

Natural Capital Assessment in Northern Ireland: Urban Study

Dr Jim Rouquette

Dr Debbie Coldwell and Dr Alison Holt



What is natural capital?

- Natural Capital is defined as “*..elements of nature that directly or indirectly produce value or benefits to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions*” (Natural Capital Committee 2014).

Our stock of natural assets



- The stock of natural assets (e.g. soils, water, biodiversity) produces a wide range of ecosystem services that provide benefits to people
- These benefits include food production, regulation of flooding and climate, pollination of crops, and cultural benefits such as aesthetic value and recreational opportunities

Provisioning

Products obtained from ecosystems
e.g. food, timber, water



Regulating

Benefits obtained from environmental processes that regulate the environment
e.g. air quality, climate regulation, pollination



Cultural

Non-material benefits people obtain from ecosystems
e.g. recreation, aesthetic experiences, health and wellbeing



Supporting (intermediate services)

Internal processes within ecosystems essential for the production of all other ecosystem services, e.g. soil formation, photosynthesis, nutrient cycling.



The Natural Capital Agenda

- The concept is increasingly being recognised in the UK and globally, in both the public and private sectors
- A natural capital approach is central to the Government's 'A green future: Our 25-year plan to improve the environment' (2018)
- A key component of post-Brexit agricultural policy
- Concept embedded in NI biodiversity and planning policies:
 - Valuing Nature - Northern Ireland Biodiversity Strategy to 2020
 - Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development
- **But how can the natural capital approach be applied in practice?**

Natural capital accounting

“Natural capital accounts are a series of interconnected accounts that provide a structured set of information relating to the stocks of natural capital and flows of services supplied by them”. ONS 2017

Natural capital accounts can be used to:

- Compare the benefits derived from existing natural capital assets with the costs required to maintain them.
- Examine change over time from a baseline year.
- Determine the potential impact of a proposal or new investment.

Natural capital accounts have been prepared for two sites in the Belfast area – Bog Meadows and Minnowburn

