Evaluating the multiple benefits of Blue-Green infrastructure

Dr Emily O'Donnell

University of Nottingham

24th November 2016

Blue-Green Infrastructure Conference, Belfast

bluegreencities.ac.uk

EPSRC Grant EP/K013661/1

Overcoming barriers to Blue-Green infrastructure

1

- Promote multifunctional space and identify, quantify and monetise the multiple benefits

2

- Improve education and communication, raise awareness, community engagement

2

- Partnership working from the project outset

Water and sediment management benefits

Controlling the water at source, slowing conveyance, attenuation and storage = reduce flood risk

Improves water quality

Increasing extent and health of GI

Surface water as an amenity

Limit flows entering man-made drainage systems

Biological breakdown of sediment pollutants

Improves resilience

Managing flows above ground

Environmental benefits: habitat and biodiversity

Source www.nwl.co.uk

Environmental benefits

- Improve air quality
- CO_2 sequestration
- Reduction of the urban heat island effect
- Reduction in noise

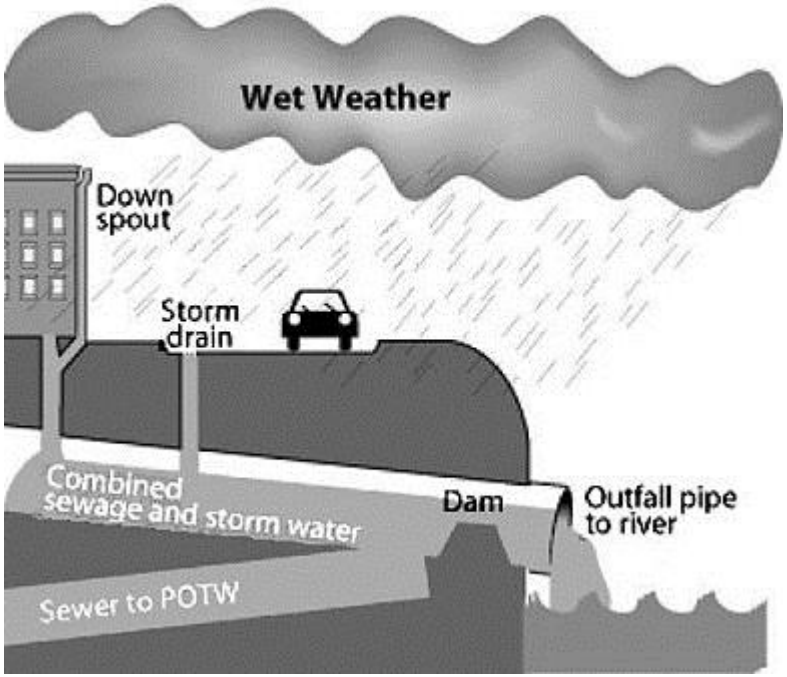
Social and cultural benefits

- Recreation
- Aesthetics
- Amenity
- Wellbeing and liveability (stress relief, restorative benefits)
- Encourages community cohesion, social interaction
- Physical and mental health

Green streets - traffic calming

Adaptability and flexibility

(climate change adaptation)



