



# Coastal loss innovative funding and financing (CLIFF)

**Phase 1b options feasibility assessment**

Follow-on paper to CLIFF Phase 1a  
quick scoping review



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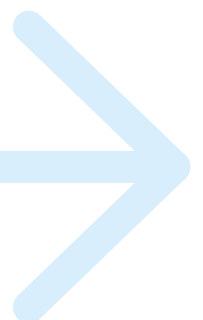
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# Executive summary

## 1.1. Project rationale and scope

Today, coastal erosion and coastal flood inundation represent a significant natural hazard to many properties throughout coastal areas of the UK; an issue predicted to intensify under future climate change projections. In 2020, as part of an initial investigation into innovative financing and funding mechanisms to support properties impacted by these perils, we undertook a systematic Quick Scoping Review (CLIFF Phase 1a, 2022), which identified three potentially viable options, focused on supporting residential populations. These three options are:

- 1. Coastal Accumulator Fund** – Households pay into a fund tied to their property (similar to a life assurance principle which stays with the property over time). Individual fund contributions are managed and administered by a central entity, which allows for the fund to grow. At a pre-determined point, funds are released directly to the homeowner to support them post-loss.
- 2. Local Authority Coastal Adaptation Fund** – Local Authorities (LA) collect funds from properties at risk from coastal erosion via an agreed mechanism. Funds are managed to promote growth. Funds can be released to the LA when agreed conditions are met to support coastally exposed households and communities with, for example, relocation, protection, adaptation and resilience.
- 3. Levy Model** – Funds are collected through a levy-style mechanism (such as household insurance) for a chosen population. Raised funds are managed centrally and pay-out directly to an agreed entity once a pre-defined condition is met. Although similar in mechanism to Option 2, the Levy Model offers scope for greater participation at, for example, a national level.

This Phase 1b Feasibility Assessment project is a follow-on to the CLIFF Phase 1a (2022) project that involves a comprehensive multi-factor evaluation of Option 1, Option 2 and Option 3, with an Option 0 benchmark of “continue current practice”. This report presents a comprehensive feasibility evaluation of each option and the development of a bespoke coastal risk financial model to understand whether any option(s) could be implemented within a potential future coastal financing solution.





## 1.2. Methodology

The methodology for this project was designed and developed by a project steering committee consisting of stakeholders from Marsh, Coastal Partnership East, Lewes District Council, North Norfolk District Council, the Local Government Association Coastal Special Interest Group as well as stakeholders from the Department for Environment, Food and Rural Affairs, Scottish Government, Welsh Local Government Association and the Environment Agency. To assess the feasibility of each option, a three-step methodology was followed consisting of:

- 1. Evaluation criteria development** – Designing a transparent framework to assess the strategic scope, operational requirements, financial/economic viability, and social, commercial, political and legal requirements relevant to each option.
- 2. Option assessment process** – Informing each evaluation criteria component through conducting industry expert interviews, performing a data availability assessment and developing a bespoke quantitative coastal loss financial model to assess the economic viability and cost-benefit of each option.
- 3. Option feasibility evaluation** – Reviewing each option against the agreed evaluation criteria and outlining an indicative target operating model for how the best-performing option(s) could be structured to deliver a successful solution.

## 1.3. Option results summary

Overall, interviews across the UK Government and the private sector highlighted significant appetite for an innovative, national-level financial mechanism to support properties at risk of coastal erosion and coastal flood inundation. Whilst several data sources to support the development of a financial mechanism have been identified, current publicly available data for coastal loss modelling presents limitations in terms of granularity and coverage. Quantitative coastal loss financial modelling enabled more detailed assessments of the average annual contributions required to make an option viable (for instance number of households paying into a scheme) and quantified the average amount a fund could pay-out to beneficiaries (based on the number of households at risk of coastal erosion / inundation). Key results are presented below;

- 1. Coastal accumulator fund** – Coastal loss modelling shows a successful mechanism would require pay-out scenarios to remain low (for instance ~£10,000), and need a large number of contributors across multiple Epochs (such as periods of time out to 2100) to minimise cost. To achieve required number of contributors, any mechanism would likely need to be mandatory, which, based on current policy and legislative frameworks, would be challenging to implement. Overall delivery potential is therefore deemed limited.
- 2. Local authority coastal adaptation fund** – Modelling identified that expanding the scope across all coastal Local Authorities offers stronger cost-benefit under all scenarios tested and performs optimally where larger, loaned cash injections are utilised. Interviews noted precedent from similar UK schemes and various operational structures that could be leveraged. Overall delivery potential is moderate to high although current policy and legislative framework may require further review/adaptation in order to successfully implement.
- 2. Levy model** – Interviews noted coastal flood inundation is covered by existing national-level FloodRe scheme (currently set to end in 2039). Modelling highlighted the mechanism operated most-effectively at national level, permitting larger pay-outs whilst reducing cost. Whilst a national-level mechanism offers maximum cost-benefit, the levy-style mechanism was noted as mirroring the pre-existing FloodRe programme and could have limited appetite from an erosion risk perspective. Overall delivery potential is moderate to high.

#### 1.4. Option feasibility evaluation

Permanent coastal flood inundation was noted as being covered by the existing FloodRe programme so is deprioritised as an immediate short-term financing priority. Centring on erosion-focussed solutions, Option 1 is viewed as inflexible and potentially at risk of delivery failure due to its higher costs, lower financial benefit and voluntary nature of participation. Whilst Option 3 offered the greatest financial cost-benefit due its national coverage, issues impacting its delivery potential were noted around the mechanisms insurance-based operational structure and its inability to support larger coastal areas / communities, likely affecting future stakeholder appetite for a national-level mechanism.

Where an equitable balance of benefits and coverage at the Local Authority level can be achieved, Option 2 likely represents the most viable CLIFF option due to its high cost-benefit and strong delivery feasibility. The option can likely leverage a variety of existing operational structures allowing for more efficient fund management and greater pay-out benefit flexibility due to the autonomy offered to Local Authority fund administrators.

#### 1.5. Recommendations and next steps

Overall, positioning CLIFF as a self-sustaining, disaster preparation and coastal transition fund likely offers the best solution to build fiscal resilience for supported residents and communities across all coastal erosion risk profiles. As a next step, it is proposed that future projects should focus on developing further strategy actions to formalise cost-benefit model analysis, incorporate more granular data and establish integration into wider coastal risk management frameworks. Exploration of funding options and partners should also be considered to test for political, private and public appetite for endorsing a CLIFF mechanism.



# Project background

In our accompanying Coastal Loss Innovative Funding and Financing (CLIFF) Phase 1a (2022) report, we outlined the need for innovative financing and funding mechanisms to be investigated which can be used to support residential properties impacted by coastal erosion and permanent coastal flood inundation caused by sea level rise (CLIFF Phase 1a, 2022).

Whilst Local Risk Management Authorities, through action within their Shoreline Management Plans, have protected many areas of the coastline with physical defence infrastructure, there still remains a population of coastally exposed properties which have no protection today because physical defences may not be economically viable. In the future, due to projected increases in sea level rise and coastal erosion rates, some coastal community defences will likely become unviable and unmaintainable, further increasing the number of properties at risk (Committee on Climate Change, 2018).

To limit future impacts, the Government's Flood Policy Statement (HM Government, 2020) and Environment Agency's Flood and Coastal Erosion Risk Management (FCERM) Strategy (Environment Agency, 2020) has recognised these issues, with the announcement of £5.2 billion to create new flood and coastal defences and an additional, £200 million for the delivery of a Flood and Coastal Resilience Innovation Programme. As demonstrated in the Phase 1a (2022) report, the CLIFF project fits directly within the Resilience Innovation part of these statements, which aims to "encourage and incentivise a greater range of [...] investment and finance by encouraging new and innovative methods" (HM Government, 2020; pg. 17). Therefore, in support of this, CLIFF aims to further design and develop a fit-for-purpose financing mechanism to support those most at risk of coastal losses both today and under future climate change.

The CLIFF Phase 1a (2022) report identified three of five potential financing options to be explored through a more comprehensive feasibility assessment (see CLIFF Phase 1a, 2022 for detail). These options are;

- 1. Coastal accumulator fund** – Households pay into a fund tied to their property (similar to a life assurance policy). Individual fund payments are managed and administered by a central entity, which over time allows for the fund to grow. At a pre-determined point (for instance once a property is deemed uninhabitable), funds are released directly to the homeowner.
- 2. Local authority coastal adaptation fund** – Local Authorities (LA) collect funds from properties at risk from coastal erosion and coastal flooding via an agreed mechanism (such as council tax). Funds are managed to promote growth. Funds can be released to the LA when agreed conditions are met to support coastally exposed households and communities with e.g. relocation, protection, adaptation and resilience etc.
- 3. Levy model** – Funds are collected through a levy-style mechanism such as household insurance for a chosen population (such as national, or across Local Authorities). Raised funds are managed centrally and will pay-out directly to an agreed entity once a pre-defined condition is met, for example once a coastal property is lost due to erosion. Although similar in mechanism to Option 2, the Levy Model potentially provides scope for greater participation, including at a national level.



## 2.1. Aims and objectives

Phase 1b was commissioned by Coastal Partnership East (CPE as shared coastal management team of North Norfolk District Council, Great Yarmouth Borough Council and East Suffolk Council), Lewes District Council (LDC) and the Local Government Association Coastal Special Interest Group. The project was steered by the commissioning bodies alongside DEFRA, Scottish Government, Welsh LGA and the Environment Agency. This report aims to provide a more detailed evaluation of the three options identified in CLIFF Phase 1a (2022) in order to establish the most viable option(s) applicable for a new coastal financing solution. Subsequently, this paper has three core objectives:

1. **Establish the relative feasibility and cost-benefit of each option.**
2. **Identify the data requirements necessary to support coastal loss modelling of each option.**
3. **Develop an indicative target operating framework for the most viable option(s), outlining inputs, functionality and outputs.**

As shown in Figure 1, both reports presented from Phases 1a and 1b are intended to run concurrently, to inform which option(s) should be taken forward as a potential financing solution.

### 01| CLIFF Phase 1a and 1b project overview.

	Phase 1a Quick scoping review	Phase 1b Feasibility assessment	Phase 2 Option testing
Key stages	<p><b>Problem statement definition</b></p> <ul style="list-style-type: none"> <li>➤ Define problem with project stakeholders.</li> <li>➤ Establish conceptual model and project scope.</li> </ul> <p><b>Evidence review</b></p> <ul style="list-style-type: none"> <li>➤ Inventorying of relevant articles and reports.</li> <li>➤ Shortlisting of key resources to inform interviews.</li> </ul> <p><b>Expert interview</b></p> <ul style="list-style-type: none"> <li>➤ Interview variety of industry experts.</li> <li>➤ Establish potential problem solutions.</li> </ul> <p><b>Solution option deep-dive</b></p> <ul style="list-style-type: none"> <li>➤ Formalise solutions into financing and funding options.</li> <li>➤ Outline design choices/Phase 1b considerations.</li> </ul> <p><b>Option prioritisation</b></p> <ul style="list-style-type: none"> <li>➤ Recommend option prioritisation for Phase 1b.</li> </ul>	<p><b>Evaluation criteria development</b></p> <ul style="list-style-type: none"> <li>➤ Establish option evaluation criteria alongside steering committee (and other stakeholders as required).</li> </ul> <p><b>Option assessment process</b></p> <ul style="list-style-type: none"> <li>➤ Undertake further research/interviews as required to access each option.</li> <li>➤ Establish data availability and requirements to support option modelling.</li> <li>➤ Undertake coastal loss modelling to evaluate costs and option viability in the short and long term.</li> </ul> <p><b>Option feasibility evaluation</b></p> <ul style="list-style-type: none"> <li>➤ Evaluate each option using pre-defined criteria.</li> <li>➤ Outline recommendations for progressing most feasible option(s).</li> </ul>	<p><i>Possible follow-on projects to e.g. test option(s), expand cost-benefit assessments and identify potential implementation options.</i></p>
Outputs	<ul style="list-style-type: none"> <li>✓ Comprehensive overview of available literature, reports and expert opinions.</li> <li>✓ Overview of options to explore in more detail within Phase 1b work.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Evaluate option feasibility.</li> <li>✓ Identify recommendations to inform which option(s) could be taken forward.</li> </ul>	

Given the phased nature of this project, we recommend that the Phase 1a and Phase 1b reports and recommendations should be read and deployed together to inform next steps activities for Phase 2 Testing.

# Methodology

We followed a three-step methodology to deliver this project, consisting of; 1) evaluation criteria development, 2) option assessment process, and 3) an option feasibility evaluation.

The methodology for this project was designed and developed by a project steering committee consisting of stakeholders from Marsh, Coastal Partnership East (CPE), Lewes District Council (LDC), North Norfolk District Council (NNDC), the Local Government Association Coastal Special Interest Group as well as stakeholders from the Department for Environment, Food and Rural Affairs (DEFRA), Scottish Government (SG), Welsh Local Government Association (WLGA) and the Environment Agency (EA). The approach was developed and agreed by this committee, with outputs and deliverables reviewed regularly and signed off at each stage. A technical review committee was also established to promote discussion and allow for greater stakeholder participation across project outputs. Final decisions were discussed and agreed through the steering committee.

Figure 2 describes each of the three project stages and its constituent components where applicable. The methodology for each stage is outlined in detail in the below sections.

## 02| Project workflow overview.

Stage	Component(s)	Description
<b>3.1. Evaluation Criteria Development</b>	n/a	Development of the option evaluation framework to assess each option equally and transparently to highlight relative benefits and downsides of each.
<b>3.2. Option Assessment Process</b>	3.2.1 Interviews	Undertake targeted interviews for each option to assist with the completion of evaluation criteria and coastal loss model requirements.
	3.2.2 Data Requirements	Establish input data requirements for CLIFF coastal loss financial modelling and evaluate data accessibility/availability.
	3.2.3 Coastal Loss Modelling	Using publicly available coastal erosion and coastal flood inundation loss data, design a financial model to assess the economic viability and cost-benefit of each option and inform the evaluation criteria.
<b>3.3. Option Feasibility Evaluation</b>	3.3.1 Evaluation Assessment	Write-up and review each option against the agreed evaluation criteria.
	3.3.2 Operating Model Design	Based on the evaluation assessment, produce an indicative target operating model of how the best-performing option(s) could be structured to deliver a solution.

### 3.1. Evaluation criteria development

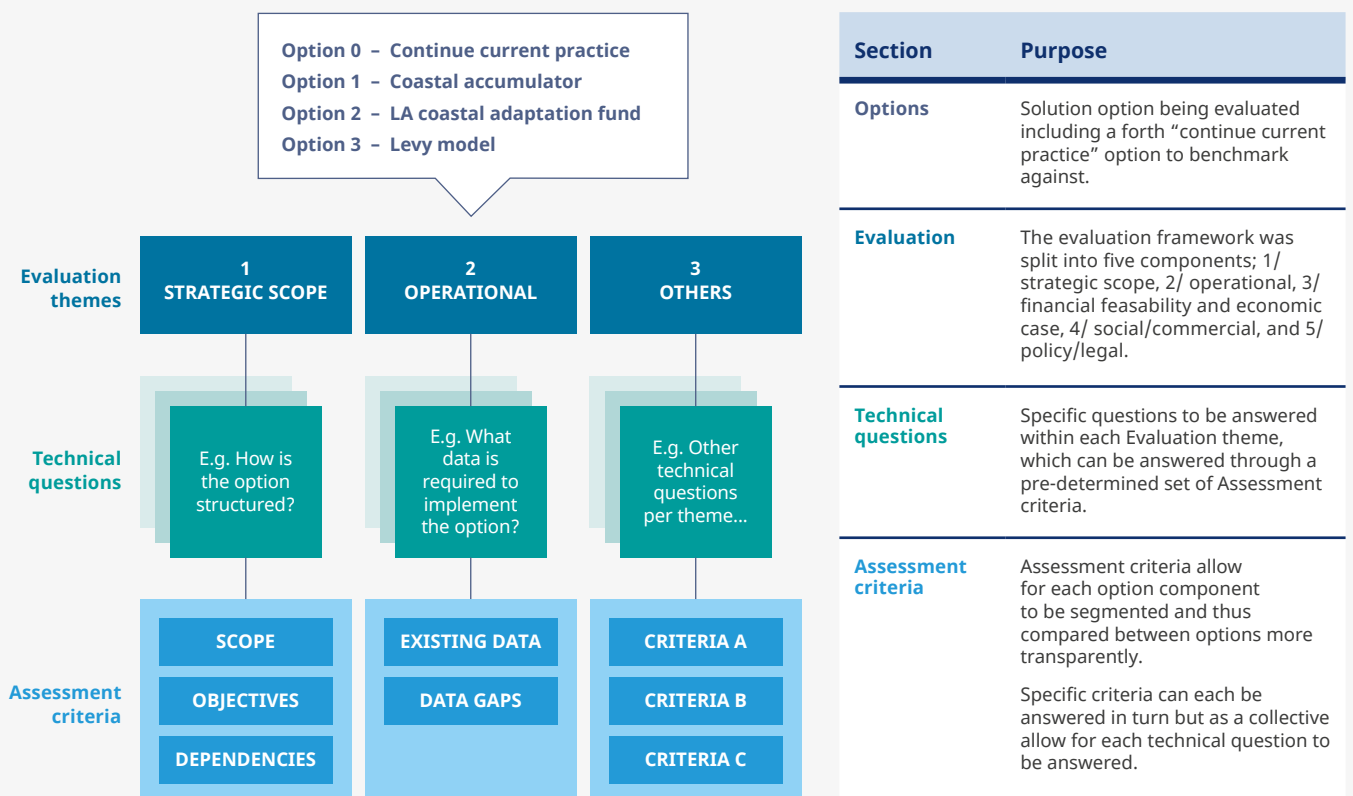
This project sought to design a method for evaluating Option 1, Option 2 and Option 3 fairly and transparently to highlight relative benefits and downsides of each. Following guidance from the Steering Committee, a fourth “continue current practice” option was also assessed within the evaluation framework to act as a benchmark from which the relative cost-benefit and value-for-money of each option could then be assessed. Notably, the evaluation criteria were designed to allow:

- An inclusive multi-factor approach to be adopted with no stated priority, spanning a full range of strategic, economic and socio-political themes.
- For independent comparison between each option that ensured differences between options could be assessed and evaluated without bias.
- The evaluation criteria to be structured to assess each option’s constituent components, to explore the possibility of a blend of options being identified as the most suitable approach to address the problem.

