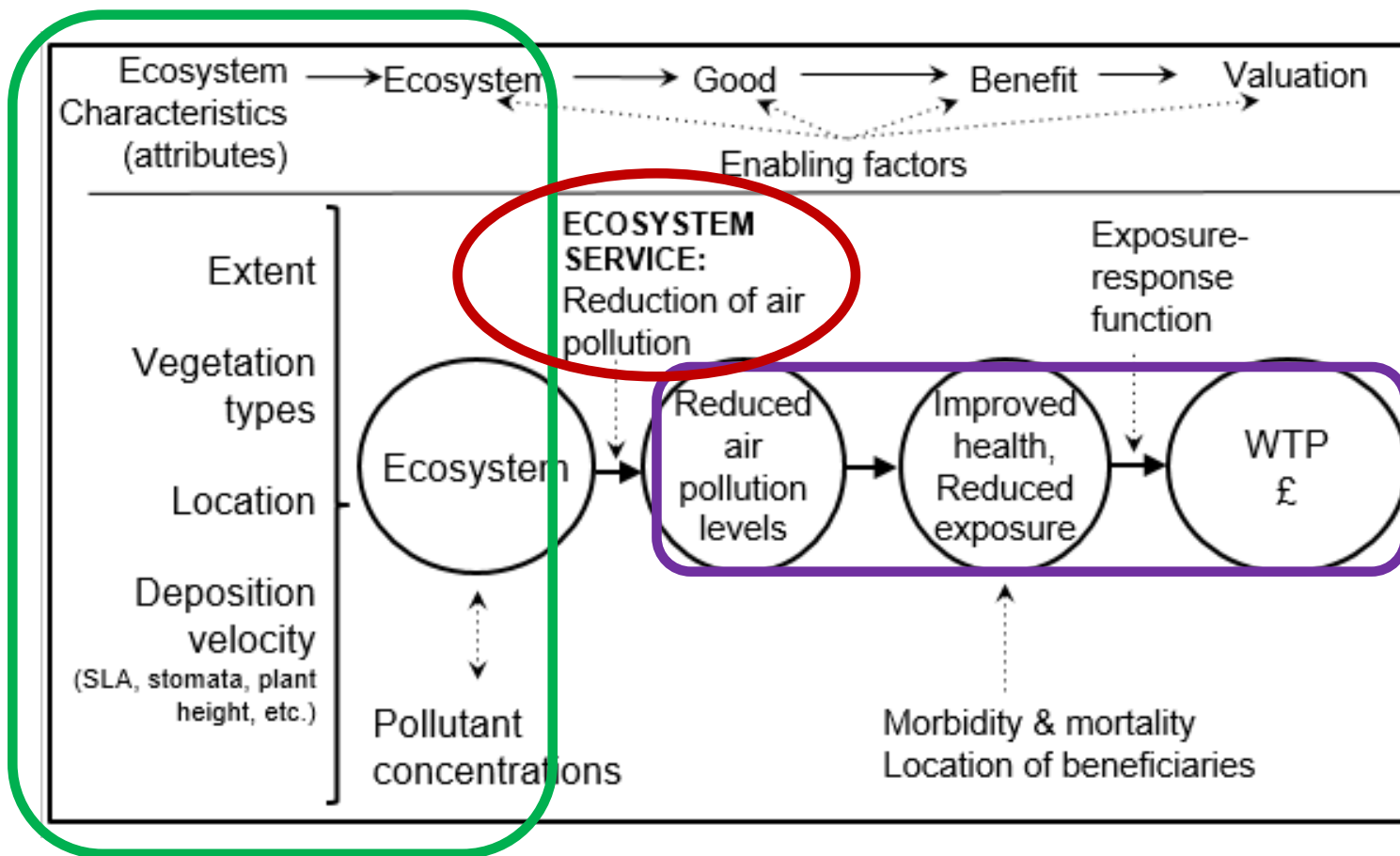


Developing the natural capital account for air pollution removal by vegetation



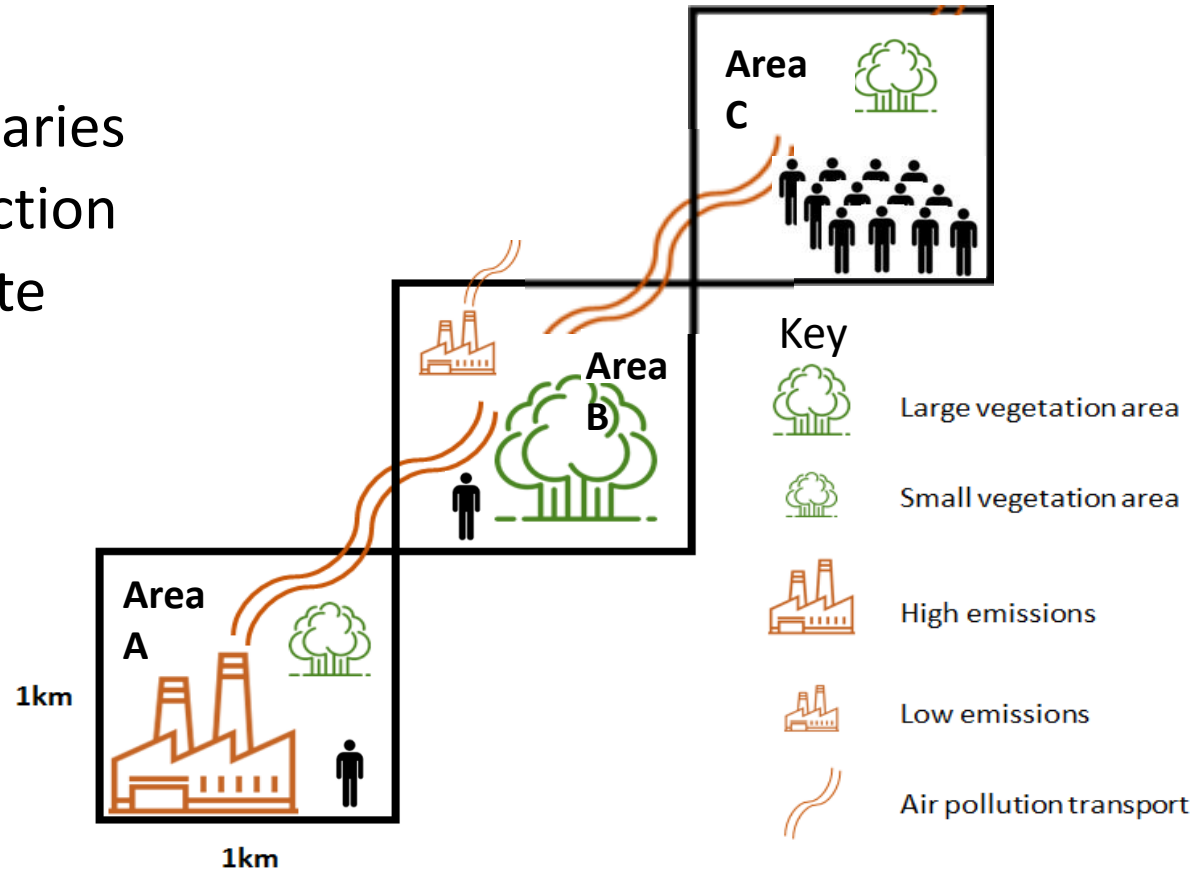
SEEA Natural Capital accounts



