



Swindon & Wiltshire
LOCAL ENTERPRISE PARTNERSHIP



UNIVERSITY OF
BATH

Natural Capital: Specifying the Value of Nature

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IIP subgroup, 3rd November

Overview

- 1. Difference between Natural Capital and standard asset valuation**
- 2. Framework for Natural Capital evaluation**
- 3. Contributions of project and outlook**

Differences to standard asset valuation?

What's the value of capital? For 'normal asset', e.g. firm, stocks..

$$V = 1/(1+r) * \text{profit}_1 + 1/(1+r)^2 * \text{profit}_2 + 1/(1+r)^3 * \text{profit}_3 + \dots + 1/(1+r)^T * \text{profit}_T$$

Story: Asset produces goods and services that yield a **profit stream** with profit_1 in period 1, profit_2 in period 2 ... until lifetime T. Profit stream is **discounted with discount rate r** (interest rate/time preference rate) to obtain **net-present value of capital**.

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Key differences with Natural Capital

- **Objective: Economy wide perspective** (societal well-being/social welfare) instead of narrow firm/profit focus
- **Many services produced by Nature not traded in markets**, e.g. pollution reduction, temperature cooling ... (market failure due to lack of property rights)
- **Everybody in vicinity of Nature benefits** (e.g. from pollution reduction), **without diminishing benefit for their neighbours** e.g. health benefit from pollution reduction (market failure due to non-rivalry and non-excludability)

Steps in Natural Capital Evaluation

Objective: Value to society (welfare W) = sum of well-being of citizens in SWLEP area

$$W = u1 + u2 + u3 + \dots + uN (+ I?)$$

(u1 refers to utility (well-being/welfare) of person 1, u2 of person 2 ... at a certain period in time.)

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By how much does a certain type of Natural Capital increase societal welfare W?

Step 1: What ecosystem services does type of natural capital asset produce (physical accounts)



Broad Habitat Type	
Urban	Mountains, Moors and Heathland
Enclosed farmland	Woodland
Freshwater	



Category	Captured in Natural Capital Accounting
Provision services	Agriculture biomass (i.e. food and crops), timber, water supply
Abiotic flows	Solar, wind and tidal power
Regulating services	Air filtration, water regulation, noise mitigation
Cultural services	Recreation activities, value added to house prices

Steps in Natural Capital Evaluation

Objective: Value to society (welfare W) = sum of well-being of citizens in SWLEP area

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By how much does a certain type of Natural Capital increase societal welfare W?

Step 1: What ecosystem services does type of natural capital asset produce (physical accounts)

Step 2: How much do these ecosystem services **increase utility of citizens** (societal welfare)

- ecosystem services can have direct benefit (health from pollution reduction, recreational value) or via increasing material wealth (e.g. furniture production using timber, higher productivity via temperature cooling ..)
- when can we use **market prices** to reflect utility increase from certain ecosystem services (e.g. timber)
- how can we measure **societal value when markets do not exist**
e.g. pollution reduction, temperature cooling
- **how many persons benefit** from ecosystem service
(depending on distance to location of natural capital asset, is ecosystem service non-rival/non-excludable, ownership)

Total Value of Natural Capital

Putting it all together:

Value of certain type of natural capital A (e.g. woodland) at location L (within SW area): **$V(AL)$**