Natural capital accounting – Step 1

Asset
Register

Assess natural capital assets



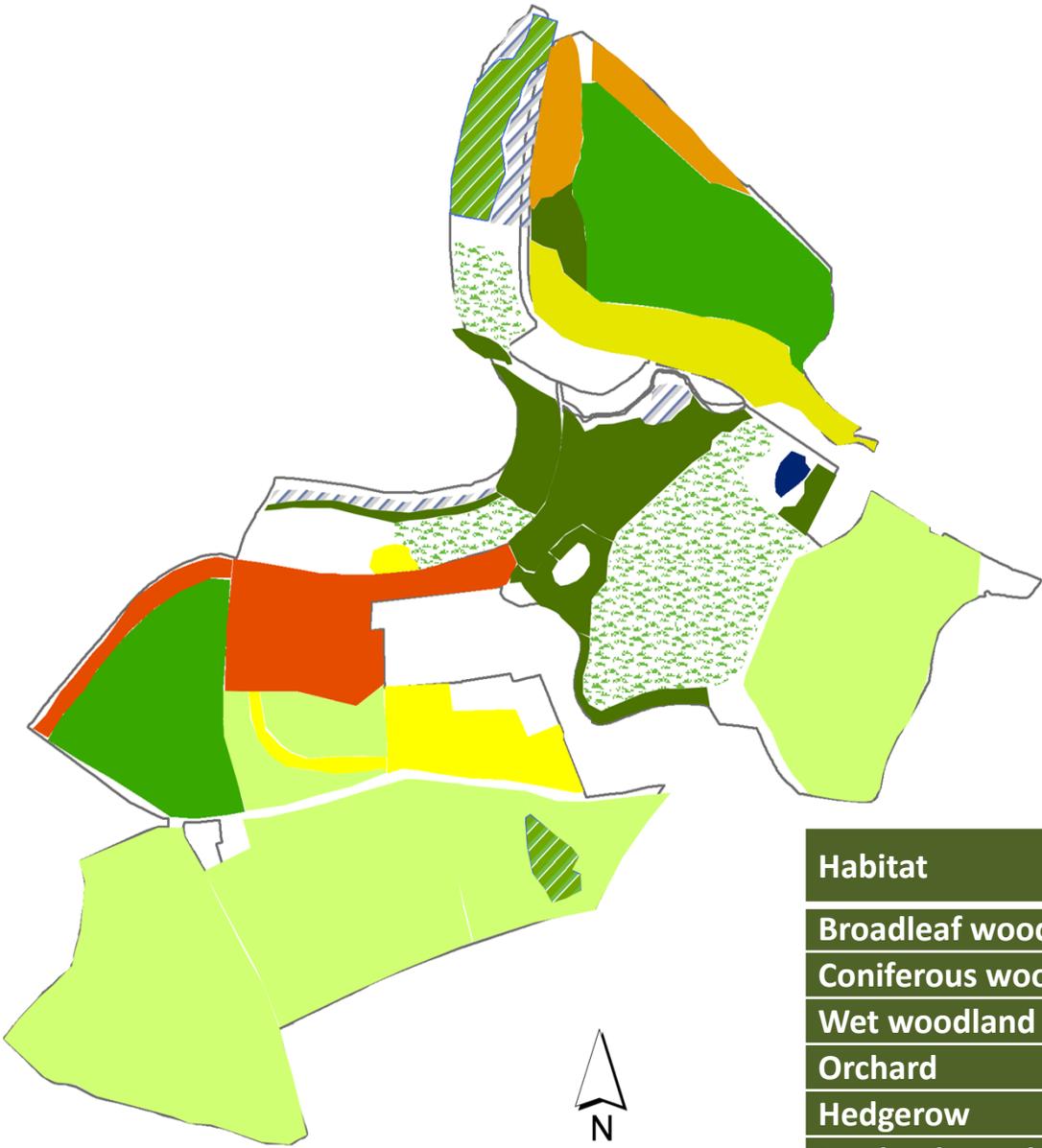
Bog Meadows



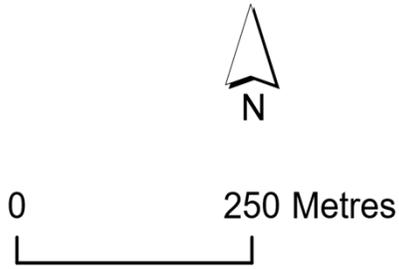
- Amenity grassland
- Bare ground
- Building
- Dense scrub
- Hedge
- Marshy grassland
- Neutral unimproved grassland
- Open/standing water
- Path
- Semi-natural woodland
- Swamp

Habitat	Condition	Area (ha)	% Area
Broadleaf woodland	moderate	2.4	13.9
Dense scrub	moderate	0.2	1.2
Hedgerow	moderate	0.7	4.1
Neutral unimproved grassland	moderate	6.6	38.2
Amenity grassland	good	0.1	0.8
Marshy grassland	moderate	0.6	3.6
Swamp	moderate	5.5	31.9
Open/standing water	moderate	1.1	6.4

Minnowburn



- Beech, pine & larch
- Broadleaf woodland
- Improved grassland
- Lowland meadows
- Marshy grassland
- Minnowburn beeches
- Mixed woodland
- Pond
- Semi-improved grassland
- Wet woodland
- Broadleaved woodland (in WGS)