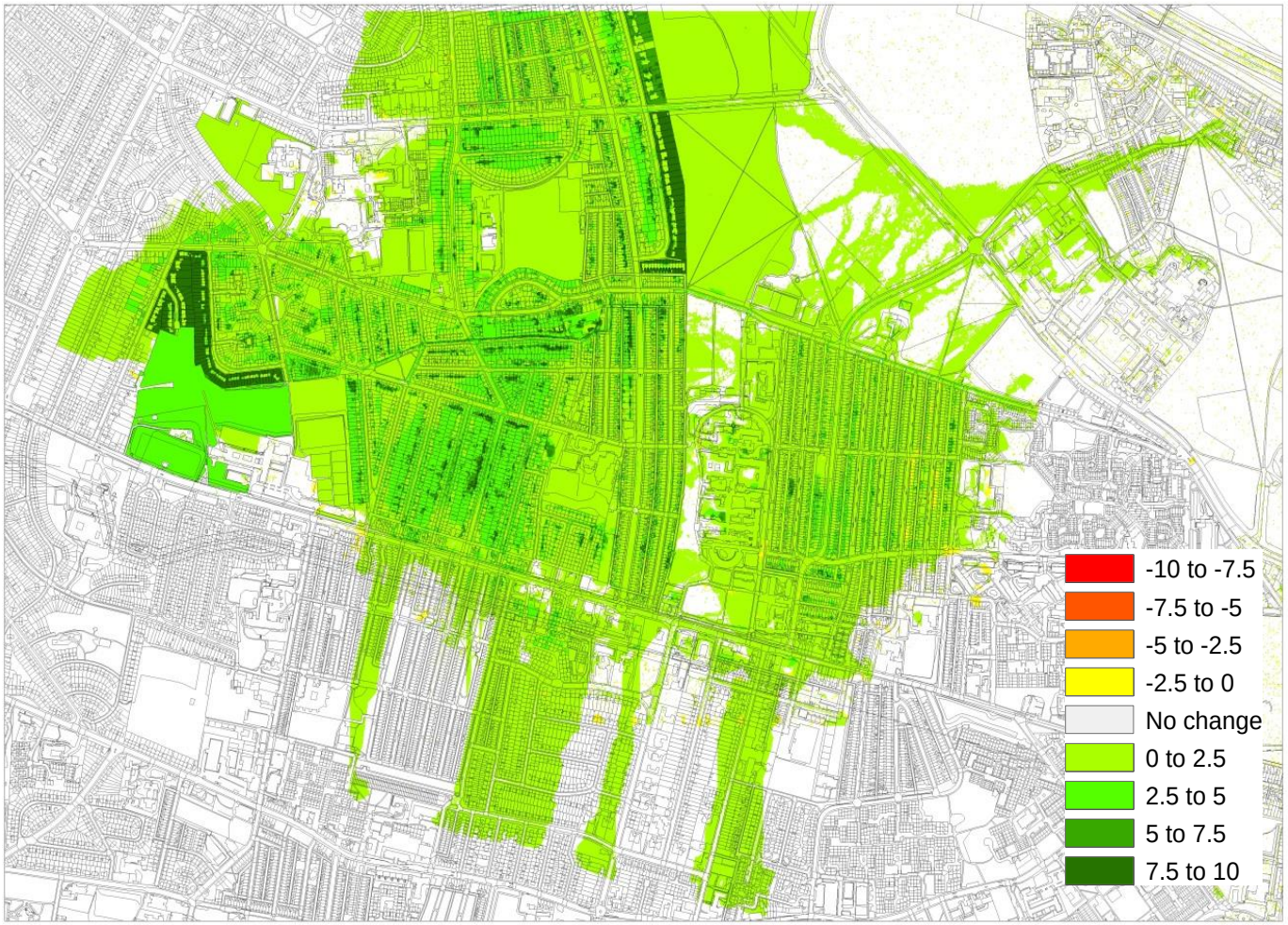
- **Technological lock-in?**

Evaluating the multiple benefits of Blue-Green infrastructure

ArcGIS toolkit for multiple benefit evaluation

- Air pollution
- Access to greenspace
- Carbon sequestration
- Noise
- Habitat connectivity
- Flood damage reduction