$$V(AL) = 1/(1+r) * W_1(A,L) + 1/(1+r)^2 * W_2(A,L) + ... + 1/(1+r)^T * W_T(A,L)$$

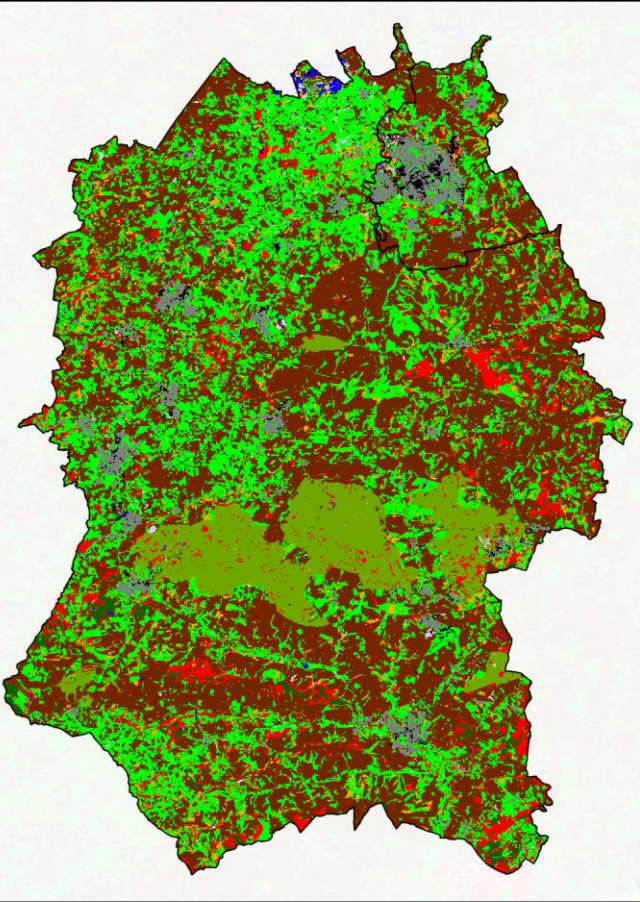
$W_1(A,L)$ refers to societal welfare from natural capital asset A in location L in period 1.

Final step:

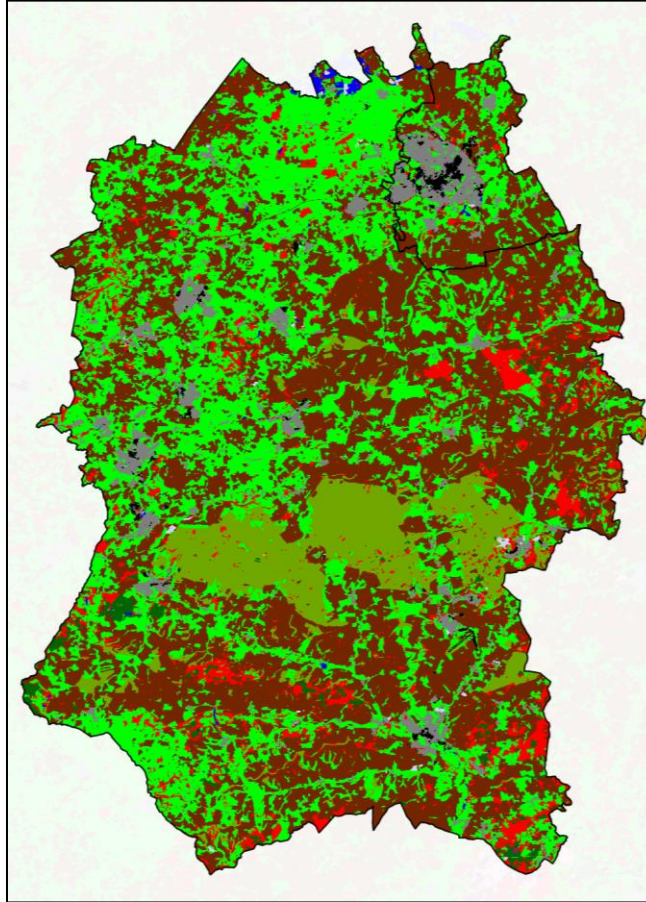
Total Natural Capital Value = Sum of values of the different types of Natural Capital across locations within SWLEP area.

