Environment Agency

Research & Development Contract

Scope

Project / contract Information

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| --- | --- | --- |
| Revision date | Summary of changes | Version number |
| 22/01/21 | First issue – draft to share for comment | 1.0 |
| 04/02/21 | Adding section 10 and other minor edits | 2.0 |
| 05/02/21 | Commercial review / update | 3.0 |

Executive Summary

The Environment Agency seeks to appoint up to ten independent technical experts to moderate, advise and review work to develop and produce the next long-term investment scenarios (LTIS). This will help LTIS fulfil its requirements and enhance its reputation with stakeholders as robust world leading analysis.

Details of the services

Details of the services are:

1. Background: Long-term investment scenarios

The long-term investment scenarios are an economic assessment showing what future flood and coastal erosion risk management (FCERM) could look like over the next 50 years in England. LTIS sets out the total national level of investment if we invest in all the places where the benefits are greater than the costs. This is called the optimum level of investment for FCERM. LTIS provides compelling evidence to government and others and is needed to inform policy, investment choices and funding decisions. It provides a top-down 'helicopter view' of all national investment to manage flood and coastal risk.

The Environment Agency (EA) produced LTIS 2014 and LTIS 2019. LTIS 2019 brings together our latest understanding of the scenarios for FCERM. It’s based on the LTIS 2014 report and new analysis carried out in 2018. LTIS 2019 was published in February 2019 and describes future risks, future opportunities, and the implications for long-term investment levels. It considers climate change, how development on flood plains is managed, and the future costs and benefits of managing flooding and coastal erosion.

The main customers of LTIS evidence are within government - Defra, HM Treasury and the Ministry of Housing, Communities and Local Government. We also engage and collaborate with the National Infrastructure Commission, the Committee on Climate Change, infrastructure owners and operators, Natural England, the Forestry Commission, Flood Re and the ABI. We seek to learn from, influence and inform many other stakeholders.

LTIS has recently supported the case for funding in Budget 2020, and the new National FCERM Strategy. It also informs the National Infrastructure Assessment and Climate Change Risk Assessments.

2. National FCERM Strategy

The new National FCERM Strategy changes the direction of FCERM. Defra have also published a new FCERM policy statement. Taken together, the policy statement and the Strategy will ensure that our country is more resilient to flooding and coastal erosion in the long term.

The National FCERM Strategy sets a vision of a nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100. It has three ambitions:

* Climate resilient places;
* Today’s growth and infrastructure to be resilient in tomorrow’s climate; and
* A nation ready to respond and adapt to flooding and coastal change

The Strategy states (Measure A3) that by 2025 the Environment Agency will produce a new set of long-term investment scenarios to inform future policy and investment choices for achieving flood and coastal resilience.

We need to update LTIS to provide scenarios which will inform the policy and investment decisions associated with this new direction. Research to establish how to measure resilience is also being commissioned by the Environment Agency; this will help to frame the questions LTIS needs to address.

3. Requirements for the next LTIS

The next LTIS will need to meet a more challenging set of needs from the Environment Agency and other users, and address relative weaknesses in the current analytical approach. It will benefit from significant improvements in related work to assess flood risk, manage assets, and estimate costs.

High level requirements for the next LTIS are provided in Appendix 1. The requirements are outlined in three groups:

* Policy and reputational requirements
* The needs of investment and policy advisors in the Environment Agency and Defra, and other organisations such as National Infrastructure Commission, Committee on Climate Change, Flood Re. These are worded as “I need …”
* Reporting and presentation

The Environment Agency are currently discussing these requirements with stakeholders to prioritise them.

4. Development of the next LTIS

The next LTIS will be developed and delivered by supplier teams under the Environment Agency’s Client Support Framework (Lot 1). The Independent Technical Experts will work in parallel with the Environment Agency in support of this work.