Spatial context of service and beneficiaries

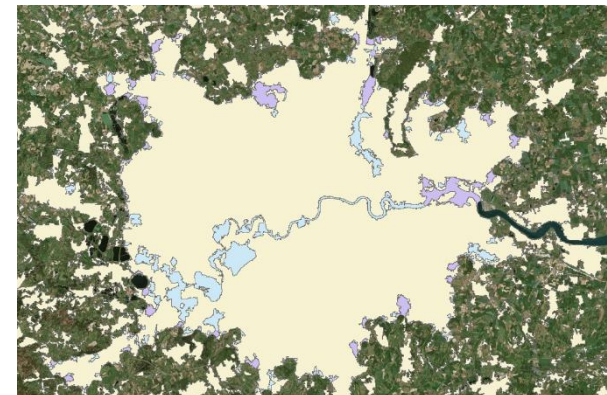
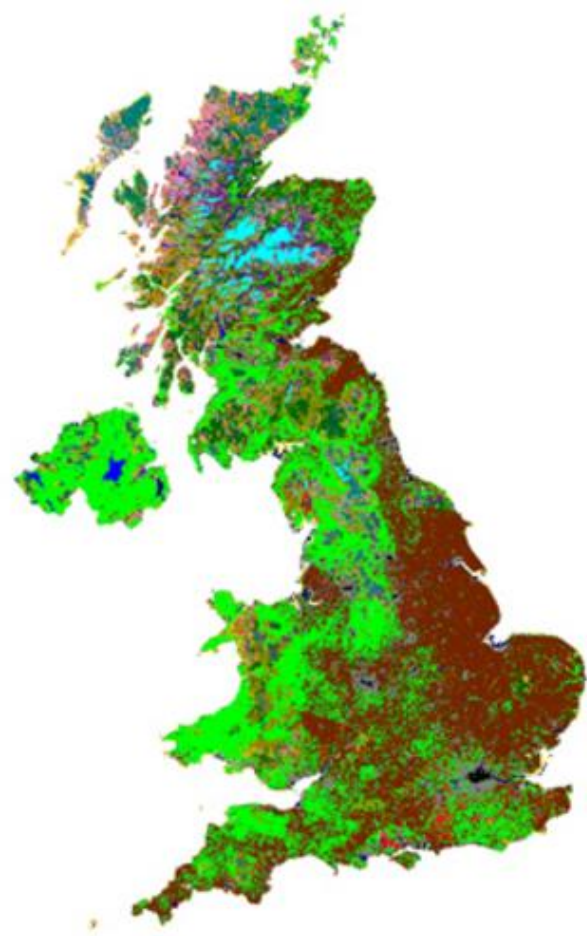
Atmospheric transport:

- I. Location of beneficiaries
- II. Health damage function
- III. Chemical and climate interactions



Summary of approach

- Physical account: EMEP4UK atmospheric transport model
- Health and monetary account: ALPHA RiskPoll model
- Scenario approach
- Separate UK & urban calculations

