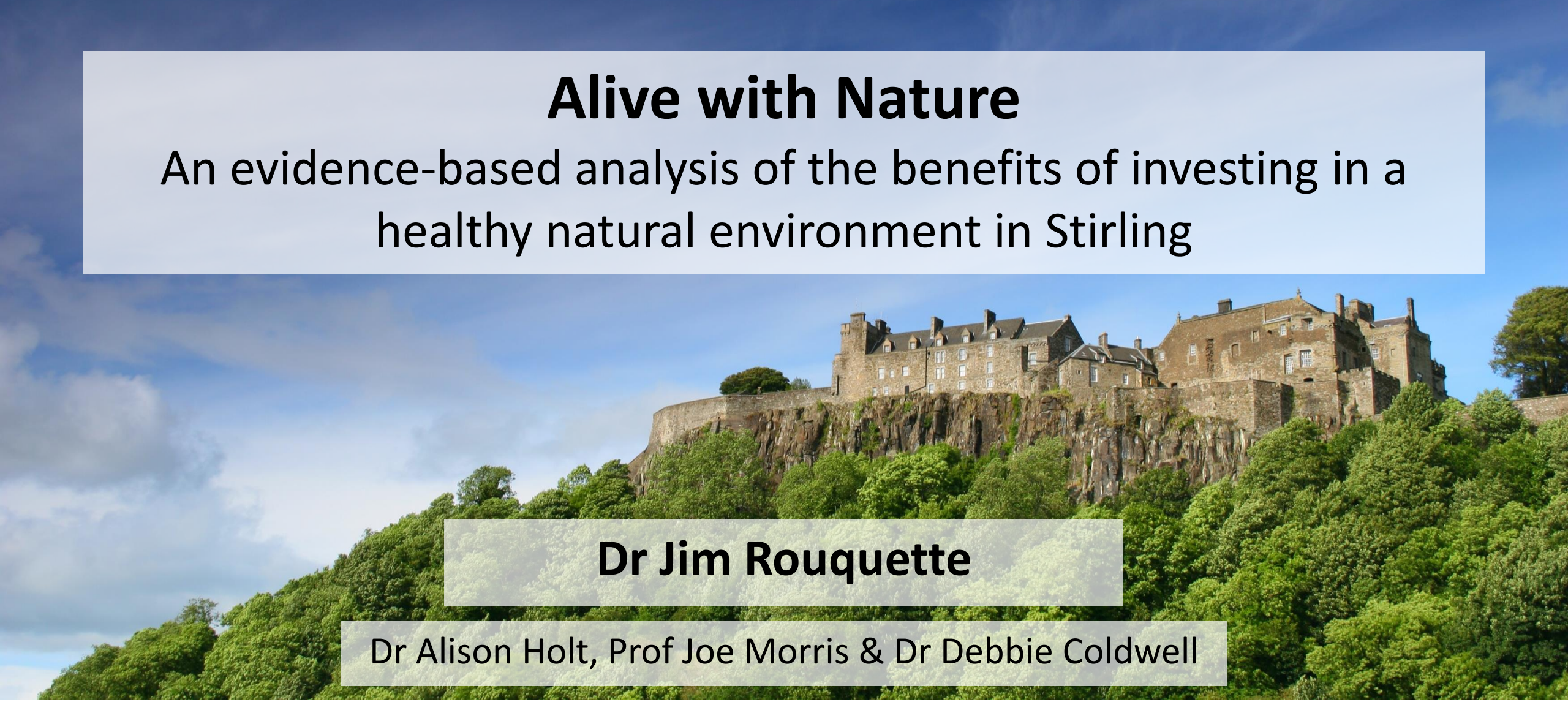
Alive with Nature

An evidence-based analysis of the benefits of investing in a healthy natural environment in Stirling



Dr Jim Rouquette

Dr Alison Holt, Prof Joe Morris & Dr Debbie Coldwell

World Forum on Natural Capital
EDINBURGH · 2017

Natural Capital Solutions

27th November 2017

Natural Capital Solutions

Stirling City Deal case study

- The City of Stirling is planning a major investment in the natural and built environment as part of a City Deal.
- What will be the impact of the new investments on natural capital and the benefits that it provides?
- Will this derive a positive or negative Return on Investment?
- What lessons can be learnt to support better decision making and to put natural capital at the heart of the economy?