Types of Natural Capital at different locations in SW

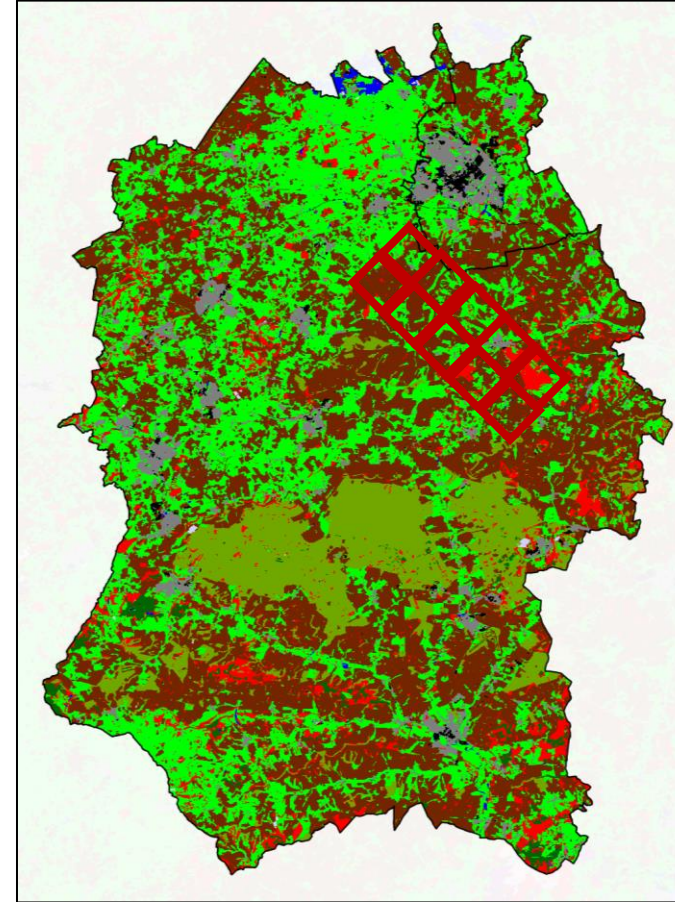
2007



2015



2019



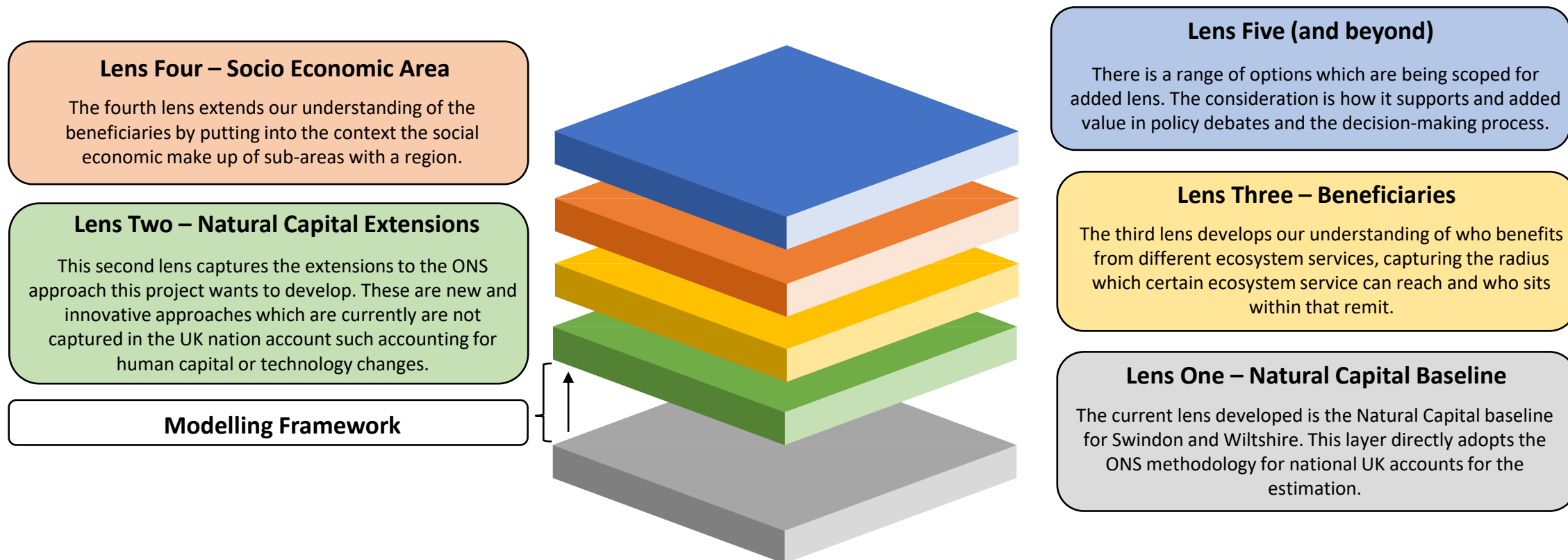
	Arable and Horticulture
	Broadleaved Woodland
	Calcareous Grassland
	Coniferous Woodland
	Rough Grassland
	Freshwater
	Heather
	Heather Grassland
	Improved Grassland
	Inland Rock
	Suburban
	Urban

Key contributions and outlook

- **Clear analytical framework, rooted at the frontier of current research** and contributing by **extending theory for local application**
- **Connecting to UK Natural Capital accounts and going beyond by**
 - extending scope of ecosystem services evaluated
 - providing a coherent tool for decision making at local level
- **Transparent tool for policy makers at the local level**
- Analytical framework can be used to further elaborate on
 - role of socio-economic differences in evaluation of Nature, (i.e. is the utility increase from ecosystem services the same for individuals in **different socio-economic layers**)
 - role of **technological progress** in green technology
 - role of the right **discount rate** r to evaluate Natural Capital
 - role of **uncertainty** about projections of future societal benefits of Natural Capital

