

MARSH

2 March 2026

Coast Re

Exploring potential models for
coastal erosion insurance



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Acknowledgements

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Section 1

Executive summary

1.1 Project rationale and scope

Coastal erosion has long been a concern for seaside communities but, now more than ever, the impacts are more challenging to manage due to the effects of climate change exacerbating sea level rise and increasing storm activity. With losses of land, properties and infrastructure worsening, the lack of support or options for residents losing their homes has been increasingly scrutinised.

Some governmental support is provided in the form of the Coastal Erosion Assistance Grant to mitigate a portion of the cost of demolition for at some risk properties. However, the burden of acquiring a new home is on the residents themselves or, very often, the relevant Local Authority through social or temporary housing, which is often over-subscribed. Further, coastal erosion risk is not covered by property insurance policies and, with limited ability to sell high risk homes, residents are often unable to benefit from private market funding to enable independent relocation.

North Norfolk Council, as part of the Coastwise project, sought to understand whether a national level Public-Private insurance scheme, akin to Flood Re for flooding risk, could be possible for coastal erosion, whether integration into the existing Flood Re scheme would be a feasible option, how coverage of erosion risk might overlap with landslip risk and the scale of future annual erosion losses that a scheme would need to cover, based on National Coastal Erosion Risk Mapping (NCERM) data.

Marsh has undertaken detailed research, SME interviews and data analysis to:

- Define the **key challenges of insuring coastal erosion risk** and why certain, similar risks (landslip, life insurance) are readily insured where coastal erosion is not
- Review private market insurance landscape to establish **if coastal erosion is ever covered**, including in international markets
- Establish **how cases of landslip associated with coastal erosion have been treated** in practice
- Analyse NCERM data to provide an indication of the **annual scale of properties at risk of coastal erosion** for different defence and climate scenarios
- Review existing Public-Private climate-related insurance schemes, including Flood Re, to assess the **applicability of current examples and structures to coastal erosion risk**. This included more detailed analysis for Flood Re to determine the **feasibility of adding erosion risk into the existing scheme**

- Outline **alternative risk transfer solutions** that do not rely on traditional indemnity insurance mechanisms

1.2 Conclusions and next steps

Public sector involvement would be required to establish a solution at the national level, and **new legislation would be needed** to define the scope of a scheme and apply a suitable mandate to promote private sector involvement. Policy change related to household support payments for erosion loss would also support creation of a solution, **shifting the mindset away** from providing money for nothing to enabling adaption and proactive risk management.

Traditional indemnity insurance does not easily apply to coastal erosion risk, making **establishment of a national insurance scheme challenging**. A broader climate risk insurance scheme that covers other climate perils, as well as erosion risk, may be more feasible as it would increase the pool of people requiring cover and diversify the scheme's exposure. **Integrating erosion risk directly into Flood Re is not deemed a viable option**, as this would also require legislative change and significant amendments, and is limited by the expected end date of 2039 for Flood Re.

Alternative solutions to financing coastal erosion risk exist, including:

- **Public sector risk funds** that are likely to have fewer challenges than private insurance, however a capital stream to fund a scheme would need to be established
- **Local Authority level parametric** insurance which relies on a relevant risk-related measure (index) and a trigger point being met rather than an actual loss, which has the potential to be pooled at a national level

Recommendations following this piece of work are:

1. **Central government engagement** to communicate the outcomes of this report, align on the insurability challenges of erosion and define the potential need for legislative / policy changes
2. **Broader engagement of Local Authorities with erosion risk** to spread awareness of erosion risk transfer options and enable understanding of priorities in other regions
3. **Continue ongoing work to develop possible options for a public fund solution** to share learnings and pursue more viable options from previous work, assessing feasibility of a public risk fund and engaging communities to understand their needs
4. **Coastal erosion parametric insurance feasibility study** to develop a possible parametric insurance solution for coastal erosion for a Local Authority, including design of an appropriate index, trigger point and limits

Section 2

Coastal erosion insurance landscape

Unlike many other climate-related risks, property insurance does not cover erosion-related losses. The risk is often termed uninsurable, however this wording can be misleading. Technically, any risk could be insurable at the right price. For coastal erosion risk, especially for those at highest risk of loss in the near future, the premium would need to be significant to make underwriting the risk a profitable activity. The cost needs to reflect the risk a property brings to the insurer and, in the case of erosion, it could be close to the value of the property. Therefore, the inclusion of erosion risk is deemed unfeasible.

In this section, we define coastal erosion risk, the factors that make it “uninsurable” from a traditional indemnity perspective (compensating for a financial loss to place the insured in the same financial position as they were in pre-loss) and how it aligns with other risks, in order to identify potential innovative financing solutions.

2.1 Coastal erosion definition

Coastal erosion is defined as a natural process whereby the movement and impact of the sea causes movement and loss of soil, sand and bedrock. Sediment and rocks are washed away, causing the coast to move landwards.

2.1.1 Causes and drivers of coastal erosion

Causes

Wave action, currents, tidal and sediment movements all contribute to the natural processes that cause coastal erosion.

There are four main processes that cause it to occur:

- Hydraulic Action
- Abrasion
- Corrosion (Solution)
- Attrition

Hydraulic Action

Hydraulic action occurs due to the force of waves hitting against cliffs and the shore. The waves cause air to be forced and compressed into holes and cracks in these

structures, which creates a change in pressure. As waves retreat and the air rapidly leaves the cliff, it can cause an explosive effect due to the release of pressure. This process, alongside weathering, can cause significant breaks in cliffs and substantial coastal material to be released into the sea.

Abrasion

Coastal erosion caused by abrasion (also referred to as corrasion) occurs when waves and currents carry rocks and pebbles that are repeatedly thrown against cliff faces and rock surfaces. The constant grinding and impact wears down the rock over time.

Corrosion

Corrosion (also known as solution) is a type of coastal erosion where salts and acids in seawater chemically react with minerals in the rock. This reaction gradually dissolves and weakens the rock, particularly those that are more soluble, leading to its disintegration over time.

Attrition

Attrition is a form of coastal erosion where sediment particles carried by waves and currents collide and break into smaller, smoother pieces. As rocks and pebbles hit each other, they gradually wear down and, over time, the fragments can become very small particles such as sand or silt. Smaller particles can be easier to carry away by waves and currents, increasing sediment transport and reducing the sediment levels in certain areas of the coast. Sediment often buffers the impact of waves on the coastline, so lack of this in some areas can increase the risk of other erosion processes. In addition, attrition can exacerbate abrasion, increasing the abundance of abrasive materials present in the water.

Drivers

A number of factors drive these natural processes, increasing the rate of erosion. These drivers include:

Wind

Wind can generate and intensify waves that deliver greater energy to the shore, increasing the capacity to dislodge and transport sediment and rock. It can also directly erode beaches by picking up and moving sand and other particles.

Storms

Linked to wind, storms are example events that can produce stronger, more frequent waves, as well as storm surges, that raise water levels and wave energy. The combination of intense winds, strong currents and high water levels can push waves further inland, inundating beaches and coastal structures, eroding cliffs and removing sediment, accelerating coastline retreat.

Tides

Strong tidal currents mobilise and transport substantial volumes of sediment during flood and ebb cycles, increasing shoreline erosion. This is particularly true where tidal ranges are large, meaning that there is a big difference between the high and low tide levels, resulting in stronger tidal currents.

Sea-level Rise

Sea-level rise raises the baseline water level, enabling waves and storm surges to reach further inland, with greater energy hitting beaches, cliffs and coastal defences, increasing the frequency and severity of high-tide and storm-driven erosion — all of which accelerate shoreline retreat.

Cliff Geology

Cliff geology strongly controls coastal erosion risk. Rock type determines inherent resistance: soft materials like clay, sandstone and shale erode quickly, whereas hard rocks such as granite and basalt are more resistant. The structure of the cliffs also plays a part in the risk. The presence of joints, faults and fractures introduces weakness that concentrate weathering and can result in collapse, particularly through hydraulic action. Bedding orientation of the rock layers can also promote slumping or sliding.

Climate Change

The majority of these drivers (excluding cliff geology) are exacerbated by the changing climate. Global warming is causing sea-level rise, adding to increased wave energy and the reach of the sea. In addition, climate change is increasing the occurrence of adverse weather events, causing more storms and strong winds than before, resulting in longer periods of intense erosion activity.

2.1.2 Consequences of coastal erosion

The consequences of coastal erosion can be broadly grouped into three key areas:



Environmental Damage

Destruction of natural habitats and increased coastal risk



Social Impacts

Direct impacts to coastal communities, including homes and businesses



Economic Costs

Significant damage to infrastructure and costs for defences

Environmental Consequences

- **Loss of habitats:** Coastal ecosystems like sand dunes, salt marshes, and cliffs are destroyed, affecting biodiversity and wildlife. Erosion of certain, carbon-rich ecosystems, such as peat cliffs, salt marshes and buried seagrass, can release long-term stored carbon into the ocean and atmosphere, contributing to climate change. Where these ecosystems have been depleted, it also reduces the future carbon sink capacity.
- **Increased coastal flooding:** Beaches and sediment can act as natural barriers to coastal inundation and storm surge. With erosion breaking down these natural defences, some areas may be at greater risk of flooding.
- **Changes to sediment deposit:** Erosion in one area can affect deposition elsewhere, with processes such as longshore drift removing the sediment from one coastline and depositing it on the other, to the detriment of the initial location. The UK has a naturally functioning coast with normal coastal processes that historically would have allowed its landforms and habitats to move and shift, developing over time in a dynamic way. However, previously introduced hard structures along the coast have arrested these natural coastal processes in some places, re-directed them in others and even intensified them elsewhere.

Social Consequences

- **Displacement of communities:** People living in high-risk coastal areas are often forced to move out of the local area, breaking up communities. This is sometimes known as "climate migration". Where homes, business, access roads or community amenities are lost over time, communities can be reduced or fragmented from the surrounding area.
- **Mental health effects:** The loss or threat of loss of a home, frequent disruption, displacement and economic uncertainties can all contribute to stress, anxiety and depression for coastal residents. The Environment Agency previously undertook a high-level assessment to quantify an associated mental health cost of coastal erosion. The estimate from 2018 indicated that the cost is around £9,500 per adult, incurred once in the year that their home was lost to erosion, although it is widely accepted that this is likely to be an underestimate. Further, living in a home at risk of erosion can lead to a lack of maintenance and poor housing condition, which can cause physical health conditions and emotional distress.
- **Loss of heritage sites:** Erosion poses a threat to UK heritage sites, endangering castles, monuments and architectural sites. Historical landmarks and culturally significant areas, once lost to erosion, cannot be replaced. Many residents and tourists alike are attached to the landscapes and heritage being lost.

Economic Consequences

- **Damage to property and infrastructure:** Coastal erosion can cause permanent loss of homes, businesses, roads, and utilities near cliffs due to the collapse of underlying structures. Where debris remains from damaged infrastructure, there can also be significant demolition costs to make sites and surrounding areas safe. Once properties are demolished, there is limited support to enable residents to meet their own housing need property and often local councils will be required to rehouse them.
- **Loss of property value:** Properties located in high-risk erosion zones can lose significant value, making it more difficult for homeowners to sell up and afford a similar priced house once they decide to move elsewhere.
- **Impact on tourism:** Coastal erosion may pose a threat to the value created by the tourism industry. A drop in tourism can also translate into increased unemployment.
- **High cost of coastal defences:** Sea walls, groynes, and other defences are expensive to build and maintain, and many of these costs are often borne by local councils. Defences will likely be uneconomic in many locations, and it is often impossible to attract sufficient funding. Once implemented, defences can be substantial to the point that they can spoil the nature of an area, potentially impacting the tourism value and becoming increasingly expensive to inspect and maintain. If not maintained or replaced, eventual failure of the defences would lead to a large and rapid "catch up" erosive period.

2.2 Comparison with landslip risk

Landslip, or landslide, risk can be linked to coastal erosion. A landslip event involves the downhill movement of earth or rock due to gravity. They can be triggered by factors unrelated to a coastal location, such as heavy rainfall or groundwater saturation, which weaken the underlying ground / geology.

Coastal erosion can also contribute to the occurrence of a landslip event. Erosion at the base of cliffs will reduce support lower down, undercut the structure and make slopes more unstable, increasing the likelihood of collapse.

Losses due to landslip, unlike coastal erosion, are often covered under property insurance policies. However, exclusions also apply in landslip policies where the loss was deemed to be caused by erosion. This can cause confusion amongst policy holders on the coast, who may consider themselves insured until they experience a loss and receive no payout because erosion is deemed the proximate cause. Therefore, it is unlikely that there is clarity of coverage amongst policyholders as to the difference between the risks and the scenarios that insurance will actually pay out for.

Given the possible link between the two processes, it is important to understand the differences and overlaps to further clarify why one is insurable and the other is not.

2.2.1 Types and causes of landslide

Types

Slides

A slide event involves a downslope movement of material along a rupture or slip surface. There are two types of slide failure:

- **Rotational (slumps):** The slip surface is listric (curved or spoon-shaped)
- **Translational (planar):** Slide occurs along a planar surface of weakness, such as a fault or joint

Falls

Landslips that involve the collapse of material from a cliff or steep slope are categorised as falls. These events usually involve free fall or rolling of material, resulting in debris near the base of the slope.

Topples

Topples are caused by forward rotation and movement of earth out of a slope, rotating around an axis at the base of a cliff.

Flows

A flow landslide involves the movement of fluid material down a slope. These events can involve mud, debris or rock flows.

The types of landslide that are most commonly related to coastal erosion are those that occur due to the undercutting of the base of a cliff. They include:

1. **Rotational slides (slumping)** whereby erosion causes a curved slip surface to form that allows earth at the top of the slope to slide down
2. **Translational slides** on cliffs with rock layers that sit on top of weaker materials such as clay. With the bottom layer eroded, the top layer can slide down a flat plane
3. **Rock falls** occur on harder cliffs, such as limestone. Erosion weakens the base, causing a sudden vertical fall
4. **Mudflows** result from saturation of soft soil in coastal slopes, either from waves or rainwater, causing material to flow downslope

Causes

Cliff Geology

Characteristics such as rock type, soil composition (especially clay-rich soils), slope steepness, and the presence of fractures can affect the susceptibility of a cliff to fall.

Weather Triggers

Heavy or prolonged rainfall, rapid snowmelt, freeze thaw fracture, wind and wave action and prolonged periods of very dry, hot weather can weaken the cliff material or initiate ground movement and landslips. Earthquakes can induce ground shaking that weakens cliff material and looking further afield, volcanic eruptions can also induce landslips.

Human Contributions

Deforestation, excavation, slope cutting, altering drainage patterns, and adding weight through construction can destabilise slopes by removing natural support, increasing water saturation, or changing the angle of a slope.

2.2.2 Consequences of landslip

The consequences of landslip are largely the same as those of erosion, as both ultimately result in loss of land. In reality, landslip can be a consequence of coastal erosion, causing the associated, significant impacts on the environment, society, and finances.

2.2.3 Regional examples of erosion processes

In both North Norfolk and the East Riding of Yorkshire, the coastline largely consists of sands, gravels, silts and clays. The soft nature of the cliff geology results in greater vulnerability to erosion caused by wave action, causing undercutting. In addition, the sand and gravel components are permeable, while clay is not. This results in permeated water being intercepted by the clay structure, pooling on top of this layer and discharging from the cliff, increasing risk of landslide.

Undercutting from erosion makes the cliffs more prone to landslip events. Further wave action will remove any fallen material from cliff bases so that faces remain steep and unstable, susceptible to further failures. Wave action will quickly remove fallen material from the base of the cliff, maintaining the face at a steep, unstable, angle and leaving it prone to further failure.

Groundwater erosion from saturation of the clay layers can cause either mudflows or slumping. These can be small however, on high cliffs, it can result in significant mudflows or rotational slides that displace large volumes of material.

2.2.4 Landslip vs coastal erosion

Summary of key factors

Factor	Landslip	Coastal Erosion
Definition	Sudden or gradual downhill movement of earth, rock, or debris due to gravity — often triggered by high groundwater levels, earthquakes, or unstable slopes (which can result from erosion)	Gradual, ongoing wearing away of the land along coastlines by waves, tides, currents, and wind
Location	Coastal or inland slopes and cliffs, areas with saturated or weak soils, especially after heavy rain	Beaches, sea cliffs, and shorelines, especially active in areas with soft rock or high-energy waves
Certainty	Lower certainty that a landslip event will occur, often reliant on triggering conditions to be met which are uncertain	Ongoing gradual erosion process means that there is high certainty coastal land will be eroded

Overlap of processes

- **Erosion as a trigger for landslips:** Coastal erosion is a cause of landslip. Wave action at the base of a cliff, removing cliff material and creating an undercut, can result in the unsupported layers collapsing, leading to a landslip event
- **Landslips and coastal processes:** Landslips can dump a large volume of soil, sediment or rock into the sea. Waves then erode this new material, increasing sediment movement and possibly reshaping beaches

An actual loss event caused by coastal erosion is likely to result from some form of landslip, as the land upon which a property stands will no longer be strong enough to hold its weight, and the cliff will collapse. Therefore, insurance coverage of coastal erosion has significant potential to overlap with landslip. The next section explores the current insurance landscape and how these risks are commonly treated in the market.

2.3 Coastal erosion insurability

2.3.1 Factors that make a risk insurable

For a risk to be insurable, there are a number of conditions that typically need to be met, including a non-exhaustive selection below:

- **Uncertainty:** The happening of an event must be unforeseeable and not inevitable (life insurance is an exception to this rule, more information provided in section 2.5). The loss has to be a sudden occurrence, not due to a gradual cause that is anticipated.
- **Predictability of loss probabilities:** While insurers are averse to covering inevitable losses, they want to understand the probability of an event occurring. Therefore, they require historic data that is sufficiently accurate to provide an estimate of how often losses will occur and how severe a loss event could be. This ultimately helps to determine the premium they will set for the risk, with the aim of the total premium collected exceeding the total loss experienced.
- **Losses are unlikely to be catastrophic:** A large number of losses at the same time (e.g. highly concentrated or systemic risks) could incur a significant payout from insurers at one time, potentially putting at risk an insurer's ability to pay all claims. As such, insurers aim to diversify the risks that they underwrite to minimise the possibility of incurring catastrophic claims. Insurers may also purchase reinsurance to manage this challenge.
- **Large, homogenous exposure:** There should be a significant group of similar risks to enable pooling. Pooling of risks benefits from the law of large numbers, enabling insurers to better predict frequency and severity. This is true when the exposure is homogenous and the risks are similar, as too much variety in risk would make statistical analysis difficult.
- **Economic feasibility:** Premium charged must be sufficient to cover expected losses, as well as expenses, administrative costs and required solvency provisions. The cost must also be low enough for the insured that the relative benefit of purchasing the insurance is enough that they will be willing to pay the premium.
- **Legal and social acceptability:** Covering the risk must comply with legal constraints and public policy. Moral hazard (an insured party becoming laxer with risk management due to the knowledge that insurance will payout in the event of loss) and adverse selection (when one party in a transaction has more information than the other, often resulting in outcomes that favour the more informed party) must also be manageable.