A spatial assessment framework

Asset Register

Map natural capital assets before & after investment

Physical flow account

Map physical flow of benefits before & after development

Monetary flow account

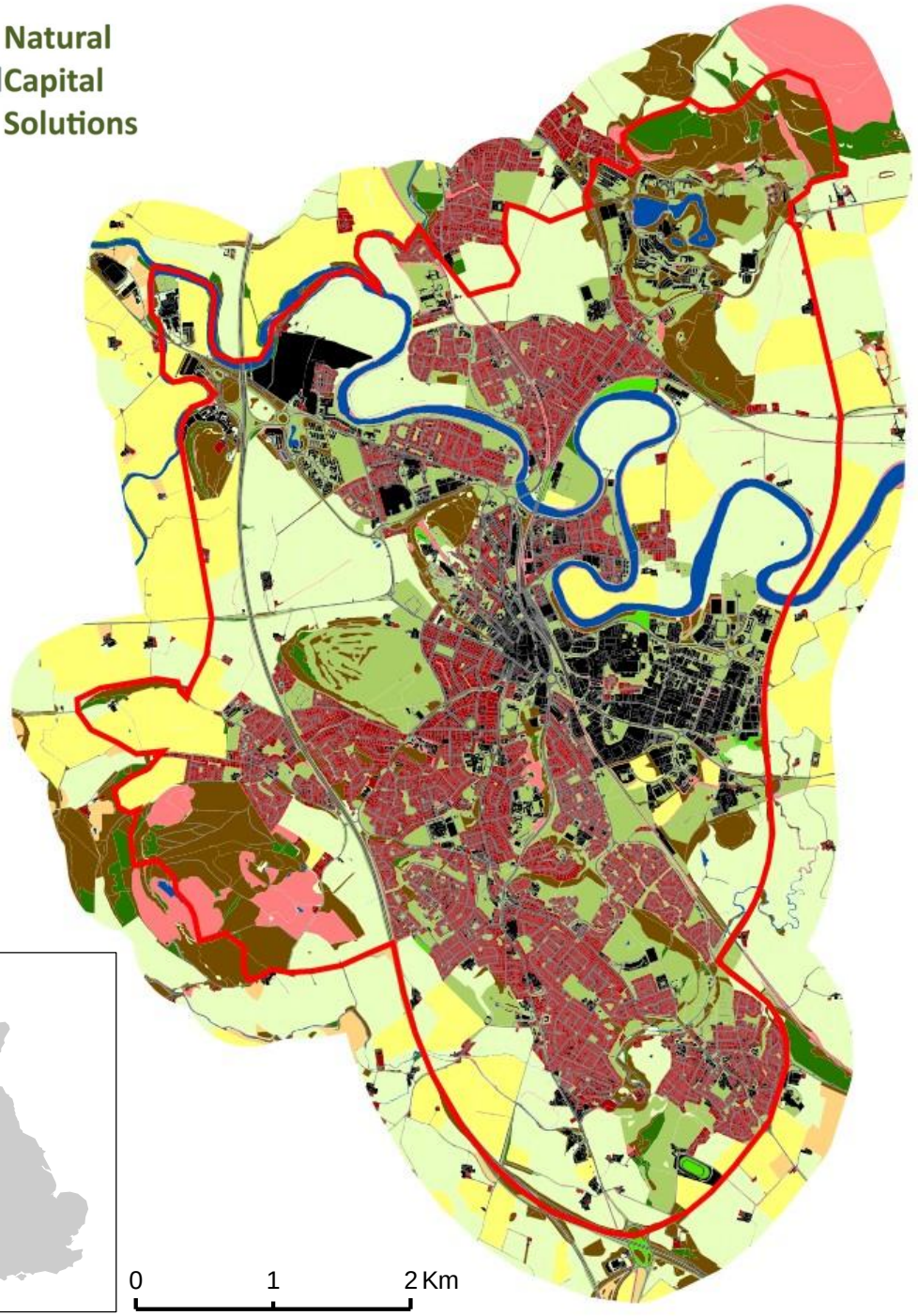
Map value of benefits before & after development

Economic appraisal

Examine costs and benefits over project lifetime to determine GVA and Return on Investment

Natural Capital Solutions

Natural capital assets - baseline



Legend

- Stirling City boundary

Broad habitat

- Cultivated land
- Uncertain agriculture
- Improved grassland
- Amenity grassland / road verges
- Semi-natural grassland
- Unknown grassland
- Woodland and scrub
- Water
- Built up areas
- Infrastructure
- Gardens
- Other habitats