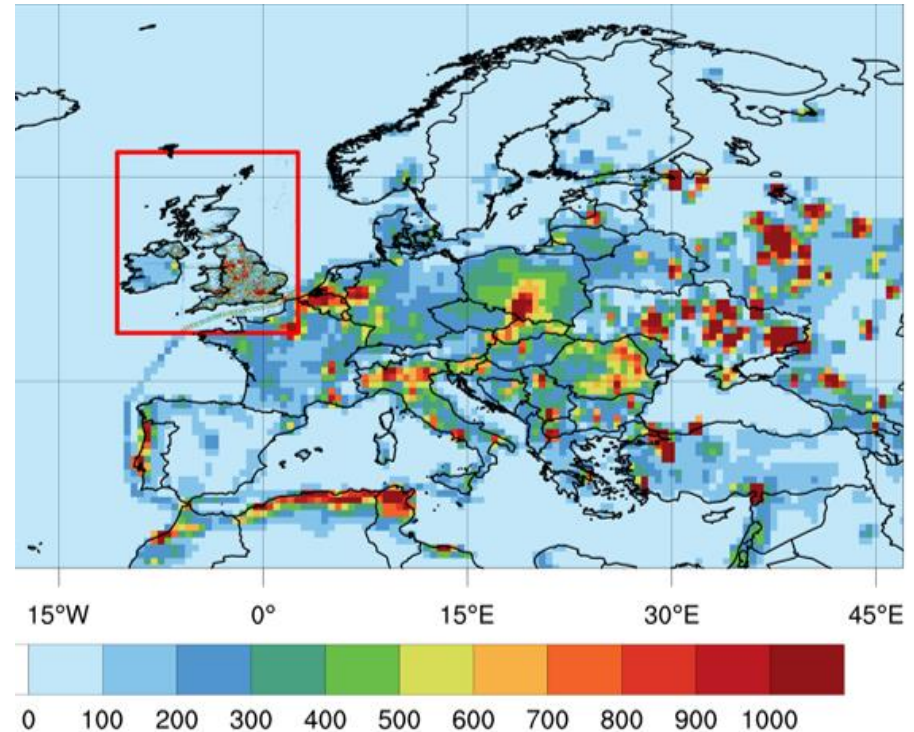


Atmospheric chemistry modelling – physical account

The EMEP4UK Atmospheric Chemistry Transport Model

- 5x5km (~2x2km)
- Hourly timestep
- Generates concentrations from emissions
- Chemical & meteorological interactions
- Transport
- Five pollutants (PM2.5, SO2, NH3, NO2, O3)

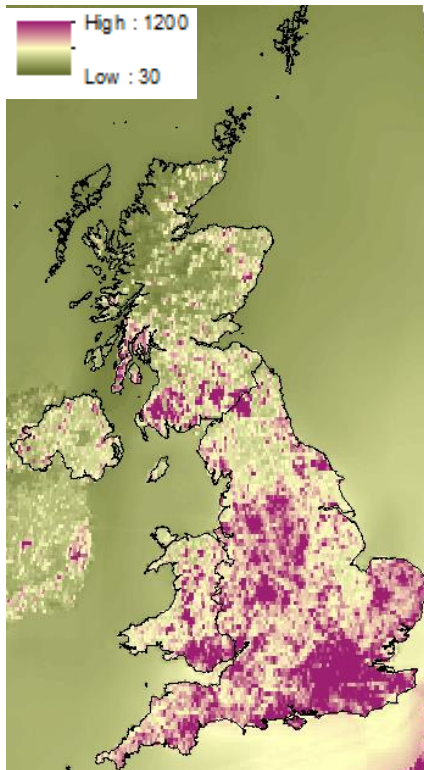
2015, emissions PM2.5 mg/m²



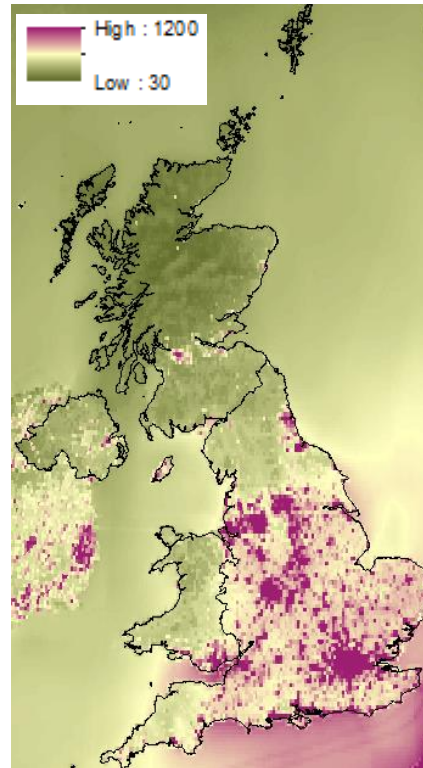
EMEP model outputs – national run, all vegetation

Quantity of PM2.5 removed (mg/m2)