Morgan and Fenner, *in review*

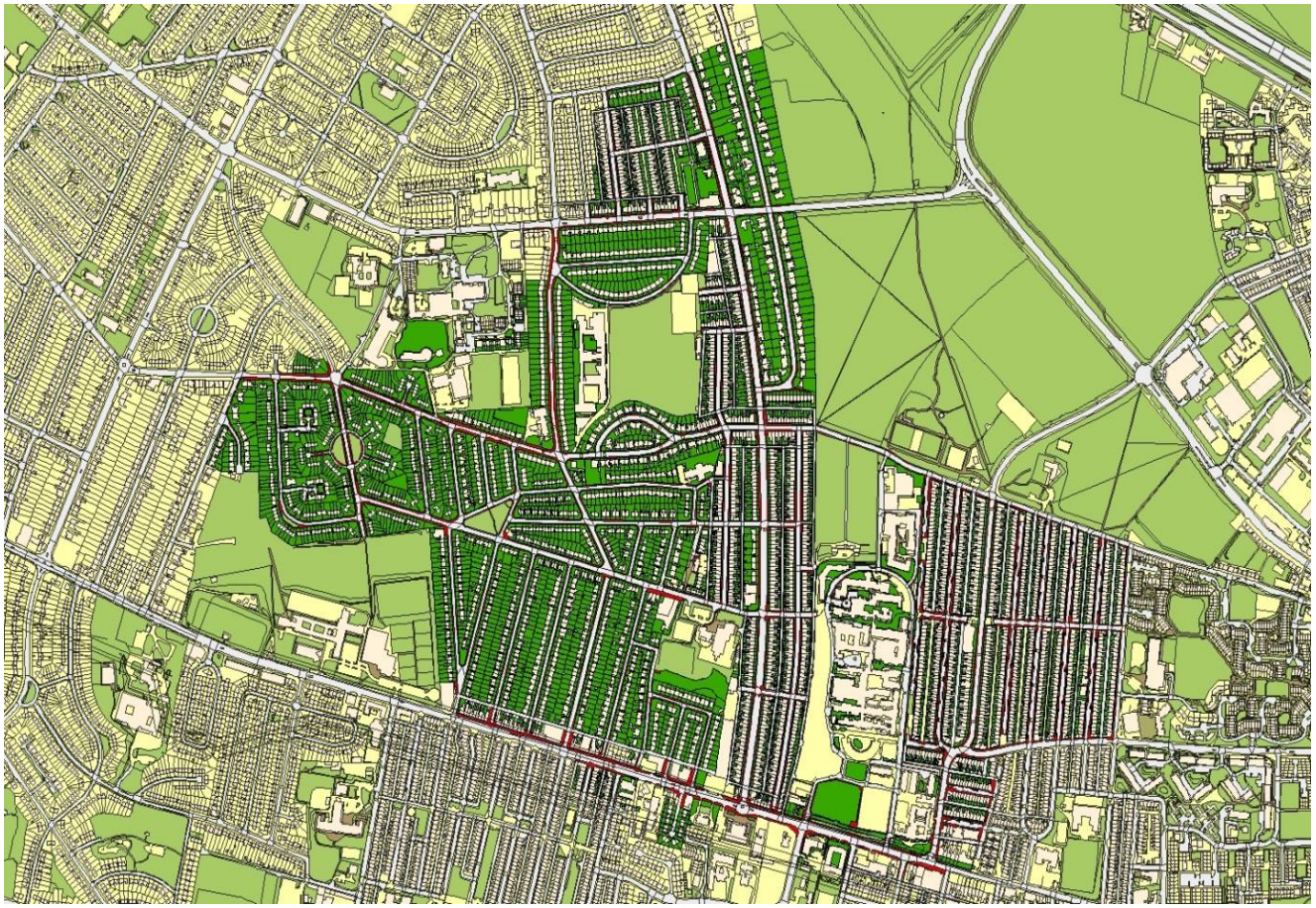


Free to download: http://www.bluegreencities.ac.uk/bluegreencities/publications/multiple-benefit-toolbox.aspx

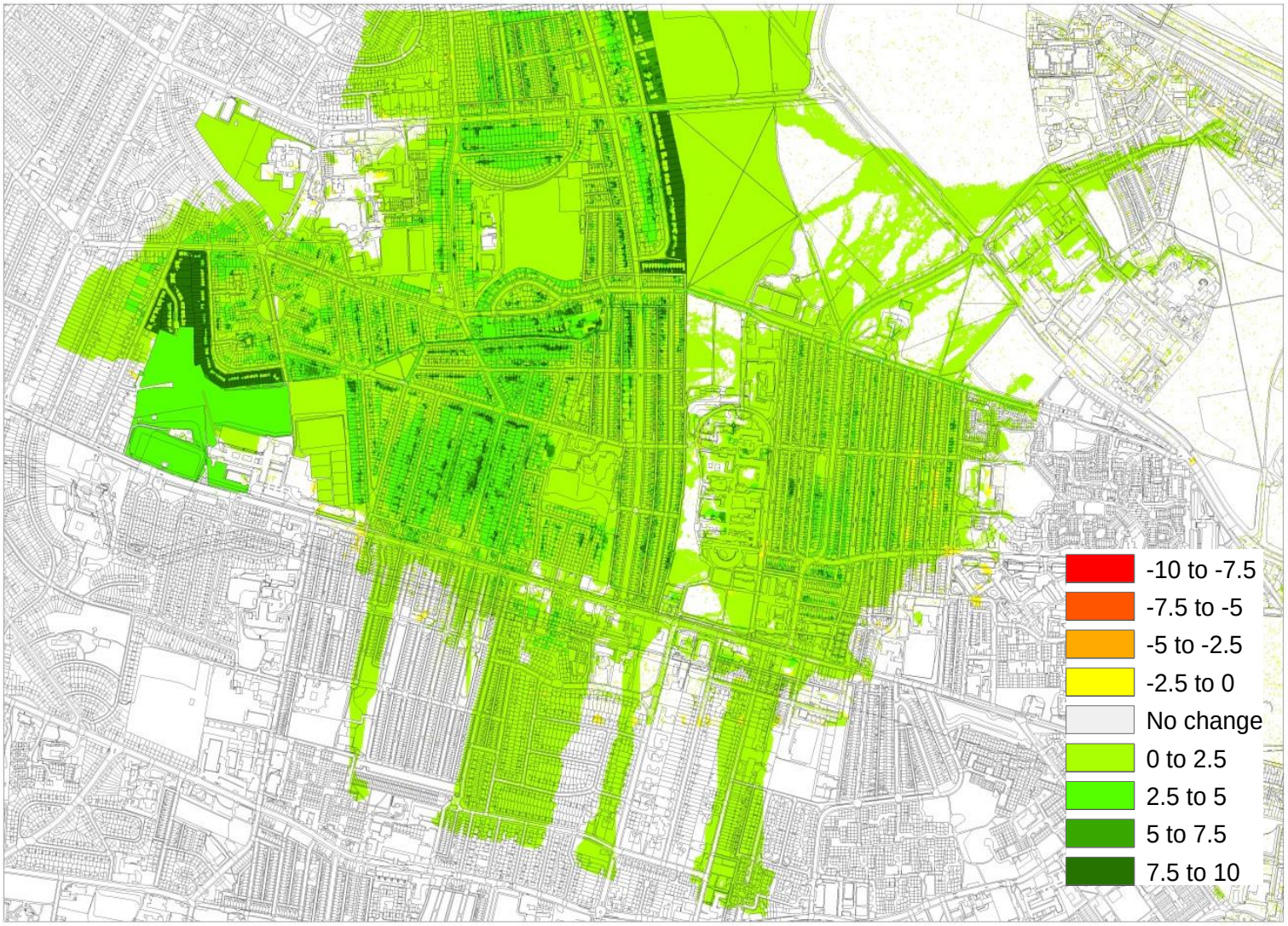
Blue-Green Scenario:
urban greening and permeable paving, Newcastle UK