2.3.2 Challenges of insuring coastal erosion

When considering the applicability of these conditions, erosion risk to coastal properties fails to meet / does not fully align with a number of key criteria for traditional insurability.

Uncertainty	• Coastal erosion is largely a gradual, inevitable process as opposed to a discrete, accidental event • It is often predictable in direction, especially with climate change and rising sea levels, however the rate of erosion and the exact locations of damage do have some uncertainty • Insurers prefer to cover risks that are sudden, discrete, and not guaranteed to happen – erosion being inevitable (albeit with uncertainty about exactly when a loss could occur) makes it difficult to underwrite
Predictability of loss probabilities	• Rates of erosion vary significantly by location due to differing geological composition, defences, local policy and climate change impacts • Therefore, the data available to insurers may make it difficult to model, with any level of certainty, the likelihood of losses for the pooled risks • Although it is possible to estimate broad-scale erosion risk (e.g. number of homes at risk across a time period), the precise timing and extent of loss are more challenging to predict
Losses are unlikely to be catastrophic	• Erosion could result in significant, potentially catastrophic losses through two levers: The size of an individual loss and the potential for many concurrent losses • Erosion can lead to irreversible losses, where properties are permanently lost (either due to being lost to the sea or forced demolition) and the land is no longer available to rebuild on – This could result in a significant payout by insurers to indemnify total losses, compared to e.g. flooding where properties often experience some damage but are still largely intact • The cost from significant solo losses can be drastically compounded if many properties in one region are similarly threatened, resulting in a large aggregate exposure for insurers – thousands of properties are anticipated to be lost to erosion over time in the UK, which could cause significant strain to insurance companies were the risk covered

Large, homogenous exposure	• Aligned to the challenges of modelling the probability of coastal erosion risk, coastal properties at risk are highly heterogeneous in exposure, meaning there is uneven distribution of risk across a group. Some people are on the very edge of a cliff, whilst others are inland and face minimal risk • This reduces the ability to pool risk in a way that smooths the individual risks – Some properties are more exposed than others, which could lead to adverse selection whereby only those with less risk are able to buy cover, as insurers aim to exclude high-risk properties
Economic feasibility	• For coastal erosion risk, given the high uncertainty in when a loss might occur and high potential losses, premiums would need to be significant to cover the risk brought to insurers
Legal and social acceptability	• In England and Wales, the management intent for sections of coast is detailed in Shoreline Management Plans. These are non-statutory documents that include agreed management approaches for individual sections of coast. In some locations the agreed approach is managed realignment or no active intervention. Insurance usually depends on some expectation of mitigation, something which properties in some policy areas will not benefit from. • There is no legal requirement or scheme compelling insurers to cover erosion losses, as with Flood Re for flood risk • The public are often not well informed about erosion risk, with many expecting that local or central government will take action to slow the risk or aid once property is lost – However there is no mechanism to compensate loss due to erosion, with government support limited to grants for demolition in some situations and social rehousing where eligible • There may also be moral hazard challenges where property owners try to anticipate when the loss will occur and when to take out the insurance policy

Other challenges may arise because of the gradual nature of erosion. The time horizon over which losses occur could be longer than mortgage or policy terms, making it difficult to align insurance with other financial instruments.

Given these challenges, **property insurance in the UK does not provide explicit coverage for coastal erosion and will often make exclusions where related risks (landslip) are covered by the policy.** This significantly reduces the possibility of any losses linked to erosion being covered by a policy.

2.4 Coastal erosion and landslip risk insurance coverage

2.4.1 UK private property insurance policy wording

Property insurance policies often cover a number of climate perils however, given the challenges outlined, this does not extend to coastal erosion. The potential for a property policy to cover a related risk arises in the coverage for landslip (or subsidence), as a landslip event can be caused by coastal erosion.

Landslip risk is not subject to all the same insurability challenges as erosion:

- Landslip is often a sudden accidental event, as opposed to gradual loss
- It does not have the same level of certainty – although it can be assumed that coastal erosion is occurring, it does not automatically mean there will be a landslip as a result
- Landslip exposure is more diversified – other properties have risk of landslip, even inland, making pooling of policies possible, benefitting from the law of large numbers, without the same risk of catastrophic loss

Insurer capacity to cover landslip can be mixed. Although it is a commonly covered risk as part of a property policy, there are often exclusions applied to reduce the insurer's assumed risk.

Example UK policy wordings from well-known insurers (accessed online as of October 2025) demonstrate how coverage for landslip is provided, while coastal erosion losses are excluded.

Insurance policy	Landslip wording	Gradual loss wording
Allianz: Complete Property Owner policy wording	Policy covers “subsidence, ground heave or landslip of any part of the Premises on which the Property Insured stands excluding... damage caused by coastal or river erosion ”	Policy excludes “damage caused by or consisting of inherent vice, latent defect, gradual deterioration ”
RSA: Properties policy wording	Policy “covers landslip but excludes... damage arising from the settlement or movement of made-up ground or by coastal erosion or erosion by any water course ”	Policy excludes “damage caused by... inherent vice, latent defect, wear and tear, gradual deterioration or any gradually operating cause ”
Aviva: Signature Home Insurance Policy	Policy covers subsidence, heave or landslip excluding “ damage caused by riverbank or coastal erosion ”	Policy excludes “ gradually occurring damage: wear and tear (natural and predictable damage which happens over time or due to normal use or ageing)”
Admiral: Home Insurance Policy	Policy covers landslip excluding “loss or damage caused by settlement, shrinkage or expansion by coastal or river erosion ”	Policy excludes “gradual causes: any loss or damage caused by anything that happens gradually ”

Policy wordings highlight that coastal erosion risk is often excluded from property insurance through two levers: one explicit and one implied. Terms are used to exclude landslip where the proximate cause of the loss is erosion. In addition, any losses caused by loss of land due to gradual erosion processes will also not be covered, because of the broader exclusion of all gradual losses.

Coverage for condemned properties

For coastal erosion risk, the requirement by Local Authorities for residents to vacate because their property has been condemned is often when the loss occurs, as opposed to it being lost over a cliff. This approach reduces the potential for risk to life by ensuring a property is uninhabited before it is lost because of erosion. It also allows for

safer, timely demolition and site clearance, reducing the potential for dangerous debris to fall onto the beach and associated environmental harms of pollution. This pre-emptive element adds another challenge to insuring the risk, as insurance requires a loss in order to indemnify policyholders.

In UK property policies, terms do exist that address the associated costs of dealing with a property that has been condemned due to impacts of a climate risk. They are largely provided for by reinstatement and debris removal cost provisions, which are standard in most UK property policies.

Aviva's Signature home insurance policy (2025) outlines key terms and clauses that provide for situations of building condemnation post-climate event:

- **Rebuilding a property as it was before the event** – "Your buildings sum insured must be high enough to cover the full cost of rebuilding the buildings to the same specification..."
- **Demolition and debris removal** – "...including demolition, removal of debris and architects' and surveyors' fees."
- **Alternative accommodation** – "If your home can't be lived in because it's been damaged... we will pay for the following until it's fit to be lived in: reasonable costs for additional alternative accommodation for you (including your pets) if you live in the home"

Coastal erosion applicability

In order for an insurer to cover rebuild costs following condemnation, there often needs to have been physical damage to the property caused by an insured peril. The damage caused by this peril needs to be the reason that the property has been condemned. Insurance claims for landslip can be made either for actual property loss or in cases where a demolition order has been issued, provided that there is substantial evidence that indicates an imminent landslip event, such as visible cracks.

Therefore, if there is not physical damage to the property, including signs that a following loss event is imminent, insurance is not likely to payout for the rebuild. Even if erosion was an insurable risk, situations in which homeowners are required to vacate prior to any physical signs of damage would not automatically be covered without changes to wording.

Indemnity insurance is in place to pay for losses that have already happened, not actions to reduce the risk of future losses, such as demolition due to exposure. Landslip claims present a possible outlier to this rule. However, the need in these cases for there to be physical signs of damage to a property and the surrounding area, indicating that a full loss is imminent, somewhat align with the terms in an insurance policy that it will payout in the event of a demolition where an insured peril has caused damage that

makes the property too dangerous to live in. Therefore, for properties with erosion risk, substantial evidence that a loss will occur, including possible damage to the structure, would likely be needed to achieve insurance payout for demolition.

Relevant example: Aviation insurance

An existing example in insurance where assets are covered because they are unusable, but with no physical damage, is coverage for planes that are stranded due to political reasons. Aviation policies can include cover for grounding, detention or confiscation extensions, designed to protect aircraft owners, lessors, and financiers from the loss of use or total loss of assets due to political or regulatory actions.

Although a very different risk to erosion, it sets the precedent for payout without damage. However, the policy is paying out for the insured cause of the loss, not a pre-emptive action to avoid the insured risk. The loss event is fortuitous, and the causation is external and sudden. For erosion risk, this is unlikely to be deemed the case by insurers.

In the plane scenario, assets are stranded entirely due to an external reason, such as hostile detention as experienced in during the Russo-Ukrainian war (2022-present). For erosion, Local Authorities demolish properties that they deem unsafe. Insurers may consider this payout trigger as subjective without a physical event occurring. In addition, where the Local Authority could benefit from insurers paying out, it may be deemed that there is a perverse incentive if they are also the party deciding when a property is demolished. The strict requirements that councils use to make the decision about property demolition would need to be clearly outlined, and any third-party validation of the decision would help to limit this issue.

The loss of property pre-damage is another element of coastal erosion risk that makes traditional indemnity insurance less applicable. In order to provide real support, both to individual properties and the Local Authorities responsible, intervention would be better undertaken before actual damage is caused by the peril.

2.4.2 International coastal erosion coverage

As with the UK, international insurance that provides cover for erosion-related risks are not widespread. Where there is cover, it is only when there is a sudden and unexpected loss, not gradual coastal recession. Eligible losses are often due to natural disasters, such as storms or flooding which exacerbate erosion, causing loss to occur sooner than expected were gradual erosion left to materialise. The loss is often the result of a landslip event.

Two examples of coastal-related insurance covers have been identified: Australia's "Actions of the Sea" cover and the US' Coastal Property / Home insurance.

Australia Actions of the Sea Cover

“Actions of the sea” in Australian home insurance refers to any movements of the sea, including sea level rise, waves and high tides.

Hazards included: The phrase covers hazards such as tidal inundation, coastal and estuarine inundation, coastal erosion, sea level rise and tsunami

How it works:

- Most standard home policies do not provide cover for these hazards, and often list “actions of the sea” as an explicit exclusion, with similar reasons as previously highlighted, including the inevitable nature and high / uncertainty of those hazards
- Some limited circumstances may be covered, such as damage caused by storm surge, tsunami or loss caused by a sudden event

Applicability to coastal erosion: Gradual coastal erosion, shoreline recession or damage caused by sea-level rise are excluded from policies, even where other “actions of the sea” may be covered

US Coastal Property / Home Insurance

Due to the elevated coastal risks across a number of US states, insurance products have been designed specifically for coastal properties.

Hazards included:

- Storms, high winds, hurricanes and hail: Policies for these hazards are particularly found in states that are prone to hurricane activity, such as Florida
- Flood-related coverage: Standard home policies often exclude flood risk, so coastal properties must purchase separate flood insurance to cover inundation and storm surge. Flood policies can be purchased from private insurers, but there is also the National Flood Insurance Program administered by the Federal Emergency Management Agency

How it works:

- Coastal-related policies are often layered, with a base standard homeowner policy, plus additional cover purchased for flood. Wind or hurricane may be further covered through either specific policies or endorsements to existing insurance
- These specialised coverages often have higher premiums given the exposure of the properties, plus more exclusions than standard property insurance. Deductibles also tend to be higher compared to standard policies. A deductible is the amount that a policyholder has to retain and pay themselves per loss before their insurer will pay a claim. Therefore, in this case, coastal properties will have to pay a larger amount of money towards a loss.

- Gradual impacts that cause deterioration of property are typically not covered

Applicability to coastal erosion:

- Even with options for insurances tailored to address risks faced by coastal properties, long-term erosion is generally not covered as a risk by these policies, as well as gradual sea-level rise and slow land subsidence also being excluded
- Flood insurance provided by NFIP may cover some elements of erosion-related losses if a flood event results in landslip. This coverage, however, is not very broad

International examples identified typically reflect the UK's private insurance view that gradual erosion is not covered. There is limited to no precedent globally of erosion, as a continuous coastal process, being an insurable risk as part of home insurance policies.

2.5 Life insurance

Life insurance is an existing policy type that exhibits some similarities to coastal erosion, as the ultimate loss caused by the risk is inevitable. In the case of life insurance, this would be the death of the policyholder. Although inevitability is a key challenge for erosion risk, life insurance is well-established, with the first recorded policy written in 1583, and the first life insurance company, Amicable Society, established in 1706.

Life insurance provides individuals with financial security against the uncertainty of their premature death through a risk-transfer mechanism. Individuals pay a small, known premium to reduce potential larger financial consequences in the event of death. Insurers then use risk-pooling so that any one individual loss is spread across a larger group.

Life insurance more broadly is necessary for the economy to function. It reduces the need for people to save up significant finances to cover all costs in the event of their death, including paying off debts and ensuring family is cared for. Without this payout mechanism, it would be far more challenging for people to afford costs in their daily life, buy properties and have a family, as saving need would be far larger. Instead, paying a known, manageable premium enables greater redistribution of funds into the economy.

2.5.1 Life insurance mechanism

A life insurance policy is a contract that establishes a promise to pay between the insurer and policyholder. Insurers agree to pay a specified sum to policy beneficiaries in the event of the policyholder's death. The policy is provided in exchange for premiums paid by the policyholder, with the value based on the assessment of the probability that the insured will die in a particular period. Insurers aggregate the risk of premature death of many individuals, with each premium set so that the expected claims paid out

and the associated expenses, as well as margin for profit, are covered across the pool of policyholders.

Although the risk of death is inevitable, there are a number of key factors that enable the life insurance mechanism to be feasible:

- Defined payout trigger
- Pooling of risk
- Predictability
- Premium affordability
- Moral hazard

Defined Payout Trigger

Life insurance has a well-defined trigger, paying out in the event of the insured party's death. Although ultimately the trigger event is inevitable, there is uncertainty as to when it will occur.

Why it is possible for life insurance:

- The uncertainty in timing, instead of in the event occurring, allows life insurance to function
- The trigger is clearly defined and verifiable using e.g. a death certificate, enabling insurers to use it as the basis for a contract

Pooling of Risk

Risk pooling involves combining a significant number of policies to reduce the impact of variability in the timing of death for individuals, providing a more predictable risk profile. Premiums for all policies are pooled together, giving the insurer the capacity to pay for the losses that occur.

Why it is possible for life insurance:

- The risk of death affects everyone, and so many people buy life insurance. Insurers can spread the risk across this large pool of policyholders
- Pooling enacts the law of large numbers: as the sample size (number of insured parties) increases, the results (actual number of deaths) will be closer to the average number of the population. This means that insurers can expect reduced variance with larger pools
- The risks are largely independent, as there is limited correlation between one person's death and another. Pooling independent risks is desirable, as it reduces

the risk of insurers paying out significant sums because one event causes a large number of losses

- For large pools, one death corresponds to a small payout compared to the pool size, meaning each individual policyholder can pay in a relatively small premium. Without pooling, premium would likely be unaffordable
- Although each insured will die eventually, only a proportion will die across the group in a given year. Some may even live beyond the policy period. In collecting premiums from all in the pool, insurers are able to cover the payouts for those who die and still make the necessary profit

Predictability

Insurers require significant information to generate sufficiently reliable estimates for the probability of death and possible timing across the insured pool. Predictability goes hand in hand with pooling of risk, as the law of large numbers enhances insurer ability to predict the aggregate number of claims across the pool.

Why it is possible for life insurance:

- Insurers make use of historical datasets, mortality tables and actuarial statistics related to mortality for specific biological characteristics, to predict the death rates for different groups of people
- Insurers can predict the aggregate cost of claims across a pool, enabling them to comfortably estimate the premium they need to charge to cover claims and expenses. This ability means insurers are comfortable with covering the risk

Premium Affordability

Insurance can only be viable where the premium is set at a level that people are willing to pay. On the other side, the premium must provide insurers with enough money that they can cover all their costs and provide a profit margin. If premium is large relative to the benefit provided by the insurance, the product is not viable.

Why it is possible for life insurance:

- Insurers can offer affordable premiums because of the pooling of a large number of insureds, meaning that the aggregate money collected will be sufficient to pay for the proportion of parties who require a payout in a given period.
- The premium charged per policy is generally significantly less than the benefit provided upon payout of the policy, resulting in a willingness of insureds to pay. Benefits can be scaled so that policyholders can pay the premium that they can afford and receive the corresponding level of cover

- Insurers can adjust premiums based on risk factors, such as age and health, enabling lower premiums for those who present a lower risk to the pool
- Insurers can invest premiums and generate returns that can offset claims and maintain lower premiums. Given the large scale of life insurance pools and the predictability of losses, insurers have an idea about how much will be paid out in a year, and therefore how much money that can be put into less liquid investments, which often generate bigger returns

Moral Hazard

Moral hazard is a concept whereby insureds / prospective insureds change their behaviour because of the presence of insurance. This can result in policyholders taking lower precautions or exhibiting more risky behaviour because they know they will be covered if something goes wrong. Insurers need to manage moral hazard to avoid associated increases in losses.

Why it is possible for life insurance:

- Risk-based pricing helps to mitigate some moral hazard, as people who bring greater risk to the fund, such as smoking, will pay greater premium. Policies can also exclude high-risk activities, as well as other clauses, which reduce insurer liability in certain circumstances
- Moral hazard is a lower risk for life insurance than it is for other types, such as property. Increasing risk of death in the short term is generally more difficult than e.g. the risk of theft due to leaving a door unlocked. In addition, the end event is more catastrophic, so people are more likely to take care to maintain a healthy lifestyle, regardless of their life insurance status

Summary

The driving force that makes life insurance feasible, although the loss event is certain, is the risk pooling of large numbers of policyholders.

- Pooling brings together a large number of independent risks so, although all the policyholders will ultimately experience a loss event, they will not all occur in the same policy period
- Uncertainty in timing for each individual policy, combined with aggregated ability to predict the expected losses in a given year, makes writing of life insurance possible
- A significant proportion of the population is eligible to buy life insurance, and this ability to pool a large number of policies means that the proportion of losses experienced in a given year are covered by a significant group. This helps to maintain premiums at affordable levels that are minimal relative to the potential benefit

2.5.2 Comparing life insurance to coastal erosion risk

Examining the factors that support the viability of life insurance and how they apply to coastal erosion highlights why life insurance is a well-established product and cover for erosion is yet to be provided.

