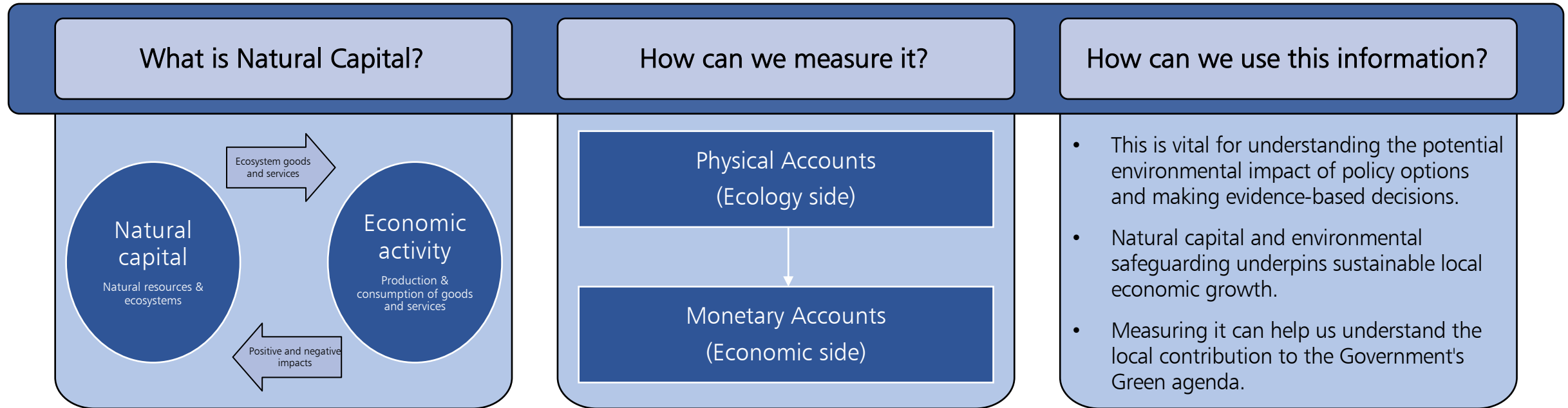# Natural Capital:
Specifying the Value of Nature

Parsa Mohammadpour

22nd July

Overview

What is Natural Capital?

Natural capital → Ecosystem goods and services → Economic activity

Natural capital
Natural resources & ecosystems

Economic activity
Production & consumption of goods and services

Positive and negative impacts

How can we measure it?

Physical Accounts (Ecology side)

↓

Monetary Accounts (Economic side)

How can we use this information?

- This is vital for understanding the potential environmental impact of policy options and making evidence-based decisions.

- Natural capital and environmental safeguarding underpins sustainable local economic growth.

- Measuring it can help us understand the local contribution to the Government's Green agenda.