There are two stages to the work:

Conceptual approaches

This is an initial piece of work to consider potential ‘conceptual approaches’ to the next LTIS, i.e. ideas about the technical methods that could be used. This could be described as a tactical pre-discovery, inception or research piece. Its aims are:

1. To identify a preferred technical option for the next LTIS

2. To ensure the reputation of LTIS is enhanced

3. To increase the familiarity of framework suppliers with LTIS

## Main project

The bulk of the work will be to develop the next LTIS, test it, and produce a new set of long-term investment scenarios to inform future policy and investment choices for achieving flood and coastal resilience.

5. Aim and objectives

The Environment Agency seeks to appoint up to ten independent technical experts to moderate, advise and review the LTIS work. This will cover both stages of the work, as described in the aims and objectives below.

## Aim

* To provide independent technical expertise to the development and production of the next LTIS. This will help LTIS fulfil its requirements and enhance its reputation with stakeholders as robust world leading analysis.

This role builds on the previous independent peer reviews of LTIS. LTIS 2014 was reviewed by Prof Jim Hall. LTIS 2019 engaged Paul Sayers, Jaap Flikweert and Edmund Penning-Rowsell to review work at key milestones (method statements, initial results and final results). For the next LTIS, we want to work more closely with independent technical experts, so that we can seek their advice and opinion on technical decision points in the work, as well as the key milestones. This will make it easier to respond to their feedback, making the analysis more robust. The moderation role is specific to the first stage of the work (Conceptual Approaches) – see Section 6.

## Objectives

* Provide independent advice, guidance, feedback and formal review roles for specific technical decisions as well as at key milestones throughout the work
* Provide technical expertise which is independent of both supplier and client, to ensure that biases and preferences of individuals in both supplier and client teams do not diminish or restrict the quality of the work
* Provide consistent expert technical input throughout the project from inception to final products, understanding and learning from earlier technical decisions and considering the impact of decisions on other stages of the work
* As appropriate, to challenge and criticise, as well as provide constructive advice and guidance, offer alternatives or endorse approaches
* Bring a wider ‘industry view’ to the project, including links with research and other studies and sectors, particularly those not represented within the supplier and client project teams
* Advise on the prioritisation of efforts within the development and production of the next LTIS to maximise quality under the constraints of time and cost
* Warn of weaknesses and threats which could damage reputation
* Identify and highlight strengths and opportunities to enhance reputation
* Provide independent technical expert advice on specific issues which cut across LTIS and other major projects such as national flood risk assessment, asset management planning, carbon cost tool.

6. Focus of requirements for different stages

The independent technical experts are required to start work in 2021 and support the project team through the whole life cycle of the project to completion in 2025.

## *Conceptual approaches*

During this stage the Environment Agency need some of the technical experts to act as independent moderators. Moderators are impartial and make sure the work is conducted in a fair, consistent and organised way. Moderators will play a neutral, supportive role across the whole ‘Conceptual Approaches Team’ (Client Support Framework Consultants, Independent Technical Experts, and the Environment Agency client). They will use their experience in LTIS to date, such as from previous research or a peer review role, to ensure the next LTIS learns from previous work. They will use their skills, knowledge and experience to review, critique and improve the conceptual approaches. The moderators will:

* Share expert technical knowledge of existing LTIS, and other relevant studies about long-term national FCERM or long-term investment planning in other infrastructure sectors
* Suggest ranges and associated trade-offs to consider in order to develop sufficient variety of conceptual approaches (see Appendix 2)
* Establish measures to evaluate and appraise the conceptual approaches against, informed by the LTIS requirements and their priorities
* Ask questions to ensure the approaches are well understood, and make relative comparisons between the approaches
* Provide their own reflections on the conceptual approaches - identify strengths, weaknesses, opportunities and threats, and suggest alternatives
* Lead the evaluation and appraisal of the conceptual approaches against established measures, and compare to LTIS requirements and their priorities
* Ensure that the options are being evaluated and appraised fairly and consistently
* Help achieve an ‘industry view’ on the relative merits of different options
* Identify which evaluations and appraisals are unanimous and which are contentious
* Identify which options are unproven and higher risk, and which are easier to deliver and lower risk
* Make recommendations and support the identification of a preferred technical option
* Document the work in the form of technical notes, which can be shared within and beyond the project team.

