

# THE NATURAL CAPITAL STORY OF THE OXCAM ARC



**NATURAL CAPITAL**

Putting nature at the heart of progress



“An innovative and collaborative process has been taking place to develop a Local Natural Capital Plan (LNCP) for the Oxford to Cambridge Arc. This plan has produced a Natural Capital Baseline that provides a detailed and complete picture of the land cover types in the Arc and a Natural Capital Account which gives us a snapshot of the huge value for society found within the Arc’s invaluable natural landscapes. In itself this information represents key pieces of evidence for both driving forwards the Government’s ambitions for the Arc and providing the potential for everyone to better quantify the environment in development decisions, which is extremely significant to delivering highly sustainable new places in the Arc and beyond.

The Oxford to Cambridge Arc’s Natural Capital provides £2.3 billion of value each year and as the Arc grows it is important that the protection and enhancement of the landscape goes hand in hand with this progress.”

Professor Paul Leinster CBE – Chair of the OxCam Arc LNCP Partnership Group, Member of the OxCam Arc Environment Working group and the national Natural Capital Committee

This document has been created to help illustrate how future infrastructure developments can support the Governments’ 25 YEP and enhance the environment through embracing a natural capital approach.

Through working with key stakeholders and experienced consultants, and using the Oxford to Cambridge (OxCam) Arc as a project with which to apply the concept, this document aims to provide a blueprint by considering how to define the need, design the evidence base and successfully deliver a natural capital approach.

Having the OxCam Arc at the core of the project allowed the LNCP framework to be developed and applied over a wide geographical area, producing an approach for others to adopt and integrate on a local scale.

Tangible outputs to help support others in taking a Natural Capital approach include a suite of tools and frameworks developed with key stakeholders, along with a comprehensive review of lessons learnt where approaches have been tried and tested.

Whilst the LNCP project has closed the core OxCam team should be your first point of contact for any further information, at [www.oxcamlncp.org](http://www.oxcamlncp.org)

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# About The Arc & Our Project

## About the Oxford to Cambridge Arc

The OxCam Arc is the name given to a cross-government initiative that supports planning for the future of the five ceremonial counties of Oxfordshire, Bedfordshire, Buckinghamshire, Cambridgeshire and Northamptonshire up until 2050.

The OxCam Arc aims to ensure the harmonious delivery of improved connectivity, productivity and place-making, whilst ensuring pioneering environmental standards and enhancements are delivered. Because of the commitments to green growth, its governance and scale, the OxCam Arc represents a unique opportunity to put the **Government's 25 Year Environment Plan** into action. The creation of a Local Natural Capital Plan (LNCP) for the OxCam Arc is an essential first step in achieving this, as it provides a Natural Capital baseline and framework that helps to monitor environmental change and de-risk growth.

The Arc already contributes over 2 million jobs and £110 billion of annual Gross Value Added (GVA) whilst providing a place to live for over 3.7 million residents.

## LNCP Objectives

To help our partners in the Arc to provide:

**Environmental Protection** – helping our partners to understand the current state of the environment and avoiding, or minimising, negative impacts on key environmental assets in the Arc

**Environmental Enhancement** – helping our partners to seek opportunities and leverage resources to invest in environmental assets

## LNCP Outcomes

Greener, cleaner, healthier and more productive communities across the Arc

Measureable biodiversity net gain and support for wider environmental gains across the Arc

Overall streamlining of environmental requirements and opportunities through the planning system

*“The creation of a LNCP for the Arc is an essential first step to ensure we have an evidence base that allows us to understand the current state of natural capital and monitor environmental change within the Arc. This LNCP, underpinned by collaboration, is essential to help de-risk growth and deliver the ambitious vision for the Arc – as well as providing a replicable approach for place based initiatives elsewhere in the country.”*

## About the OxCam Arc Local Natural Capital Plan Project

The LNCP is a Defra Group-led project (cross-Defra, Natural England, Forestry Commission and Environment Agency), with a team hosted by the Environment Agency. It was conceived to develop a LNCP for the OxCam Arc in order to support the delivery of environmental protection and enhancement as part of the planned growth and investment within the Arc. Within the 25 Year Environment Plan, the government committed to LNCPs, with the aim of embedding Natural Capital thinking into growth plans. However there was no detailed framework for what these should encompass, aside from setting out that they should be locally owned and co-designed strategic place-based plans.

A secondary aim of the LNCP project is to provide a scalable and replicable framework for local Natural Capital plans and a Natural Capital approach elsewhere.

Working in partnership with stakeholders across the Arc and national government, the project has:

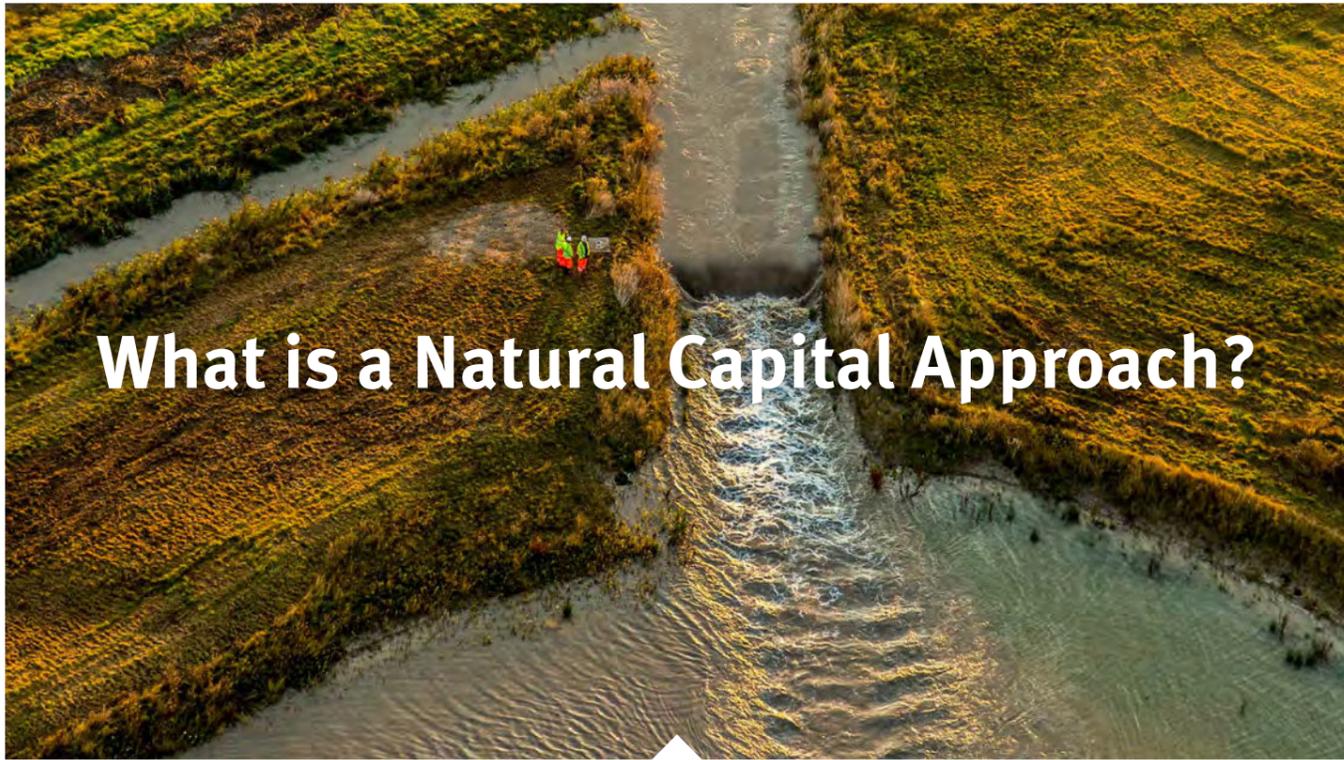
**Defined** a detailed scope for the project, and reviewed Natural Capital approaches.

**Developed** a Natural Capital evidence base for the OxCam Arc.

**Delivered** trials and guidance to test, improve and facilitate others to take a Natural Capital approach.

## What a Local Natural Capital Plan Provides

- Our LNCP provides a consistent, open and accessible evidence base for the whole of the OxCam Arc, setting out the Natural Capital present and the Ecosystem Services it provides to society. This gives a complete picture of the OxCam Arc's natural assets which will help stakeholders in their strategic decision making.
- It can be used to help ensure protection of high quality environmental assets beyond designated sites, i.e. SSSIs (Site of Special Scientific Interest), European Sites and Local Wildlife Sites, enabling these to be factored in at an early stage in decision-making, avoiding issues later in the planning process.
- It can assist in identifying strategic opportunities for enhancing the natural environment and providing off-site biodiversity net gain on a strategic scale.
- A value for the OxCam Arc's Natural Capital and Ecosystem Services which flow from, it helps to promote the benefits of protecting and enhancing the Arc's natural environment to the public and decision makers.
- Finally taking a Natural Capital approach will allow others to join up across different aspects of the natural environment and consider issues together which can help save costs, for example by helping join up thinking on greenspace provision, access and recreation, climate mitigation and water management.



# What is a Natural Capital Approach?

## Enabling Natural Capital Approaches, DEFRA

**“At its simplest, a Natural Capital approach is about thinking of nature as an asset, or set of assets that benefit people. The ability of Natural Capital assets to provide goods and services is determined by their quality, quantity and location. These in turn can be affected by background pressures, management practices and drivers of demand.”**

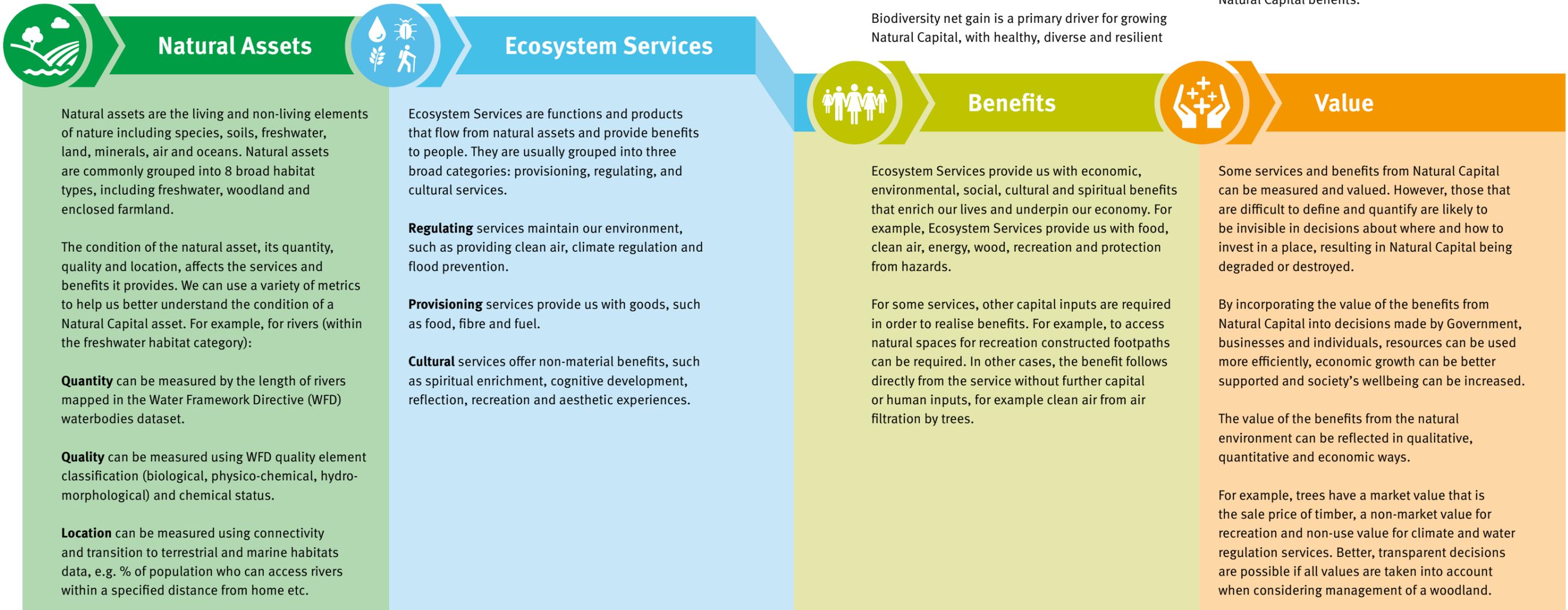
**Natural Capital comprises the elements of nature that directly or indirectly produce value to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions.**

Recognising the complex ways in which natural, social and economic systems interact enables us to make better decisions that protect and enhance Natural Capital so that it can continue to deliver the services and benefits we need.