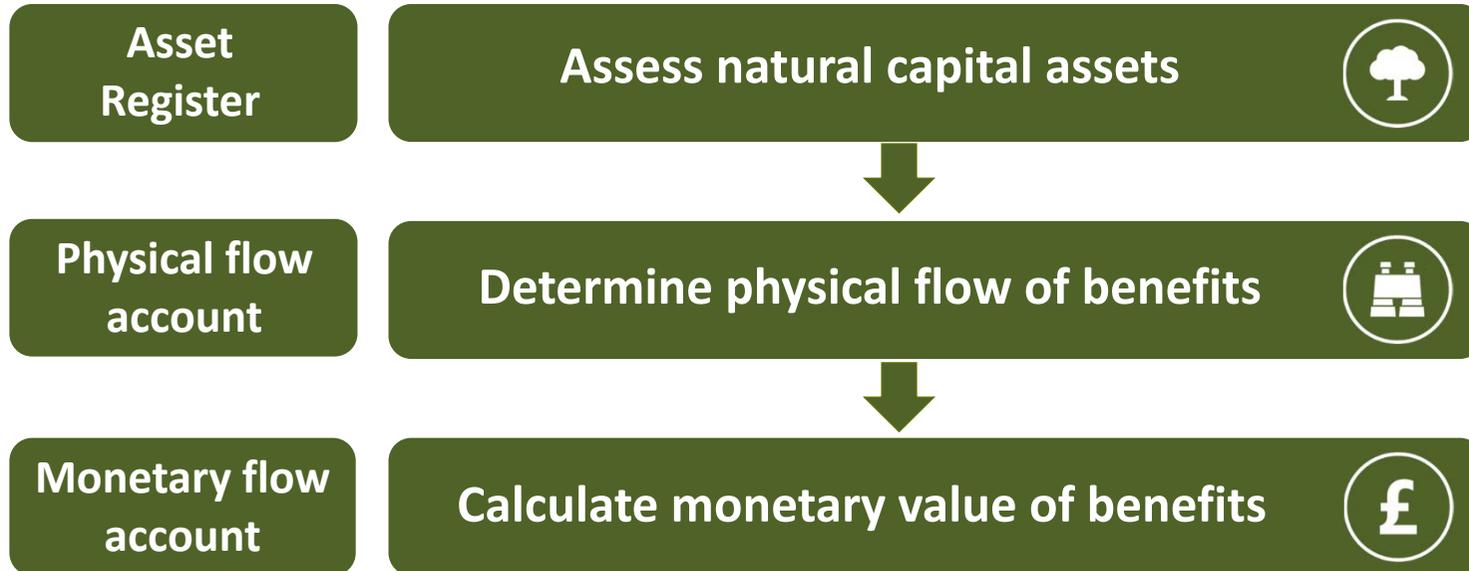


Habitat	Condition	Area (ha)	% Area
Broadleaf woodland	good	18.9	37.1
Coniferous woodland	-	1.0	2.0
Wet woodland	moderate	1.0	1.9
Orchard	-	0.1	0.1
Hedgerow	moderate	0.4	0.8
Lowland meadow	good	6.3	12.3
Semi-improved grassland	moderate	2.0	3.8
Improved grassland	poor	19.8	38.9
Marshy grassland	good	1.3	2.6
Open/standing water	good	0.2	0.3

Natural capital accounting – Step 2



Natural capital accounting – Step 3



Qualitative assessment – Bog Meadows

Estimated ecosystem service provision scores: 0 - no delivery; 0.5 - some delivery but not significant, 1 - delivery, 2 -significant delivery, 3 - very significant delivery.

Ecosystem service category	Ecosystem service	Estimated provision	
Provisioning	Food: crop and livestock production	1	
	Fibre and fuel	0.5	
	Water	0.5	
Regulating	Carbon sequestration and storage	1	
	Local climate regulation	2	
	Air quality regulation	1	
	Water quality regulation and erosion control	2	
	Water flow regulation	3	
	Pollination	2	
	Pest and disease control	2	
	Noise attenuation	2	
	Soil quality regulation	2	
	Habitat and population maintenance (biodiversity)	3	
	Cultural	Aesthetic experiences	2
		Education, training and scientific investigation	3
Recreation and tourism		2	
Health and well-being		2	
Characteristics and features of biodiversity that are valued (existence, option, bequest)		2	
	Spiritual and cultural experiences	2	

Qualitative assessment - Minnowburn

Estimated ecosystem service provision scores: 0 - no delivery; 0.5 - some delivery but not significant, 1 - delivery, 2 - significant delivery, 3 - very significant delivery.