Factor	Life insurance	Coastal erosion	Feasibility of erosion insurance
Defined Payout Trigger	The trigger of death of insured within the policy period is clear and verifiable	Ambiguous as it lacks a discrete, widely accepted “moment of loss” because of the progressive nature of erosion. Loss would need to be defined (e.g. certain distance between property and cliff edge, building condemned). This may be difficult to agree on and verify	Low feasibility It is difficult to establish a discrete trigger for erosion as there is often not a sudden event, but long-term coastal recession
Pooling of Risk	Risk pooling is effective because the risk of insured’s death is largely independent. The population of the pool is wide, as well as large	Challenging to pool because the risk may be highly geographically correlated. The group of people requiring coverage is much smaller, and may only be limited to those with highest risk	Low feasibility Correlation of risk reduces the diversification of a pool, meaning there is greater risk of catastrophic insurer losses. To increase the size and diversity of the pool, it would require those unaffected by the risk to contribute, which would be challenging with standard insurance
Predictability	Strong ability for insurers to predict losses in aggregate using mortality tables. Timing for individuals is uncertain, but predictable across the pool	Difficult to predict, depending on complex factors such as sea-level rise, cliff geology, storm frequency etc. The risk is highly variable by region. Models are uncertain, and often predict losses over long-time horizons, rather than an annual basis	Low-moderate feasibility While modelling is possible and supports a broader understanding of the risk, there is still significant uncertainty that makes pricing difficult

Factor	Life insurance	Coastal erosion	Feasibility of erosion insurance
Premium Affordability	Premiums are affordable, often a small percentage of the coverage benefit per year, given that the probability of payout is low and a large pool enables spreading of the risk	Premiums would likely be significant due to the likelihood of many high-risk properties requiring payout in a given period. In addition, the size of pool would likely be relatively small, with localised hotspots of risk, and only high-risk properties purchasing insurance. These factors make pricing difficult and potentially unaffordable, especially when compared to the scale of possible insurance benefits	Low affordability High premiums needed to cover the risk, which are likely to exceed the insurance benefit, and even property value, over time
Moral Hazard	Moral hazard is limited, not easy to influence timing of death in the short term and insurers can mitigate through exclusions and pricing	High moral hazard, property owners / Local Authorities may minimise coastal defences efforts. Insurance may enable residents to resist relocation or developments close to the cliff edge as they know there is insurance coverage. It could be possible to enforce a date limit on property purchase e.g. properties only to be covered that were purchased before an insurance product was created to mitigate this risk	Medium moral hazard Presence of insurance could discourage efforts to mitigate coastal erosion, adapt to the risk or relocate, unless it is closely regulated

The risk of moral hazard for erosion insurance varies dependent on location. Many UK communities, including North Norfolk, are undefended because it is economically challenging or technically difficult to deliver sufficient defences for the long-term.

The most significant difference between life insurance and the risk of coastal erosion, that make one risk easily insurable and the other a challenge, is the level of randomness and independence of individual losses:

- For life insurance, the loss event is certain, however the timing of an individual loss is sufficiently random and independent across a large pool. There is enough uncertainty in the timing of the loss to outweigh the certainty of the loss happening.
- For coastal erosion risk, although there is some uncertainty in timing of a property loss, it is largely non-random, based on a number of factors. The risk is also spatially correlated, meaning multiple properties in an area will have similar risk and may experience loss at the same time. It is therefore much harder to predict losses across an aggregated pool, and there is high chance of simultaneous losses. Both these factors make it significantly difficult for insurers to price with confidence a standard property policy that covers coastal erosion.

2.6 Conclusion

Coastal erosion has key factors that make the risk uninsurable in a traditional indemnity sense

There are a number of challenges that contribute to coastal erosion not being an insurable risk. Ultimately, the gradual nature of the process and the lack of a sudden accidental loss event and defined trigger point are the key contributors.

Currently, insurance policies across the board exclude coastal erosion risk

UK insurance policies make explicit exclusions for erosion, especially where it is linked to covered perils such as landslip. It is implicitly excluded through policy terms that exclude loss from a gradual process. International policies, even those specifically designed to address coastal risks, do not seem to include gradual coastal erosion.

Standard indemnity policies require a physical loss to occur, which is not always the case for coastal properties that are condemned due to the risk

Properties are often lost to erosion before there is an actual loss event through properties being condemned as unsafe. Insurance policies can provide cover where properties are condemned, however this often requires damage by a covered peril and this damage must be the reason for it being condemned. These criteria do not always apply to erosion, as a property may not have experienced damage before it is condemned for being situated at an unsafe distance from the cliff edge.

A life insurance-type model is less applicable to coastal erosion because of a number of differences in the risk and the scale of economic impact

Life insurance covers a risk that has more insurable characteristics than erosion, such as the randomness of loss, the larger pool of parties with risk and the independence of these parties. Ultimately life insurance does not face the same challenges as erosion risk, although it shares the same certainty of the outcome. Life insurance plays a significant role in the operation of the national economy, justifying the need for this type of solution. Erosion, although highly impactful at the local level, the scale of the risk nationally is less relevant than the risk of mortality.

Section 3

Coastal erosion and landslip in practice

Reviewing policy wording provides only half the view of how erosion and landslip are treated by insurers. Deeper understanding is gained when examples of real-life cases are examined where claims have been made to insurers. In this section, two situations of landslip loss have been reviewed: landslips in the Isle of Wight and a recent case in North Norfolk that went to the Financial Ombudsman Service. For the former, insurance paid out for property losses caused by the landslip events, while for the latter the Ombudsman found in favour of the insurer that they were not liable to pay. The factors that drove these respective outcomes have been reviewed.

3.1 Isle of Wight case studies

A UK case study that highlights the differences and overlaps in coastal erosion and landslip on the ground is the Isle of Wight. The Isle of Wight has large coastal exposure due to its significant coastline and the cliff geology in certain areas of the island. As a result, gradual cliff erosion occurs every year with landslip events (although less frequent) materialising, particularly in the South and Southwest of the Island. The cases of landslip property loss in the Isle of Wight demonstrate where coastal area landslips can be covered by insurance, even though policies often, if not always, exclude landslip caused by coastal erosion.

3.1.1 Coastal erosion and landslip in the Isle of Wight

Coastal erosion is a naturally cyclical process. The Isle of Wight experiences between 1-3 metres of land loss per year, or around 10 centimetres annually in chalk cliff areas. However, the increasing impacts of climate change and rising sea levels are making these once predictable patterns less predictable, and in most cases, more severe.

Image 1: Coastal erosion on the Isle of Wight between Compton Bay and the cliffs before Freshwater



Landslip is a sudden movement of earth that, although there is uncertainty associated with the event occurring, is often predictable in terms of locations at risk. Landslip susceptibility mapping identifies areas likely to be affected, and the Isle of Wight Council has undertaken extensive mapping of the island. Monitoring systems and forecasting tools, which use effective rainfall data, provide the ability to predict whether a landslip is imminent. While they can often be associated with coastal environments, landslip is a distinct process influenced by a variety of factors, not all directly linked to coastal erosion. For example, a significant driver of landslip in the Isle of Wight is the presence of excess groundwater. Areas of the island are formed with layers of Gault Clay between the rock which, with sufficient rainfall and drainage, can cause areas of land above the clay to slip towards the sea. Coastal erosion can also contribute to landslips by undermining the base of cliffs, thereby destabilising the slope and increasing susceptibility to landslip.

In Ventnor the cause of land movement is more complicated and is therefore known as a 'landslide complex'. The town is sliding on a slip surface within the Sandrock Formation which is at depths of 30-40m below sea level, while the upper part of the landslide complex is sliding on the Gault Clay.

The Undercliff of the Isle of Wight is a 12km coastal zone on the southern coast of the island with particular susceptibility to landslips due to its complex geological make up and history of mass movement. Ground instability in this area is greatly exacerbated by prolonged rainfall, and a number of major landslip events have occurred along this coastal zone.



Image 2: Cliffs at Blackgang at the far west end of the Undercliff, overlooking areas of Gault Clay and site of previous landslip events

Isle of Wight landslip events

In recent years, a number of landslip events have occurred that have caused significant damage to surrounding area and infrastructure. Two examples which have impacted residential properties occurred at Bonchurch and St Lawrence.

Bonchurch

The landslide event at Bonchurch in December 2023, in an area known to residents as “The Landslip”, occurred following a period of exceptionally wet weather. The large-scale slide displaced an estimated 2.5 million cubic metres of land, resulting in the evacuation of 20 properties and increasing the risk of a nearby key road by bringing it significantly closer to the edge of the cliff. The event, which was triggered by the elevated groundwater levels and pressure within the Gault Clay Formation, prompted the Isle of Wight Council to undertake a detailed inspection and mapping of the area.



Image 3: Drone image of the 2023 Bonchurch

Whilst the 2023 movement at Bonchurch was caused by excess groundwater, the landslide area has been impacted by other historic events attributed to coastal erosion. For example, the 1910 Great Landslip at Borderledge, in the same area as Bonchurch, was triggered by coastal erosion. This resulted in slopes that were vulnerable to further events in 1995 and 2001, both triggered by coastal erosion and high rainfall. The 2023 landslide was the only event in the area triggered solely by significant rainfall, a long-anticipated readjustment to the slope gradient following the 1910 Great Landslip.

The area remains at high risk and still poses a threat to property and surrounding infrastructure, and ongoing monitoring is undertaken to manage the risk as it evolves.

St Lawrence

The ancient landslide area at St Lawrence was reactivated in March 2024 in the wake of a period of substantial rainfall. The event resulted in one of the worst reactivations of the Undercliff system in recent times, with rainfall reaching levels reflective of a 1-in-20-year return period event. The landslide caused damage to properties and infrastructure, including loss of some homes, displacement of others and damage to a road which is at risk of collapse.



Image 4: Aerial view of the landslide damage at St Lawrence

Insurance response to landslip property losses

The identified cause of a landslip event is important in this context because of standard property insurance policy wording, as referenced in section 2.4.1. Policies largely exclude landslip loss when the cause is coastal erosion. In both the Bonchurch and St Lawrence cases, the properties that were deemed lost (4 and 7 houses respectively) received insurance payouts. This situation demonstrates that coastal area landslips can be covered by insurance in practice, when it is deemed that the proximate cause is not coastal erosion. In the case of the Isle of Wight examples, the proximate cause was instead the significant rainfall causing increased groundwater.

While increased rainfall and groundwater levels are the underlying causes that initiated slope failure, the actual damage to properties resulted from the landslip movement. Consequently, the insurance claims were made based on the physical damage caused by the landslip resulting from the rainfall, rather than the antecedent land instability because of historic coastal erosion events.

Insurance claims for landslip may be made for actual property loss or in cases where a demolition order is issued, however there must be substantial evidence, such as visible cracks, indicating an imminent landslip event. Insurance payouts can cover the total loss value, enabling affected residents to relocate to safer sites further up the slope. Properties on the Isle of Wight have noted that insurance premiums can increase significantly following a landslip loss event, often by thousands of pounds. Previously, insurers have reassessed the risk across entire regions, identifying high-risk properties across a broad area, even where existing mapping suggests otherwise.

In contrast, coastal erosion alone is excluded from household policies and is not typically referenced in property conveyancing documents. Efforts by the Isle of Wight Council, in collaboration with the Law Society and Trading Standards, to incorporate erosion risk into guidance for solicitors and estate agents have not yet resulted in formal inclusion.

3.1.2 Coastal risk sociological considerations

The Isle of Wight Council has noted that sociological factors significantly influence the risks and consequences associated with coastal risk. Often, the most vulnerable individuals and communities are not covered or prepared for the loss of their property due to coastal erosion. A key driver of the lack of preparedness is limited awareness of the risk:

- Despite the known hazards, **coastal properties continue to be both developed and sold on at-risk land**. There is no consultation on planning for building on the coast to factor in the risk of erosion
- On the Isle of Wight, a cultural expectation exists that residents understand the inevitability of property loss to the sea; however, **new residents often do not possess this level of knowledge**, leading to gaps in risk awareness
- The Council has identified a clear **need for improved communication**, or even regulations, to ensure sellers effectively explain the nature of the risk and provide realistic timelines for potential impacts, where known

Property owners are not only at-risk of losing their residences, but they are also liable for any litter or debris originating from their properties that may wash onto the shore. While there is limited precedent on the Isle of Wight for owners paying for debris removal, largely because demolition typically occurs before materials fall over the cliff, several challenges persist. These include:

- Difficulties faced by demolition contractors operating on unstable land, which is often the case when facing risk of landslide
- Incidents of looting in condemned properties prior to clearance
- Local Council requiring property owners to obtain liability insurance to cover risk of injury on derelict sites

The financial burden of demolition can be substantial, sometimes reaching £80,000 for more complex structures. The costs can far exceed available demolition grants of around £6,000, resulting in cost disparity that places considerable strain on both property owners and local councils.

Beyond the financial and legal implications, coastal erosion exerts a profound impact on the mental wellbeing of affected individuals and communities, highlighting additional, often intangible impacts of the risk and the need for comprehensive support mechanisms.

3.2 Landslip loss insurance exclusion example

3.2.1 Ombudsman ruling on coastal erosion

While insurance payouts have been made for landslip-related property losses on the Isle of Wight, it is important to recognise that insurance coverage is not guaranteed in all cases involving landslip. Where the insurer determines the proximate cause of a landslip to be coastal erosion, the loss will not be covered by insurance due to the usual exclusions.

A recent ruling by the Financial Ombudsman Service concerning a coastal property in North Norfolk illustrates the complexities and challenges in establishing insurance liability where coastal erosion is involved. In this case, the homeowner claimed on their policy for loss due to a landslip event. However, the insurer declined the claim on the basis that the proximate cause of loss was coastal erosion, which was explicitly excluded under the terms of the policy.

Key evidence considered

- **Regional surveyor's assessment:** The property was located very close to a cliff edge with a known history of landslip. The policyholder and Local Council noted that the underlying geology differed from surrounding areas, consisting of sandy soil over clay. This geological composition allows rainwater to percolate through the soil, reach the clay layer, and flow towards the sea, causing soil movement. Photographic evidence showed that several metres of land behind the property had been lost over the previous three years, leaving parts of the property unsupported by solid ground
- **Coastal assessment and site investigations:** Aerial photographs revealed significant coastal erosion over the past decade near the property boundary. Imagery from 2024 indicated that the cliff edge was approximately four metres from the site boundary. The assessment concluded that natural forces had caused substantial coastline regression, impacting the site. Additionally, a Local Council article highlighted awareness of potential property losses due to erosion
- **Additional erosion evidence:** Information from the British Geological Survey indicated that erosion processes can increase the likelihood of landslip. Planning applications in the area acknowledged the risk of coastal erosion within the next 20 years, and coastal management schemes had been implemented to mitigate this risk
- **Local Council correspondence:** The council acknowledged coastal erosion as a risk in the area and confirmed that cliff failures occur nearby. They noted that cliff failure can result from a combination of factors, including geology, groundwater, surface water runoff, and coastal processes. In this instance, upper cliff failure

appeared to be driven primarily by geology, cliff steepness, and groundwater, with no significant changes observed at the cliff toe

Ombudsman findings

The Ombudsman ruled in favour of the insurer, determining that erosion was the proximate cause of the landslide and subsequent property damage. Key points included:

- **Ambiguous definition of erosion:** The Ombudsman classified rainwater percolating through sandy soil to the clay layer, causing soil to erode into the sea, as a form of erosion. Although the Local Council noted no significant change at the cliff toe, this referred to a specific type of coastal erosion and did not exclude other erosion mechanisms, such as groundwater-induced erosion beneath the property. The case focused on whether any form of erosion contributed to the property loss, as the insurer's policy wording excluded landslide caused by non-specific erosion
- **Insufficient evidence to the contrary:** There was insufficient evidence to demonstrate that erosion *did not* impact the property or that it was not the proximate cause. The coastline was identified as high-risk for erosion, with historical and ongoing challenges. The Council confirmed multiple contributing factors to cliff failure, including erosion. More substantial evidence would have been needed to establish groundwater as the overwhelming cause of the loss
- **Loss could be deemed as foreseeable:** The insurance policy only covered 'unforeseeable events.' The insurer argued that the landslide was foreseeable, given publicly available information, including historic sales listings that warned that mortgage financing would be unavailable due to the high likelihood of property loss from erosion
- **Lack of property owner awareness:** Although the Ombudsman found in favour of the insurer, the property owner's awareness of the risk was not assumed because it was not explicitly demonstrated. While the insurer believed the owner should have been aware of the risk based on available literature, the Ombudsman found it unfair to expect the owner to have foreseen the event. The property lacked a pre-purchase survey, and there was no evidence that the owner knew the property was sold at a reduced price for cash buyers because of the erosion risk

This case highlights the nuanced and often challenging nature of insurance claims related to coastal erosion and landslide, emphasising that coverage is not automatic and depends heavily on the proximate cause and available evidence.

3.3 Conclusions

Insurance coverage for landslip where erosion is also relevant is ambiguous and potentially inconsistent

The two cases examined highlight that landslip policy wording may pay out for and decline claims for similar cases. Both areas in the Isle of Wight and North Norfolk have historically been impacted by coastal erosion shaping the coastline, exposing these areas to other risks which may cause further land movement. The difference is due to the clear evidence of coastal erosion for the North Norfolk landslip whereas, in the Bonchurch 2023 movement, the slope gradient was naturally adjusting to the historic 1910 erosion event, and the toe remained stable.

Therefore, the proximate cause of the recent Isle of Wight cases was not deemed to be coastal erosion and the policies paid out. For North Norfolk, following the Ombudsman investigation, the insurer's denial of the claim was upheld because of the pertinence of coastal erosion in this particular case. Differing payout verdicts highlight the complexities in determining the proximate cause of damage where a coastal property experiences a landslip loss. Furthermore, the Norfolk case employed alternative definitions of erosion, demonstrating that understanding and application of wording can vary.

Greater clarity in policy wordings (e.g. specifying the landslip exclusion as coastal or riverine erosion) could help to reduce the potential for confusion in scenarios where insurers will pay out however, coastal property owners may not be able to rely on their landslip insurance, regardless of whether other factors seem to be the primary cause of loss.

Targeting a risk transfer solution for coastal erosion explicitly will be more beneficial than focusing on landslip

Landslip cover exists in the market with exclusions for erosion however, it is applicable to other situations where properties do not have coastal risk. Therefore, focusing on landslip and overlaying an erosion solution would be challenging. Although there is some overlap, landslip insurance requires damage or loss in order to pay out. For coastal erosion, this is often avoided by condemning the property before loss occurs.

As these risks have differing trigger points, this adds further complexity in incorporating erosion risk into existing landslip insurance solutions. Designing a risk transfer or insurance solution for coastal erosion explicitly would avoid these additional integration challenges and enable provision of support that is better aligned to the aims of affected Local Authorities to address the risk pre-loss. In addition, a defined solution for erosion risk that clearly outlines the boundaries between when it applies, versus where landslip insurance should provide cover, would help to reduce the uncertainty that currently exists for landslip coverage.

Lack of awareness continues to put at-risk property owners in unexpected adverse positions, impacting both financially and emotionally

Vulnerable communities often lack sufficient knowledge about their risk and what their insurance covers. Although there may be certain signs that a property has risk during the buying process, this needs to be explicitly demonstrated to the client, for example through a pre-sale survey. Development continues on high-risk land without adequate disclosures or planning controls in place.

The financial burden of demolition can be significant, placing further unexpected costs on property owners, as well as potential liability for injury injuries occurring in condemned and vacated properties. Without full awareness of the situation, the shock of the financial impact, as well as the stress and emotional strain of losing a property, can take significant toll on resident mental health.