The schematic in Figure 3 provides an overview of the evaluation framework, which has 5-key themes:

- 1. Strategic Scope** – Outlines the rationale of why the option is required, its primary objectives and defines the outcomes it intends to achieve.
- 2. Operational** – Assessment of the deliverability of each option to ensure they can be implemented successfully in accordance with industry best practice.
- 3. Financial Feasibility and Economic Case** – Economic appraisal to establish critical success factors for each option and establish an overview of the costs / benefits associated with each.
- 4. Social/Commercial** – Examines how each option will contribute social and commercial value to individual households and across communities.
- 5. Policy/Legal** – Evaluation of current policy and legal framework to establish fit, existing gaps and critical success factors required to deliver each option.

### 03| Evaluation criteria framework.





Each Evaluation Theme was designed around a set of Technical Questions. Answers to these questions were completed by the project team following a series of structured Assessment criteria which allowed for each Technical Question to be answered systematically and transparently, per the Steering Committee requirements. The full Evaluation Framework is outlined in Appendix A.

## 3.2. Option assessment process

To obtain the information required to complete the Option Evaluation Criteria, information was gathered through a structured process comprising 1) Interviews, 2) Data Availability and Requirements assessment, and 3) Coastal Loss Modelling. Each of these are detailed below.

### 3.2.1. Interviews

Interviews were initially selected by Marsh and the technical review committee and agreed in consultation with the project steering committee. To build on the expert interviews selected in the CLIFF Phase 1a (2022) report, experts were selected from a range of industries, including financial services, Government and non-governmental organisation's (NGO's). Interviews were chosen to enable thorough completion of the evaluation framework for each of the options being appraised. The full list of expert interviews conducted is outlined in Figure 4.

Each interview was conducted through a structured format, with questions aimed at targeting specific areas of the evaluation framework and to support parameterisation of the CLIFF Coastal Loss Model. For example, the interview with the Ministry for Housing, Communities and Local Government (2021) asked specific questions to evaluate policy and legal considerations in relation to different funding mechanisms. Prior to each interview, a two-page problem statement was provided to all interviewees, giving an overview of the project, its aims and objectives (see CLIFF Phase 1a, 2022). Members of the Steering Committee were involved in each interview.



## 04| List of expert interviews conducted.

Company	Sector	Specialism	Interviewee Role
<b>Ministry of Housing, Communities and Local Government</b>	Government	Housing Policy	Local Government Finance Directorate
<b>Scottish Government</b>	Government	Flood and Coast Innovation Team	Flood Risk Mgmt. & Coastal Erosion, Policy Development
			Chief Managing Officer, Moray Council
			Senior Engineer, Flood Risk Mgmt. & Coastal Environment
			Head of Infrastructure, Highland Council
<b>Welsh Local Government Association</b>	Government	Flood and Coast Innovation Team	Head of Flood and Incident Risk Management, Natural Resources Wales
			Head of Internal Consultancy, Gwynedd
			Strategic Planning and Investment Manager for Flood Risk, Natural Resources Wales
<b>Environment Agency</b>	Government	Innovative and Green Financing	Senior Advisor, FCERM
			National Flood and Coastal Risk Manager
			Principal Advisor, Coastal Flood & Erosion Risk Management
<b>DEFRA</b>	Government	Flood and Coast Innovation	Senior Policy Advisor
			Team Leader, Flood and Coastal Innovation Team
			Head of Water and Floods Integration
<b>Municipal Bonds Agency</b>	Government	Local Authority Bonds	Director at PFM, managed service provider to the Municipal Bonds Agency
<b>Association of British Insurers</b>	Finance (Trade Association)	General Insurance Division	Manager, General Insurance Policy Team
			Manager, Climate Change
<b>Green Finance Institute</b>	Finance	Sustainable Finance Initiatives	Director, Building and Infrastructure Stream
<b>Legal and General</b>	Finance (Insurance/Pensions)	Pensions / Capital Structuring	Group Capital Actuary
			Structuring Analyst, L&G Retirement
			Head of Retirement and Lending Structuring and Lifetime Mortgage Funding
			Investment Manager, L&G Capital
<b>Nationwide</b>	Finance (Banking)	Mortgage Team	Head of property risk and climate change strategy
			Property Risk Manager
			Risk Analyst Lead, Property Risk
<b>FloodRe</b>	Finance ((Re) Insurance)	Insurance Pools	Head of Transition
			General Counsel

### 3.2.2. Data availability and requirements

In order to meet the second objective of this project, we undertook a systematic review of publicly available data to support the development of the Coastal Loss Model. Principally, the review revolved around identifying suitable data on the number of residential properties at risk of coastal erosion and permanent flood inundation from sea level rise over the next 100 years, and information on the possible timing of potential losses. Additional data reviews were undertaken during the design and construction of the Coastal Loss Model as supplementary data requirements were identified. For example, the model required information on residential property prices by region thus requiring data reviews to identify the most suitable publicly available databases holding this information. For each data component identified, a review of its benefits, downsides, data gaps and model assumptions was outlined. Where applicable, recommendations for data improvements / enhancements are outlined where it may support any potential future coastal loss modelling or option implementation decisions.

### 3.2.3. Coastal loss modelling

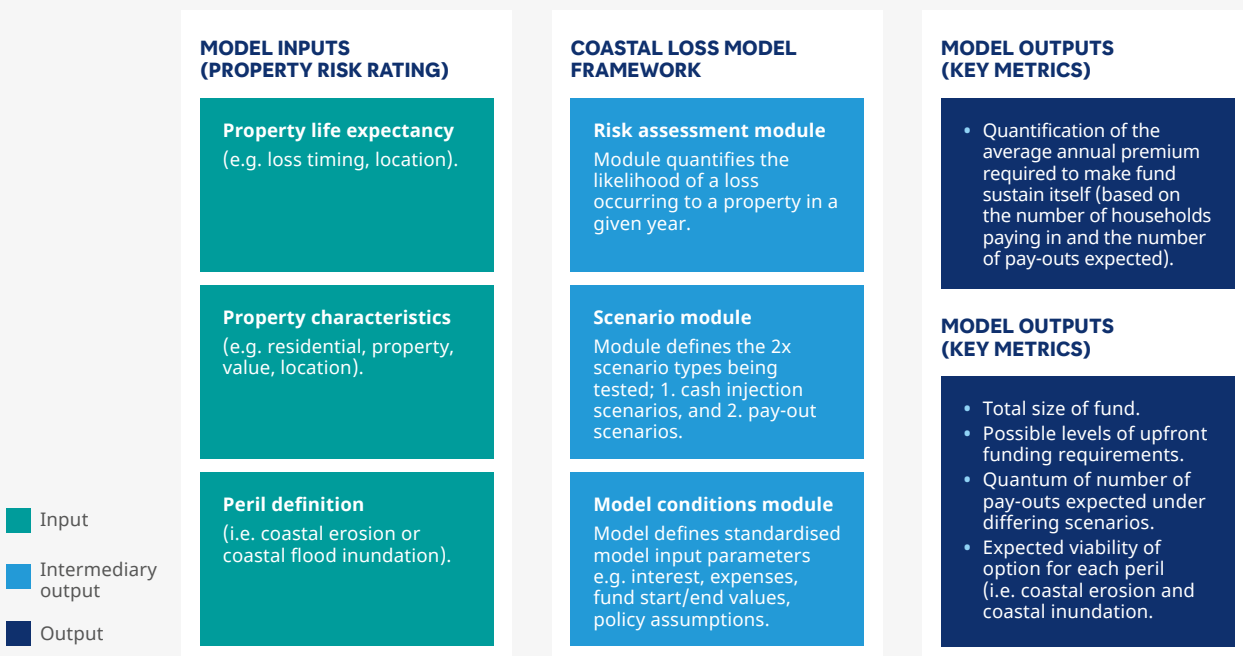
The design and deployment of the CLIFF Coastal Loss Model was a core component of Phase 1b feasibility assessment activities, as it provided a means of quantifying and comparing each financing option’s operational and financial robustness. Erosion and permanent coastal flood inundation are noted as distinct coastal perils affecting different geographies through different damage mechanisms. As such, two separate models were developed to support methodologically aligned, but independent option assessment.

In terms of functionality, model development was undertaken with the specific goal of being able to:

1. **Assess the likelihood of a loss** given a properties coastal risk rating.
2. **Consider the number of households** required to pay in vs. the number of households receiving a pay-out.
3. **Quantify the average annual premium or contribution** required to make the option viable (based on the number of households paying in).
4. **Quantify the average amount a fund could pay-out to each beneficiary** based on the number of households predicted to be at risk of coastal erosion/coastal inundation).

From Figure 5, the CLIFF Coastal Loss Model comprises three components; model inputs (via a property risk rating), coastal loss model framework and model outputs (comprising key metrics to support the principal objectives).

## 05| Overview of the CLIFF coastal loss model.





Due to data availability limitations, it is noted in this report we run coastal erosion and flood inundation models based on data for England only. We highlight that model outputs should be treated as a 'first' iteration and once better data is available, expanded across Wales, Scotland and Northern Ireland.

### 3.2.3.1 Model inputs (property risk rating)

Model inputs relate to specific data components which define the property's overall risk rating to either coastal erosion or coastal flood inundation. Each household is assigned a property risk rating based on three components:

1. **Property life expectancy** – The expected length of time left until the property may be lost to coastal erosion/inundation. This data informs the number of at risk households that may require a future pay-out from a given option being tested.
2. **Property characteristics** – Principally relating to the property value and its location. This data defines how much a potential option may be required to pay-out in a given model scenario and where those properties are located geographically (region / local authority).
3. **Peril definitions** – To determine if a property was included within either the coastal erosion and/or the coastal flood inundation model.

### 3.2.3.2 Coastal loss model framework

The Coastal Loss Model Framework is comprised of three core components which work together to generate the required output metrics. Each component serves a unique function, described below.

#### Risk Assessment Module

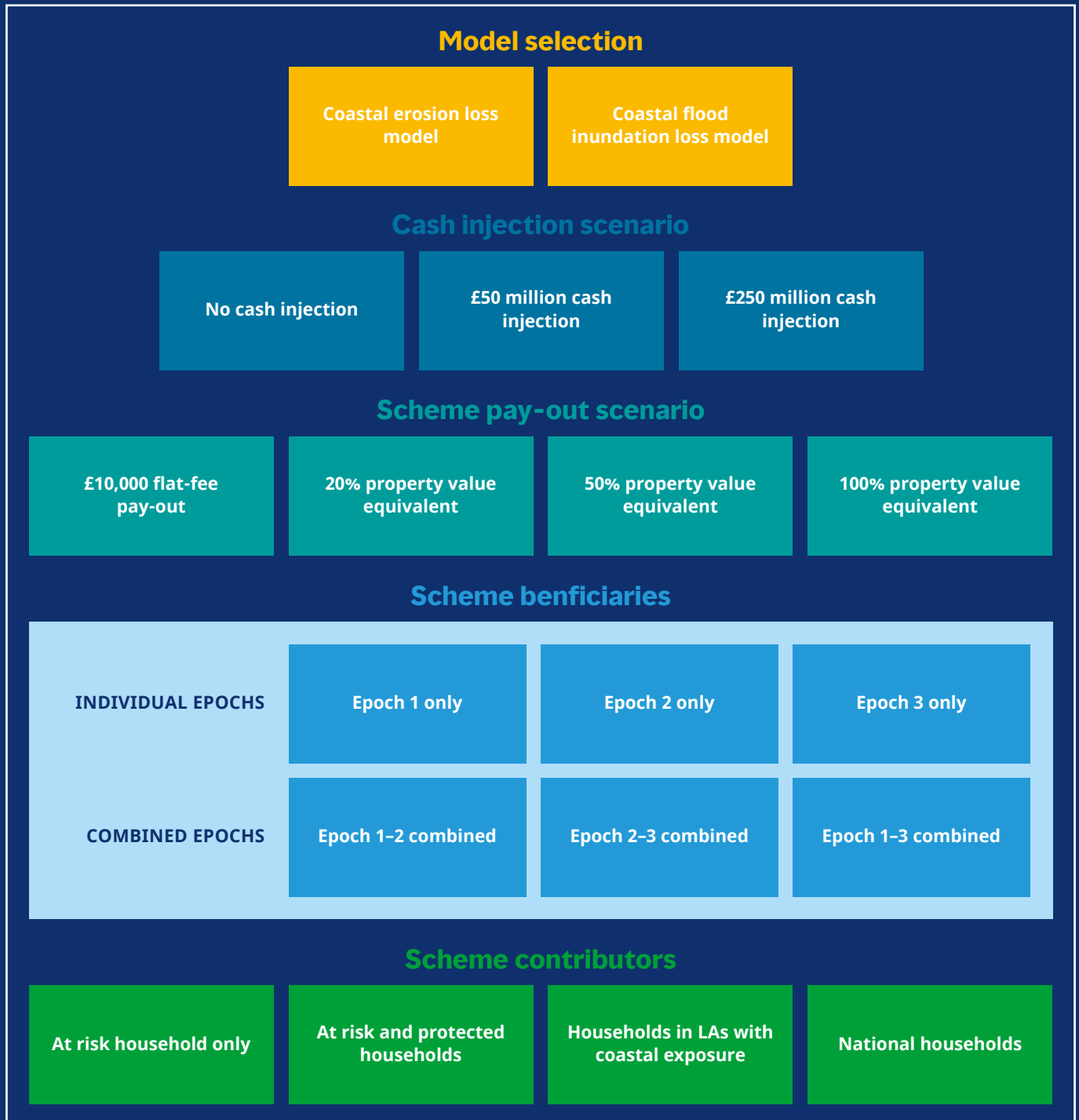
This module brings together the property risk rating inputs to quantify the likelihood of a given property being 'lost' to coastal erosion / coastal flood inundation in a given year. Property-level loss likelihoods were aggregated to quantify the overall number of expected property losses in each year. To maintain consistency with Shoreline Management Plans, we have categorised the overall number of expected losses in each year into three space-time epochs, defined as 0 to 20 years (Epoch 1), 20 to 50 years (Epoch 2) and 50 to 100 years (Epoch 3) from present.

#### Scenario Module

The scenario module was constructed to test how changing various model parameters altered both the annual premium/contribution requirements and the average amount a fund could pay-out to beneficiaries. The scenario conditions tested followed a sequenced logic to test each parameter in turn; conditions are summarised in Figure 6 overleaf.



06| Overview of Scenario Module construction, key conditions tested and outputs recorded.



For each run within the scenario module, the model records...



Overall, the scenario module tested five core conditions. A full description is outlined below of the five scenario module conditions tested.

1. **Model selection** – Defines which Coastal Loss Model is being run, such as Coastal Erosion and Coastal Flood Inundation.
2. **Cash injection scenario** – Defines whether the model begins with an upfront cash injection, informing whether upfront capital makes a potential fund more viable. Based on the interview with the Municipal Bonds Agency (2021) we test three possible scenarios; a) no cash injection, b) a £50 million cash injection, and c) a £250 million cash injection. As detailed in the Model Conditions Module (see below), the model assumes certain start and end conditions based on the type of cash injection scenario run. Cash injections are included to quantify the potential benefits of upfront funding, such as allowing for early availability of capital, greater fund growth through interest and also establish whether scheme costs could be lowered across households contributing.
3. **Scheme pay-out scenario** – Defines the pay-out amount to be provided for each property loss. Four pay-out targets were tested:
  - **10,000** representing an amount similar to the Coastal Erosion Assistance Grant to cover costs of site clearance and demolition post-loss.
  - **20%, 50% and 100%** of property value equivalent based on the average regional property value for England per the UK House Price Index in May 2021 (HM Land Registry, 2021).
4. **Scheme beneficiaries** – Defines the group of properties receiving a pay-out under a given scenario. Per the Risk Assessment module, the model identifies beneficiaries as any property at risk within a given Epoch (1 to 3). It is noted that the model only includes beneficiaries as properties at risk within Epochs 1 to 3 (properties outside Epoch 3 which may become at risk in the distant future, are not included here). The model has the ability to test two Epoch groups:
  - **Individual Epochs** – Beneficiaries in each Epoch are treated in isolation to understand implications on annual premium contributions and pay-outs.
  - **Combined Epochs** – Beneficiaries across multiple Epochs are tested. Where Epochs are combined (i.e. Epoch 1-2, Epoch 2-3 and Epoch 1-3), the model incorporates a cross-subsidisation mechanism which allows for properties paying in to subsidise the cost of the households at immediate risk.
5. **Scheme contributors** – Defines the number of properties paying into the scheme. The model tests a range of options from individual properties through to a national-level scheme. Principally we test four main groups (full data descriptions outlined in Data Availability and Requirements results in **section 4.2**):
  - **At risk households only** – Any property at risk of coastal erosion or coastal flood inundation contributes based on Shoreline Management Plan (SMP) data, segmented by each Epoch. Used to test Option 0 (Continue Current Practice) and Option 1 (Coastal Accumulator Fund).
  - **At risk and protected households** – Any property at risk and any property which benefits from coastal erosion / flood protection contributes based on SMP and NAI (No Active Intervention) data, segmented by each Epoch. Used to test Option 1 (Coastal Accumulator Fund) and Option 2 (Local Authority Coastal Adaptation Fund). Note, due to NAI data limitations for coastal flood inundation, this scenario was not tested in the Coastal Flood Inundation Loss Model.
  - **Households in Local Authorities with coastal exposure** – Any property within a Local Authority that has coastal exposure to either coastal erosion and/or coastal flood inundation contributes (number of LA's differs based on Coastal Loss Model being run. Used to test Option 2 (LA Coastal Adaptation Fund) and Option 3 (Levy Model).
  - **National households** – Every household across England contributes. Used to test Option 3 (Levy model).