Ecosystem service category	Ecosystem service	Estimated provision	
Provisioning	Food: crop and livestock production	2	
	Fibre and fuel	2	
	Water	0.5	
Regulating	Carbon sequestration and storage	2	
	Local climate regulation	2	
	Air quality regulation	2	
	Water quality regulation and erosion control	2	
	Water flow regulation	2	
	Pollination	2	
	Pest and disease control	2	
	Noise attenuation	2	
	Soil quality regulation	2	
	Habitat and population maintenance (biodiversity)	2	
	Cultural	Aesthetic experiences	3
		Education, training and scientific investigation	2
Recreation and tourism		3	
Health and well-being		3	
Characteristics and features of biodiversity that are valued (existence, option, bequest)		2	
	Spiritual and cultural experiences	3	

Quantitative assessment and monetary valuation

Ecosystem service	Physical flow	Valuation
Air quality regulation	Tonnes of PM ₁₀ and SO ₂ absorbed	Costs avoided £/tonne of PM ₁₀ and SO ₂ /year
Carbon sequestration	Quantity of CO ₂ sequestered	£/tonne of CO ₂
Greenhouse gas emissions from agriculture	GHG/ha	£ /ha/year
Recreation	Number of visits	Average spend/visit/year
Health and wellbeing	Active visits	£/QUALY/year
Agricultural production	Yield/ha	£ /ha/year
Timber/woodfuel production	m ³ /ha	£/m ³ /year