O'Donnell, E. 2016. *Evaluating the benefits and identifying the beneficiaries of Blue-Green infrastructure to encourage institutional collaboration and community action*. Final Report to Northumbrian Water Limited under project number 512672, University of Nottingham, 99p.

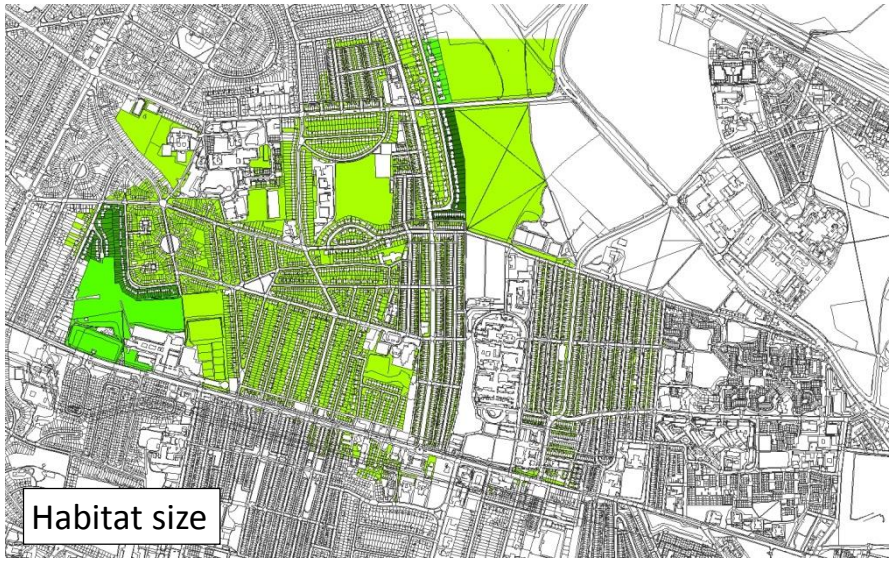
Blue-Green Scenario:
urban greening and permeable paving, Newcastle UK

