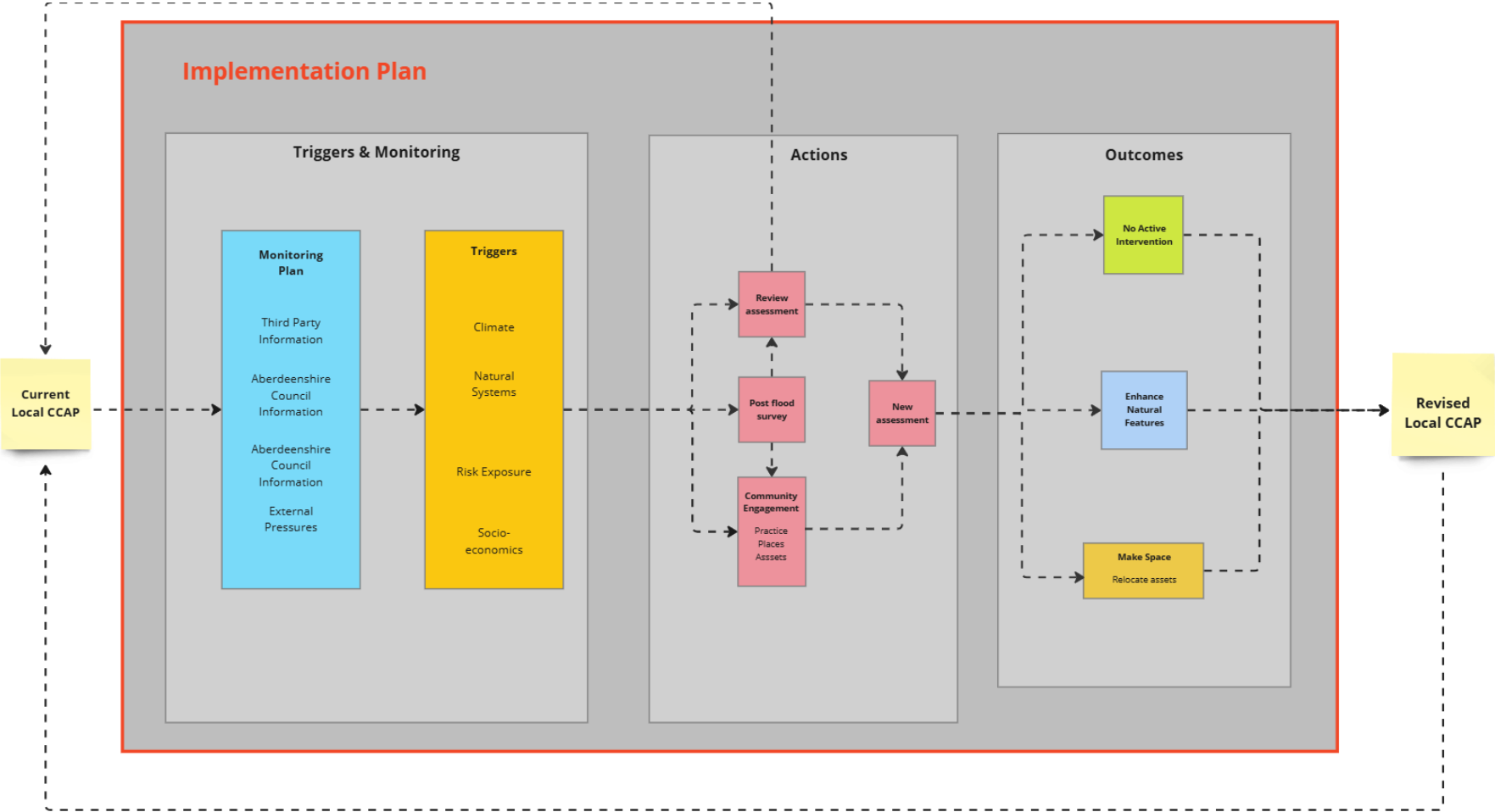


Figure 6-3: Complete Implementation Plan for Buchan East CCAP

6.5 Example application

Figure 6-4 provides a schematic describing an example application of the Implementation Plan and how it fits in with the wider Adaptation Framework for Buchan East. The red box highlights the processes described in this iteration of the CCAP.

