Addressing global climate change: capturing and storing carbon in Sustainable Drainage (SUDS) devices using Coventry, West Midlands, UK, as a case study

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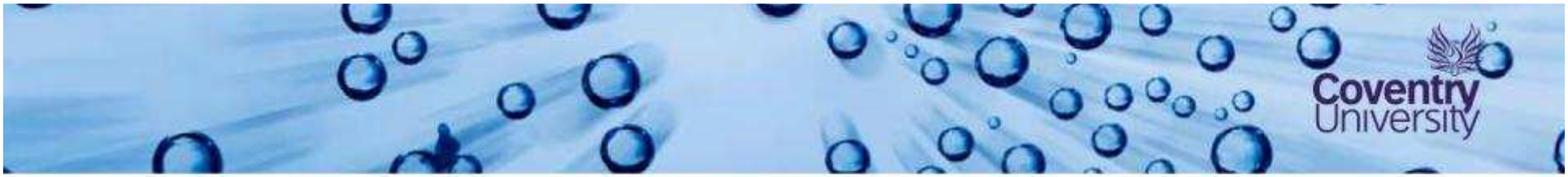
Coventry University



1. The background
2. Carbon sequestration rates of SUDS
3. Case study: Coventry

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Global Climate Change in perspective

- Urban areas = 2.4% of global land mass
- House 50% of human population
- Responsible for >70% global CO_2 emissions
- By 2050, >70% of human population will live in urban areas….

- Carbon sequestration (CS)
- Capture, isolation and diversion to storage of carbon emissions
- A method of keeping carbon emissions from reaching the atmosphere
- Can also include the removal of CO_2 from the atmosphere
- Typically using vegetation

The spirit of SUDS

Coventry University

Multiple benefit and flexible approaches

Climate change adaptation and mitigation

Role of new development and retrofit

What is practical in an urban environment?

NB Always look on the bright side…. (with apologies to Monty Python)

Vegetated SUDS devices - a spotter's guide

- Constructed wetlands
- Ponds
- Swales
- Green roofs/ walls
- Vegetated permeable paving
- Trees

CS abilities of various SUDS devices

Device	C sequestration rate
1 tree	100 kg C yr^{-1}
Green roof	0.4 kg C m^{-2} yr^{-1}
Pond	0.33 kg C m^{-2} yr^{-1}
Wetland	0.0029-2.2 kg C m^{-2} yr^{-1}
Turf	0.032-0.078 kg C m^{-2} yr^{-1}

Charlesworth & Warwick 2011

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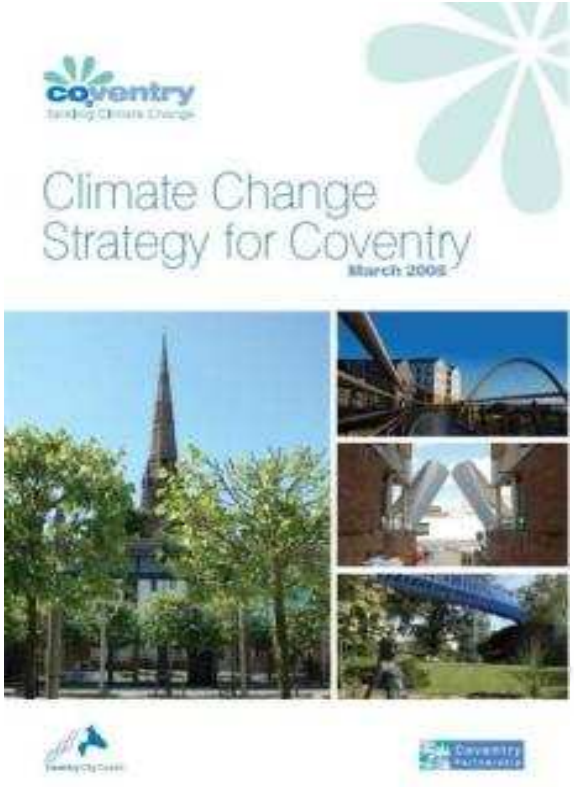
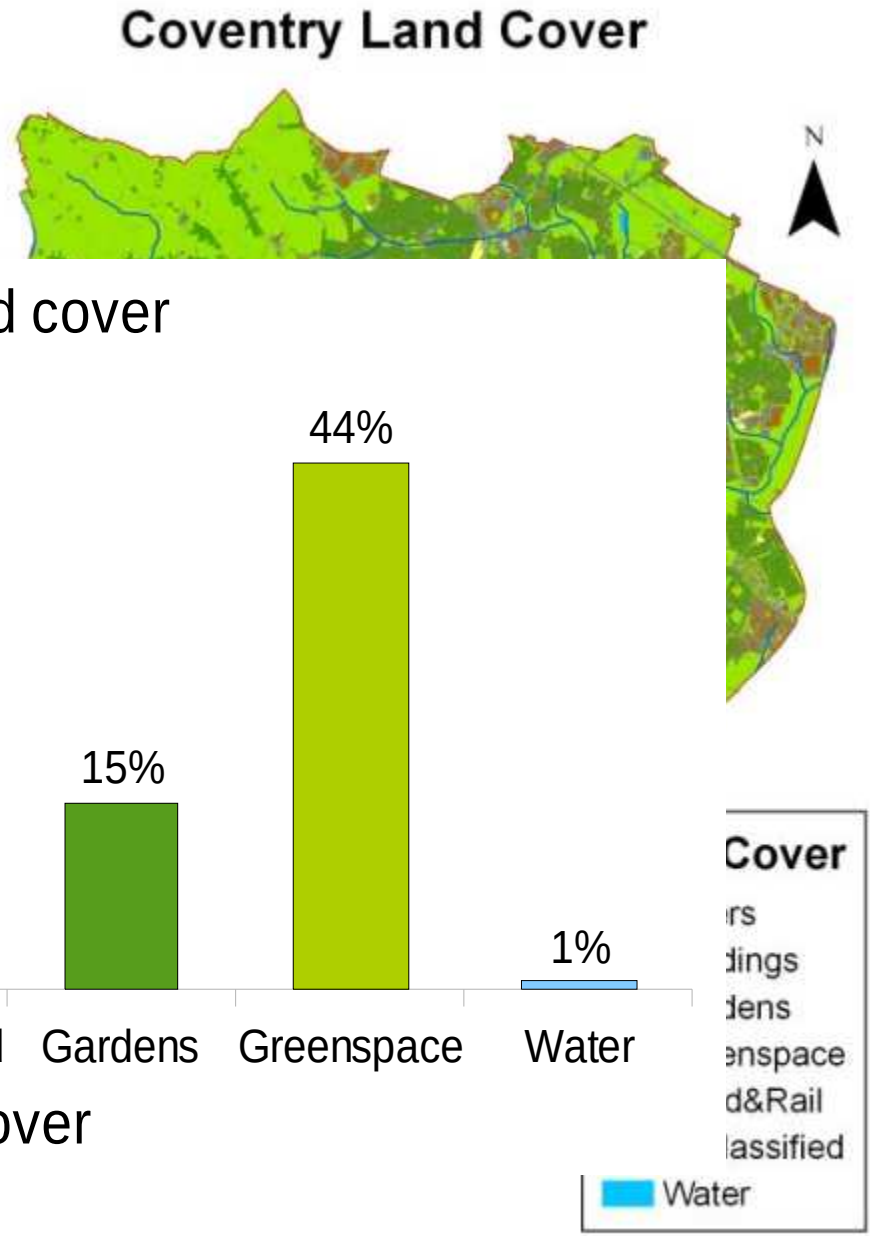
Vegetated permeable paving, Kenilworth