Broad habitat	% cover
Cultivated land	7.1
Improved grassland	22.1
Amenity grassland / road verges	15.3
Semi-natural grassland	1.3
Unknown grassland	0.4
Scrub	1.1
Trees / Parkland	2.0
Broadleaved woodland	4.8
Coniferous woodland	2.7
Mixed woodland	1.3
Water	3.2
Built up areas	13.0
Infrastructure	10.0
Gardens	12.7
Other habitats	2.9

Natural Capital Solutions

Natural capital assets - baseline

Legend

- Stirling City boundary

Broad habitat

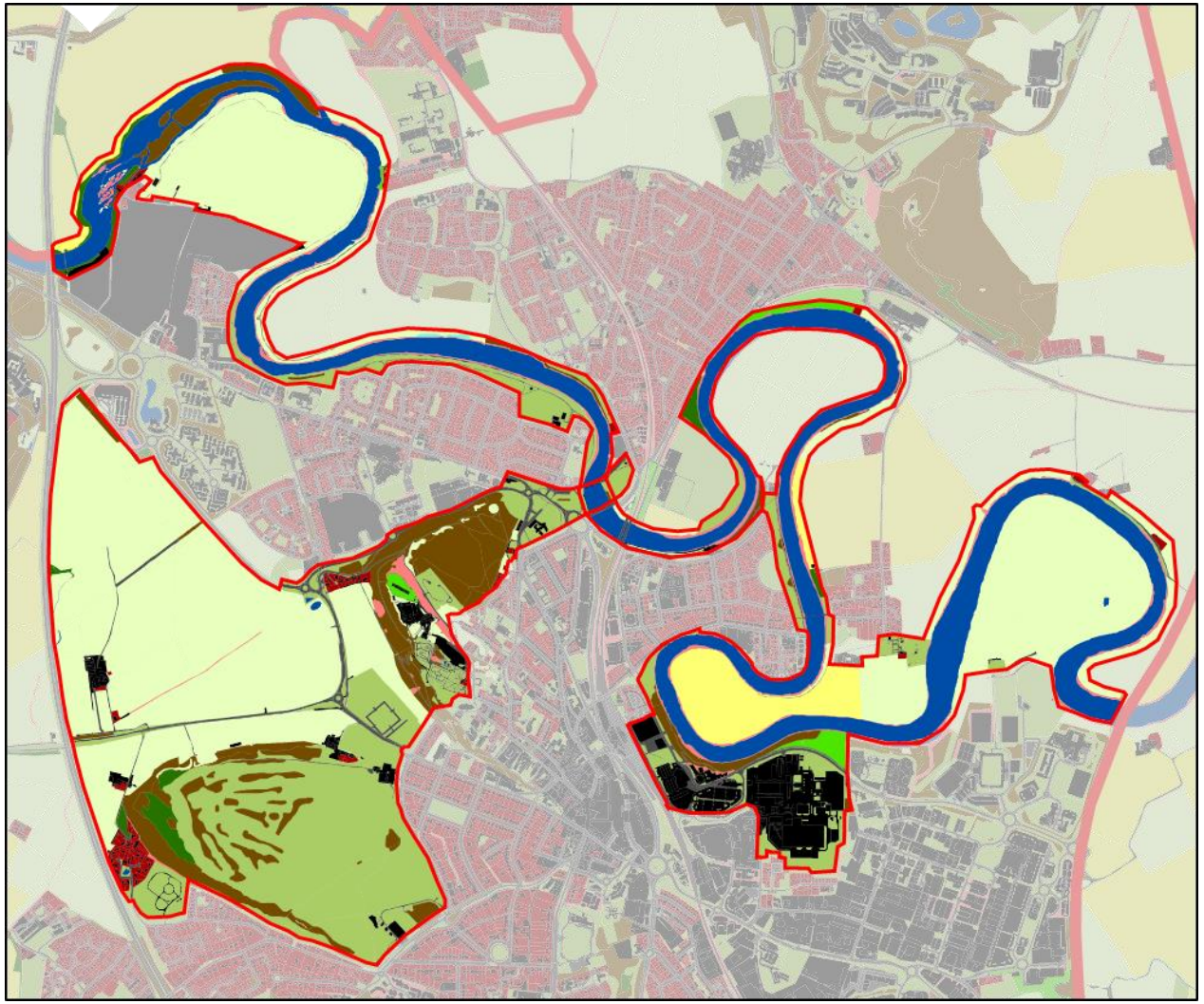
- Cultivated land
- Uncertain agriculture
- Improved grassland
- Amenity grassland / road verges
- Semi-natural grassland
- Unknown grassland
- Woodland and scrub
- Water
- Built up areas
- Infrastructure
- Gardens
- Other habitats