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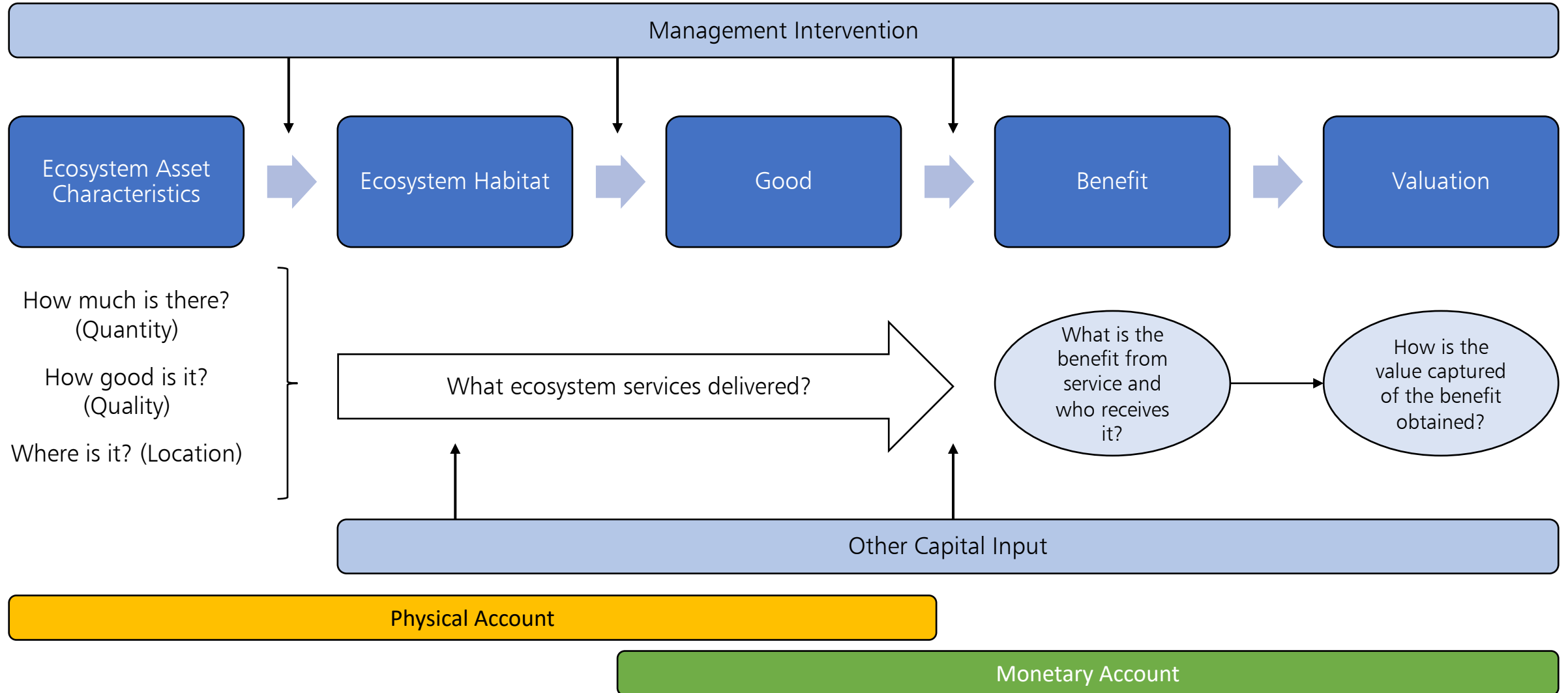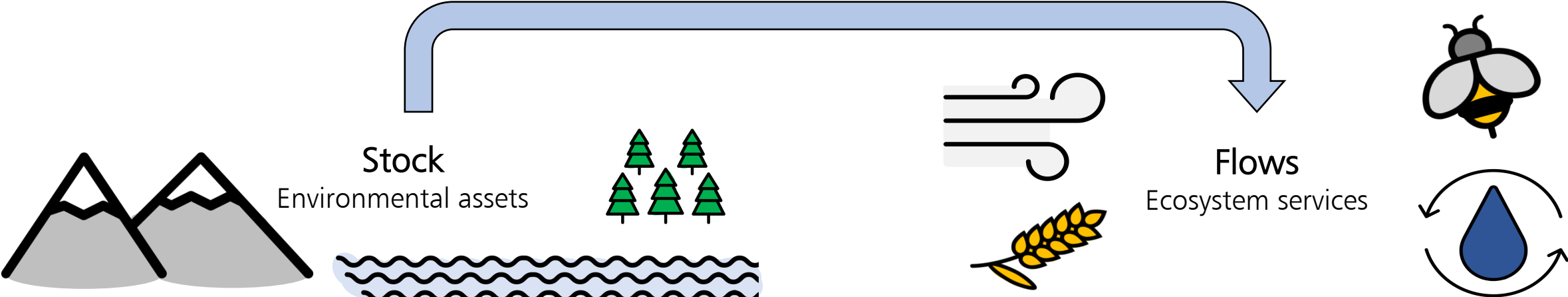
Recap from our previous meeting

Understanding the natural capital logic chain (1/2)

Understanding the natural capital logic chain (2/2)

Stock
Environmental assets

Broad habitat type	
Urban	Mountains, Moors and Heathland
Enclosed farmland	Woodland
Freshwater	

## Flows
Ecosystem services

Category	Examples
Provision services	Food, timber, water supply, crops
Abiotic flows	Minerals, oil & gas; solar, wind and tidal power
Regulating services	Air filtration, water regulation, noise mitigation
Cultural services	Settings for recreation, education, tourism
Aggregated or bundled services	Amenity, biodiversity, landscape, water quality, non-use values