### Model Conditions Module

The model conditions module refers to control variables which are kept constant throughout all scenario runs. These are specific conditions governing how the fund is managed, model start / end values and any long-term coastal policy assumptions.

- 1. Fund management conditions** – Covering both fund interest and management expenses / fees. Interest and expenses fees are applicable here as all three options being tested assume a centralised fund manager function is used to manage the pool of payments into and out of the scheme. It is assumed this central fund would be invested to grow over time, with the fund manager likely taking a small percentage as fund management fees. In this model, interest is set at 1% and fund expenses / fees are set at 0.85%, both applied to the total fund value at the end of each modelled year (agreed by project Steering Committee).
- 2. Start / end values** – The model assumes certain start and end conditions based on the type of cash injection scenario run, informing the potential benefits of additional cash injections into the fund at the start of the fund period. For scenarios with a £0 cash injection, the fund was run to start and end at £0, i.e. payments into the fund balance pay-outs and management fees. Funds with a cash injection of £50 million or £250 million, were set to end with double the input amount, for example a £50m fund start value would be set to end with a £100 million fund value. This is based on guidance provided during the Municipal Bonds Agency (2021) interview that highlighted any cash injection is likely to be a loaned amount (for instance as a bond, or government loan). Therefore, by ending the fund with double the cash injection value, it provides an allowance for the loan to be repaid at the end of the funds term, whilst also allowing for a fund base to remain for any future fund period.
- 3. Policy assumptions** – Further to these control variables, it is assumed that all current coastal risk management policy is maintained throughout the modelled time periods. We note this as a model limitation to be improved and refined in future iterations, particularly as projected increases in sea level rise and coastal erosion rates will likely cause some coastal community defences to become unviable in the future (Committee on Climate Change, 2018), thus meaning more properties will need to be included within the scheme long-term.

#### 3.2.3.3 Model outputs (key metrics)

Each model run produces 4x key outputs (Figure 6). The principal output from each model scenario run is the average annual premium or contribution required to make the fund sustain itself (such as fund start and end points balance based on the number of households paying in and the number of pay-outs expected). Notably, the proportionality of premiums / contributions is an important consideration, discussed in greater depth as part of the evaluation in Section 5. Currently, the model assumes all payments into and out of the fund are equal across each geography, local authority and household circumstance. However, the exact payment configuration could be adjusted by for instance a Local Authorities risk profile (for example those with more erodible coast and properties at risk pay more) or by property value (for example higher value properties pay-in more than lower value properties).

In addition to the premium, each model run also records the total cumulative pay-out for the scheme, the number of properties contributing and the number of properties receiving benefit.

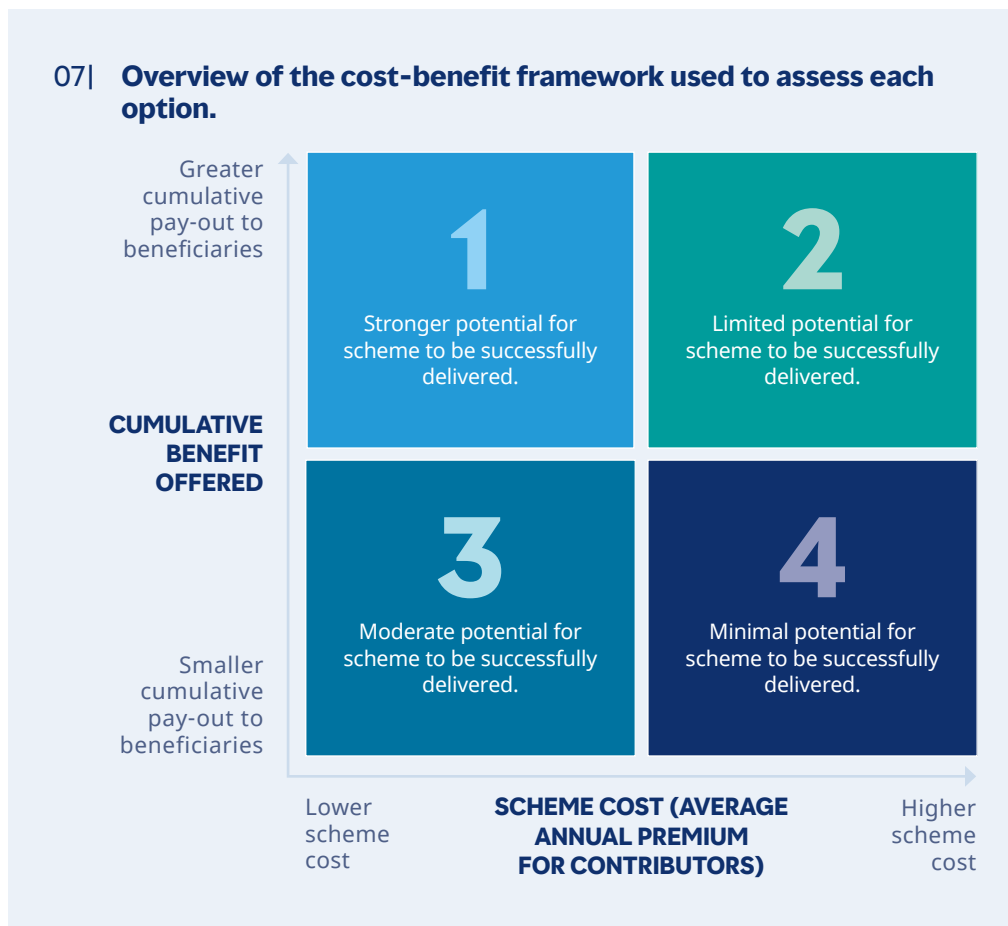


### 3.3. Option feasibility evaluation

#### 3.3.1. Evaluation assessment

Once the interviews, data availability and requirements review and coastal loss modelling was completed, each option including the “continue current practice (Option 0)” was evaluated using the evaluation criteria developed (see Section 3.1). Each option assessment was supported by evidence gathered from the interviews, the model output results and additional research papers and case studies where applicable.

Following this, the indicative cost-benefit of each option was assessed quantitatively against each the framework outlined in Figure 7. Options were rated against two parameters; 1) cost – the average annual premium / contribution required to implement and operate the scheme, and 2) benefit – the value delivered through the scheme relative to its costs, based on the total cumulative pay-out offered to beneficiaries. The objective of this evaluation was to identify those options that delivered both the greatest benefit to households paying into the scheme for the lowest cost.





Evaluation of the cost-benefit offered by a particular option also considered potential appetite amongst contributors for paying into a scheme. Based on a feedback gathered during interviews, each option was categorised as follows:

- 1. Stronger potential for scheme to be delivered** – Low scheme cost coupled with a higher cumulative pay-out to beneficiaries were key requirements in order for an option to be considered both cost effective and beneficial to those contributing.
- 2. Moderate potential for scheme to be delivered** – Where scheme cost is minimised yet cumulative benefit is small, an option is considered moderately viable.
- 3. Limited potential for scheme to be delivered** – Based on interview feedback, annual scheme cost was a critical enabler for CLIFF options to succeed. Therefore, schemes delivering greater benefit yet require higher scheme costs to implement are only deemed to have limited potential to be successfully delivered.
- 4. Minimal potential for scheme to be delivered** – Options with both high scheme costs and lower cumulative pay-out benefit were identified as having negligible viability.

Notably, this is a financially focused view of stakeholder appetite as a first-order assessment for whether a given option could be easier / harder to deliver, implement and be accepted amongst coastally exposed communities. Robust testing amongst households and communities to understand acceptability / willingness to participate should follow as part of Phase 2 Testing. Also, where an option is challenging / costly to deliver, there may still merit in pursuing it where there is significant benefit.

### 3.3.3. Operating model design

Following the evaluation of every option, a potential target operating model is outlined. This operating model reflects a blend of components which together deliver the greatest cost-benefit and operational viability. The model aligns all elements assessed within the evaluation criteria, focussing on key operational decisions, option structure and strategic objectives to outline the most viable option(s) to take forward. The structure and information requirements of the option may be further optimised following additional feedback and data gathering in future project phases.



# Option assessment results

This section provides a synthesis of the results and findings from the option assessment process examining outputs from the interviews, data availability and requirements assessment and coastal loss modelling in turn.

## 4.1. Interview synthesis and results

11 interviews were conducted with over 25 individuals from organisations across Government and the private sector, each targeting different areas of the option evaluation assessment criteria. Overall, interviews highlighted significant appetite for an innovative, financial scheme to support properties at risk of coastal erosion and coastal flood inundation. A full description of interview results is presentation in Appendix A.

### Key themes and discussion points

Generally, interviewees highlighted a strong need for more robust, long-term and nationally joined-up coastal risk management solutions that focussed on adaptation and financial resilience. Interviews with Defra (2021), Scottish Government (2021) and Welsh LGA (2021) all individually emphasised that no solution was currently in place that met all these requirements. As noted by the Environment Agency (2021), current coastal risk management toolkits are often focussed on short-term planning and infrastructure schemes, rather than developing finance-based, national-level programmes that can support properties that may not traditionally be applicable for coastal defence projects. This was a recurring theme highlighted across several interviews, where many noted that the approaches offered by the Local Authority Coastal Adaptation Fund (Option 2) and the Levy Model (Option 3) were potentially more advantageous and likely to succeed due to their larger-scale, joined-up structures.

However, discussions with the Welsh Local Government Association (Welsh LGA, 2021) and Coastal Partnership East (2021) stressed that for any option to succeed, it required stronger communication and broader acceptance amongst the households it was aiming to support. Some interviewees noted specific local examples where residents in at risk coastal areas remained strongly in support of coastal defences despite potential adaptation, relocation or financial resilience options being offered as an alternative option to prevent or reduce the impacts of future coastal losses.

Consequently, it is clear that for any option to succeed, Local Authorities, environmental protection / regulation agencies (for example Environment Agency, or Scottish Environment Protection Agency) and national Government across the UK need to be in the driving seat in order to promote awareness and better communicate the benefits of any new innovative financial schemes; although at present there is no requirement for Local Authorities to take this role (Coastal Partnership East, 2021). An interview with the Ministry of Housing, Communities and Local Government (MHCLG, 2021) further supported this, where it was noted that any national, joined-up scheme would most likely require both central Government / Parliamentary support and cross-council / Local Authority buy-in, to implement, communicate and deliver any future financing scheme.

When discussing each option with various private sector and financial services organisations, interviewees focussed more strongly on option scope, operational benefits and potential financial cost implications. For example, interviews with Legal and General (2021) and the Association of British Insurers (2021) noted that where schemes focussed on insurance-based principles, e.g. Coastal Accumulator Fund (Option 1) or elements of the Levy Model (Option 3), the scheme could be challenging to deliver / obtain private sector support where it acted as 'compensation for loss'.

It was noted in the Environment Agency (2021) and Scottish Government (2021) interviews that this could potentially be avoided where financial pay-outs from options supported the specific needs of different communities and households, for example, through adaptation projects, relocation or new defence infrastructure. This emphasised that options needed to ideally offer greater autonomy to those delivering and administering each option (such as Local Authorities), in order to promote greater support amongst private sector industries, thus indicating the LA Coastal Adaptation Fund (Option 2) may have greater operational viability.

Furthermore, interviews with the Municipal Bonds Agency (2021) and the Green Finance Institute (2021) highlighted that if Local Authority / Local Government bodies administered and delivered a potential new scheme, it could offer greater operational benefits, particularly with regards to any upfront cash injections needed and in relation to how funds could be collected and distributed. The Municipal Bonds Agency (2021) specifically noted that Local Authorities may be able to 'join together' to secure a potential combination of central government funding, bonds, loans and/or private sector investment as seed funding into a scheme (particularly to support options 2 and 3). Similarly, the Green Finance Institute (2021), Environment Agency (2021) and FloodRe (2021) interviews also noted that depending on how the schemes were operated (for example privately or by local government bodies), existing frameworks, policies and practices already in operation could be leveraged to collect fund contributions and administer pay-outs (for example through council taxation processes, Regional Flood and Coastal Committee levies or national general taxation mechanisms).

Moreover, depending on the type of pay-out benefit received from each option, some interviews also indicated that funds could be used to financially support mortgage liabilities in certain circumstances, potentially offsetting property blight from a lender perspective (Nationwide, 2021). Similarly, funds could also offer wider community-level benefits, including gentrification programmes, commercial opportunities, alternative adaptation/relocation schemes for settlements etc. (Defra, 2021; Scottish Government, 2021; Welsh LGA, 2021).

Finally, it was noted in the interview with FloodRe (2021) that under current legislation, coastal flood inundation events are included within the FloodRe scheme, whereas coastal erosion losses are not. This potentially has implications on the number of properties who could contribute to a new CLIFF scheme as only erosion is an immediate priority in the short-term, until FloodRe terminates in 2039 and, where subsequently, coastal flood inundation may need to be reconsidered within a financing scheme.

### **Option summary**

An overview of the positives and negatives discussed through each interview for Options 1, 2 and 3 is summarised in Figure 8. Overall, all interviewees were generally in support of new innovative funding and financing options which offered an alternative, more sustainable opportunity for coastal risk management in comparison to 'Continuing Current Practice' (Option 0).



08| Overview of interview results for each option.

	Option 1: Coastal Accumulator Fund	Option 2: Local Authority Coastal Adaptation Fund	Option 3: Levy Model
<b>Option Summary Recap</b>	Households pay into a fund tied to their property. Fund payments are managed by a central entity, which allows the fund to grow. At a pre-determined point (e.g. once a property is uninhabitable), funds are released directly to the homeowner.	Local Authorities collect funds from properties at risk via an agreed mechanism (e.g. council tax). Funds are managed to promote growth. When agreed conditions are met, funds are released to the LA to support coastally exposed households and communities with e.g. protection, adaptation, property-level resilience etc.	Funds collected via levy mechanism (e.g. general tax) for given population (e.g. national, specific LA's etc.). Raised funds are managed and pay-out to an agreed entity once a pre-defined condition is met e.g. coastal property is lost.
<b>Positives</b>	<ul style="list-style-type: none"> <li>Residents able to take on cost and not rely on Local Authorities.</li> <li>Principles of life assurance concept potentially make it an attractive investment for private sector finance.</li> <li>Principal of large-numbers to build a viable fund.</li> <li>Premium-based subscriptions could be set on individual households property risk profiles (i.e. risk based pricing).</li> </ul>	<ul style="list-style-type: none"> <li>LA's have greater control over payments into and out of scheme.</li> <li>Pay-outs could be determined by each LA based on needs/ local initiatives (e.g. house purchase, social housing, rollback, community-level benefits).</li> <li>Could leverage existing policy mechanisms to obtain funds.</li> <li>Flexibility to adjust scheme contributions so e.g. wealthier households pay more.</li> <li>Could support households across all Epoch's, with pay-outs differentiated across individual risk circumstances.</li> <li>Local Authorities can leverage borrowing powers.</li> <li>Could promote joined-up, UK schemes.</li> </ul>	<ul style="list-style-type: none"> <li>Principle of levying wider population to generate numbers.</li> <li>Could leverages existing policy mechanisms to obtain funds.</li> <li>Large pool of households paying into scheme likely makes individual contributions small / insignificant.</li> <li>May be able to promote private sector investment.</li> <li>Over time, could be widened to include more perils (e.g. coastal flood inundation after FloodRe ends in 2039).</li> <li>Potentially provides scope for greater participation within the scheme, e.g. at a UK-wide level.</li> </ul>
<b>Negatives</b>	<ul style="list-style-type: none"> <li>Difficult to mandate/incentivise residents to join scheme.</li> <li>May require changes to existing policy or new policy to run.</li> <li>May not have enough numbers to keep payments low (i.e. financial viability).</li> <li>Likely requires independent fund manager.</li> <li>Properties at risk in short term may not be applicable.</li> <li>Households responsible for own contributions i.e. if payments are stopped the schemes viability could be impacted.</li> </ul>	<ul style="list-style-type: none"> <li>Relies on LA's grouping together to build large pool.</li> <li>Central government may need to mandate and support LA action to get national sign-up.</li> <li>Large, upfront cash injection could be challenging to obtain.</li> <li>Likely requires independent fund manager.</li> </ul>	<ul style="list-style-type: none"> <li>FloodRe style scheme likely challenging depending on how pay-outs are used.</li> <li>Insurer-led collection of premiums could be challenging.</li> <li>Hard to levy a national population when only small subset are at risk of coastal losses.</li> <li>Likely requires independent fund manager.</li> <li>Potentially difficult to only collect funds from subset of population (could be mitigated by leveraging a taxation mechanism).</li> </ul>

## APPLICABLE CASE STUDIES

Throughout interviews, several case studies were noted which provided possible precedent for the implementation of certain financing mechanisms. The box below outlines five case studies which support several mechanisms proposed across Options 1, 2 and 3.

# 1

### Somerset rivers authority

Launched in January 2015 as a response to the floods of winter 2013-14, the Somerset Rivers Authority provides Somerset with additional funding to support greater river flood protection and resilience, beyond the activities of other Flood Risk Management Authorities. Initially, interim funding was provided by Defra and local councils to initiate the programme (~£2.7 million). To maintain this annual budget, the Ministry for Housing, Communities and Local Government gave powers to Somerset County Council and local district councils to raise a shadow precept of 1.25% of council tax. Each year since, shadow precepting has continued to raise ~£2.7 million annually.

Linkages to CLIFF – although the Somerset Rivers Authority specifically excludes coastal flooding, the concept of raising a shadow precept through council tax gives strong precedent as a method to raise annual funds that can be allocated to a specific programme. This most strongly applies to Option 2 (Local Authority Coastal Adaptation Fund), where local district councils / county councils could raise similar precepts in order to generate additional capital.

# 2

### Warwickshire county council climate emergency fund

In 2019, Warwickshire District Council declared a Climate Emergency. In February 2020, they subsequently developed a proposal to launch a 'Climate Emergency Action Programme' which specifically targeted raising a 'ring-fenced' Climate Action Fund to support local preparations for future climate disasters such as flooding. The proposal aimed to generate an additional £3 million annual funding through raising Council Tax by £57 per annum for Band D properties (ranges from £38 p/a in Band A to £114 p/a in Band H with additional reductions for low income households). This proposal was agreed unanimously by all group leaders of all political parties in Warwick District Council and was to be put to a referendum in May 2020 to ratify the council tax rise. However, due to COVID, the referendum was not held and thus has not yet been launched.