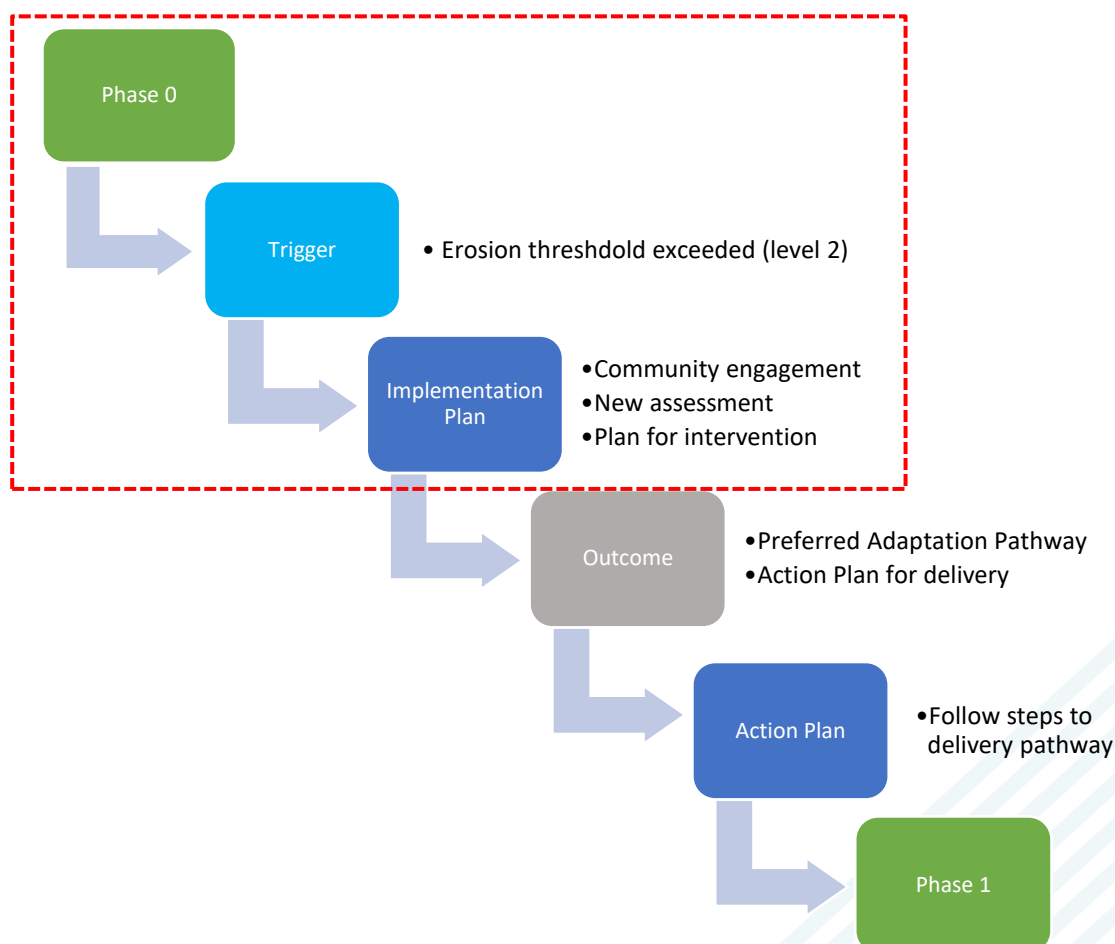


Figure 6-4: Example application of Phase 0 to Phase 1 of the adaptation process and how the Implementation Plan works with Adaptation Pathways and Action Plans.

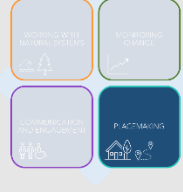
6.6 Supporting Steps and Proactive Actions

The nature of adaptation means that future decisions and directions are unknown and will be affected by external changes not necessarily under Aberdeenshire 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 6-3. These are designed to complement the wider Proactive Actions identified in the Regional CCAP.