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What ecosystem assets do we have in Swindon and Wiltshire?
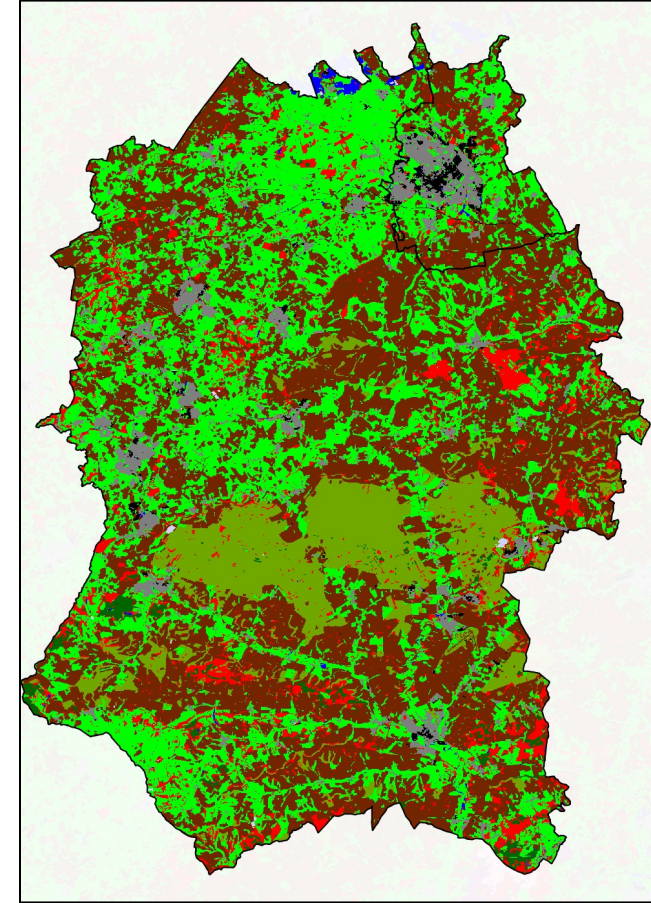
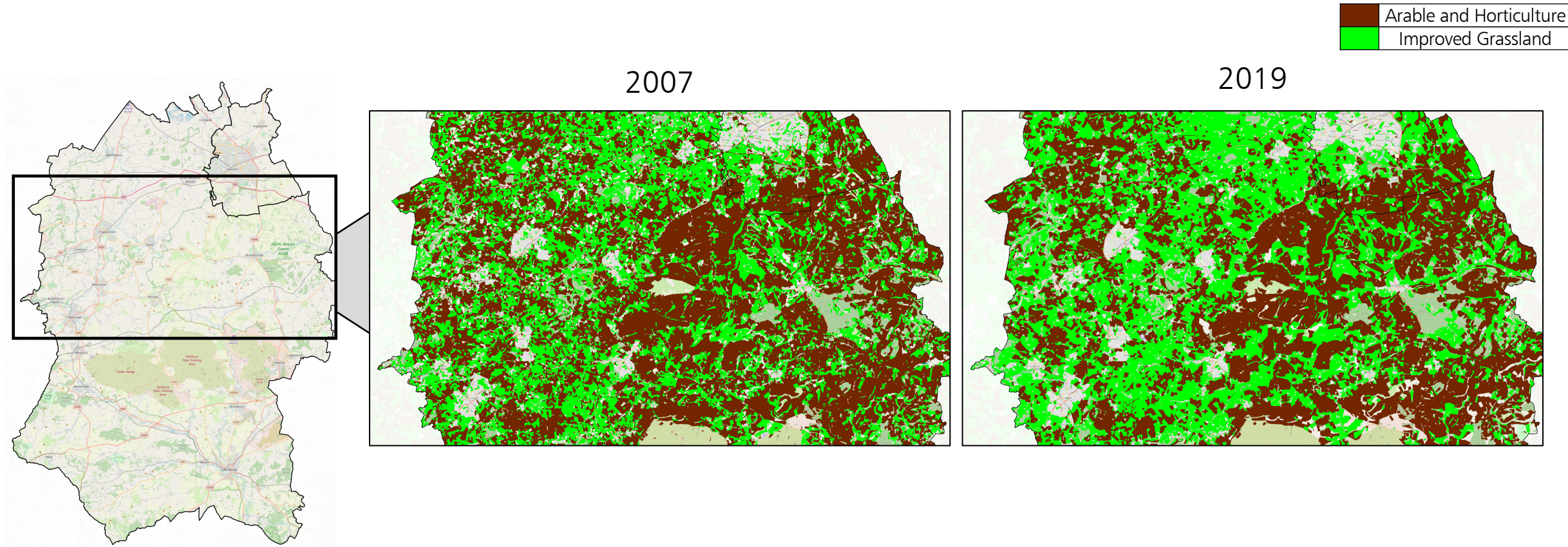2007   2015   2019
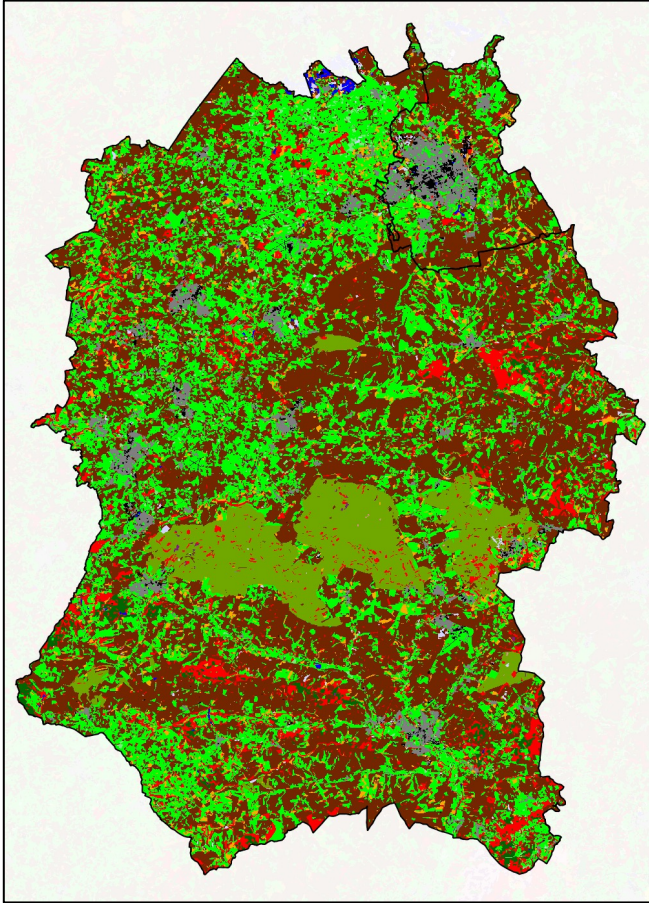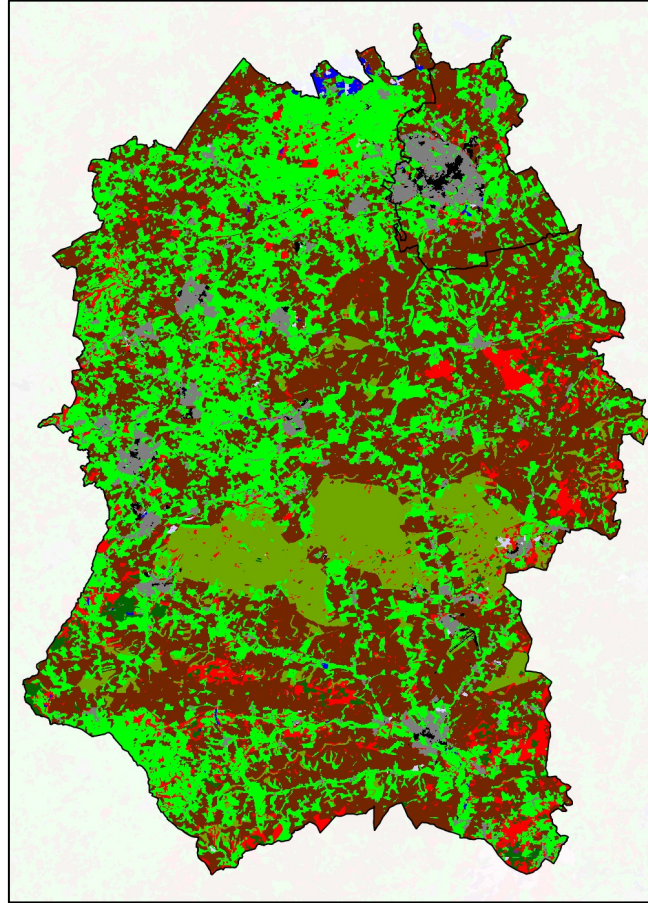
Legend:
- Arable and Horticulture
- Broadleaved Woodland
- Calcareous Grassland
- Coniferous Woodland
- Rough Grassland
- Freshwater
- Heather
- Heather Grassland
- Improved Grassland
- Inland Rock
- Suburban
- Urban

