MCCIP Marine Climate Change Impacts Partnership

Welsh Coastal Groups Forum

UNIVERSITY OF LIVERPOOL

Swansea Bay © Hannah Barrow, Swansea and Carmarthen Bay Coastal Engineering Group

BLUEPRINT

To develop a Dynamic Climate Adaptive Pathway, for coastal groups and local authorities in Wales

2026

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1. Background

The Marine Climate Change Impacts Partnership (MCCIP) was founded in 2005 as an independent source of marine climate change impacts evidence and adaptation advice for the UK, guided by core principles of scientific integrity and effective stakeholder engagement.

Climate change risks to coastal communities have been identified as a major knowledge gap by MCCIP in our reviews of physical, ecosystem and societal impacts of climate change, largely due to the scarcity of published evidence. During a rapid consultation exercise undertaken by MCCIP, research and policy experts confirmed that critical and wide-ranging gaps in our understanding persist.

In 2024, MCCIP initiated a project called '*Climate change risks to COastal COmmunities and their health and wellbeing (COCO)*' to help bridge the gap between science and people by translating climate hazards research into accessible outputs for coastal community groups. In collaboration with climate resilience experts and coastal hubs across Wales, Northern Ireland, England and Scotland, MCCIP has taken forward a set of four community-led pilot activities to resolve local barriers to coastal adaptation.

This document presents the result of the collaborative pilot study in Wales between MCCIP and the Welsh Coastal Groups Forum.

2. Aim

The overall aim of the MCCIP COCO pilot project for Wales was *to develop generic guidance or a blueprint to help local authorities and coastal groups in Wales develop a dynamic climate adaptive pathway for their coastal areas*.

This blueprint guidance sets out a 10-step process to support the development and eventual use of dynamic climate adaptive pathways in Wales to manage change along the coast. The key recommendation of the document is that the 10 Step Blueprint process is applied to three real-life case-study localities within the Swansea and Carmarthen Bay Coastal Engineering Group (SCBCEG) area in South Wales. This will demonstrate how the different steps involved in the development of a climate adaptation pathway can be applied to varying local areas, each with different triggers of coastal change (e.g. erosion, flooding etc.) and different levels of management intervention.

To avoid duplication of effort, this blueprint draws information from existing documents and resources as much as possible. The structure and content have been steered by the Welsh Coastal Groups Forum, and it incorporates guidance produced as part of the Coastal Adaptation Programme of Natural Resources Wales.

3. Coastal adaptation and the CCRA3

The third UK Climate Change Risk Assessment (CCRA3) Evidence Report, published in 2021, highlighted some key messages specific to flooding and coastal change. In particular, it identified that risk no. I3: "Risks to infrastructure services from coastal flooding and erosion", warrants further investigation. Overall, the CCRA3 concludes that we can expect increases to extreme coastal water

levels driven mainly by increases in sea level rise. In this regard, beneficial recommendations for the immediate future include the following:

- The use of flexible **adaptation pathways** for the long-term planning of flood risk management in an uncertain future. Such adaptation pathways help decision-makers identify critical thresholds and plan adaptive actions in advance, ensuring that future interventions are timely, cost-effective, and resilient under a range of possible climate and socio-economic scenarios. They were first used in developing the Thames Estuary 2100 flood risk management strategy, and therefore they appear to be a promising technique that can be applied more widely in the UK.
- Given sea level rise **uncertainties**, high-end coastal risk scenarios can help understand options for action in the event of extreme rates of change in the future.

As part of the Climate Change Adaptation Monitoring Framework published in 2023, the Climate Change Committee provided the ten principles for good climate adaptation based on the Committee's advice on the CCRA3, which defines the robust adaptation decision-making needed for a well-adapted UK. They are summarised below:

1. A vision for a well-adapted UK
2. Integrate adaptation into other policies
3. Adapt to 2°C, assess risks for 4°C
4. Avoid lock-in
5. Prepare for unpredictable extremes
6. Assess interdependencies
7. Understand threshold effects
8. Address inequalities
9. Consider opportunities
10. Funding, resourcing, metrics, research.

At the time of finalising this document, the Fourth UK Climate Change Risk Assessment (CCRA4) Independent Assessment and the A Well-Adapted UK Report were also published. Coastal community risks feature prominently in both reports, with 'risks to buildings and communities from coastal change' assessed as requiring further investigation in Wales.

4. Overview of Shoreline Management Plans and triggers of coastal change

This Shoreline Management Plan (SMP) strategic document for South Wales is available from the Swansea and Carmarthen Bay Coastal Engineering Group website. They are intended as a guide for local authorities and coastal groups in Wales to manage sections of the coast over time by taking into consideration physical, environmental, economic, and social aspects. A SMP provides a large-scale assessment of coastal risks, mainly erosion and flooding, and identifies the policies necessary to manage those.

SMPs are non-statutory documents that set out a shared strategic approach for managing the coastline from coastal flooding and erosion risks. Their aim is to reduce the risks to people, the developed, historic and natural environments over a 100-year timeframe from 2005. Shoreline Management Plan 2 (SMP2s) in Wales were developed between 2006 and 2012, superseding the original iterations developed in the late 1990s and early 2000s. SMPs have been subject to peer

review and public consultation. Coastal Groups then agreed the SMPs, which were also approved by local council cabinets and Natural Resources Wales before they were signed off by the Welsh Government in 2014.

There are four SMPs covering the Welsh coastline, two of which, SMP19 and SMP22, are cross-border with England. More details can be found in the Shoreline Management Plans information webpages of Natural Resources Wales (NRW), and on this interactive Shoreline Management Plans ArcGIS Storymap platform.

Each SMP is delivered by a corresponding Coastal Group, which holds joint ownership of the plan and oversees its implementation. Their geographical correspondence is shown and represented in Figure 1.

- **Severn Estuary Coastal Group** (SMP19 – Anchor Head to Lavernock Point)
- **South Wales Coastal Group** (SMP20 – Lavernock Point to St Ann's Head)
- **West of Wales Coastal Group** (SMP21 – St Ann's Head to the Great Orme)
- **Northwest England and North Wales Coastal Group** (SMP22 – The Great Orme).

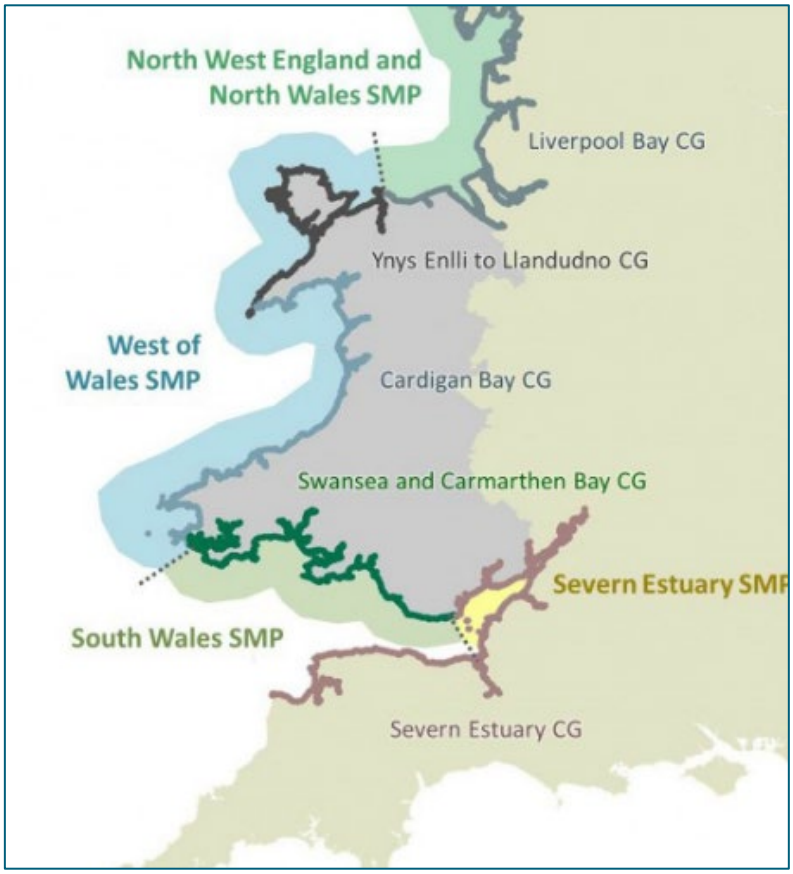

Figure 1. Shoreline Management Plan Areas in Wales. Map copied from Geography in the News.

The South Wales SMP20 Area covers the shoreline areas between Lavernock Point (Vale of Glamorgan) in the east and St Ann's Head (Pembrokeshire) in the west (Halcrow, 2012), and is the focus for this blueprint.

The SMP2 plans were based on the latest available climate change information at the time, improved the understanding of flood and erosion risk, and incorporated those updates into environmental legislation.

Further information on SMPs in Wales is available from the Natural Resources Wales SMP webpage.

5. SMP Policy and Options, and sub-categories

There are four SMP policies that can be applied to each Policy Unit (for each epoch, see further explanation regarding the definition and the use of epochs below), setting out the Management Approach for a section of coast over the 100-year timeframe as set out within the SMP documents. These policies are grouped into four Management Approaches as shown in Table 1.

Table 1. Main SMP Policy Options. Collated from information available from the Swansea and Carmarthen Bay Coastal Engineering Group and Natural Resources Wales.

STRATEGY	DESCRIPTION
Hold The Line	Preserves current shoreline with hard structures to protect urban areas and infrastructure from erosion and flooding. It can help safeguard assets, but it is costly and often impacts natural processes.
Managed Realignment	Controlled retreat of the shoreline to a more sustainable position by breaching or modifying existing defences to create natural habitats. It is an environmentally friendly and cost-effective option for coastal protection through ecological restoration but may require relocation of existing infrastructure.
No Active Intervention	Allows natural processes to shape the coastline and assumes loss of land and property over time and so may only be suitable for less developed / valuable areas. No up-front costs but there may be impacts later as shoreline retreats.
Advance The Line	Seaward expansion of the shoreline through aesthetically pleasing and environmentally friendly solutions like beach nourishment and offshore breakwaters, with ongoing maintenance required.

These SMP policies can change over the short- (0 to 20 years), medium- (20 to 50 medium) and long-term (50 to 100 years), also referred to as Epochs 1, 2 and 3, and they may be composed of specific sub-policy strategies for each area.

It is important to note that although the SMP was initially based on those specific Epochs, the preference now is for a trigger-based approach. These triggers define critical conditions that signal when the existing SMP policy becomes unworkable, prompting a shift to the next policy. This highlights the growing importance of coastal adaptation pathway planning.

These policy sub-categories describe in more detail what is intended for each area and are summarised in Table 2 below.

Table 2. Policy Sub-Categories that describe more accurately what is intended by the Main SMP Policy.

SUB-CATEGORY	DESCRIPTION
Cease To Maintain	Existing defences or infrastructure are no longer to be maintained.
Local Activity Only	Some allowance for privately constructed defences to protect private land, subject to the permit application and approval.
Maintain/Replace	Existing defences or infrastructure will be maintained.
Natural Features	Natural coastal features like cliffs or sand dunes are monitored and managed sustainably.
No Need to Defend	Natural features of the coastline are allowed to behave naturally.
Remove Defences	Existing defences are removed to reinstate the natural behaviour of the coastline while sustaining use of the area.
Repair Not Replace	Existing defences are maintained but not upgraded or replaced.
Set-Back Defence	A new defence line is created and/or maintained further back from existing defence or coastline as part of managed realignment.
Slow Erosion	Erosion of frontage is slowed down with appropriate inventions and management on a site-by-site basis.

5.1 Case-study locations in South Wales

Within the South Wales SMP20 Area, the coastline is divided into 21 Policy Scenario Areas. These are stretches of coastline with similar or interacting coastal processes, land uses, or management intentions. These Policy Scenario Areas are then further subdivided into Policy Units, which are areas with similar or interacting coastal processes, or assets that can be effectively managed together. More information on the South Wales SMP20 Area, Policy Scenario Areas and Policy Units is available from the Swansea and Carmarthen Bay Coastal Engineering Group.

To better demonstrate the steps involved and the practical applicability of a climate adaptation pathway, and following discussion with the Welsh Coastal Groups Forum, this blueprint has focussed on the following three case-study locations within the SCBCEG area in South Wales: Oxwich Bay, The Knap, and Pembrey Sands. These are non-contentious, relatively low risk areas that represent three different SMP Policy types and therefore were deemed ideal case study locations to test this adaptive blueprint.

The sections below present a brief overview of each of these locations.

5.1.1 Oxwich Bay

Oxwich Bay is located within the SMP Area 10 beyond Mumbles Head to Worms Head, Policy Unit 10.8 (Wales Coastal Monitoring Centre Policy Unit 8b10.8; Figure 2).

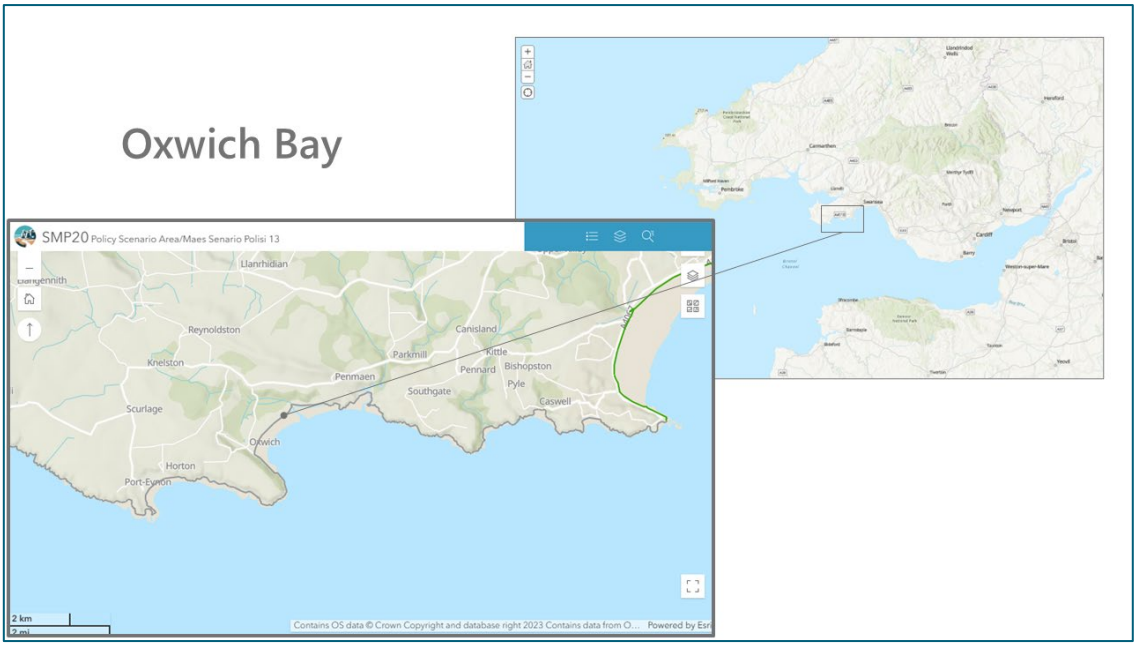

Figure 2. Oxwich Bay area, SCBCEG SMP Dashboard from the Swansea and Carmarthen Bay Coastal Engineering Group.

The policy for the Oxwich Bay Policy Unit (10.8) is Managed Realignment across all 3 Epochs (previously referred to as short-, medium-, and long-term time periods, see Section 5), with the Policy sub-categories being Local Activity Only for all 3 Epochs, meaning that any small-scale privately constructed defences would not contradict the overarching Managed Realignment policy MP20 Area policies. There are currently no actions described for any of the SMP Area 10, and the Oxwich Bay beach frontage is not currently monitored by the Wales Coastal Monitoring Centre (WCMC).

5.1.2 The Knap

The Knap is located within the SMP Policy Scenario Area 3 from Cold Knap Point to Bull Cliff, Policy Unit 3.1 (Wales Coastal Monitoring Centre Policy Unit 8b3.1; Figure 3). The Knap is fronted by a large shingle ridge bar.

