OxCam

Flood Risk Investment Study

Investing to protect the economy

Existing infrastructure and future Infrastructure investments need to be 'future proofed' against climate risks through mitigation and adaptation measures to ensure the protection and enhancement of productivity (Gross Value Added). Specifically relevant for this study is that housing and industrial infrastructure need to be protected against current and future flooding. Protection against flooding is required not only for unlocking economic uplift, but also to ensure that growth is sustainable.

Investing in reducing flood risk

Investments in flood risk infrastructure have traditionally come from identifying locations at flood risk and designing individual schemes to protect these areas. Through the design of the schemes, an assessment of the costs to deliver and maintain against the benefits of the scheme is made to justify the investment. Traditionally schemes that are taken forward have yielded a cost-benefit ratio of around 1:8. Some of the key benefits that sit on the 'benefits' side of the equation are listed below:

- Avoiding property damages, interruption to businesses, research and education.
- Avoiding loss of critical infrastructure.
- Revitalized neighbourhoods and improved public spaces.
- Enhanced public safety and wider ecosystem benefits.

The challenge of deep uncertainties and 'Adaptive Approaches'

As laid out, there is often compelling economic evidence to invest in specific flood risk protection schemes where the risk and the costs can be well established. However, there is less certainty and data if we look at what the risks there will be 50-100 years in the future, across a regional area.

There are two main causes of uncertainty:

- We do not know how many residential and commercial buildings will be built, their location, or how they will be built such as new towns, new cities and / or expansion of existing settlements).
- The extent of the affect that climate change will have on flood risk exposure.

In a changing climate it is important that flood risk is planned for and managed in a way that is flexible and adaptive. We do not want to fixate on a singular future scenario and focus our efforts in investing and planning around it, only to find that it is not realised. The use of adaptive approaches enables us to continue to plan for the future, but leaves sufficient room for future decisions.

We need to build plans and approaches to flood protection investment that are adaptive and can vary over time according to risk. This will allow us to avoid premature or late investments and avoid under or over investments.

Why the Oxford to Cambridge Arc?

The Oxford to Cambridge Arc offers an opportunity to test if an ***adaptive approach to flood protection investment*** can be developed at a larger scale. In 2017, the National Infrastructure Commission outlined the transformational economic potential of the Oxford-Cambridge Arc in its report 'Partnering for Prosperity'. As part of a developing transformational programme, growth scenarios for additional new homes together with associated commercial developments and infrastructure by 2050 to maximise its economic potential were developed. In addition, climate resilience and environmental enhancement is very much at the heart of the developing programme, mirrored by local partners who have come together across the geographies to outline their ambitions in an Arc Economic Prospectus and the Arc Environmental Principles including their ambition for Net Zero, integrated water management and sustainable development. This meant that there was high stakeholder support, understanding and potential project partners to work with. With this stakeholder interest came complimentary partner projects such as the spatial mapping of various population increase scenarios.

Project Overview

Challenges in the Arc

25%

of the Arc land area is currently at risk of flooding with annual damages estimated at £1.06 billion

70%

Surface water contributes 70% of present day risk, with rivers contributing 30%. The effect of climate change reverses that, so that by 2120, surface water only contributes 29%, with fluvial contributing 71%

5710Km

There are 5710Km of rivers and streams across the Arc across three large river catchments – Thames, Nene, Ouse

100 years

Over the next 100 years, annual average damage could increase to between 2 and 5 times its current value if there is no new investment in flood risk management.

The OxCam Flood Risk Investment Study (FRIS) is a pilot project in the Environment Agency's "FCERM Strategy – adaptive approaches frontrunners" portfolio. The portfolio's aim was to fund and support frontrunner projects which could share adaptive approaches learning to help build capacity within the organisation.

Frontrunner projects aimed to:

- develop a mechanism where stakeholders in a place can describe how they will adapt to a range of climate scenarios
- identify the barriers and challenges to implementing adaptive pathways
- identify potential solutions and feed directly into the development of national guidance, frameworks, and tools
- provide advice on future resources and implementation within the Environment Agency's (EA's) business model

The OxCam FRIS project was different to the other adaptive approaches pilots in the following ways:

- **Focus of study:** FRIS focuses on the economic optimum spend rather than risk reduction or maintaining risk levels in the face of change. This provided similarities to the EA's National Long Term Investment Scenarios (LTIS) work. This way of working is very different to the EA's core approach to flood risk management
- **Geographical area:** covering large parts of three major river catchments. Other frontrunner pilots centred around smaller or hydrologically focused locations, for example the Thames Estuary and specific coastal communities
- **Increased uncertainty:** FRIS looks at future growth scenarios in addition to future climate change
- **Multiple risk sources:** FRIS considers both fluvial flooding, surface water flooding and touches on coastal flooding influencing

Project Aims

to identify

to identify the optimum level and timing of investment in flood protection across the OxCam Arc and to use those findings to influence future investment.

to learn

to learn from a study of this complexity and share learnings with interested parties in this field in line with the wider aspirations of the frontrunner pilots. For example, was it technically feasible and what worked well or could be improved?