How haves these assets changed over time? (1/2)

Legend: Arable and Horticulture, Improved Grassland

2007

2019

How haves these assets changed over time? (2/2)

Change in Swindon and Wilshire land usage during 2007 – 2019 (KM ^{2})

Land Cover Map Classification	Wiltshire (3,485 KM ^{2})			Change 2007 - 2019
	2007	2015	2019	
Broadleaved Woodland	254	251	275	21
Coniferous Woodland	49	42	49	0
Arable and Horticulture	1582	1488	1408	-178
Improved Grassland	1028	1202	1157	129
Rough Grassland	115	0	0	-115
Neutral Grassland	28	0	0	-28
Calcareous Grassland	286	328	397	112
Acid Grassland	0	0	0	0
Fen, Marsh and Swamp	0	0	0	0
Heather	0	0	0	0
Heather Grassland	0	0	0	0
Inland Rock	10	7	3	-7
Freshwater	7	10	14	7
Urban	17	14	17	0
Suburban	108	146	160	52

Land Cover Map Classification	Swindon (40 KM ^{2})			Change 2007 - 2019
	2007	2015	2019	
Broadleaved Woodland	1.1	1.4	1.7	0.6
Coniferous Woodland	0.0	0.0	0.1	0.0
Arable and Horticulture	17.3	16.6	13.8	-3.5
Improved Grassland	11.2	12.5	14.7	3.5
Rough Grassland	1.6	0.0	0.0	-1.6
Neutral Grassland	0.5	0.0	0.0	-0.5
Calcareous Grassland	0.0	0.2	0.0	0.0
Acid Grassland	0.0	0.0	0.0	0.0
Fen, Marsh and Swamp	0.0	0.0	0.0	0.0
Heather	0.0	0.0	0.0	0.0
Heather Grassland	0.0	0.0	0.0	0.0
Inland Rock	0.2	0.0	0.0	-0.2
Freshwater	0.1	0.1	0.2	0.1
Urban	1.6	1.8	2.6	1.0
Suburban	6.3	7.4	7.0	0.7

What ecosystem services are being delivered from these assets?

Ecosystem services	Final effect on economic output or welfare	Relevance to the 8 Broad Habitats							
		Urban	Farmland	Mountain, moor and heath	Freshwater	Woodland	Coastal	Marine	Semi-natural grassland
Allotments	Food	✓	✓	✓			✓		✓
Crops for human food and animal feed									
Grass biomass									
Wild food and game									
Timber (standing)	Timber	✓	✓	✓		✓			
Water resources	Public water supply		✓	✓	✓				
Water resources	Industrial / agricultural use								
Fish capture inc	Food				✓		✓	✓	
Aquaculture									
Energy crops	Energy		✓						
Pollination	Food; recreation; non-use values		✓						
Peat extraction	Fuel; growing media		✓		✓				
Supporting navigation	Transport				✓		✓	✓	
Air pollution removal	Health	✓	✓			✓			✓
Carbon sequestration	Climate	✓	✓	✓		✓	✓	✓	✓
Water regulation (fluvial)	Reduced flood damage	✓	✓	✓	✓	✓	✓		✓
Enabling recreation	Outdoor recreation	✓	✓	✓	✓	✓	✓	✓	✓
Enabling physical activity	Physical health	✓	✓	✓	✓	✓	✓	✓	✓
Environmental settings for mental health	Mental health	✓	✓	✓	✓	✓	✓	✓	✓
Nature-based tourism	Tourism		✓	✓	✓	✓	✓	✓	

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Valuing an ecosystem service case study – Air quality improvements from woodlands

Physical Accounts

The physical accounts show the physical movement of our 'stocks' and 'flows'. In this case study the physical account is show by the:

- Quantity of pollutants removed from the air through our woodlands; and

This was done using the UK's Centre for Ecology & Hydrology atmospheric model (named the EMEP4UK model).