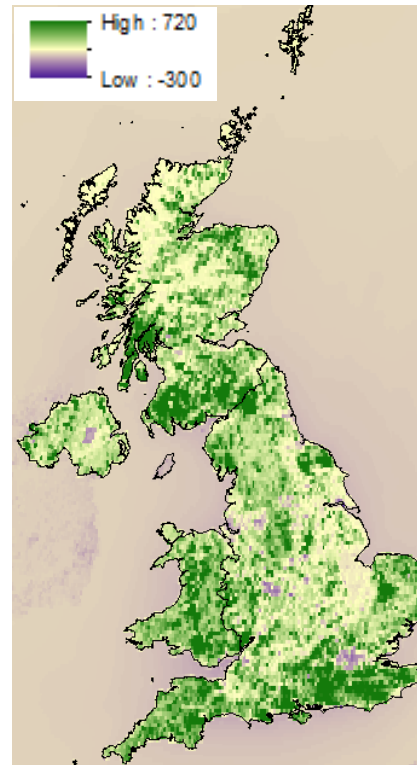
Base map, 2015



No vegetation scenario

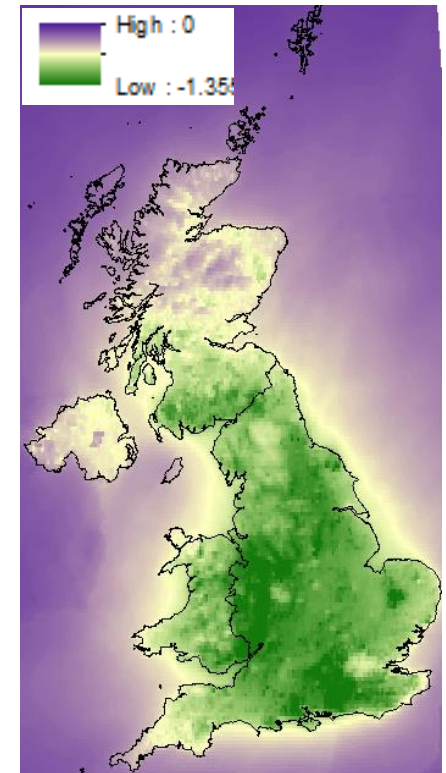


Difference map



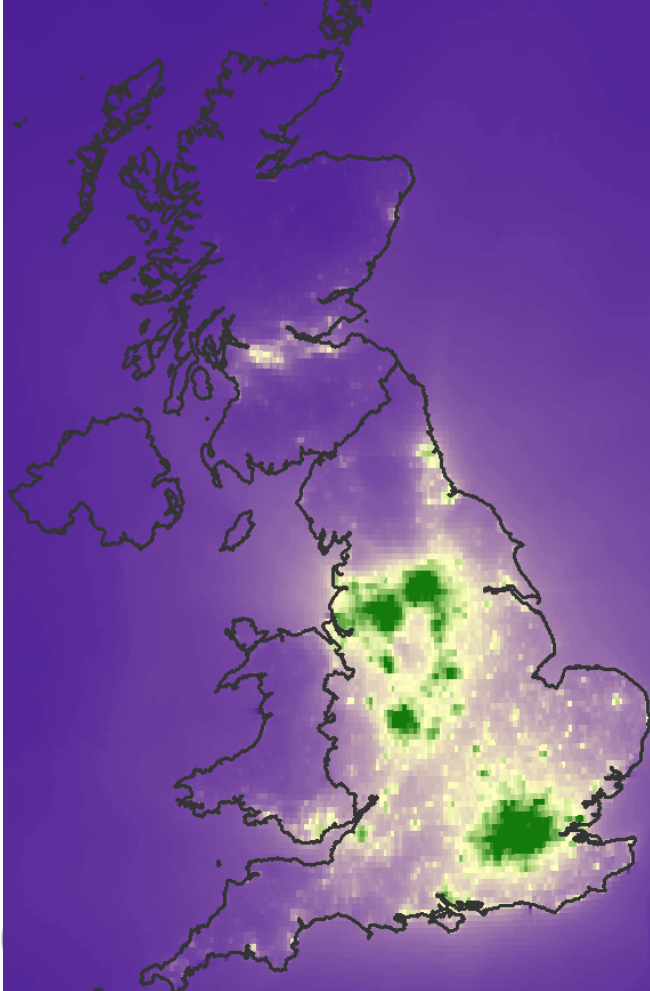
Change in exposure to PM2.5 ($\mu\text{g}/\text{m}^3$)