Broad habitat	% cover
Cultivated land	7.1
Improved grassland	22.1
Amenity grassland / road verges	15.3
Semi-natural grassland	1.3
Unknown grassland	0.4
Scrub	1.1
Trees / Parkland	2.0
Broadleaved woodland	4.8
Coniferous woodland	2.7
Mixed woodland	1.3
Water	3.2
Built up areas	13.0
Infrastructure	10.0
Gardens	12.7
Other habitats	2.9

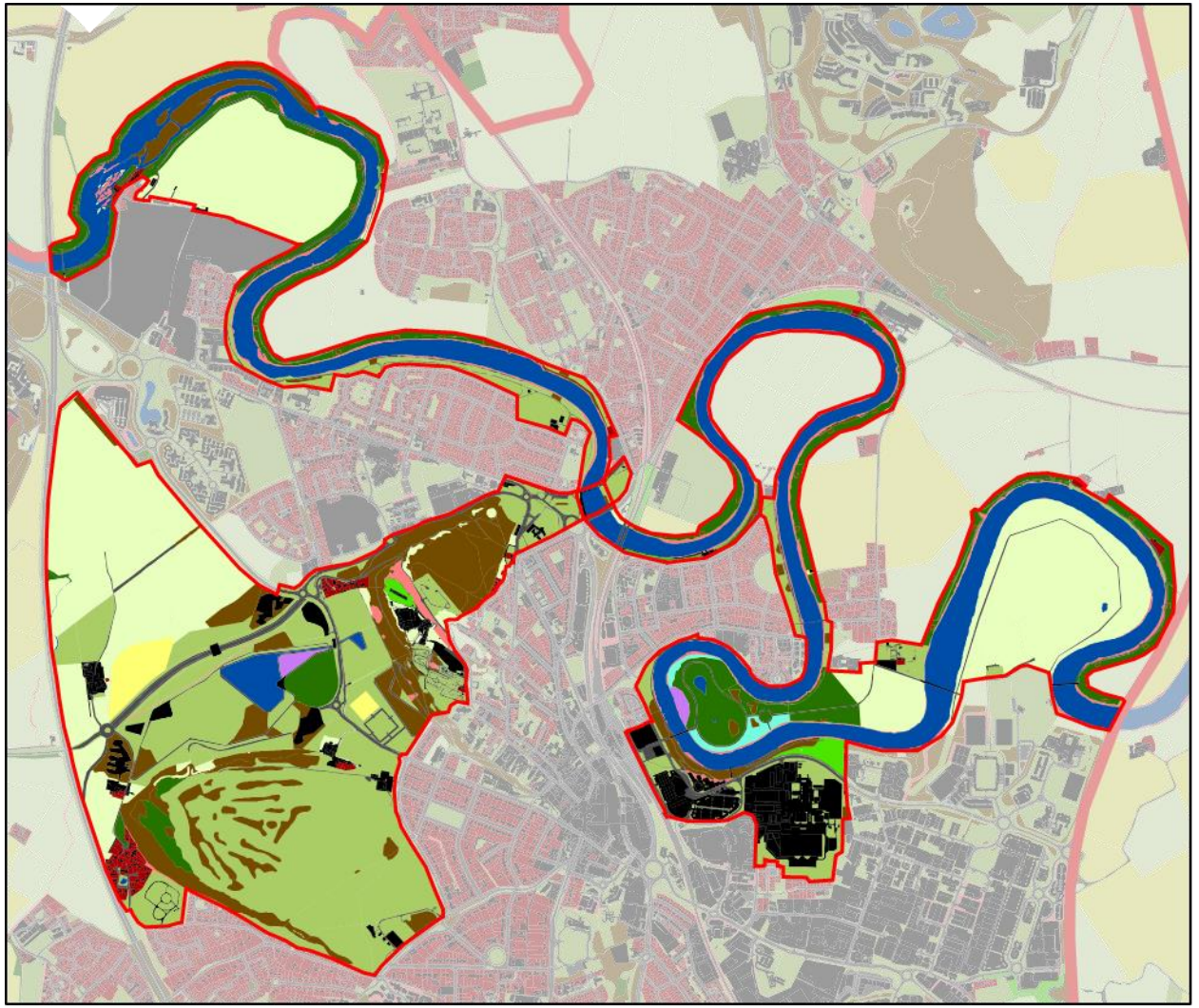
Natural Capital Solutions

Natural capital assets: City Park and River projects

Baseline



Investment

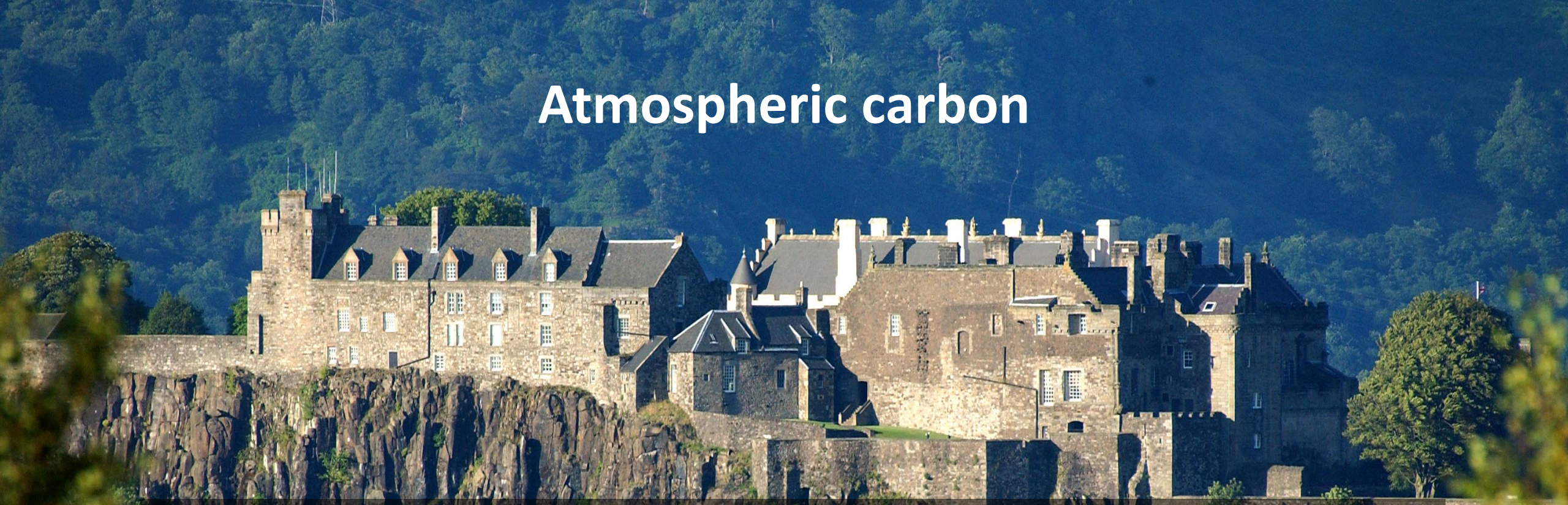


Mapping ecosystem services and their values

Type of service	Benefits	Physical & monetary flows
Provisioning	Agricultural production	✓
	Timber production	✓
Regulating	Atmospheric carbon	✓
	Air quality regulation	✓
Cultural	Recreation	✓
	Health and wellbeing	✓
Other benefits	Property prices	✓

Type of service	Benefits	Indicative maps
Regulating	Noise regulation	✓
	Local climate (urban heat) regulation	✓
	Surface water runoff	✓
	Water quality	✓
Cultural	Cultural heritage	✓

Atmospheric carbon



New plantings will sequester (take up) an additional:

- 14.1 tonnes of **CO_2** along the river and 62.9 tCO_2 in the City Park

Changing land-use will reduce agricultural emissions by:

- 67.5 tCO_2 along the river and 106.6 tCO_2 in the City Park

Providing an annual benefit of **£5,230** (river) and **£10,840** (City Park).