Biodiversity net gain is a primary driver for growing Natural Capital, with healthy, diverse and resilient

ecosystems essential to underpin the delivery of a wide range of services and long term Natural Capital benefits for people and places.

For the OxCam Arc LNCP, our principle is to take a biodiversity-first approach that is founded on and complements requirements in the Environment Bill for mandatory Biodiversity Net Gain (BNG) and Local Nature Recovery Strategies, whereby environmental enhancement should deliver BNG as a prerequisite and biodiversity cannot be traded-off against other Natural Capital benefits.





# Defining Our Approach

## Working with Partners – Forums

- Bi-annual large stakeholder group events with representation from organisations across the OxCam Arc and different sectors to steer and shape our approach.
- Monthly Technical Group meetings to develop mapping and technical approaches with specialists.
- User-specific workshops with utilities, infrastructure, planning & development and land management sectors – to ensure our products are fit for purpose.

*“We have benefitted from a better understanding of the methodologies and approaches to LNCP. It improves our ability to engage with the subject and make connections across government”*

*“Really appreciated the support for our scoping study on applying a Natural Capital investment Approach, and looking forward to using the methodology and data you have highlighted”*

*“Via networking and input into such a pioneering and strategic approach. The opportunity to help steer / validate and challenge thinking as it evolved was very welcome”*

## Collaborative Approach

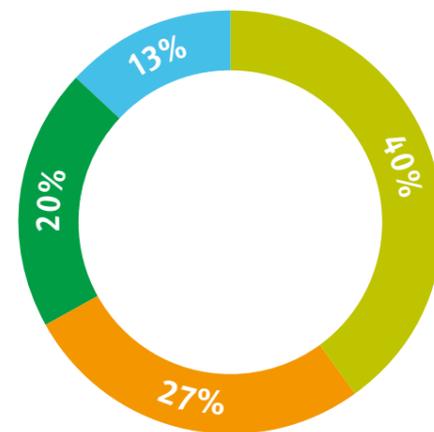
### Co-design with Partners

The first phase of our project centred on collaboratively developing an approach to creating a LNCP for the OxCam Arc. A number of projects focusing on Natural Capital planning and valuation have been trialled before our project began and we have built on these experiences and this understanding.

From the very beginning we have worked closely with local and national partners to define and refine what makes an LNCP. It was in our first meeting of our stakeholder group that we agreed what components the LNCP should encompass and since then we have continued to run workshops, deliver presentations and host meetings with over 70 different organisation from different sectors across the OxCam Arc (including planning and development, infrastructure and land management) to ensure that we built the LNCP together.

As part of this collaborative design process we have subjected our outputs to review by our Governance Group, Technical Group and Stakeholder Group to make sure that they meet the needs of those who will ultimately use them.

To ensure that our partners were benefiting from being involved with the LNCP, we asked them what they, or their organisation, felt that they got out of this engagement.



- Promotion of NC Approaches
- Co-design & Engagement
- Data & Evidence
- Pushing the Boundaries

## Supporting Local Projects

To inform our project and approach, and to assist local efforts to enhance Natural Capital, we have worked with local partners to support three projects.



### Oxfordshire Local Enterprise Networks (LENs)

The LEN is an innovative and new approach that aims to link landscape management to the long term needs of businesses and society by enabling them to work together to positively influence the quality and performance of the landscapes in which they operate. For this work we supported a project to consider where and how the LENs approach could be applied in Oxfordshire.

### Testing Approaches to Mapping Habitat Quality & Ecosystem Condition

Quality and Condition are an important facet to Natural Capital but this information is often missing from Natural Capital baseline assessments. This study therefore attempted to develop a method to assess condition of habitats at a landscape scale using existing data and inferences, to create maps of Natural Capital assets and environmental quality.

### Doubling Nature Investment Plan Scoping Study

This study researched and compared current approaches to Natural Capital Investment Planning in the UK to help inform the development of a Doubling Nature Investment Plan in Cambridgeshire, and other potential Natural Capital investment approaches elsewhere. The study provides key findings and recommendations that were drawn out of this work.

[View projects in full](#)



# Refining Our Approach

## Natural Capital Approaches and Tools Review

Our initial stakeholder engagement was focused on understanding from the different sectors that would support and use the LNCP, what approach we should take and what components should make up the LNCP. Natural Capital planning is a new and developing area and although we had agreed with our partners what should make up the LNCP, it became apparent from initial conversations with stakeholders and experts that a number of approaches were being taken forward in the OxCam Arc already as well as elsewhere, and there was no single recognised approach to taking forward a project like this.

The aim of the Review was therefore to help, alongside our continuing stakeholder engagement, create a roadmap for the steps to take when developing and implementing a LNCP for the OxCam Arc. In addition, it was intended to provide key steps and elements to support the creation of LNCPs and local Natural Capital approaches elsewhere.

Our review can be seen as another piece of supporting information that works with and supports the **Defra Enabling Natural Capital Approaches (ENCA) toolkit**. The ENCA tool is an overarching reference hub to support those who want to know more about Natural Capital and environmental valuation, and review all aspects of the approach. There is currently guidance on place based application of Natural Capital, and we will work to add in our findings to this section, adding considerations for cross boundary, and multi-county working.

The tools review in our document and ENCA's, show the wide range of tools available, and highlight that defining your objectives and circumstances will help guide which tool(s) and approaches will work best for you.

## How was the review undertaken?

**We contracted an independent specialist to undertake the review. We wanted to ensure we had, as best as we could, an independent and extensive review of approaches already in use both within the OxCam Arc and beyond, with specific focus on the pro's and con's of those approaches in relation to our objectives and project parameters. The review looked at over 80 different Natural Capital approaches and tools.**

The review was steered by the LNCP Technical Group of experts from across consultancies, universities and government bodies. Throughout the review, the LNCP team fed in outputs from user workshops and continued stakeholder engagement.

In addition, towards the end of the project the first draft of the findings went through a peer review panel of experts from across the Defra Group.

[Download detailed review](#)

[Download summary](#)

## What does the review tell us?

The full report is extensive and outlines all the findings in detail, however the key points are outlined below:

- We should follow a six step approach to developing and delivering a LNCP for the OxCam Arc as shown below.
- The LNCP should use a matrix-based tool with inherent logic evidence chains to determine Ecosystem Tools across the OxCam Arc.
- It identifies which tools are most useful in different circumstances and the importance of being clear on objectives in determining the approach to use.

- A LNCP should engage and involve stakeholders throughout the different steps. This recommendation supports our existing co-design and development approach, and our continuous stakeholder engagement – something we have continued to do and advocate as we developed the LNCP.

The overarching six step approach has provided a clear framework for developing and creating our LNCP. It has also supported our efforts to communicate and embed the outputs of the LNCP and our approach more widely.



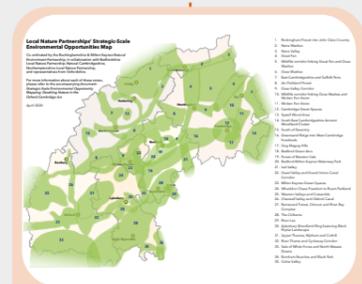
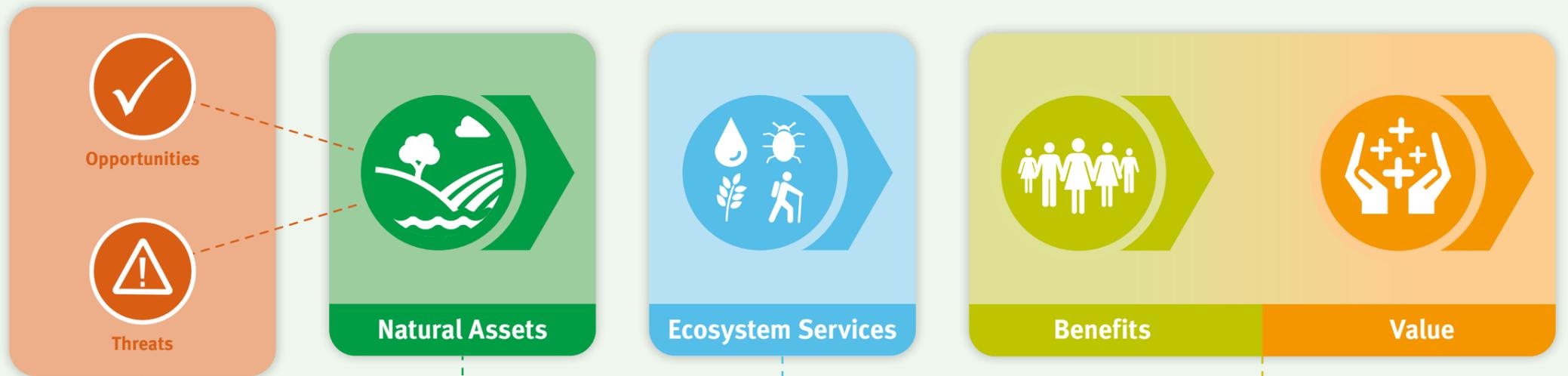
# Developing Our Evidence Base

Building our evidence base

With a recommended approach to create an LNCP outlined by the review and endorsed by partners, we set to develop its foundations – an open, accessible and consistent evidence base that utilises the best available data.