Ave: -0.55 (-10%)



EMEP model outputs – urban natural capital

Change in exposure to PM_{2.5}
(ug/m³) Ave: -0.06 (-1%)



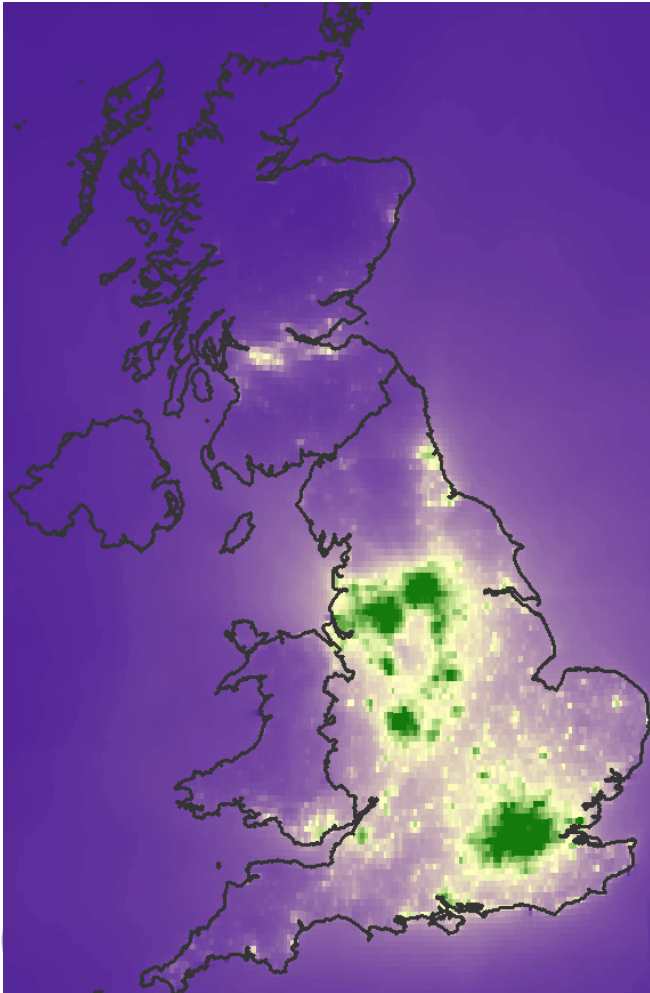
Urban natural capital: pollutant removed & health outcomes

	Habitat	2015	
Pollutant removed (ktonnes)	All pollutants	Urban woodland	38.2
		Urban grassland	4.9
		Urban fresh/saltwater	0.1
		Total urban natural capital	43.2