## *Main project*

During this stage the Environment Agency will require all of the technical experts to act as peer reviewers. The experts will moderate, advise and review work to develop and produce the next LTIS. This will help LTIS fulfil its requirements and enhance its reputation with stakeholders as robust world leading analysis.

The work will be structured around the formal peer review process at key milestones, likely to be:

* Initial/draft method statements
* Testing of methods
* Initial results and their validation
* Final results

The work will also involve providing advice and guidance, on a call-off basis, at key technical decision points:

* Review the information provided on which a decision is required
* Provide comments on the pros and cons of the decision options and the potential impact on the project’s aims, critical success factors and other requirements
* Make recommendations about the decision and related work/implications
* This may involve presenting to Project Board about important decisions

7. Process and outputs

## *Conceptual approaches*

The Conceptual Approaches work includes the following specific tasks for the independent technical experts in their role as moderators.

Preparing and sharing information

* Independent technical experts draft measures for evaluating and appraising the technical options. These will be informed by the LTIS requirements and their priorities, as well as the ranges of potential approaches and associated trade-offs. This will include a measure of flexibility to achieve future needs which are not yet known
* Independent technical experts may also share knowledge of relevant studies
* WORKSHOP 1: independent technical experts shall present draft measures for evaluating and appraising technical options

Developing conceptual approaches

* Independent technical experts share finalised measures for evaluating and appraising the technical options
* WORKSHOP 2: independent technical experts discuss, debate and comment on conceptual approaches, asking questions to clarify issues, suggesting alternatives and improvements. Independent technical experts lead the appraisal of each option, to ensure that the options are being evaluated and appraised fairly and consistently. This aims to achieve an ‘industry view’ on the relative merits of different options, a mutual understanding of strengths and weaknesses, and a recognition of any issues where the merits are uncertain, or there is no clear consensus.
* The independent technical experts continue their moderation role, providing written comments on the draft technical notes and checking the appraisal of each option.

Recommending conceptual approaches

* WORKSHOP 3: independent technical experts provide comment and advice on the technical options
* The independent technical experts continue their moderation role, checking and finalising the appraisal of each option, resulting in an order of preference for the options

The outputs will be the measures used for evaluating and appraising the technical options, and the comments and advice provided to the Client Support Framework Consultants at the workshops and as written comments on technical notes. The appraisal outcome will be summarised in a short note for the LTIS Project Board.

## *Main project*

The process – the work will be structured around the formal review process at key milestones, but with additional involvement at technical decision points. The additional involvement will include providing technical advice and helping the Environment Agency appraise technical options and make technical decisions. The key milestones will be programmed, and additional involvement will be sought ad-hoc, giving as much notice as possible and targeting different experts with different technical issues as appropriate. The Environment Agency will aim to balance the need for continuity in the involvement of some independent technical experts, and the use of others to provide technical advice on specific areas of expertise. The work will typically be completed within a two week time period, with material provided for review and a written response returned within that allowance. Ad-hoc advice will be sought via attendance at project meetings. More detail will be provided about this specific scope and timings after the award of the contract for the main LTIS 2025 project.

Outputs – the outputs will be in the form of technical notes at key milestones (reviewing methods and results). The additional involvement can be documented in different ways as appropriate, which might be via correspondence, minutes of a meeting or a short technical note.