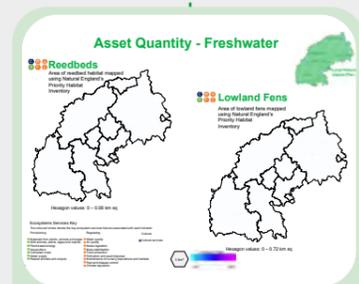
The project has provided direction and leadership in this area by working with data owners, to challenge assumptions and existing ways of working to facilitate creating an evidence base that meets these objectives. We also developed an account and valuation to demonstrate the benefits of the natural environment in the OxCam Arc, and looked at opportunities, risks and pressures for the Natural Capital of the Arc – now and in the future.

You can follow the story page by page, or use the clickable sections on the logic chain menu below to jump to a section you are interested in.



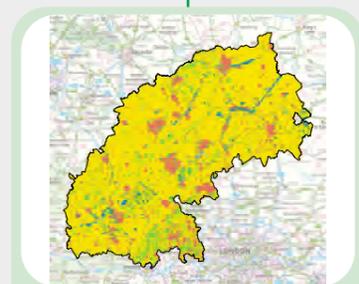
Mapped **opportunities** and risks across the Arc

[View report](#)



**Natural Capital Indicator Maps** supporting our baseline highlighting some quality indicators – based on the Natural England Atlas

[View Indicator Maps](#)



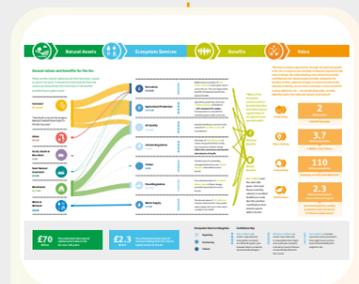
Creating a **Natural Capital Baseline** of asset type, quantity and location

[View report](#)



Mapped **Ecosystem Services** to show what benefits our natural assets provide

[Ecosystem Services mapping](#)



**Natural Capital Account** to articulate benefits and values that flow from the Natural Capital of the Arc

[View report](#)



**Investment Toolkit and other guides** to highlight why and how to take a Natural Capital approach

[View guide](#)

Co-designed and Quality Assured with Partners to create a Natural Capital Evidence Base



# Creating Our Baseline Maps

## Natural Capital Indicator Maps

We created Natural Capital Indicator Maps for the OxCam Arc – these maps are based on Natural England’s National Natural Capital Atlas mapping approach and map the state of Natural Capital within the OxCam Arc in terms of its quantity, quality and location.

These maps were created as a **visual starting point for collaboration** and we have found these maps provide us with a fantastic base for explaining the inter-relationships between datasets and the Ecosystems Services that they provide. This work really gave us a head start in ensuring that we, and our stakeholders, understood what different datasets were telling us and which datasets were available to use.

The National Atlas used 25km<sup>2</sup> hexagons to show the relevant presence of different indicator datasets across the UK.

We have used the same datasets to develop a 1km<sup>2</sup> hexagonal grid version, with values displayed as relative to what is present in the OxCam Arc (rather than nationally).

The indicator maps are not designed to be used at a detailed local scale or to influence local planning decisions. They are designed to give a strategic overview of the Natural Capital within the OxCam Arc and we, and our partners, will use them to generate awareness of such. We used the Indicator Maps as a tool in our Autumn 2019 workshops to help inform discussions and decisions regarding the Natural Capital baseline assessment, e.g. to agree an appropriate scale to display this more detailed baseline.

[View full report on Indicator Maps and visuals](#)

## Asset Quantity & Location Highlights

### Agricultural land

- OxCam Arc’s agricultural picture mirrors that of England; arable to the East and livestock to the West. However, in comparison to England as a whole, the Arc has a higher proportion of agricultural land and is more productive: approximately 20% of England’s Grade 1 Agricultural land is within the OxCam Arc. Defra’s agricultural land class data shows that 6.32% of OxCam Arc’s total land is Grade 1 agricultural land and 24.17% is Grade 2, as compared to England, which is 2.72% and 14.18% respectively.

### Woodland

- Using Natural England’s Ancient Woodland dataset we can determine that 8.5% of England’s ancient woodland land cover is within the OxCam Arc, with the majority of it found within the Chilterns. There are however, lots of ancient woodland patches elsewhere in the OxCam Arc, just at a lower density. This is why undertaking this mapping at a more detailed scale (1km<sup>2</sup> hexagons) is crucial to provide real context at a local level - these smaller but plentiful ancient woodlands are not shown visually on the national mapping.

[Download data](#)

## Asset Quality & Context Highlights

### Hydrology and geomorphology

- It is well documented that the South East of England is a water stressed area and our indicator mapping shows that many of the groundwater aquifers across the south eastern area of the OxCam Arc did not achieve ‘good’ quantitative status for WFD in 2016
- The water scarcity message is also reiterated as these maps show low values across the OxCam Arc for surface water being readily available for water abstraction

### Cultural

- Within the OxCam Arc 1.76% of its total area, around 20,000 Hectares of land, has been designated as Sites of Special Scientific Interest (SSSI’s). Our indicator maps show that of these 20,000 hectares only 47.16% of this land cover is in a favourable condition

## Mapping Methodology

1km<sup>2</sup> Hexagons

The Oxford to Cambridge Arc was broken down into a 1km<sup>2</sup> Hexagon Grid.

Each hexagon shows density of indicator

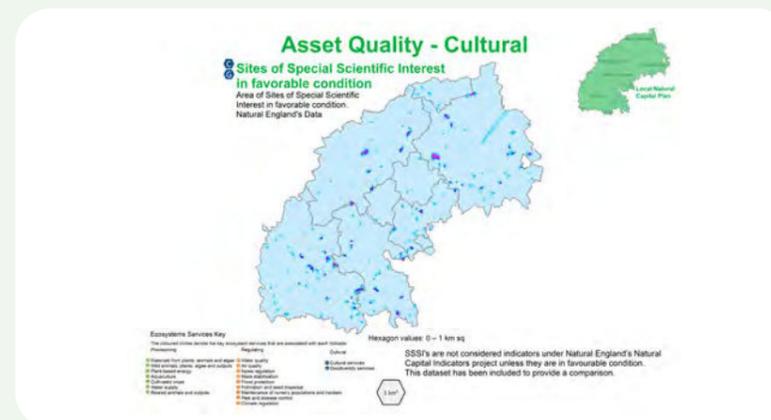
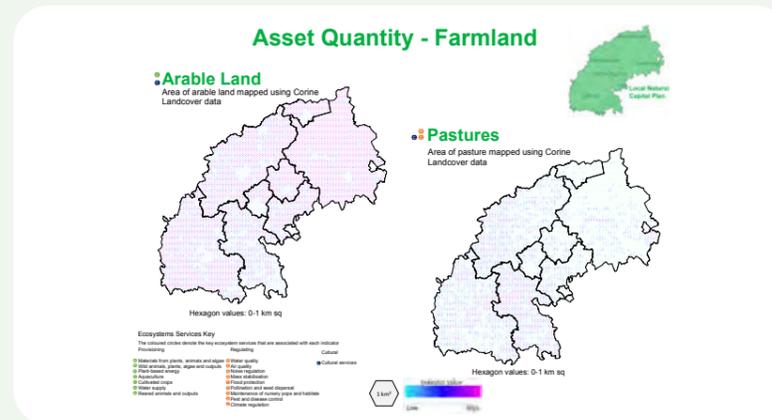
For each indicator, datasets were overlaid on top of the grid system and each hexagon given a value. For most indicators this value is the km<sup>2</sup> coverage of the indicator within each hexagon.

Arc Specific

The scale for each indicator was determined using the range of values for that indicator within the OxCam Arc. This helps highlight natural assets of importance in the OxCam Arc that would be missed when a national range is used.

Strategic Scale

These maps are not designed to be used at a local scale or to influence local planning decisions. They are designed to give a strategic overview of Natural Capital within the OxCam Arc and to assist in early engagement.





# Creating Our Baseline Maps

## A Detailed Natural Capital Baseline Map

We used the indicator based maps to engage with stakeholders across the OxCam Arc to understand exactly what our partners needed from a Natural Capital Baseline.

The first and most fundamental step in creating a LNCP is to understand the Natural Capital assets of an area. Information is required on the type, extent, location and condition of Natural Capital assets, which can then be utilised to map those habitats present. This is an important output in its own right but is also a necessary prerequisite to assessing the benefits that arise from Natural Capital, their value, and opportunities to enhance Natural Capital assets and place them at the heart of decision making. To that end, the LNCP commissioned Natural Capital Solutions to both create a habitat basemap for the whole OxCam Arc, building on maps already created in several of the counties, and to carry out an assessment of the basemapping process and its consistency compared to other independently produced habitat basemaps.

To create our Natural Capital Baseline map we started with the OS Mastermap Topography Layer which is the most detailed and accurate mapping available and identifies all roads, buildings, fields and other features as individual polygons. We then used a series of geospatial rules and other mapping layers to classify each polygon (unit of land) into a

habitat type. Additional rules and layers were then used in a series to gradually build up as complete a picture as possible. For example, areas identified as improved grassland, but within urban areas, were classified as amenity grassland. All polygons were assigned to a Phase 1 habitat type, although areas currently undergoing development were marked as unclassified.

The detailed baseline shows the location and extent of Natural Capital across the OxCam Arc at a finer scale than the Natural Capital indicator mapping. It also builds on the indicator maps by bringing in local and qualitative data on the assets.

Both of these pieces of work together provide the first essential step to enable us to look at Ecosystem Services, flows, benefits and values from Natural Capital assets in the OxCam Arc. Ultimately this evidence base supports the realising of opportunities and planning of other interventions that help to protect and enhance the natural environment of the OxCam Arc for people and nature.

**Data sets used:** OS MasterMap Topography Layer; OS MasterMap Greenspace; OS Open Greenspace; Natural England Priority Habitats Inventory; CEH Land Cover Map 2015 vector; Built-up Area Boundaries; Ancient Woodlands Inventory; National Forest Inventory; Local Environmental Record Centres data; and Boundary-Line.