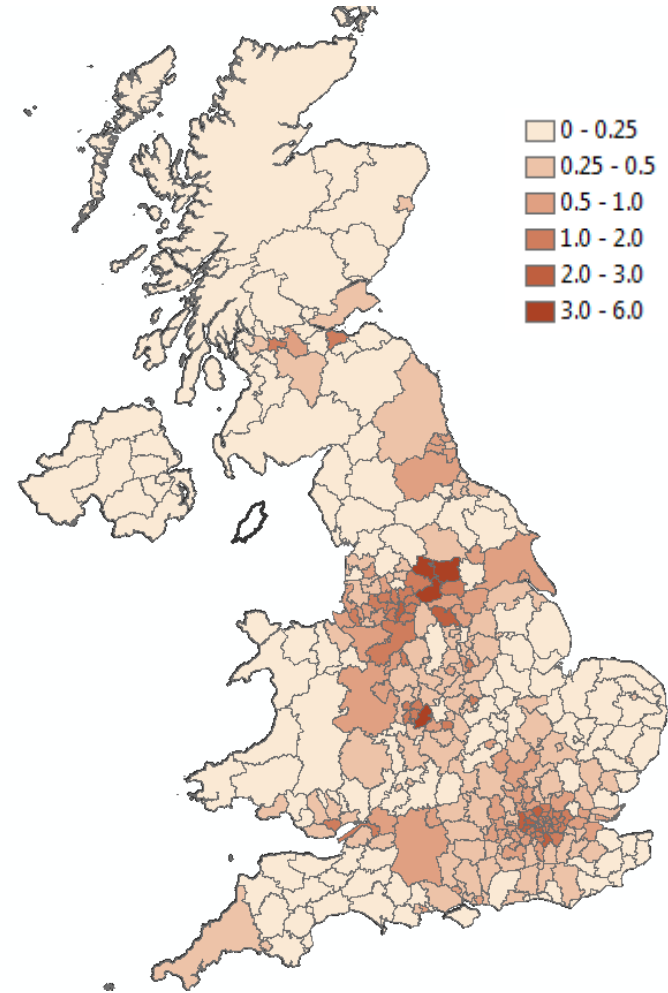
	Health outcome	No/yr	
Health outcomes	All pollutants combined	Respiratory hospital admissions	-538
		Cardiovascular hospital admissions	-182
		Life years lost	-5,899
		Deaths	-105

EMEP model outputs – urban natural capital

Change in exposure to PM2.5
(ug/m3) Ave: -0.06 (-1%)



Value of health outcomes (£m)



SUMMARY

- Approach is based on realistic chemical interactions, meteorology and pollutant transport
- National account shows substantial benefit (£1bn)
- Urban accounts show wider benefit to surrounding areas
- Results are broadly comparable to other studies (i-tree, USA, but differ by pollutant)



EXTRA SLIDES

Physical account - urban

Change in concentration

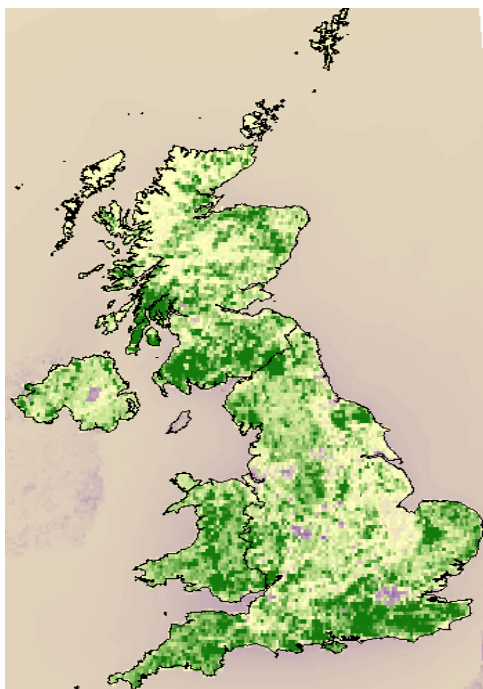
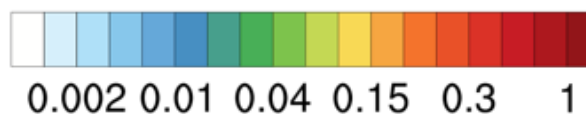
Pollutant	Habitat	2015	2030
PM10	Current vegetation	9.69	7.64
	No vegetation	9.75	7.68
	Absolute difference	-0.06	-0.04
	Difference (%)	-0.66	-0.53
PM2.5	Current vegetation	5.06	3.40
	No vegetation	5.11	3.44
	Absolute difference	-0.06	-0.03
	Difference (%)	-1.09	-0.98
SO2	Current vegetation	0.84	0.47
	No vegetation	0.86	0.48
	Absolute difference	-0.02	-0.01
	Difference (%)	-2.64	-2.48