Linkages to CLIFF – this case study offers precedent for applying significant increases in council taxation specifically to generate 'ring-fenced' funds with a specific objective. Importantly, it also highlights that a progressive increase in council tax can be applied differentially across tax bands allowing for wealthier households to contribute more. This mechanism directly relates to Option 2 and to some extent Option 3 where levies through taxation can be used to generate required ring-fenced capital.

# 3

### Olympic precept for council tax

Between 2006 and 2017, the Greater London Authority (GLA) raised a £20 Band D council tax precept as its contribution towards the costs of the Olympic and Paralympic Games. This precept was specifically raised from all 32 of London's Boroughs, who together contributed a total of £625 million to the GLA. In order to centrally coordinate funds, the Olympic Delivery Authority was set up to act as a non-departmental public body of the Department for Culture, media and Sport, responsible for delivering the Olympic Games.

Linkages to CLIFF – the Olympic precept for council tax highlights several principles that relate to CLIFF. Firstly, the unique concept behind this scheme was that fund contributions were only made across London Boroughs, who each raised the same, uniform precept on council tax. For the Local Authority Coastal Adaptation Fund (Option 2), the concept of raising funds systematically between individual councils is noted as a possible contribution mechanism, and this case study gives precedent for where this has been successfully implemented. Moreover, a specific non-departmental public body, the Olympic Delivery Authority, was set up to manage contributions from the precept. A similar, central management entity is a proposed requirement across all three CLIFF options, highlighting that a specific body could be set-up to coordinate and manage a potential innovative financing scheme.

## 4

**American tobacco master settlement agreement and tobacco bonds**

In 1998, a national settlement across all 52 US states was made with the four largest tobacco companies under a 'Master Settlement Agreement' to settle dozens of lawsuits brought to recover health care related costs associated with smoking. Out of this agreement, Tobacco Bonds were subsequently issued by US states to obtain immediate cash back up with a won lawsuit against a tobacco company. These bonds share a revenue stream from the Master Settlement Agreement where tobacco companies agreed to make annual payments to these states in perpetuity to pay off outstanding health care cost liabilities. These bonds typically last ~30 years, pay interest annually and have encouraged widespread private sector investment.

Linkages to CLIFF – one of the key scenarios being tested in this report is whether upfront cash injections into a scheme offers greater financial benefit, particularly in relation to Option 2. Although based in the USA, this case study highlights a potential mechanism for Local Authorities in the UK to obtain upfront funding via bonds, issued to tackle short-term coastal losses. The upfront capital issued through the bond would give Local Authorities additional funds to tackle properties at most imminent risk, whilst payments into the CLIFF scheme would then support properties likely to be at risk in the longer term. Contributions into the CLIFF scheme (for example via regular council tax contributions) could also be used to 'secure' the repayment of the initial bond.

## 5

**California “forest resilience bond”**

The Forest Resilience Bond (FRB) is a recent financing mechanism launched by Blue Forest Conservation and the World Resources Institute to tackle forest losses caused by wildfires in California. For one project, 'The Yuba Project', the FRB operated by initially raising ~\$4 million in capital from private investment to fund the initial costs of forest restoration (for instance replanting lost trees). Upfront capital investments are repaid by the US Forest Service and State of California over a period of several years. Through multiple 'projects', the FRB aims to generate >\$100 million in capital to support similar projects.

Linkages to CLIFF – this case study offers a potential alternative upfront funding mechanism to generate a cash injection into a possible financing scheme. For the CLIFF options (Options 2 being most applicable), private capital from investors could be raised to finance the immediate costs of properties/communities most exposed to coastal erosion / inundation. The repayment of this capital to investors is likely to sit with the delivering body (for example Local Authorities or a non-departmental body), however the contributions from residents paying into the scheme, could be used to payback this initial upfront capital, in addition to providing additional funding for homes longer-term.

\* For case study details, please see references - page 44.





## 4.2. Data availability and requirements results

To support the development of the Coastal Loss Model, applicable, publicly available data was identified and evaluated. Each identified data source was reviewed within the technical review committee and approved by the project steering committee at each step before incorporating into the model structure. Figure 9 below summarises the data sources utilised for each model component. Assumptions and potential options for improvement are considered.

### 09| Overview of data components and sources used in coastal loss modelling.

Model component	Data component	Data source	Assumptions and potential model improvements (where applicable)
<b>Property risk rating and risk assessment module</b>	# properties at risk of coastal erosion	National Coastal Erosion Risk Model (NCERM, 2012)	<ul style="list-style-type: none"> <li>See detail in section 4.2.2.</li> </ul>
	# properties at risk of coastal inundation	National Flood Risk Assessment (NaFRA, 2021)	<ul style="list-style-type: none"> <li>See detail in section 4.2.2.</li> </ul>
	Geographies included	England only	<ul style="list-style-type: none"> <li>NCERM and NaFRA data was only extracted for England coastal frontages.</li> <li>Next model iteration should consider including data for Wales, Scotland and Northern Ireland.</li> </ul>
	Loss likelihood / timing	Shoreline Management Plan	<ul style="list-style-type: none"> <li>Annual average assumed based on the number of properties in Epoch 1, 2 and 3.</li> <li>Example: for Epoch 3, which covers a 50-year time period, if there are 1,000 at risk properties, the model assumes an average of 20 losses would occur annually.</li> <li>An improvement would be to model the individual loss likelihoods of each property to assess the impact of more/less frequent losses over time.</li> </ul>
	Model timeline start point	Marsh	<ul style="list-style-type: none"> <li>Assumed that 8 years of losses between 2012 to 2020 have already occurred, so model only assesses losses for remaining 12 years of Epoch 1.</li> <li>Improvement would be to re-run model using update data on coastal erosion and coastal flood inundation losses.</li> </ul>
<b>Scenario module</b>	Average house price per LA	HM Land Registry (2021)	<ul style="list-style-type: none"> <li>Average house price for England applied to inform pay-out totals.</li> </ul>
	Pay-out scenarios	Project Steering Committee	<ul style="list-style-type: none"> <li>Four pay-out scenarios are considered, reflecting range of possible pay-out benefits.</li> <li>£10,000 flat fee and 20% / 50% / 100% of average house price per LA.</li> </ul>
	# households per local authority	Office for National Statistics (2019)	<ul style="list-style-type: none"> <li>Used to inform number of Local Authority and National household contributors within scenario module.</li> </ul>
<b>Model conditions module</b>	Fund expenses / interest	Marsh	<ul style="list-style-type: none"> <li>In absence of more robust data, model assumes fund expenses are 0.85% and fund interest is 1% per annum.</li> </ul>
	Cash injection	Interview with Municipal Bonds Agency (2021)	<ul style="list-style-type: none"> <li>Three cash injections (£0 / £50 million / £250 million) considered based on input from Municipal Bonds Agency (2021) on the typical loan/bond value Local Authorities have secured.</li> </ul>
	Coastal defence policy	Shoreline Management Plans (various)	<ul style="list-style-type: none"> <li>Assumption made that all current coastal risk management policy is maintained throughout the modelled time periods.</li> </ul>



#### 4.2.2 Datasets on the number of properties at risk

##### Properties at risk of Coastal Erosion

Here, we use data from the National Coastal Erosion Risk Model (NCERM) in 2012 to quantify the number of properties at risk of coastal erosion in each Epoch. Whilst more recent NCERM data is available (NCERM, 2018), the 2012 data is selected here due to its data structure allowing for the model to quantify two key variables;

##### 1. The number of at risk households

- Data based on Shoreline Management Plan (SMP) boundaries, allowing for a quantification of the number of properties at risk of erosion. The SMP definition incorporates all coastal policy options including Hold the Line (HtL), Managed Realignment (MR) and Advanced the Line (AtL).

##### 2. The number of households benefitting from coastal erosion protection

- Data based on a “No Active Intervention” (NAI) scenario allowing for the number of properties benefitting from coastal erosion protection to be quantified. This represents the predicted number of households that may be at risk if ‘no active coastal management’ was taken. Specifically the following applies to this scenario;
  - Assumes all coastal risk management investment is withdrawn.
  - Assumes erosion defence assets degrade over time based on its condition grade and design lifespan.

An assessment of Epoch 2 using NCERM 2018 data highlighted that there is a difference between the 2012 and 2018 number of properties at risk, indicating that the 2012 data was potentially under-estimated the number of at risk by >20%. Similarly, it is noted that the 2012 under-represents exposure to complex cliffs particularly in parts of east England and Norfolk which could further increase the number of properties requiring support within a scheme. Despite these assumptions, the 2012 data was viewed to fit for purpose for this exercise due to the limited data options available, allowing for a first-order assessment of whether a financial scheme could be designed for properties at risk of coastal erosion.

We do note several potential improvements to this dataset for future model iterations, including:

- Incorporating complex cliffs into the assessment utilising reasonable engineering judgement where possible.
- Analysis of properties at risk using the NCERM 2018 data to get complete Epoch 1, 2 and 3 numbers to give a more robust quantification of possible coastal erosion losses.
- Consider utilising alternative, private company datasets to inform losses.

##### Properties at risk of Coastal Flood Inundation

Here, we use data from the National Flood Risk Assessment in 2021 to quantify the number of properties at risk of coastal flood inundation. It should be noted that this method utilising NaFRA does not natively align to the Epoch approach used within the Coastal Loss Model, so we use a probabilistic approach to assign flood return periods into ‘Epoch-based’ loss groupings. Moreover, NaFRA is designed to analyse the combined risk of flooding from multiple sources and does not represent fluvial and tidal risks independently in its output. Therefore, the properties selected from NaFRA may include some properties at risk of both tidal and fluvial sources over-representing the true number of properties at risk. This was minimised as far as possible through only including properties located within the Shoreline Management Plan boundaries. Despite this, these limitations are accepted due to NaFRA being currently the best available method for assessing coastal flood inundation risk using publicly available data.

### 4.3. Coastal loss modelling results

This section synthesises the key results identified from running the Coastal Loss Model for erosion and coastal flood inundation.

Per the coastal loss model methodology outlined in section 3.2.3., the two primary objectives were to; 1) to quantify the average annual premium or contribution required to make the option viable (based on the number of households paying into a scheme), and 2) to quantify the average amount a fund could pay-out to each beneficiary (based on the number of households predicted to be at risk of coastal erosion / coastal inundation). For each objective, we present results from each coastal loss model outlining the key findings and outputs generated across the four primary scenarios tested (cash injection scenarios, scheme pay-out scenarios, scheme beneficiaries and scheme contributors).

#### 4.3.1 Coastal erosion loss modelling

The results of the Coastal Erosion Loss Modelling for each of the four CLIFF options are shown in Figure 10. Below, option results are analysed in turn.

**Option 0 – Continue Current Practice:** this option assessed the cost requirements for individual households within each Epoch to support themselves financially prior to a future loss (for instance annual contribution required for a given undefended property to save enough to pay-out such as £10,000 once their property is lost to erosion). Under all pay-out scenarios tested, the cost requirements for an individual property to self-support itself are prohibitively expensive. No case was identified where contributions per household are <£100 per annum (p/a). Only 6 out of 36 scenarios tested had premiums <£1,000 p/a. In particular, properties in Epoch 1 are amongst those most at risk due to the limited time remaining until they are lost, meaning on average each property would need to save >£1,650 p/a, in order to generate a ~£10,000 pay-out once their property is lost to erosion.

**Option 1 – Coastal Accumulator Fund:** this option assessed the cost requirements for properties within each Epoch to pay into a fund tied to their property (similar to a life assurance policy). Individual fund payments are managed and administered by a central entity, which over time allows for the fund to grow. At a pre-determined point (such as once a property is deemed uninhabitable), funds are released directly to the homeowner. Principally, this Coastal Accumulator Fund considers two primary scenarios; a) where only at risk properties contribute and receive a pay-out, and b) where at risk and protected properties contribute, but only at risk properties receive a pay-out.

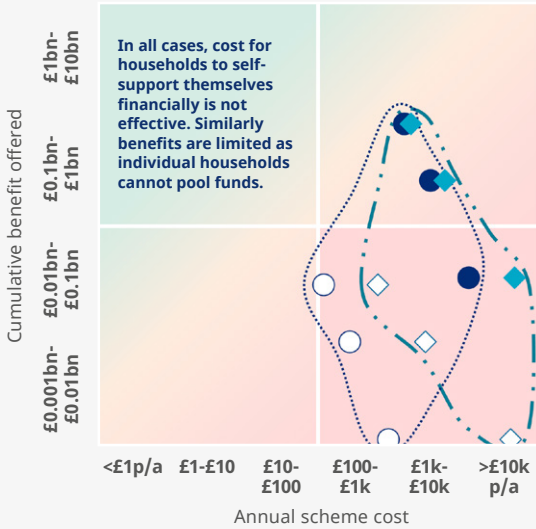
For a), under a £10,000 pay-out scenario with no cash injection, annual contributions range from ~£150 p/a when cross-subsidising properties across Epoch 1-3 to ~£400 p/a when only cross-subsidising properties across Epoch 1-2. Consequently, it was identified that including Epoch 3 within a Coastal Accumulator Fund was essential, in order to keep costs to a minimum. However, the model quantified that under nearly all higher pay-out scenarios (for example 20%, 50%, 100% property value), even with no cash injection, annual contributions under a Coastal Accumulator Fund would exceed £1,000 p/a, indicating such a scheme would have limited potential to be successfully delivered.



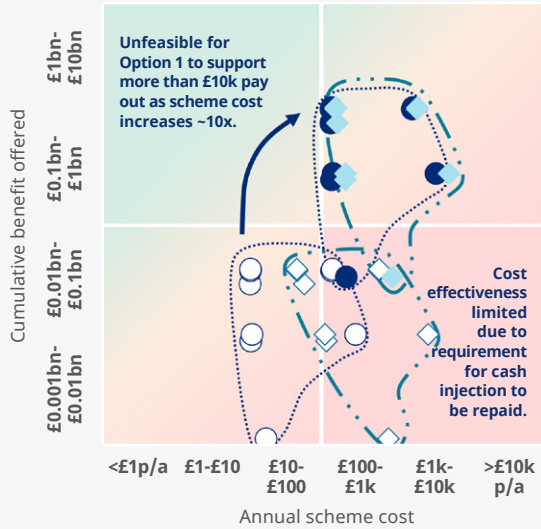
10| **Cost-benefit of each CLIFF option based on coastal erosion loss modelling.**

Note that the mix of circles and diamonds within each graph represents the different combinations of contributors and pay-out scenarios tested (see key).

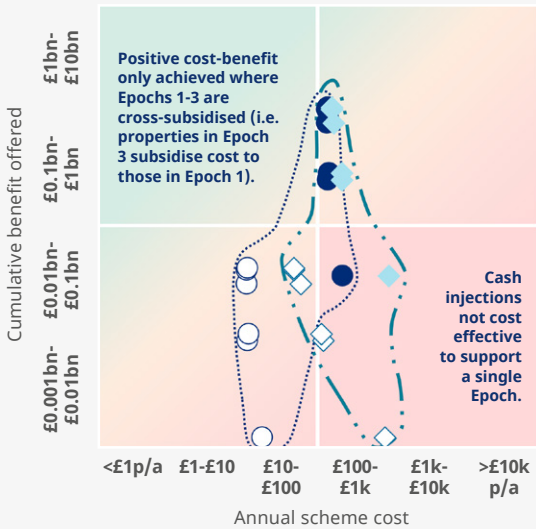
**OPTION 0 – CONTINUE CURRENT PRACTICE**



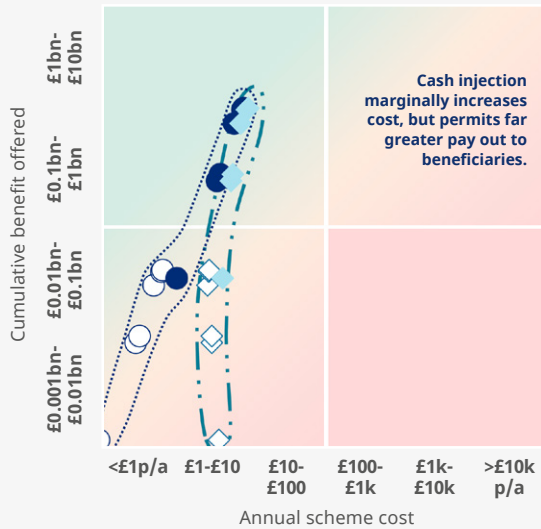
**OPTION 1 – COASTAL ACCUMULATOR FUND**



**OPTION 2 – LA COASTAL ADAPTATION FUND**  
(applied only to Epochs 1 to 3)



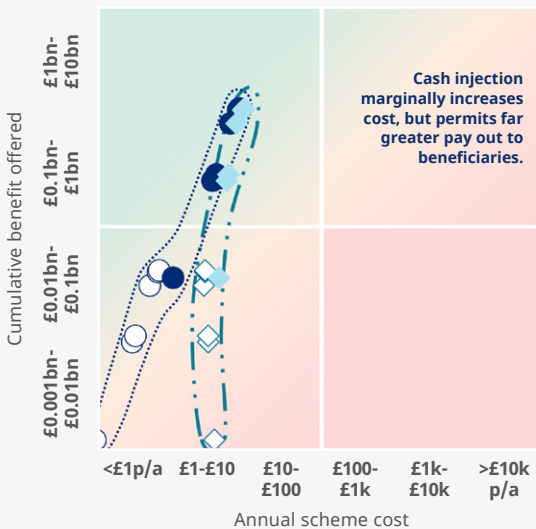
**OPTION 3 – LEVY MODEL**  
(applied only across coastal Local Authorities)



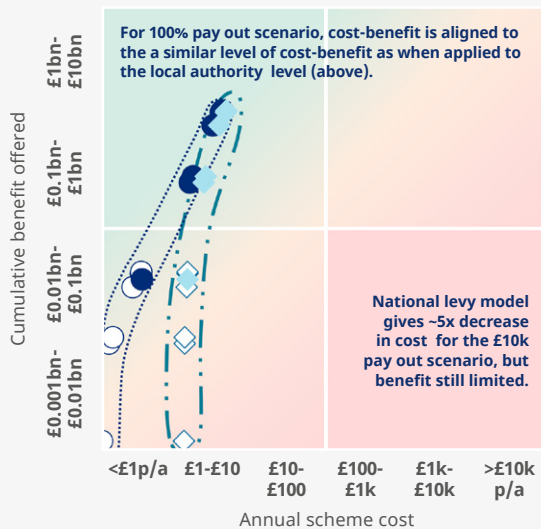
**KEY**

- Option envelope
- No cash injection | £10k pay-out
- No cash injection | 100% property equivalent pay-out
- Option envelope
- £250m cash injection | £10k pay-out
- £250m cash injection | 100% property equivalent pay-out

**OPTION 2 – LA COASTAL ADAPTATION FUND**  
(applied only across coastal Local Authorities)



**OPTION 3 – LEVY MODEL**  
(applied nationally to households in England)



For b), under a similar £10,000 pay-out scenario with no cash injection, annual contributions are significantly reduced to ~£5 p/a when cross-subsidising properties across Epoch 1-3, due to the increased number of scheme contributors. Similarly, even when only cross-subsidising properties across Epoch 1-2, annual contributions remain at ~£6 p/a. However, under higher pay-out scenarios, cost requirements are typically >£100 p/a, limiting cost effectiveness.