## Developing The Baseline

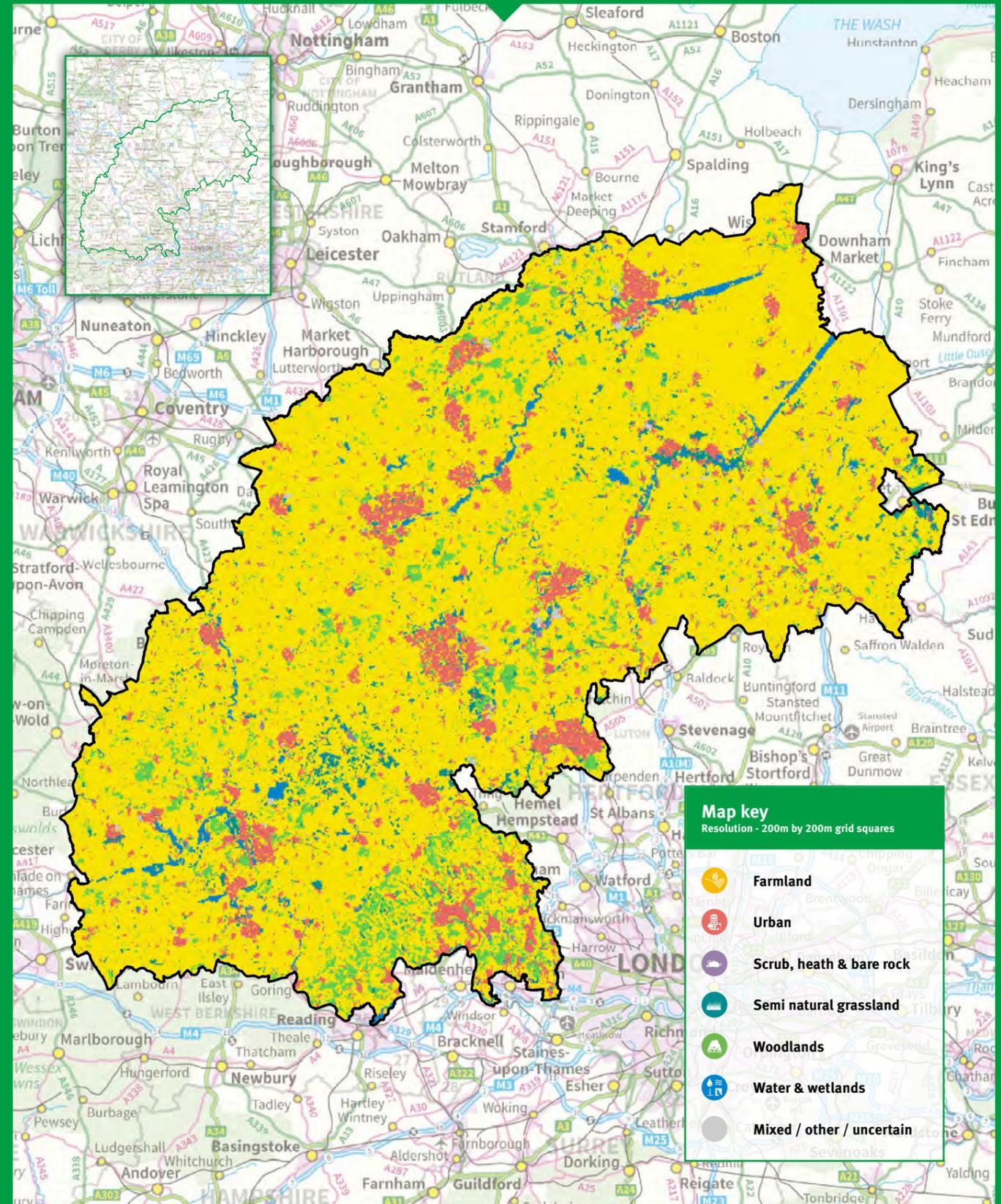
As part of developing the baseline, we have developed a number of reports that collectively ensure we have documented our approach and lessons learned. The first of these looks into **how the Natural Capital Baseline was created**, the second compares **whether the use of different techniques or data** (e.g. freely accessible or paid for data) **makes a significance difference to the creation of a Natural Capital Baseline map**, and the third **outlines the lessons that have been learnt** from this project. All of these reports can be found on our website.

You can view the Baseline Maps for the Arc at a 200m grid square scale using the simplified categorisation on the opposite page.

Should you want to use our baseline maps these are available to download from our website [oxcamlncp.org](http://oxcamlncp.org) or by using the link below.

[View all baseline maps](#)

# Oxford to Cambridge Arc Natural Capital Assets



This map was created using data from various sources. Please contact the Oxford to Cambridge Local Natural Capital Plan Team for full information. Contains Ordnance Survey data © Crown copyright and database right 2020. Produced using LCM2017 © and database right NERC (CEH) 2017. All rights reserved.

Contains data provided by Buckinghamshire & Milton Keynes Environmental Records Centre. All rights reserved. Contains data provided by Bedfordshire and Luton Biodiversity Recording and Monitoring Centre. All rights reserved. Incorporates biodiversity data supplied by Thames Valley Environmental Records Centre (TVERC) in 2019. Copyright to TVERC. All rights reserved.

Contains Corine Data. © Landcover data was produced by a programme coordinated by the European Environment Agency (EEA) with funding from the European Union. This map includes Cambridgeshire and Peterborough Biodiversity Group habitat information as produced by Natural Capital Solutions Ltd. © Natural Capital Solutions Ltd 2020.

This map incorporates biodiversity data supplied to the OxCam LNCP by the Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire (Wildlife Trust BCN), and is copyright to Wildlife Trust BCN and/or its partners. Data supplied is a snapshot in time and data owners should be contacted for up-to-date information.



# Mapping The Ecosystem Services

Using the Natural Capital baseline, we have completed an assessment of Ecosystem Services within the OxCam Arc. The review of tools and approaches set out which scenario each Natural Capital tool would be most appropriate for, and so we were able to decide which tool is best for us to quantify Ecosystem Services and provide this for the OxCam Arc. Using the review as a guide we have chosen to use a matrix-based approach using the scores developed for the Eco-metric. The Eco-metric is an Ecosystem Services scoring matrix currently being piloted by Natural England that has undergone extensive peer review.

The Eco-metric approach was described in the review as being “best for habitat-based Natural Capital asset register using a simple, replicable method”. It is a good basis for us to gather the Arc’s Ecosystem Services data quickly and to provide a foundation for further actions using other approaches that the review recommends.

## Quote from Jacobs review:

**“The initial recommended approach is to use matrix-based tools such as the Natural Capital Planning Tool (NCPT) and the Eco-metric. These are simple to apply and cover a comprehensive range of services. They use logic chains that synthesise expert opinion and scientific literature on the links between Natural Capital assets and the Ecosystem Services and benefits they provide.”**

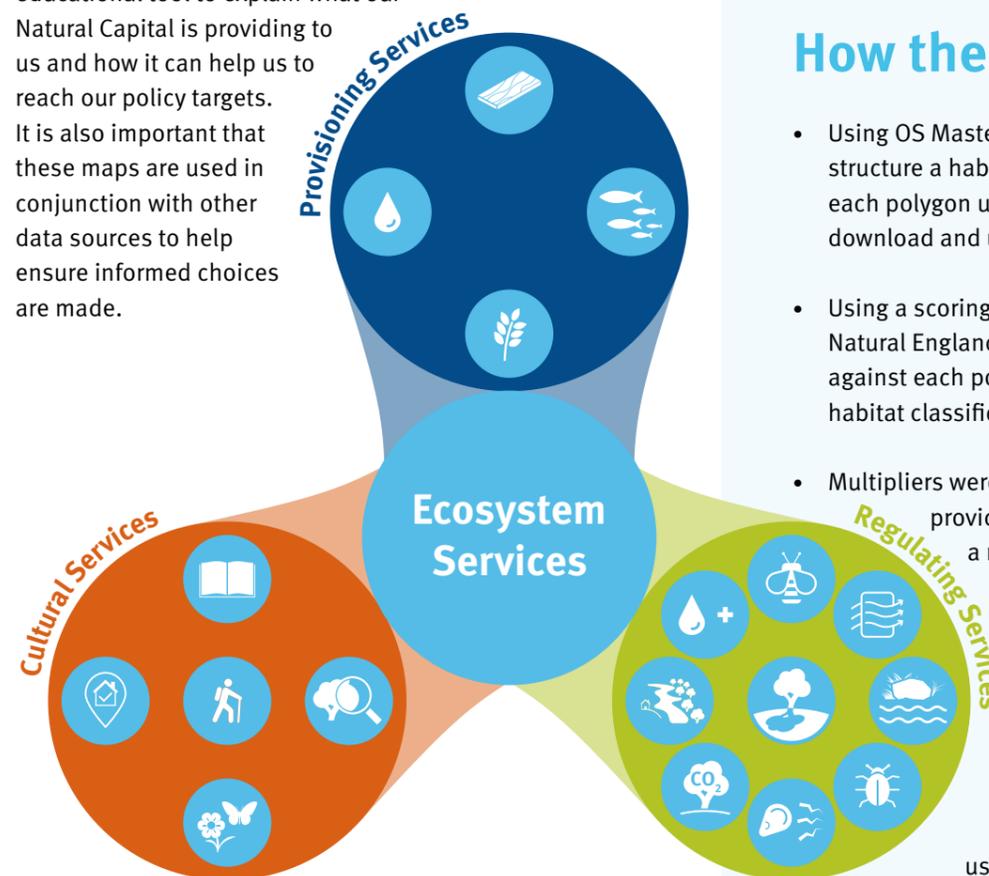
## LNCP Ecosystem Services Mapping Summary

We have mapped 18 different Ecosystem Services provided by the Natural Capital within the OxCam Arc. Each map shows where within the OxCam Arc there is the potential for high or low levels of each Ecosystem Service to be provided by local Natural Capital.

### How should these maps be used?

The maps in the links below give a strategic indication of the potential Ecosystem Services that are being provided within the OxCam Arc. We believe they can be used to help support decision making at a strategic scale and to identify future policies which may seek to enhance certain services that nature is providing.

We also feel that this data can be used as an educational tool to explain what our Natural Capital is providing to us and how it can help us to reach our policy targets. It is also important that these maps are used in conjunction with other data sources to help ensure informed choices are made.



## How Ecosystem Services were assessed

To assess the potential provision of Ecosystem Services across the OxCam Arc, we commissioned A. Smith from the University of Oxford to produce maps using the scoring matrix she developed as part of Natural England’s Eco-metric.

### Risks and Limitations

This mapping is designed to be used strategically. It is not designed to be used at site level or master planning scale. If you want mapping that can be used at a more tactical level it would be better for you to use a more in-depth modelling approach. Our mapping also does not widely consider the condition of the habitats (which would impact on the provision of an Ecosystem Service) and it does not assess the location of the habitats e.g. the noise regulation scores are the same whether a habitat is next to a noise source or not. However some of these Ecosystem Services scores are uplifted if a habitat is located in a designated landscape, and for recreation the scores are raised if the habitat is accessible to the public. Equally a weighting is given



to our food production scores depending on the class of the agricultural land.

[View all maps](#)

## How the maps were created

- Using OS MasterMap polygons as the base mapping structure a habitat classification was assigned to each polygon using data that is free for anyone to download and use.
  - Using a scoring matrix that was derived from Natural England’s Eco-Metric, scores were assigned against each polygon for each service based on its habitat classification.
  - Multipliers were applied for certain services to provide a more refined score. For example, a multiplier was applied to set the score for the recreation service to zero if there is no public access.
  - A 25m by 25m grid square image of the map for each service was then created which:
    - Encourages the maps to be used strategically as intended
  - Allows the maps to be displayed quickly on mapping software
  - Meets the licence restrictions of OS MasterMap
  - By us creating and displaying the data as a grid it allowed us to control how the computer displays the data. If we did not, when saving the image as a pdf or jpeg the machine would pixelate the image itself in an uncontrolled way because there is too much detail.
  - Aids people’s understanding that these maps show indications of the potential services and are not comprehensive.
- We created two versions of the ecosystem services maps. One using paid for environmental data, which we called the ‘best available’ and one only using freely available datasets, with the exception of OS MasterMap, which we called ‘the most accessible’ due to it having less licensing restrictions.