8. Skills and experience required

The experts need to have the following skills and experience:

*Expert skills in risk assessment and investment*

* Either in FCERM risk assessment – including national scale modelling of risk from surface water, rivers and the sea, and coastal erosion (including the management and processing of large complex datasets)
* And/or in long-term investment planning – including the development and appraisal of long-term strategic investment plans, analysis of long-term drivers of change (climatic, socio-economic, engineering, environmental), the development and evaluation of investment decision rules, optimisation of investment and the development of adaptive approaches

*Expert knowledge and experience*

* Either in LTIS analysis to date – including LTIS technical research and development, conducting the analysis for LTIS 2014 and LTIS 2019, and formal independent peer review roles
* And/or in other major risk and investment modelling studies – including the new national flood risk assessment (NaFRA2), the FCERM elements of the Climate Change Risk Assessment (CCRA) and National Infrastructure Assessment (NIA), and similar long-term investment planning studies from other infrastructure sectors such as water resources and rail.

9. Programme

The outline below assumes the overall LTIS 2025 Independent Technical Experts project starts on Monday 19 April 2021.

The outline expected programme for those works associated to the above date is as follows:

*Conceptual approaches*

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Preparing and sharing information

* This could begin on Monday 19 April, for 3 weeks
* Workshop 1 could be in the third week, i.e. the week commencing 3 May; possibly on Wednesday 5 May

Developing conceptual approaches

* This could begin on Monday 10 May, for 6 weeks (includes school half term)
* Workshop 2 could be in the fifth week, i.e. the week commencing 7 June; possibly on Wednesday 9 June

Recommending conceptual approaches

* This could begin Monday 21 June, for 3 weeks
* Workshop 3 could be in the second week, i.e. the week commencing 28 June; possibly Wednesday 30 June
* Technical notes would be finalised by the end of the third week, i.e. by Friday 9 July.

*Main project*

Following completion of the Conceptual Approaches work, the Environment Agency will complete a Full Business Case for the next LTIS and tender the work under the Client Support Framework Lot 1.

* The procurement process is expected to be completed by the end of 2021
* The main study could then begin in early 2022
* 2022 and 2023 would be spent developing and testing the method
* Final results would be produced 2024
* LTIS 2025 would be published in 2025
* Work to present the results could continue in parallel in 2025

10. Contract / Commercial / Evaluation

The LTIS 2025 Independent Technical Experts will be Let through a Research and Development Contract with a proposed duration of approximately 5 years. The Environment Agency is seeking to appoint and Contract with up to ten (10) confirmed Bidders as part of this procurement.

The total budget for all Independent Technical Experts will be capped at a maximum of £120k. Work will be shared between the different experts on the basis of their areas of expertise. The successful Bidders shall be awarded a LTIS Independent Technical Expert contract with a Purchase Order value up to the maximum of forty thousand pounds (£40k), however the Environment Agency does not intend to spend up to that value for most experts. Once successful Bidders have been appointed, and the Environment Agency therefore understands their relative areas of expertise, bespoke discussions regarding the quantity of work expected for each expert will take place.

*Rates*

The below table is the maximum an expert can charge on a **daily basis**. Bidders are requested to complete the Contract Pricing Schedule with their daily rate as part of their tender return.

|  |  |
| --- | --- |
| Employment category | Not to exceed people charge rate cap (£) |
| Senior Director / University Professor  | £1,200.00  |
| Associate Director  | £950.00  |
| Principal  | £750.00  |
| Analyst  | £650.00  |

*Rights*

The Bidder shall not acquire any right, title or interest in or to the Intellectual Property Rights (IPR) of the Environment Agency or its licensors, including:

* all LTIS 2025 procurements, including the Independent Technical Experts (this procurement) resultant outputs;
* the Environment Agency Software;
* the Environment Agency Data; and
* the Environment Agency Background IPRs.

*Conflicts of interest*

The Environment Agency would like to draw all Bidders attention to potential conflicts of interest regarding this and other LTIS procurements.