Project Stages

1	2	3	4	5	6	7
Represent Flood Risk	Represent Future Scenarios	Represent Flood Interventions	Quantify Flood Impacts and Benefits of Interventions	Quantify Costs (£ and Carbon)	Calculate Optimal Investment	Review and evaluation of methods
Hydrology			Economic		Adaptive Approach	Reviewing Our Methods

Project Findings

Investing in flood resilience can safeguard economic activity and protect public and private investments in housing and infrastructure

Innovative thinking and approaches can be applied to establish an adaptive pathway towards the right level and timing of flood resilience investment when considering an uncertain future in terms of climate change and growth

The optimum level of investment in flood resilience for the OxCam Arc is around £5.63 billion (varying between £4.63 and £6.20 billion depending on future risk) and this level of investment is likely to yield economic benefits worth £21.5 billion (range between £17 billion - £24 billion) over a 100 year appraisal period

A significant proportion of investment can be described as 'no regrets investment' (£1.21 billion capital investment, £2.11 billion including carbon and maintenance costs) as it is cost beneficial now and is not dependent on future increases in risk

Adaptive approaches to flood resilience are key to achieving climate resilience. The OxCam Flood Risk Investment Study highlights the true economic costs of flooding in the Arc, now and in the future, and the economic rewards of timely flood resilience investment. The economic case for flood resilience investment is compelling even before considering the more important social impacts of flooding to our communities and businesses who live in the Arc.

Our Outputs

Use the interactive menu below to read our reports and summaries for the project. You can choose to read a summary, or the technical report by section – or jump straight in with the full summary report covering all aspects of the project at a high level.

OxCam
Flood Risk Investment Study

Read Full Summary Report

Variables considered when representing future flood risk – We explored future risk under 27 future scenarios combinations

What level of climate change will we experience?

Medium | High | High ++

How will new properties be built?

New towns | Urban Extensions | Hybrid

How many new properties will be built?

23,000 Dwellings/y | 30,000 Dwellings/y | 43,000 Dwellings/y

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Hydrology

Although primarily an economic study, hydrological modelling was needed to provide the underlying evidence.

Economic

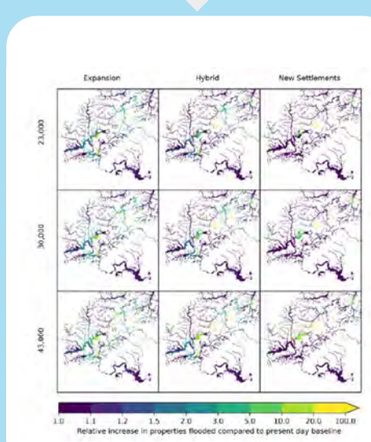
Our approach to quantifying the economic impacts of flooding, the cost of interventions and the benefits of those interventions.

Adaptive Approach

Our approach to optimising investment options across the uncertainty of multiple future scenarios.

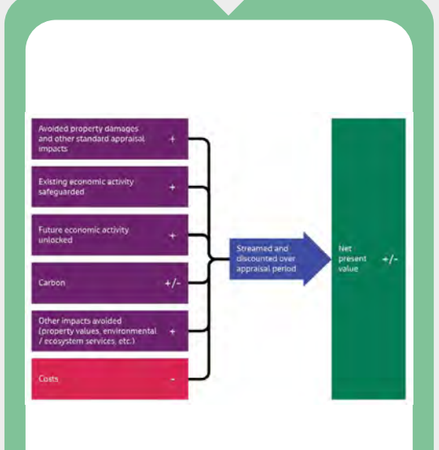
Reviewing Our Methods

Review of methods and outputs for others to consider and learn from this approach.



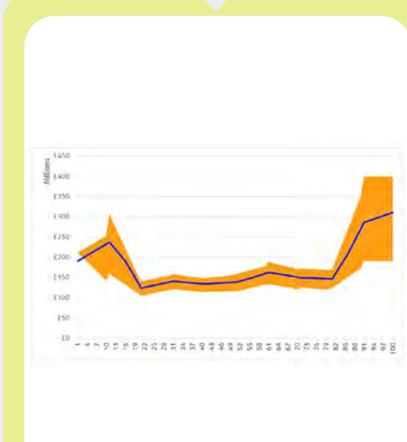
Hydrology Summary Report

Want to learn more? Read full technical report



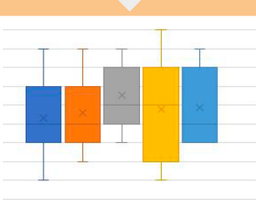
Economic Summary Report

Want to learn more? Read full technical report



Adaptive Approach Summary Report

Want to learn more? Read full technical report



Testing the Robustness of Our Methodology

Recommendations for Others Taking This Approach

Understanding how we need to adapt to rethink our flood resilience