The ‘most accessible’ maps were created using the following Datasets: Ordnance Survey MasterMap, the Rural Payments Agency’s CROME Crop Map, Natural England Priority Habitats Inventory, OS MasterMap Greenspace and OS Open Greenspace.



# Mapping Opportunities & Risk

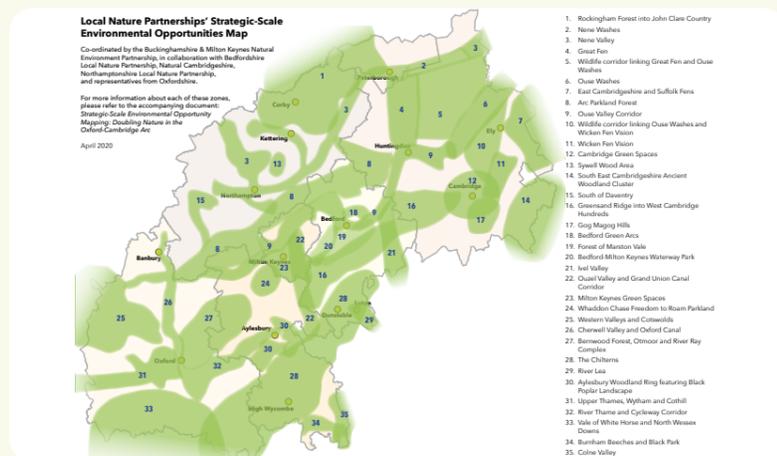


The overarching objective of OxCam LNCP is to enable delivery of environmental protection and enhancement in the OxCam Arc. Baseline mapping of existing environmental assets allows us to see the most important assets that should be protected, enhanced, and highlight where we need to consider mapping opportunities for environmental improvements that deliver wider and more connected environmental benefits.

We held workshops and discussed the best way to do opportunity mapping with stakeholders and users of LNCP outputs to inform how we can best support improvements to the environment via this work. Based on this, we decided to collate the

variety of environmental improvement opportunity areas and projects already identified across the OxCam Arc together in a single location. Doing this allows those that have developed this thinking and are basing their decision-making on these maps to consider where there is join-up across different sectors and overlapping priorities.

This report highlights the opportunities and priority areas that exist across the OxCam Arc already. By necessity, to make the content visible and meaningful they have been broken down into various maps although we would encourage organisations to work across these.



## Local Nature Partnerships Opportunity Areas

The Local Nature Partnerships covering Bedfordshire, Buckinghamshire and Milton Keynes, Cambridgeshire and Northamptonshire, along with representatives of the Oxfordshire Environment Board and local authorities, have produced a collaborative map to illustrate the priority strategic-scale environmental opportunity zones in the Oxford to Cambridge Growth Arc. The map shows:

- **Green numbered zones:** These are strategic-scale and collectively-agreed areas of high environmental value and opportunity and large-scale investment potential – for example to create or enhance biodiversity, habitats and/or green infrastructure. The accompanying guidance document provides further information on the opportunities.

- **Cream areas:** These are locations of more local-scale opportunity and investment potential. Opportunities for nature exist throughout these areas, but at the smaller-scale and could be away from centres of population. Smaller-scale opportunities are still hugely valuable for nature and local communities, and serve as corridors and stepping-stones for wildlife to move between larger sites and habitats – which improves the resilience of wildlife to external pressures.

To find out more information about any of these areas please contact the Local Nature Partnerships.



## Understanding Risks and Pressures the Natural Capital of the OxCam Arc faces

Through the LNCP a broad summary of the the risks and pressures the OxCam Arc's Natural Capital faces has been produced. It is not a systematic analysis of impacts because the size and scale of the Arc means that it is not feasible for the LNCP to create a detailed risk register, which we believe would be more appropriately created on a smaller geographical scale.

The receptors for risks have been broken down into topics to explore within this document enabling focused expert input. Two main categories of pressure were identified:

- Population increase and development of land for homes and businesses – this is a common pressure across the UK, however with up to 1 million new homes planned to be built across the OxCam Arc by 2050 this pressure is a significant issue across the OxCam Arc. To put this in context the Ministry of Housing, Communities & Local

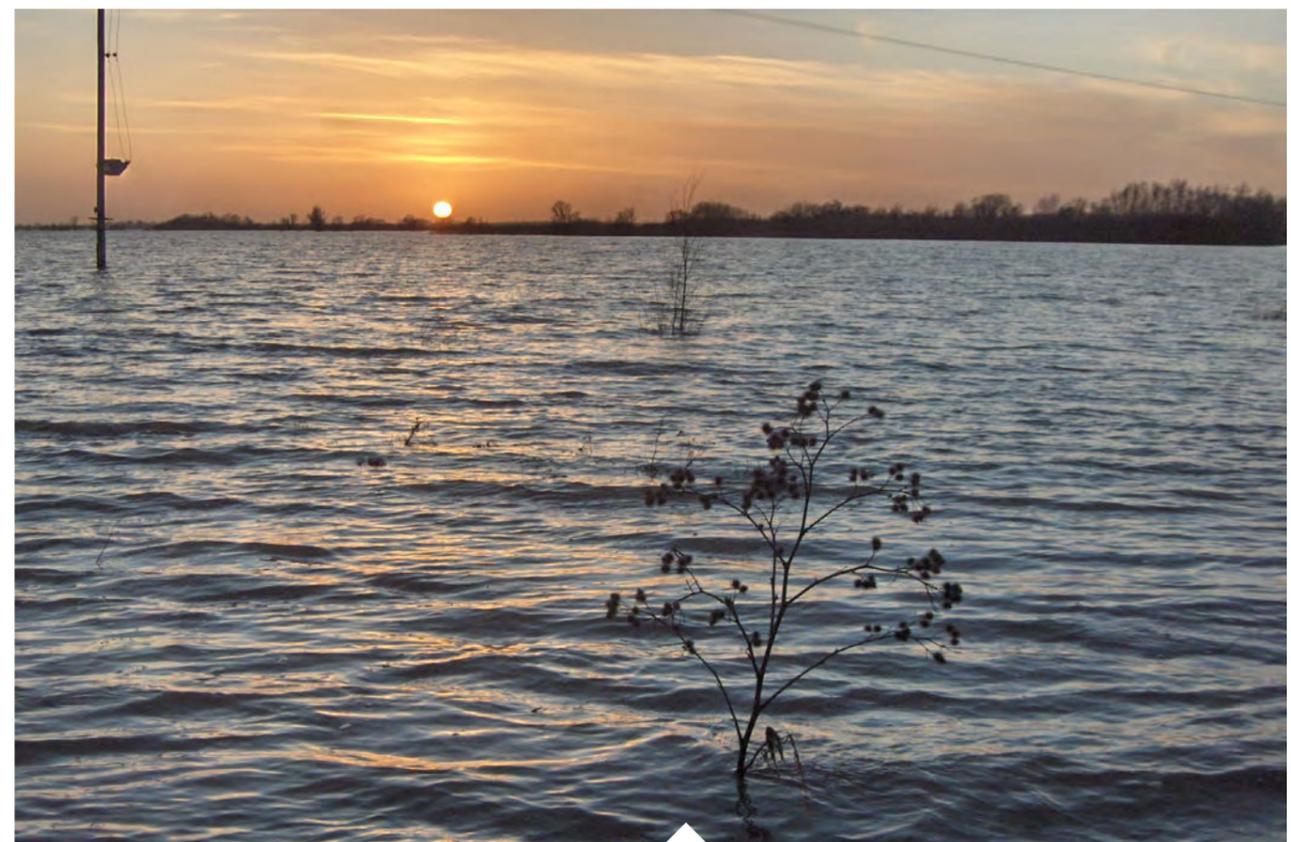
Government statistics state in 2016 the OxCam Arc contained 1.5 million dwellings.

- Climate Change – the Earth's climate is changing and these changes threaten the ability of species and habitats to survive in the locations that we currently find them, as well as creating challenges for human health and wellbeing.

Within the different sections of this report (excluding Soils, Sense of Place, Tranquility and Climate Change) a list of metrics of risk has been provided. These metrics can be used to provide a benchmark of the current risks that we hope can be used to track changes against in the future. Appropriate policies and plans are also signposted where appropriate.



For this report, we have created a map with some key risks and pressures mapped across the OxCam Arc, in context with opportunities and characteristics of the Arc. This can be seen on the next page.



# Mapping Opportunities & Risk



There are 3 Areas of Outstanding Natural Beauty (AONBs); The Cotswolds, the Chilterns and the North Wessex Downs, together covering **10%** of the total OxCam Arc area.

Within the OxCam Arc around **20,000 Hectares** of land are notified as SSSIs, this is **1.76%** of the total OxCam Arc area and **47%** of this area is defined as in favourable condition. There are around **50,000 hectares** of local wildlife sites.

**Risk**

**Habitat connectivity** – Lawton 2000 highlighted that lowland area is more at risk of fragmented habitats. The highly fragmented nature of the OxCam Arc’s environment is demonstrated by the relatively small size of SSSIs: only 1 out of the Arc’s 175 SSSIs is within the top 100 (by area) of sites in England, despite the OxCam Arc making up 9% of England’s total land area.

**Opportunity**

**Habitat connectivity** – By understanding the Natural Capital assets within the OxCam Arc, and the Ecosystem Services that flow from them, we can map opportunities at a spatial level in order to join up assets and interventions to improve habitat connectivity.



“Half of the UK’s population of the **rare native black poplar trees** are found in Aylesbury Vale in the OxCam Arc”

**650,000 tonnes** of carbon sequestered by habitats such as woodland and peatland.

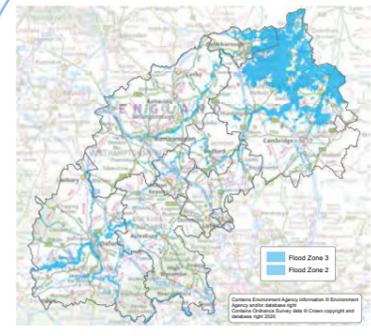
The Fens, located in the north east of the OxCam Arc around Cambridge, have some of the highest densities of flood plains in the country. This provides the area with highly productive agricultural land.

**Risk**

**Flood and drought regulation** – 14.7% of the OxCam Arc’s land area is at a high risk of flooding. Across the OxCam Arc there are currently **74,000** properties within the Environment Agency’s fluvial and coastal flood zone.

**Opportunity**

**Natural flood risk management techniques** are being used more frequently as part of flood alleviation schemes. These can deliver multiple ecosystem services aside from reducing flood risk.



**76%** of the Arc is classed as enclosed farmland with **6.32%** classed as Grade 1 agricultural land and **24.17%** Grade 2, as compared with England-wide figures of **2.72%** and **14.18%** respectively. The Arc’s agricultural picture mirrors that of England, arable to the East and livestock to the West.



“The Chilterns Area of Outstanding Natural Beauty (AONB) covers **324 square miles** of countryside, with much of it within the OxCam Arc, and over 1/5th of the area is wooded. Chalk streams are also a characteristic and attractive feature of the Chilterns landscape and are a globally rare habitat. **More than 85% of all the chalk streams in the world are found in England, with 11% of these in the OxCam Arc.**”

There is a lower density of rivers along the southern ridge, across the north of the Chilterns, but the chalk streams that do feature are of significance to this area.