Section 4

Scale of coastal erosion risk

Understanding the scale of coastal erosion risk is key to designing and developing a suitable solution to support property owners. Updated NCERM data has been used to estimate annual at-risk property figures across England by Local Authority.

4.1 NCERM2 data

The National Coastal Erosion Risk Mapping (NCERM) dataset, originally developed by the Environment Agency in 2011, estimates the long-term coastal erosion risk across all Local Authorities in England and Wales, providing one of the most comprehensive public datasets globally for shoreline change and property exposure. NCERM was updated in 2024, factoring different climate change scenarios into forecasts.

4.1.1 Overview of NCERM 2024

The NCERM data utilises a feature line, divided into approximately 7,000 units, along the English coastline, establishing a baseline for future coastal changes. Underlying recession rates, representing the annual natural shoreline retreat without defences, are calculated from historic mapping and over a decade of LiDAR / aerial imagery across each coastline section.

These recession rates are extrapolated into the future and integrated with various climate change scenarios and Shoreline Management Plans (SMPs) to estimate the extent of coastline recession through to 2105 under each scenario. The predicted sea level rise in three climate scenarios has been assessed to determine the associated impact on the coast of England: a continuation of present-day (2020) sea levels, RCP8.5 70th percentile (the 'Higher Central'), and RCP8.5 95th percentile (the 'Upper End'). The present-day scenario is based on historical erosion rates to project future erosion, with no additional impacts of climate change.

These climate scenarios were selected to reflect the significant level of uncertainty in predicting future sea level rise. The influence of SMPs on erosion risk are accounted for, with approaches varying widely from fully preventing erosion to allowing natural shoreline retreat. The effectiveness and timescale of these approaches are evaluated, and the future projections of coastline recession are adjusted accordingly.

Finally, the National Receptor Dataset (a spatial dataset using Ordnance Survey data that maps risk receptors, typically residential and commercial properties) is overlaid on the coastline recession data to obtain a figure for the number of properties predicted

to be at erosion risk in each Local Authority through to 2105. Both residential and non-residential properties have been included in the analysis.

4.1.2 Changes to NCERM1 data

The NCERM data was updated in 2024 to improve the initial publication:

- **Defence scenarios:** Shoreline Management Plans, originally developed between 2004 and 2011, have been updated and incorporated into a single source, meaning the SMP-related data in NCERM more accurately reflects the current and future management approaches in place across every Local Authority, giving a better estimation of the difference between No Future Intervention and SMP-related erosion distances
- **Granularity:** more granular assessment of recession rates with data obtained for every individual NCERM frontage (approximately 7000)
- **Climate Scenarios:** Incorporated two UKCP18 climate scenarios: 70th percentile RCP8.5 and 95th percentile RCP8.5
- **Time Horizons:** the updated SMPs have three time horizons: 2025, 2055, and 2105. This has led to NCERM having two epochs – 2055 and 2105, instead of the previous three (20-year, 50-year, 100-year)

4.1.3 Limitations

NCERM provides a strong basis for modelling future figures for at risk property due to coastal erosion, however there are several limitations results:



Temporal granularity: NCERM provides values for properties at risk of erosion for only 2 points in time, 2055 and 2105, with intermediary predictions during these periods being excluded. For year-on-year figures, statistical interpolation methodologies have had to be adopted.



Smooth, consistent recession assumption: Due to the complexities of episodic erosion rates and events through time, the model extrapolates a linear underlying recession, which is subsequently influenced by SMP management approaches, defence failure and climate change. In reality, shoreline retreat is often episodic and driven by factors such as storm activity, sediment supply, or defence failure.



Absence of uncertainty metrics: NCERM represents a best estimate result and does not quantify spatial or temporal uncertainty, meaning there are no confidence intervals for any values, compounding the challenge of interpolating the year-on-year figures.



Simplified physical representation: Local coastal morphology, sediment composition, and wave interactions are generalised, which can under- or overestimate risk at finer (property-level) scales.



Inconsistent historical data: Historical mapping of coastline position, on which the coastal recession predictions are based, varies in quality and consistency, especially over the long term. This limits the accuracy of the future prediction due to the carrying forward of residual errors.



Defence effectiveness: SMP figures are predicated on assessments of defences in each Local Authority. These assessments involving the condition, adequacy and exposure, are largely subjective, creating uncertainty. NCERM relies on a snapshot of defence condition at the time of calculation. Defence features are subject to change over time, which has not been accounted for, reducing confidence in the long-term.



Classification of mobile properties: The inclusion of caravans in the NCERM dataset has the potential to skew the data, given caravans may be classified as either residential or non-residential, depending on their purpose. Furthermore, the mobile nature of some caravans is not reflected in the data, which could lead to inflated at risk property values in some areas. Static caravans, however, are more difficult to move than mobile homes, and would still require professional support to remove them, as with built properties.



Overlap with flooding risk: Some areas at risk of coastal erosion have been excluded from the NCERM data given their overwhelming flood risk, resulting in under-reported at-risk property figures when aggregated.

4.2 Modelling

To obtain estimates for future properties at risk under different climate scenarios, stochastic modelling was used to evaluate annual figures, run numerous times in a Monte Carlo simulation. The averages were calculated and displayed in a Power BI dashboard, allowing for a comparison of properties at risk under a range of scenarios.

4.2.1 Interpolation of intermediate at-risk property values

Analysing the timeline for properties at risk of coastal erosion is not currently straightforward using the NCERM dataset. The number of properties at risk are only available in 2055 and 2105 in the dataset and estimates are not yet provided annually. A straightforward approach to estimating intermediate risk would be to assume a linear rate e.g. 2 additional properties at risk per year on average between 2025 and 2055. However, based on historical data, coastal recession not linear, and are instead highly variable year on year.

Historical coastline recession data collected in the East Riding of Yorkshire provides an indication of how often coastline recession occurred. The data showed that, on average across the 123 coastline sections analysed, there was no coastline recession in ~39% of the years. Assuming that a year with zero recession equated to no additional properties at risk, this figure has been used as a reference point in the modelling.

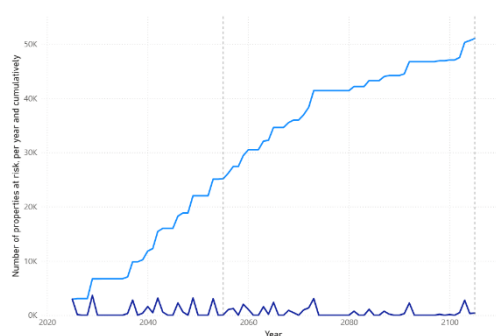
To incorporate a layer of randomisation, a stochastic time series was used to model annual risk, as this method provides the ability to model unpredictable changes. In this context, it offers a more realistic approach compared to linear or exponential interpolation. While some methods assume a continuous, predictable rate of coastline recession over time, coastal erosion is influenced by numerous random and independent factors, making the property risk over time inherently discrete. Using a stochastic model captures this randomness and better reflects the natural variability in erosion impacts.

The time series provided year on year property at risk numbers per Local Authority as the output. The results included years where some Local Authorities experienced no or low additional property risk, and other years with multiple properties becoming at risk. The assumptions applied to the modelling constrained the data so that the property risk generated reached the total numbers provided by NCERM for 2055 and 2105.

4.2.2 Modelling process

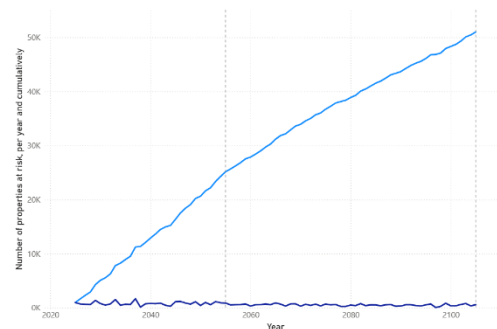
Using the finalised probability distribution and NCERM data, modelling was undertaken to evaluate possible future property at risk figures using a Monte Carlo simulation. These simulations involved running a random process numerous times, enabling the calculation of probabilities of certain events in the system. In this case, running the stochastic time process several times gave an indication of the maximum number of properties at risk in each Local Authority in a given year under certain scenarios, and an associated likelihood.

Ten simulations were run for each combination of Local Authority, climate scenario, defence plan, property type and year. These results were then averaged to give an illustrative figure for properties at risk per year. The below graphs show the difference between property risk figures in one simulation versus ten – one simulation gives a more accurate depiction of reality, with more staggered property numbers per year. However, each simulation can differ greatly from the next given the random nature of events, so a smoother sample size of ten is better placed to draw conclusions from.



— Cumulative number of properties

Figure 1: Modelling results for one model simulation. A single simulation is staggered, which best simulates reality



— Annual number of properties

Figure 2: Modelling results for ten averaged model simulations, creating a smoother line and offering a larger sample size

4.2.3 Results

A Power BI dashboard has been created to allow for a dynamic presentation of the results. Each view has filters which enable the user to change the Local Authority, climate scenario, defence plan and property type. The display changes to match the filter selection. The first dashboard provides an overview of all the results, displaying the number of properties lost in each year, as well as cumulatively over time. This view also allows an average of ten runs to be shown, or each individual run to be displayed, giving an insight into a potential real-world future scenario.

Alongside the graph are some headline statistics which change depending on the filters applied.

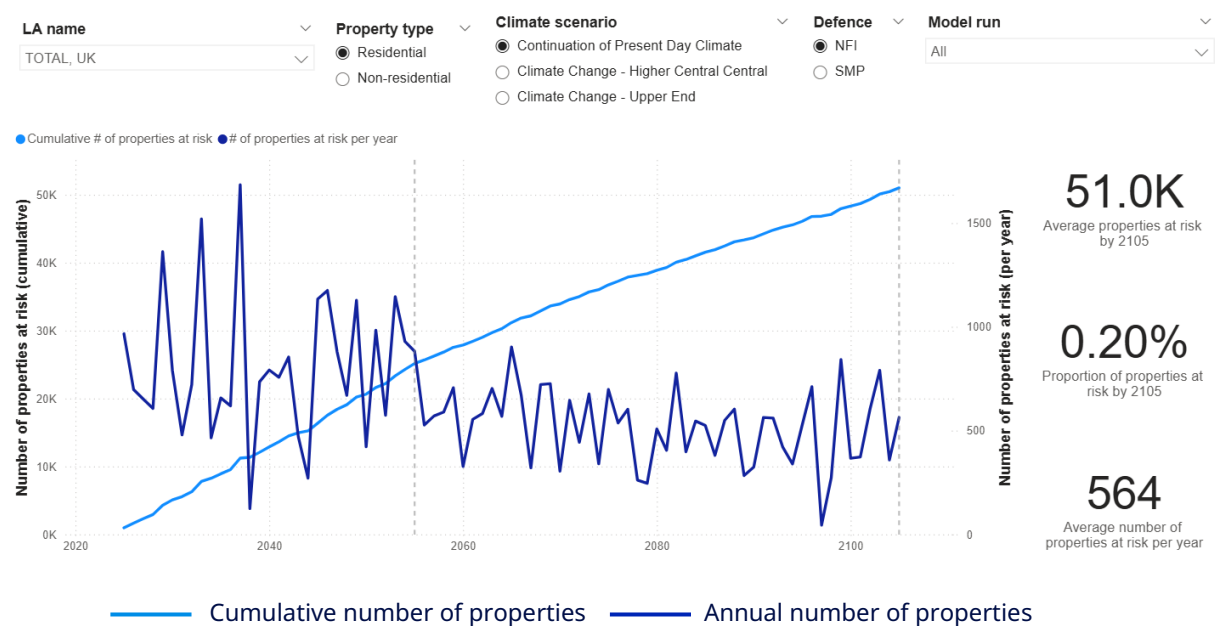


Figure 3: Dashboard showing model results for residential properties in the continuation of present-day climate, under the No Future Intervention scenario

The next dashboard contains a map of England with a point located at each Local Authority. The darker the colour of the point, the greater the risk of coastal erosion. Hovering the mouse over each points displays the Local Authority's name and the number of properties at risk in the selected year.

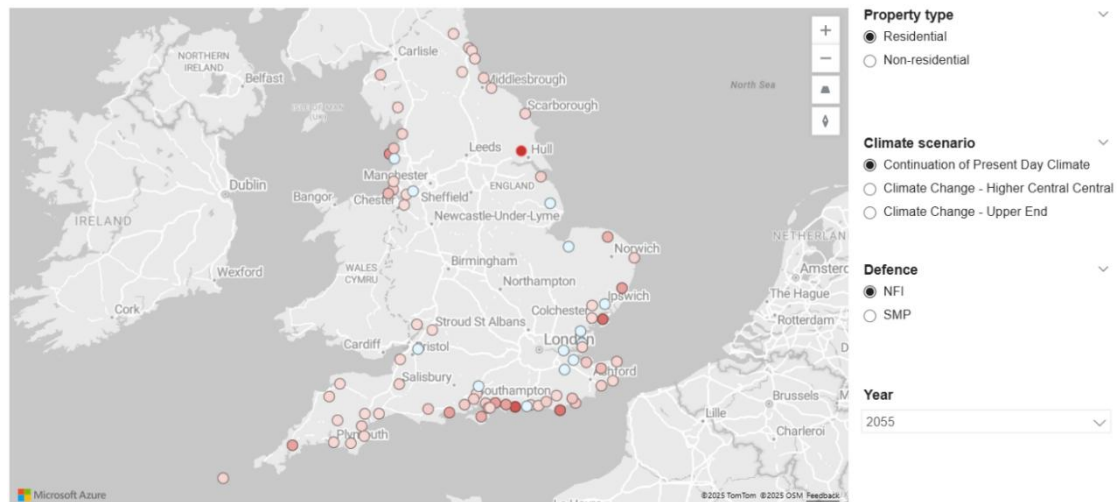


Figure 4: Map showing model results for residential properties in the continuation of present-day climate, under the No Future Intervention scenario in the year 2055

The map highlights high risk to properties in the central south coast of England. The most affected Local Authority is expected to be the East Riding of Yorkshire, due to the large coastline and abundance of properties located on the coast. However, the results for East Riding are likely inflated by the significant number of mobile properties in the dataset, which can be relocated and do not have the same risk as fixed properties. Several Local Authorities do not have any properties at risk, highlighted in blue.

The third dashboard compares properties at risk split between residential and non-residential properties, displaying the figures for NFI and SMP defences.

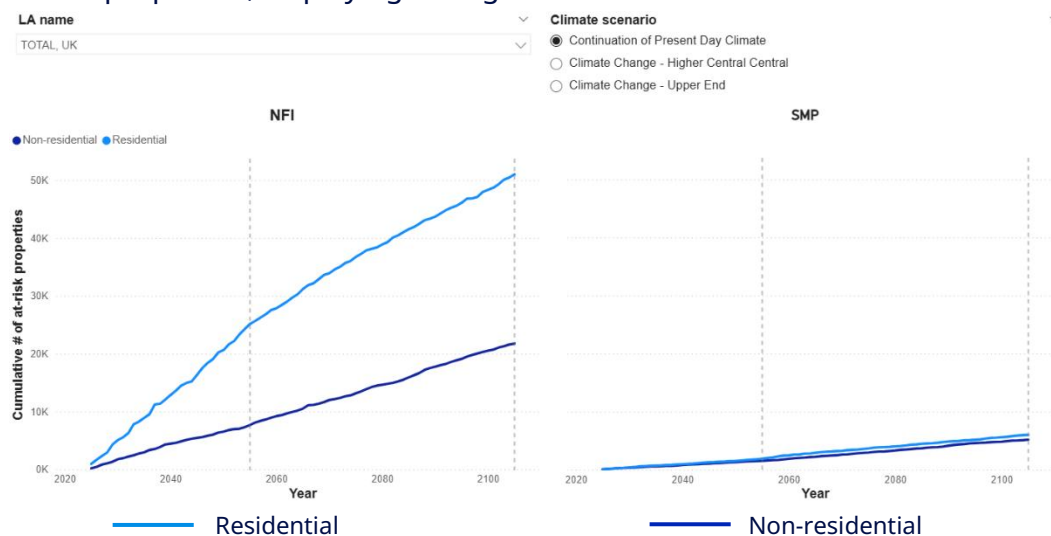


Figure 5: Model results comparing residential and non-residential properties at risk under the present-day climate scenario, shown for both the NFI and SMP defence scenarios

SMP's across all Local Authorities have a significant impact in reducing at risk property numbers, by approximately 90% for residential properties and 75% for non-residential properties, in the continuation of present-day climate scenario, across all time periods. When different Local Authorities are examined, these figures can vary drastically, with some SMP's having minimal impact on properties at risk, while others almost eliminate property risk entirely. These differences are due to the varying approaches that Local Authorities are able to take based on National NCERM Policy.

The final dashboard displays a comparison between the three modelled climate scenarios, and their effect on at risk property numbers through to 2105.

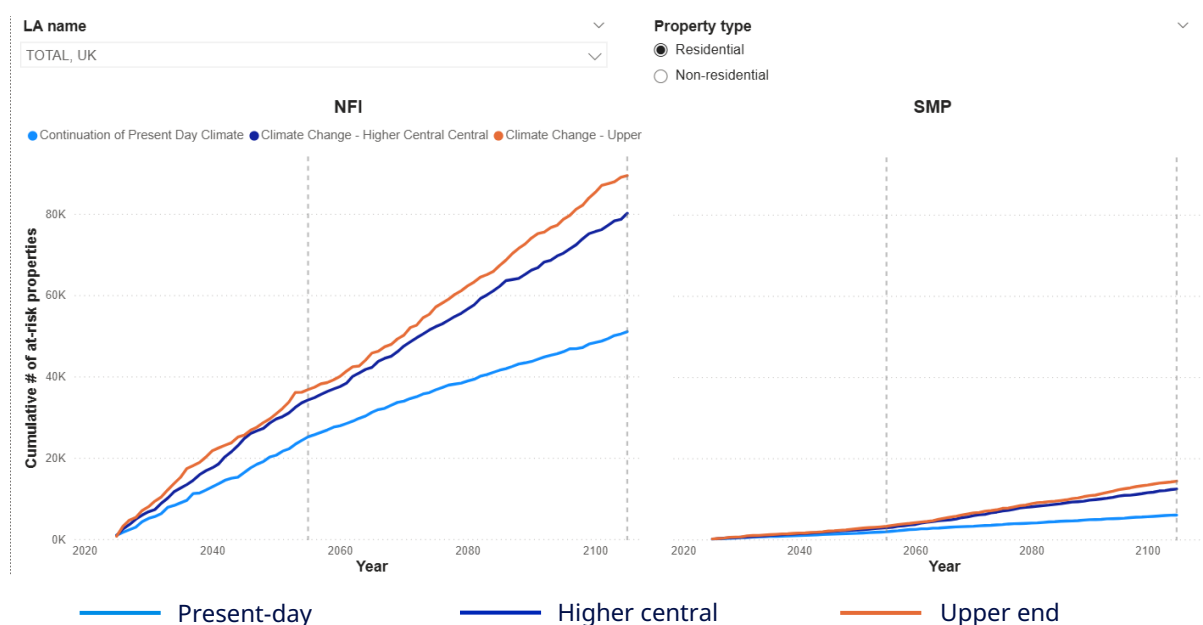


Figure 6: Model results comparing residential properties at risk under the present-day, shown for both the NFI and SMP defence scenarios

The impact of climate change is considerable across all time periods, with over 35,000 more properties at risk by 2105 in the highest scenario compared to the continuation of present-day climate. While over twice as many properties are still expected to be at risk, SMP's are predicted to significantly reduce the rate in any climate scenario. Every Local Authority will have more risk due to greater climate change; however certain areas will have much greater risk than others. For example, properties at risk in one authority area on the South Coast are estimated to quadruple in an Upper End scenario compared to present day, while other Local Authorities only experience a 20% rise.