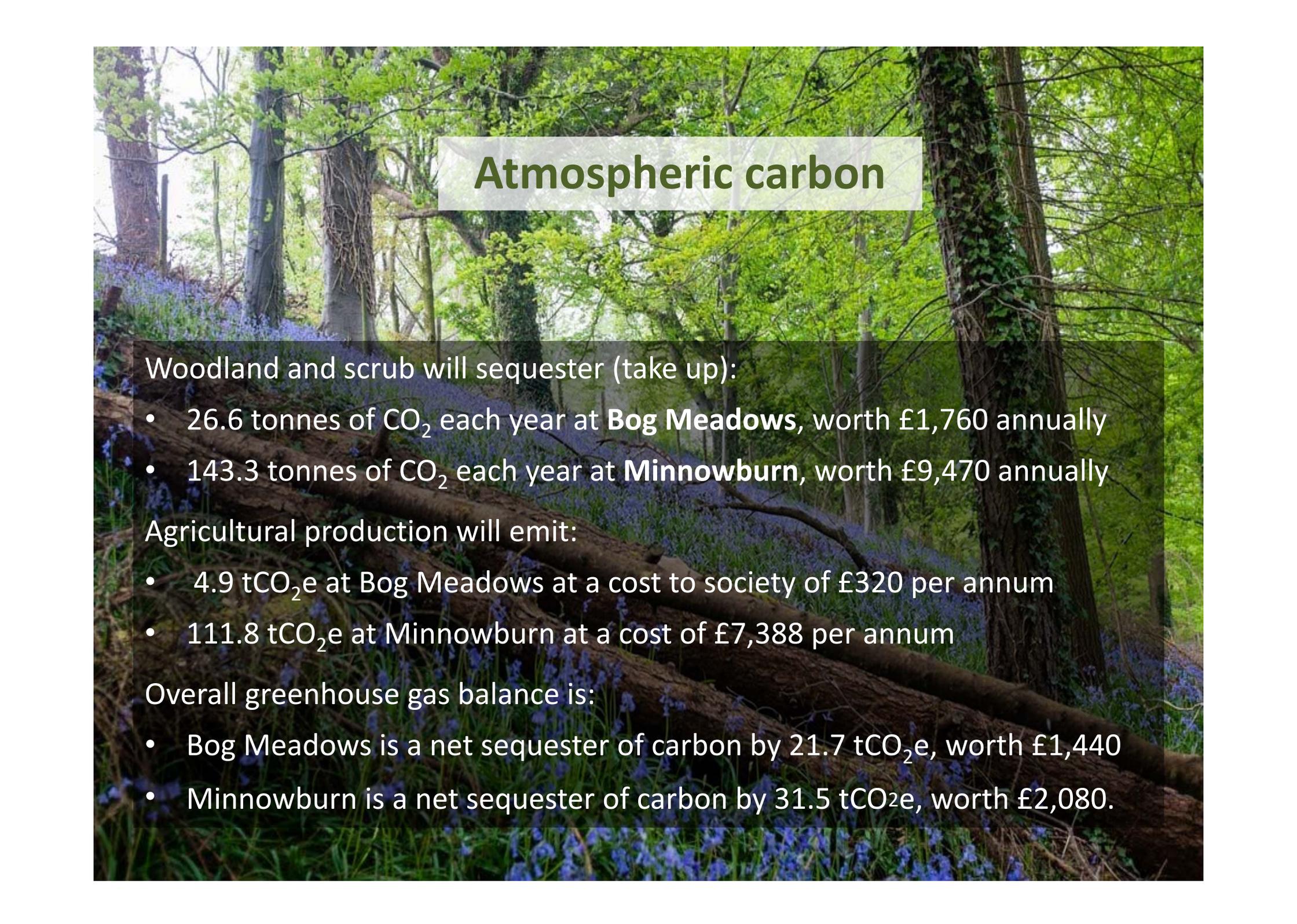


Air quality regulation

Vegetation will absorb:

- 120 kg of PM_{10} at Bog Meadows and 740 kg at Minnowburn
- 2 kg of SO_2 at Bog Meadows and 9 kg of SO_2 at Minnowburn,

With an annual value of **£10,200** (Bog Meadows) and **£32,400** (Minnowburn).



Atmospheric carbon

Woodland and scrub will sequester (take up):

- 26.6 tonnes of CO₂ each year at **Bog Meadows**, worth £1,760 annually
- 143.3 tonnes of CO₂ each year at **Minnowburn**, worth £9,470 annually

Agricultural production will emit:

- 4.9 tCO₂e at Bog Meadows at a cost to society of £320 per annum
- 111.8 tCO₂e at Minnowburn at a cost of £7,388 per annum