Corine landcover data shows that **8%** of the OxCam Arc’s total land cover is woodland. Using Natural England’s Ancient Woodland dataset we can determine that **8.5%** of England’s ancient woodland landcover is within the OxCam Arc, **31,111.89 Ha**, the majority of it found within the Chilterns with patches distributed throughout.

The Natural Capital assets in the OxCam Arc, with woodlands contributing most, remove **57,000 tonnes** of air pollutants avoiding healthcare costs of **£43 million** per annum just from GP visits.

There are 344 WFD river waterbodies across the Arc. Whilst **62.68%** are at moderate status, 251 of them have a reason for failure of achieving good status attributed to point source pollution and 234 attributed to diffuse source pollution.



Soil underpins all of our landscapes. It is at risk from erosion, compaction, carbon loss, pollution, loss of condition and ultimately degradation and complete loss.



“The Arc is the UK home to the rare black hairstreak butterfly, which is only found in woodlands on the heavy clay soils between Oxford and Peterborough”

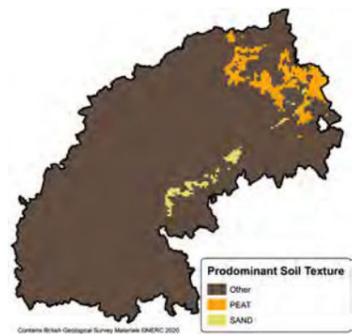
There are over **17,000 km** of public rights of way across the Arc. These rights of way ensure that people are able to move through and interact with the landscape and receive all the health benefits associated with it.

**Risk**

Soil degradation directly increases risks to various Ecosystem Services within the OxCam Arc including water quality, flood risk management and agricultural production. The most significant risk of soil erosion and loss arises where there is intensive arable land coinciding with sandy or peat soils, although the way land is managed can affect the risk profile greatly.

**Opportunity**

More robust evidence bases around the value of the natural environment and the benefits it provides can drive projects that pay farmers for the Ecosystem Services they provide, including future environmental land management and business-led agricultural land payment schemes.



This is an illustrative map only, to highlight some of the key themes and messages around the natural assets and characteristics of the OxCam Arc.



# Understanding the Benefit & Value of Natural Capital

## A Natural Capital Account

The Natural Capital Account for the OxCam Arc helps to show some of the value nature provides – both in monetary terms and through highlighting the wider benefits to society. The account and the information used to calculate many of the benefits is derived from our baseline mapping work and includes information about the landscape, pressures and opportunities unique to the area.

The account highlights the value of the benefits Natural Capital provides to society – and all the interlinking and overlapping dependencies, but it also shows the gaps in the evidence and understanding which are just as important. A Natural Capital approach is about everyone understanding all of the multiple benefits that come from nature, and their value to society up front.



Natural Assets



Ecosystem Services



Benefits



Value

Our Natural Capital valuation, or account, is based on the entire Natural Capital approach. It is a way of quantitatively linking together the total benefits that flow from nature and tracing them through the flows back to the assets.

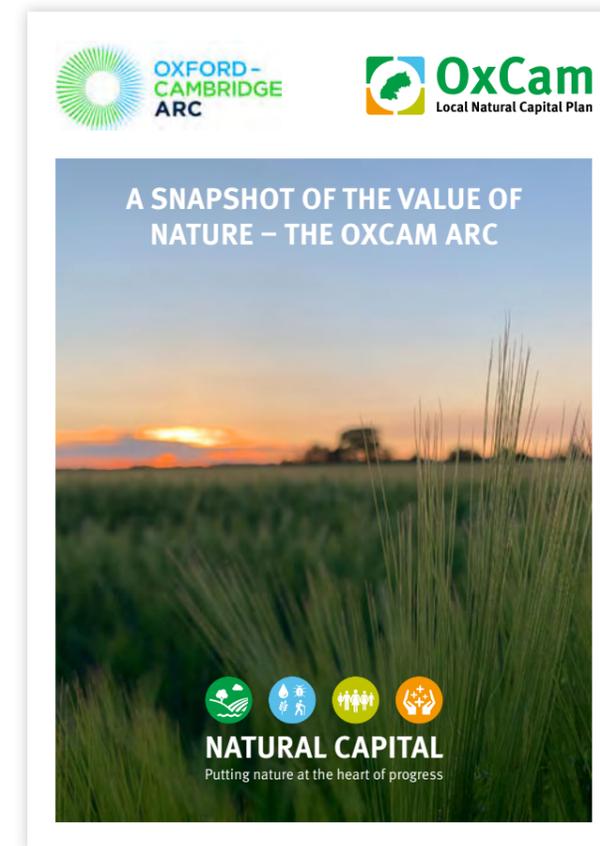
That's important, as if we just focus on the benefits and values in isolation we miss the point that it's the assets we have to look after. The quality and quantity of these assets change over time due to pressures and drivers of change, such as human population growth.

## Using the account to encourage green growth

In order to support the aspirations of the OxCam Arc and green growth we need to encourage sound investment in the environment and sustainability.

Natural Capital planning, and particularly accounting, can help to highlight the value of the environment to people and society. It also shows

the multiple benefits that flow from our natural assets, encouraging the need. We want businesses and organisations within the OxCam Arc to consider how they can build the approach into projects and developments, and use our tools and evidence base, to maximise investment and the value that the environment brings.



The next few pages take you through some highlights from the OxCam LNCP Account and show you where to go for more county level account information.

[View snapshot report](#)

[View county report](#)

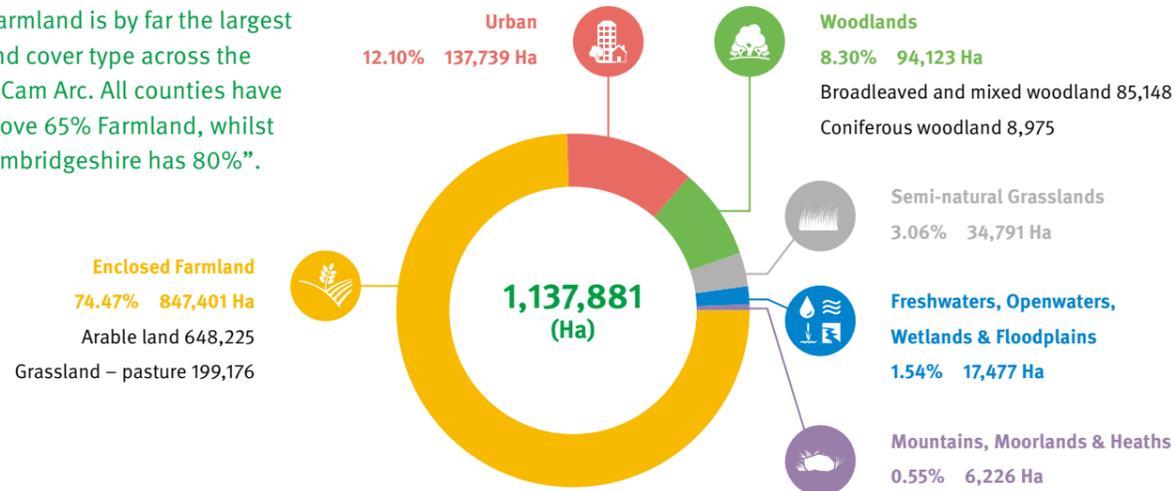


# Understanding the Benefit & Value of Natural Capital



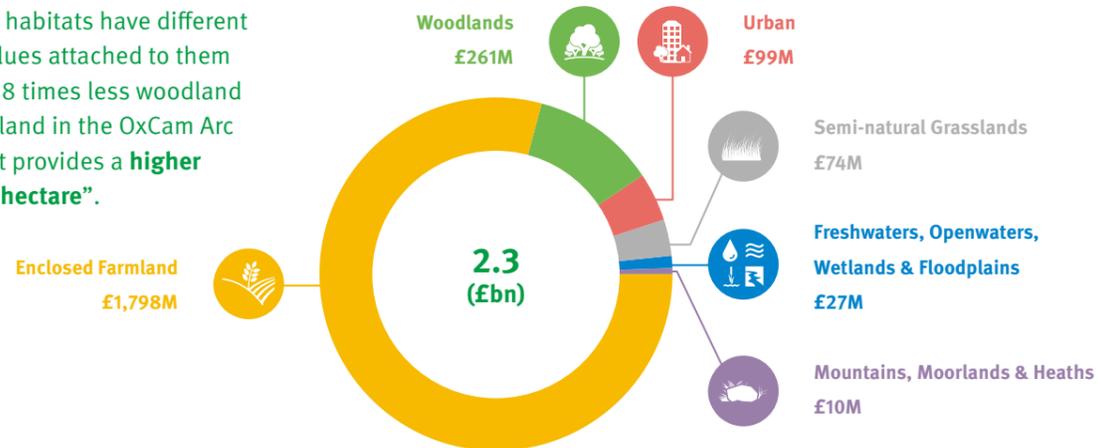
## The land cover types of the OxCam Arc by area

“Farmland is by far the largest land cover type across the OxCam Arc. All counties have above 65% Farmland, whilst Cambridgeshire has 80%”.



## The value of the natural assets of the OxCam Arc

“Different habitats have different sets of values attached to them – there is 8 times less woodland than farmland in the OxCam Arc however it provides a **higher value per hectare**”.



## Per hectare value of each natural asset



These values are an average. They are made up from direct valuations of more detailed habitat/land-use types, and through attributing the monetary valuations of water supply, recreational visits and river health to the habitat categories.



## The Ecosystem Services of the OxCam Arc



**Biodiversity** plays a vital role in ecosystem functioning. Processes such as capturing essential resources, producing biomass and recycling nutrients, are all impaired as biodiversity declines. Furthermore, biodiversity not only underpins ecosystem functioning, it also enables these processes to be resilient in the face of global change.



Most of our Natural Capital assets, if appropriately connected and maintained, support our **mental and physical health**.