Monetary Accounts

The monetary account shows the £ value individuals in the region would be willing to pay for improved air quality. This reflects:
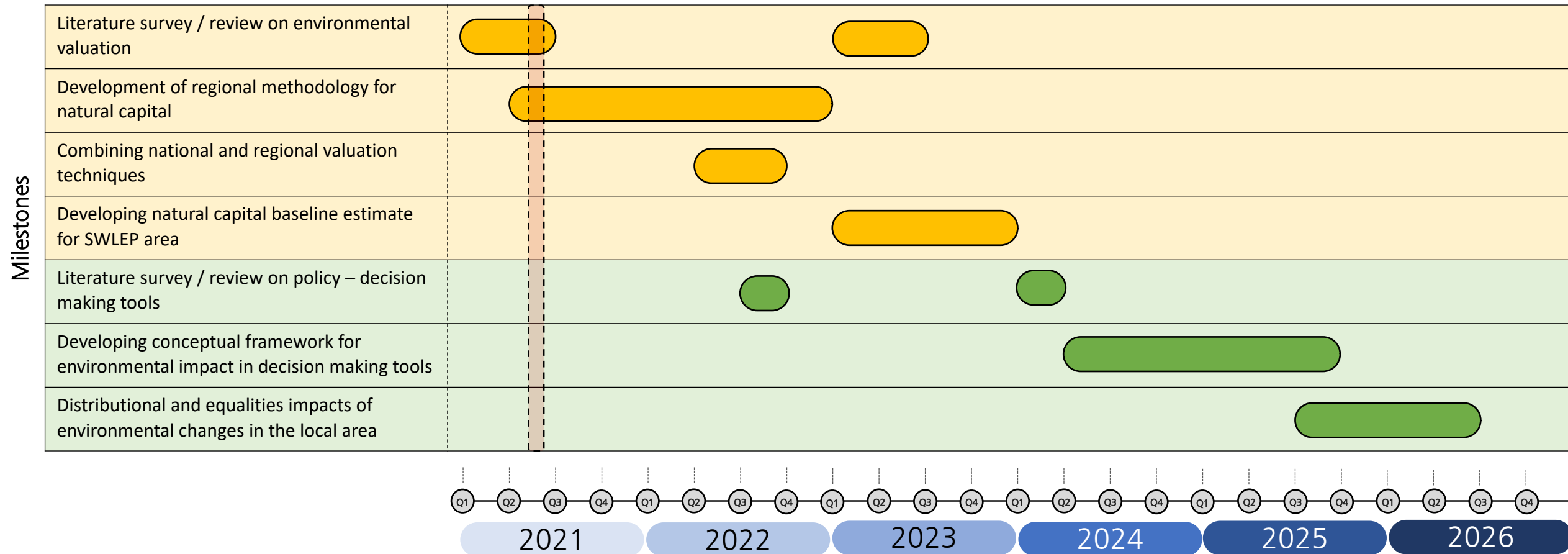
1. Total population impacted;

2. Current access to or proximity to the benefits received from the ecosystem service.

Valuing an ecosystem service case study – Air quality improvements from woodlands

Variable	Wiltshire	Swindon
Total area (Ha)	325,500	23,000
Area of woodlands (Ha)	28,300	640
Population	485,300	217,800
PM2.5 removed by woodland (kg/year)	208,800	4,550
PM2.5 removed rate per ha woodland (kg/ha year)	7.4	7.1
Asset value of PM2.5 removal (£m, 2019 prices)	207.6	57.4
Asset value of PM2.5 removal per ha (£/ha, 2019 prices)	£7,315	£89,875
Change in asset value from 10ha of woodland planted	£46,850	£574,590
Change in asset value from 10ha of woodland removed	-£73,150	-£898,740

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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.