URBAN ACCOUNT - MONETARY

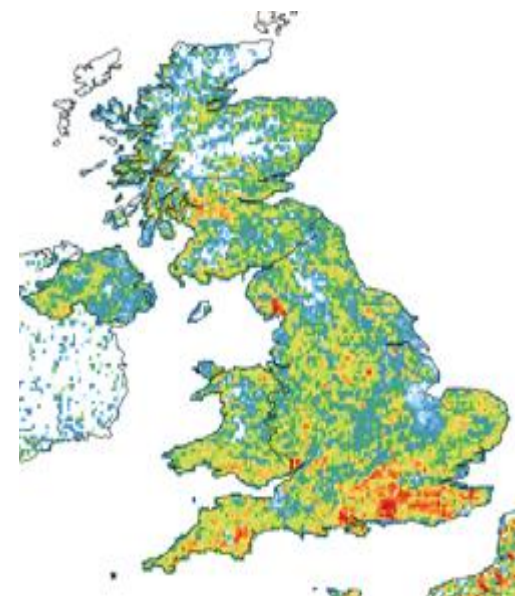
Annual value of health benefit

		Annual value	
		2015	2030
		£/yr	£/yr
PM2.5	Respiratory hospital admissions	£800,000	£500,000
	Cardiovascular hospital admissions	£700,000	£500,000
	Life years lost	£193,800,000	£106,500,000
SO2	Respiratory hospital admissions	£300,000	£200,000
NO2	Respiratory hospital admissions	£200,000	£50,000
	Cardiovascular hospital admissions	£100,000	£40,000
	Life years lost	£12,600,000	£3,800,000
O3	Respiratory hospital admissions	£2,200,000	£2,800,000
	Cardiovascular hospital admissions	£300,000	£400,000
	Deaths	£600,000	£700,000
Total		£211,600,000	£115,490,000

Where is the PM_{2.5} being removed



Coniferous woodland



Deciduous woodland

Physical account- national

Change in
concentration

Pollutant	Habitat	2007	2011	2015	2030
PM10	Current vegetation	11.55	10.74	9.9	8.01
	No vegetation	12.53	11.6	10.55	8.38
	Absolute difference	-0.98	-0.86	-0.65	-0.37
	Difference (%)	-7.8	-7.4	-6.2	-4.4
PM2.5	Current vegetation	6.36	6.08	4.85	3.31
	No vegetation	7.2	6.83	5.4	3.61
	Absolute difference	-0.84	-0.75	-0.55	-0.3
	Difference (%)	-11.7	-11.0	-10.2	-8.3
SO2	Current vegetation	1.46	1.07	0.85	0.5
	No vegetation	2.07	1.55	1.21	0.72
	Absolute difference	-0.61	-0.48	-0.36	-0.22
	Difference (%)	-29.5	-31.0	-29.8	-30.6

Monetary account - national

Annual value of health benefits

			Annual value				
			2007	2011	2015	2030	
			£/yr	£/yr	£/yr	£/yr	
Total value of air quality regulation	PM2.5	Respiratory hospital admissions	£5,400,000	£4,600,000	£3,500,000	£2,100,000	
		Cardiovascular hospital admissions	£4,600,000	£3,900,000	£3,000,000	£1,800,000	
		Life years lost	£1,495,800,000	£1,212,900,000	£882,300,000	£445,400,000	
	S02	Respiratory hospital admissions	£2,100,000	£1,600,000	£1,200,000	£700,000	
	NO2	Respiratory hospital admissions	£2,300,000	£1,300,000	£800,000	£20,000	
		Cardiovascular hospital admissions	£1,900,000	£1,000,000	£700,000	£20,000	
		Life years lost	£196,600,000	£101,900,000	£64,500,000	£500,000	
	O3	Respiratory hospital admissions	£31,100,000	£32,500,000	£33,400,000	£39,000,000	
		Cardiovascular hospital admissions	£4,700,000	£4,900,000	£5,000,000	£5,800,000	
		Deaths	£10,800,000	£10,500,000	£11,400,000	£12,700,000	
	Total			£1,755,300,000	£1,375,100,000	£1,005,800,000	£508,040,000