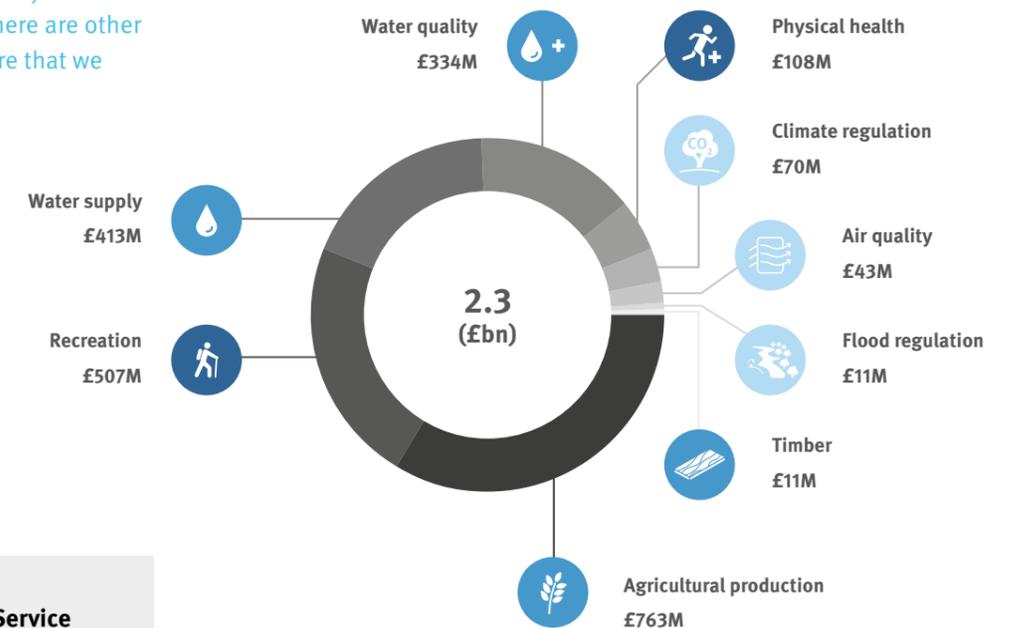


Mental and physical health are not captured as separate Ecosystem Services within the account, due to the difficulty in valuing them, but these benefits should not be underestimated.



## The value and benefits from Ecosystem Services of the OxCam Arc

“£2.3 billion is the estimated annual value in the OxCam Arc flowing from the Ecosystem Services shown. There are other benefits from nature that we cannot yet value”.



### Ecosystem Service Categories

- Regulating
- Provisioning
- Cultural



# Natural Assets



# Ecosystem Services



# Benefits



# Value

## Annual values and benefits for the OxCam Arc

These are the Natural Capital assets that have been valued as part of our work. It should be noted that the financial values for these assets are derived from the total value of all of the ecosystem services benefits provided by any given asset.

**Farmland**  
£1,798M  
847,401 Ha



“Farmland is by far the largest Natural Capital asset type in the OxCam Arc by area but is not the most valuable per hectare”

**Urban**  
£99M  
137,739 Ha



**Mountains, Moorlands & Heaths**  
£10M  
6,226 Ha



**Semi natural grassland**  
£74M  
34,791 Ha



**Woodlands**  
£261M  
94,123 Ha



“Different habitats have different sets of values attached to them – there is 8 times less woodland than farmland in the OxCam Arc however it provides a higher value per hectare”

**Water & wetlands**  
£27M  
17,477 Ha



<b>Recreation</b> £507M	Welfare from recreation of <b>168 million visitors</b> to open green space across the OxCam Arc. This can bring added benefits of improved mental and physical health.
<b>Physical health</b> £118M	Physical Health value calculated from active recreation visits.
<b>Agricultural production</b> £763M	Agriculture production from over <b>847,000 hectares</b> of farmland – <b>34% livestock &amp; 76% arable</b> . Food provision is essential for maintaining the health of society.
<b>Air quality</b> £43M	Avoided healthcare cost due to the removal of <b>57,000 tonnes</b> of air pollutants.
<b>Climate regulation</b> £70M	The value of <b>650,000 tonnes</b> of carbon sequestered from habitats such as woodland and peatland. Climate change affects the social and environmental determinants of health.
<b>Timber</b> £11M	The net value of sustainably managed timber from over <b>94,000 Hectares</b> of woodland across the OxCam Arc.
<b>Flood regulation</b> £11M	An estimated volume of <b>25 million m³</b> /year of flood storage is provided by woodlands across the Arc.
<b>Water supply</b> £413M	<b>863 million m³</b> of water abstracted for clean water supply and energy generation. Access to clean water underpins our health.
<b>Water quality</b> £334M	Value of water quality is based on how much people are willing to pay to know the water quality in their local/national rivers is in a good condition. This approach estimates the value of water quality to citizens for amenity, recreation and “non-use” (wellbeing) reasons.

“Many of the Ecosystem Services and the benefits that flow from them impact significantly on our physical and mental health.”

Physical health benefits  
Mental health benefits

“We have a unique opportunity, through the planned growth in the OxCam Arc, to protect and enhance its Natural Capital and the value it brings. By understanding more about the positive contributions our natural assets provide, alongside the benefits of other planned changes to improve productivity and place-making, we can look to develop a more connected society within the OxCam Arc – connected physically, socially, digitally and to our natural environment.”

**Productivity**

**2**  
Million jobs  
Up to 1.2 million new jobs

**Place-making**

**3.7**  
Million residents  
Up to 1 million more homes

**Connectivity**

**110**  
Billion annual GVA  
Provide new enabling infrastructure to support a further £20 billion GVA pa

**Environment**

**2.3**  
Billion annual asset value of natural capital  
Increased quantity, quality protection and connection of natural capital assets

**£72**  
Billion  
The estimated total asset value in the Arc over 100 years.

**£2.3**  
Billion  
The estimated annual value of services flowing from the natural capital assets in the Arc.

### Ecosystem Service Categories

- Regulating**
- Provisioning**
- Cultural**

### Confidence Key

- High confidence** in results. Input data and assumptions are based on statistical reports, peer reviewed values or industry standard methodologies.
- Moderate confidence** in results. Input data and/or assumptions from single source/not peer reviewed, or based on sources that are not specifically tailored to this context.
- Low confidence** in results. Input data and/or parameters from single source and low level of transferability from original to site.



# Funding & Investment Toolkit

To illustrate how a Natural Capital evidence base can help secure investment, we created an introduction to Natural Capital funding. The guide focuses on three areas;

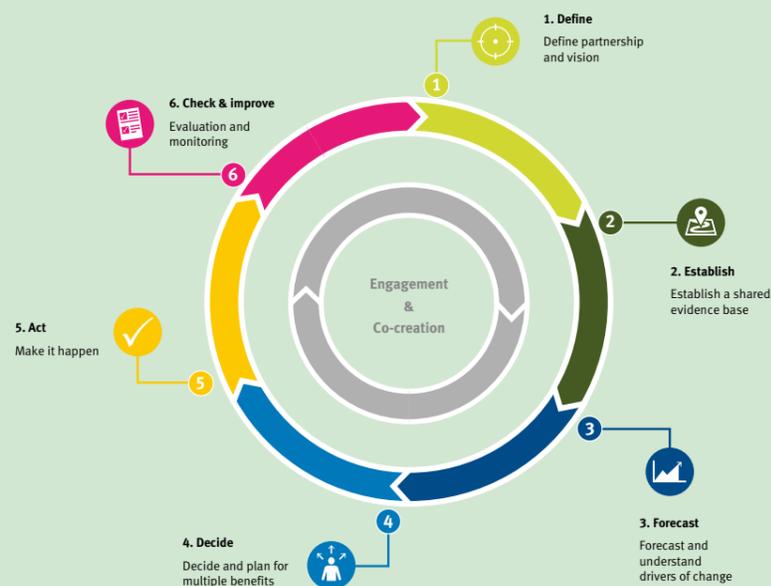
- **Understanding** – the landscape of environmental projects and Natural Capital
- **Application** – review different planning and delivery approaches and tools
- **Examples** – access to resources that highlight evidence and examples
- To support organisations in embracing a Natural Capital approach and to avoid creating another

standalone method, we have created an interactive, stage based planning tool. There are two versions of the 6-step toolkit;

- to support standard business planning, or
- a version tailored to the planning sector

The tool sets out an approach that can be integrated into spatial and project planning at the earliest stages, to help ensure environmental protection and net gains, alongside benefits to people, are at the centre of developing growth proposals.

## The six step approach to developing a Natural Capital approach



# Applying to Planning Policy

**Natural Capital and Ecosystem Assessment Pilot Project: Applying a Natural Capital Approach to planning policy and the growth agenda in the OxCam Arc.**

Aim: Investigate how a Natural Capital and Ecosystems Services (NCES) evidence base has been, or could be applied to planning policy making across the OxCam Arc. We also had an ambition to support partners to apply NCES evidence through the duration of the project.

The project was broken down into a series of work packages with each focusing on a level of plan making this allowed us to use specialist consultants to focus on their topic areas. Within the planning system we focused on talking with policy and plan makers, rather than with development control. This was a conscious decision as NCES evidence needs to be embedded in the plans before it can strongly influence individual decisions. The partners that we focused our engagement on were local & national government reps and NGOs, for example local enterprise partnerships.

## Work Packages

We found that there is widespread awareness through the planning system of the idea of a Natural Capital approach, (except at the neighbourhood plan level), however there was little knowledge of how to take forward the approach and use Natural Capital and Ecosystem Services (NCES) data in decision making and plan writing.

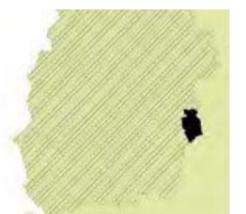
### Key Recommendations:

- Make use of Local Nature Partnerships
- Evolution not revolution from Green Infrastructure
- There needs to be clear information, guides and support on how to take a Natural Capital approach and use a Natural Capital evidence base

Oxford – Cambridge Arc Level

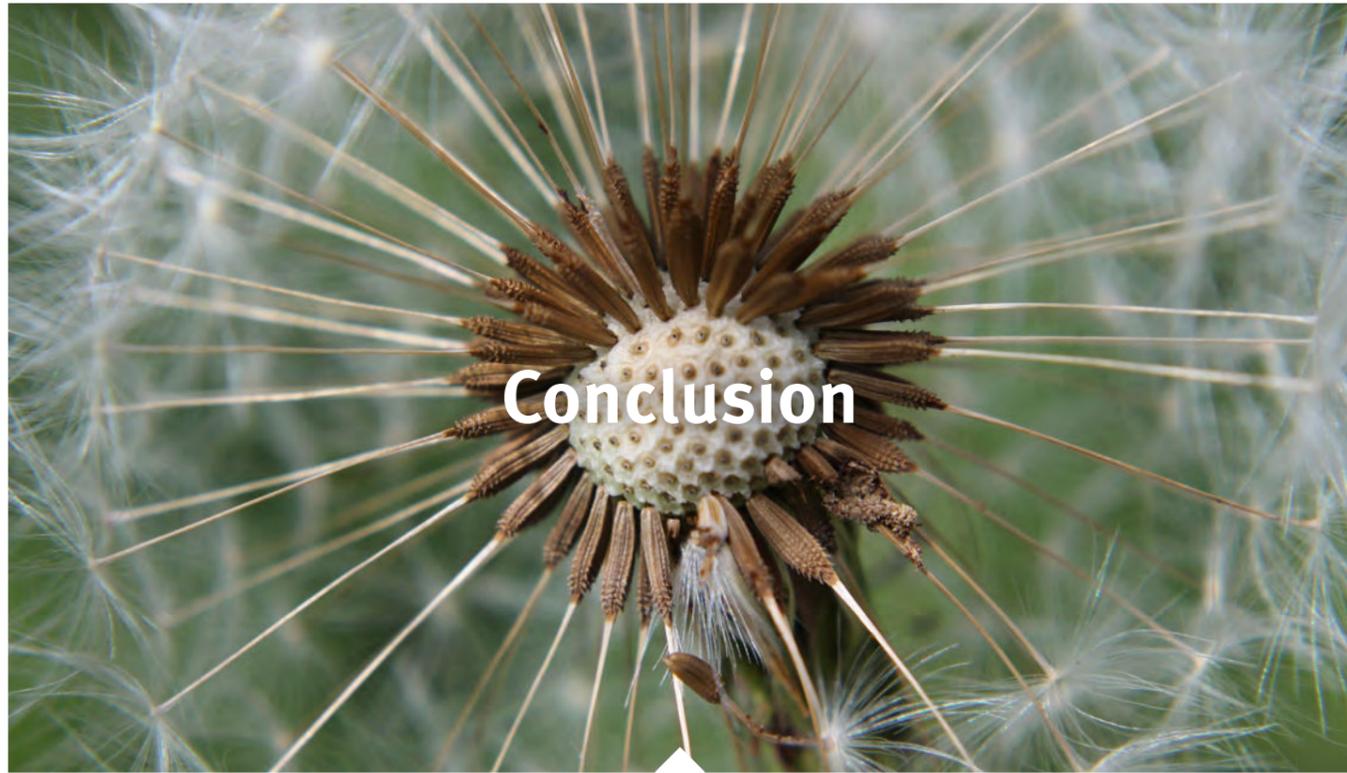
County / Local Authority Level

Neighbourhood Plans Level



Masterplan Level

Planning reform proposals



# Conclusion

**The LNCP set out to create a replicable and inclusive framework, that future developments could implement to enhance environmental protection.**