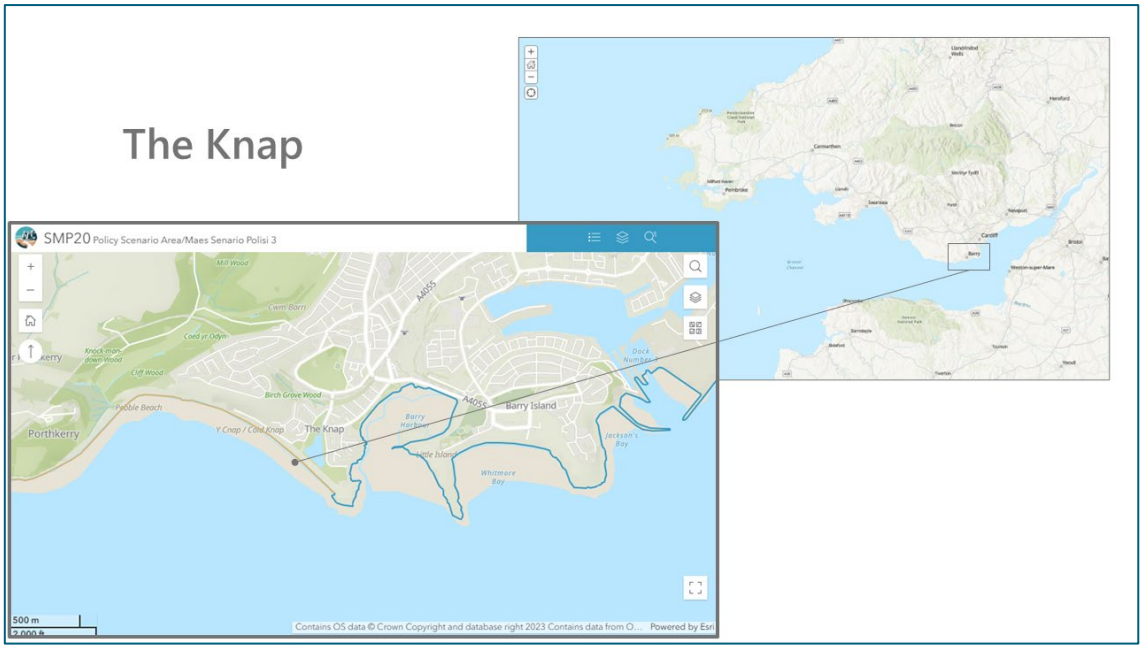

Figure 3. The Knap area, SCBCEG SMP Dashboard from the Swansea and Carmarthen Bay Coastal Engineering Group.

The SMP policy rationale for The Knap is to maintain the existing promenade in the short term. In the medium to long term, the intent is to allow the shingle ridge to behave more naturally, whilst considering the implications for assets. In that regard, the short-term policy is hold-the-line while maintaining/replacing some structures, and the medium to long-term policy is managed realignment with a sub-category of setting back coastal defences, and the long-term policy is managed realignment. The SMP action status for The Knap is shown in Table 3 below.

Table 3. The SCBCEG SMP20 Action Plan for The Knap.

POLICY UNIT NAME (LOCATION)	ACTION DESCRIPTION	PROGRESS STATUS
3.1 The Knap (Cold Knap Point to Bull Cliff)	Undertake a study to investigate the feasibility of managed realignment at The Knap which will include community engagement, consideration of the defence function of the shingle ridge, predicting future development of the shingle ridge, whether the construction of secondary defences is necessary to manage the risk of coastal erosion and flooding to properties inshore, consideration of current management and future management.	On hold
3.1 The Knap (Cold Knap Point to Bull Cliff) & 3.2 Bull Cliff	Undertake detailed monitoring programme of the shingle ridge, its function as a defence and likelihood of a breach.	Progressing
3.1 The Knap (Cold Knap Point to Bull Cliff)	Inform the local community, key stakeholders and general public about the change in epoch management policy for this area, and how the policy will be implemented.	Not yet started

5.1.3 Pembrey Sands

Pembrey Sands comprises an extensive natural dune system located within the SMP Scenario Area 13 from The Nose to South of Tywyn Point, Policy Unit 13.1 (Wales Coastal Monitoring Centre Policy Unit 8c13.1; Figure 3), at the mouth of the Gwendraeth Estuary.

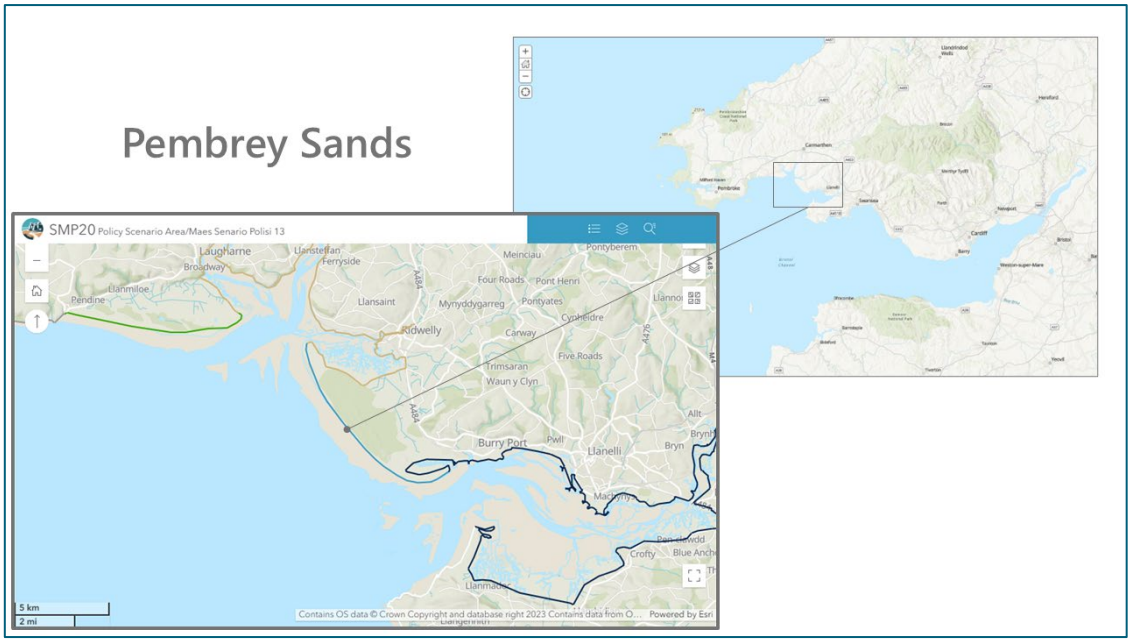

Figure 4. Pembrey Sands area, SCBCEG SMP Dashboard from the Swansea and Carmarthen Bay Coastal Engineering Group.

A study of potential impacts under a range of future climate change and sea level rise scenarios has been carried out in collaboration with the RAF Pembrey Sands Air Weapons Range to consider where flood protection or relocation of assets may be necessary. The SMP policy rationale for Pembrey Sands intends to allow natural behaviour of the coast, whilst allowing localised dune management as required and potentially considering the removal of built defences. The short to medium to long-term policy is local management realignment based on local activities only. SMP action status for Pembrey Sands is shown in Table 4 below.

Table 4. The SCBCEG SMP20 Action Plan for Pembrey Sands.

POLICY UNIT NAME (LOCATION)	ACTION DESCRIPTION	PROGRESS STATUS
13.1 Pembrey Sands (The Nose to South of Tywyn Point)	Engage with and encourage the RAF Pembrey Sands Air Weapons Range to undertake a feasibility study to consider the potential impacts under a range of future climate change/ sea level rise scenarios to inform the development of suitable adaptation and mitigation measures which may include flood resilience, flood protection or relocation of assets.	Complete

5.2 Triggers of change

In the context of shoreline management, Coastal Groups can use 'triggers' to identify critical changes or 'thresholds' to the coastal state and appropriate 'decision points'. According to the Committee on Climate Change, these terms are defined as:

- *Trigger*: when a condition reaches a point where existing policies and responses should be reviewed.
- *Threshold*: a limit that once crossed could result in coastal flooding and erosion impacting assets.

- *Decision Point*: when a choice needs to be made between alternative future responses to avoid conditions reaching a threshold.

SMPs initially based the progressive future management of coastlines on three epochs: Epoch 1 (0 to 20 years), Epoch 2 (20 to 50 years) and Epoch 3 (50 to 100 years). However, the preference now is for a trigger-based approach (see Section 5) as certain factors may determine a change to the coast that is not necessarily fixed in time, such as acute extreme events, long-term climate change, availability of funding, or adaptive capacity of communities, which require a different management approach or policy (see Section 3.5.2 of NRWs SMP Refresh Guidance for more information and references).

Progressive and adaptive shoreline management plans, as opposed to those that are rigid, ineffective and reactive, focus on a desired longer-term management 'target' and the pathway to get there. To help define that pathway, triggers can be used to determine when a transition of policy is necessary due to circumstances that could either enable, block, drive or delay a transition from one policy to another, for example: where assets are relocated proactively or funding is made available; faster erosion rates, increasing deterioration of defences, or a sudden extreme storm; and new insights or information showing changes are slower than initially thought or where social aspects may delay original timescales.

There are broadly two types of triggers in shoreline management, as shown in Table 5.

Table 5. Types of shoreline management triggers. Adapted from Section 3.5.2 of NRWs SMP Refresh Guidance.

TRIGGER TYPE	DESCRIPTION	EXAMPLES
 Physical & environmental	Climate-related processes (whether linked to acute extreme events or long-term progressive changes) driving erosion rates and flood risk and causing defence deterioration and habitat loss or change.	- Erosion and recession (gradual or rapid loss) - Increased flood risk and overtopping (sea-level rise, storm surges, or high tides) - Defence or structure deterioration (weakening or failure) - Sediment supply changes (interruption or alteration) - Habitat change or loss (e.g. coastal squeeze) - Extreme events (storms, surges, or prolonged heavy rainfall) - Long-term climatic influences (sea-level rise and increased storminess)
 Social & economic	Circumstances involving changes to adaptive capacity, funding, technical advances, new information and evidence, land uses, marine zone uses, legislation or national policy.	- Changes to people/infrastructure/habitats - Changes in funding / affordability - Changes in land-use - Technical advances - Legislation and policy changes - Social attitudes - Political will - New designations - Archaeology and heritage - Commercial/industrial operations - Change in use of defence - New evidence challenges policy

Most of the focus has been on the physical and environmental processes, with Coastal State Indicators (CSIs) set out that typically include short-term parameters such as beach volume, level and width, as well as some long-term indicators based on coastal systems modelling, while the use of social and economic triggers allows for a more adaptive, climate-smart thought process of shoreline management.

It is worth mentioning that such physical CSIs could largely be found using the data already collected by the WCMC, where the area is within the monitoring programme.

Adaptive pathways can explore how triggers might influence decisions in terms of timing and the possibility of alternative outcomes. While critical decisions have already been made by the SMP, highlighting the driver for change and the corresponding policy change, adaptative pathway approaches can still add significant value by:

- setting what the high-level triggers are for a transition in policy
- defining monitoring parameters to be incorporated into action plans
- defining the thresholds that may drive change; and
- identifying lead-in times needed for a transition in approaches.

Setting appropriate threshold levels can mean the difference between proactive and reactive management responses. For example, East Riding of Yorkshire Council use terms such as ‘alarm’, ‘crisis’, ‘action’ and ‘emergency’ as part of their Beach Management Plans to reflect the level of risk and response, as well as the period of awareness and planning required before action must be taken.

5.3 Coastal Monitoring Activities

Shoreline monitoring underpins most policy recommendations of the SMP, which are implemented through coastal erosion and flood risk management schemes or actions. The analysis of coastal monitoring data helps detect coastal processes that confirms (or otherwise) assumptions made in policy development. Targeted studies are also used to assess specific impacts and understand mitigation requirements and uncertainties around the implementation of some policies, and feed into future revisions of the SMP (see Section 3.5.2 of NRWs SMP Refresh Guidance for more information and references).

Strategic regional monitoring is an essential part of the shoreline management processes and is supervised by the WCMC conjunction with the Natural Resources Wales and includes acquisition, storage and analysis of the data. A monitoring programme is in place within Swansea Bay and Carmarthen Bay with scope for extension along other coastal management units of the South Wales SMP to include the Pembrokeshire coast and up to the tidal limits of estuaries.

The Knap, for example, is monitored bi-annually in the WCMC Coastal Monitoring Programme and is also regularly used by the WCMC for coastal monitoring training. There is a significant amount of local topographic data that has already been collected, which opens opportunities for utilising that for further research on gravel barriers for example, with the support of the WCMC. Bi-annual profiling monitoring is also carried out by the WCMC at Pembrey Sands, and data indicate ongoing erosion of the dune system.

Coastal Monitoring data in Wales can be accessed via the WCMCs Website.

5.4 What's at risk: nature and people

The SMP20 Area includes coastal cities and towns and many natural, historic, and cultural assets. The connection between people and the environment is profound along the coastline, and has historically involved activities such as fishing, cockling, farming, mining, shipping, warfare, and art. These connections and links are therefore intertwined and so a sustainable approach to coastal management should achieve equitable outcomes that balance nature and people.

Access to blue spaces is associated with distinct health and wellbeing benefits, and there is wide recognition of the importance of protecting opportunities for people to experience these environments (Liverpool Public Policy Briefing, 2023). In addition, blue-grey spaces, such as promenades, harbours, and other transitional or 'liminal' areas, offer safe and accessible ways for people to connect with the coast and estuaries. While SMPs were not originally designed with these social and wellbeing aspects in mind, adaptive pathways provide a valuable opportunity to integrate and balance multiple uses of the coastal zone in future planning.

The SMP takes into consideration the physical, environmental, economic, and social aspects, aiming to balance the need to protect communities and infrastructure while preserving natural environments. The three case study locations reflect this challenge, where coastal change presents risks to the natural environment, people's properties and livelihoods, infrastructure, and the historic heritage.

It is worth mentioning here that some coastal sites may be vulnerable to compound or combined hazards, where extreme marine and fluvial conditions coincide to exacerbate flooding or erosion. During such events multiple drivers like surges, heavy rainfall, and high river discharges can occur simultaneously or in close succession, significantly amplifying impacts on coastal systems and infrastructure (Lyddon et al., 2023). This compound nature of risk can be difficult to capture within adaptive pathways, as most frameworks tend to model or plan for single hazard types in isolation. Accounting for the interactions between marine, fluvial, and even groundwater processes require more integrated data, modelling, and scenario testing, as well as greater flexibility in pathway design (Lyddon et al., 2024; Robins et al., 2021). Recognising these potential compound risks is therefore crucial to developing resilient and realistic adaptation strategies, but currently this remains an unknown for South Wales in general and the SMP20 Area in particular, and it would be important to assess as part of any coastal strategy to inform trigger type development.

Oxwich Bay is a wide bay with an extensive natural dune system which is a Site of Special Scientific Interest and part of The Gower Area of Outstanding Natural Beauty (AONB). The area is also very popular with tourists and visitors, and a hotel serves as a popular beachfront wedding location. There are also other buildings behind the beach including a restaurant, coffee shop, and private car park. Slightly further inland is a small caravan site and residential properties.

The Knap is fronted by a large shingle ridge bar that protects a man-made lake surrounded by a few properties, as well as a roman heritage site. The barrier is very substantial and expected to withstand dynamic shoreline processes although there is still a risk of breaching during a significant storm surge event.

Pembrey Sands is a designated country park and Site of Special Scientific Interest comprising an extensive natural dune system. It is a popular site with tourists and visitors and includes a caravan site, and while there are no buildings on the frontage, there are residential properties further inland

along a road and in front of the railway, all of which are at risk of tidal flooding. Bi-annual profiling data from the WCMC as well as anecdotal evidence indicate a rapidly eroding dune system, which has implications for tourism, leisure, environment, heritage and possibly properties.

6. Coastal Adaptation Pathways

Coasts are by their very nature highly dynamic environments, but climate change together with other socio-economic conditions (for example changes in a range of aspects such as farming or agricultural practices, industrial or commercial activities, social attitudes, policy, availability of funding, relocation of people or assets, etc. as well as new evidence becoming available), introduce additional long-term challenges and uncertainties. Adaptation pathways are intended to respond to continually evolving coastal change risk and can provide additional benefits such as greater collaboration with interested groups, opportunities for innovative funding and higher standards of coastal protection (EA, 2021).

There are advantages in incorporating adaptation pathways into existing policy frameworks. For example, they can help assess climate uncertainty around resource management, and they improve flexibility by bringing in the consideration of all plausible options, which avoids ‘locking in’ to a single strategy. Adaptation pathways can have varying complexity depending on the situation, risk and funding availability.

Below we present in a simplified manner, the basic elements of an adaptation pathway, the steps involved in its development, and what makes an adaptation pathway a dynamic one. We also present some examples of their application from elsewhere in the UK, and as a practical exercise explore how they might apply to the three selected locations in South Wales: Oxwich Bay, The Knap, and Pembrey Sands.

6.1 Common features of adaptation approaches

Generally, adaptation approaches have a set of common features or elements, also applicable in the case of coastal adaptation pathways: 1) framing the problem, 2) appraising the options, 3) selecting the pathway and short-term actions, and 4) implementing long-term monitoring and assessment (EA, 2021). These common elements are represented in Figure 5 below.