It is noted that under both a) and b), implementing an upfront cash injection can increase the benefits offered within the option, however it significantly increases the cost requirements needed for the fund to sustain itself by >10x in nearly all cases. It is noted however that the model assumes any upfront cash injection would need to be repaid over the lifespan of the scheme, and thus, greater benefit from a cash injection may be possible where it is not required to be repaid (for example a grant rather than a loan).

**Option 2 – Local Authority Coastal Adaptation Fund:** for this option, Local Authorities (LA) collect funds from properties at risk from coastal erosion via an agreed mechanism (such as council tax). Funds are managed to promote growth. Funds can be released to the LA when agreed conditions are met to support coastally exposed households and communities with e.g. protection, adaptation, property-level resilience etc. Per the results presented in Figure 10, the below synthesis is segmented into two groups; a) where contributions are only collected from properties within Epochs 1 to 3 (under an SMP + NAI scenario) and, b) where contributions are collected from all properties within Local Authorities that have coastal erosion exposure.

For a), scenarios tested broadly show moderate potential for a scheme to be successfully delivered, particularly under lower pay-out scenarios (annual contributions range from £5 to £10 p/a under all £10,000, no cash injection scenarios tested). Under greater pay-out scenarios, cumulative benefit offered increases up to 25x, however annual contributions remain >£70 p/a for all 50% and 100% pay-out scenarios (no cash injection). It is noted that implementing a cash injection significantly increase cost requirements for low pay-out scenarios between 10-20x for all scenario tested (excluding Epoch 1 SMP + NAI only). Where contributions are cross-subsidised between Epochs 1-3, pay-out scenarios are above 50% and a cash injection is implemented, there is only a marginal cost increase (<£25 p/a) to scheme contributors. However, because all annual contributions remain >70 p/a in these cases, overall likelihood is deemed limited to higher costs involved.

For b), where entire Local Authorities with coastal exposure are included in contributions, scenarios tested show significant potential for a scheme to be successfully delivered. In all pay-out and cash injection scenarios tested, annual scheme costs remain below £10 p/a, with cumulative benefit exceeding £1 billion where pay-outs are used to support at risk properties across Epoch 1, 2 and 3 (for example community level). Notably, due to the low annual scheme contributions modelled, higher pay-out scenarios (i.e. >20%) become increasingly more viable, giving greater flexibility to Local Authorities to manage coastal exposure.

**Option 3 – Levy Model:** under this option, funds are collected through a levy-style mechanism such as household insurance, local/national taxes for a chosen population (such as national, or across Local Authorities). Raised funds are managed centrally and will pay-out directly to an agreed entity once a pre-defined condition is met e.g. once a coastal property is lost due to erosion. Although similar in mechanism to Option 2, the Levy Model potentially provides scope for greater participation within the scheme, such as at a national level.

Due to the design of the Coastal Loss Model, applying a Levy-style mechanism at the Local Authority level means cost-benefit results mirror those outlined under Option 2, for case b (see above paragraph). However, as shown Figure 10, when testing this scenario at the national level, costs in all scenarios tested remain <£5 p/a, whilst benefits mirror those also offered through a Local Authority level scheme (i.e. >£1 billion where pay-outs support at risk properties across Epoch 1, 2 and 3).



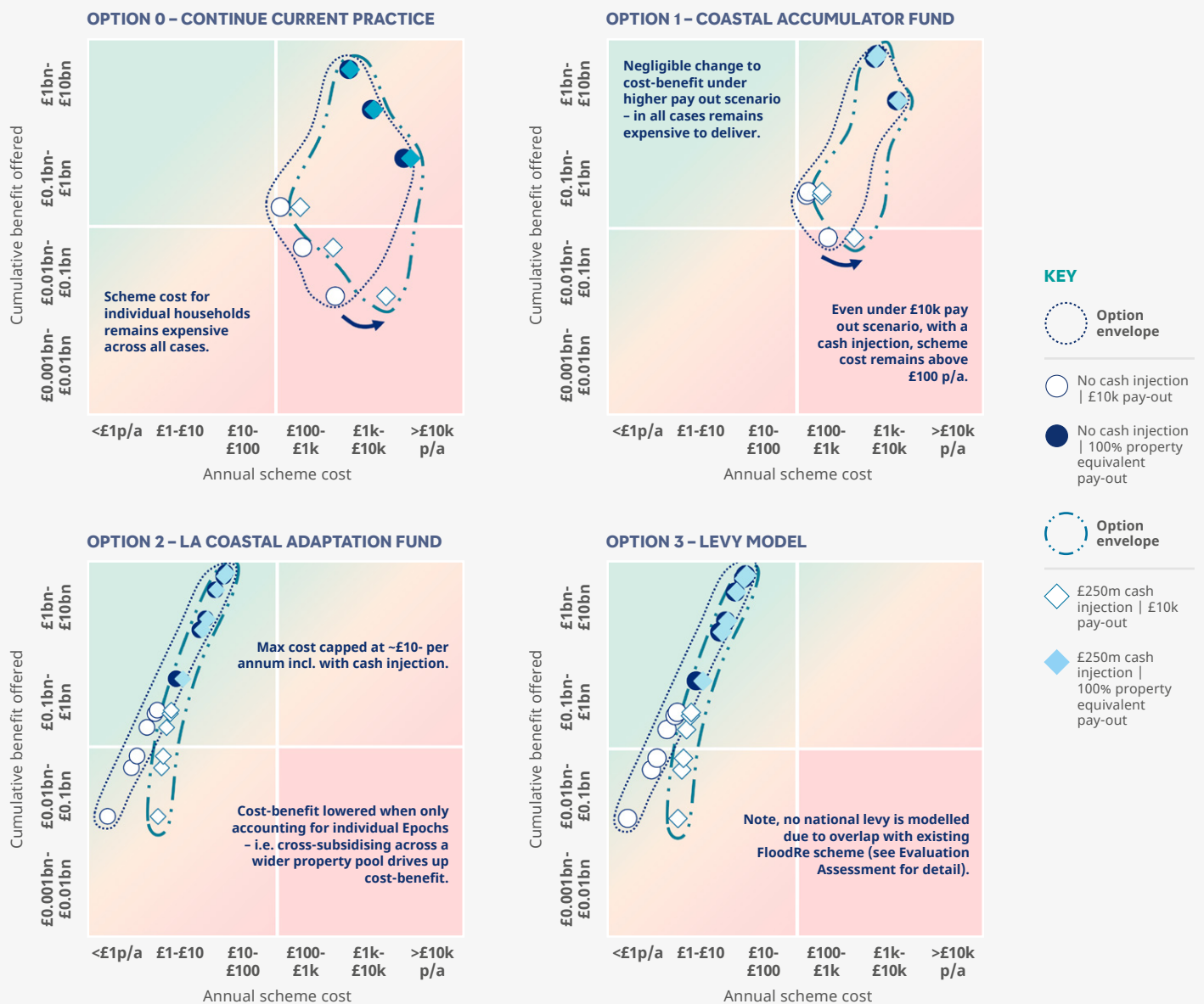
### 4.3.2 Coastal flood inundation loss modelling

The results of the Coastal Flood Inundation Loss Modelling for each of the four CLIFF options are shown in Figure 11. Below, option results are analysed in turn.

**Option 0 – Continue Current Practice:** this option assessed the cost requirements for individual households within each Epoch to support themselves financially prior to a future loss in the absence of a FloodRe mechanism in place (i.e. annual contribution required for a given undefended property to save enough to pay-out e.g. £10,000 once their property is lost to flood inundation). Similar to the erosion modelling, under all pay-out scenarios tested, the cost requirements for an individual property to self-support itself are all >£100 p/a. Only 8 out of 36 scenarios tested had premiums <£1,000 p/a, all of which related to properties located within Epoch 2 / 3 (for instance where properties have a longer time period to build up a fund, so comparatively are able to pay less per annum). Although relative benefits quantified are moderate, these can only realistically be achieved if every household at risk of inundation began making annual savings now; this is noted as a highly unlikely scenario and thus the benefits should be considered very low.

**Option 1 – Coastal Accumulator Fund:** this option assessed the cost requirements for properties within each Epoch to pay into a fund tied to their property (similar to a life

## 11| Cost-benefit of each CLIFF option based on coastal flood inundation loss modelling.



assurance policy). Individual fund payments are managed and administered by a central entity, which over time allows for the fund to grow. At a pre-determined point (such as, once a property is deemed uninhabitable), funds are released directly to the homeowner. Due to data limitations in the construction of the Coastal Flood Inundation Loss Model, the Coastal Accumulator Fund here only considers scenarios where at risk properties contribute and receive a pay-out (for example, where no scenario is tested where at risk and protected properties contribute).

The results show that under a £10,000 pay-out scenario with no cash injection, annual contributions range from ~£155 p/a when cross-subsidising properties across Epoch 1-3 to ~£440 p/a when only cross-subsidising properties across Epoch 1-2. Similarly, due to the number of properties who could benefit from such a scheme, under the same scenario cumulative benefit offered ranges from £80 million-£250 million (a moderate to high benefit). However, to maximise benefit and minimise cost, it is noted that including Epoch 3 within any flood inundation Coastal Accumulator Fund is essential. However, the model quantified that under 75% of all pay-out scenarios tested, even with no cash injection, annual contributions under a Coastal Accumulator Fund would exceed £800 p/a, indicating such a scheme would have limited potential to be successfully delivered.

Although implementing an upfront cash injection can increase the benefits offered within the option, however it significantly increases the cost requirements needed for the fund to sustain itself by 5-10x in most cases. It is noted however that the model assumes any upfront cash injection would need to be repaid over the lifespan of the scheme, and thus, greater benefit from a cash injection may be possible where it is not required to be repaid (such as a grant rather than a loan).

**Option 2 – Local Authority Coastal Adaptation Fund:** for this option, Local Authorities (LA) collect funds from properties at risk from coastal flood inundation via an agreed mechanism (for instance council tax). Funds are managed to promote growth. Funds can be released to the LA when agreed conditions are met to support coastally exposed households and communities with for example protection, adaptation, or property-level resilience. Due to data limitations in the construction of the model, here, the LA Coastal Adaptation Fund only considers contributions collected from all properties within Local Authorities that have coastal flood inundation exposure.

Scenarios tested broadly show moderate to strong potential for a scheme to be successfully delivered, particularly under the £10,000 pay-out scenario where annual contributions are all <£5 p/a even with a £250 million cash injection. Under greater pay-out scenarios, cumulative benefit offered increases up to 20x, with annual contributions remaining capped at ~£10 p/a even for 100% pay-out scenarios with cash injections. It is noted that implementing a cash injection does increase cost requirements for low pay-out scenarios most strongly (>10x increase for a £10,000 scenario benefitting Epoch 1 only). Notably, where contributions are cross-subsidised between Epochs 1-3, there is only a marginal cost increase. As all scenarios tested show high benefit and low annual scheme cost contributions, overall scheme viability is deemed as having a moderate to strong potential for successful delivery.

**Option 3 – Levy Model:** under this option, funds are collected through a levy-style mechanism such as household insurance for a chosen population (such as national, or across Local Authorities). Raised funds are managed centrally and will pay-out directly to an agreed entity once a pre-defined condition is met e.g. once a coastal property is lost due to permanent flood inundation. Due to the design of the model, the Levy Model results mirror those outlined in Option 2. Due to the existence of FloodRe, the model does not test a national level scheme as this is already in place. Thus, the primary difference between Option 2 and 3 sits with the mechanism through which funds are collected and distributed.

# Option feasibility evaluation results

This section summarises the evaluation assessment completed across each option and outlines a proposed future operating model. The full evaluation assessment is outlined in Appendix A.

## 5.1 Evaluation assessment

The following section highlights the key interview and model outputs that have guided the evaluation of each option. Through the interviews, as noted in section 4.1., it was established that the existing provisions for flooding under FloodRe would also cover households affected by coastal flood inundation (FloodRe, 2021). Specifically, it was noted that FloodRe would also cover costs associated with reinstating properties to nearby areas with no / low flood risk, where households are repeatedly impacted by coastal losses 'year on year'. Notably, the FloodRe interview (2021) emphasised that coastal erosion losses were not covered within the remit of FloodRe.

Therefore, for as long as FloodRe continues to operate (expected end date in 2039) coastal flooding is currently covered within its definition of insured losses and thus a CLIFF financing scheme does not need to include these properties in the short-term. Consequently, we have de-prioritised properties at risk of coastal flood inundation within the subsequent evaluation, however we note that longer-term (for instance post-2039) there may be scope to consider including these properties into the CLIFF-style scheme. As such, the focus of this evaluation is on households at risk of losses from coastal erosion as they are not currently covered by any formal financing scheme.

### 5.1.1 Strategic scope

Overall, interviews highlighted significant appetite for a new, innovative financial scheme to support properties at risk of coastal erosion and coastal flood inundation (Defra, 2021; Welsh LGA, 2021; Scottish Government, 2021). Notably, interviewees emphasised that any such scheme required a more robust, long-term (>10 years) and nationally joined-up coastal risk management solutions that focussed on supporting adaptation in addition to financial resilience (Environment Agency, 2021). There was also broad agreement that there is an unserved, at risk population that would benefit from a solution other than coastal protection that is more comprehensive than the current Coastal Erosion Assistance Grants for covering site clearance costs.

Critically, whilst current coastal risk management was noted as effective in many cases (for instance Option 0), interviews and published research indicates there is increasing concern that climate change may enhance the risks posed by coastal erosion from sea level rise (Committee on Climate Change, 2018). Thus, a shift to more innovative, finance-based solutions is needed; any deliverable CLIFF option should therefore be complementary to existing coastal risk management toolkits, supporting investment in coastal areas to be climate resilient and enable adaptation in a more sustainable, long-term manner.

Consequently, for Options 1, 2 and 3, strategic scope must be scaled appropriately so funding contributions and pay-outs delivered are suitable, cost efficient and maximise benefit to both individual properties and wider coastal communities. Similarly, due to the complexity of the UK coastline, the exact combination of benefits delivered would require adjustment to local circumstances and conditions (Coastal Partnership East, 2021). Importantly, any such financing mechanism needs to represent good value for money where the costs to those contributing do not outweigh the benefits that such a scheme can deliver.



With this in mind, Option 1 (Coastal Accumulator Fund) offers a comparatively weaker strategic choice, as the scheme focuses on individual home owners voluntarily paying into a property-level fund, with pay-outs going directly to homeowners once lost to erosion. Thus, there was a perception from the interviews conducted that this option may be viewed as a coastal subsidy benefitting only those that can afford to pay into such a scheme (ABI, 2021; Green Finance Institute, 2021). On the other hand, Options 2 and 3 offer a stronger strategic case due to their ability to give Local Government greater autonomy and control over how funds are collected, managed and distributed. This structure greatly decreases the potential for the scheme to be used as a compensatory-type mechanism, ensuring pay-outs and benefits focus on adaptation and financial resilience, whilst putting greater emphasis on supporting individual properties and wider coastal communities. Consequently, despite all three options offering an opportunity for alternative financial support in coastally exposed areas, the strategic case for change is noted as greatest for Options 2 and 3.

### 5.1.2 Operational

This section offers an assessment of the operational set-up, structure and deliverability of each option. Overall, various choices and decisions were noted through interviews regarding how each option could be designed and rolled-out. Broadly, across all options, the following key points can be drawn;

- All Options are likely to function more efficiently at a national scale however Options 2 and 3 may be able to run at a smaller scale.
- All schemes would likely require an independent fund advisory / manager to implement and operate.
- The threshold at which funds can be released needs greater consideration and will require standardisation to ensure funds are used appropriately and consistently across the UK.
- Greater flexibility over how scheme contributions and pay-outs are made is likely to make a financing scheme more viable; Option 2 offers the greatest autonomy and control overall.
- A policy mandate or legislative requirement is likely necessary to ensure required levels of uptake are made into the to the scheme; this is likely most challenging for Option 1 due to difficulties around mandating sign-up to a scheme.
- Option 1 was perceived as potentially unviable for most at risk households Epoch 1 whereas Option 2 and Option 3 can likely offer consistent benefit to all Epochs.

More specifically, in terms of operational structure, Option 1 was noted as having the most rigid arrangement, with pay-outs only offering benefit equal to the contributions being paid in over time (such as risk-based premium setting). Similarly, due to Option 3 managing funds through a central function (for example following an insurance-style set-up), payments into and out of the fund would most likely require standardisation across all properties, making it challenging to deliver wider benefit to, for example, coastal communities.