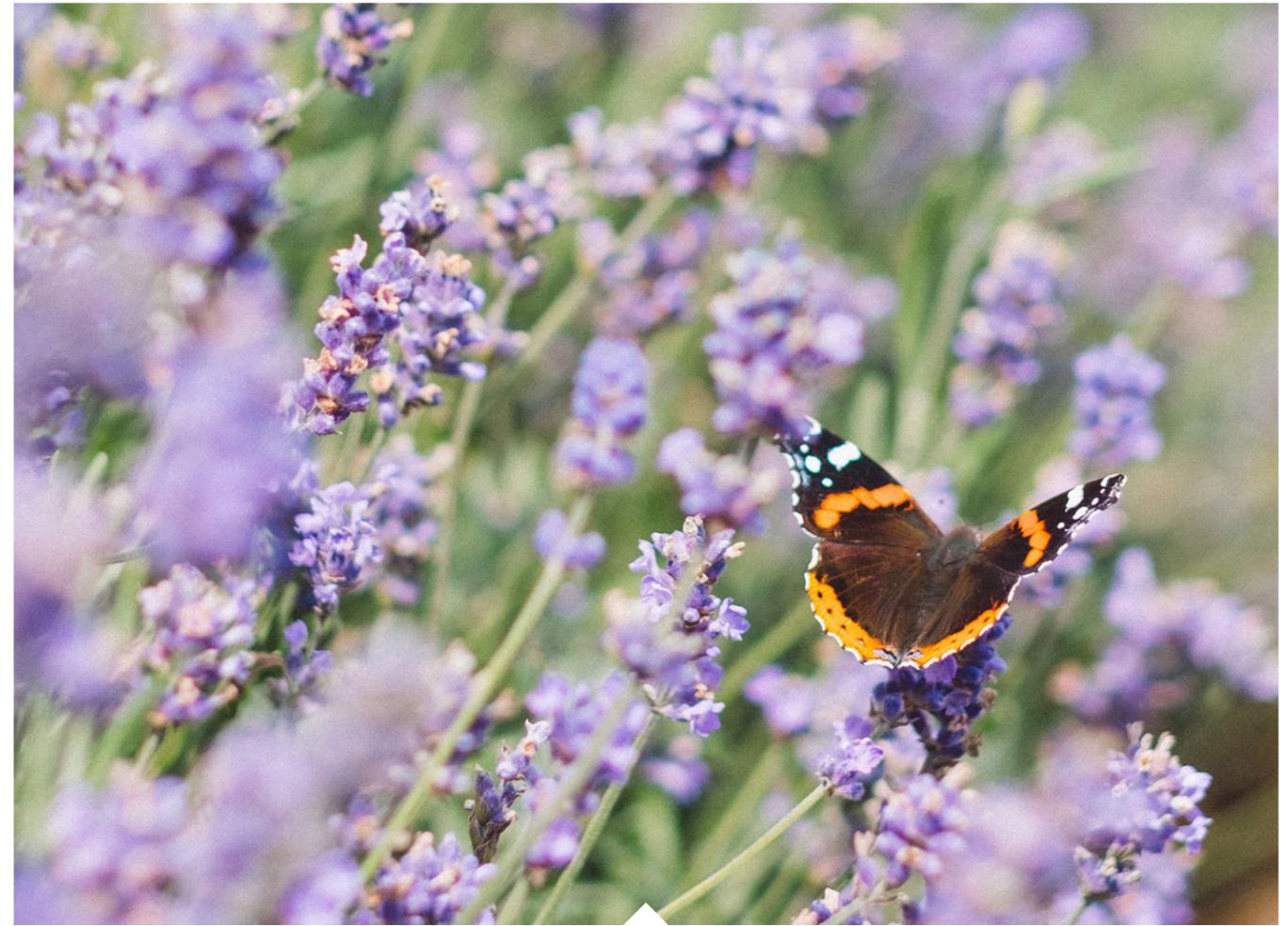
To support this objective, we produced an open and accessible Natural Capital and Ecosystem Services Baseline for the whole of the OxCam Arc, and provided key information on the value, opportunities and risks faced by the Arc's Natural Capital. We have also shared an approach which, if used alongside the outputs of the LNCP, will promote a greater understanding of the wider benefits to society of the environment and will lead to better decisions being made for the OxCam Arc's Natural Capital, and future developments in general.

The LNCP Project itself concluded in April 2021 but the Defra Group are continuing to work with local and national stakeholders to ensure the outputs are promoted and integrated into future strategies, plans and frameworks, including the development of the **OxCam Arc Spatial Framework**.

The next priority is to ensure that a Natural Capital approach is taken across the OxCam Arc Programme to ensure the Environment is placed at the heart of the development of the OxCam Arc, and that an exemplar framework can be developed to support similar work in the future.

**Stakeholder involvement has been integral throughout the development of the LNCP. We are grateful to all of those organisations and individuals from the public, private and third sector who have taken the time to contribute to the success of this project.**

In particular we would like to thank our Project Chair Paul Leinster, and those members of our Governance Groups who have given up their time and expertise over the last two years to support this work as mentioned overpage.



**Anglian Water**

**Bedfordshire Local Nature Partnership**

**Buckinghamshire & Milton Keynes Natural Environment Partnership**

**Department for the Environment, Food & Rural Affairs**

**East West Rail**

**Environment Agency**

**Forestry Commission**

**Highways England**

**Homes England**

**Infrastructure Projects Authority**

**Ministry for Housing, Communities & Local Government**

**Natural Cambridgeshire**

**Natural England**

**Nature's Arc**

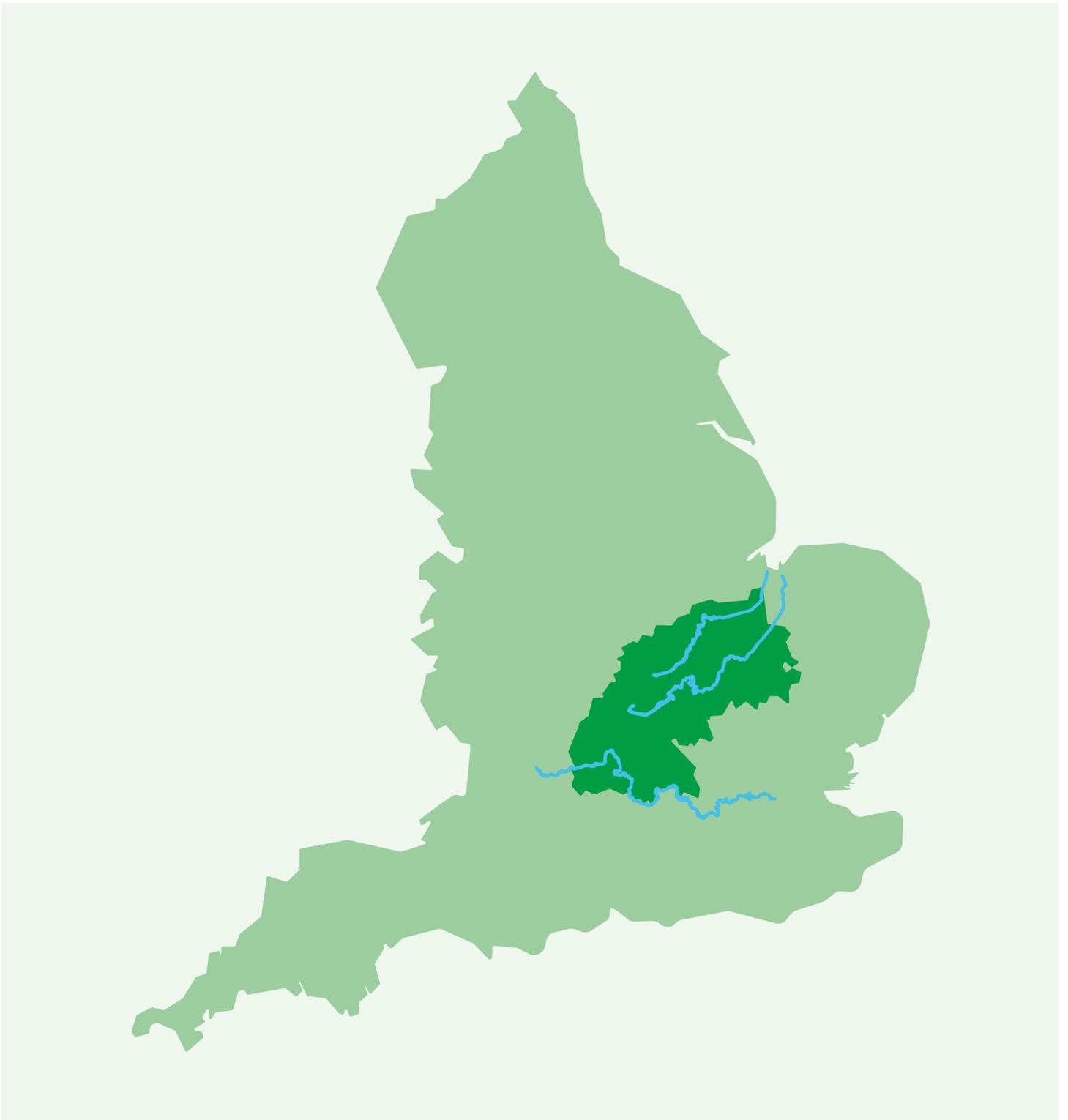
**Northamptonshire Local Nature Partnership**

**OxCam Arc Environment Working Group**

**Oxfordshire Environment Board**

**Oxfordshire LPA Environment Group**

**South East Midlands Local Enterprise Partnership**



**OxCam**  
Local Natural Capital Plan

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