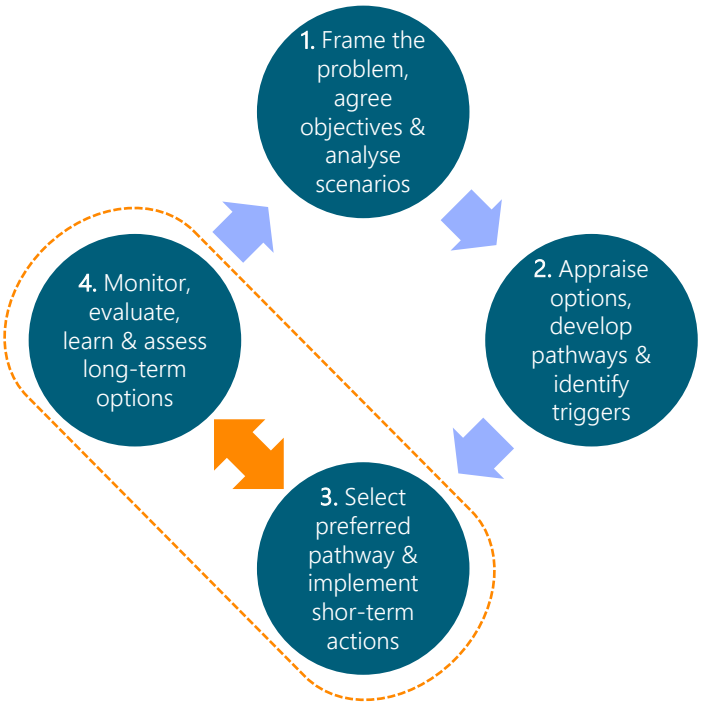

Figure 5. Common features or elements of approaches taken to adaptation pathways (EA, 2021).

In slightly more detail, these features or elements consist of the following:

1. The first step is to set objectives, assessing current vulnerabilities as well as future scenarios. A basic pathway will only assess a limited number of future scenarios, while more complex approaches will consider a range of scenarios including high-end or extreme estimates. The way in which scenarios are assessed also vary, from understanding of simple trends to more complex, high-resolution modelling of local conditions that might utilise either traditional process-based modelling or more cutting-edge, data-driven Artificial Intelligence and Machine Learning approaches. Complex cases may also involve risk assessment and priority setting with stakeholders.

2. The next stage evaluates different options for action in terms of cost and effectiveness, as well as developing pathways and identifying triggers for monitoring. Sometimes this step is split into a number of decision points with involvement from stakeholders.

3. Thirdly, the preferred plan is selected and implemented, and any short-term actions and long-term options described. Short-term actions are the immediate ones, and they are also preparatory for keeping long-term actions open. A governance model ensures appropriate timing for long-term actions.

4. Finally, the last stage involves an iterative loop of monitoring, evaluation and learning. Stages 3 and 4 are strongly linked, as monitoring outcomes may affect the preferred pathway, and monitoring ensures that the objectives of the preferred pathways are being achieved. Any stage of the process may have to be re-evaluated as a result of changing variables or situations.

6.2 A further step up: the Dynamic Adaptive Pathway

Dynamic adaptive pathways are used to help policy makers develop adaptive strategies under deep uncertainty. In essence, a **dynamic adaptive pathway** is a combination of ***adaptive policymaking*** and ***adaptation pathways***. Dynamic adaptive pathways provide policy makers with the methods and tools they need to close gap between climate knowledge and action, by utilising information even when faced with inconsistent or unpredictable change and uncertainty within real-world values and views (Haasnoot et al., 2021).

6.2.1 The Adaptation Pathway

An adaptation pathway presents a sequence or route of possible actions after reaching a decision point triggered by a critical change or threshold (see Section 5.2 for definitions of these terms). Any given route is an adaptation pathway. Pathways can take the form of 'cycles', 'decision trees' or 'route maps', reflecting the range of options, how they relate to each other, and how they might be implemented into the future (Figure 6).

Along the pathway, decisions are triggered when conditions approach a threshold beyond which the risk is unacceptable, or the system loses performance. At that point, alternative options are needed, and while some of the actions may need to be short-term to address immediate management risks, in other cases options may be delayed into the future.

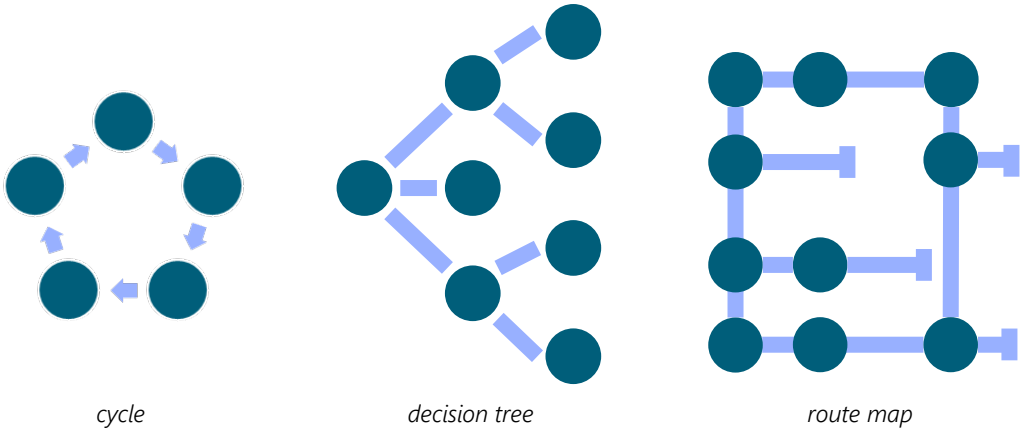

Figure 6. Types of adaptation pathway. Adapted from EA Report (2021).

Typically, an adaptation pathway approach uses scenario modelling to assess several actions across a large ensemble of transient scenarios. The exact date of a threshold or tipping point is not important; getting the decadal time horizon roughly right is sufficient. Sequences of actions can be assessed in the same way as individual actions, and the values and views of different stakeholders can be mapped out (Figure 7).

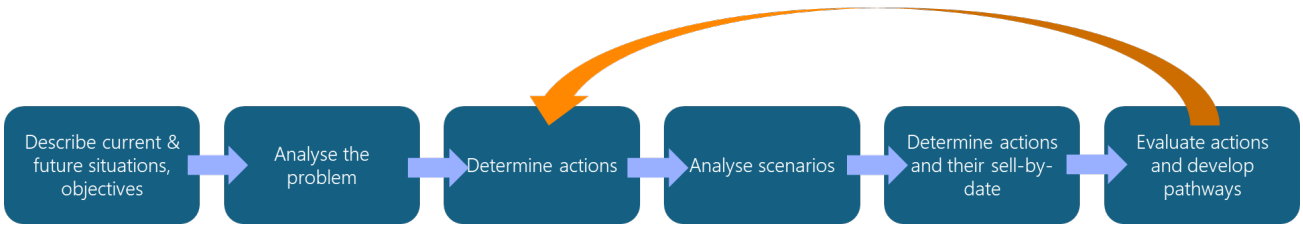

Figure 7. Stepwise process of an adaptation pathway. Adapted from Haasnoot et al. (2013).

Adaptation pathways can be combined into a map, based on modelling or expert judgment and represent alternative routes to get to the same desired point in the future, much like an underground transport system map (Figure 8). This adaptation map can be used to prepare a plan for actions to be taken immediately, and to make preparations for implementing an action in the future in case conditions change.

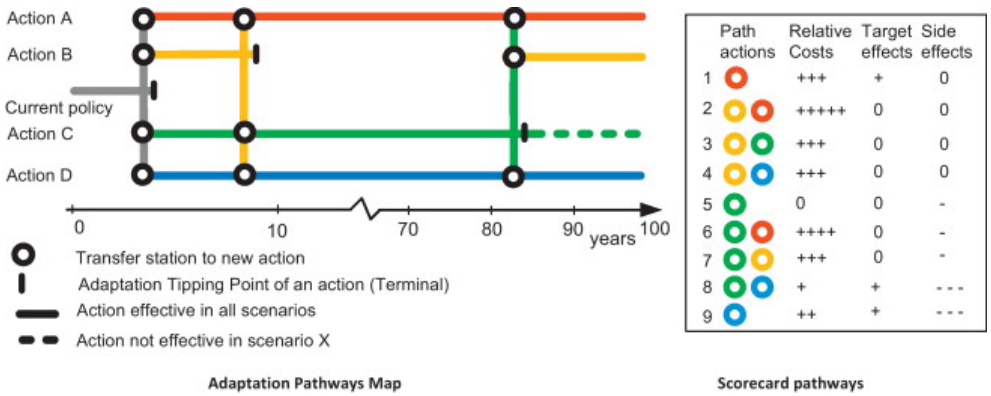

Figure 8. Example of an Adaptation Pathways map (left) and a scorecard presenting the costs and benefits of the 9 possible pathways presented in the map (right). In the map, starting from the current situation, targets begin to be missed after four years. The grey line represents the current policy, which contemplates four options (A, B, C and D and the colour rings in the scorecard refer to each of those actions). From Haasnoot et al. (2013).

The decision process under adaptation pathways is based on a sequence of actions over time, and an ensemble of transient scenarios. Uncertainties about future developments, in terms of trends and changes but also uncertainty around natural variability, are considered in the planning process. A variety of pathways can be explored using a fast, simple model, and what makes the plan 'dynamic' is the identification of tipping points, the *sell-by* date of actions, and the shift to other actions. The pathways map provides the decisionmaker with information, but there is no guidance to help translate the map into an actual plan.

6.2.2 Adaptive Policymaking

Then, the adaptive policymaking, consists of a structured approach for designing robust dynamic plans (Haasnoot et al., 2013). It follows five basic steps:

1. The conditions of a system are analysed and future objectives specified.
2. A basic plan assembled to achieve those objectives, which is then strengthened through the actions in the next step:
3. Strengthening actions:
    - *mitigating – to reduce the likely adverse effects of a plan,*
    - *hedging – spread or reduce the uncertain adverse effects of a plan,*
    - *seizing – to seize available opportunities,*
    - *shaping* – to reduce failure or enhance success.
4. Contingency planning, using the following:
    - *signposts* – information that should be tracked to determine whether the plan meets conditions for success,
    - *triggers* – critical values of signpost variables beyond which additional actions should be implemented are specified, which are specified in the next step (v):
5. Additional actions:

- *defensive* – to clarify the basic plan, preserve its benefits, or meet outside challenges so long as the basic plan remains unchanged,
- *corrective* – to adjust the basic plan,
- *capitalizing* – to improve the performance of the basic plan,
- *reassessment* – initiated when the analysis and assumptions critical to the plan's success have lost validity.

The decision process under adaptive policymaking is different to that of an adaptive pathway, as it specifies a stepwise approach to designing a plan. From a basic course of action based on well specified objectives, risks and opportunities are identified, and actions can be taken, now or in the future, to either cope with vulnerabilities or capitalise on opportunities. Uncertainties can then be accounted for, and a monitoring system and associated actions result in a plan that is more robust and dynamic. However, adaptive policymaking offers no further clear guidance, and cannot address questions around vulnerabilities, or even actions.

6.2.3 Dynamic Adaptive Pathways: a combined approach

As explained above, Adaptive Policymaking and Adaptation Pathways have their own strengths and weaknesses (Table 6). The combination of Adaptive Policymaking and Adaptation Pathways, known as Dynamic Adaptive Pathways, draws on the stronger more resilient elements of each approach.

Table 6. Comparison of Adaptive Policymaking and Adaptation Pathways approaches, and their relative strengths and weaknesses. Adapted from Haasnoot et al. (2013).

ASPECT	ADAPTIVE POLICYMAKING	ADAPTATION PATHWAYS
Focus	The decisionmaker's vision defines the plan.	Takes into account links between the system and the wider societal context.
Consideration of multiple futures	Indirectly, via vulnerabilities and opportunities.	Explicitly, via transient scenarios.
Planning process	Comprehensive stepwise approach.	Short stepwise approach.
Clarity for designing a plan	Limited, starts from a high-level framework that can lead to many different plan versions.	Application oriented, uses models to develop a specific plan.
Types of actions	Distinguishes different types of actions that can be taken.	No specific categorization of actions, although they will be loosely based on societal perspectives.
Designing the pathway	One basic pathway is developed, but without clear guidance.	Several pathways based on different perspectives. Unclear how to prioritise promising pathways when confronted with many possible actions.
Uncertainties	In principle any uncertainty can be accounted for.	In principle any uncertainty can be accounted for, with explicit attention to social uncertainty.
Flexibility of resulting plan	Flexibility is established through the monitoring system and associated actions.	Cleary specifies when a policy should be changed, and what the next action should be.
Dynamic robustness	Dynamic robustness results from the monitoring system and actions.	Indirect dynamic robustness via 'sell-by date' actions, and action shifting.

Dynamic adaptive policy pathways integrate uncertainty in the form of transient scenarios that change over time, with a toolbox of actions to tackle risks and opportunities, with adaptation pathways made up of sequences of actions; and a monitoring system with built-in contingency to keep the plan on track of a preferred pathway.

6.3 Building a Dynamic Adaptive Pathway

As presented above, a Dynamic Adaptive Pathway combines the strengths of adaptive policymaking and adaptation pathway approaches. From there, a dynamic pathway for **climate adaptation** is essentially a sequence of potential actions that can be taken to anticipate risks, opportunities, and uncertainties brought about by climate change and other compounding changes in other societal, growth and economic circumstances (EA, 2021). These actions are linked to specific thresholds so they can be stepped up where a change happens (for example, higher sea levels or increased flooding). Alternative pathways help explore and identify low-regret, short-term actions vs long-term options for adaptation. This help ensure decisions are resilient in a changing climate.

6.3.1 The building steps

A mainstream guide for policy and practice, sets out a 9-step framework for building a climate adaptation pathway (according to EA, 2021, and also based on Decision-making for climate change adaptation pathways guide, from the British Standards Institution, BSI, 2021). The stepwise framework is represented in Figure 9.

Figure 9. Steps to develop climate change adaptation pathways. The orange circular arrows indicate points for reassessment and where to integrate quick low-regret, short-term actions that have well-evidenced benefits, with long-term options to adapt, if necessary (BSI, 2021).

This stepwise process can accommodate ‘stop-and-think’ reassessment points, particularly between Steps 3 and 4, and 4 and 5. It may happen that by evaluating actions vs risks and opportunities in Step 4 there is a need to go back to Step 3 to identify new or additional actions, and the iteration may need to be repeated until the toolbox of actions is deemed adequate, at which point pathways can be designed (see orange cyclical arrows, Figure 9).

The steps involved are explained below in more detail, presented as a blended approach based on the dynamic adaptive pathways as proposed by the EA (2021) and Haasnoot et al. (2013). In addition, an important extra 10th step – Monitoring – has been added, taking inspiration from best practice guidance on coastal climate change in New Zealand (Ministry of the Environment, 2024).

1. **DEFINE** scope, aims, objectives and constraints:

   This first step consists of a description of the study case area, including the system's characteristics, the objectives, current and future constraints, and any major uncertainties (about the future, data, models, etc). It also requires defining the desired, successful outcome, and determining any thresholds, triggers, indicators and targets that will be used to evaluate the performance of actions and pathways, and to assess the ‘*sell-by* dates’ of the actions.

   This step can also include consideration of links between climate and other social and economic drivers of change, if required. Where relevant, those considerations are then built into the following steps.

2. **UNDERSTAND** risks and opportunities from current and future climate change, including high-end extreme scenarios:

   This step consists of an analysis of the problem. The current and possible future situations are compared to the objectives as defined in Step 1, to identify any gaps, which will require actions. Possible future situations are used as references so long as policies do not change, and their transient scenarios span the uncertainties identified in Step 1. Risks and opportunities should be considered, as blockers or enablers in achieving the objectives respectively, which can be done using computer modelling.

3. **IDENTIFY** actions that can achieve a successful outcome:

   This step identifies possible actions, specified in light of the risks and opportunities, and categorised according to the adaptive policymaking types: shaping, mitigating, hedging, and capitalising. The aim is to assemble a toolbox of possible actions, based on varied stakeholder perspectives if appropriate.

4. **EVALUATE** actions vs different scenarios, levels of opportunity and risk and their thresholds:

   Next, the potential effect of each action is evaluated for each scenario, which will help determine the *sell-by date* for each action. Actions are also assessed against each risk and opportunity, to understand whether an action can reduce or remove a risk, seize an opportunity, or indeed whether any given action can create new risks or opportunities.

Ineffective or risky actions are screened out, so only effective actions are used in the next steps.

5. **ASSEMBLE**: a range of pathway options in response to risks and opportunities that will tackle the thresholds:

   Pathways can now be assembled using all the information gathered up to this point. It may happen that by evaluating actions vs risks and opportunities in Step 4 there is a need to go back to Step 3 to identify new or additional actions, and the iteration may need to be repeated until the toolbox of actions is deemed adequate, at which point pathways can be designed.