Moreover the Environment Agency reserves the right to not invite an organisation or an individual expert to tender for work under the LTIS Independent Technical Experts procurement, or to remove a an organisation or an individual expert from the tender process, where there is a perceived or actual conflict of interest (including without limitation, its reputation or standing). This includes, but is not limited to, an organisation or an individual expert being engaged to deliver work through another LTIS procurement. The decision will be solely at the Client’s discretion. A register of organisations and experts that are currently working on and have worked on all LTIS procurements will be held by the Environment Agency.

*Quotation evaluation*

Tender Evaluation of bidder’s submissions is explained in the separate Tender Evaluation document; and will be assessed as standard by a cross-section of experienced Environment Agency personnel.

Suppliers’ proposals will be assessed to ensure:

* they meet the requirements of experts in Section 8 (Skills and experience required) and
* the suppliers’ ability to complete the project against the timescales in the outline programme in Section 9 (Programme).

In addition to the Quality bidder submissions, Bidders are also required to complete and submit the Contract Pricing Schedule. Bidders should note that those values populated within it will not be evaluated, but will be used during the Research and Development Contracting stage.

Appendix 1 Requirements of next LTIS

Initial, draft priorities are identified for requirements 8-16 in the table below using the following shorthand. Individual bullet points are only commented on if they differ from the priorities for the overall requirement (the bold headline).

* Must, Should or Could – indicates how important this is within the scope
* Shallow or Deep – indicates the level of detail of the analysis, which may be constrained by ambition, data or methods
* Explore – indicates that the topic should be explored before determining if the analysis is shallow or deep.

These priorities are a working draft and will continue to be updated. A revised version of this appendix will be provided at the start of the Conceptual Approaches work.

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| **Policy and reputational requirements** |
| 1. **Strategy and policy statement - the new National FCERM Strategy for England provides a vision of a nation ready for, and resilient to, flooding and coastal change - today, tomorrow and to the year 2100. The strategy provides a framework for the direction set by the Defra FCERM policy statement.**
* The new National FCERM Strategy for England commits the Environment Agency to update its long-term investment scenarios in 2025 to inform future policy and investment choices for improving resilience and adaptation to future climate risks.
* We need to update LTIS analysis with new scenarios that describe the investment and outcomes associated with this new direction. We will use the latest science and data, such as climate projections and the new national flood risk assessment.
* LTIS will provide the evidence which government and others will use to consider future policy and investment choices.
 |
| 1. **Unique, independent world-leading analysis - LTIS must remain a unique, independent analysis, which uses the latest data and science to provide world-leading evidence for investment and policy decisions.**

Unique and independent* We want LTIS to remain an original analysis which is owned by the Environment Agency and benefits from comparison to other national analysis
* The next LTIS needs to answer the questions set out below (the requirements of investment and policy advisors in the Environment Agency and Defra) with a unique and independent analysis which is sufficiently robust and accurate.
* Whilst there are new questions for LTIS to address, it must keep its unique selling point of providing the ‘helicopter view’ of all investment in all FCERM in all Risk Management Authorities, for the whole of England, for all major sources of flooding and coastal change, looking 50-100 years into the future.

World-leading: using the best, most appropriate technical approach to do the LTIS analysis* We need to understand the pros and cons, strengths and weaknesses, opportunities and threats of different technical options for the next LTIS, and obtain a broad consensus of their relative merits
* This understanding needs to be sufficient for the Environment Agency to identify the most appropriate technical option for the next LTIS, which meets our needs and not only maintains but enhances the reputation of LTIS as world-leading economic evidence
* Understanding technical options needs to be a collaborative process among a team of experts as well as moderators and facilitators. It is important that we achieve an “industry view” of the options and their merits so that next LTIS will maintain and enhance its reputation across the whole industry. This process needs to be completely open and transparent so that anyone involved, and anyone not involved, can use the process and outputs to inform the development of the next LTIS