Overall greenhouse gas balance is:

- Bog Meadows is a net sequester of carbon by 21.7 tCO₂e, worth £1,440
- Minnowburn is a net sequester of carbon by 31.5 tCO₂e, worth £2,080.



Timber / woodfuel production

- At Bog Meadows 18.7 m³ of woodfuel could be produced each year, worth £295
- At Minnowburn an average of 136 m³ of timber or woodfuel could be produced, worth £2,180 per annum.



Agricultural production

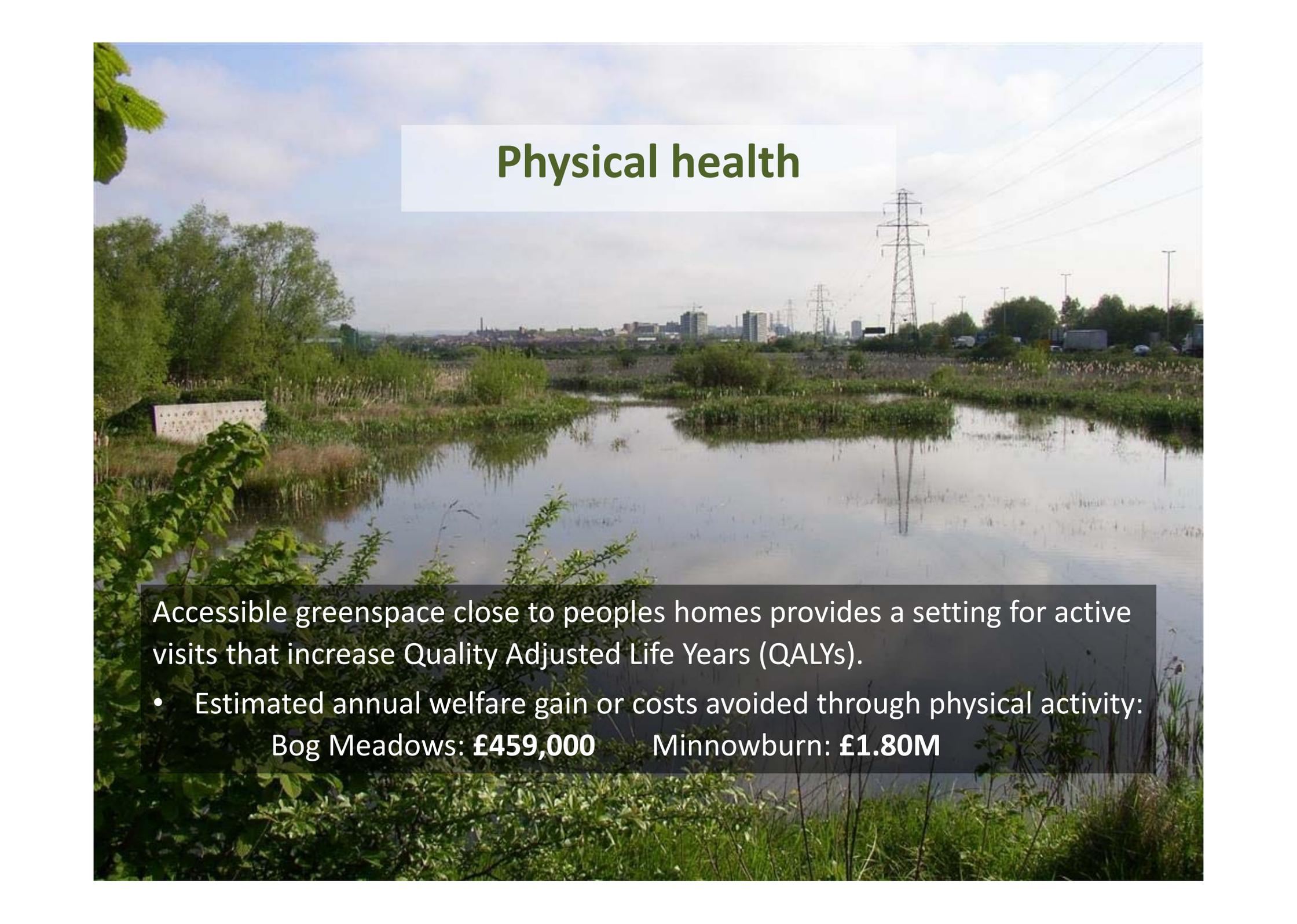
- 3.4 ha of Bog Meadows and 25.9 ha of Minnowburn is cattle grazed
- If all costs and subsidies are removed, these are providing an annual loss of £714 at Bog Meadows and £7,200 at Minnowburn