   A pathway is a sequence of actions, single or combined, where each new action(s) is activated once its predecessor is 'turned off' because it can no longer meet success. Pathways can be assembled in different ways, even by exploring all possible route combinations with all available actions, however some actions may cancel others, and some sequences may be illogical. Fundamentally, actions will carry their own time-horizon and urgency, impacts their own severity and uncertainty, and certain action options may need to remain open, all of which can be used to devise a map of logical, 'promising pathways' most likely to achieve success.

6. **DEVELOP** a range of preferred pathways:

   The aim of this step is to develop a manageable number of preferred pathways, ideally two to four, that reflect a range of different perspectives. This will result in physically robust, as well as socially robust pathways.

7. **CONTINGENCY** actions:

   The preferred pathways can be made stronger using contingency actions to keep each pathway on track. Contingency actions can be used for keeping one or more preferred pathways open, and to anticipate and prepare for unexpected futures. Contingency actions (see the previous Adaptive Policymaking section) can be corrective, defensive, and capitalising. They are associated with a monitoring system and trigger values, so it is clear what to monitor, and when the contingency action needs activating.

8. **THE DYNAMIC ADAPTIVE PLAN**:

   This step crystalises all previous steps into a dynamic adaptive plan, using the following focus question: given the preferred pathways and future uncertainties, what actions/decisions should we take now, and which ones can be postponed? The plan must meet a key challenge: to keep the preferred pathways open for as long as possible. Thus, the plan summarises results from previous steps, specifies actions to be taken immediately, actions to be taken *now* that are necessary to support *future* adaptations, and sets out the system that will be used for monitoring this.

9. **IMPLEMENT**:

   On this final step, the actions that must be taken immediately are implemented, and the monitoring system is turned on. Time starts, signpost information related to the triggers gets collected, and in response, actions will be started, altered, stopped, or expanded as required. Once any initial 'now' actions are implemented, all other actions are paused, until a trigger event occurs.

10. **MONITOR** (additional step, from Ministry of the Environment, 2024):

    This is an additional but important step that reflects the implementation of monitoring as well as any review mechanisms. In practice for the South Wales case study locations, it could involve setting up a monitoring framework, and utilising current governance structures from the Coastal Groups and Forum, that give suitable time to act before thresholds are crossed. Plans could be reviewed regularly, e.g., 5 years, to adjust accordingly as more evidence, information, monitoring data etc…come to light.

6.3.2 Simple vs complex pathway approaches

Generally, adaptation pathways can fit a broad range of complexity and analytical power, depending on their intended use. At the basic level, qualitative pathways can be very helpful for communicating a narrative and raising awareness with stakeholders, for example to encourage debate on possible actions that could be taken to address thresholds of future change.

Further, more detailed, comprehensive pathways can be useful for large-scale or complex problems. Typically, those may include cost-benefit analysis of measures, as well as specific triggers and thresholds. Monitoring can then help determine when a threshold is reached that indicates an adaptation tipping point may be reached soon, which in turn could support decision making on additional research, implement follow-up actions, or make adjustments to the adaptation pathway. Ultimately, adaptation pathways account for future uncertainty by considering multiple possible future scenarios when initial decisions are made.

Table 7 for example shows how each of the four basic elements or features (framing the problem, appraising the options, selecting the pathway and short-term actions, and implementing long-term monitoring and assessment) of two contrasting pathway approaches, one simple and one more complex, can be compared (Haasnoot et al., 2013).

Table 7. Comparison of the basic adaptation features between two contrasting pathway approaches, one simple and one more complex.

	SIMPLE PATHWAY APPROACH	COMPLEX PATHWAY APPROACH
1. Frame the problem, agree objectives & analyse scenarios	Some key stakeholders involved in framing the problem Shared objective defined by stakeholders Qualitative assessment of baseline Single future scenario considered	Multiple stakeholders involved framing the problem Governance framework developed Competing objectives from different stakeholders Quantitative assessment of baseline Multiple future scenarios considered including a high-end scenario
2. Appraise options, develop pathways & identify triggers	Consideration of a limited range of options Trigger points identified	Consideration of a wide range of options incorporating different stakeholder views Trigger points identified, indicators selected, and monitoring framework identified
3. Select preferred pathway & implement shor-term actions	Preferred pathway developed Implementation in a single stage with key stakeholder involvement	Multiple pathways developed with preferred pathway identified based on advanced analysis Implementation over a multi-year programme with involvement of multiple stakeholders
4. Monitor, evaluate, learn & assess long-term options	Longer review cycle of the actions Re-evaluation only when drastic changes in conditions or circumstances	More regular and frequent review of actions, decisions and approach taken Re-evaluation as required of the plan Re-evaluation when drastic changes in conditions or circumstances

6.4 Other UK examples

Below there are several examples from across the UK showing the practical application of adaptation pathways, adaptive policy making, and dynamic adaptive pathways.

6.4.1 Scotland's Coastal Change Adaptation Plan

Scotland's Coastal Change Adaptation Plan (CCAP), published by the Scottish Government in 2023, currently serves as a practical way of developing and applying a Dynamic Adaptive Pathways approach, informed by management triggers (Scottish Government, 2023; Haasnoot et al., 2013). The CCAP is the Scottish version of an SMP that combines shoreline management planning and dynamic adaptive pathways for Scotland's coast.

As the dynamic approach relies on ongoing monitoring and planning for multiple scenarios and outcomes, which can be adapted as future events unfold, it can manage future uncertainty flexibly and effectively. For coastal assets at risk of flooding or erosion, and where protection is not feasible, the only viable option may be adaptation by relocation out of harm's way – which is made possible by securing the space and planning required to accommodate those assets, at the right temporal

horizon. At the same time, the dynamic approach is used to identify areas of natural protective features where future hard development should be avoided (e.g. sand dunes and saltmarsh).

In the CCAP, triggers are often site-specific. Physical process triggers are readily quantifiable, and trends can be predicted through monitoring. On the other hand, while they can also incorporate sudden significant changes such as defences breaching during major storms. Social and economic factors (referred to as 'enablers and inhibitors' by the CCAP) may be binary (yes/no) and so difficult to quantify and less predictable and certain.

By using trigger points, management actions can respond to new information or changing circumstances: for example, a storm damaging assets may trigger a switch to beach replenishment, while at a later trigger point management may switch to relocating assets out of harm's way, resulting in coastal erosion methods becoming redundant. Table 8 below shows some examples of trigger points.

Table 8. Examples of common trigger points. Adapted from Scottish Government's CCAP (Scottish Government, 2023).

TRIGGER TYPE	DESCRIPTION	EXAMPLE
Physical process triggers	Proximity of asset to coast	House is less than 20 m from Mean High-Water Springs
	Proximity of asset to coast	Road is less than 15 m from vegetation edge
	Flood risk	Probability of over-wash is higher than 10% Annual Exceedance Probability
	Defence structure deterioration	Inspection reveals failure of necessary protection level (for example, 10% Annual Exceedance Probability)
	Erosion or flood event	Storm undermines defence, or over-wash leads to considerable damage to properties
Enablers and inhibitors (social and economic) triggers	New information	New study shows current land-use not sustainable
	Lack of funding/affordability	Funding exhausted
	Defences or adaptations not viable	Cost-benefit analysis doesn't support intervention
	New funding available	Adaptation or resilience activities can be enabled using new funding
	Relocation of infrastructure, property or people	Council ceases to repair existing defence
	Changes in land use	Business closes
	Changes in commercial / industrial operations	Business relocates
	Social attitudes change	Community chose not to maintain activity
	Changes to legislation or policy	New government funding stream

6.4.2 Environment Agency Flood and Coastal Erosion Risk Management Strategy

The Environment Agency has developed a roadmap (currently to 2026) to realise the Flood and Coastal Erosion Risk Management Strategy (EA, 2020). The roadmap incorporates a series of programmes, one of which is a government-funded **Adaptive Pathways Programme**, developing

long-term plans for managing coastal flooding and change to 2100 and beyond for some vulnerable locations including some major estuaries.

The roadmap envisions sets of objectives at 3 levels of ambition, as shown in Table 9 below.

Table 9. Strategic ambitions in the Flood and Coastal Erosion Risk Management Strategy set by the Environment Agency, and a summary of the objectives underpinning each ambition (EA, 2020).

STRATEGY AMBITION 1: Climate Resilient Places	STRATEGY AMBITION 2: Growth and Infrastructure	STRATEGY AMBITION 3: A nation ready to respond and adapt to flooding and coastal change
People and places will be more resilient to flood and coastal change. People and places can plan for and adapt to future hazards. People and places make better use of nature-based solutions. Farming and land practices better support resilience in rural areas.	New homes are safe from flooding. Flood and coastal risk investments drive environmental and sustainable growth. Building back better and recovering more quickly after flooding. Assets are more resilient to current and future flooding and coastal change. National infrastructure is more resilient to current and future flooding and coastal change.	People are better prepared to respond to flooding and coastal change. People and businesses get back to normal quicker after flooding. More people with education and skills to develop careers in flood and coastal risk management. Research and best practice underpin flood and coastal risk management. Carbon emissions from flood and coastal risk management will be reduced.

6.4.3 Ministry of Justice Climate Change Adaptation Strategy

In the Third UK National Adaptation Programme (NAP3), which responds to each of the risks and opportunities from climate change identified in the CCRA3, one of the key risks highlighted was increasing risk of overheating, flooding, and water scarcity in prisons due to raising temperatures (risk H13).

The Ministry of Justice reports to Defra on the actions committed to as part of their **adaptation pathway** submission for the NAP3, which has strategic objectives designed to improve the resilience of prisons to climate risks and build adaptive capacity (Ministry of Justice, 2024). Main actions from the adaptation pathway include:

- Update the ministry's Climate Change Risk Assessment using different degrees of warming and research and pilot interventions to increase understanding of appropriate measures with potential for upscaling.
- Design and build new prisons with improved minimum standards, including reduction of overheating and flooding risks.
- Better understand links between climate, staff and prisoner behaviour, nature, health and wellbeing, and pilot operational interventions to reduce the risk of failures.

6.4.4 The UK Climate Resilience Roadmap

The UK Green Building Council (UKGBC) are co-developing the UK's first Climate Resilience Roadmap for the built environment industry, intended as an evidence-based pathway (UKGBC, 2024). The process of building resilience is essentially a cycle of four stages that allows for ongoing learning, improvement and adaptation (see Figure 10), very similar to the four common features or elements of adaptation approaches discussed in Section 6.1:

- Awareness & Education: understanding hazards and vulnerability
- Anticipation: assessing risk and monitoring local area
- Prepare & Adapt: implementing measures, reducing sensitivity and enhancing adaptive capacity, including use of NBSs
- Sustain Resilience: adapt, respond and recover for the long-term.

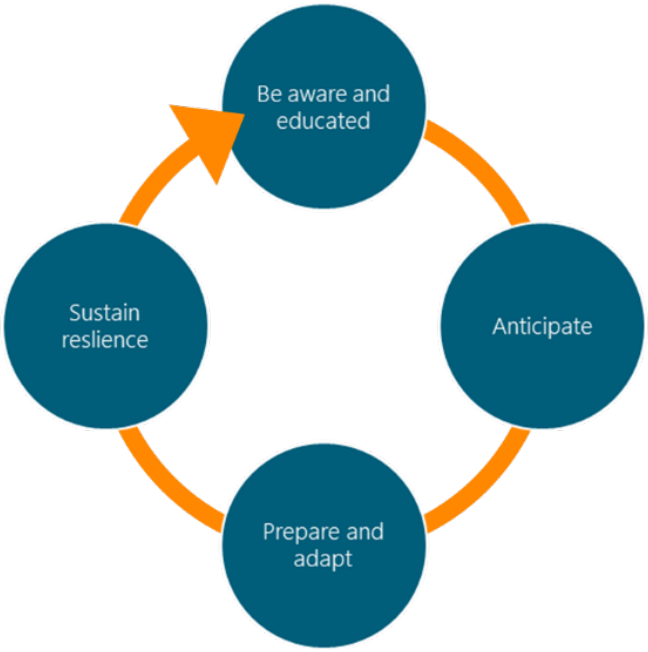

Figure 10. Main cyclical stages for building climate resilience, adapted from the UKGBC UK Climate Resilience Roadmap proposal (UKGBC, 2024).

The desired outcome of the roadmap is to help the UK build long-term resilience against evolving climate challenges.

7. Building coastal climate adaptation in Wales

7.1 General climate adaptation roles and responsibilities

As set out within the Climate Adaptation Strategy for Wales 2024, climate adaptation in Wales is delivered through a shared set of responsibilities across national government, environmental bodies, public health agencies, local authorities, strategic partnerships, and communities (Welsh Government, 2024). The overarching responsibility sits with the Welsh Government, which provides national leadership, sets policy direction, and coordinates more than 240 adaptation actions across multiple sectors. It plays a central role in embedding climate resilience into national planning, overseeing cross-government delivery, and enabling strategic investment such as through its Flood

and Coastal Erosion Risk Management (FCERM) programme to reduce climate-related risks to people, infrastructure, and ecosystems.

Supporting this national leadership, NRW acts as the primary environmental delivery body with a significant operational role. NRW leads on implementing nature-based adaptation solutions, managing flood and coastal risks, restoring and protecting habitats, and delivering coastal adaptation pilots in particularly vulnerable regions. It also provides vital monitoring, modelling, and evidence to guide adaptation planning. NRW's strategic and technical work forms a core component of the adaptation actions identified within the Climate Adaptation Strategy.

Public Health Wales contributes a specialised role by assessing climate-related health and wellbeing risks. It publishes Health Impact Assessments and supports organisations in understanding how climate hazards such as extreme heat, flooding, and air quality degradation may affect communities. This ensures that public health considerations are embedded into wider climate adaptation efforts, recognising climate change as both an environmental issue and a growing health challenge

At the regional and local scale, Local Authorities are essential delivery partners. They operationalise national adaptation objectives within place-based planning, infrastructure management, emergency preparedness, and community resilience activities. Local authorities also play a crucial role in implementing SMP policies (discussed in Section 6.1.3) and translating national frameworks into workable local actions, particularly within coastal regions. Their work ensures that adaptation measures are tailored to the distinct risks faced by individual Welsh communities.

Working alongside local authorities, Public Service Boards (PSBs) coordinate multi-agency action at the local level. Through their statutory well-being plans, they integrate adaptation into long-term community strategies and ensure that public bodies collaborate effectively to enhance local resilience. PSBs therefore act as an organisational bridge between national ambitions and local implementation, providing a joined-up approach aligned with the Well-being of Future Generations (Wales) Act (see Section 7.2.1).

7.2 The Welsh legislative context

Wales has one of the most comprehensive and legally grounded climate adaptation frameworks in the UK. This framework is built on a combination of primary legislation, national strategies and sector-specific guidance, with a strong emphasis on long-term thinking, prevention and sustainable decision-making. Collectively, these provide a robust foundation for adaptation, including at the coast. Coastal Adaptation in Wales is supported and will be shaped by a multi-layered governance framework combining, cross-cutting statutory duties on sustainable development and long-term resilience, national spatial planning policy, and the National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales, including SMPs.

However, whilst Wales has strong legislative drivers for adaptation across multiple sectors, there is no single, unified statutory coastal adaptation framework; instead, coastal adaptation is operationalised through FCERM instruments, planning policy mechanisms and a suite of enabling Acts and regulations.

7.2.1 The overarching statutory duty: The Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations (Wales) Act 2015 (WBoFGA) provides the principal statutory basis for 'adaptive' governance in Wales by requiring public bodies to apply the sustainable

development principle, including long-term thinking, prevention, integration, collaboration and involvement.

In policy terms, WBoFGA functions as a horizontal duty that conditions how FCERM authorities and planning bodies should frame decisions on long-lived coastal assets and risk pathways, supporting avoidance of lock-into interventions that are likely to become maladaptive under accelerating sea-level rise and storm risk.

In the Welsh adaptation discourse, this long-term duty is commonly interpreted as planning 'one generation ahead' (frequently expressed as looking towards the middle of this century, around 2050), aligning with the need to anticipate inter-epoch transitions in shoreline policy.

7.2.2 National spatial planning driver: Future Wales: The National Plan 2040, Planning Policy Wales and TAN15

Future Wales: The National Plan 2040 was published in 2021 and is the national development framework that embeds resilience expectations into strategic planning decisions, requiring planning outcomes that support long-term resilience even though it is not an adaptation-specific instrument.

At the operational level, the coastal adaptation interface with planning is primarily mediated through Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15), together with Local Development Plans (LDPs), which are the statutory vehicles through which coastal flood and erosion risk considerations are translated into spatial allocations, development management and (where applied) identification of Coastal Change Management Areas (CCMAs).