Air quality regulation

New plantings will absorb an additional:

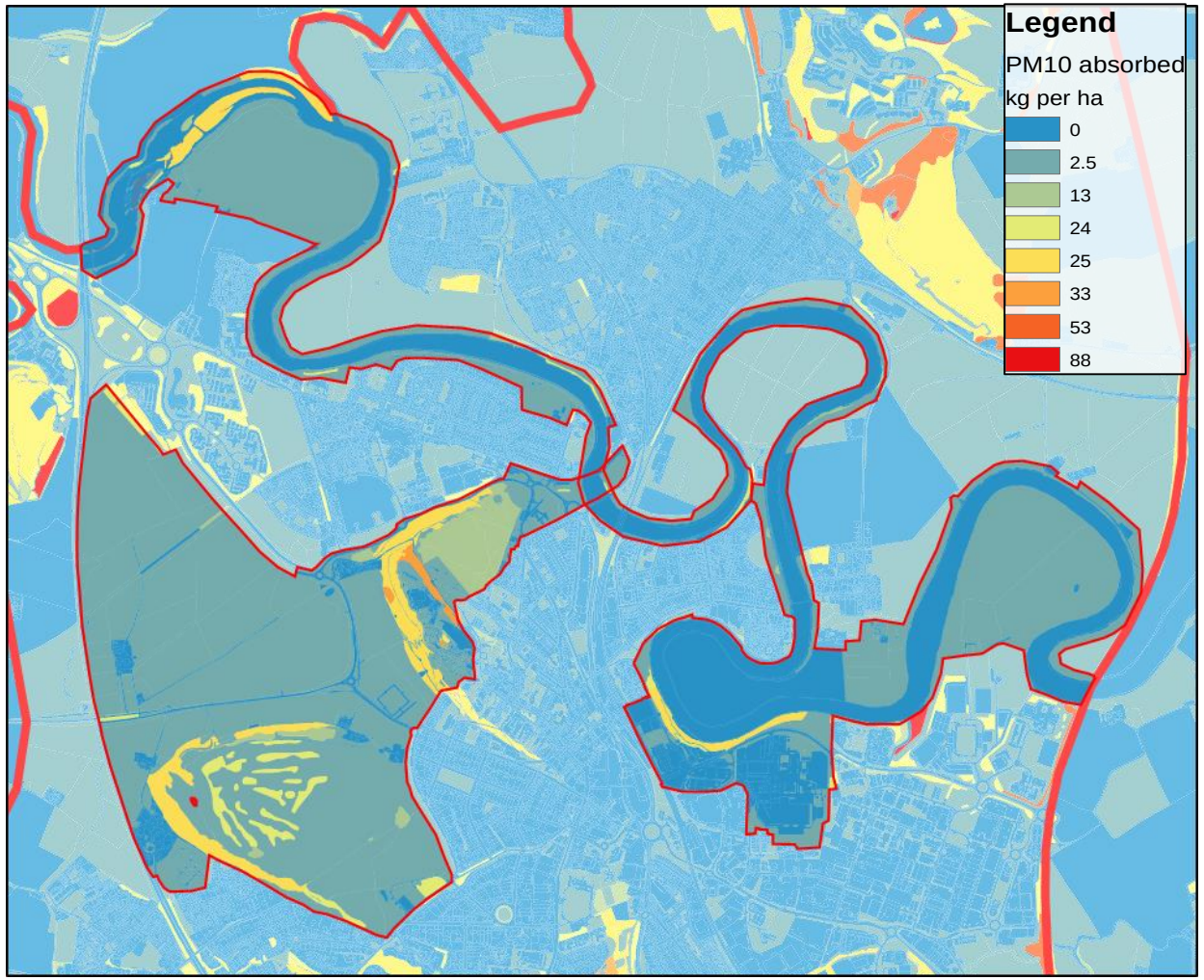
- 74 kg of PM_{10} along the river and 139 kg in the City Park
- 0.83 kg of SO_2 along the river and 0.62 kg of SO_2 in the City Park,

With an annual value of **£5,700** (river) and **£10,700** (City Park)