Next steps

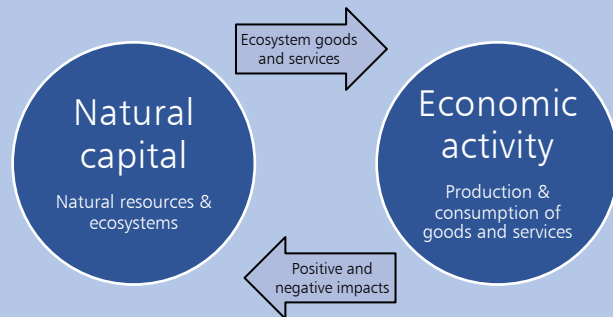Key areas of focus for the PhD in the coming months are:

Understand the quality of the environmental assets in the Swindon & Wiltshire area and consequent impact on potential ecosystem services they provide.

Understanding the beneficiaries of our natural capital based on their location to an asset or service being provided.

Starting to develop a baseline of natural capital in Swindon & Wiltshire based on the ONS national methodology.

Detailed Annex

Overview

What is Natural Capital?

- Natural capital is the term used to describe those elements of the natural environment that provide benefits for humans and society.
- The language of natural capital is based on accountancy. Natural capital assets (i.e. land, oceans or minerals) are referred to as 'stocks'. The services derived from these stocks are called 'flows' (i.e. crops, pollination, water filtration and recreation).

Ecosystem goods and services →

Natural capital
Natural resources & ecosystems

Economic activity
Production & consumption of goods and services

← Positive and negative impacts

How can we measure it?

- The UK's national accounts do not consider the depreciation of natural assets and many of the benefits of natural capital are not included in GDP.
- Economic valuation is one way in which to understand how much something is worth to people or society, typically by looking at the choices people make.
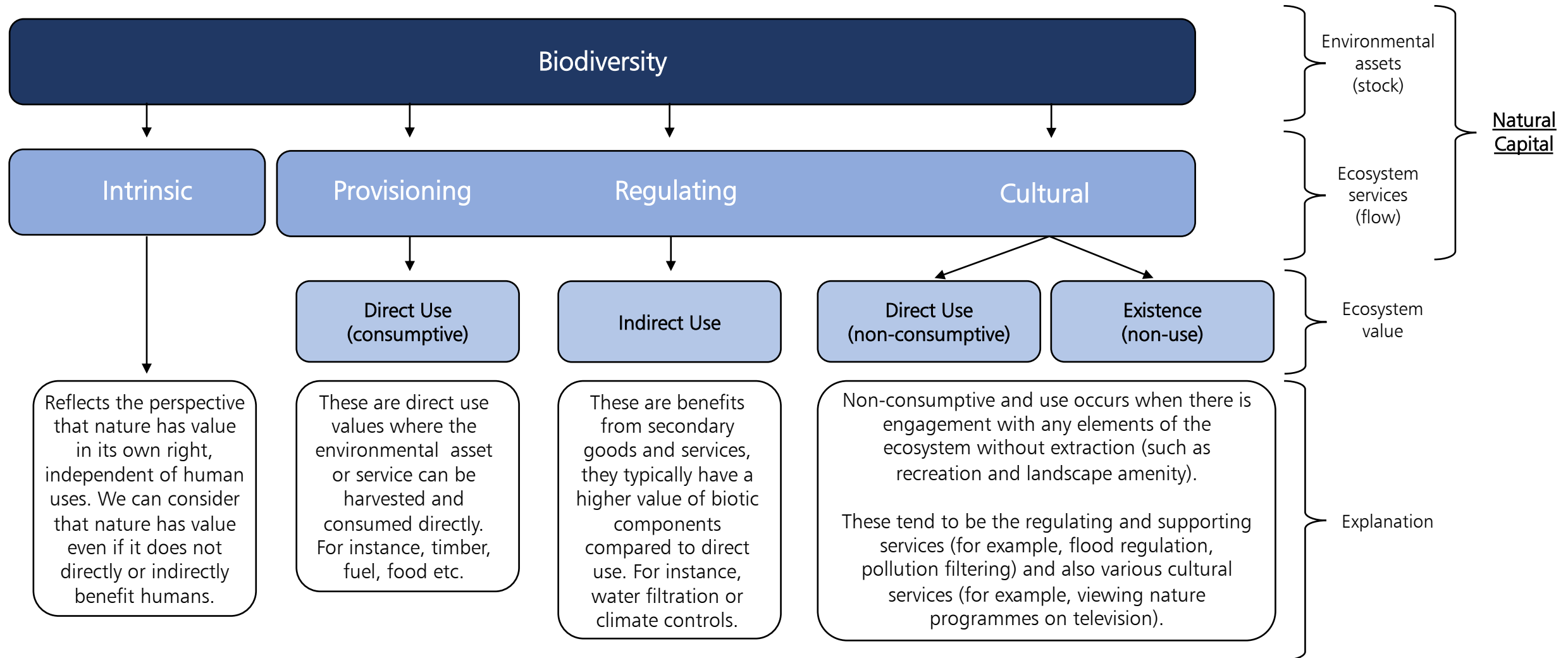- In cases where the services or effects are not typically traded in the market we would use a non-market values.