This planning tier is central to coastal adaptation because it governs future exposure (e.g., locating new development and infrastructure outside evolving hazard zones) and provides a mechanism for aligning land-use decisions with long-term shoreline policy intent.

7.2.3 The Climate Adaptation Strategy for Wales (2024)

The Climate Adaptation Strategy for Wales is the Welsh Government's most up-to-date, overarching adaptation framework and is supported by sector-based Adaptation Action Plans spanning, inter alia, nature, water, health, transport, buildings and infrastructure systems (Welsh Government, 2024).

Although the Strategy explicitly highlights climate risks associated with flooding, coastal erosion and storms, the coast/marine environment is not delineated as a discrete 'sector' within the Strategy's action-plan architecture; coastal adaptation delivery is therefore distributed across FCERM, planning, environment and infrastructure policy regimes rather than organised under a single coastal adaptation programme.

7.3 FCERM as the primary delivery architecture for Coastal Adaption

7.3.1 National Strategy for FCERM in Wales

The FCERM National Strategy in Wales provides the principal policy framework for managing coastal flood and erosion risks, defining responsibilities across Risk Management Authorities (RMAs) and setting measures for delivery and reporting.

Within this framework, the requirement for enhanced coastal adaptation support is explicitly recognised through the Strategy's measures—most notably the identification of the need for clear advice/guidance on coastal adaptation for RMAs and communities.

A Guidance Flood and Coastal Erosion Risk Management Authorities in Wales document was published in 2022 to support the FCERM National Strategy.

7.3.2 The role of SMPs

As presented in Section 4, SMPs set out the shared strategic approach for managing the coastline from coastal flooding and erosion risks. They set the SMP Management Intent within geographical Policy Units for defined Planning Timeframes. SMPs are non-statutory documents; their governance function is therefore to provide a shared, evidence-based strategic position that guides local authority decision-making, NRW inputs and partner alignment.

The policy implementation challenge in Wales is increasingly framed as transitioning, from using a epoch framing, to a more adaptive trigger-informed management and supported by monitoring and periodic 'health checks' of policy assumptions (see Section 5). This shift is reflected in Welsh practice through NRW's 'SMP Supplementary guidance for their ongoing maintenance and delivery – Wales' which emphasises consistent, accessible and up-to-date communication of SMP Policy and the development of triggers/thresholds to inform when policies may need to change or be operationalised (NRW, 2021).

7.4 Enabling and constraining legislation relevant to Coastal Adaptation in Wales

As Coastal Adaptation is shaped by a wide legislative perimeter beyond the National Strategy for FCERM in Wales and SMP Policy, there are a range of potential constraints that will have to be considered relating to statutory powers, consent regimes and duties relating to environment, infrastructure, access and importantly heritage, these are highlighted below;

7.4.1 FCERM and Coast Protection Powers and Risk management Authorities Duties

Key legislative instruments include the Coast Protection Act 1949 (coast protection works powers and associated consent/notification considerations), the Flood and Water Management Act 2010 (risk management duties and LLFA role), and the Water Resources Act 1991 (flood/sea defence-related functions).

Marine works at or seaward of high water are additionally governed through the Marine and Coastal Access Act 2009, which introduces marine management and licensing interfaces relevant to many coastal interventions.

7.4.2 Environmental designations, habitats duties and compensatory requirements

Adaptation schemes, particularly those involving realignment, habitat change, or works affecting designated sites, must operate within the Wildlife and Countryside Act 1981 (SSSI duties) and the Conservation of Habitats and Species Regulations 2017 (Habitats Regulations Assessment requirements for SAC/SPA/Ramsar interactions), alongside the Environment (Wales) Act 2016 and related sustainable management duties.

7.4.3 Infrastructure, access and public rights of way

Coastal adaptation actions frequently intersect with statutory duties on highways, drainage, and access (e.g., Highways Act 1980, Transport Act 1962, and Countryside and Rights of Way Act 2000), which can materially affect deliverability and sequencing of adaptation pathways where defences double as transport/access corridors or where rerouting becomes necessary.

7.4.4 Historic environment protections

Where adaptation interacts with heritage assets, statutory controls apply through instruments including the Ancient Monuments and Archaeological Areas Act 1979, Planning (Listed Buildings and Conservation Areas) Act 1990, and Historic Environment (Wales) Act 2016, often requiring additional consents and structured engagement with relevant bodies (e.g., Heneb and major landowners).

7.4.5 Emergency management context

Operational coastal risk management also sits alongside the Civil Contingencies Act 2004, which frames emergency preparedness and response duties relevant to flood/coastal events and informs cross-agency coordination alongside longer-term adaptation planning.

7.5 Coastal adaptation roles and responsibilities

In the particular case of FCERM, the is no formal guidance or legislation driving the implementation of Coastal Adaptation in Wales. Therefore, roles and responsibilities for adaptation at the coast must be drawn together from requirements set out within the National Strategy for FCERM in Wales (2020) and NRW's Shoreline Management Plans: Supplementary guidance for their ongoing maintenance and delivery.

7.5.1 Welsh Government

Current role in FCERM

Welsh Government holds overall strategic responsibility for FCERM in Wales. It sets the national policy framework and long-term direction for FCERM, including climate adaptation priorities, as laid out in the National Strategy. This includes establishing national measures, defining the legislative and policy context, and ensuring coherence between coastal risk management, land-use planning, and wider climate resilience aims. The Welsh Government also oversees the implementation of SMPs via national measures 10 and 11, requiring Coastal Groups to report on the implementation of SMP Action Plans and the implementation of Epoch 1 SMP Policies, ensuring they align with national policies and provide consistent guidance for managing coastal change across Wales. Furthermore, it oversees funding for FCERM activities, determines investment priorities, and monitors how Risk Management Authorities (RMAs) deliver against the Strategy.

Future role in coastal adaptation planning

Regarding Coastal Adaptation, Welsh Government is expected to facilitate a similar role by setting the national mandate for the adoption of Coastal Adaptation planning, oversee and monitor their implementation, provide national guidance to ensure national consistency, in the same manner as SMP reporting, and administer a funding framework to support their delivery. Welsh Government will also play a critical role in aligning adaptation planning with planning policy frameworks such as TAN15, funding models, and climate resilience programmes, ensuring adaptation becomes a core capability.

7.5.2 Natural Resources Wales

Current role in FCERM

Natural Resources Wales has a central role in FCERM, providing technical expertise, evidence, modelling, and coastal monitoring to underpin risk management decisions. Its responsibilities include managing coastal flooding from main rivers and the sea, maintaining and reviewing key

evidence that informs SMP policies, and ensuring that decisions reflect the latest climate and environmental data. NRW also leads the SMP Refresh process, evaluating how new information and legislative changes affect policy implementation and ensuring SMPs remain relevant and deliverable.

Future role in coastal adaptation planning

NRW will become increasingly central to delivering coastal adaptation. Future roles include developing and applying enhanced climate projections, identifying where defences can no longer sustainably be maintained, and facilitating transitions toward long-term adaptive approaches such as managed realignment or nature-based coastal resilience. NRW will also support the production of Coastal Adaptation Pathways by supplying technical information, coordinating across authorities, and guiding communities through the implications of coastal change.

7.5.3 Coastal Groups and the Wales Coastal Group Forum (WCGF)

Current role in FCERM

Coastal Groups are responsible for developing, managing, and maintaining SMPs. They coordinate RMAs, Local Authorities (LAs), technical specialists and stakeholders, ensuring that SMP policy is consistently applied at regional scales and across administrative boundaries. The SMP Supplementary Guidance assigns Coastal Groups a key role in delivering the SMP Refresh, reviewing policy units, assessing at-risk locations, and maintaining Action Plans that identify required actions for each SMP region.

Future role in coastal adaptation planning

Moving forwards, Coastal Groups will become the coordinating bodies for long-term adaptation. As adaptation pathways evolve, the Groups will oversee the integration of SMP policy shifts (e.g., moving from Hold The Line to Managed Realignment) into local decision-making and community planning. They will also become key hubs for communication, ensuring that communities, planners, and stakeholders understand adaptation timelines and triggers and that regional adaptation strategies remain consistent with national priorities and evidence. Through reporting to Welsh Ministers via the WCGF, Coastal Groups will ensure Coastal Adaption Plans are being implemented in a consistent manner across LAs and will play a key role in providing LAs with the required resource and capacity to develop and integrate Coastal Adaptation Pathways.

7.5.4 Local Authorities (LAs)

Current role in FCERM

Local authorities play a dual role: they act as Lead Local Flood Authorities (LLFAs) for managing surface water and ordinary watercourse flooding, and they serve as coastal planning authorities responsible for integrating SMP policy into land-use planning. This includes enforcing planning controls that prevent inappropriate development in areas affected by erosion or flooding and designating Coastal Change Management Areas (CCMAs) where necessary. LAs also approved SMPs at the local level before Welsh Government sign-off and engage directly with communities to build awareness and resilience. LAs are also responsible for applying for and managing Coastal Capital Projects as part of the Welsh Governments Flood and Coastal Erosion Risk Management Programme, specifically projects funded as part of the Coastal Risk Management Programme.

Future role in coastal adaptation planning

LAs will play a pivotal role in delivering adaptation at the coast. They will be responsible for developing Coastal Adaptation Pathways for specific coastal areas or Policy Units and for implementing adaptation measures that align with SMP and Coastal Adaptation Pathway recommendations, such as planning for managed realignment, undertaking necessary SMP Policy Changes, undertaking community engagement and revising local development plans to reflect long term coastal change. They will act as the primary interface between communities and national adaptation objectives, ensuring local needs and social considerations shape dynamic adaptation pathways

7.5.5 Wales Coastal Monitoring Centre (WCMC)

Current role in FCERM

The Wales Coastal Monitoring Centre (WCMC) provides strategic coastal monitoring for Wales, supplying the evidence base that underpins FCERM. With support from National Trust Wales, the Coastal Groups and LAs, the WCMC is responsible for the collection, management, analysis and dissemination of coastal monitoring data.

The monitoring programme supports the implementation and review of SMPs by validating policy assumptions, identifying trends in coastal behaviour, and informing SMP Action Plans. Survey effort is prioritised using a risk-based approach, focusing limited resources on the most vulnerable coastal frontages. WCMC data are made publicly available via an online portal and are supported by technical advice, interpretation and training for Risk Management Authorities.

Through this role, the WCMC provides a consistent, Wales-wide evidence base to support defensible FCERM decision-making.

Future role in coastal adaptation planning

As Wales transitions towards dynamic, trigger-based coastal adaptation, the WCMC will play a collaborative role in supporting adaptation planning. Coastal Adaptation Pathways depend on reliable monitoring to define coastal state indicators, thresholds and triggers, and the WCMC is well placed to provide this evidence.

In future, the WCMC could support coastal adaptation planning by:

- Supporting the definition and application of standardised monitoring indicators across SMP areas.
- Providing evidence to identify early warning signals and trigger points for policy or management change.
- Translating monitoring data into decision-ready insights to support adaptation pathways and long-term planning.

Over time, the WCMC could help underpin a more integrated national adaptive monitoring framework, ensuring that Coastal Adaptation Pathways are informed by consistent, long-term evidence and enabling a shift from reactive management towards planned and anticipatory adaptation.

8. Building a Dynamic Adaptation Pathway for Wales – The BLUEPRINT Approach

To help synthesise and simplify the development of place-based 'trigger informed' Coastal Adaptation Pathways, the MCCIP COCO pilot project for Wales proposes a **10 step BLUEPRINT** for the development of Coastal Climate Adaptation Strategies, seen in Figure 11 in English (Figure 11A) and Welsh (Figure 11B) language versions. This builds on national best practice for the development of Dynamic Adaptive Pathways as proposed by the Environment Agency (EA, 2021) and by Haasnoot et al. (2013).

This Blueprint process is designed to be implemented within existing governance and legislative frameworks in Wales, from the long-term duties embedded within the Well-being of Future Generations (Wales) Act 2015, to the spatial planning policy (including Future Wales/PPW/TAN15) and FCERM and SMP governance and guidance.

Crucially, Wales currently has no single statutory Coastal Adaptation Act or unified Coastal Adaptation Guidance document and framework; instead, coastal adaptation delivery must be assembled from roles and requirements set out through the National FCERM Strategy, SMP governance (via Coastal Groups and WCGF), and RMAs legislative and supporting functions.

The Blueprint therefore provides a structured way to translate non-statutory SMP Management Intents (e.g., transitions from Hold the Line to Managed Realignment and No Active Intervention) into locally deliverable Coastal Adaptation Strategies that anticipate risks and opportunities, address uncertainty, and consider social, economic, and environmental needs.

In Figure 11 below, each Blueprint step outlines:

(i) Why the step matters.
(ii) How to undertake it in Wales, including lead organisation(s), suggested inputs and outputs.

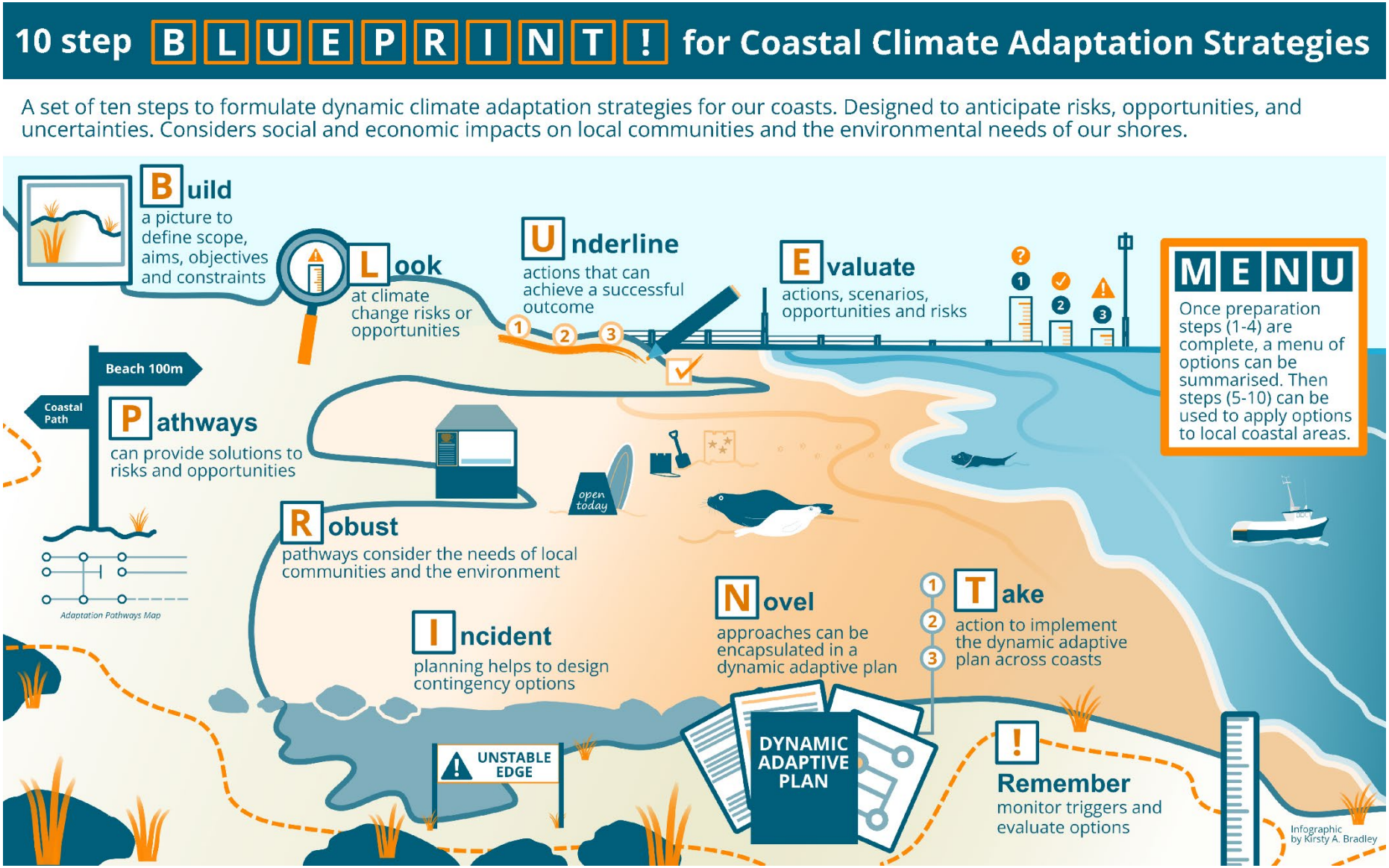

Figure 11A. English language visual summary of the 10 steps to develop a dynamic coastal adaptive pathway. © MCCIP, created by Kirsty Bradley.