Conversely, as Option 2 is principally controlled by Local Authorities, it offers more autonomy, control and flexibility over how contributions can be collected and managed (MHCLG, 2021). For example, as noted in the Somerset Rivers Authority and Warwickshire Climate Emergency Fund case studies, using council tax as scheme contribution mechanism could enable contributions to better reflect socio-economic circumstances by applying the scheme differentially across tax bands (for example allowing wealthier households to contribute more). Similarly, as pay-outs are controlled by individual Local Authorities, it could allow scheme pay-outs to be tailored to each coastally exposed area / property, further maximising benefit to those at risk.

When assessing how well each option solved the problem, it was noted that all Options adequately offered a solution for supporting properties at risk of coastal erosion and coastal flood inundation and could offer greater resilience by offsetting the predicted future impacts of climate change. Similarly, all Options suitably covered all UK geographies and it was highlighted that the operation of each scheme would work most effectively as a nationally joined up approach to maximise benefit and increase the number of properties contributing (such as to minimise scheme costs). Whilst a national scheme is likely critical for Option 1 to succeed, it is noted that for Options 2 and 3 there may be scope to operate smaller funds for specific regions, however this would need more rigorous testing to confirm.

### 5.1.3 Financial feasibility and economic case

This section offers an economic appraisal of each option to establish critical financial success factors and give an overview of the costs / benefits. Overall, the following key points can be drawn;

- For properties wanting to save enough as an individual household to prevent a future loss, costs are prohibitively expensive, making a 'continue current practice' option less viable.
- A Coastal Accumulator Fund (Option 1) is only likely to be financially viable where pay-out scenarios remain low (such as ~£10,000) and Epochs 1, 2 and 3 would have to contribute.
- It is noted that contributions to this scheme would likely not be mandatory making it challenging to balance financially.
- A LA Coastal Adaptation Fund (Option 2) presents a very strong proposition where all Local Authorities with coastal exposure contribute, allowing for pay-out benefits to reach 100%.
- The scheme can also work when incorporating multiple Epochs however pay-outs would need to be capped at a 20% property value equivalent.
- A Levy Model (Option 3) presents the lowest cost option at a national-scale, however benefits are harder to justify to inland properties contributing. Despite this, there is precedent from within the current FloodRe arrangement, where some properties with 'zero' flood risk pay into the scheme.
- The most viable scheme scale likely mirrors the Local Authority approach per Option 2.

More specifically, the following financial feasibility assessment summarises the key points for each option;

**Option 0 – Continue Current Practice:** Under current frameworks, if a property at risk of coastal erosion wanted to save enough as an individual household to prevent a future loss, it would in all cases tested be prohibitively expensive. No case was identified where contributions per household were <£100 p/a highlighting its current viability as an option for households as very low. This demonstrates that in many cases, households will not be in a position to mitigate / minimise their own losses.

**Option 1 – Coastal Accumulator Fund:** based on the scenarios tested, this scheme sits between having limited and minimal potential to being successfully delivered depending on the structure of the option. This conclusion stands for the majority of cases tested, particularly where pay-out scenarios exceed 20%, as contribution costs increase to >£100 p/a making the scheme financially unviable. However, it is noted that a coastal accumulator has a moderate cost-benefit where Epochs are cross-subsidised (for instance multiple Epochs, for example 1-3, contribute to the scheme) and a £10,000 pay-out scenario is followed. Under these cases, premiums fall below £100 p/a increasing the potential viability of the option. Despite this, the cumulative benefit offered remains low under this scheme, even where cash injections are included.

Therefore, for a coastal accumulator fund to be considered further under its current design, two conditions would need to be met; 1) pay-out scenarios would have to remain low (such as ~£10,000), and 2) multiple Epochs, ideally those in 1, 2 and 3, would have to contribute. It is noted that the model currently assumes all properties in each Epoch contribute, however, the likelihood is such a scheme would not be mandatory and thus not every property would be willing to pay into a coastal accumulator fund. Consequently, it is most likely that this options viability remains very limited / minimal.

**Option 2 – LA Coastal Adaptation Fund:** per the modelling results, this option can be segmented into two groups; a) where contributions are only collected from properties within Epochs 1 to 3 (under an SMP + NAI scenario) and, b) where contributions are collected from all properties within Local Authorities that have coastal erosion exposure.

Under a), a LA Coastal Adaptation Fund shows moderate potential for a scheme to be delivered successfully. Collecting scheme premiums from SMP and NAI properties (i.e. properties contribute if they are at risk or benefit from coastal protection) ensures that annual scheme costs remain below £70 p/a under all £10,000 and 20% pay-out scenarios tested. However, under higher pay-out scenarios (such as 50%-100%), annual contributions remain >£70 p/a, with cash injections increasing this figure further. Moreover, where only individual Epochs are involved in a scheme, costs to operate become prohibitively expensive (for example Epoch 1 only with a 50% pay-out and no cash injection has a cost of ~£140 p/a). In contrast, where multiple Epochs are cross-subsidised within a scheme, costs become lower (for example Epoch 1-3 cross-subsidised with a 50% pay-out and no cash injection has a cost of £75 p/a).

Under b), where entire Local Authorities with coastal exposure contribute, the scheme has a far stronger delivery potential. In all pay-out and cash injection scenarios tested, annual scheme costs remain <£10 p/a, making this option very robust from a cost perspective. Similarly, as higher pay-out scenarios can be achieved, cumulative benefits offered exceed £1 billion tested, annual scheme costs remain below £10 p/a, with cumulative benefit exceeding £1 billion where pay-outs are used to support at risk properties across Epoch 1, 2 and 3 (such as community level benefits). It is emphasised that the financial cost-benefit of this approach is very strong, offering the greatest degree of flexibility to Local Authorities to better support properties at risk of coastal erosion. Notably, this option also showed strong cost-benefit for coastal flood inundation, which, post-2039, could be embedded within such a scheme, further decreasing annual scheme costs and increasing cumulative benefit. In summary, for a LA Coastal Adaptation Fund to operate successfully under a), it is proposed that the model incorporates multiple Epochs, pay-outs are capped below 20% and either a smaller loaned cash injection is used or none at all. However, due to the far stronger cost-benefit offered by b) under all scenarios tested, it is noted that b) would be a more viable option to explore in further detail.

**Option 3 – Levy Model:** as noted in the modelling results, due to the design of the Coastal Loss Model, applying a Levy-style mechanism at the Local Authority level means cost-benefit results mirror those outlined under Option 2, for case b (see above). In this instance, it is only the operational mechanism through which scheme funds are collected which would differ (such as Option 2 administered through Local Authorities and Option 3 through a privatised scheme such as an insurance levy). However, modelling for Option 3 also tested scheme viability for scenarios at the national level. This highlighted that benefits mirrored those offered through a LA scheme, although costs reduced to <£5 p/a. It is noted however that the justification for a national-level scheme could be challenging due to the way benefits are used (such as pay-outs focus on supporting coastal properties and communities which has limited benefit to land locked properties). This national scale approach is however already embedded into the current FloodRe approach whereby the majority of insured properties pay in irrespective of their flood risk. The justification for a national-level scheme would therefore likely need to be explored further and as such at this time, it is proposed that overall a Local Authority level approach likely offers a more appropriate scale for a scheme.

#### 5.1.4 Social / commercial

This component examined how each option contributes social and commercial value to individual households and across wider communities. It was noted across interviews that under current practice, households can be protected by public protection where cost-benefit is deemed viable, however for smaller communities / individually exposed households, such defences may not be financially feasible (Environment Agency, 2021). This highlighted that Options 1, 2 and 3, each offer a level of financial resilience above current practice, although social and commercial value differs between each. Similarly, whilst not assessed directly through this project, it is anticipated that public support for such a CLIFF scheme is likely moderate-high, particularly amongst households which historically have not benefitted from traditional coastal protection programmes. Specific points for each option are outlined further below.

**Option 1 – Coastal Accumulator Fund:** this scheme likely only applies to homeowners (not tenants) as it is a property-linked fund (Legal and General, 2021). Therefore this limits social benefit to only certain coastally exposed groups. As a property-level scheme, this option also has limited funding potential for community-level resilience and adaptation, only supporting those households which contribute to a scheme. Consequently, the social value to individual homeowners is noted as comparatively positive, whereas overall community-level benefit is limited due to the scope and structure of the Coastal Accumulator Fund.

**Option 2 – LA Coastal Adaptation Fund:** this scheme has potential to support any residential household (including owners and tenants) due to the way Local Authorities have greater autonomy over how funds are used. Depending on the final set-up of such a scheme, benefits could be used to support both undefended and defended properties, and wider coastal adaptation through for example enhanced tourism, greater commercial opportunities and buy-and-lease back etc. (Scottish Government, 2021; Welsh LGA, 2021). Similarly, although commercial / industrial / public premises are not currently in scope here, there is a possibility that the scheme could offer expanded value by being available to these groups. Therefore, the LA Coastal Adaptation Fund is viewed as strong in both social and commercial value, particularly where it enables the “levelling up” of coastal communities and at risk residential households.

**Option 3 – Levy Model:** similar to Option 2, this scheme is able to support all residential households however due to the operational mechanisms through which a Levy model could operate (i.e. resembling a FloodRe type approach), it may be slightly more restrictive in terms of how benefits can be utilised. For example, under an insurance-style levy, depending how funds are administered, it may restrict pay-outs to only certain applications (e.g. funds to support individual household relocation and not wider community benefit). This could be improved through implementing levies via alternative mechanism such as the Regional Flood and Coastal Committees who approve the annual programme of Flood and Coastal Risk Management work, however there is limited precedent for it to operate at the UK-wide scale required by this scheme (Environment Agency, 2021). Consequently, the Levy Model is viewed as moderate-strong in terms of its social value (depending on the operational structure used), although commercial value is likely low due to the limiting mechanisms through which a Levy model can operate.







### 5.1.5 Policy / legal

This section evaluates the current policy and legal framework to establish option fit, existing gaps and critical success factors required to deliver each option. Key points are outlined below.

- Developing a FloodRe mechanism or equivalent for coastal erosion was not seen as viable from interview feedback due to the non-insurable nature of the peril. Although FloodRe by its nature provides insurance to those exposed to flood risk, who would otherwise not be viably or affordably insurable.
- The legislative remit of FloodRe currently covers occurrences of coastal flood inundation within its definition of flood risk so is not an immediate priority, although this may need to be reconsidered in the long term when the scheme expires in 2039 (FloodRe, 2021).
- Due to legislative challenges, it may be difficult to mandate contributions into a Coastal Accumulator Fund (Option 1) as there is little precedent for such a scheme under current legal and policy frameworks (MHCLG, 2021).
- For Option 1, there could be negative policy implications where only at risk homeowners are required to pay an additional premium to support themselves financially when other coastal properties benefit from coastal defences (Green Finance Institute, 2021).
- Local Authorities could leverage a variety of existing mechanisms already in place to collect and administer scheme contributions for Option 2 (and to some extent Option 3). There are current mechanisms for raising precepts within council taxation, collecting ring-fenced contributions towards Internal Drainage Boards or, contributions could utilise the Regional Flood and Coastal Committees or an approach such as the Somerset Rivers Authority.
- For Options 2 and 3, there needs to be an equitable distribution of benefits driven by decisions on what broader socio-economic objectives are sought (Environment Agency, 2021). For example, benefits are unlikely to be able to 'compensate' homeowners for loss, but could instead offer funds to support rehousing, relocation, buy-and-lease back, coastal rollback or broader community goals such as restoration of coastal access and supporting commercial opportunities in communities.
- To justify policy and legal change, an equitable balance needs to be found where those most vulnerable to coastal erosion are supported adequately, such as where contributions versus pay-outs are adjusted provide equal benefit (Defra, 2021). This applies most strongly to Option 2 and 3.
- Depending how fund contributions are structured for Options 2 and 3, there is potentially a risk that tenanted properties may end up supporting property owners (MHCLG, 2021). This risk needs to be managed and mitigated through for example adjusting fund contributions / benefits to ensure landlords and tenants are supported equitably.



### 5.1.6 Conclusions

The overarching aim of the CLIFF project was to identify the potential for innovative financing and funding mechanisms to be established to support residential homeowner's whose properties are at risk or lost due to coastal erosion and permanent coastal flood inundation caused by sea level rise. Based on the evaluation assessment, a number of conclusions and indicators for further work can be drawn as follows;

1. Existing provisions under FloodRe were identified as most likely covering households affected by coastal flood inundation, highlighting that the immediate priority is to support properties at risk of coastal erosion. Prior to 2039, when FloodRe terminates, coastal flood inundation could be revisited to understand potential inclusion within a CLIFF scheme.
2. There is significant appetite for an innovative financial scheme to support properties at risk of coastal erosion and to succeed, the scheme must provide a longer-term (>10 years), nationally joined-up coastal risk management solution that focuses on both adaptation and financial resilience.
3. Greater flexibility over how scheme contributions and pay-outs are made is likely to enhance deliverability of a new scheme. To achieve this, it is highlighted that structuring scheme governance at the Local Authority level likely represents the most efficient operational design (such as Option 2 and components of Option 3).
4. Based on current practice (Option 0), it is not financially feasible for individual properties to save the sums of money required to deliver a benefit greater than the existing Coastal Erosion Assistance Grants (CEAG) from the Government, which covers a portion of coastal erosion demolition costs up to the value of ~£6,000.
5. Any scheme relying only on households at risk of erosion to contribute are prohibitively expensive and deliver minimal benefit. Coastal Erosion Loss Modelling in Option 1 and elements of Option 2 highlights that where households benefitting from existing coastal defences / Government funding are included in the model, the cost-benefit of a financial scheme improves and can be delivered for a non-burdensome cost where pay-out scenarios are capped at 20% (<£70 p/a per household).
6. Opening up scheme contributions to coastally exposed Local Authorities significantly strengthens the cost-benefit of Option 2 and Option 3. At this larger scale, upfront, loaned cash injections become more financially sustainable (both at the £50 million and £250 million level) and further enhance scheme benefit without causing scheme costs to increase above £10 p/a.
7. All Options explored offer a degree of financial resilience above current practice. However, social and commercial value can be further maximised within Option 2 and elements of Option 3 where financial benefits permit support to a more diverse range of stakeholders such as at risk households, communities and local businesses etc.
8. Due to coastal erosion representing a traditionally uninsurable natural hazard, an insurance-style levy is likely to be less favoured by insurers and investors as a mechanism for scheme contributions. Leveraging pre-existing frameworks already in place likely represents the most viable solution to successfully implement a scheme (supporting Option 2 and 3), such as council tax, general taxation or Regional Flood and Coastal Committee levies.
9. All Options require greater clarity around how benefits can be used and the thresholds at which funds are released. All benefits must be equitably distributed based on the types of stakeholder contributing and depending on what broader socio-economic objectives are sought through the scheme.

## 5.2. Proposed operating model

Overall, based on the interviews, data availability assessment and coastal loss modelling, the most deliverable single solution based on the cost-benefit analysis and current policy and legislative framework appears to be Option 2 (Local Authority Coastal Adaptation Fund) when applied across a Local Authority scale. It is noted that for several mechanisms, a blend of different option structures and components could complement Option 2 further. The following is a proposed operation model assembled from each assessment conducted within this report and additional input from the Steering and Technical Review committees.

### 5.2.1 Inputs

**Property Risk Rating Data** is an essential requirement to predict the number of properties within each Epoch at risk of coastal erosion. Whilst existing NCERM data offers a good initial starting point, for a scheme to become national, it requires a more granular, consistent national dataset which also considers potential future impacts of climate change.

**Contribution Pool** sets the number of properties contributing to the scheme. The larger the number, the lower the scheme cost. The likely best fit reflects all properties in Local Authorities with coastal exposure contributing, including those protected by existing coastal defenses.

**Fund Contribution Mechanism** outlines how properties contribute to a scheme. Based on the current legislative and policy environment utilising an existing fund collection mechanism is proposed. Following precedent from case studies and interviews, the most viable approach is likely to be through council taxes. This would allow Local Authorities to base levies on their specific risk profiles (such as risk-based contributions) and allow for contributions to be graded by council tax band, ensuring balance between properties of differing socio-economic circumstance.

**Policy and Legislation** is required to implement the scheme. It is likely that most policy and legislation is already in place to permit such a scheme however greater clarity is likely needed around how benefits can be used and thresholds at which pay-outs are triggered. A review should also be conducted to understand how Local Authorities fund contributions can be grouped together to generate a larger funding pool for mutual benefit.

**Cash Injection Funding** is proposed to kick-start any future scheme. Based on current modelling, both £50 million and £250 million cash injection scenarios show viability under a Local Authority model. In current markets, low cost capital is likely available (for example as bonds or private investment). Alternatively, Government funding could further enhance the viability of a scheme where initial cash injections are not required to be repaid (such as not a loan). Comparison to recent fund raising via Local Authority bonds highlights that private investors are willing to invest in these products, whilst the “Green” and “Social” aspects of this type of cash injection give confidence to investors that capital is sustainability focused.





### 5.2.2 Fund Administration

**Fund Management** outlines how funds are collectively managed. Interviewees identified that the likely best fit was to group individual Local Authority scheme contributions and manage them collectively in a ring-fenced fund. This approach has an ability to improve efficiency and generate economies of scale particularly where the funding pool is managed by a dedicated fund manager. Active fund management could generate larger returns (which may offer further benefit if a large cash injection is used) whilst passive fund management would likely have a lower management fee rate. The manager would be expected to take a percentage fee for running the fund in both cases.

**Future Capital Investment** is proposed on an ad hoc basis to ensure the fund is able to function from the start and address early arising risks. Seeding the fund with capital investment such as retained Local Authority bonds could offer a good first approach, however this requires more detailed examination once scheme structure has been refined. Although not tested here, future capital investment could be repeated to attract additional (public and/ or private) funding into the scheme at a point in the future if necessary.

**Interest and Loan Payback** outlines how the fund could grow and how cash injections may need to be paid back. As a managed fund, contributions would be pooled to earn interest and above a certain threshold it is reasonable for fund interest to outpace required pay-outs and/ or any cash injection loan repayments, for example a Local Authority bond loan acting as a cash injection could be paid back through interest alone, rather than scheme contributions. It is likely that any loaned cash injection would need to be repaid within 50 years (based on precedent from interviews with the Municipal Bonds Agency, 2021). This would leave the fund at a point in the future funded without outstanding debt further enhancing its viability, such as scheme contributions would only be required to counterbalance the payments for coastal erosion events longer-term.