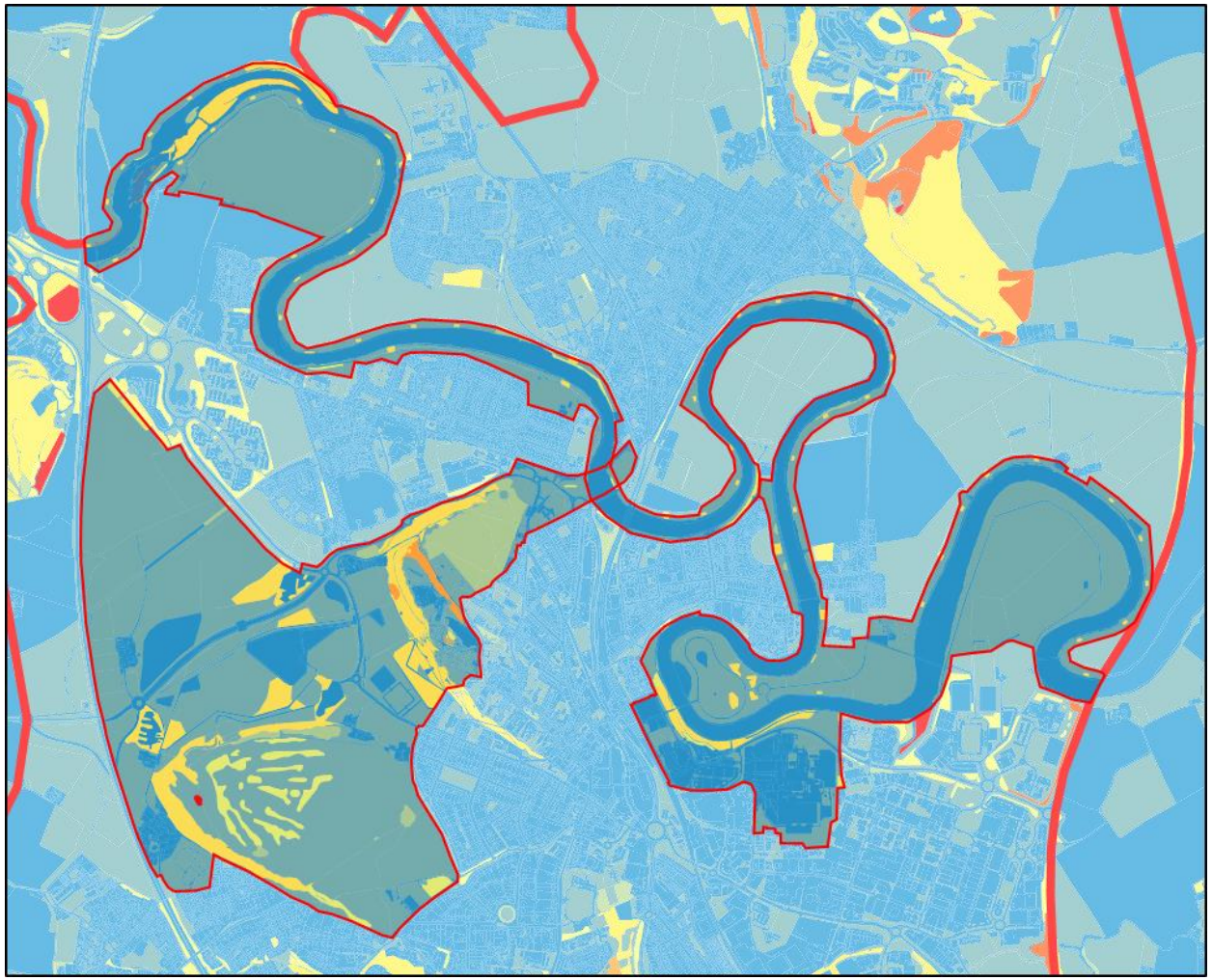
Natural Capital Solutions

Air quality regulation

Baseline



Investment



Recreational visits

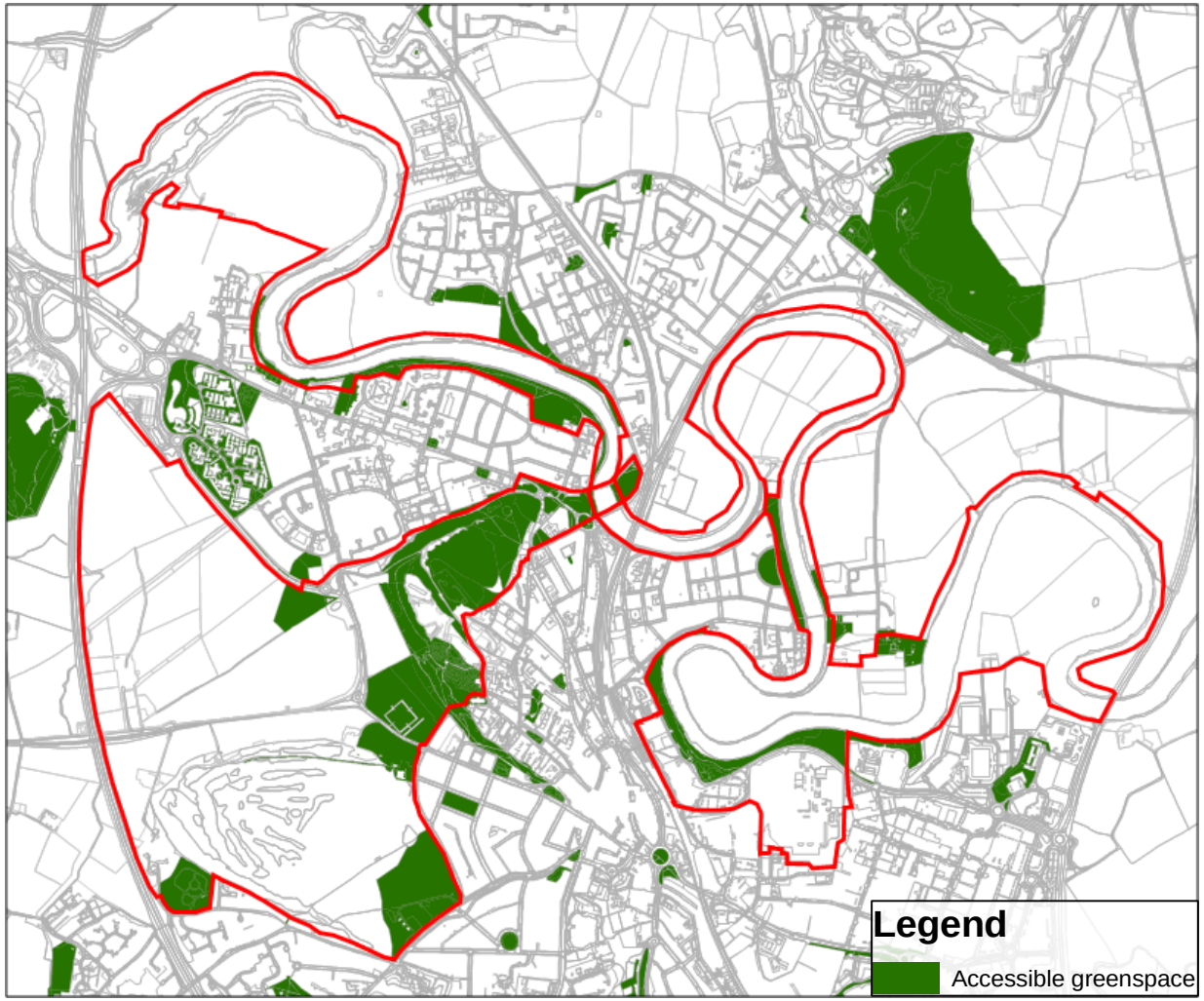
New accessible greenspace estimated to attract an additional:

- 580,00 recreational visits to the river area and 560,000 to the City Park
- providing additional annual benefits of **£2.40M** and **£2.31M** respectively

Natural Capital Solutions

Recreational visits

Baseline



Investment

Health and wellbeing

- River project will provide a large increase in accessible greenspace close to peoples homes. City Park will provide large destination greenspace.
- Minimum annual welfare gain or costs avoided through physical activity:

  River: **£278,300** City Park: **£16,100**

Economic appraisal of investments

		City Park	River
		Present value at 3.5%, £M (2017 prices)	
Benefits	Ecosystem services	39.8	45.4
	Property enhancement	11.7	12.5
	Tourism	115.8	92.6
	GVA benefit gain from investment	15.5	13.0
	TOTAL	**182.8**	**163.5**
Costs	Capital	38.6	37.4
	Operational & maintenance	86.5	102.8
	TOTAL	**125.1**	**140.2**
Net Present Value	50 years at 3.5%	**57.7**	**23.3**
Internal Rate of Return		**9.5%**	**6.5%**
Sensitivity analysis	NPV range (low-high benefits)	19.4 - 99.7	-8.4 - 61.2

Natural Capital Solutions

Key points

- The benefits of investing in natural capital are considerable and should be taken into account in decision making
- Recreation and health and wellbeing provide the greatest benefits
- The value of ecosystem service benefits ensure a positive Return on Investment for the proposals in Stirling
- Mapping the spatial location and distribution of benefits (especially in relation to demand) provides valuable additional information.
- Building a green urban network that optimises biodiversity and ecosystem services provision will provide considerable benefits for health and prosperity