10 cam C A N L L A W I A U ar gyfer Strategaethau Addasiad Hinsawdd Arfordirol

Deg cam i ffurfio cynlluniau strategol addasrwydd i'n harfordir. Wedi ddylunio i rhagweld risgiau, cyfleon ac ansicrwydd tra'n cysidro effaith cymdeithasol, economaidd ac amgylcheddol ar gymunedau lleol.

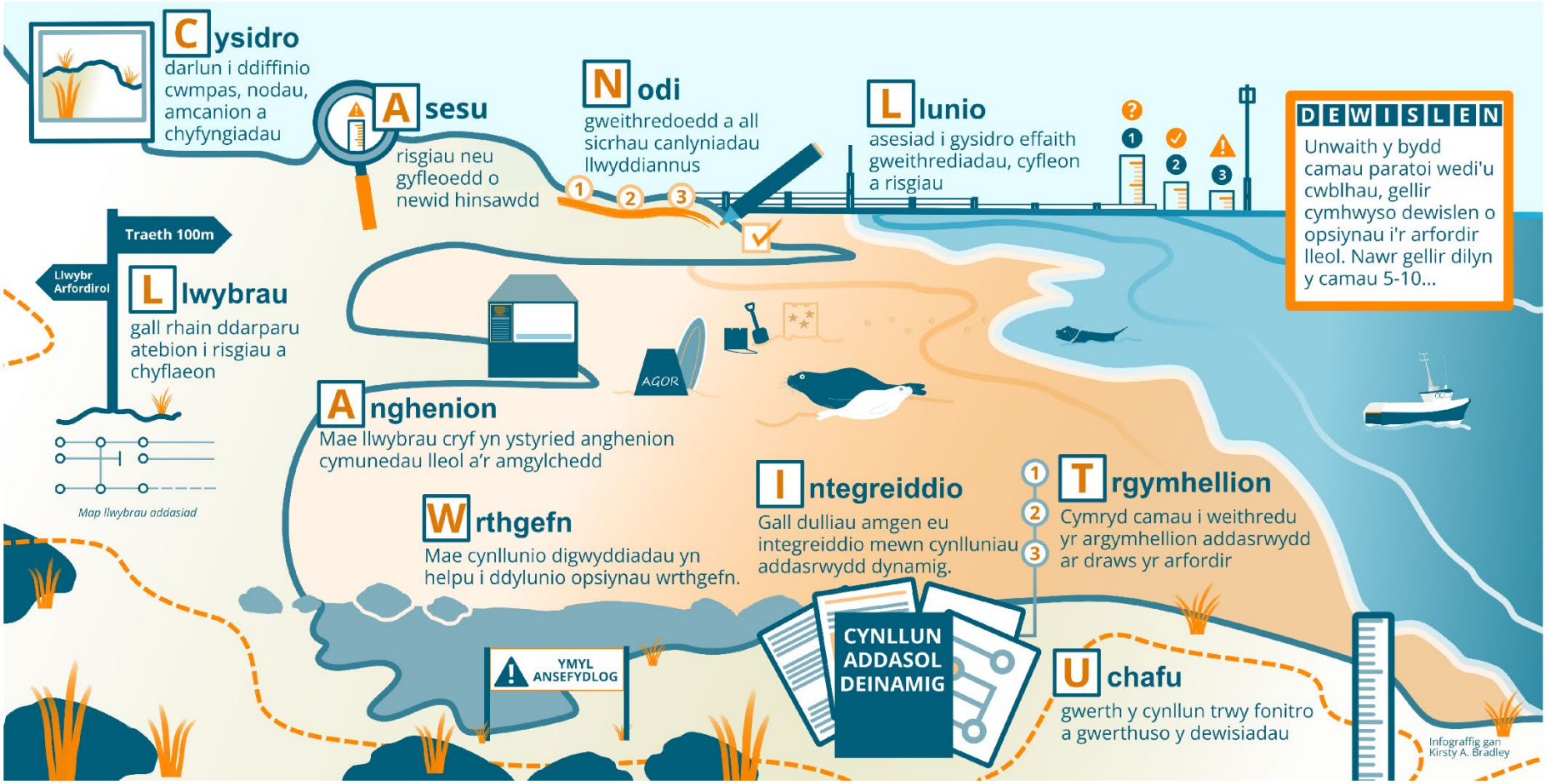

Figure 11B. Welsh language visual summary of the 10 steps to develop a dynamic coastal adaptive pathway. © MCCIP, created by Kirsty Bradley

8.1 Preparation phase (B-L-U-E): Building the 'menu' of adaptation options

[NOTE: FOR FURTHER INFORMATION ON SOME OF THE ABBREVIATIONS IN THESE SECTIONS, SEE ACRONYMS LIST]

1 → **Build** a picture to define scope, aims, objectives and constraints	
Reasoning	This step sets the coastal geomorphological context and defines 'project objectives' and 'community objectives' of a Coastal Adaptation Pathway, including key uncertainties, thresholds, indicators, and triggers that will later determine when an action's 'sell-by date' is reached. In Wales, it also anchors the plan in long-term, preventative decision-making expectations consistent with the Wellbeing of Future Generations (Wales) 2015 and FCERM objectives.
How to do it	• Define the planning unit using existing SMP information for Wales (e.g., SMP Policy Units and Policy, frontages, or geomorphologically linked Policy Units). • Define the 'project objectives' and 'community objectives' that combine FCERM risk outcomes with wider community derived outcomes (wellbeing, environment, economy), so the plan supports multi-benefit delivery and future funding narratives. Further information on how to produce 'project objectives' and 'community objectives' can be found in Section 9.8. • Compile constraints register covering local community derived thresholds, planning policy (PPW, TAN15 and LDPs), coastal protection/flood risk powers, marine licensing needs, statutory environmental protection designations (SSSI, SAC, SPA and Ramsar), highways and PRoW constraints, alongside heritage constraints (listed and scheduled assets). • Define decision coastal state indicators now: the indicators, thresholds and trigger points you will later use to decide whether an action is still viable. • Agree governance and ownership: identify the Lead Authority/RMA, the relevant Coastal Group, NRW technical/regulatory roles, and WCGF reporting interface (aligning with existing FCERM/SMP governance structure). • Align objectives explicitly to FCERM and wellbeing outcomes and ensure outputs can feed into Coastal Group / FCERM governance and reporting structures e.g. Measure 10 action plan reporting. • Use SMP epochs (e.g., Epochs 1/2/3) as an initial time-structure, while preparing to shift to trigger-informed timings (rather than fixed dates) as recommend within NRW's SMP Supplementary Guidance.
Lead(s)	Local Authority and the relevant Coastal Group, with NRW providing technical and regulatory guidance and evidence. WCGF to provide consistency and a reporting interface.
Inputs	• SMP policy intent and Action Plan items. • LDP and TAN15 context. • Constraints from Habitats/SSSI, marine licensing, highways/PRoW, heritage regimes. • Baseline monitoring availability (WCMC). • Community engagement and consultation responses.
Outputs	• Costal Adaptation Scope statement. • Community and project objectives. • Constraints register. • Stakeholder map. • Draft indicator and trigger list.
Useful links	SMP scope and triggers / 'epoch readiness' framing: NRW – *SMP Supplementary guidance for ongoing maintenance & delivery (Wales)* (PDF) SMP context & Wales coverage: NRW – *Shoreline Management Plans* overview page SMP spatial context / policy unit look-up: WCMC ArcGIS StoryMap – *Shoreline Management Plans (Wales)* Long-term duty & 'ways of working' (objectives + governance fit): Welsh Government – *Well-being of Future Generations Act: essentials* and Welsh Government – *Well-being of future generations: guidance* National spatial planning 'hooks' for objectives/constraints: Welsh Government – *Future Wales: The National Plan 2040* Flood/coastal planning policy interface: Welsh Government – *TAN15: development, flooding & coastal erosion* Major policy change process (helps define constraints & governance route): WCGF – *Guidance to major policy change process in Wales* (PDF) Consent constraints (marine): NRW – *Marine licensing* hub and NRW – *Marine licensing in Wales* (process/steps) Consent constraints (habitats): Welsh Government – *Habitats Regulations Assessment (HRA) guidance* Constraint register (heritage): Cadw – *Listed building consent* and Cadw – *Scheduled monument consent* Constraint register (access/PRoW): NRW – *Public Rights of Way in Wales*

2 → **Look** at climate change risks and opportunities	
Reasoning	The Dynamic Adaptive Approach requires explicit treatment of planning within deep uncertainty. This step identifies how hazards evolve under different future emission scenarios, including high-end climate scenarios to avoid lock-in and under-preparedness. It seeks to conceptually understand and compare current and plausible future conditions and compares these to the community and project objectives to identify the 'adaptation gap' (what needs to be done). Risks are to be treated as blockers and opportunities as enablers, recognising compound hazards and cascading impacts. This step should be consistent with FCERM expectations and the relevant SMP long-term management intent, while also acknowledging compound hazards where relevant (where there might be concurrent coastal, fluvial and groundwater flood risk).
How to do it	• Use existing evidence as the starting point, this should **include SMP policy rationale and existing data / information**, SMP-refresh and health check outputs to define the baseline risk and known delivery challenges. • Build a Wales appropriate risk picture by integrating coastal flood and erosion evidence, defence condition/asset performance, and the distribution of receptors (people, property, infrastructure, environmental sites, historical and cultural assets). This should be used to quantify hazard-exposure-vulnerability. • Include **high-end and stress-test scenarios** (not one 'most likely' future) so the plan remains credible under uncertainty and avoids lock-in. • Identify compounding climate hazards, such as compound flood hazards, and cascading impacts (e.g., transport disruption, access loss, habitat squeeze, business impacts) to ensure the plan addresses social and economic resilience, not just hydraulics/geomorphological solutions. • Explicitly connect the analysis to SMP policy transitions (e.g., Hold The Line to Managed Realignment) and identify what must be true before transition is deliverable (land, consent, funding, community readiness).
Lead(s)	NRW (evidence, modelling/monitoring interfaces) and the Local Authority (local receptors, services, community vulnerability). Relevant Coastal Group to coordinate.
Inputs	• Baseline risk evidence embedded in SMP documents, SMP supplementary Guidance and Health Check reports. • Wales-wide datasets and local studies: NRW Flood and Coastal Erosion Risk Maps, asset type and condition data, critical infrastructure. • WCMC Coastal Monitoring data (where available). • Welsh Government Flood Consequence Assessments: Climate Change allowance. • Community vulnerability data.
Outputs	• Risk/opportunity register by policy unit/frontage. • Delivery Constraints register with an accompanying uncertainty statement (outlining the decision critical variables such as PRoW habitat creation requirements). • Prioritised list of decision points where action will be required.
Useful links	Wales adaptation framing & sector actions: Welsh Government – *Climate Adaptation Strategy for Wales 2024* (PDF) Planning-grade flood extents (inc. climate change): NRW – *Flood Map for Planning* Operational flood risk view (incl. defences, SMP & erosion layers): NRW – *Flood Risk Assessment Wales map* Coastal erosion evidence (NCERM) & scenarios: NRW – *Check your coastal erosion risk (NCERM)* Climate change allowances for FCAs (updated March 2026): Welsh Government – *Climate change allowances & flood consequence assessments* Monitoring evidence base (coastal change): Wales Coastal Monitoring Centre (WCMC) – data portal/home and National Coastal Monitoring – Wales landing Coastal adaptation risk context: CCC – *Managing the coast in a changing climate*

3 → **Underline** actions that can achieve a successful outcome	
Reasoning	This step builds a 'menu' of options that can be used to bridge the 'adaptation gap' identified in step 2 'Look'. Actions should cover scheme development, planning, nature-based solutions, community objectives and governance and aim to ensure both near-term actions and longer-term transitions remain feasible. The options set should be consistent with the long term SMP management intent (e.g., MR) while allowing enabling actions (e.g., local Hold the Line measures, data gathering and modelling, community engagement, land strategies planning design actions, nature-based solution measures) that make transitions deliverable.
How to do it	Build a 'menu' of options across the following categories (*Note: this will be site specific and may require more unique and location-specific actions*): • **Asset / engineering options**: maintenance of existing defences, removal of defences, nature-based solution implementation, development of new coast defence schemes • **Planning / land use options**: development control, establishment of Coastal Change Management Areas (CCMAs) where applicable, rollback space, safeguarding of local assets identified within community objectives. • **Community / organisational options**: engagement programmes, support packages, governance capacity. • **Nature and habitat options**: habitat resilience / creation measures, designated site compliance, addressing coastal squeeze. • **Enabling actions**: supporting studies, community engagement materials and eves, land access strategies, funding and partnership building. • **Ensure** the menu includes enabling actions (monitoring requirements, engagement strategy and timings, land strategy, planning safeguards), not just physical interventions. An indicative 'lead in time' should also be applied to each option.
Lead(s)	Will be dependent on the type of option / action. Likely to be the relevant Local Authority and Coastal Group. NRW to input on evidence / consenting and WCMC on current and future monitoring requirements.
Inputs	• Long-term SMP management intent by epoch, delivery constraints register, risk / opportunity register and the prioritised list of 'decision points' identified in step 2 'Look'. • Legislative and policy 'must comply with' list including habitats/SSSI, marine licence, highways/PRoW, heritage consents.
Outputs	• Structured options 'menu' outlining associated SMART based delivery actions and owners, dependencies, indicative lead-in-times, thresholds (sell-by-dates) consent pathways and which project and community objective it addresses.
Useful links	NRW approach to coastal adaptation project delivery: NRW – *Our coastal projects* Nature-based options (funding & delivery expectations): Welsh Government – *Natural Flood Management: guidance to undertake NFM works* Marine works / coastal defence licensing requirements (incl. SMP policy unit alignment): NRW – *Marine licensing application forms* (notes for flood/coastal defence works) and NRW – *How to prepare a band 2 marine licence application* Planning controls & coastal change interface: Welsh Government – *TAN15* Options inspiration & how to structure local coastal adaptation plans: Scottish Government/Dynamic Coast – *CCAP Guidance* (PDF) Adaptive pathways practice framing (what belongs in the 'toolbox'): Environment Agency – *Evidence to support an adaptive approach…*

4 → **Evaluate** actions, scenarios, opportunities and risks	
Reasoning	The Dynamic Adaptive Approach requires the evaluation of how actions are likely to perform across scenarios and when these cease to meet the project and community objectives (their sell-by-date or thresholds). Uneconomical, ineffective and high-risk actions are screened out, trade-offs are document including actions that create new risks and opportunities. Evaluation must explicitly include SMP management intent coherence, FCERM investment / funding pathways, statutory compliance (Habitats Regulations Assessment, Strategic Environmental Assessment, Environmental Risk Assessment where required) and the disruptive impacts on communities, linking directly with the community objectives outlined in step 1 'Build'. This is the point to sense check the project and community objectives against the Welsh FCERM architecture, deliverability and funding routes.
How to do it	• Apply a consistent appraisal approach across options (qualitative or quantitative where feasible), including multi-criteria appraisal that captures not only FCERM benefits but wellbeing, environment and socio-economic outcomes. • Identify decision-critical thresholds (e.g., defence condition failure, overtopping frequency, habitat loss triggers, affordability limits, social acceptability thresholds) and estimate lead-in times for transitions. • Screen out actions that are legally / operationally not viable (e.g., incompatible with habitats duties without feasible mitigation / compensation or blocked by access / PRoW constraints without a route solution). • Document enabling requirements (land access, PRoW reroutes, habitat compensation, marine licensing timescales), as these often determine the real-world viability. • Explicitly record statutory compliance implications (HRAs / SSSI, marine license) early, these frequently dictate feasibility and timings.
Lead(s)	Local Authority supported by NRW. Relevant Coastal Group should ensure consistency across Local Authority and SMP boundaries.
Inputs	• Projects and community objectives from step 1 'Build'. • Risk and opportunities register alongside the delivery constraints register from step 2 'Look'. • Options 'menu' from step 3 'Underline'. • A Wales Coastal Group Forum agreed performance criteria, taking into account not only FCERM benefits but wellbeing, environment and socio-economic outcomes.
Outputs	• Short-listed 'menu' of options, with clear rationales for their inclusion that are linked to project and community objectives. • Performances summaries of each option, related to the agreed performance criteria. • Management Triggers, thresholds (sell-by-dates) and lead-in-times for each short-listed option.
Useful links	Wales FCERM appraisal / business case structure (Better Business Cases + wellbeing): Welsh Government – *FCERM Business case guidance* Planning acceptability/testing (flood consequences, resilience & mapping): Welsh Government – *TAN15* and NRW – *Flood Map for Planning* Coastal squeeze assessment (often a critical 'screen-out' constraint for Hold The Line works near designations): NRW – *Assessing coastal squeeze* Habitats assessment process (planning-side): Welsh Government – *HRA guidance* Marine licensing 'must-include' tests (WFD/WNMP signposting etc.): NRW – *Marine licensing in Wales* Coastal erosion/flood risk evidence layers for evaluation: NRW – *NCERM coastal erosion risk map* and NRW – *Flood Risk Assessment Wales map*