4.3 Conclusion

Scale of coastal erosion risk across the England is highly dependent on the climate change scenario and defence planning scenario realised

For No Future Interventions scenario

Approximately 33,000 properties are expected to be at risk in England by 2055 due to coastal erosion if No Future Interventions are made to defend the coastline under present-day climate, increasing to over 73,000 by 2105, equating to roughly 900 additional properties per year. The 2105 figure rises to over 124,000 properties in an Upper End climate change scenario, closer to 1,500 properties per year.

For Shoreline Management Plan scenario

If Shoreline Management Plans are implemented, the number of properties at risk reduces dramatically. Under present day climate, closer to 3,400 properties are at risk by 2055, and approximately 11,000 by 2105, equating to about 140 additional annual properties. Under the Upper End scenario, around 24,600 properties could be at risk by 2105 (~300 properties annually). An effective implementation of Shoreline Management Plans can reduce the number of properties at risk by ~90% in many areas, regardless of the future climate scenario.

The Power BI dashboard is a useful visualisation tool for understanding the risk under different scenarios and regions of England

Presenting the results in a dynamic dashboard, allowing users to change the filters and compare the different factors affecting properties at risk, can enable valuable insights to be extracted from the data. The inclusion of a map facilitates prioritisation of heavily affected areas of the coastline, and adjacent graphs can aid in discovering the factors that compound the coastal erosion risk in each Local Authority.

The NCERM product was not designed to probability of a loss due to coastal erosion, therefore other analysis would be needed to support underwriting the risk for an insurance solution

The NCERM dataset currently provides at risk property estimates for the years 2055 and 2105. Some of the assumptions and limitations of the data make property risk prediction more challenging on an annual basis. The product was designed for a long-term view of coastal erosion risk and highlighting the risk zones, not for more granular loss estimation. To design an insurance product, or other type of solution, that provides coverage for coastal erosion property loss, additional data analysis and modelling would be required.

Section 5

Public-related climate insurance schemes

Property insurance markets are currently under significant financial pressure. Severe weather events, such as winter storms across 2023/ 24 have resulted in significant payouts, putting strain on insurers. The Association of British Insurers article “Adverse weather pushes property insurance payouts to £6.1 billion in 2025” highlights that £1.2 billion of total property claims in 2025 were weather-related, a 14% increase on 2024. £758 million of this figure is due to claims for weather damage to homes and possessions. Large scale climate losses are not exclusive to the UK. The World Bank article “Natural disasters have cost us \$162 billion this year” outlines that this significant figure was the total global economic loss in the first half of 2025 alone, more than double the 21st-century average value of \$41 billion. Innovative approaches are increasingly being implemented internationally to enable sustainable provision climate-related property coverage.

Many countries have taken the approach of establish public-private sector climate / disaster insurance schemes. These schemes are largely implemented to manage the financial impacts of insurable risks that are typically more challenging to insure exclusively in the private markets. Some programmes operate outside private insurance markets, whilst others adopt a combined approach, resulting in increasing partnerships of private sector expertise & capacity and public intervention.

5.1 Public-related insurance scheme examples

5.1.1 UK Flood Re

Launched in 2016, Flood Re is a not-for-profit reinsurance scheme in the UK designed to make flood insurance more affordable and accessible for homeowners in high flood-risk areas. Established as a joint initiative by the UK insurance industry and government, its primary purpose is to ensure that homeowners in flood-prone areas can obtain affordable home insurance. The scheme was set up under the Water Act 2014, therefore any changes to the scheme, such as adding lines of business, would require an Act of Parliament. The scheme was established as a temporary measure and is set to end in 2039, with the goal that the market will have self-adjusted by this time.

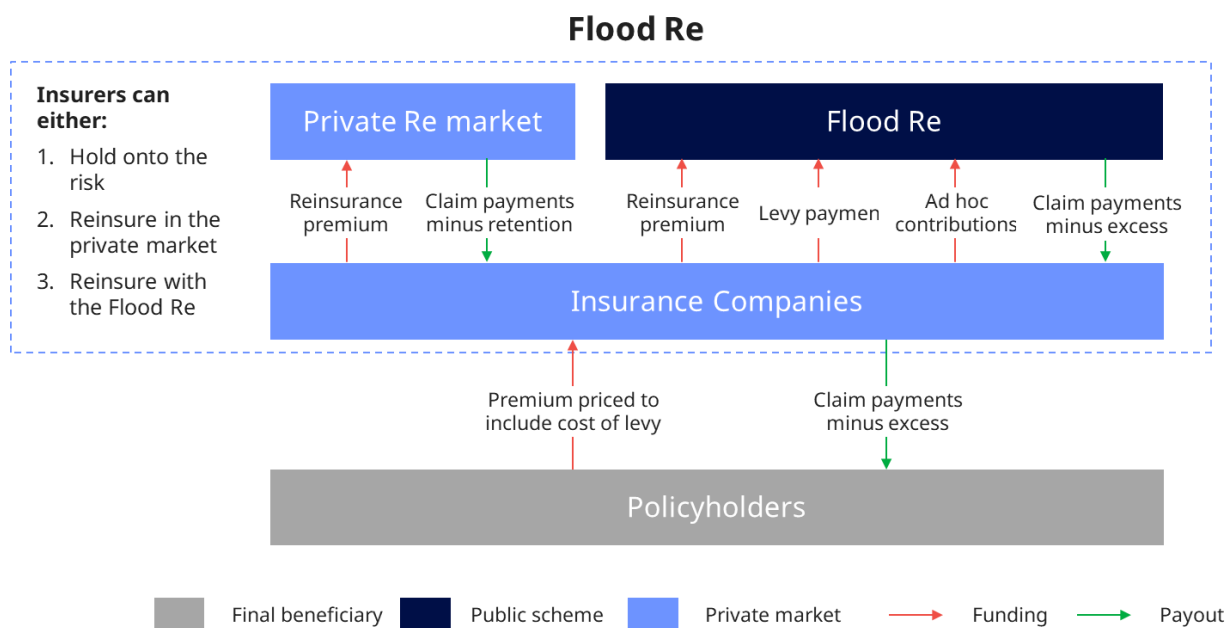
Rationale for the scheme

Previous agreements had been made between the UK Government and the insurance industry in order to facilitate the market's provision of flood insurance. However, major flood events prior to the scheme's set up resulted in significant payouts, with flood risk increasing due to climate change and urban development. In response to this increased pressure and potential market failure, the Government and insurers decided a new approach was needed.

Scheme structure

Flood Re provides a reinsurance option for flood risk. Private insurers provide the primary layer of flood insurance as part of residential property policies, without policyholders interacting directly with Flood Re. When the flood risk component of a policy becomes too expensive for an insurer to cover competitively, the insurer may choose to cede that portion of the policy to Flood Re. This arrangement allows insurers to offer more affordable premiums to customers in flood-prone areas with a history of flood claims by transferring the risk to Flood Re.

The diagram below outlines the structure of the Flood Re scheme:



The Association of British Insurers states on their "Flood Re explained" page that Flood Re required initial set up costs of over £20 million, funded by the insurance industry, with additional investments made by individual insurers to change their systems. How this money was specifically spent to get Flood Re set up is not explicitly outlined. Ongoing funding to cover claims is generated through from two primary sources:

- An annual levy on UK home insurers
- A fixed charge for each policy ceded to Flood Re

The UK Government sets the total annual levy amount through regulations, and the proportion that each insurer pays is based on the market share of household insurance that they write. In recent years, the levy amount dropped from £180M to £135M, until April 2025 in which the levy was raised to £160M. Insurers can decide how they pay for the levy, however it is assumed that many will pass the cost onto household policyholders through their premiums.

The premium is not risk-based and is instead calculated according to the property's council tax band. Fixed premiums per council tax band helps the scheme to offer affordable prices to those with higher flood risk, with lower risk homes subsidising the cost. The levy is also used to purchase Flood Re's own reinsurance to protect against significant or multiple flood events in a given year. In the event of a flood claim, the policyholder's insurer manages the claim and any necessary repairs as normal. The insurer then recovers the flood-related costs from Flood Re, which helps distribute the financial risk across the insurance industry.

Coverage

Flood Re only covers flood risk and no other perils. This includes, surface water, riverine and coastal flooding. The scheme will only provide for the flood portion of any claim.

In terms of the properties that the scheme will cover, Flood Re has eligibility criteria:

- They must be private, residential properties – this can include primary, second and holiday homes or buildings containing under four residential units, where other criteria are met
- They are covered by a household insurance contract, on an individual basis, and the holder of the policy or immediate family live in the property for some of the time, or the property is unoccupied
- They were built before 1st January 2009 (also eligible if a home is built before this date but then demolished and rebuilt) – applied to avoid incentivising new construction in flood-risk areas
- They have a domestic Council Tax band A to H

There is no cap on the number of policies Flood Re can cover. The decision to cede a policy to Flood Re is made by the insurer based on financial factors: if an insurer can offer a better flood insurance price outside Flood Re, they will do so. Only when the cost of flood risk coverage exceeds Flood Re's fixed premium does it become advantageous to pass the risk on. Flood Re also offers a "Build Back Better" scheme, which provides up to £10,000 for flood resilience measures as part of a flood claim.

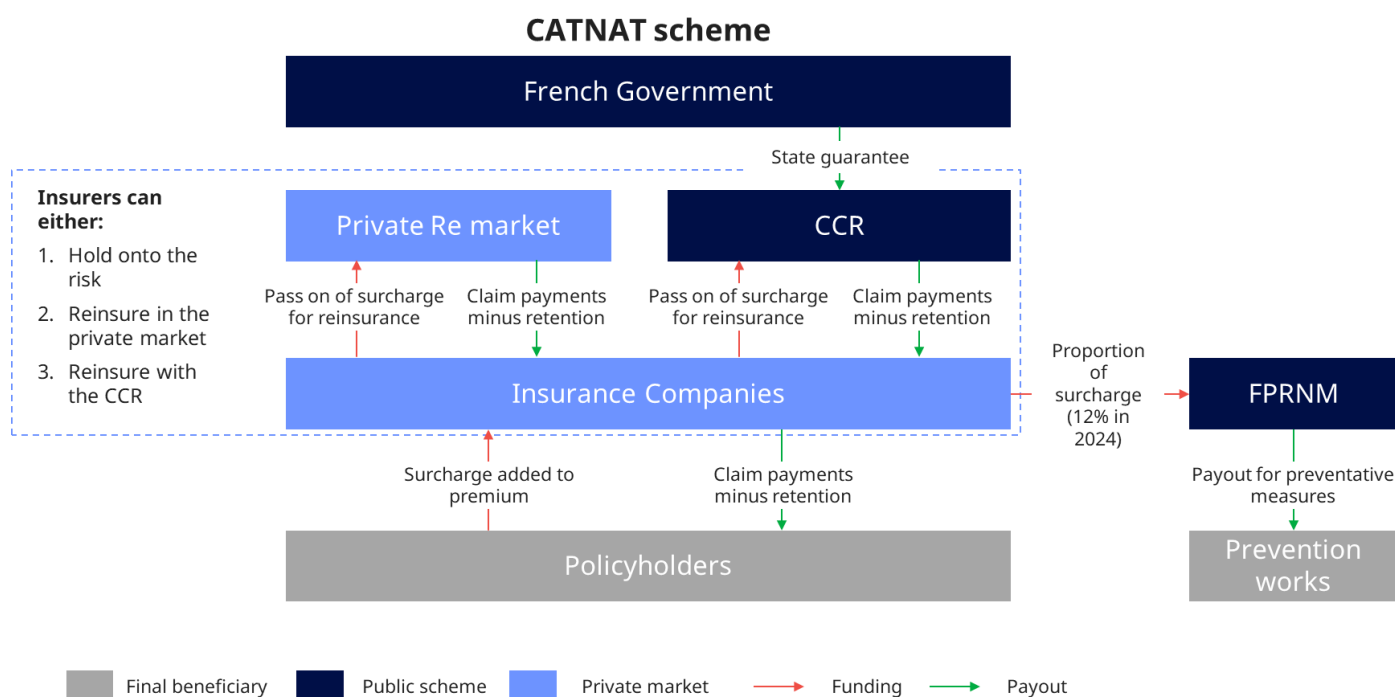
5.1.2 France CATNAT scheme

The Natural Catastrophe Compensation Scheme (commonly abbreviated in French to CATNAT) was established by Law n°82-600 of French Law and Insurance Code L125-1 of the French Insurance Code in the 1980s to ensure that coverage for major natural disasters is provided automatically to anyone who purchases a property or motor insurance policy. The scheme enables coverage of risks that are often excluded from insurance policies because of the possibility of catastrophic losses.

Scheme structure

To support the CATNAT scheme, the French Government has established two funds that increase the capacity for insuring natural disasters and enable preventative action to be taken: the Central Reinsurance Fund (CCR) and the Major Natural Risk Prevention Fund (FPRNM). The CCR is a public reinsurer that helps the private insurance market to underwrite catastrophic risk by providing state guarantee-backed reinsurance capacity. The FPRNM is a proactive fund that aims to provide financing for preventative measures and projects, including support to relocate residents from high-risk areas through acquisition of properties.

The diagram below outlines how these funds fit into the CATNAT scheme:



Central Reinsurance Fund (CCR)

The Central Reinsurance Fund (translated from Caisse Centrale de Réassurance) is a publicly owned reinsurer, created to provide reinsurance capacity for risks that insurers are unwilling to cover, including nuclear and terrorism. Within the CATNAT scheme, the

CCR is referred to as the “reinsurer of last resort” for the mandatory natural catastrophe cover that insurers must provide. It aims to ensure the availability and affordability of insurance for large natural disaster events that could result in catastrophic loss, stabilising the market and protecting policyholders.

CATNAT coverage is automatically provided upon the purchase of the relevant policies (residential property, commercial property and motor). It is funded through a surcharge on the premium of each policy. Previously the charge was 12% of premium on property policies and 6% for motor, however this was increased at the beginning of 2025 to 20% and 9% respectively to account for increasing loss activity. The scheme relies heavily on the private insurance market to write the underlying risks which it then reinsures.

Private insurers can cede the CATNAT surcharge paid by policyholders to the reinsurance fund in return for cover. However, they do not have to cede the natural catastrophe risk to the CCR. They can choose to retain the risk themselves, ultimately being responsible to bear the cost of claims. They can also reinsure the risk with the private reinsurance market, either as an alternative to, or in conjunction with, the CCR. Although the CCR is known as a “last resort” fund, insurers do not have to exhaust the private market before reinsuring risk with the fund. Instead, they can proactively use the CCR for reinsurance capacity. This approach might be preferred, as the CCR is backed by the government, providing an unlimited state-backed guarantee that losses will be covered even if the CCR is depleted.

Major Natural Risk Prevention Fund (FPRNM)

Established by law in 1995, the Major Natural Risk Prevention Fund, also known as the Barnier Fund, was initially created solely to finance compensation for the expropriation of properties located in areas at high risk of natural disasters. The fund has evolved over time to finance broader risk prevention and mitigation measures.

The fund’s primary objectives are to prevent repeated future losses in high-risk zones that are likely to keep experiencing impacts of natural disaster:

- Reducing natural hazard exposure by providing funding to local government risk-prevention planning, as well as other structural mitigation projects
- Supporting relocation from properties that are deemed no longer safe to live in, through buying and demolishing homes in high-risk zones that have experience repeat disasters
- Undertaking education and risk awareness activities

The fund is financed primarily through a levy on the CATNAT surcharge, with insurers that collect the surcharge paying a proportion of the premium into the FPRNM. Prior to 2025, the contribution equalled 12% of the surcharge. This has increased into 2025

however the new figure is not clearly published. The FPRNM may also receive funding through state budget allocations or special funding following major disasters.

Coverage

The CCR scheme only reinsures losses caused by events that are officially declared as a natural disaster that are, according to the Code “non-insurable by normal private insurance markets”. The types of peril covered include:

- Flood
- Mudflows
- Ground movement (such as clay shrink-swell drought)
- Earthquake
- Volcanic eruption
- Tsunami
- Some cyclones

These perils are often deemed non-insurable by normal insurance due to some of the same challenges as for coastal erosion: Unpredictability, correlated / non-independent risk causing many losses from one event, significantly high costs. A number of perils are excluded from this coverage, often because they are covered by standard insurance. However, one of the exclusions is coastal erosion, which has no existing coverage. Again, erosion is deemed uninsurable in this case because it is a gradual process as opposed to a sudden disaster.

The FPRNM also provides support for a range of natural hazards, including flooding, landslips, and other major risks. Financing of prevention is available for coastal flooding and, in some cases, coastal erosion where it is related to one of the recognised natural disaster risks. However, by itself erosion would not be an eligible risk, again due to its gradual nature, and because the FPRNM is in place to support in cases of major risk to life, or repeated natural disaster impact, neither of which are obviously applicable to erosion.

5.1.3 Norwegian Natural Perils Pool

The Norwegian Natural Perils Pool (NNPP) was established in 1980 and is governed by the Natural Perils Insurance Act and the Rules for the Norwegian Natural Perils Pool. It is a loss-equalisation pool that shares the nation's natural hazard risk across the insurance market, effectively functioning as a mutual reinsurance mechanism. The NNPP is fully funded by private insurer premiums, therefore categorising it as a “public” scheme may be a misrepresentation however, the pool was created through government and private insurers realising the need for a mandatory national insurance

mechanism. The State created the Act that mandates involvement in the NNPP, and therefore it has some public involvement, even if the pooled fund itself is only built from private sector input.

Scheme structure

All Norwegian insurers who issue coverage for fire insurance are mandated to be members of the NNPP. Anyone who purchases fire insurance for a property will also be covered for natural perils through their insurer and the pool. Following an eligible event, the insurer of a property with fire cover settles the claim with the policyholder as standard. The insurer then submits the claim to the NNPP and all the associated costs (compensation, administrative, reinsurance and loss assessment costs) are distributed across all member insurers. Each member's share of the risk is based on their fire-insurance sum insured compared to the total sum in Norway.

Premiums for the NNPP are calculated based on the fire insurance sum insured for each property and a premium rate. The premium rate is set by the NNPP board on an annual basis and is the same across all policies. Each insurer collects the premium directly when policies are purchased and held by the individual insurer in order to cover the cost of natural disaster claims. If the premiums earned are greater than an insurers share of claim payments through the NNPP, the remainder is allocated to a natural perils reserve at the insurer, to cover future natural peril claims. Settlements are made regularly between members to invoice for their share of claims costs.