**Scheme Pay-out Coverage** sets how and when and what levels of pay-outs can be made from the scheme. On the use of funds, a clear mission statement is likely required to set how funds can / will be used. It is likely to be beneficial that this mission sets statements covering immediate 'pre-funding of disaster response' through to longer-term adaptation and community-level resilience for areas not at imminent risk. This will likely help support more equitable distribution of benefits to those properties contributing.

**Fund Alteration / Exit Strategy** defines options for how the scheme could be changed / terminated over its lifetime. The exact mechanisms for which the scheme conditions / inputs / benefits could be altered will likely depend strongly on the way in which funds are administered through the scheme (for example, depending on public and private contributions into / out of the scheme). It is important the some flexibility in the financial mechanisms used is incorporated into the operating model of the proposed solution to ensure the approach remain adaptive to future needs and changes, especially as requirements from the scheme evolve.





### 5.2.3 Benefits

It is proposed that the design and implementation of any future CLIFF scheme should meet the Governments levelling up agenda not just to improve housing but also local areas, communities and businesses. Following an Option 2 based approach will likely offer the best route map to achieve this.

**Pay-out Mechanism** defines how pay-outs are made. As a Local Authority governed scheme, it is proposed that pay-outs are drawn down gradually based on pre-determined thresholds from the collective pool. Local Authorities would likely define the point at which a property becomes uninhabitable / requires support and thus triggers a pay-out under set criteria. Criteria would likely need to be pre-determined based on the property risk rating and individual residents' situation in order to set the pay-out level.

**Benefit Coverage** outlines how scheme pay-outs can be used. It is envisioned that the pay-out would offer more than a simple cash payment to the property owner (such as insurance does) but would include a range of options based on the specific needs of the property / community at risk. A critical aspect of the benefits will likely need to be disaster resilience and recovery for properties at imminent risk of erosion, including emergency response (health and safety-led focus), social/temporary housing support and demolition costs. However, for properties with a longer life expectancy, CLIFF benefits could fund more proactive coastal risk management to support for example commercial ventures through buy-and-lease back, property / community rollback / relocation, housing needs assessments and neighborhood resilience planning incl. temporary / permanent defence planning. In the longer term, an option could be for pay-outs to taper, as there is more time for individual property decisions to be made in the knowledge of their risk and potential support options.

It is also noted that coastal erosion typically incurs additional costs through the loss of a property which could be further supported through the funds generated by CLIFF. Such secondary benefits could include reinstating lost access to beaches, alteration to services such as sewerage, telecoms and water lines, temporary housing of residents, and adaptation or access restoration of highways. Staff time for all public services associated with emergency response to a coastal loss event is another financial benefit to Local Authorities. These benefits are particularly beneficial where contributions are made from within a Local Authority, as greater mutual benefit is achieved.

Furthermore, if a broader view of costs incurred by coastal erosion loss events were taken – including intangible aspects such as stress to residents, negative press and reduction in housing values – this could inform a higher view of benefits to the CLIFF scheme which could improve the cost-benefit balance further for pursuing it. Similarly, the view of the cost-benefit to this program could be improved by inclusion of the cost of future impacts such as reduction in tourism through loss of beach amenities, economic impacts to local businesses due to reduced visitors or relocation of public facilities such as lifeboat stations.

Overall, these benefits together demonstrate that there are more potential beneficiaries than only homeowners / residents. A CLIFF scheme with a broader remit could help Local Authorities act proactively in advance of future coastal loss events, further minimising damage and increasing the resilience of the communities around those coastal residences.



# Next steps

Overall, positioning CLIFF as a self-sustaining, disaster preparation and coastal transition fund likely offers the best solution to support residents and communities across all coastal erosion risk profiles.

Where CLIFF is progressed further into a next phase, we note several items to improve aspects of the modelling, further identify possible funding / financing routes and define the overarching strategy of the scheme. These are noted below.

## Model improvements and recommendations

- Update financial modelling to include England, Scotland, Wales and Northern Ireland. Should consider greater differentiation between specific regions and their individual risk profiles and funding needs.
- Update input coastal erosion loss data to include for example private sector erosion data, NCERM2 data, assumptions around complex cliffs, climate change projections.
- As the scheme is envisioned as a long-term, possibly perpetual scheme, consideration for climate change / sea level rise should be included in the model to understand how climate could accelerate / enhance the number of properties at risk.
- Update model to stress-test implications of changes to timing and number of properties at risk. The model methodology should be updated to account for individual property circumstances that account for individual loss likelihoods (incorporating data on erosion confidence intervals and/or more granular erosion scenarios for specific regions where available).
- Consider broadening scope of financial modelling to include for example commercial / industrial / institutional properties within scheme to assess impacts on fund contributions and pay-outs within the scheme.
- Perform data sensitivity testing to understand success thresholds of CLIFF, considering for example pay-in thresholds (for example differentiation by socio-economic factors), pay-out thresholds (for example differentiation house price / geography), exclusions, implications on residential property types (for example home owners, tenants, second home owners, social housing etc.).
- Assess timeframe decision point impacts, perpetual scheme versus cut-off end date on a defined year (similar to FloodRe ending in 2039). Clarification and financial model testing could be conducted to consider specific scheme termination / extension options.
- Give consideration to a single Local Authority / small subset of Authorities to understand cost-benefit of piloting potential scheme on a smaller scale. Possible pilot could be undertaken to test a group of geographically scattered local authorities which are at a similar level of coastal erosion risk exposure (for example East of England / Somerset / North Wales coast).



## Funding recommendations

- Identify most appropriate scheme contribution mechanism (and so likely to be council tax) and understand positives / negatives, potential legal / policy considerations and Local Authority appetite.
- Develop comprehensive stakeholder engagement map and explore acceptability of proposed CLIFF scheme to establish appetite and ensure scheme coverage is equitable across proposed beneficiaries.
- Establish potential partners for designing, implementing, delivering and managing potential future CLIFF scheme.
- Identify options for encouraging private sector investment into scheme to support fund growth (for example through cash injections at scheme inception or at interim funding cycles throughout scheme lifespan). Consideration should also be given to whether broadening scheme scope to include for example commercial / industrial / institutional properties will offer greater ability to embed private sector investment within the scheme.
- Consider management options and refinement of likely costs and benefits of such approaches with or without cash injections into the scheme. Where scheme cash injections are proposed, consider sources of funding injection and ensure funding is broad enough to consider all sectors.

## Strategy recommendations

- Formalise cost-benefit analysis incorporating by tangible (for example financial benefits) and intangible (for example community improvements, commercial benefits, support on mental health) components.
- Assess public and political acceptability / appetite for intended CLIFF strategy.
- Identify options for embedding CLIFF into wider coastal risk management funding and strategy frameworks.
- Establish suitable CLIFF pay-out thresholds and benefit use cases (for example funding to support individual properties at risk, wider coastal risk management tools, wellbeing etc.).
- Consider options for rolling out pilot / demonstrator project across smaller area (for example as a demonstration project) to test and promote scheme.
- Map out current policy / legislative environment surrounding CLIFF scheme and identify potential areas where new policy / legislation is required or existing frameworks need to updating / adapting.
- Understand how CLIFF fits within wider coastal risk management strategies and how CLIFF could enhance these strategies to deliver greater benefits to exposed communities (for example through reviewing options against existing coastal management policy strategy).
- Consider develop a model engaging with different stakeholder groups on how to test appetite and scheme viability within communities, ensuring the scheme has a compatible approach and results deliver the intended benefits.





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# Appendices

## APPENDIX A DETAILED FEASIBILITY EVALUATION

**1. Strategic Scope:** Outlines the rationale of why the option is required, its primary objectives and defines the outcomes it intends to achieve.

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
1	a. What is the structure of the option?	Scope	<ul style="list-style-type: none"> <li>Coastal risk management activities related erosion are primarily directed through Local Authorities, who set the strategic direction of coastlines and arrange investment into defence schemes (e.g. through local Shoreline Management Plans).</li> <li>Additional detail can be found in the Coast Protection Act (1949).</li> </ul>	<ul style="list-style-type: none"> <li>Household-centered fund tied to the value of a property which builds up over-time, offsetting any depreciated property value once it reaches the end of its life expectancy.</li> <li>Funds are paid out to each household once the property is lost, giving owners control over how payouts are used.</li> </ul>	<ul style="list-style-type: none"> <li>Local authorities oversee the collection of funds throughout coastally exposed households.</li> <li>Funds are administered by the LA allowing for greater autonomy over how payouts are issued and used (e.g. for adaptation, relocation).</li> </ul>	<ul style="list-style-type: none"> <li>A levy-based approach to raise capital via a broader, universal mechanism (e.g. council tax, insurance).</li> <li>Funds are specifically allocated to pay-out a cash-sum to coastal properties once they reach a defined threshold (i.e. deemed uninhabitable).</li> </ul>
		Case for change	<ul style="list-style-type: none"> <li>There is increasing concern that climate change may increase the risks posed by coastal erosion and inundation from sea level rise.</li> <li>Growing evidence for investments in coastal areas to be climate resilient and enable adaption in a sustainable way (<b>National FCERM strategy for England, 2020</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Increasing need to begin looking at alternatives to coastal defence infrastructure and identify alternative financing options to build adaptive, resilience coastal communities (e.g. <b>Scottish Government, 2021; HM Government, 2020; Environment Agency, 2020</b>).</li> <li>Each of the three options outlined offer an opportunity for communities exposed to coastal erosion / inundation, particularly those currently undefended, to build resilience and adapt in advance of households becoming uninhabitable</li> <li>Without change, there is potential for insurers, lenders and banks to more heavily factor coastal risks into pricing / valuations, potentially impacting exposed households longer-term (<b>Nationwide, 2021; Legal and General, 2021; FloodRe, 2021</b>).</li> <li>Due to the certainty of coastal erosion losses, conventional insurance does not apply to this peril (<b>Legal and General, 2021</b>). This leaves undefended homeowners with limited options for adaptation and with few options in comparison to properties benefitting from coastal defences or flood insurance schemes such as FloodRe (<b>FloodRe, 2021</b>).</li> </ul>		
		Potential risks/issues	<ul style="list-style-type: none"> <li>Areas currently benefitting from coastal defences may not, in the future, continue to benefit from new defences, particularly where schemes are not cost-effective (<b>Environment Agency, 2021</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Pooled risk funds related to coastal erosion and permanent coastal flood inundation are naturally smaller in comparison to e.g. FloodRe, so need to be designed to ensure potential costs to households don't outweigh the benefits (<b>Defra, 2021</b>).</li> <li>Potential changes need to be considerate of each community and households needs, delivering good value for money and an ability for greater, long-term adaptation (<b>Green Finance Institute, 2021; Scottish Government, 2021</b>).</li> </ul>		



**2. Operational:** Assessment of the deliverability of each option to ensure they can be implemented successfully in accordance with industry best practice.

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
2	a. What is the operational set-up of the option?	Implementation /scheme management	<ul style="list-style-type: none"> <li>Implementation occurs on a “per scheme” basis, managed by each Local Authority.</li> </ul>	<ul style="list-style-type: none"> <li>All three options will likely require an independent fund advisor/manager in order to administrate payments into and out of the scheme (<b>Legal and General, 2021</b>).</li> </ul>		
		Operation of pay-outs under scheme	<ul style="list-style-type: none"> <li>Principally, current practice has two forms of benefit, including;                             <ol style="list-style-type: none"> <li>Investment for a local defence infrastructure project to protect households from coastal erosion /permanent inundation.</li> <li>Households may receive a Coastal Erosion Assistance Grants (CEAG) from the Government to cover demolition costs up to the value of £6,000.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Pay-outs are made to individual households who are paying into the coastal accumulator fund.</li> <li>Pay-outs could either be reflective of each properties risk profile (e.g. premium-based) or standardised across all households paying into the scheme.</li> </ul>	<ul style="list-style-type: none"> <li>Pay-outs are decided by individual Local Authorities, giving them autonomy over what the money is used for (<b>Municipal Bonds Agency, 2021</b>).</li> <li>Possible options could include either costs to directly support households (e.g. relocation) or indirect costs to benefit adaption within the community (e.g. rollback, neighborhood resilience strategies).</li> <li>As pay-outs are administered by the Local Authority, there may be scope to adjust pay-outs to provide more support to e.g. households in lower socio-economic situations (<b>Green Finance Institute, 2021; Welsh LGA, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Pay-outs are administered through a central managing function to any household meeting the conditions set for pay-out (i.e. similar to an insurance set-up) (<b>Legal and General, 2021</b>).</li> <li>Pay-out benefits would likely be a cash payment, standardised across all properties however there is scope to adjust pay-outs so they are reflective of the socio-economic and/or risk profile (<b>Municipal Bonds Agency, 2021</b>).</li> </ul>
		End of life decommissioning	<ul style="list-style-type: none"> <li>Depending on the specific policy of the coastal area, defence schemes will either undergo maintenance, upgrading or in some cases, be decommissioned the to return to a managed realignment / no active intervention policy (<b>Environment Agency 2021</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Ideally, all three options would have a perpetual life-span so that each year new households within the coastal risk area (i.e. properties entering Epoch 3) are able to be included in the scheme (<b>Environment Agency, 2021; Defra, 2021</b>).</li> <li>Option end of life decommissioning has not been explored further through this exercise but would likely need to be considered as part of the implementation if any options are progressed.</li> </ul>		

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
2	b. How do recipients qualify for the proposed benefits?	Pay-out trigger points	<ul style="list-style-type: none"> <li>CEAG Grants awarded in consultation with the Local Authority and Environment Agency on a case by case basis (<b>Coastal Partnership East, 2021</b>).</li> <li>Coastal defense investment allocated through FCERM Guidance.</li> </ul>	<ul style="list-style-type: none"> <li>Thresholds will likely need to be decided in collaboration with Local Authorities / coastal authorities (<b>Coastal Partnership East, 2021</b>), but could include;                             <ol style="list-style-type: none"> <li>Once the property is deemed uninhabitable.</li> <li>At an agreed life expectancy (e.g. 1-year remaining).</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Local Authorities have greater control and flexibility over the pay-out trigger point, depending on how the pay-out will be used (<b>Environment Agency, 2021; Scottish Government, 2021</b>).</li> <li>Pay-outs to households will likely need to be based on an agreed definition e.g. once uninhabitable (<b>MHCLG, 2021</b>).</li> <li>Indirect pay-outs for adaptation based use cases could occur several years in advance of loss (e.g. to support local defences, buy-and-lease back a coastal property) (<b>Environment Agency, 2021</b>).</li> <li>Adaptation schemes using indirect pay-outs will likely still require a defined threshold to release payment (<b>MHCLG, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Thresholds will likely need to be decided in collaboration with Local Authorities / coastal authorities (<b>Coastal Partnership East, 2021</b>), but could include;                             <ol style="list-style-type: none"> <li>Once the property is deemed uninhabitable.</li> <li>At an agreed life expectancy (e.g. 1-year remaining).</li> </ol> </li> </ul>
		Exclusions	<ul style="list-style-type: none"> <li>Any household / community at risk of coastal erosion and coastal flooding / inundation is in scope however a scheme may not be deemed cost-effective when evaluated on a “per scheme” basis. Some properties do not qualify for the CEAG or for defense funding.</li> </ul>	<ul style="list-style-type: none"> <li>It is likely any property within Epoch 1 (i.e. 10 years from a loss occurring) will require substantial premiums in order to build up a sufficient a property-level fund, thus any household with short life-expectancies may be out-priced from this scheme.</li> <li>It is possible some household ‘archetypes’ may need to be de-scoped from this option / have pay-outs adjusted e.g. very high-value properties, second home-owners (<b>Environment Agency, 2021; Scottish Government, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>None - ability to generate a larger risk pool nationally negates requirement to exclude certain households from option.</li> <li>It is possible some household ‘archetypes’ may need to have adjusted pay-outs e.g. very high-value properties, second home-owners but are unlikely to require excluding from the option (<b>Environment Agency, 2021; Scottish Government, 2021</b>).</li> </ul>	