World-leading: benefiting from latest data and knowledge* The next LTIS will benefit from significant development in supporting datasets, knowledge and understanding. Ongoing work within the AIMS (Asset Information Management System), NaFRA (National Flood Risk Assessment) and CCT (Carbon Cost Tool) programmes will provide better data, enabling new and exciting analysis within LTIS.
* These improvements will open doors and enable LTIS to do new analysis that wasn’t possible before. But rather than try to analyse everything, LTIS will need to use the data intelligently and not create an overly complicated and confusing black box of scenarios.
* These improvements should also allow LTIS outputs to be used for new purposes – for example for regions – but we’ll need to understand the uncertainty around results so that we can be clearer about what purposes they are fit for.
 |
| 1. **Government rules and guidance on economic analysis**

The next LTIS will continue to follow the latest rules, guidance and exemplars for economic analysis. It will fully adhere to the HM Treasury Green Book, and benefit from other guidance on best practice such as the Blackett Review of Computational Modelling, and the Aqua Book. Publication on gov.uk will adhere to Government Digital Service standards. |
| 1. **Expertise – to maintain the reputation of LTIS for providing world-leading evidence for investment and policy decisions, we require an exceptional level of expertise to deliver the analysis**

To ensure this level of expertise we require the delivery team to have the following skills and experience:Expert skills in risk assessment and investment* Either in FCERM risk assessment – including national scale modelling of risk from surface water, rivers and the sea, and coastal erosion (including the management and processing of large complex datasets)
* And/or in long-term investment planning – including the development and appraisal of long-term strategic investment plans, economic analysis of long-term drivers of change (climatic, socio-economic, engineering, environmental), the development and evaluation of investment decision rules, optimisation of investment and the development of adaptive approaches

Expert knowledge and experience* Either in LTIS analysis to date – including LTIS technical research and development, performing the analysis for LTIS 2014 and LTIS 2019, and formal independent peer review roles
* And/or in other relevant major risk and investment modelling studies – including the new national flood risk assessment (NaFRA2), the FCERM elements of the Climate Change Risk Assessment (CCRA) and National Infrastructure Assessment (NIA), and similar long-term investment planning studies from other infrastructure sectors adapting to climate change such as water resources and rail.
 |
| 1. **Collaboration - LTIS is world-leading, high profile analysis. We require an exceptional set of experts to develop the next LTIS.**

We expect that the best team of experts will be found via collaboration between suppliers.  |
| 1. **Independent peer review - independent peer reviews have always been important to LTIS work, helping to understand its strengths and weaknesses, target improvements and enhance its reputation.**

 The next LTIS will continue to work with a set of independent peer reviewers. These experts will provide review and assurance of methods and results at various stages throughout the work. |
| 1. **Lessons from previous LTIS – the next LTIS must learn lessons from previous LTIS, address current weaknesses and answer questions which have previously been difficult to answer**

LTIS 2019 also tried to address some specific policy questions about achieving particular outcomes (in terms of risk reduction or numbers of properties at risk) and exploring the timing of investment. Within the existing toolset (developed for LTIS 2014 to identify the optimum level of investment) these were difficult to answer. Next LTIS analysis will need to be more flexible to address these. Questions around the timing of investment (and changing policies and activities over time) need better evidence as the National FCERM Strategy promotes more adaptive management. LTIS 2019 improved the range of activities included within the analysis but wasn't able to optimise investment across all these activities in combination, so that will also be a priority for future work to inform how we achieve climate resilient places.Whilst LTIS 2014 and 2019 include an element of analysis on investment to reduce risk from surface water, this is a relatively high-level analysis. The new National Flood Risk Assessment should enable improvements to the surface water element.LTIS 2019 states that we want future LTIS analysis and capabilities to include: * an integrated assessment of investment across all sources of flood risk, all FCERM activities and a wider set of metrics to support place-based decision making and the 25 Year Environment Plan
* robust decision making so that uncertainty informs the results
* alternative, flexible ways to model future investment in order to explore timings and sequences of investments and different targets and services provided by both authorities and individuals