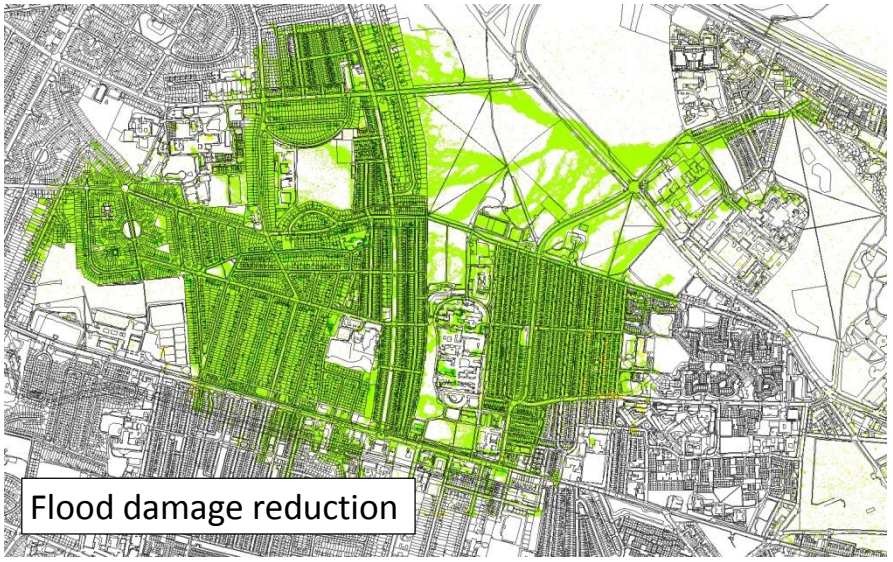


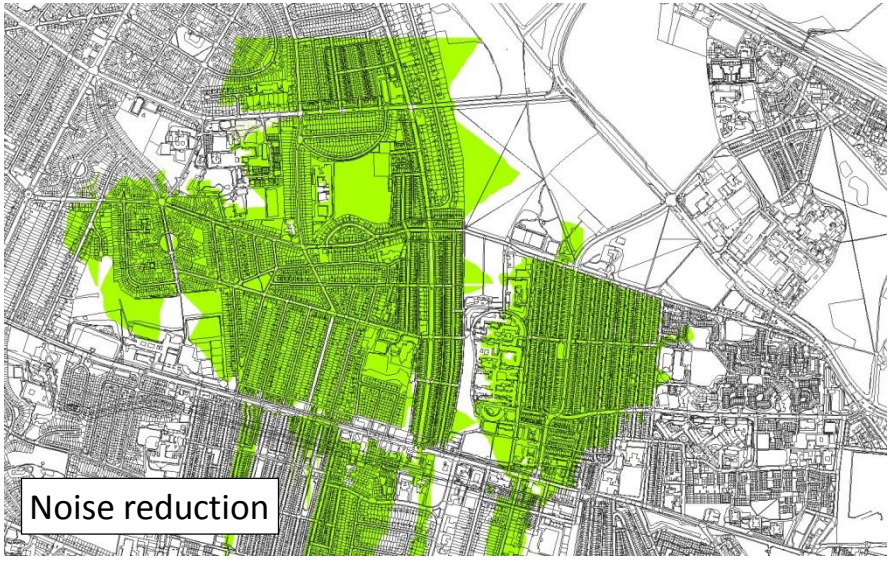
Multiple benefits

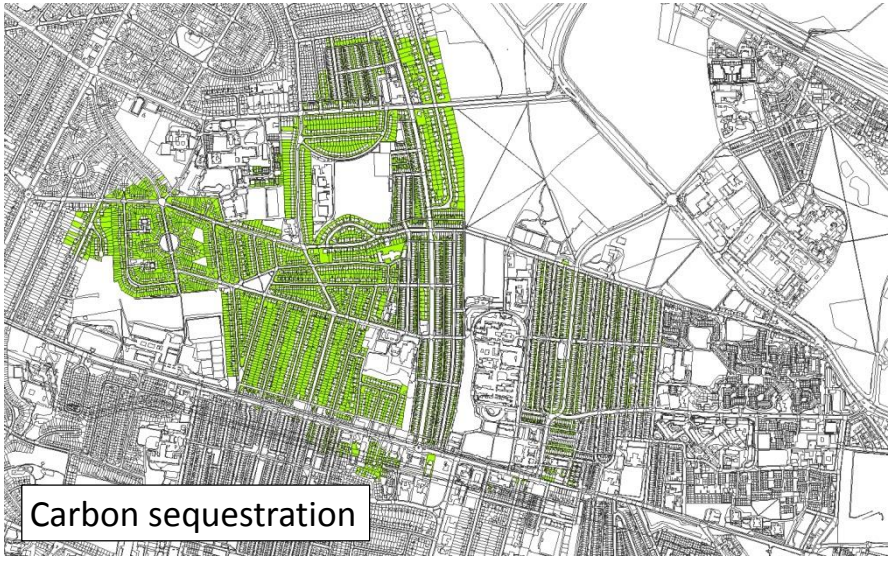


Single benefits

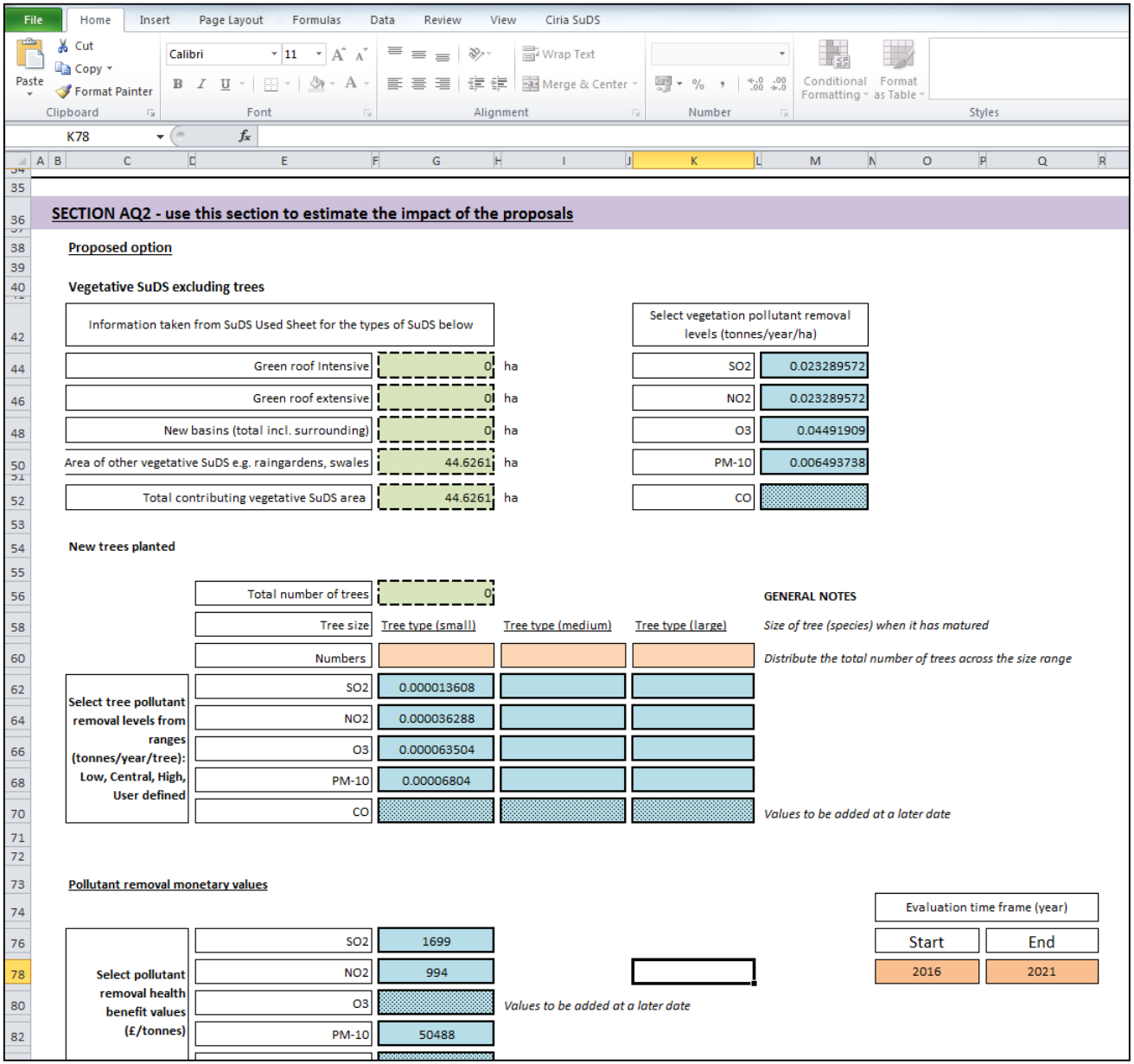








Benefits of SuDS Tool (BeST)



SECTION AQ2 - use this section to estimate the impact of the proposals

Proposed option

Vegetative SuDS excluding trees

Information taken from SuDS Used Sheet for the types of SuDS below		
Green roof Intensive	0	ha
Green roof extensive	0	ha
New basins (total incl. surrounding)	0	ha
Area of other vegetative SuDS e.g. raingardens, swales	44.6261	ha
Total contributing vegetative SuDS area	44.6261	ha

Select vegetation pollutant removal levels (tonnes/year/ha)	
SO2	0.023289572
NO2	0.023289572
O3	0.04491909
PM-10	0.006493738
CO	

New trees planted

	Total number of trees	0		
	Tree size	Tree type (small)	Tree type (medium)	Tree type (large)
	Numbers			
Select tree pollutant removal levels from ranges (tonnes/year/tree): Low, Central, High, User defined	SO2	0.000013608		
	NO2	0.000036288		
	O3	0.000063504		
	PM-10	0.00006804		
	CO			