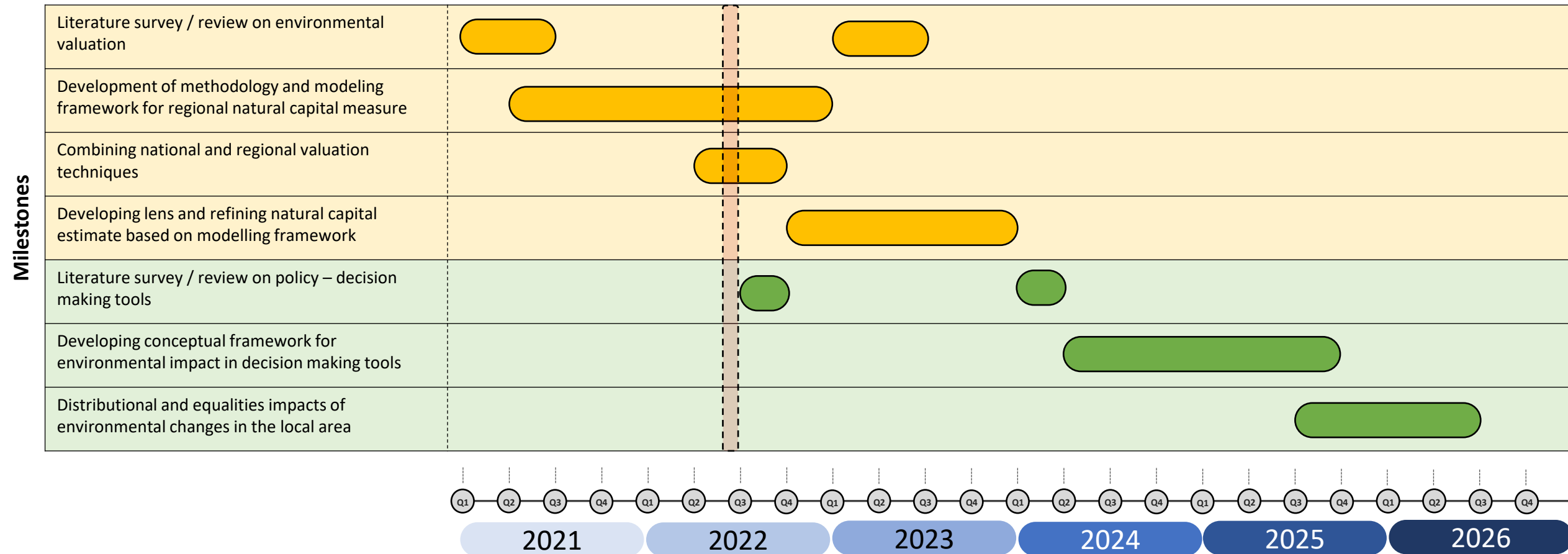
Next Steps

The modelling framework set the analytical foundation of the project to build on. The next steps will involve applying the model approach to the data and evidence we have. The outputs should be able to display the evidence related to natural capital in different lens to show different aspects and factors to support the policy decision making process. The below is an illustration of how the lens will show different pieces of information:



Update on PhD project milestones and timelines

Milestones and timelines relating to developing the Natural Capital baseline time series for SWLEP can be seen in **Yellow section**, the **Green section** relates to the conceptual Framework of how Natural Capital can inform local decision making.