These aspirations remain valid. |
| **Requirements of investment and policy advisors in the Environment Agency and Defra** |
| 1. **Investment headlines - headline facts about the national case for investment in FCERM, used to inform Budgets, Spending Reviews, Public Accounts Committee, Environment Food and Rural Affairs Select Committee, Environmental Audit Committee, National Audit Office, post-flood reviews and other major, high-profile FCERM investment decisions and policy debates.**

**Must – Deep (‘risk’ items are deep, ‘resilience’ items are shallow)*** to know the economic optimum level of investment for the next 50-100 years for all FCERM activities, all Risk Management Authorities, all England, all sources of flood and coastal risk
* to know what the optimum level of investment achieves in terms of risk and resilience
* to know how risk and resilience outcomes change for different levels of investment around the optimum
* to know what "no new investment" means in terms of risk and resilience
* to know what level of investment, in what mixture of activities, is needed to achieve a particular level of risk or resilience (e.g. % change in damages or number of properties at risk, or other resilience metrics)
* to know how the optimum level of investment is made up of components addressing individual sources of flooding (river, sea, surface) or coastal erosion
 |
| 1. **Benefits and costs - the new FCERM Strategy shifts the focus on FCERM from risk to resilience, so LTIS will need to move beyond expected annual damages and numbers of properties at risk, to include a broad range of metrics to understand resilience.**

**Priorities vary – see individual bullets*** to know the overall benefit-cost ratio of the optimum level of investment and how this changes with different levels of investment Must – Deep
* to know the benefit-cost ratios for specific FCERM activities (and the place making/protect/respond/recover groups of activities Should – Shallow) within the optimum level of investment, and how the overall benefit-cost ratio changes with different combinations of these activities Must – Deep
* to know how different scenarios affect vulnerability and social equality (Could – Explore)
* to know how different levels of investment affect a wide set of outcomes/benefits e.g. infrastructure resilience, health (including mental health), environment (including natural capital), agriculture and economic outcomes (including economic growth) Must – Explore
* to know the optimum level of investment and future levels of risk and resilience under different cost (including carbon) scenarios Must – Deep
* to know how risk and resilience outcomes vary with different levels of ambition and success in terms of cutting carbon Should – Explore
 |
| 1. **Climate resilience - the next LTIS will also need to build on LTIS 2019 to capture the range of activities to reduce risk and increase resilience, and what combinations deliver the best returns.**

**Must – Deep** * to know the optimum level of investment and future levels of risk and resilience under a full range of different climate change scenarios (from none to High++)
* to know what mixture of activities generates the optimal level of investment, and how much flexibility there is in that mix i.e. different ways to achieve climate resilient places
* to know what levels of investment will prevent risk increasing and resilience decreasing due to different levels of climate change
* to know what the economic optimum balance is between place making/protect and respond/recover activities (in the National FCERM Strategy)
* to know the potential of individual activities (e.g. Property Flood Resilience, Natural Flood Management, Environmental Land Management, coastal realignment, Sustainable Urban Drainage Systems) to reduce risk and increase resilience
* to know how what future risk and resilience look like under different climate scenarios if we continue to invest at the current level and in current activities
 |
| 1. **Place making and protect – the next LTIS will need to set out how these activities contribute towards optimum investment to achieve climate resilient places**

**Must – Deep** * to know how much of the optimum level of investment is in 'place making' activities, what this achieves in terms of risk and resilience, and how it would change with different levels of investment in 'place making' activities
* to know how much of the optimum level of investment is in 'protect' activities, what this achieves in terms of risk and resilience, and how it would change with different levels of investment in 'protect' activities
* to know the optimum level of investment and future levels of risk and resilience under different population growth and development scenarios
* to know what future risk and resilience look like with different planning policy, implementation of policy, and population growth scenarios
* to know where climate change or population growth / development are the dominant drivers of future risk Should – Deep
* to know, under different climate scenarios, how many communities may have to relocate and what are the social and financial costs Must – Explore
 |
| 1. **Respond and recover – the next LTIS will need to set out how these activities contribute towards optimum investment to achieve climate resilient places**