8.2 Application phase: (P-R-I-N-T-!): Choosing from the 'menu' of options

5 → Pathways can provide solutions to risk and opportunities	
Reasoning	A Pathway is a sequence of options / actions that evolve as conditions change, they are a method for planning when you know things will change, you don't know exactly how or when. Each step is activated when its predecessor reaches its threshold (or sell-by-date) and can no longer meet the projects or communities' objectives. Pathways should be assembled iteratively, often looping back to step 3 'Underline' and step 4 'Evaluate' until the 'menu' or toolbox of options to be incorporated within the pathway is deemed adequate by the project team and local community. It is essential that pathways link to the long-term SMP management intent, especially where adaptation involves moving from a Hold The Line to Managed Realignment or No Active Intervention management intent and should identify the enabling actions required to make later pathway steps deliverable.
How to do it	• Collaboratively, draft logical pathways (the number of these will be determined by place-based requirements, dependencies and vulnerabilities) for the relevant Policy Unit that is consistent with the long-term SMP management intent and planning constraints • For each pathway, specify: the enabling actions, prerequisites, it's trigger point and rationale that causes a switch from one option to the next and the lead-in time required before the trigger is reached and the current option reaches its threshold (sell-by-date). • Use SMP Epochs as an initial base but convert 'epoch change' into trigger types and conditions (e.g., physical or socioeconomic) to support adaptation timing.
Lead(s)	Relevant Local Authority (determining the local feasibility) and Coastal Group (ensuring regional pathways coherence) with NRW evidence support.
Inputs	• Short-listed 'menu' of options Management Triggers and thresholds from step 4 'Evaluate'. • SMP transition / management intent context and consent and funding dependencies from step 3 'Look'.
Outputs	• Visual pathway maps. • Pathway logic tables. • SMART based enabling pathway actions that are worked into existing SMP Action Plans and reporting / governance structures.
Useful links	Core DAPP method reference (pathway logic, tipping points, sequencing): Haasnoot et al. (2013) – *Dynamic Adaptive Policy Pathways* (TU Delft portal) Pathway decision-making standard (structured steps; useful for method write-up): BSI BS 8631:2021 – adaptation pathways guide (landing page) Interactive pathway mapping tool: Deltares – *Pathways Generator* (tool page) Environment Agency 'pathways in practice' programme (England examples + tools hub): EA – *Adaptation Pathways Programme* Local-authority oriented explainer & toolkit pointers: ADEPT – *Adaptation Pathways* Wales trigger/epoch framing: NRW – *SMP Supplementary guidance* (triggers; epoch readiness)

6 → **Robust** pathways consider the needs of local communities and the environment	
Reasoning	Robust pathways require selecting a small set of preferred pathways that remain viable under multiple features and are defensible not only technically but socially and environmentally, this is particularly important where choices imply relocation, access change, habitat change or heritage impacts. Robust pathways must integrate statutory duties and cross-cutting constraints (designations, access, heritage) and explicitly address community impacts and inequalities in line with the broader Welsh policy context.
How to do it	• Co-develop preferred pathways with affected stakeholders (community, asset owners, NRW, planners) ensuring consistency with the Well-being of Future Generations (Wales) Act 2015 ways of working and FCERM governance expectations. • Stress-test pathways against deliverability constraints (consents, land, funding), environmental compliance (Habitats Regulation Assessment /SSSI), and knock-on effects (sediment systems, coastal squeeze, PRoW continuity). • Take into account (vulnerability, local economics and service access). • Build the preferred pathways set around a manageable number (2 to 4), documenting trade-offs and rationale clearly for governance and public transparency. • Make explicit how preferred pathways will be embedded into LDPs and TAN15 decision-making and how they align with wider FCERM objectives and reporting.
Lead(s)	Local Authority (community interface and planning) with Coastal Group coordination and NRW support for evidence / compliance.
Inputs	• Community objectives and stakeholder values. • Statutory constraints (habitats, heritage, access).
Outputs	• A set of preferred pathways with robust justification accounting for project and community objectives. • Management Triggers for pathway implementation.
Useful links	Statutory 'ways of working' for co-production & fairness: Welsh Government – *Well-being of Future Generations Act: essentials* Wales adaptation progress & gaps (useful evidence narrative for robustness/inequalities): CCC – *Adapting to climate change: Progress in Wales* (PDF) Community-led adaptation example (Wales; lessons re acceptability & governance): Fairbourne – *Preliminary Coastal Adaptation Masterplan* (PDF) Planning alignment as a robustness test: Welsh Government – *Future Wales* and Welsh Government – *TAN15* Environmental robustness (designation duties / coastal squeeze): NRW – *Assessing coastal squeeze* and Welsh Government – *HRA guidance*

Note: Step 6 'Robust' will require a collaborative, place-based approach. Proportion resource and time should be applied to this step as an iterative process looping back to step 3 'Underline' and step 4 'Evaluate' is best practice and essential to ensure pathways deliver both project and community objective setting, expanded on further in Section 9 'The importance of communication and public engagement'.

7 → **Incident** planning helps to design contingency options	
Reasoning	Strengthen pathways using contingency actions that keep options open and prepare for 'surprises', explicitly linked to signals and trigger. Coastal change includes physical shocks (storms, breaches) and delivery shocks (funding, consent delays), where possible, these should be integrated with FCERM emergency and asset management planning. Contingencies keep the preferred pathways on track and maintain flexible.
How to do it	• Define contingencies for sudden extreme events (storm damage), accelerated erosion, defence failure, funding interruptions, consent delays, and social acceptability barriers (derived from community objectives). • Link contingencies to who activates them (LA/NRW/asset owner), what evidence triggers them (WCMC/inspections), and how they are governed through Coastal Group/WCGF structures. • Include contingencies for consent delays (marine licence/HRA), PRoW re-routing complexity, and funding interruptions—frequent barriers highlighted in the WCGF Measure 11 report.
Lead(s)	Relevant Local Authority and NRW (asset & emergency planning) supported by Coastal Group coordination, WCMC providing necessary monitoring input (where available).
Inputs	• Community objectives from Step 1 'Build'. • Consent / funding risks from Step 2 'Look'. • Trigger set (physical and socio-economic) from Step 6 'Robust'.
Outputs	• Contingency register with Management Trigger thresholds, responsible parties and lead-in times.
Useful links	Wales multi-agency flood response roles & triggers: Welsh Government – *Wales Flood Response Framework* (PDF) Local Resilience Forum structure (Civil Contingencies Act duty-to-cooperate): Welsh Government – *Local Resilience Forums* National resilience approach & lessons management: Welsh Government – *Wales Resilience Framework 2025* (PDF) Live flood warning feed (operational trigger input): NRW – *Flood warnings and alerts* Sign-up warnings for communities/asset owners (contingency activation): NRW – *Sign up to receive flood warnings* Community response planning template: NRW – *Community flood plan*

8 → **Novel** approaches can be encapsulated in a dynamic adaptive plan	
Reasoning	This step consolidates the preferred pathways and contingencies into a single visual dynamic plan, answering: "*what must we do now, what can wait, and how do we keep options open?*" This should be structured to align with current FCERM programme expectation, National Strategy Measures and objectives, SMP reporting alongside legible planning and consenting systems.
How to do it	• Specify *now* actions (e.g., monitoring requirements, feasibility studies, engagement programme, planning safeguards) and *future* actions (e.g., Managed Realignment implementation, relocation, habitat creation), with clear lead-in times. • Embed these actions within relevant Coastal Group SMP Action Plans and assign appropriate leads. This ensures they are picked up in annual SMP Action Plan reporting to Welsh Government Ministers via the WCGF. • Embed compliance pathways: SEA/EIA/HRA/marine licensing considerations and decision gateways.
Lead(s)	Relevant Local Authority with Coastal Group alignment, NRW to provide evidence / regulatory guidance with the WCGF ensuring standardisation and reporting to Welsh Government.
Inputs	• Preferred Pathways from Step 6 'Robust'. • Contingency register and agreed Management Triggers and thresholds alongside the associated monitoring framework from Step 7 'Incident'. • Appropriate Adaptation Pathway visualisation software such as: 'Pathways Generator'
Outputs	• A visualised Dynamic Adaptive Pathway outlining Coastal Adaptation measures for a particular Policy Unit. Outlining *now* actions, *future* actions, current management options thresholds (sell-by-date), lead-in times to this threshold, Management Triggers and review cycles.
Useful links	Pathway visualisation tool (download + how-to): Deltares – *Pathways Generator* EA programme resources & examples (useful for 'dynamic plan' write-up style): EA – *Adaptation Pathways Programme* Local authority friendly framing + toolkit pointers: ADEPT – *Adaptation Pathways* Core method reference (for justification of map logic & triggers): Haasnoot et al. (2013) – TU Delft portal record Standards-based step structure (helps document the plan clearly): BSI BS 8631:2021 landing page

9 → **Take** action to implement the dynamic adaptive plan across the coast	
Reasoning	Implementation activates the *now* actions (enabling actions) and instigates the monitoring of predefined and agreed Management Triggers to determine lead-in-times to defined management options thresholds (sell-by-dates). Other options or pathways remain in reserve until Management Triggers indicate a decision point. This should be discussed at a relevant Coastal Group meeting, allowing for information to be passed on to the WCGF, FCEC and Welsh Ministers. It is important that the implementation of the Coastal Adaptation Pathway should be integrated with specific Local Authority delivery mechanisms, NRW evidence/consenting functions, Coastal Group regional coordination, and WCGF reporting to Welsh Government under FCERM/SMP governance.
How to do it	• Translate *now* actions (often enabling actions) into work programmes of the Local Authorities or Coastal Group via SMP Action Plans. This includes, studies, schemes, procurement, engagement requirements. This should align with SMP reporting and FCERM funding cycles. • Establish implementation governance: Coastal Adaptation Pathway sub-group, reporting lines and decision points. • Use existing FCERM measures and SMP reporting formats and timeframes to embed deliverability and accountability.
Lead(s)	Relevant Local Authority with NRW support, Coastal Group coordinating across internal and external stakeholders to enable delivery of enabling actions (e.g., partnership funding) alongside the support of the WCGF.
Inputs	• FCERM programme. • Consenting route map. • Implementation governance structure.
Outputs	• Implementation of *now* actions (enabling actions). • Costed work programme. • Operational Management Trigger management plan, in coordination with the Wales Coastal Monitoring Centre.
Useful links	Welsh Government FCERM investment programme pipeline (good for implementation narrative): Welsh Government – *FCERM Programme 2026–2027* (and earlier example year: *2024–2025*) Wales scheme appraisal / approvals route: Welsh Government – *FCERM Business case guidance* Marine consent delivery route (often on the critical path): NRW – *Marine licensing in Wales* and NRW – *Marine licence application forms* Planning delivery route for place integration: Welsh Government – *TAN15* Trigger-informed SMP governance / 'major change' route if needed: WCGF – *Major policy change process guidance*

10 → **Remember!** Monitor Management Triggers and evaluate options	
Reasoning	Monitoring is what makes the plan dynamic. Signals are tracked, triggers are assessed, and the plan is reviewed/adjusted on a defined cycle, agreed by the relevant Local Authority and Coastal Group, in coordination with the WCGF. Monitoring should build on WCMC and local asset inspection regimes, and review should be embedded in existing Coastal Group/WCGF governance, with a periodic review cadence (e.g., ~5 years) and event-driven reviews after major storms.
How to do it	• Define Coastal State Indicators, thresholds (sell-by-dates) and Management Trigger points and assign responsibility for data collection / interpretation within *now* actions that are embedded within Coastal Group SMP Action Plans. • Use current Coastal Group and WCGF reporting mechanisms and timelines to coordinate decision points discussions and secure necessary consents with SMP and FCERM governance e.g. SMP Major Changes if required. • Embed monitoring outputs into SMP Action Plan updates and policy change conversations, supporting consistent Wales-wide interpretation of Management Triggers and decision points.
Lead(s)	• Relevant Local Authority, WCMC (monitoring evidence) and NRW (technical interpretation), coordinate through the relevant Coastal Group and the WCGF.
Inputs	• WCMC datasets and local asset inspections. • Agreed Management Triggers and thresholds from Step 7 'Incident'. • Visualised Dynamic Adaptive Pathway from Step 8 'Novel'.
Outputs	• Realtime Monitoring Dashboards. • Coastal Adaptation Pathway review timetable and annual / periodic review reports. • Trigger-response plan. • Updates SMP Action Plans.
Useful links	Primary coastal monitoring portal (data for CSIs/triggers): Wales Coastal Monitoring Centre (WCMC) Flood/coastal risk mapping (regular updates + baseline for monitoring): NRW – *Flood Risk Assessment Wales map* and NRW – *NCERM coastal erosion risk map* SMP trigger approach & health-check refresh cycle: NRW – *SMP Supplementary guidance* Operational warnings (event-driven reviews after storms): NRW – *Check flood warnings* National adaptation monitoring context: Welsh Government – *Climate Adaptation Strategy for Wales 2024* and CCC – *Progress in Wales*

9. The importance of communication and public engagement

This section has been compiled from the Project-Level Stakeholder Engagement Handbook for Project Managers, produced as part of the NRW Coastal Adaptation Programme (CAP), which at the time of preparing this Blueprint was not yet publicly available.

9.1 Community-based evidence

Understanding stakeholders and communities, their perspectives, motivations, and the social and economic circumstances means engagement is more meaningful and the involvement of people adds more value. A more involved community means the project is more likely to meet their needs and succeed.

There are many benefits to early-on engagement by coastal practitioners and authorities, internally and externally (Table 10).

Table 10. Some of the benefits of internal and external engagement.

BENEFITS OF INTERNAL ENGAGEMENT	BENEFITS OF EXTERNAL ENGAGEMENT
• Reduces conflict • Provides consistency • Gathers important different insights • Utilises existing expertise and resources more efficiently • Ensures scope contributes towards the Well-being of Future Generations (Wales) Act 2015 • Enhances projects with social and ecological adjacencies	• Reduces conflict • Provides consistency • Reduces risk of objections, complaints, and legal reviews • Increases local awareness and confidence • Empowers local knowledge and passion • Community feels understood and gains sense of ownership • Better management of risks and opportunities

9.2 Who needs to be engaged, and at what level?

Stakeholders can be identified, mapped and analysed, starting from the target local zone, then looking more broadly:

- Who else will be affected (positively and negatively) or might think they are affected (even they aren't)?
- Who's interested, or likely to support/object?
- Whose input is key?
- Who could be influential through their opinion or leadership?
- Who's well connected within the community, and can help share information?
- Are there any minority or disadvantaged groups?

It is important not to exclude any groups, even those perceived as difficult. Stakeholders across the community will have different interests, concerns, needs and motivations, which together with the different stages of the coastal plan or project, will determine the most appropriate level of engagement:

- Informing.
- Consulting.

- Involving.
- Collaborating.
- Co-creating.

It is important to note that any previous work involving stakeholders or the community will affect the way in which they respond, and their circumstances and therefore their views inevitably also evolve over time. This should be addressed as part of an engagement and communications strategy or plan, as well as other important considerations such as:

- Clear objectives for communications and engagement activities.
- Any statutory obligations, regulations, etc.
- Land ownership issues.
- Clear, consistent, and relevant messaging.
- Accessibility, language, and inclusivity.
- Self-evaluation of communications and engagement activities.

9.3 Materials and activities

All engagement and communications activities should be planned in advance (who's doing what and when etc...) and should also align with the objectives of the overall communications and engagement plan. Any materials, information brochures and boards, even external media notices and posts, should also be prepared in advance and with the following in mind:

- What is the message?
- Who needs to know?
- What's the best way to reach them?
- If a response or feedback is needed, how will that be collected?
- Clear details regarding timescales, processes, information or evidence, and next steps.

9.4 Types of engagement events

Stakeholder engagement activities should be designed with the needs and wants of the stakeholders involved and may consist of a series of engagement activities appropriate for each stage along the project's journey. Bearing that in mind, things to consider generally include purpose of the activity, logistics, materials available, key roles (facilitators, note-takers, record-keepers), house rules (listening, conflict management, etc…), risks and mitigations, event communications and updates, and 'hot' issues likely to arise.

More public events require good planning and preparation, and sometimes pre- and post- event briefings. Just like for general stakeholder engagement activities, things to consider would include purpose, logistics, health and safety, materials available, key roles, house rules, communications, risks and mitigations, and issues likely to arise.

9.5 Closing the loop: feedback

After collating the feedback received, that needs to be analysed and shared, any particular issues or concerns raised highlighted, and stakeholders should be informed about how that feedback was used as part of the work ('you said, we did' style).