Recreational visits

The sites are an important recreational resource:

- 60,000 recreational visits to Bog Meadows and 145,000 to Minnowburn each year.
- Providing annual benefits worth **£372,000** and **£897,000** respectively.

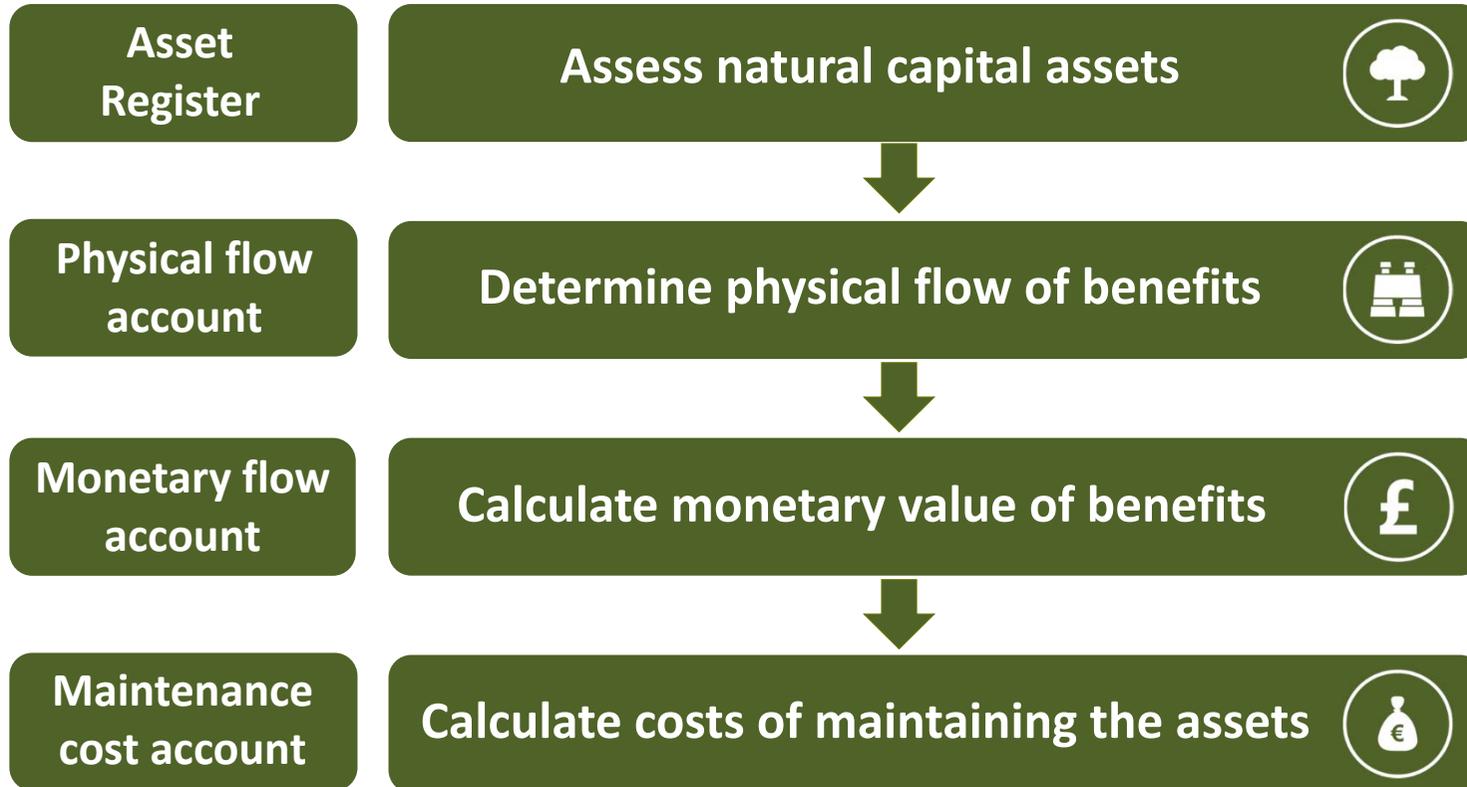


Physical health

Accessible greenspace close to people's homes provides a setting for active visits that increase Quality Adjusted Life Years (QALYs).

- Estimated annual welfare gain or costs avoided through physical activity:
Bog Meadows: **£459,000** Minnowburn: **£1.80M**