The Pool has a limit of liability for a single natural disaster event of NOK 16BN (just over £1BN as of December 2025). For additional capacity, the Pool has a private reinsurance programme, run on behalf of the insurer members. In 2025, the Pool also begun to establish a central fund that will gradually accumulate a minimum of NOK 4BN (nearly £300M) to provide support to insurers in years where natural peril claims costs exceed the premium collected. The central fund will be built up using insurer's surplus premium in years where claim activity is lower.

Coverage

The Act on Natural Perils Insurance defines that cover is provided when the damage is "directly caused by a natural disaster in the form of ..." the following perils:

- Landslip (including avalanche type events)
- Storm
- Flood
- Storm surge or tidal wave
- Earthquake
- Volcanic eruption

- Meteorite strike

The Pool covers “sudden natural perils” not gradual erosion processes, as this natural process does not meet the threshold of “natural disaster”. Where storm surge is associated with gradual erosion, the Pool may even implement deductions or exclusion of payout. Sudden landslip events are covered, and so properties impacted by gradual erosion that experience a landslip may be eligible for payout, however the damage must be deemed to be directly caused by one of the named peril events.

5.1.4 New Zealand Natural Hazard Cover

The Natural Hazards Commission (NHC), formerly the Earthquake Commission (EQC), is a Crown entity established in 1945 which was restructured under the Natural Hazards Insurance Act 2023, effective July 2024. The Natural Hazards Insurance (NHI) scheme in New Zealand, established as part of this restructuring provides primary layer natural hazards cover for homes and residential land.

Scheme structure

The Natural Hazards Commission, a New Zealand Crown entity, acts a public insurer to provide cover to homeowners for natural hazard risks on a first loss basis. This means that the scheme provides the base layer of insurance, above the homeowner retained excess and up to a capped amount of NZ\$300,000 for a defined list of perils. As coverage through the scheme is not unlimited, private insurers provide additional coverage as required to ensure homeowners are entitled to full indemnity.

Coverage under the NHI scheme is accessible to all property owners who purchase home insurance policies that include fire cover. Premium payments for these policies include an NHI levy, which private insurers collect in full and pass the levy portion onto the government to fund the scheme. At time of writing, the levy was set at 16 cents per NZ\$100, up to NZ\$300,000, meaning the maximum annual levy payment is NZ\$480, plus tax. If a covered hazard causes damage to an eligible property, the property owner submits their claim via their insurer who passes on the relevant portion of the risk to NHI.

Coverage

The Natural Hazards Insurance Act 2023 defines the following as natural hazards:

- Earthquake
- Hydrothermal activity
- Landslide
- Tsunami
- Volcanic activity

- Storm
- Flood

The scheme covers property damage for all listed hazards except storms and floods, for which there is cover for land damage only, as damage to properties should be handled by private insurance. Cover can also include imminent damage, where a loss has not happened straight after the event, but is more likely to happen than not in the 12 months post-event. The Act explicitly excludes erosion from the natural hazard definition using the following wording: *“However, the normal action of the wind or water causing gradual erosion (including, for example, coastal erosion, bank erosion, and sheet erosion) is not a natural hazard”*.

5.1.5 Natural Catastrophe Insurance of Iceland

In Iceland, the natural catastrophe insurance scheme (known as Náttúruhamfaratrygging Íslands, or NTÍ) is a mandatory state-run insurance scheme for natural disaster losses for real estate and fire-insured contents. Originally established through legislation in 1975, the current legal framework took effect in 1992 under the Special Act on Icelandic Natural Disasters Insurance, No. 55/1992.

Scheme structure

Coverage from the NTÍ is automatically provided if a property has fire insurance, which is mandatory in Iceland, meaning all real estate should be covered. The scheme is the only primary insurer for the specified catastrophe hazards. The insurance will pay up to 100% of the insured value declared in the fire policy, minus the deductible value. The deductible is set as 2% of the loss, and property owners will retain this amount. There is a minimum deductible that must be paid, which is currently ISK 400,000 for buildings and ISK 200,000 for moveable property (~£2,000 and ~£1,000 respectively, as of December 2025). There is a statutory payment-obligation cap per insurance event for very large disasters, which means that the NTÍ will not pay out more than 0.75% of the total insured value in Iceland. If the cap is met, payments to claimants are pro-rated so as to not exceed this amount.

Premium for the NTÍ is collected by private insurers when premium for fire coverage is paid, which is then passed to the scheme. The most recent amendment to legislation in 2025 set the premium rate to 0.0375% of the property's fire insurance value. Following a natural disaster loss, insured property owners report the damage through their private insurers, who perform initial assessments and pass the claim onto the NTÍ, which assesses the damage and provides the suitable compensation. Where houses are completely destroyed, the scheme will compensate for reconstruction or replacement value. Rebuilding clauses state that funds should be used to rebuild in the same location however, if the property location is no longer suitable to rebuild on, owners may be exempt from these restrictions and can use the funds to purchase or build elsewhere.

Coverage

The scheme provides coverage for “major natural perils”, which include:

- Volcanic eruption
- Earthquake
- Landslide
- Avalanche
- Water flooding

It excludes certain weather events like typical storm damage, snow-weight collapse, or flooding from ash or cloud fall. Although not explicitly excluded, no mention is made of coastal erosion being a covered peril.

5.1.6 Switzerland Elemental Perils Insurance

Switzerland has a dual approach to natural peril insurance, using a cantonal-level system as opposed to national scheme. Coverage for fire and elemental perils is mandatory in the 19 “KGV” cantons via the cantonal public insurers, each mandated through their own legislation. In the seven “GUSTAVO” cantons, elemental perils coverage is provided exclusively by the private market and is compulsory in three of the cantons, voluntary in four.

Although coastal erosion is not a relevant risk for Switzerland given it is a landlocked country, the scheme presents a useful and slightly varied approach to a public-private natural hazard insurance scheme.

Scheme structure

Two main insurance schemes are used in Switzerland, dependent on the canton. In the seven “GUSTAVO” cantons, elemental perils, included in fire insurance for buildings and contents, are covered by the private market. The remaining 19 cantonal areas provide compulsory building insurance, including natural disasters cover, through Cantonal Building Insurers (known as Kantonale Gebäudeversicherer or KGVs). In each canton, KGVs are the sole insurance provider of mandatory building insurance for fire and elemental perils.

Both the public and private approaches are underpinned by the principle of ‘double solidarity’: solidarity among insureds and solidarity among insurers. “Solidarity among insureds” reflects the systems’ approach to pricing of premium. For the KGVs, prices are set at a cantonal level, reflecting the risk of the specific canton, but not the individual property profile. Therefore, every insured within the same canton will pay the same price for natural disaster insurance, as a percentage of the insured property value. For

the privately insured cantons, the same price is charged for all, again as a percentage of insured value, set by the federal government.

“Solidarity among insurers” refers to sharing of excessive losses among insurers through pooled funds. The KGVs finance an inter-cantonal solidarity fund to offer relief where an insurer experiences losses larger than the 50 year return annual loss. The KGVs established the Inter-cantonal Reinsurance Association (Interkantonaler Rückversicherungsverband or IRV) to obtain reinsurance for the aggregated cantonal risk. The IRV also manages the solidarity fund. The private insurers established the Natural Hazard Pool (Elementarschaden or ES-Pool), a voluntary association to share the risk, enabling the provision of affordable natural disaster insurance. The mechanism for the ES-Pool involves the insurers retaining the initial 20% for each loss and pass the remaining 80% to the pool. This 80% is apportioned among the contributing insurers based on their overall market share. Both the public and private pooled fund solutions purchase private reinsurance to further increase the capacity of their respective schemes.

The KGV system also supports risk prevention and mitigation efforts through the integrated national risk-management system. They contribute portions of their budget into training and equipping fire brigades, which helps to adopt preparedness approaches to reduce flood related damage. They are also involved in building resilience, providing feedback on design features for large constructions to support implementation of adaptation measures that can have significant mitigation of climate impacts.

Coverage

The natural perils covered as part of the mandatory insurance include:

- Flood
- Windstorm
- Landslide
- Falling rock
- Avalanche
- Hail
- Weight of snow

Earthquake is not usually an included peril and instead requires its own specific insurance cover.

5.2 Conclusion

5.2.1 General scheme applicability to coastal erosion risk

Erosion is not covered under existing schemes

As with standard private property insurance, the public climate insurance schemes identified also exclude coastal erosion, either explicitly or through omission. Therefore, any UK scheme would be the first of its kind to include erosion as a covered risk and would need to innovate and work with various stakeholders to make coverage of the risk feasible.

A national scheme will require legislation or policy change

All existing public insurance and reinsurance schemes identified have been established in law, with Acts created to define the scope, mechanism and the perils covered by such a scheme. **To introduce a scheme for erosion, legislation would be required.**

Without a legal requirement for the UK Government and / or private insurers to provide cover for erosion, a risk that is not currently covered, and for the public to pay the extra charge, a nationwide insurance scheme is highly unlikely.

Another area of current policy that may need updating is the UK Government's stance on compensating people who suffer loss due to erosion. Presently the Government aims to avoid providing compensation in the event of erosion loss, however this stance makes it difficult to establish a fund or scheme that is worthwhile in terms of the benefit it provides to the end recipient. **The mindset would need to pivot from perceiving that residents are getting money for nothing, and instead that a known amount of money is being given to enable a safe and controlled relocation** that saves local government from spending significant funds on emergency response and public housing in order to meet their legal duty to rehome those who lose their house.

A broader natural disaster fund is more feasible than an erosion-only solution

Many of the existing national / sub-national schemes identified cover multiple natural hazards, instead of focusing on one particular risk. Flood Re is an exception, set up as a temporary solution to a market failure that needed to be addressed. Given flood is a well-known, already insurable risk, unlike coastal erosion, the single peril scheme was feasible. However, covering a wider set of risks in a scheme, in general, is more feasible, due to benefits such as risk diversification stabilising losses across the pooled risk, lower capital requirements per peril and easier procurement of reinsurance. It also reduces the risk of adverse selection (only people with exposure to the risk buying the cover).

- This is key for erosion, as an erosion-only pool would only need to provide cover for people who have risk. As highlighted in section 2.3.2, erosion risk is both heterogeneous (in that exposure can vary greatly across a group of people) but also could lead to very large losses where a particular location is impacted at once. These challenges make it difficult to create a fund exclusively designed to cover erosion risk.
- It is unlikely that funding of an erosion-only insurance scheme can be spread across all property owners, as this structure would reflect more of a compensation scheme than an insurance mechanism. If only those with erosion risk paid into a scheme, costs could be significant. For this reason, it also makes it more challenging to implement a national mandatory scheme as with some of the international examples. A mandate for a levy on everyone could face backlash where they are not also receiving some sort of insurance coverage in return, and it would not be possible to mandate nationwide coverage. Adverse selection is a significant challenge of coastal erosion because there is such a big spread in the level of risk, and it is likely only those in coastal areas with high risk who would gain benefit from, and therefore purchase, the cover.
- Therefore, diversifying a fund to incorporate other climate risks could be a solution to mitigate these challenges. It would increase the pool of people exposed to eligible risks, making payment of premium by all more attractive. Sharing the cost across low and high-risk properties would help to make the insurance affordable for all. Although existing natural disaster schemes still exclude erosion, the broader risk profile of more predictable, less certain risks that impact a greater population of the public may enable an option for erosion to be included. This would likely have to come with caveats and limits, potentially as an add-on for an additional cost.

Public-private collaboration is required; the level of each party's involvement would need to be determined through engagement; a national reinsurance solution may be more challenging as the private market would need to underwrite the initial risk

The examples identified demonstrate solutions with varying levels of public and private sector involvement. This includes:

- **Dual responsibility:** At sub-national levels, certain jurisdictions using state insurers, others using the private sector, both backed by pooled funds in case of extreme loss
- **Public sector base layer, private sector reinsurance:** National insurer provides the primary layer of insurance coverage, purchasing suitable reinsurance from the private sector
- **Private sector base layer, public sector reinsurance:** Private insurers provide the primary layer of coverage, and pass the relevant natural disaster risk to national reinsurance schemes. Ceding to the reinsurance pool may be mandatory (NNPP) or optional for the private insurers (Flood Re)

The Government and private insurers would need to engage to determine the most optimal structure for the UK. Schemes that provide reinsurance capacity as opposed to primary insurance may be less suited to erosion risk, as it requires the private market to initially cover the risk in order to reinsure it. Although the Norwegian Natural Perils Pool demonstrates the precedent for mandating the private market to provide initial coverage, again this only includes perils that have been historically covered by insurance markets. To mandate coverage of erosion, something that insurers exclude and have not had to take liability for before, may be significantly more challenging. This issue would, as mentioned above, also likely be tempered by the adoption of a broader natural hazards pool.

A scheme whereby the Government adopts a national natural disaster insurer for the primary layer may also help to bolster input from the private markets through leading by example. Private insurers may begin crowding into the market, at least providing reinsurance to the national insurer. This might encourage dedicated efforts to build out underwriting capabilities for erosion risk. Challenges will exist for whomever takes on the risk, as there is not currently historical insurance or claims data to understand the probability of loss. There would need to be reliance on other data sources, which could have significant disparity across regions of the UK.

With the national insurer option, the UK Government could have greater ability to design the insurance response to be appropriate for erosion, such as including it as an add-on, introducing payment caps, paying to support with particular costs associated with erosion loss, or providing greater flexibility for use of funds where rebuilding on the land is not feasible (as with the Icelandic scheme).

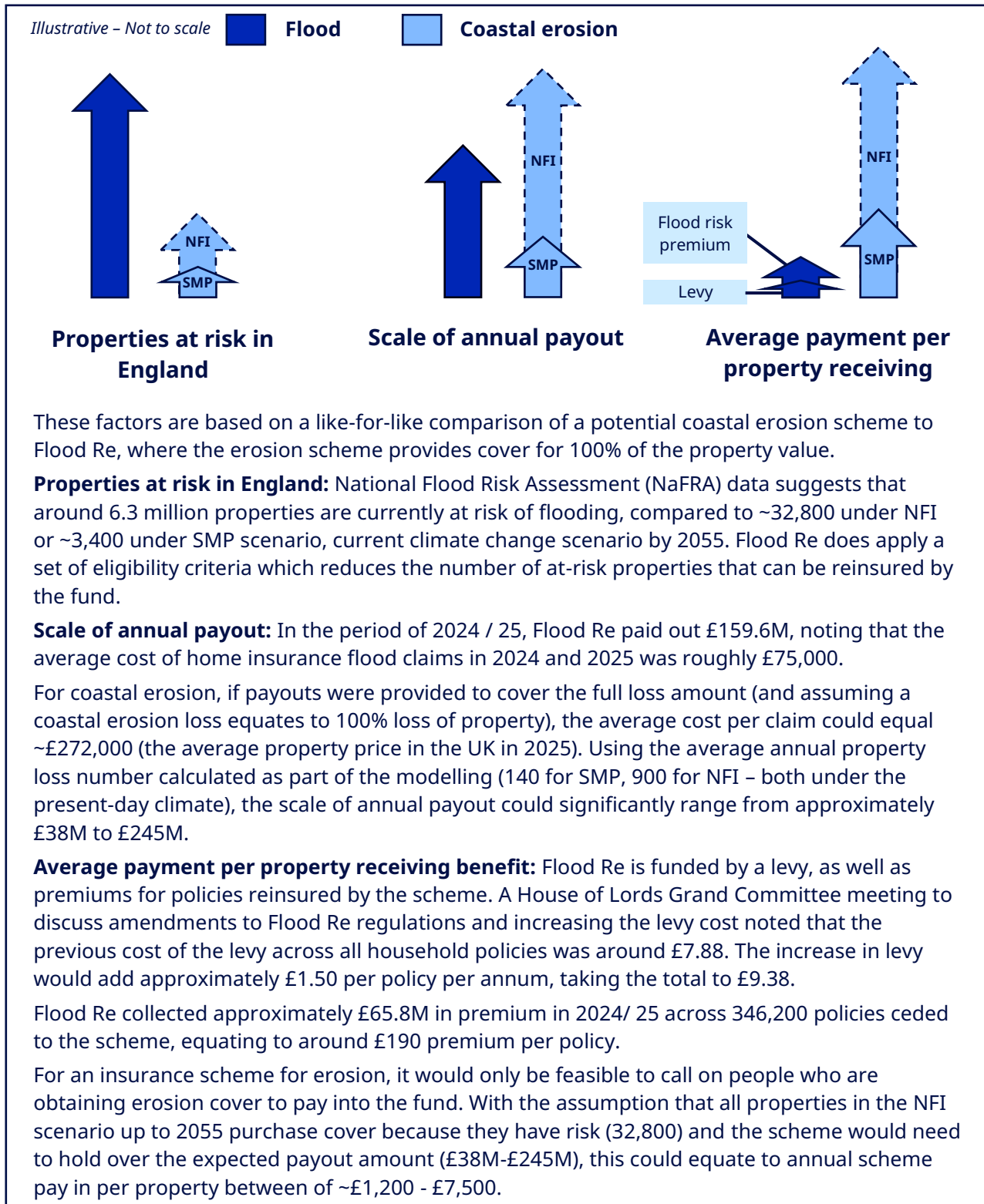
Regardless of the scheme's structure, an overarching theme from existing examples is the use of private insurer premium collection mechanisms. Scheme funding is collected through the normal mechanism, usually alongside the purchase of other policies (often fire insurance) and then passed on to whoever is responsible for administering the natural disaster scheme. This reduces the need for additional administrative processes for collecting funds. If a UK insurance scheme were to be set up, existing insurer premium collection should be utilised to collect payment for the additional coverage.

A public insurance scheme would have the potential to support in wider preventative measures for erosion

The French CCR and Swiss KGV examples highlight the ability of these schemes to not only support provision of affordable insurance cover, but also to collect money for preventative measures. A similar approach would be beneficial for erosion in the UK. Existing funding for mitigating erosion is limited, with the responsibility often falling to Local Authorities. A means to generate funding ring-fenced for climate resilience projects would provide opportunity for coastal authorities to develop and fund measures to address erosion risk, something that is not currently an option for many areas.

5.2.2 Flood Re applicability to coastal erosion risk

Differences in the risks and how Flood Re is set up bear significant structural constraints for incorporating coastal erosion into the scheme



Flood Re is a viable solution for flooding, as it addresses a probabilistic and repairable hazard, benefits from a strong private-public partnership, operates under a politically acceptable universal levy, manages reinsurance liabilities effectively, and incorporates a planned transition towards reducing long-term risk. Low risk properties subsidising those with high risk is possible because the low-risk properties also purchase flood insurance as part of their household policies.

For erosion, the risk is different because it is so heterogeneous, where many properties have essentially zero exposure to coastal erosion loss due to their location inland. These properties will not need to purchase coastal erosion cover and therefore would not be paying into the insurance solution. If all property owners nationally were called upon to pay an amount to support those with risk, this would be some sort of compensation scheme, and not insurance.