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
2	c. Who is able to deliver the option?	National Government	<ul style="list-style-type: none"> <li>Overall policy and strategy managed by national government via Environment Agency.</li> </ul>	<ul style="list-style-type: none"> <li>Policy and strategy could be controlled by Government, but isn't a requirement as the option could be set-up as a private initiative (Defra, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Policy and strategy will likely need to be controlled and disseminated by central Government in order to facilitate uptake across Local Authorities (Defra, 2021; Municipal Bonds Agency, 2021).</li> <li>Although not necessary, funds could be centrally managed by Government, e.g. Treasury (MHCLG, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Policy and strategy will need to be set by Government to enable scheme to be implemented (Defra, 2021).</li> <li>Depending on how the funding mechanism is set-up (e.g. general taxation), Government may need to play a role in managing payments into the scheme (MHCLG, 2021; Municipal Bonds Agency, 2021).</li> </ul>
		Local Authorities	<ul style="list-style-type: none"> <li>Local Authorities, in alignment with Shoreline Management Plans and FCERM guidance, manage local defence strategic approach.</li> </ul>	<ul style="list-style-type: none"> <li>Local Authorities may be required to work with households to determine point of loss (MHCLG, 2021).</li> <li>No administrative responsibility of the fund is expected.</li> </ul>	<ul style="list-style-type: none"> <li>Policy and strategy will likely need to be controlled and disseminated by central Government in order to facilitate uptake across Local Authorities (Defra, 2021; Municipal Bonds Agency, 2021).</li> <li>Although not necessary, funds could be centrally managed by Government, e.g. Treasury (MHCLG, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Policy and strategy will need to be set by Government to enable scheme to be implemented (Defra, 2021).</li> <li>Depending on how the funding mechanism is set-up (e.g. general taxation), Government may need to play a role in managing payments into the scheme (MHCLG, 2021; Municipal Bonds Agency, 2021).</li> </ul>
		Private Sector	<ul style="list-style-type: none"> <li>Individual households / communities may fund defence infrastructure (e.g. residents of the village of Thorpeness).</li> </ul>	<ul style="list-style-type: none"> <li>Option delivery is likely to lie within the private sector including scheme contributions, fund management, and pay-out administration (Legal and General, 2021).</li> <li>Delivery could lie with e.g. existing insurance companies, special purpose insurance vehicles or asset/fund managers (Legal and General, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Fund management is likely to sit within the private sector as e.g. new entity (e.g. FloodRe equivalent), asset/fund management organization (Municipal Bonds Agency, 2021).</li> <li>Private sector fund management could promote investment into the scheme from additional stakeholders (Legal and General, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Set-up likely to resemble a FloodRe type approach, with a distinct entity required to manage and administrate payments into and out of the fund (Municipal Bonds Agency, 2021).</li> <li>Private sector fund management could promote investment into the scheme from additional stakeholders (Legal and General, 2021).</li> </ul>
2	d. What are the critical enablers for the option to succeed?	Households applicable to scheme	<ul style="list-style-type: none"> <li>Any property at risk of coastal erosion / permanent flood inundation could be considered.</li> </ul>	<ul style="list-style-type: none"> <li>Only households with coastal erosion risk and/or risk of permanent coastal inundation.</li> </ul>	<ul style="list-style-type: none"> <li>Households at risk of coastal erosion risk and/or coastal inundation.</li> <li>Pool could be widened to the all Local Authorities with coastal risk permitting a larger funding pool to be obtained, helping drive down scheme contribution costs (Municipal Bonds Agency, 2021; Green Finance Institute, 2021).</li> </ul>	<ul style="list-style-type: none"> <li>Households at risk of coastal erosion risk and/or coastal inundation.</li> <li>Applicable household pool could be widened nationally (e.g. akin to FloodRe) permitting a far larger funding pool to help drive down household contributions into the scheme (Municipal Bonds Agency, 2021; FloodRe, 2021).</li> </ul>
		Mandatory vs. voluntary scheme	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>All three options would likely require a mandated / legislative requirement being passed to ensure enough households pay into the scheme (Defra, 2021; MHCLG, 2021; FloodRe, 2021).</li> <li>A voluntary system could be viable, but this would make it challenging to meet the required levels of uptake within the scheme (Defra, 2021; FloodRe, 2021).</li> </ul>		

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
2	e. How well does the option solve the problem?	Epochs covered	<ul style="list-style-type: none"> <li>Defences and grants principally focused on protecting properties at short-term / immediate risk (i.e. Epoch 1 / next 10 years).</li> <li>Some longer-term schemes (e.g. Thames Flood Barrier) are implemented where cost-benefit is robust.</li> </ul>	<ul style="list-style-type: none"> <li>Properties in Epoch 1 likely only have &lt;10yrs to build up a scheme, so thus will likely be priced out of a solution due to the high costs of premiums.</li> <li>Households in Epoch 2 and 3 are covered.</li> </ul>	<ul style="list-style-type: none"> <li>Depending on the size of the pool contributing to the fund, there is scope to cover properties within Epoch's 1, 2 and 3.</li> </ul>	
		Climate change considerations	<ul style="list-style-type: none"> <li>Individual defence schemes will consider local impacts of climate change.</li> <li>Designs may be adapted to account for possible sea level rise etc.</li> </ul>	<ul style="list-style-type: none"> <li>Climate change is predicted to increase the number of properties exposed to coastal erosion and permanent coastal flood inundation / sea level rise (reference).</li> <li>All three options are structured flexibly to allow for properties that may become exposed to climate change impacts in the future, be included within the scheme.</li> <li>Climate change has not been considered in the modelling contained within this report – this is an area that should be explored in greater detail in any follow-on assessments.</li> </ul>		
		Perils covered	<ul style="list-style-type: none"> <li>Coastal erosion.</li> <li>Coastal flood (incl. permanent inundation, and future sea level rise).</li> </ul>	<ul style="list-style-type: none"> <li>All three options can cover both coastal erosion and coastal flood (incl. permanent inundation and future sea level rise).</li> <li>Whilst FloodRe is in operation (expected end date of 2039), coastal flooding is currently included within the definition of insured losses (<b>FloodRe, 2021</b>) and thus there schemes may need to consider the inclusion of coastal flooding as it is already covered through FloodRe (see Evaluation Theme 5 for implications on policy).</li> <li>Whilst this project has only considered coastal erosion and flooding, there may also be scope in the future to bring additional perils into the scheme which require more innovative funding/financing solutions (e.g. subsidence) (<b>Environment Agency, 2021</b>).</li> </ul>		
		Geographies covered	<ul style="list-style-type: none"> <li>England, Scotland, Wales and Northern Ireland currently have processes in place.</li> </ul>	<ul style="list-style-type: none"> <li>All geographies; England, Scotland, Wales and Northern Ireland.</li> </ul>		
		Most effective scale for rolling out the option	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Scheme operation would work most effectively as a nationally joined up approach (i.e. between England, Scotland, Wales and Northern Ireland).</li> <li>This will increase the number of households who can benefit from the scheme.</li> </ul>	<ul style="list-style-type: none"> <li>Scheme operation would work most effectively as a nationally joined up approach.</li> <li>This will increase the number of households who can benefit from the scheme.</li> <li>If a nationally joined up approach is not feasible, there may be scope for individual Local Authorities / regions of the UK to operate smaller funds however the specific financial feasibility of each of these would need to be assessed on a case by case basis.</li> </ul>	



**3. Financial Feasibility and Economic Case:** Economic appraisal to establish critical success factors for each option and establish an overview of the costs/benefits associated with each.

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
3	a. How does the option generate required capital?	Upfront/seed funding	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Upfront funding would be required to fully design and implement the scheme (e.g. similar to the set-up period for FloodRe) (<b>FloodRe, 2021</b>).</li> <li>Seed funding is not essential as funds are based upon the individual households paying into the fund but where available, funding could enable properties in Epoch 1 to be included within the scheme.</li> <li>Any seed funding would likely require either central Government funding or private investment (<b>Municipal Bonds Agency, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Upfront funding would be required to fully design and implement the scheme (e.g. similar to the set-up period for FloodRe) (<b>FloodRe, 2021</b>).</li> <li>Seed funding is not essential as the larger pool size enables a greater funding pool.</li> <li>Seed funding could offer greater flexibility for Local Authorities to use pay-outs, and may increase the longevity of the scheme in the longer-term (<b>Municipal Bonds Agency, 2021; MHCLG, 2021</b>).</li> <li>Seed funding could be derived from a combination of central Government funding, private investment or also through Local Authority loans/bonds (<b>Defra, 2021; Municipal Bonds Agency, 2021</b>).</li> </ul>	
		<p><b>Scheme contribution(s):</b></p> <ul style="list-style-type: none"> <li>Contribution type (e.g. premium, tax)</li> <li>Contributing party (e.g. homeowner, government)</li> </ul>	<ul style="list-style-type: none"> <li>Government contribution through national taxation.</li> <li>Some private schemes may be funded by individual households / communities not considered viable through public agencies.</li> </ul>	<ul style="list-style-type: none"> <li>Household owners likely responsible for all scheme contributions as a form of household premium</li> <li>Contributions are likely to be voluntary under current policy structure, although there may be scope to explore a mandated contribution to the scheme in order to increase the pool size (<b>MHCLG, 2021</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Contributions likely to form some part of taxation, which may include a new system or leverage an existing system (e.g. council tax, internal drainage board fees) (<b>MHCLG, 2021</b>).</li> <li>Scheme could be tied to a Local Authorities risk profile, where each LA is responsible for collecting its own contributions from properties fallen within the parameters of the scheme.</li> <li>Possibility for Local Authorities to provide upfront funding through, for example, a loan/bond (<b>Municipal Bonds Agency, 2021</b>).</li> <li>Depending how the scheme is set up, there could be additional contributions from government to support growth of the fund.</li> </ul>	<ul style="list-style-type: none"> <li>Contribution mechanisms will likely depend on the scale of the solution.</li> <li>A smaller pool may utilise a more local contribution mechanism through, for example, Regional Flood and Coastal Committees (RFCC) who approve the annual programme of Flood and Coastal Risk Management (FCRM) work and set the local levy that funds FCRM activities (<b>Environment Agency, 2021</b>).</li> <li>A larger pool may utilise a more national mechanism such as council, general taxation or a system similar to FloodRe where contributions are made through household property insurance premiums (<b>FloodRe, 2021</b>).</li> </ul>
	b. Does the option represent value for money?	Benefits	<p>Considerations for table:</p> <ul style="list-style-type: none"> <li>Economic/Social Impacts (community benefits).</li> <li>Opportunities for economies of scale.</li> <li>Financial sust/capacity for self-funding.</li> <li>Anticipated impacts of non-completion.</li> <li>Benefits to Local Authority and Gov.</li> </ul>	<ul style="list-style-type: none"> <li>See coastal loss modelling results (Section 4.3).</li> </ul>	<ul style="list-style-type: none"> <li>See coastal loss modelling results (Section 4.3).</li> <li>Fund payouts could be used to pay-off homeowner mortgage liabilities, reducing potential for property blight from the perspective of banking lenders (<b>Nationwide, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>See coastal loss modelling results (Section 4.3).</li> </ul>
		<p><b>Costs/affordability analysis:</b></p>	<p>Considerations for table:</p> <ul style="list-style-type: none"> <li>Design/set-up.</li> <li>Implementation.</li> <li>Post-completion/scheme man.</li> <li>Option benefit/fund maturity.</li> <li>Decommissioning.</li> </ul>	<ul style="list-style-type: none"> <li>See discussion within section 4.3 and section 5.1.3 for full evaluation.</li> </ul>		

**4. Social/Commercial:** Examines how each option will contribute social and commercial value to individual households and across communities.

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
<b>4</b>	<b>a. Who benefits from the option?</b>	<b>Parties benefitting from scheme</b>	<ul style="list-style-type: none"> <li>Households can be protected by public defences where implemented.</li> <li>Smaller communities/ individual exposed households may not benefit from public defences where the cost-benefit of defences is not deemed viable.</li> <li>Commercial/ industrial/public premises can be protected by public defences where implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Scheme likely only applies to household homeowners in properties at risk of erosion/inundation (i.e. not tenants) as it is a property-linked fund (<b>Legal and General, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Scheme has potential to support any residential household (incl. owners and tenants) at risk of erosion and inundation.</li> <li>Depending on the scale of fund/ who is required to contribute, benefits may also include properties within defended areas e.g. wider funding to support community-level resilience to erosion/inundation (<b>Scottish Government, 2021</b>).</li> <li>Depending on how payouts are used by LA's, coastal adaptation through e.g. funding to increase tourism, promoting commercial opportunities, could benefit non-local members of the public who use the coast (<b>Environment Agency, 2021; Welsh LGA, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Scheme has potential to support any residential household (incl. owners and tenants) at risk of erosion and inundation.</li> <li>Depending on the scale of fund/ who is required to contribute, benefits may also include properties within defended areas e.g. wider funding to support community-level resilience to erosion/inundation (<b>Scottish Government, 2021</b>).</li> </ul>
		<b>Parties who do not benefit from scheme</b>	<ul style="list-style-type: none"> <li>Smaller communities/ individually exposed households may not benefit from public defences as cost-benefit of defences is not viable.</li> </ul>	<ul style="list-style-type: none"> <li>Commercial/industrial/ public premises not currently not in scope.</li> <li>Possibility scheme could be expanded to include commercial premises longer-term.</li> <li>Limited benefit to non-homeowners e.g. tenants.</li> <li>No funding potential for community-level resilience/adaptation.</li> </ul>	<ul style="list-style-type: none"> <li>Commercial/industrial/public premises not currently not in scope.</li> <li>Possibility scheme could be expanded to include commercial premises longer-term.</li> </ul>	
<b>4</b>	<b>b. What is the social impact of the option?</b>	<b>Likely levels of public support</b>	<ul style="list-style-type: none"> <li>High amongst protected communities.</li> <li>Low where households are unprotected/ potential negative.</li> </ul>	<ul style="list-style-type: none"> <li>Whilst not assessed directly through this project, anticipated public support is likely high, particularly amongst households which historically have not benefitted from traditional coastal defence programmes.</li> <li>If progressed, a public engagement process should be undertaken to understand likely levels of support for the scheme across communities who would be contributing to the schemes.</li> </ul>		
		<b>Positive social impacts</b>	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Homeowner/house market likely to remain viable even in more exposed areas as option offsets loss of house value.</li> <li>Scheme supports any homeowner and could be adjusted to provide enhanced support to those more vulnerable/in need (<b>MHCLG, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Homeowner / house market likely to remain viable even in more exposed areas.</li> <li>Community cohesion will likely be retained, acting to "level-up" the local coastal areas and promote investment, settlement, tourism and business (<b>Defra, 2021; Scottish Government, 2021; Green Finance Institute, 2021</b>).</li> <li>Scheme supports all residential situations (e.g. homeowner, tenants, social housing) and could be adjusted to provide enhanced support to those more vulnerable / in need (<b>MHCLG, 2021</b>).</li> <li>Where funding can be used indirectly to support communities (e.g. funding to improve the local area such as beach access, facilities, amenities to increase visitors / tourists), businesses may benefit (<b>Environment Agency, 2021; Welsh LGA, 2021</b>).</li> </ul>	
		<b>Negative social impacts</b>	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Where commercial/ industrial/public premises are not currently not in scope, there may be gradual loss of community cohesion.</li> <li>Non-homeowners e.g. tenants, are unlikely to benefit from the scheme so may be adversely affected.</li> </ul>	<ul style="list-style-type: none"> <li>Where commercial / industrial / public premises are not currently not in scope, there may be gradual loss of community cohesion. This could impart be minimized through the use of funds to support community-level resilience / adaptation (<b>Environment Agency, 2021; Defra, 2021; Scottish Government, 2021</b>).</li> <li>Both options could also be expanded to include these premises however this was not in the scope of the current report.</li> </ul>	

**5. Policy/Legal:** Evaluation of current policy and legal framework to establish fit, existing gaps and critical success factors required to deliver each option.

	Technical Questions	Assessment Criteria	Option 0 – Continue Current Practice	Option 1 – Coastal Accumulator Fund	Option 2 – LA Coastal Adaptation Fund	Option 3 – Levy Model
5	a. What policy is required to implement option?	Relevance of existing policy/legislation	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Policy implications of FloodRe mean that coastal inundation is currently included within its remit, however coastal erosion losses are not (<b>FloodRe, 2021</b>).</li> <li>This potentially has implications on the size of the pool available to contribute to a scheme.</li> </ul>	<ul style="list-style-type: none"> <li>Both options could benefit from leveraging existing mechanisms in place for e.g. collecting contributions, managing funds and/or making payouts under the scheme.</li> <li>The individual specifics of existing policy and legislation would require more thorough review where an option is progressed, however interviews with relevant parties highlighted relevance and precedent for raising funds through various mechanisms (see section 4.1 case studies for detail) (<b>Municipal Bonds Agency, 2021; MHCLG, 2021; Welsh LGA, 2021; Nationwide, 2021</b>).</li> </ul>	
		Overlap with existing mechanisms that could be leveraged	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>FloodRe already covers losses related to coastal inundation.</li> <li>Where households are repeatedly impacted through coastal flood inundation losses year on year, FloodRe's has the potential to permit property reinstatement in a nearby area which is at no/substantially lower coastal flood risk. This would be decided on a case by case basis and is dependent on individual insurers (<b>FloodRe, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Local authorities could leverage existing mechanisms already in place in order to collect scheme contributions. Examples could include council taxation, payments collected via Internal Drainage Boards and precepts set up with local authorities (<b>MHCLG, 2021; Municipal Bonds Agency, 2021</b>).</li> <li>A smaller pool may utilise a more local contribution mechanism through, for example, Regional Flood and Coastal Committees (RFCC) who approve the annual programme of Flood and Coastal Risk Management (FCRM) work and set the local levy that funds FCRM activities (<b>Environment Agency, 2021</b>).</li> <li>Although there are linkages with the Levy Model to FloodRe, coastal erosion is unlikely to be accepted by insurers as it is not a conventionally insurable peril, so likely does not overlap with any other existing programmes (<b>FloodRe, 2021; Defra, 2021</b>).</li> </ul>	
	b. Are there any policy/legislative implications of the option?	Possibility for profiteering/gaming	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Limited possibility for profiteering, particularly where fund pay-outs are linked to risk-profile and 'premiums' paid into the fund.</li> <li>Scheme payments will sit with each household owner so limited risk for e.g. tenanted properties paying to support a landlord.</li> </ul>	<ul style="list-style-type: none"> <li>The interaction between household tenants/homeowners needs to be considered to ensure equitable benefit is distributed to those contributing.</li> <li>Depending on how fund contributions are set-up (e.g. taxation mechanisms), there is a risk that tenanted properties may end up supporting property owners and tenants therefore receiving little benefit (<b>MHCLG, 2021</b>). This risk could be managed through e.g. transferring fund contributions onto household owners / tenants equitably and subsequently ensuring payouts support both the landlord (e.g. covering demolition costs) and tenants (e.g. relocation / rehousing support) (<b>Coastal Partnership East, 2021</b>).</li> </ul>	
		Implications on who bears the cost	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Homeowners with risk required to pay an additional 'premium' –potential for some homeowners not currently benefiting from coastal protection to see this as unjust (<b>Green Finance Institute, 2021</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Equitable balance needs to be found where those most vulnerable to coastal erosion/inundation are supported adequately (i.e. contribution vs. payout is adjusted to provide equal benefit) (<b>Defra, 2021; Scottish Government, 2021</b>).</li> <li>Where option contributions reflect a wider risk pool (e.g. national levy), there may be implications on how payouts benefit those that are not directly exposed to coastal erosion/inundation. Indirect payouts from the scheme could be one way in which expanding the contribution pool highlights benefit (e.g. funding to improve the local area such as beach access, facilities, amenities to increase visitors / tourists) (<b>Environment Agency, 2021; Welsh LGA, 2021</b>).</li> </ul>	







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