Natural capital accounting – Step 4



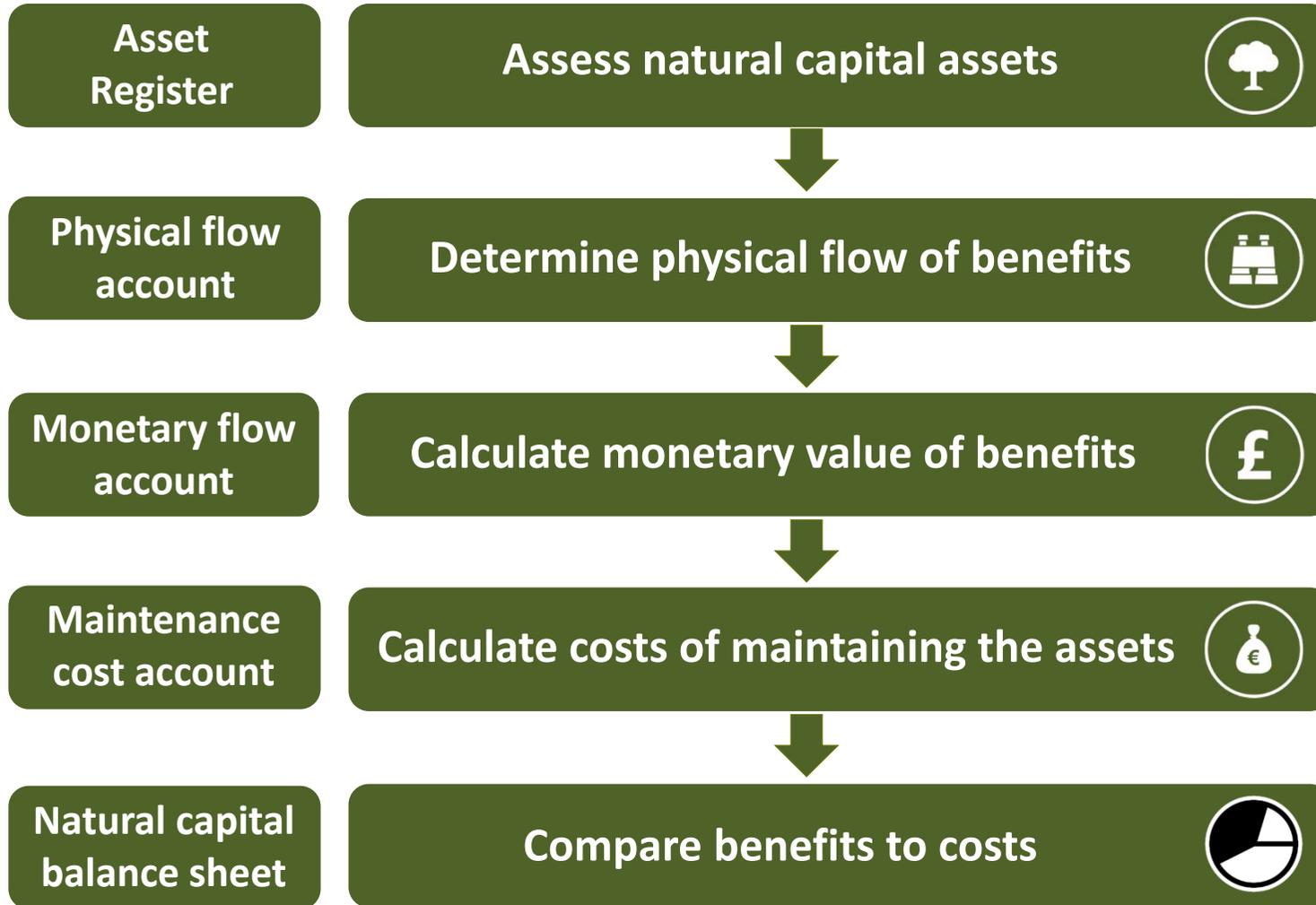
Maintenance cost account

The total cost associated with maintaining Bog Meadows is estimated to be approximately £19,400 per annum.

The total annual maintenance costs for Minnowburn are estimated to be £40,900 per annum.



Natural capital accounting – Step 5



Natural capital balance sheet – Bog Meadows

	Private value (PV £M)	External value (PV £M)	Total value (PV £M)
Assets			
Baseline value		26.80	26.80
Cumulative gains/ (losses)	-	-	
Additions/ (disposals or consumption)	-	-	
Revaluations and adjustments	-	-	
Gross asset value	-	26.80	26.80
Liabilities			
Legal provisions	-	-	
Other maintenance provisions	(0.49)	Nil	(0.49)
Total net maintenance provisions	(0.49)		(0.49)
Total net natural capital assets		26.80	26.31

Natural capital balance sheet – Minnowburn

	Private value (PV £M)	External value (PV £M)	Total value (PV £M)
Assets			
Baseline value		90.2	90.2
Cumulative gains/ (losses)	-	-	
Additions/ (disposals or consumption)	-	-	
Revaluations and adjustments	-	-	
Gross asset value	-	90.2	90.2
Liabilities			
Legal provisions	-	-	
Other maintenance provisions	(1.1)	nil	(1.1)
Total net maintenance provisions	(1.1)		(1.1)
Total net natural capital assets		90.2	89.1



Key points

- Bog Meadows and Minnowburn are both providing significant goods and services to society.
- Recreation and physical health provide the greatest benefits.
- Total benefits are 50-80 times higher than the costs of maintaining the sites.
- The benefits are all in the form of external values (public goods) rather than private values. Income for these sites does not cover costs.
- Natural capital accounting is useful at highlighting the value of the natural environment, which may otherwise remain hidden.



Recommendations

- A new policy framework should be developed to encourage the wider use of natural capital approaches. Natural capital approaches should be integrated into Strategic Planning, Local Development Plans and Environmental Impact Assessments (EIAs) as an integral component of decision making.
- Natural capital accounts should be developed for a broader range of sites in NI.
- Mapping of ecosystem services (especially in relation to demand) and habitat opportunities would greatly enhance the evidence base.
- This could lead to the development of natural capital investment strategies and plans for important locations, which would establish a compelling business case for natural capital investment.