When responding to concerns it is especially important to observe the following:

- Summarise issues simply and clearly.
- Use visuals.
- Respond in a timeline manner.
- Explain next steps.
- Provide updates.

9.6 Evaluating success

It is important to measure the degree of success of any engagement and communication activities, to understand what worked well and where things can be improved.

An immediate way to do this is by checking that all the necessary engagement and communication outputs or products have been produced at the right stage as required.

Qualitative measures of success are ideal, although they may be more difficult to obtain, for example:

- Was the information gathered useful?
- Did stakeholders participate and share?
- Was the event useful?
- Did the event help stakeholders understand the work better?
- Was the event accessible?
- How appropriate were the attempts to reach out to those who didn't participate in the event?
- Were there adequate opportunities for all participants to actively interact, and was there enough time allowed for that?
- How did the event add value to the decision making?

Other things can be measured quantitatively, for example:

- Clicks/visits to webpage.
- Likes and shares on social media.
- Number of newsletters.
- Number of attendees at events.
- Number of complaints or enquiries.
- Number of survey responses, news stories, positive feedback comments, offers to collaborate, requests for further information, follow up conversations, etc…

9.7 Sharing lessons learnt

Sharing best practice helps understand what works or doesn't and why, and it also helps consolidate the learning. Any lessons learnt from the benefits of public participation can also help the project or work itself to remain flexible and adaptive.

It is also important to report back to project funder and any partners and beneficiaries.

9.8 Project and Community Objectives

Clear, shared objectives are the foundation of effective engagement in coastal adaptation planning. They provide a transparent answer to three questions that communities and delivery partners consistently ask: '*what problem are we trying to solve, what does 'success' look like, and how will decisions be made and reviewed over time?*'

Objective setting is also the point where strategic intent such as SMP policy, FCERM priorities and planning policy is translated into place-specific outcomes that reflect local needs and values, creating a stable basis for later discussions about options, triggers and timing alongside ensuring management options and pathways remain anchored to what matters most locally.

Objective setting should be treated as a structured engagement activity, not an internal drafting exercise. The process should run in parallel with technical evidence gathering and should be revisited at key milestones as new evidence emerges and as community views evolve.

The process for setting the objectives should be undertaken in a consistent way across Wales and should take account of existing SMP Management Intent and Action Plans alongside duties and responsibilities that sit across Welsh Government, NRW, Local Authorities, Coastal Groups and the WCGF, and the Wales Coastal Monitoring Centre.

Practically, this means defining two linked sets of objectives: project objectives (what the RMA/partners must deliver, aligned to FCERM and planning duties and SMP policy direction), and community objectives (what residents, businesses and local stakeholders value and wish to protect or achieve). These should then be translated into a single, agreed objective hierarchy that can be used transparently in communication materials, engagement events, and subsequent appraisal of pathway options.

9.8.1 Project objective setting

Project objectives set the formal purpose and boundaries of the Coastal Adaptation Pathway. They should be agreed early on within Step 1 'Look' of the 10 Step Blueprint process by Local Authority and delivery partners (NRW, infrastructure owners, Coastal Groups, Wales Coastal Group Forum) and then used consistently in all communications.

Project objectives describe what the responsible organisations must deliver and why, typically framed around risk reduction, policy alignment and deliverability. In Wales, this means objectives that are consistent with FCERM expectations and the agreed long-term shoreline policy direction set by SMPs (including the need to plan for policy transitions and to communicate policy intent clearly). Project objectives will be defined when looking into the contextual SMP information within Step 1 'Look'.

How to do this: Use inputs from Step 1 'Look' of the 10 Step Blueprint process

- Confirm the planning unit(s): specify the SMP Policy Unit(s)/frontage(s) in scope and the relevant SMP policy intent (Hold The Line/Managed Realignment/No Active Intervention/Advance The Line and epoch context).
- Define non-negotiables and constraints: statutory/environmental constraints (designations, consents), planning constraints (LDP/TAN15 alignment), and delivery constraints (funding, asset ownership, land access).
- Set measurable project outcomes: e.g., a published adaptation plan for the frontage, an agreed trigger/monitoring approach, an engagement record, and a reporting pathway via Coastal Group/WCGF processes (these are developed in later steps of the Blueprint process).

A project objective might look like: *Reduce current and future coastal flood/erosion risk to an acceptable level for (frontage) consistent with SMP policy intent and FCERM priorities, while*

maximising wellbeing and environmental benefits and maintaining transparency and fairness for affected communities.

9.8.2 Community objective setting

Community objectives should be derived from values and lived experiences, not only from technical risk outputs. Community objectives should be used to separate value and objectives from the hazard and risk analysis identified within Step 1 'Look' recognising that community values shape what is considered acceptable, tolerable or worth prioritising.

Community objectives describe what local people, businesses and stakeholders value and want to protect, maintain or enable (for example: safety, housing stability, access and recreation, local economy, heritage, habitats, landscape character, and community cohesion). These objectives ensure that adaptation planning does not become purely technical and that pathways/decisions reflect social and economic realities, including inequalities in who experiences risk and who bears transition costs.

How to do this: Use a Values – objective – indicator – threshold / trigger approach, linked to the 10 Step Blueprint process.

- Run an early 'values and place' phase before presenting preferred options: ask communities what they value (homes, access, business viability, heritage, habitats, identity, recreation, Welsh language/culture where relevant), and what outcomes they want to avoid.
- Use representative structures where possible: international examples used 'Coastal Panels' matched to local coastal compartments and existing governance arrangements; in Wales, an analogous approach can be delivered through Coastal Groups/local partnerships, aligning with existing community fora and Local Authority engagement channels.
- Capture risk tolerance narratives: ask what levels of disruption, access loss, environmental change, or relocation are viewed as tolerable/intolerable, so later Management Trigger discussions have social legitimacy.

The key technical step of community objective setting is converting values into clear, decision-useful objectives that can later be used to compare a 'menu' of management options within Step 5 'Pathways'. The following translation could be applied to derive a short "Community Values & Objectives Statement" that can be published and referenced throughout the project:

1. Value *(what people care about)*
2. Objective *(what must be achieved)*
3. Indicator *(how we measure progress)*
4. Threshold / Trigger *(when action must change)*

A community value / objective translation might look like:

Value: "Safe access to the coast and promenade use" – **Objective:** Maintain safe public access routes as long as reasonably practicable – **Indicator:** days/year access is closed; route condition – **Trigger:** repeated closures/unsafe condition threshold.

Value: "Dune habitat and biodiversity" – **Objective:** Avoid net loss of key dune functions and support habitat resilience – **Indicator:** dune volume/width trends; designated feature condition – **Trigger**: sustained erosional trend or condition decline beyond agreed threshold.

Note: exact Coastal State Indicators and Management Triggers should be locally defined using monitoring feasibility and policy needs within Step 6 'Robust'.

Once project objectives and community objectives have been defined, they should be aligned into a single objective hierarchy.

9.8.3 Objective hierarchy

Once project objectives and community objectives have been developed, they should be merged into a single, agreed hierarchy that becomes the spine of the engagement programme and later options appraisal. This is an important step of the Blueprint process as that subsequent Steps (pathway development, monitoring and review) remain consistent and transparent.

The objective hierarchy should be a comprehensive document and include an engagement narrative addressing the values and objectives heard and how they have shaped the preferred adaptation pathways and management options, this should be updates as engagement progresses.

9.9 Suggested engagement methodology for objective setting

A robust objective-setting phase works best when engagement is tiered combining broad participation, to build legitimacy and reach with deeper, locally specific collaboration, and to develop workable, place-based objectives (Table 11). This should be anchored by a clear governance structure (who decides what, and when), supported by routine communications (briefings, FAQs, newsletters), and punctuated by milestone consultations where draft outputs are tested and refined. The key principle is that values and objectives are established early, before options are narrowed, and then revisited through a structured feedback loop as evidence and circumstances evolve.

Table 11. Suggested engagement sequence (objective-setting phase).

	ENGAGEMENT SEQUENCE	BENEFITS OF EXTERNAL ENGAGEMENT
1	**Scoping pack** (Project objectives + decision space)	**Purpose**: establish clarity and trust from the outset. **What to include** (plain language): • What the project is trying to achieve (draft *project objectives*). • The *planning area/frontage* and the time horizon. • **What decisions are in scope / out of scope** (legal, funding, data, asset ownership constraints). • How engagement will work and how views will shape outputs. **Outputs**: a short Scoping Pack, a one-page summary and an FAQ.
2	**Value workshops** (Community objectives)	**Purpose**: determine *what matters locally* before discussing preferred solutions. **Format options**: drop-in sessions, facilitated workshops, targeted focus groups (businesses, access users, vulnerable groups), plus an online option for those unable to attend. **Workshop prompts** (examples): • "What do you most value about this coastline and why?" • "What impacts feel unacceptable? What might be tolerable if we had time to plan?" • "What should be protected/maintained now, and what might need to change over time?" **Outputs**: a Community Values Summary and a first draft set of Community Objectives (written as outcomes, not preferences).

3	**Draft objective hierarchy published** ("We heard…")	**Purpose:** demonstrate transparency and show how engagement has been translated into decision material. **What to publish:** • A single **objective hierarchy** combining project + community objectives: • Top level outcomes (e.g., safety/risk, access & wellbeing, environmental resilience, local economy/place, deliverability & fairness). • Supporting objectives (what must happen to achieve them). • A short "We heard / We drafted" note showing where objectives came from. **Feedback window:** time boxed (e.g., 2–4 weeks) with multiple response routes (online form, email, paper copies at hubs). **Outputs:** Objective Hierarchy v1 and a feedback log.
4	**Objective sign off and integration into subsequent communications**	**Purpose:** formalise the objectives as the spine of the project so they consistently shape later steps. **What happens:** • Lead authority/partners adopt **Objective Hierarchy v2** (post feedback refinement). • Objectives become the basis for: - How risk evidence is framed ("risk relative to objectives"). - How options are appraised (criteria). - How trade-offs are explained. - What gets monitored and reviewed. **Outputs:** Objective Hierarchy v2 and a short statement "How these objectives will be used in decision making".

10. Funding for coastal climate adaptation

10.1 Funding streams in Wales

The Climate Adaptation Strategy for Wales has identified two other main funding streams in Wales (Welsh Government, 2024):

- The Flood Investment Programme: a risk-based approach to funding, intended to reducing impacts of flooding and coastal erosion to people, property and communities at greatest risk.
- The Natural Flood Management (NFM) Accelerator Programme: launched in 2023, supports investment in nature-based Solutions, working with Welsh farmers, landowners, and third sector organisations.

To the best of our knowledge however and at the time of preparing this Blueprint, there is no financial support for communities at risk of coastal erosion or permanent inundation in Wales.

10.2 Coastal Loss Innovative Funding and Financing (CLIFF)

The Coastal Loss Innovative Funding and Financing (CLIFF) is a study commissioned by Defra and Coastal Partnership East (CPE) and it is part of the Flood and Coastal Erosion Risk Management Strategy. The CLIFF study therefore operates in England and aims to explore options for funding and financial support for coastal communities in high-risk areas to provide the best solutions, from relocation to financial protection, to help them become more resilient to coastal change.

The study has gathered expertise across sectors including insurance and banking, to help develop possible solutions. The options considered were:

- Coastal Accumulator Fund
- Local Authority Coastal Adaptation Fund

- Levy Model
- Rollback Model
- Compensation Model

An initial review prioritised three for further assessment: Coastal Accumulator Fund, Local Authority Coastal Adaptation Fund, and Levy Model. These were assessed against several criteria such as scope, operational requirements, economic viability, and social, commercial, political and legal requirements. CLIFF's model concluded that the Coastal Adaptation Fund and the Levy Model were the most financially viable at defined scales.

Through a Coastal Adaptation Fund, residents at imminent risk are given support from a local authority fund. The Fund may also provide local authorities with a process with wider uses for adaptation in coastal areas.

A Levy Model on the other hand, which raises funds through household insurances, allocates cash sums once coastal properties become uninhabitable due to erosion or flooding. Levy-type models have been used globally to cover many types of risk, although a coastal loss levy is not yet proven as a viable adaptation option in the UK.

Next steps as part of CLIFF include discussions are regarding funding opportunities as part of the Flood and Coast Innovation Programmes. The Resilient Coast and Coastal Transition Accelerator Programme will develop and trial the shortlisted options to determine whether they can work in practice and how – see the next section for more details.

10.3 Coastal Transition Accelerator Programme

Since 2022, the Environment Agency has managed the Coastal Transition Accelerator Programme (CTAP). With the goal of managing coastal change rather than just resisting, CTAP has been partnering with communities such as East Riding of Yorkshire and North Norfolk and supporting some of the most vulnerable communities to adapt and transition away from parts of the coast that cannot be defended in the long term. The work delivered by this programme has enabled community-led coastal adaptation and tested practical solutions like property adaptation and voluntary purchases, promoting early planning rather than emergency response.

In January 2026, the Environment Agency announced that from 2026 to 2029, CTAP will be testing more advanced and innovative ideas through a series of Coastal Adaptation Pilots, supported by up to £30 million of government funding. The pilots will focus on three key aims: supporting the places facing the greatest erosion risk, testing practical solutions that communities can benefit from now, and building the evidence needed to shape future national policy and long-term funding.

To do this, the funding will be divided into two strands, according to two stages of coastal adaptation. Some of the areas facing the highest levels of coastal erosion across East Riding of Yorkshire, Suffolk and Norfolk are well placed to act quickly. They have experienced teams, strong relationships with their communities and a solid evidence base built up over many years of monitoring and evaluation. In those communities, the pilots will look to deliver practical, value-for-money actions, which could include selective property purchase where there is community support and a clear benefit to the public purse. Other areas will receive coastal adaptation readiness support funding, allocated through Regional Flood and Coastal Committees (RFCCs), and based on the number of homes at highest risk of erosion. In this case, the pilots will fund smaller, early-stage actions that can make a real difference on the ground, perhaps involving relocating or adapting

community buildings and car parks, making minor changes to public infrastructure, creating temporary safe spaces for communities or nature in erosion zones, or testing new approaches such as early warning systems.

11. Recommendations

The following recommendations are proposed to put this Blueprint into practice:

Recommendation 1: The Welsh Coastal Groups Forum to pilot the 10-step BLUEPRINT in three South Wales case studies (Oxwich Bay, The Knap, Pembrey Sands) to prove applicability across different coastal settings and SMP policy contexts and create a replicable template for wider Wales.

Recommendation 2: The Welsh Coastal Groups Forum to work with WCMC to establish a Wales-wide management trigger identification and monitoring methodology (standard indicators, data collection/interpretation roles, and decision-ready reporting) to operationalise dynamic pathways consistently.

Recommendation 3: The Coastal climate adaptation community of practice in Wales to shift to trigger-based adaptive delivery by defining clear thresholds, decision points and 'sell-by dates' for management options, supported by regular review and event-driven reassessment.

12. Acknowledgements

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13. Acronyms

Below there is a list with some of key acronyms included in this document.

CAP	Coastal Adaptation Programme
CCMAs	Coastal Change Management Areas
CSI	Coastal State Indicators
CTAP	Coastal Transition Accelerator Programme
EIA	Environmental Impact Assessment
FCERM	Flood and Coastal Erosion Risk Management
LAs	Local Authorities
LDPs	Local Development Plans
NFM	Natural Flood Management
NRW	Natural Resources Wales
PPW	Planning Policy Wales
PRoW	Public Rights of Way
RFCCs	Regional Flood and Coastal Committees

RMAs	Risk Management Authorities
SAB	Scheme Advisory Board
SAC	Special Area of Conservation
SCBCEG	Swansea and Carmarthen Bay Coastal Engineering Group
SMP	Shoreline Management Plans
SPA	Special Protection Areas
SSSI	Site of Special Scientific Interest
TAN15	Technical Advice Note 15
WAG	Welsh Assembly Government
WCGF	Wales Coastal Group Forum
WCMC	Wales Coastal Monitoring Centre
Welsh FCEC	Welsh Flood and Coastal Erosion Committee

14. Further information about the MCCIP COCO project

For additional useful information on the MCCIP COCO project, visit the MCCIP COCO webpage (https://www.mccip.org.uk/climate-change-risks-coastal-communities-and-their-health-and-wellbeing). The COCO Consultation Report which is available to download from the webpage also includes a list of further resources related to coastal climate adaptation and community resilience.

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This blueprint principally draws on information from the sources listed below. Please note that Section 8.1 and Section 8.2 also include their own lists of useful links specific for each step in the dynamic adaptive plan blueprint.

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For further information
visit the MCCIP webpage:
www.mccip.org.uk

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MCCIP Marine Climate Change Impacts Partnership

MCCIP is the primary independent source of marine and coastal climate change evidence and advice in the UK