To mirror the coverage provided by Flood Re and flood insurance policies, the above illustrative example assumes that an erosion scheme would also provide total loss value. A further assumption has been made that all losses from erosion would be total loss, as it is unlikely that a property will be safe to live in once a loss has occurred. However, in practice, schemes can limit their liability. Limits can be applied per loss (as with the New Zealand Natural Hazard Cover) or a limit per large disaster event (set as a fixed value as with the Norwegian Natural Perils Pool or a percentage of total loss as with the Natural Catastrophe Insurance of Iceland). For coastal erosion, limiting the payout per property could work however, the value would need to be set so that it provides adequate support to the residents while still pared back enough to reduce the capacity requirement of a fund. Dependent on the level that a cap is set, given that erosion events often result in total loss, the expectation could be that the cap will be met for every loss.

The establishment of Flood Re occurred under exceptional circumstances that do not necessarily align with the challenges of coastal erosion. Key elements of flooding that make it suitable for the scheme include:

- Flooding is a probabilistic hazard with intermittent, uncertain, losses, enabling effective risk pooling and reinsurance
- A sufficiently large number of low-risk policyholders, enabling risk diversification across a broad portfolio
- Flood damage is generally repairable, allowing claims to be managed within the insurance framework
- Flood risk is a well understood, historically insured risk that became more challenging due to climate change
- The scheme assumes a long-term reduction in risk through investments in flood defences and household resilience, supporting its financial sustainability

In contrast, coastal erosion involves:

- Gradual, less predictable yet certain loss of land that often leads to loss of entire properties
- A significant proportion of the population with no risk, as opposed to low risk, limiting insurance pooling options
- Situations that often have limited feasibility to rebuild, resulting in permanent loss of property
- No current available insurance on the market due to a number of challenges of the risk
- Development of defence plans at a regional level, with limited options for single properties to put in resilience measures – Defences are often costly

These fundamental differences mean that Flood Re's model, including its funding mechanisms, risk pooling, and property-level enhancements, cannot be directly applied to coastal erosion.

Legislative changes would be needed in order to amend the scope of Flood Re to include erosion

Flood Re was established under the Water Act 2014, which legally defines its scope. Any expansion to include coastal erosion would require new Parliamentary legislation, a complex, lengthy, and uncertain process. Additionally, Flood Re is designed as a temporary scheme, intended to operate until 2039, with a planned transition towards a normalised flood insurance market. Introducing coastal erosion risk would complicate this transition and is unlikely to be considered within the scheme's remaining lifespan.

Due to the relative scale and current inability to insure coastal erosion, set up of a complex and expensive scheme akin to Flood Re may be unpalatable to both the UK Government and the private market

Political support for expanding Flood Re to include coastal erosion may be limited. Unlike flooding, which causes widespread and immediate national disruption, coastal erosion tends to be more localised and less frequent. This lower level of national impact reduces the political urgency to broaden Flood Re's remit.

In addition, Flood Re was a complex and expensive scheme to establish, deemed necessary because of the potential market failure and the inequity in ability to get insurance cover. Many insurers had to spend money internally to ensure their readiness for the scheme. As coastal erosion is currently not insured, the market may be reluctant to cover the risk in the same manner that they do for flooding or spend the same level of money to set cover up.

Flood Re provides takeaways that can be useful in developing a coastal erosion insurance scheme

Whilst integration into Flood Re may not be feasible, Flood Re offers valuable lessons and mechanisms that could inform the development of a future coastal erosion insurance scheme:

- **Premium collection:** The use of fund collection through insurers standard premium mechanisms, making use of efficiencies and reducing additional administrative needs, could be adapted for a coastal erosion solution
- **Public-Private Partnership:** The collaboration between government and industry underpins Flood Re's success, highlighting the need for strong partnerships to address complex climate challenges
- **Resilience incentives:** Initiatives like the "Build Back Better" scheme show how insurance can incentivise resilience measures. While single property coastal erosion adaptation may be challenging, a scheme could support Local Authority level resilience activities

Conclusion

In conclusion, integrating coastal erosion into Flood Re is not a feasible solution, given the difference in risk characteristics, scale, need for legislative changes and Flood Re's 2039 expected end date. The unique risk profile of coastal erosion, combined with Flood Re's specific design for flood risk, requires alternative approaches to insure coastal erosion, such as incorporating the risk into a broader natural peril scheme. However, there lessons learned that can be utilised from the set up and operation of Flood Re.

Section 6

Alternative coastal erosion risk transfer options

6.1 Exploring alternative risk transfer models

While a coastal erosion public-private national insurance solution might be feasible where a broader scope of perils is also covered, alternative options exist that focus on coastal erosion only.

Public option: A Local Authority-held risk fund that is built up by property owners in the area through a levy.

Private option: A parametric insurance solution, purchased at a community or Local Authority level, that provides cover at defined loss points, triggered automatically when a pre-defined index is breached, paying out a pre-agreed value regardless of the actual damage experienced

6.1.1 Public options – Local Authority risk fund

Local Authorities with coastal erosion risk could look to develop funds that are available to support properties at risk. Councils currently bear a significant portion of the cost of helping residents to get back on their feet following property loss due to their duty to rehouse people. There is not currently a dedicated government scheme to help with the majority of these costs. The coastal erosion assistance grant (CEAG) provides support with the demolition costs, but the payout capped at £6,000 (first introduced in 2010 and most recent guidance published in January 2025, still limited to the same value with no increase to reflect inflation) is quickly becoming small relative to the actual cost. In addition, the eligibility criteria require a property to have been purchased by the current owner before 2009, which is very restrictive. Local Authorities have begun to take funding from other areas of council finances in order to support residents where demolition costs exceed the limit. The financial burden is growing as the risk increases, exacerbated by coastal erosion.

To aid financing of these costs, budgeting of funds and sharing of the risk, a Local Authority-level risk fund could be a viable option that helps both the council and property owners.

International public sector risk pooling examples

Internationally, public risk funds exist to support with climate risk and disaster recovery costs. They can be broadly categorised into the following:

- **National public disaster funds:** National government-created and managed disaster funds that pool financial exposure across regions or ministries to cover broad, climate catastrophe events. Examples include:
 - **Mexico** formerly had the Fondo de Desastres Naturales (FONDEN) which provided specific funding to support relief and mitigation efforts following natural disasters. The scheme was dissolved in 2020.
 - **New Zealand** (in addition to the Natural Hazard Fund providing insurance) also has the Disaster Fund, which is funded in part by the Red Cross. The fund is used to recover from disasters and provides grant funding to affected communities.
- **Sovereign risk funds:** Multi-country sovereign funds pool resources from multiple jurisdictions to provide financing following climate catastrophe, enabling sharing of risk. Examples include:
 - **Caribbean Catastrophe Risk Insurance Facility (CCRIF)** pools 19 Caribbean member nation's risks to payout after hurricane, earthquakes and significant rainfall
 - **African Risk Capacity (ARC)** brings together risk of the African Union member states to offer financing for drought contingency and payouts for disaster response
- **US state disaster funds:** A number of US states maintain budget disaster funds to provide immediate access to money got climate-related events. States with these funds include California, Texas and New York

While sovereign risk pools bring together the risk of whole nations, they set an example that could be applied to Local Authorities whereby those impacted by erosion pool their risk into one coastal erosion risk fund.

Anticipatory Action

Another disaster risk financing mechanism, which is used at a larger scale but has some relevance to erosion risk, is Anticipatory Action (AA). AA is principally used in humanitarian settings and involves releasing funds based on a forecast of future events in order to reduce the impacts before they are able to fully unfold. For example, funds may be released based on a forecast showing a high likelihood of a drought or failed harvest. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and the World Food Programme (WFP) have set up and supported the financing of AA pilot initiatives, which provide funding to certain countries when pre-agreed, pre-disaster triggers are met. It is not insurance, as the funding source is internal as

opposed to an insurer. Instead of an insurance policy, an "AA framework" is set up, which outlines the nature and conditions of the funding payout. AA typically requires:

- **Pre-agreed forecast trigger:** thresholds and criteria based on high quality, unbiased and reliable forecasts
- **Pre-agreed activities:** Feasible and effective actions before the full impact of an event is felt
- **Pre-arranged financing:** Funding that is guaranteed to be available for release upon the trigger being met to support action of the pre-agreed activities

AA has some similarities to parametric insurance (see section 6.1.2) in that it provides funding once a trigger is met but differs in its key purpose because funding is provided pre-loss rather than post-loss. An AA solution could be applicable for erosion risk, as much of the effort and financing related to the risk is associated with pre-emptively moving residents and demolishing at-risk properties to reduce the damage in the event of a cliff collapse. The introduction of a framework would provide a structure to formalise existing efforts that Councils undertake and establish a mechanism for funding the necessary actions.

Coastal erosion risk fund options

The work undertaken as part of the Coastal Loss Innovative Funding and Financing (CLIFF) project identified two viable funding mechanisms:

- **Local Authority Coastal Adaptation Fund** – Local Authorities collect funds from properties at risk from coastal erosion which can be released to the LA when certain conditions are met. Funds can be used support coastally exposed households and communities.
- **Levy Model** – Funds are collected through a levy-style mechanism. Raised funds are managed centrally and pays out to an agreed entity once a pre-defined condition is met.

A combination of these options could be considered, whereby Local Authorities levy their council areas and ring fence funds in a financial vehicle which is then paid out to the LA to support residents who need to relocate.

The Resilient Coasts project, being run by East Suffolk Council, is looking at the options for a Coastal Adaptation Fund, and has investigated a number of different components of a Local Authority-held solution, including:

- Funding
- Structure
- Interaction

- Payouts

Key considerations for establishment of such a fund include:

- Who would pay into the fund? All property owners in the area, or just those with risk?
- How would funding inputs be decided per property? Council tax band, number of rooms, square footage, or would it be risk-based?
- Would the fund cover residential properties, or include businesses as well?
- What would the fund pay out to recipients? What costs would be covered? Could different ownership models receive different payouts? (See Appendix A for possible options for payouts)

Additional work is planned as part of Coastwise to understand how a Local Authority fund could work as a Coastal Housing Assurance Scheme that should be used to address these considerations. Scaling up options exist where multiple authorities establish risk funds which would help schemes to benefit from economies of scale and administrative efficiencies. The executive summary of the Resilient Coasts report can be found in Appendix B.

6.1.2 Private option – Parametric Insurance

Parametric insurance is an innovative approach to managing risk that differs significantly from traditional insurance. Instead of indemnifying the actual loss suffered by a policyholder, parametric insurance pays out when a specific, measurable event occurs and crosses a predefined threshold. The event is tracked using an independent index, such as wind speed during a hurricane, earthquake magnitude, or rainfall levels. The key advantage is that claims are triggered by the index itself, not by assessing physical damage, which means payments can be made quickly, often within days rather than months or years.

This type of insurance is particularly useful for risks that are difficult to insure through conventional means. For example, it can cover indirect financial losses, business interruption without physical damage, or losses that fall under high deductibles or exclusions. Parametric insurance will payout a defined, pre-agreed financial value that is deemed to reflect the scale of the financial loss presented by the trigger being reached. Because the payout is based on clear, objective data, the claims process is straightforward and transparent, reducing disputes and administrative delays. This helps organisations maintain liquidity, which is especially valuable in the aftermath of a disaster, allowing many claims to be settled within 10-14 days and providing rapid financial support.

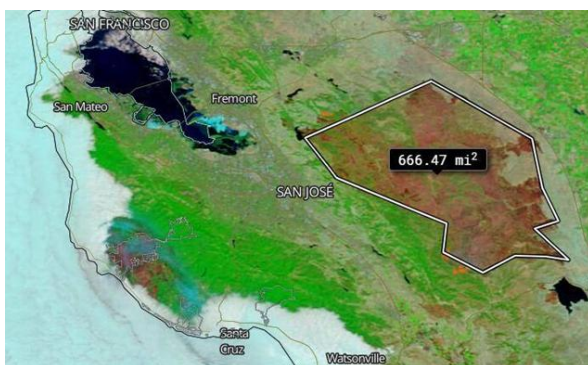
Traditional insurance, by contrast, requires proof of actual damage or loss, and claims can be complex and time-consuming to settle. Policies often include exclusions,

deductibles, and lengthy assessments, which can delay payments. Parametric insurance offers more flexibility, with contracts tailored to specific triggers and terms that can span multiple years. Pricing is based on scientific analysis of the likelihood of the triggering event, rather than market appetite or risk quality.

Example parametric insurance – Wildfire

Wildfires pose a growing threat globally, driven by climate change, population growth near wildland-urban interfaces, and forest management challenges. Traditional insurance solutions face increasing limitations due to rising premiums, coverage withdrawals, and lengthy claims processes. Parametric insurance has emerged as an innovative alternative, providing rapid, data-driven payouts based on predefined triggers such as fire footprint extent measured via satellite imagery or fire intensity data.

Marsh has explored parametric wildfire insurance programs that leverage near real-time satellite data from sources like NASA's Fire Information for Resource Management System. These programs enable insured parties to receive swift payouts once the wildfire footprint reaches certain thresholds, without waiting for time-consuming loss adjustment processes. This rapid liquidity supports immediate response, recovery efforts, and reduces the financial disruption to the economy.



Images 5 and 6: Example wildfire parametric images, showing the boundary of the parametric insurance (the white line) and the burned land meeting this boundary

Parametric wildfire insurance also rewards proactive risk management. By integrating data analytics that recognise forest management practices, such as thinning, prescribed burns, and defensible space creation, premiums can be reduced by up to 40% for well-managed risks. This incentivises mitigation and improves overall resilience.

Key Features of Wildfire Parametric Solutions

- **Trigger mechanism:** Based on objective, independent data measuring fire extent or intensity (e.g., satellite imagery)

- **Payout speed:** Rapid payment post-event enables efficient recovery and operational continuity
- **Flexibility:** Payouts can cover a range of impacts including property damage, business interruption, community support, and mitigation costs
- **Risk management incentives:** Pricing reflects proactive forest management, encouraging risk reduction
- **Data sources:** Utilises publicly available, near real-time data (e.g., NASA FIRMS), enhancing transparency and reliability

Key differences for coastal erosion risk

Coastal erosion presents a distinct and complex risk profile. Like wildfire, coastal erosion impacts can be sudden or gradual, affecting infrastructure, property, and ecosystems. There are a number of key differences with coastal erosion that would need to be considered:

- **Trigger parameters:** Coastal erosion parametric triggers would need to include measurable physical changes such as shoreline retreat rates, beach width reduction, dune height loss, storm surge intensity, or number of properties a certain distance from the cliff edge, which would require monitoring via satellite or aerial imagery and tide gauges.
- **Data complexity:** Coastal erosion monitoring may require integration of multiple data streams (e.g., satellite imagery, storm surge data, sea-level rise models, Local Authority data) to more accurately capture risk and trigger payouts
- **Mitigation measures:** Coastal risk management includes engineered solutions (seawalls, dune restoration), land-use planning, and natural buffers, which can be incorporated into parametric pricing models to incentivise resilience

Applicability to coastal erosion

As discussed in section 2, a significant challenge in establishing an insurance scheme for coastal erosion lies in the requirement for a sudden, tangible event to trigger a loss. Coastal erosion is a gradual process and does not meet this criterion until physical damage to property has occurred, often due to a landslip event. Waiting for such damage inevitably increases the extent of loss and demolition costs. Therefore, it is more beneficial to design a scheme that can provide financial support before the actual physical loss takes place, enabling people to relocate when properties are deemed unsafe.

Parametric insurance offers a promising solution by defining specific indices with predetermined 'triggers' linked directly to measurable characteristics of coastal erosion, rather than relying on the extent of property damage. For example, a trigger could be based on a predefined rate of erosion, such as a specified number of metres lost per

year, or properties 5m from the cliff edge, which would then activate a claim. These triggers can be independently verified through satellite imagery and geospatial data, ensuring transparency and efficiency in the claims process.

Early discussions with insurers conducted by Marsh in this project indicate an interest in a parametric option for coastal erosion, especially if coverage is extended to collective entities like local councils or housing associations rather than individual homeowners.

Key considerations for a parametric coastal erosion solution

Conversations with parametric experts across Marsh revealed that there is often market capacity for parametric insurance because the structure of a parametric schemes are based on data. Thus, the insurers can manage the risk. Insurers can tailor the scheme to the risk, meaning that the loss triggers can be adapted to ensure both coverage for the insured and manageable risk level for insurers.

Developing a parametric insurance scheme for coastal erosion requires consideration of several key factors. Market capacity may exist due to the data-driven nature and flexibility of parametric products, however, as with traditional insurance the risk will be priced based on the likelihood of triggers being met. If there is a high likelihood of a payout being issued, the premium will reflect this and may be higher. As such, accurate risk quantification is essential to ensure sustainable capacity and fair pricing. Insurers do not have historical information and probability data for erosion given that it has not been covered before, so effort would be needed to build out suitable probability models that the market is comfortable with.

Triggers must be objective and measurable, based on indicators such as erosion rates or coastline proximity. Given the gradual nature of coastal erosion, triggers need precise calibration to enable timely payouts before significant damage occurs. Reliable data from satellite imagery, aerial surveys, tide gauges, and geospatial property information is critical, with independent verification to ensure transparency and reduce disputes among claimants.

Payouts should be pre-agreed and linked to trigger severity. One challenge of parametric insurance is the increased basis risk. Basis risk is the potential that insurance payouts do not match the scale of the loss. With traditional insurance, valuations and property surveys pre- and post-loss help insurers to estimate the financial loss to some degree of accuracy. However, with parametric insurance, actual damage to an asset is not required to trigger payout and is based on the defined index. Therefore, there needs to be assessment of the financial cost that is associated with a coastal erosion index breaching the trigger point so that insurers can reduce their basis risk.

Example structural components of coastal erosion parametric insurance

This table outlines how a parametric coastal erosion insurance product could be designed.

Product component	Potential design
Scope – Who will purchase the policy, and what circumstances will it cover / exclude?	Local council coverage: Local Authorities take out insurance for erosion in their area, rather than providing cover per household. Local Authority policies could then be pooled. Pays out for loss due to coastal erosion risk
Funding and capacity – Level of premium payments vs the limit provided and who will pay	Local Authority contributions: Annual premium based on risk exposure (e.g., length of coastline, historical erosion rates) or population. Premiums could be covered through levy on residents. Premiums calibrated to balance affordability and sufficient coverage limits. Capacity may be supplemented by reinsurance to cover extreme erosion events
Index & trigger – What measure will be used to inform payout and what limit will trigger it?	Erosion Rate Threshold: Triggered when erosion exceeds a predefined rate (e.g., >2m/year) Distance from cliff edge to property: Triggered if certain number of properties come within a set distance (e.g., 5, 10m) from the edge in a year Verifiable triggers: Triggers will need to be verified by independent geospatial and satellite data sources to ensure transparency and objectivity
Structure – Who will the product payout to and how will it benefit residents?	Local Authorities act as cedents: Local Authorities are insured by insurers, paying premiums based on risk exposure to coastal erosion. When trigger conditions are met, the Local Authority receives a payout from the insurer. The Local Authority is responsible for how the funds are used, typically for mitigation, relocation, or recovery efforts, potentially paid out through a grant scheme. Pooling of multiple Local Authorities can help to diversify risk and reduce premiums
Payouts – What will the level of payout be, what will this be based on and how could it be used?	Payouts aligned to the designated trigger: Payout levels are pre-agreed and linked to the severity of the erosion event as measured by the index (e.g., erosion rate or proximity threshold). Funds can be used by Local Authorities for demolition costs, grants, emergency response, coastal defence reinforcement, land acquisition, community relocation, or infrastructure repair. The exact payouts would need to be calibrated with a Local Authority's intended needs, balanced against the erosion risk profile of the location. The parametric nature ensures rapid disbursement without potentially lengthy claims adjustment

Data requirements – What data would be needed to design and maintain the product?