GENERAL NOTES

Size of tree (species) when it has matured

Distribute the total number of trees across the size range

Values to be added at a later date

Pollutant removal monetary values

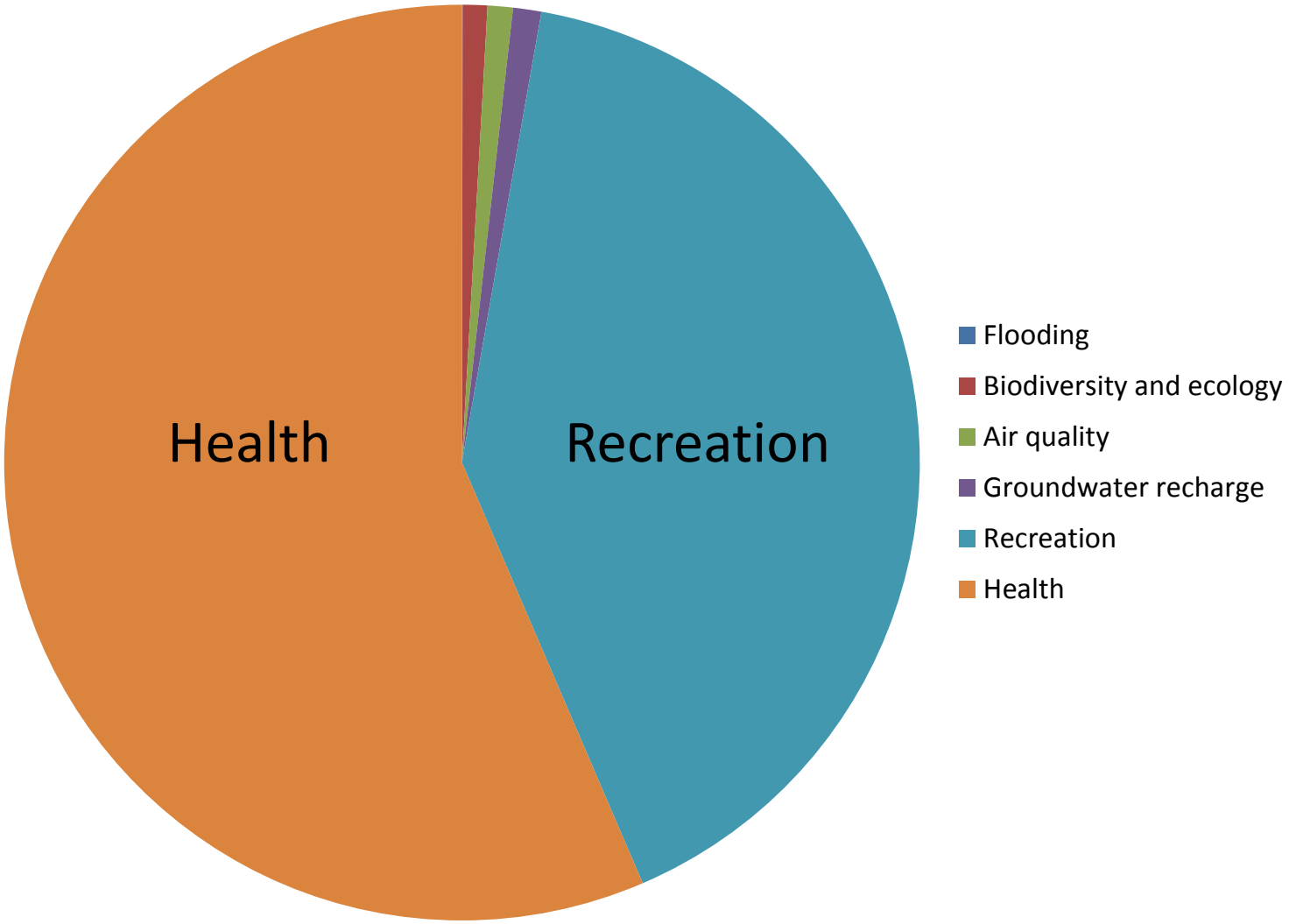
Select pollutant removal health benefit values (£/tonnes)	SO2	1699
	NO2	994
	O3	
	PM-10	50488

Values to be added at a later date

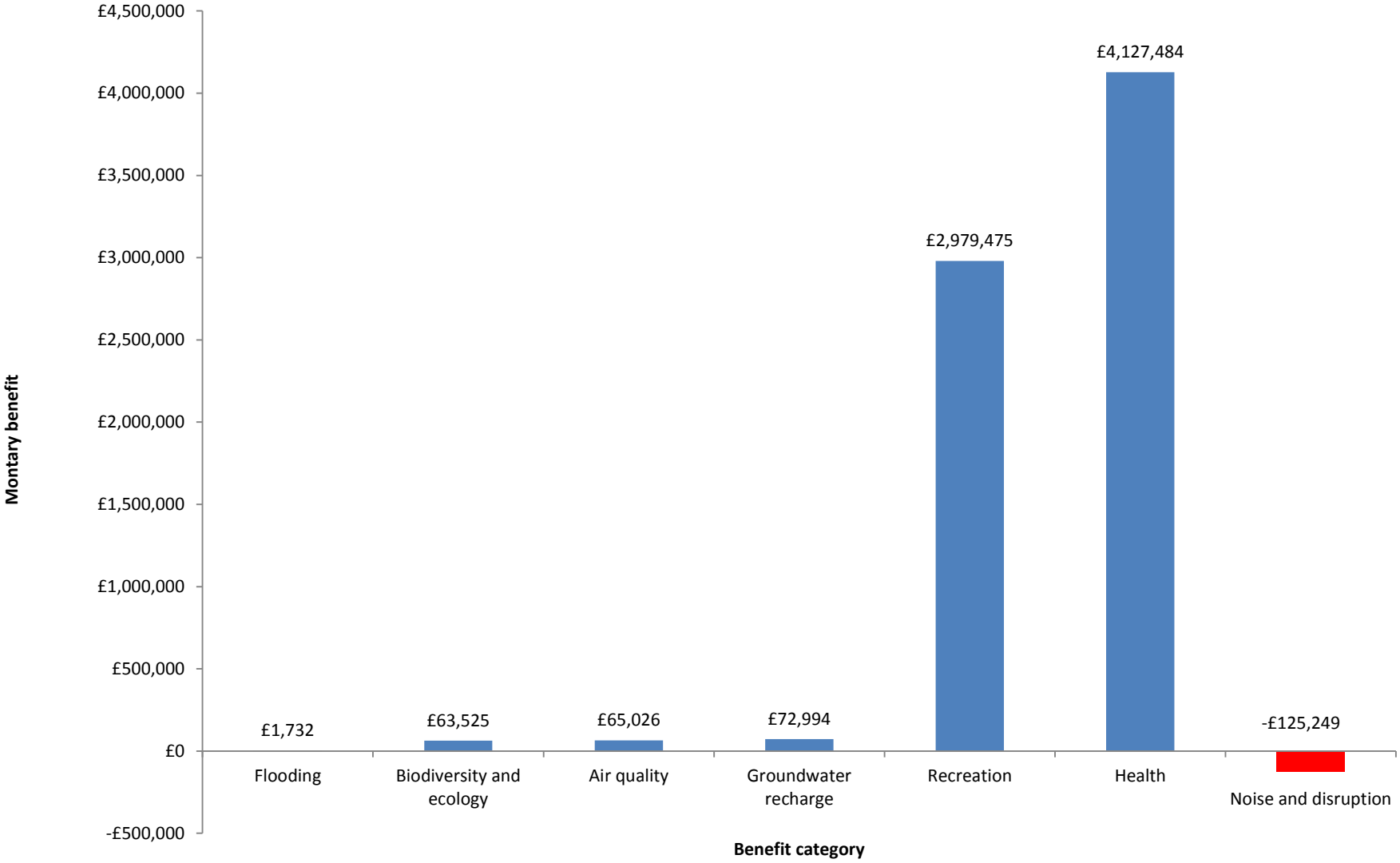
Evaluation time frame (year)	
Start	End
2016	2021