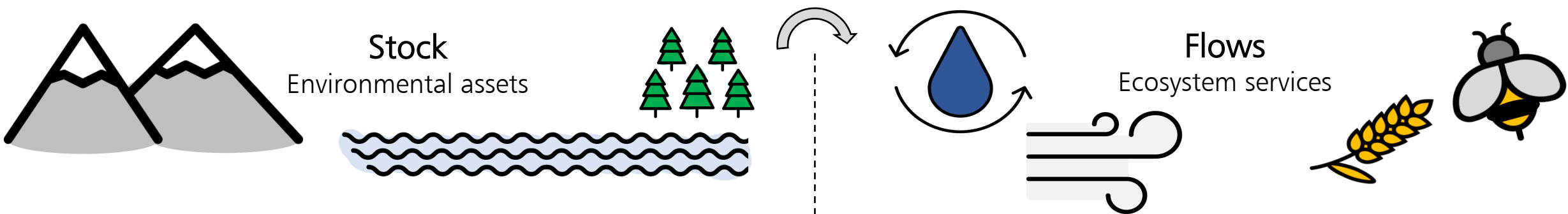**Monterey Accounts**

Physical Accounts

How can we use this information?

- Understanding natural capital captures the potential environmental impact of policy decisions, which are currently limited or nil. This is key to finding out:
  - Who might burden cost / reap the benefits
  - The trade-offs and implications of different policy options.
- Opportunities for protecting and enhancing local economic growth from natural capital may include:
  - Protecting infrastructure from climate risks,
  - Increasing competitive advantage of a local economy by creating healthy places people want to live and work in,
  - Providing opportunities for environmental net gain through the planning system.

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Recap from our previous meeting

Understanding the natural capital logic chain (2/2)

Stock
Environmental assets

Flows
Ecosystem services

Broad habitat type	Description
Urban	These areas are home to 8 out of 10 people, often living at extremely high population densities.
Enclosed farmland	The most extensive form of land use in the UK, comprising arable, horticultural land and improved grassland as well as associated boundary features such as hedgerows.
Mountains, Moors and Heathland	These are the source of around 70% of the UK's drinking water, support livestock farming, hold an estimated 40% of UK soil carbon, and include some of the country's most iconic landscapes.
Freshwater	Freshwaters include open waters, wetlands and floodplains. Freshwater habitats are a major source of water for a wide range of uses and are important for recreation
Woodland	Much of the woodland estate is managed as a source of timber, but woodlands are increasingly valued for their delivery of other ecosystem services, particularly recreation and carbon storage.

Category	Description	Examples
Provision services	Tangible outputs that can be obtained from ecosystems that meet human needs	Food, timber, water supply, crops
Abiotic flows	Flows which are not dependent upon functioning ecosystems	Minerals, oil & gas; solar, wind and tidal power
Regulating services	Ecological processes that regulate and reduce pollution and other adverse effects	Air filtration, water regulation, noise mitigation
Cultural services	Environmental settings that enable cultural interaction and activity	Settings for recreation, education, tourism
Aggregated or bundled services	There can be overlap with these categories above.	Amenity, biodiversity, landscape, water quality, non-use values