Table 6-3: Local Proactive Actions

Action	Details	Pillars	
1	Investigate dune enhancement in CMU 1 and CMU 2 and locations with vulnerable core paths	Working with Natural Processes	
2	Identify, define and adopt suitable CCMA.s.	Working with Natural Processes	
3	Establish coordinated and consistent beach monitoring plan for Natural CMUs	Monitoring Change	
4	Adaptation and resilience workshop with local community and stakeholders	Community and Engagement	
5	Identify landownership and opportunities to support Make Space outcome policies	Place Making	

7 Summary and Next Steps

7.1 Approach

This document presents the local CCAP for the Buchan East CA. 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 Aberdeenshire has been steered by relevant published documentation and the Scottish Governments guidance on CCAPs. 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 Buchan East 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 Adaptation Pathways and an Action Plan. This will happen when the process moves into Phase 1.

The following sections provide summaries of the key findings of this initial stage of the adaptation planning process.

7.2 Coastal Management Units and Risks

The Buchan East CA was subdivided into three 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 Risk
- CMU 2 – Natural with Risk
- CMU 3 – Natural with No Risk

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

7.3 Adaptation Pathways

To enable effective implementation of this CCAP, 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
 - Delivery of Phase 0 Proactive Actions
2. Phase 1:
 - Implementation Plan outcomes:
 - Preferred Adaptation Pathway
 - Action Plan for delivery
 - Delivery of Phase 1 Proactive 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 Proactive 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 Aberdeenshire Council decision making to aim to achieve this end-outcome.

7.4 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.

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

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, whereby undertaking these will only benefit and support Aberdeenshire's adaptation to coastal change.

In total, five Proactive Actions have been set.

7.5 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 Aberdeenshire 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.

A Core path prioritisation

A.1 2050 Core Path Risk Matrix

Missing core path feature IDs are for 2100 sections not predicted to erode by 2050.

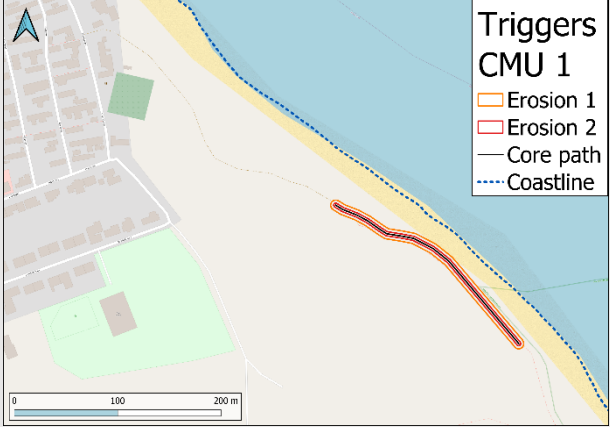
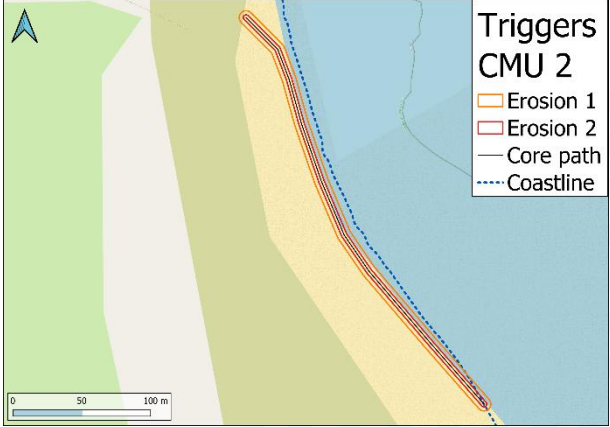
Core Path network name	GIS Feature ID	Mean land loss per DC transect by 2050 (10m intervals)	Core Path affected by 2050 (m)	Approximate total land loss by 2050 (m ²)	Distance to shore (m)	Rank - 2050 land loss total
Coastal Path Old Rattray to Peterhead	6	-34.12	442	15081	26	1
Coastal Path Old Rattray to Peterhead	10	-18.15	360	6534	7	2
Coastal Path Old Rattray to Peterhead	7	-37.63	151	5682	40	3
Coastal Path Old Rattray to Peterhead	24	-8.22	236	1940	0	4
Coastal Path Old Rattray to Peterhead	9	-12.91	121	1562	14	5
Coastal Path Old Rattray to Peterhead	20	-5.78	201	1162	0	6
Coastal Path Old Rattray to Peterhead	23	-8.59	101	868	0	7
Coastal Path St Combs to Loch of Strathbeg	4	-6.37	48	306	0	8
Coastal Path Old Rattray to Peterhead	17	-4.63	61	282	3	9
Coastal Path Old Rattray to Peterhead	21	-6.81	33	225	0	10
Coastal Path Old Rattray to Peterhead	14	-3.97	54	214	12	11
Coastal Path Old Rattray to Peterhead	5	-12.97	16	208	22	12
Coastal Path St Combs to Loch of Strathbeg	3	-6.36	29	184	0	13
Coastal Path Old Rattray to Peterhead	22	-6.65	17	113	0	14