Tool and guidance available from http://www.ciria.org/News/CIRIA_news2/New-tool-assesses-the-benefits-of-SuDS.aspx

Benefits of a permeable paving and urban greening scheme



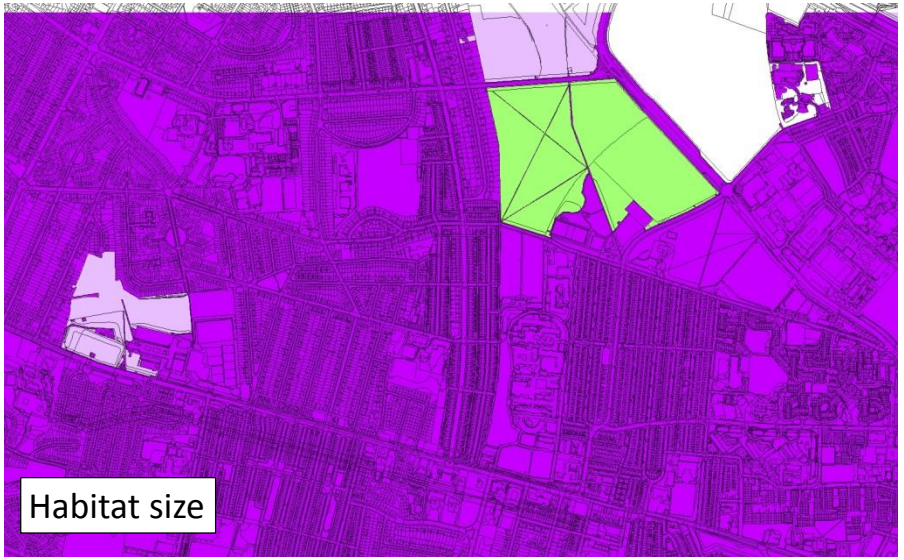
Monetary benefits



Potential multiple benefits

Evaluates whether the area selected for an intervention has the potential to create the maximum benefits possible, or whether other locations are preferable

Potential single benefits



No change
Low potential
Medium potential
High potential

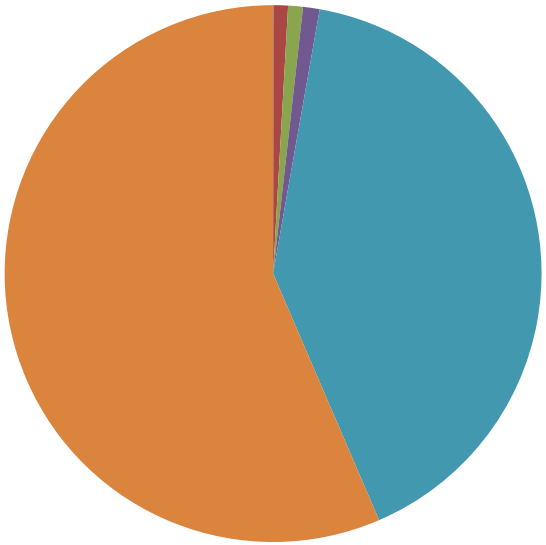
blue green CITIES

Concluding remarks

- Promotion of multifunctional space, and identification, quantification and monetisation of the multiple benefits will be key to helping many cities overcome the barriers to Blue-Green infrastructure

- New tools can provide an indication of the likely benefits:

Benefits of SuDS Tool (BeST)



Multiple Benefits GIS Toolbox