**Must – Shallow (limited data rather than ambition)*** to know how much of the optimum level of investment is in 'respond and recover' activities, what this achieves in terms of risk and resilience, and how it would change with different levels of investment in 'respond and recover' activities
* to know what future risk and resilience look like with different scenarios of investment and policy for flood forecasting and warning, incident management (including emergency planning and response – e.g. multi agency / personal flood plans, evacuation), insurance and building back better Should – Shallow (from Incident Management Strategy)
* to know what the end of Flood Re in 2039 will do to long term investment needs, risk and resilience
 |
| 1. **Adaptive pathways – the next LTIS needs to provide evidence about how the timing of investment affects risk and resilience**

**Must – Explore*** to know how risk and resilience outcomes change by changing the investment profile
* to know how the contribution from different types of flooding changes over time, with different levels of investment, and with climate change
* to know how the best value mixture of activities changes over time under different climate change scenarios and different population growth / development scenarios
* to know how adaptation pathways in different generic/typical places can use activities over time to reduce risk and increase resilience
 |
| 1. **Places – the next LTIS needs to provide evidence at a sub-national level to support investment and policy decisions for places**

**Should – Explore (expect some deep, some shallow, some zero)** * to know how well the investment decisions and scenarios in LTIS compare to those in regional strategic studies Must (for validation purposes)
* to know which LTIS results are fit for use at a regional scale, and for generic/typical places, including levels of confidence and uncertainty ranges
* to know how levels of investment, risk and resilience outcomes vary between different regions, and different generic/typical places (e.g. characterised by settlement size/population density, upland/lowland, inland/estuarine/coastal)
* to know what mixture of activities generates the optimal level of investment, and how it varies by place (using regions and generic/typical places)
* to know when and where flood and coastal risk becomes the hardest to manage (and what is the main source of that risk)
* to know what the scenarios mean for the coast - what the investment options and decisions are, and what they mean in terms of risk, resilience and transition
 |
| **Reporting and presentation** |
| 1. **Reporting – we need full technical documentation for the LTIS analysis**

**Must – Deep** * I need LTIS reporting to be tiered following the example of LTIS 2019 which produced a hierarchy of outputs which vary in their level of technical detail and therefore accessibility to different audiences
* I need LTIS reporting to enable peer reviewers and other interested readers to understand the methods and calculations used in the analysis
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| 1. **Presentation – we plan to provide some visualizations of the new scenarios. This could be part of the main LTIS project, or a separate project**

**Must – Deep for fixed graphics, Explore for dynamic (html)** * to be able to present LTIS results in different ways to engage different audiences e.g. investment and policy advisers, community engagement (climate resilient places), education (a nation ready to respond and adapt)
* to be confident that LTIS visualizations are designed to Government Digital Service and accessibility standards
* to know the levels of confidence and uncertainty ranges associated with the long-term investment scenarios at different scales (to inform publication and visualization)
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Appendix 2 Ranges of potential approaches and trade-offs

*Granularity*

Granular and detailed …to… broad and estimated

*Risk data*

Completely dependent on NaFRA2 …to… an independent user of NaFRA2

*Flexibility*

Fixed and rigorous …to… open and flexible

*Scope*

Narrow and restricted …to… extensive and far-reaching

*Complexity*

Modular and accessible …to… black-box and opaque

*Time taken to create a new scenario*

Fast and responsive …to… slow and onerous

*Number crunching*

Focused on specific outputs …to… large datasets to be mined

*Adaptation*

Fixed policies …to… changing over time

*Optimisation*

Economic optimisation of NPV …to… optimisation on other variables