Reliable data required to model and monitor risk, including:

- Historical and real-time erosion rate measurements from satellite imagery, drones, and ground surveys
- Geospatial data on property locations and distances from coastline
- Local authority risk exposure data (population, infrastructure)
- Regular updates to factor changing conditions and climate trends

Example Data Resources

1. **National, public datasets:** e.g. NCERM - historical datasets and sea-level projections
 2. **Specialist data vendors:** Parametric insurance often requires Third Party data to establish that a trigger threshold has been met, so specialist data vendors who can monitor erosion risk would be required. An example vendor is Ocean Ledger - a geospatial firm for coastal physical risk modelling that uses satellite imagery and AI models to generate 40-year, historical coastal dynamic trends and undertake real-time monitoring
-

6.2 Conclusion

Public sector risk funds are a more feasible option for coastal erosion risk financing than indemnity insurance; where funds are developed at a Local Authority or regional level, there is potential for national pooling

Local Authority level risk funds that provide support for the region would be more suitable than indemnity insurance. The constraints of transferring the risk to the insurance market are less pertinent for a public sector fund, where the risk is essentially retained but provided for through a dedicated funding mechanism. Local Authorities will have flexibility to administer the fund in a way that brings the greatest benefit and suits the needs of communities in the area. This can be reflected in:

- The value and nature of financial support provided to affected residents and communities
- The criteria that must be met in order for a party to be eligible to payout
- Costs and risk scenarios which are excluded

Challenges to this approach exist however, including:

- The need for funds to be raised by the Local Authority, rather than risk funding paid out by the insurance market and the Local Authority only required to fund the premium
- Administrative burden to set up the structure and mechanism to manage and implement a fund, including means of disbursing finances to those in need
- Potentially high fees to have active fund management to generate large investment returns

International precedent exists for public sector risk pools, providing support following climate disasters, demonstrating the ability to pool regional risk. The use of funding through Anticipatory Action to enhance preparedness and reduce the impact of a risk is also a non-insurance funding mechanism used by the public sector which could be an applicable concept for erosion, as often the action undertaken by residents and local councils is undertaken before the loss event occurs.

A potential insurance solution that could apply to coastal erosion risk is parametric insurance, as it is not triggered by actual loss of or damage to a property, instead relying on a particular threshold being met

Parametric insurance is an innovative solution that is suitable for risks that are harder to insure using traditional indemnity cover. The insurance is designed with a index, a measurable factor related to the covered risk, which pays out once a predefined threshold is met (e.g. hurricane windspeed). The value paid out by a parametric insurance policy is also predetermined, as opposed to a payout based on evaluation of the actual property damage.

Applying parametric insurance to coastal erosion, it presents a possible insurance solution to enable provision of financial support without requiring a coastal property to be lost or damaged by coastal erosion, which is useful given that properties are often demolished before a loss occurs. Parametric insurance for erosion would need to be designed for Local Authorities to purchase the cover for the region, pooling the risk and reducing the likelihood of payouts for insurers, as a per property policy would not have a level of uncertainty that insurers would be comfortable with.

An index would need to be established that would trigger the payout of the coastal erosion insurance. The index would need to be aligned to the actual loss that the Local Authority would experience, to reduce basis risk of the parametric product. The trigger would also need to be set, tailored to the particular Local Authority, at such a level that the Local Authority would retain the risk during years that losses are manageable, but would payout in unprecedented years where losses exceed expectations and council costs are above budgeted finances.

Section 7

Overall conclusions and recommendations

On the basis of this report, the following conclusions can be drawn:

1. **Traditional indemnity insurance is not readily applicable to coastal erosion risk:** The nature of the risk and key factors, such as the ongoing nature of the process, the inevitability for high-risk assets and the pre-emptive action often undertaken prior to a loss occurring, makes traditional insurance challenging and ultimately, costly. Current property policy wordings exclude erosion, explicitly specifying that landslip caused by erosion will not be covered.
2. **A national level solution requires both government and private sector involvement, including the need for new legislation:** In order to drive insurance market involvement in a scheme for a risk that is currently explicitly excluded from insurance, there would need to be government involvement. Existing national schemes, including Flood Re in the UK were all formed and defined through legislation. A solution to address coastal erosion would also require new legislation to ensure involvement of necessary parties, as well as policy change around compensation for erosion loss.
3. **Inclusion of other perils in a scheme could be more feasible than purely coastal erosion:** The challenges of covering erosion using traditional indemnity insurance could be mitigated through a broader scheme covering other climate perils. Additional perils would diversify the insurers' risk and could justify a larger proportion of the population paying for the scheme, both of which could help to reduce the likelihood of insurers incurring significant loss compared to the premium collected.
4. **Integration of coastal erosion risk into the Flood Re is not a feasible solution:** Flooding and erosion risk have different characteristics and scale, meaning it would not be a simple process to integrate into the existing Flood Re scheme. Legislative changes would likely be needed, and the scheme could require significant amendments in order to cover a new, different risk. Flood Re has an expected end date of 2039, so is not a long-term solution.
5. **Public sector risk funds present a more readily applicable solution to erosion risk however, this relies on raising funds to enable formalised risk retention:** Risk funds to address erosion at the Local Authority level could face fewer erosion risk challenges than private sector insurance however, a sustainable funding mechanism is required to ensure capital is available to provide support through the fund without applying significant financial pressure on councils. Funds could be

employed for pre-emptive adaptation and anticipatory action. Regional level funds could be pooled to achieve economies of scale and reduce administrative burden.

6. **Parametric insurance could be an applicable insurance solution for coastal erosion, specifically when purchased as a Local Authority policy:** Parametric insurance relies on a relevant risk-related index and a trigger point being met rather than actual loss, a factor which makes it suitable for erosion risk where properties are often demolished pre-loss. Parametric insurance for coastal erosion could effectively help to reduce the financial strain on Local Authorities in years where expected erosion losses are exceeded. It could be trialled at a local level, with possibility of pooling nationally to enable a broader 'insurance' solution across the UK.

Based on these conclusions, recommendations for continuing efforts towards addressing coastal erosion risk are as follows:

1. **Central government engagement:** The outcomes of this report and other ongoing erosion work should be communicated to central government. Coastal erosion risk has often been deemed uninsurable without a detailed justification, so wider sharing of this report will enable government stakeholders to align on the rationale and better understand the challenges of insuring this risk. This understanding, in turn, could help to introduce the changes that support a coastal erosion risk insurance or risk financing solution, such as legislative change and shift in mindset towards viewing household transition support payments as risk mitigation through pre-emptive adaptation action
2. **Broader engagement of Local Authorities with erosion risk:** Communication with other impacted Local Authorities will enable understanding of other regional priorities to help further shape what a national solution could look like, the benefits it would need to provide and the challenges to address. Spreading awareness of innovative risk transfer solutions beyond traditional insurance will enable assessment of whether there is a wider appetite for pooled public risk funds and / or Local Authority parametric policies, which is key to understanding if these solutions would work in practice.
3. **Continue ongoing work to develop possible options for a public fund solution:** Previous project work as part of Coastwise and Resilient Coasts schemes have begun to assess options for a public fund for coastal erosion, with future work planned in this area. Existing studies and international examples indicate that this solution is likely more feasible than a traditional insurance scheme. Further work is needed to assess the feasibility of such a scheme. Pooling of learnings from previous work would enable definitive exclusion of what will not work and further assessment of those that have potential. A key step would be to engage with communities to understand the sort of support that such a scheme could provide and what would be deemed useful.

4. **Coastal erosion parametric insurance feasibility study: Development** of a parametric insurance solution and how it could be applied to coastal erosion risk would be required to properly assess the feasibility. This would include establishing an index for the risk and defining an appropriate trigger for policy payout. The index would need to be designed with care to align with the financial loss experienced by a Local Authority as a result of the triggered event, to reduce basis risk. Assessment of the payout limit is needed to evaluate the level of support that the Local Authority would require, and an indication of the premium required to purchase this limit. Further engagement with the insurance market is needed to understand appetite and the feasibility of pooling Local Authority level policies into a national solution.

Appendix A

Payouts for properties affected by coastal erosion

Supporting research was conducted to assimilate and categorise the costs involved when a property is deemed unsafe due to the risk of coastline recession. Defining a payout amount per property is essential to determine the feasibility of any potential coastal erosion fund, while also understanding the level of support that would benefit to property owners. A summation of all the costs incurred to both the owner and the Local Authority helps to provide an estimate of the level of payout that could be awarded by a solution. This information does not feed into the core findings of this report and is included to provide contextual information only.

Document review

To estimate potential costs for coastal erosion response, several sources of information were utilised to compile a list of costs and an approximate value. The table below contains all sources of information used, and the type of cost extracted from each:

Information source	Type of cost
Rollback Costs Estimator – an output of the Coastal Transition Accelerator Programme	• Land value – the value of an equivalent plot of land at a lower risk location • Rebuild value – the cost of rebuilding an identical property, excluding the land cost • Demolition cost – the cost of demolishing the property Relocation rental cost – the cost of housing the affected occupants in an average nearby rental property
Resilient Coasts report – prior research completed by Marsh investigating different payout levels for lost properties	• Property value – the market value of an equivalent property on nearby land at lower coastal erosion risk • Risk-based valuation – based on the Louisiana Statewide Buyout Programme in which the payout amount depends on the square footage and the number of occupants in the property Mortgage deposit – a 20% deposit for an equivalent property on nearby land at lower coastal erosion risk

Hemsby total recovery costs – a breakdown of costs paid by Great Yarmouth Borough Council for 17 homes lost to coastal erosion	• Reinstatement of beach access – the cost of cleanup of waste, fixing paths / signs, refitting amenities etc. • Debris removal – cost of removing and disposing debris following the demolition • Alteration to services – ensuring utilities are safely disconnected and removed • Road adaptation – redirecting and repairing nearby roads Staff time – council, emergency services and EA staff to process all paperwork and complete the demolition activities
An example of the demolition of a property in East Riding of Yorkshire , with documentation detailing all costs involved	Relocation moving cost – the cost needed to move possessions out of the property

The above costs can be split into two broad categories: relocation support and recovery costs. Relocation support refers to payments made to the former owner(s) to offset the loss of asset value, while recovery costs account for the costs involved in moving home and restoration of any damage caused to the surrounding land by the property.

Residential property payout levels

Using the taxonomy of costs developed via the document review, a payout matrix was constructed to list out the potential payouts for lost properties. The level of payout is determined by the ownership and occupancy status of the lost property. If the owner of the property had multiple properties in the UK and did not use the property as their primary residence, they would receive no relocation support as they would not require funding to purchase another property to live in.

If the property owner was a landlord renting out the property to tenants, loss of the property would result in loss of an income stream on which they may depend on, so relocation support could still be provided to reflect this loss. This support could reflect the cost of the land, or a 20% mortgage deposit on a property of equal value. Finally, if the owner of the property is the occupant and it is their primary residence, they could be entitled to relocation support consisting of the value of the land, a 20% mortgage deposit or a valuation scaled by the property size and number of occupants.

No matter the ownership and occupancy status of the property, the Local Authority would also incur costs related to the restoration of the land to a safe and usable state. The below table summarises all the above costs, splitting them into three payout levels. The costs are likely to vary between property and so average values have been used to

give estimates on the total payout cost of each level. This cost includes a reduction of £6,000, which has been assumed to be awarded by the Environment Agency, in the form of the Coastal Erosion Assistance Grant, to any property deemed unsafe due to coastal erosion. The proportion of UK properties falling into each payout category is also given below, serving as an estimate of how likely each pay out level would be provided.

Type of cost	Cost	Level 1: Unoccupied second home (£k)	Level 2: Rented property (£k)	Level 3: Primary home (£k)
Relocation support	<i>Option 1: Land cost</i>	-	18	18
	<i>Option 2: Mortgage deposit</i>	-	55	55
	<i>Option 3: Risk-based valuation</i>	-	-	95
Recovery costs	Demolition cost	7	7	7
	Relocation – 1-month rental costs	-	1.5	1.5
	Relocation – moving costs	-	0.5	0.5
	Reinstatement of beach access	1	1	1
	Debris removal cost	9	9	9
	Alteration to services	7	7	7
	Road adaptation	3	3	3
	Staff time	1	1	1
Support grant	Coastal Erosion Assistance Grant	-6	-6	-6
Total		22	24 (+18 or 55)	24 (+18, 55, or 95)
Proportion of UK properties		1%	36%	63%

Demolition costs are highly variable, some reaching £60k+, however the average was deemed to be ~£7k.

Non-residential property payout

Payout options for non-residential properties could differ greatly depending on the industry and size of the occupying business. Non-residential properties require the same clean-up costs as residential properties, meaning the base recovery costs could remain the same at ~£24k (excluding moving and rental costs). However, any other support (equivalent to relocation support) would require significant consideration, and could be based on any of the following:

- **Revenue** – A percentage of the business' annual revenue could be paid out; this could be the whole business, or solely revenue attributed to the lost property. A cap could also be implemented to limit total fund expenditure
- **Property value** – A payout structure aligned to the residential property payout levels could be implemented, but any specialist equipment or infrastructure may require expert appraisal
- **Employee count** – Greater support amounts could be paid to larger companies with the payout amount scaling with the number of employees, again capping at a certain number
- **Income support** – In addition to the employee count payment to the business, support could be paid to the employees directly due to their loss of income e.g. 1 month's salary

All of the above would require the submission of evidence to minimise the risk of fraud and avoid overpayments, but the time and cost of administration would increase as a result. Also, Local Authorities have a duty to rehouse people, but this does not extend to businesses – therefore support payouts to businesses may be deemed a lower priority.

Appendix B

Resilient Coasts: Fund operating model development executive summary

Project rationale and scope

Nationally, many coastal areas remain exposed to coastal risk. Shoreline Management Plan activities have protected many areas of coastline through implementation of physical defences; however, this infrastructure does not cover all coastally exposed properties, largely due to the associated economic challenges. Further to this, into the future defences are likely to be rendered less effective due to both increasing sea level rise and rate of coastal erosion, putting even more properties at risk.

Due to its soft eroding coastline, the East of England is home to some of the highest coastal erosion rates in Europe. Norfolk and Suffolk collectively have more than 2,500 properties at direct coastal risk. In addition, direct and indirect impacts of loss of property, utilities and infrastructure affect thousands more of residential and commercial properties.

Current management of East Anglia's coastline is challenging, relying on a reactive approach. Ability to be proactive has been hampered, in part, by a series of winter storms in recent years that have exacerbated the risk and caused a surge in coastal properties being lost. Recent national reports and enquiries have highlighted the importance of a move towards coastal adaptation and resilience to enable a transition to planned action.

In 2020, the UK Government released a Flood Policy Statement, encouraging innovative methods of financing for flood and coastal erosion risk. The Coastal Loss Innovative Funding and Financing (CLIFF Phases 1a and 1b) work scheme was commissioned by Defra and Coastal Partnership East to investigate innovative financing and identify funding options for coastal communities, largely focused on a national level. A shortlist of fund models was developed, and feasibility assessed, outlining those with greatest viability to be:

- **Local Authority coastal adaptation fund** – Local Authorities (LAs) collect funds from at-risk properties via an agreed mechanism which are released when conditions are met to support coastally exposed households with, for example, relocation, adaptation and resilience

- **Levy model** – Funds are collected through a levy-style mechanism for chosen population. Funds are managed centrally and are paid to an agreed entity once a pre-defined condition is met. This option offers scope for greater participation, such as a national level

This innovative funding and financing work builds on previous work to further develop the options identified in CLIFF Phases 1a and 1b, focusing on how they might operate at a localised level. The aim is to identify potential options that can be tested through a coastal adaptation fund pilot, as part of the Resilient Coasts programme with Great Yarmouth and East Suffolk local authorities. The testing at pilot sites will be delivered by Coastal Partnership East.

Methodology

The methodology for this project followed established approaches to information gathering to collect the data required to evaluate the options to be considered for a coastal adaption fund operating model. A four-step process was followed, consisting of:

- **Expert interviews** – Consulting with experts from a number of relevant organisations and agencies to gain deeper insight into the operation of a public sector fund, including feasible options to pursue further and the limitations when providing support for coastal erosion
- **Desktop research** – Reviewing available literature and online sources and articles to evaluate existing funding and disaster cases and supplement the concepts and options identified through the expert interviews
- **Fund modelling analysis** – Modelling, building on methodology established in CLIFF Phase 1b) to evaluate number of properties lost annually in the East Suffolk and Great Yarmouth LAs and the potential funding requirements to be able to provide different payout options
- **Operating model appraisal** – Analysing the options identified, both qualitatively and qualitatively to appraise the options identified for the fund operating model and build recommendations to test at the pilot sites

Options results summary

The features of the fund operating model were evaluated across six broad fund elements. Below is a summary of the different potential options evaluated for each feature, with the recommended approach for the fund indicated by the colour key:

 High confidence to include	 Test in pilot	 Exclude from pilot testing	 Further study post pilot
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Summary of option recommendations

Category	Element	High confidence to include	Test in pilot	Exclude from pilot	Further study post pilot			
Scope	Risk scope	Coastal erosion risk		Coastal inundation risk		Combination of of risks		
	Property scope	Residential property		Commercial property		Combination of options		
	Recipient scope	Primary property owners	Second homeowners		Landlords		Tenants	
	Regional scope	Resilient Coasts LA areas		National level		Other regional options		
Powers	Power requirement	Existing powers		New legislation		Combination of options		
Funding and capacity	Public sector funding	Seed funding	RFCC Local Levy	Community Municipal Bond	UK Municipal Bond	Core council tax	Business rates	Combination of options
	Private sector funding	Businesses in local area		Utility companies		Businesses working towards CSR ¹ goals		Insurance companies
	Longer-term funding	New Homes Bonus		New burdens funding		Shared Outcomes Fund	Business Improvement District	Lottery Climate Action Fund
Set up and structure	Fund vehicle	Special Purpose Vehicle (SPV)				Community Interest Company (CIC)		
	Investment	Invest funding prior to pilot test		Undertake pilot test without prior investment phase		Invest as retail investor		Invest as professional investor
Interaction and access	Fund administration	Resilient Coasts LA	RFCC ²		CPE ³	LGA ⁴	Environment Agency	Something new
	Interaction	Separate portals for the Assisted Relocation Fund and Coastal Adaptation Fund				Combined portal for the Assisted Relocation Fund and Coastal Adaptation Fund		
Payouts and benefits	Property purchase options	No-risk value	Rebuild value	Risk-based value	Land value	Mortgage deposit	Combination of options	Compulsory purchase order
	Limiting liability	Limit payout value	Limit payout frequency	Limit resilience measure budget	Extra calls on community	Reinsurance	Government guarantee	Combination of options
	Land reuse	Holiday homes	Mobile home sites	Car parks	Solar panels	Wind farms	Carbon credits	BNG ⁵ credits

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