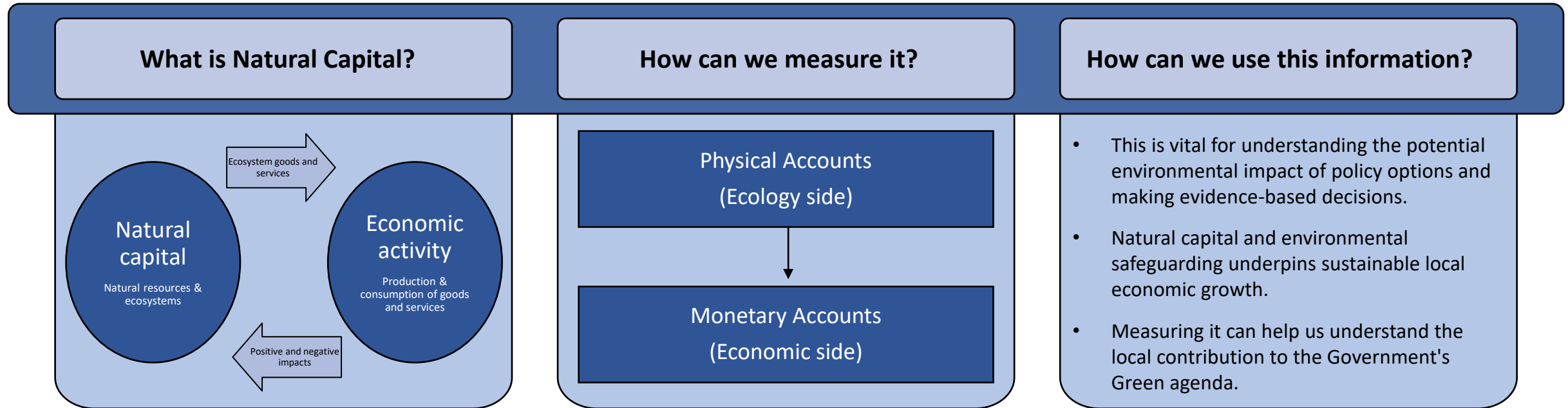
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Annex

Overview

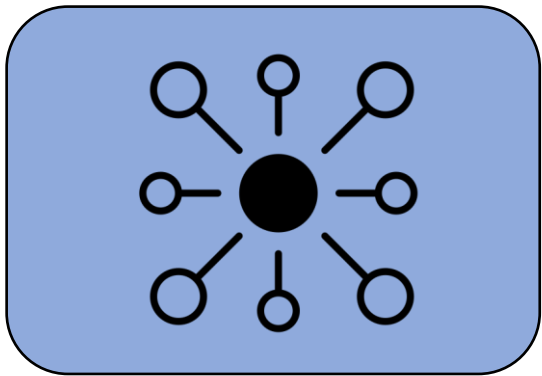


Update on the national picture and the PhD project

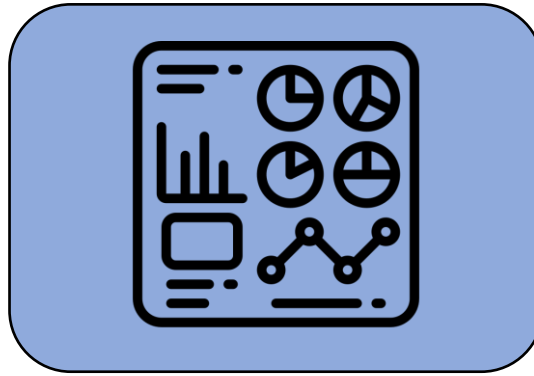
The UK Government has committed to leave the environment in a better state for future generations and reach net zero by 2050 while boosting the economy. But this transformation is pivotal on up-to-date evidence and information.

Key area of the PhD which focus on the Government's priorities on natural capital:

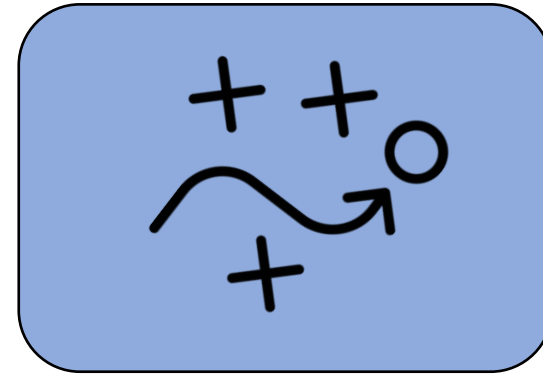
- I. Incorporating natural capital and ecosystem services into policy and management;
- II. Advancing interdisciplinary science of the value of natural capital and ecosystem services, the effects of governance and behaviour, and impacts of policy or management interventions;
- III. Understanding the provision and resilience of ecosystem services; and
- IV. Increasing awareness of the interdependence of nature and people.



Data Collection and
Exploration



Application and Usage



Embedding Nature in
Decision Making

Building the modelling framework (1/2)

The modelling framework is a pivotal part of developing and carrying out the analysis within the PhD. The framework provides clear steps to follow and leads to highly structured outputs. Having such a framework allow us to have:

Transparent decision making,
putting trust into the tool and
evidence used

Embedding environmental
evidence into the decision
making the process

Showing the broad's decision
making process to uphold
scrutiny

Building the modelling framework (2/2)