A.2 2100 Core Path Risk Matrix

Core Path network name	GIS Feature ID	Mean land loss per DC transect by 2100 (10m intervals)	Core Path affected by 2100 (m)	Approximate total land loss by 2100 (m ²)	distance to shore (m)	Rank - 2100 land loss total
Coastal Path Old Rattray to Peterhead	6	-113.371	741	84008	26	1
Coastal Path Old Rattray to Peterhead	7	-104.087	430	44757	40	2
Coastal Path Old Rattray to Peterhead	10	-55.401	756	41883	7	3
Coastal Path Old Rattray to Peterhead	24	-44.659	465	20766	0	4
Coastal Path St Combs to Loch of Strathbeg	4	-53.464	359	19194	0	5
Coastal Path Old Rattray to Peterhead	8	-59.442	231	13731	35	6
Coastal Path Old Rattray to Peterhead	9	-49.932	221	11035	14	7
Coastal Path Old Rattray to Peterhead	20	-36.239	254	9205	0	8
Coastal Path St Combs to Loch of Strathbeg	3	-26.688	336	8967	0	9
Coastal Path St Combs to Loch of Strathbeg	1	-38.328	229	8777	23	10
Coastal Path Old Rattray to Peterhead	5	-54.408	160	8705	21	11
Coastal Path Old Rattray to Peterhead	21	-30.415	185	5627	0	12
Coastal Path Old Rattray to Peterhead	23	-53.824	101	5436	0	13
Coastal Path Old Rattray to Peterhead	14	-24.079	212	5105	12	14
Coastal Path Old Rattray to Peterhead	17	-28.605	146	4176	3	15
Coastal Path Old Rattray to Peterhead	22	-27.792	145	4030	0	16
Coastal Path St Combs to Loch of Strathbeg	2	-43.675	55	2402	46	17
Coastal Path Old Rattray to Peterhead	26	-22.324	89	1987	3	18
Coastal Path Old Rattray to Peterhead	25	-21.293	76	1618	16	19
Coastal Path Old Rattray to Peterhead	11	-30.992	52	1612	34	20
Coastal Path Old Rattray to Peterhead	27	-16.838	86	1448	4	21
Coastal Path Old Rattray to Peterhead	19	-15.92	80	1274	14	22
Coastal Path Old Rattray to Peterhead	16	-18.208	53	965	15	23
Coastal Path Old Rattray to Peterhead	12	-22.738	41	932	26	24
Coastal Path Old Rattray to Peterhead	28	-32.815	23	755	1	25
Coastal Path Old Rattray to Peterhead	18	-15.02	32	481	6	26
Coastal Path Old Rattray to Peterhead	13	-15.69	14	220	10	27
Coastal Path Old Rattray to Peterhead	15	-12.26	10	123	13	28

B Triggers

B.1 Erosion Triggers

CMU	Asset	Trigger Met	Erosion Trigger
1	Core path(ID: 1)	No	 Triggers CMU 1 - Erosion 1 - Erosion 2 - Core path - Coastline
2	Core path (ID: 4)	Yes	 Triggers CMU 2 - Erosion 1 - Erosion 2 - Core path - Coastline
2	Core path (ID: 24)	Yes	 Triggers CMU 2 - Erosion 1 - Erosion 2 - Core path - Coastline

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