Case study: Coventry

- In central England
- Area 98.6 km^2
- Population 310,000 (2008)
- 15 year planning horizon



Land Cover



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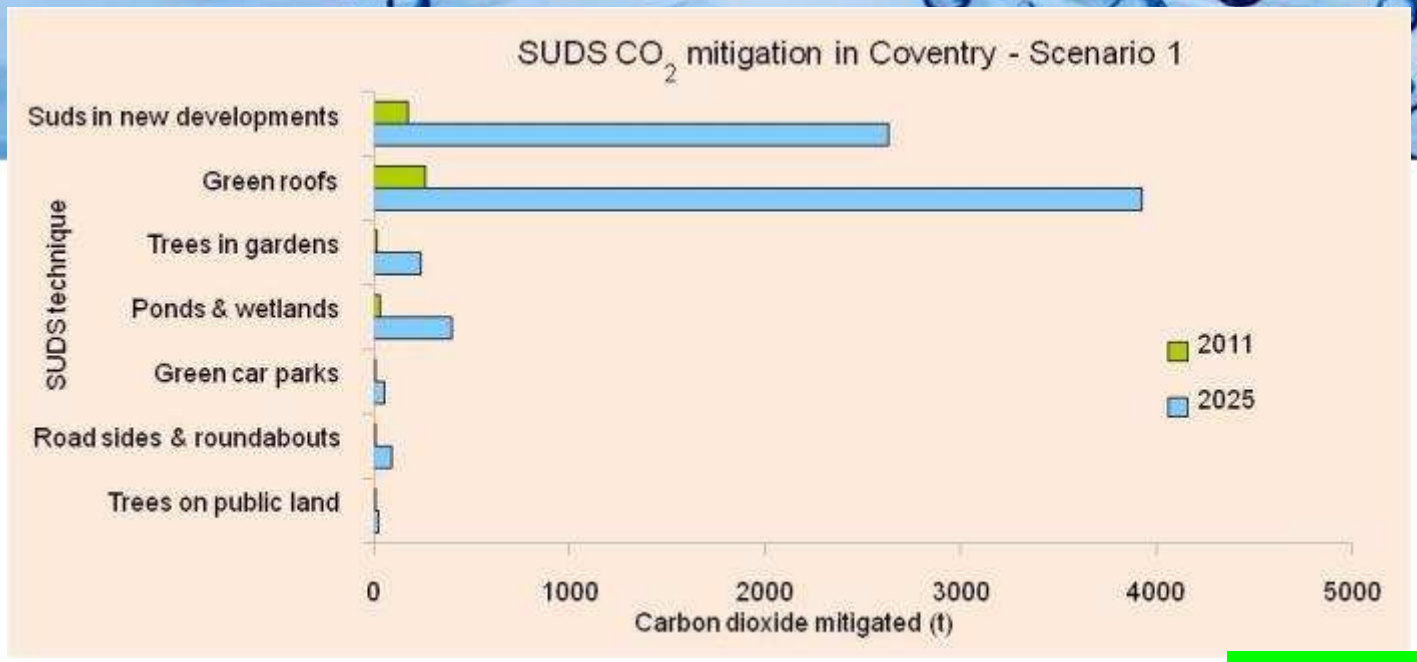
SUDS scenarios in Coventry

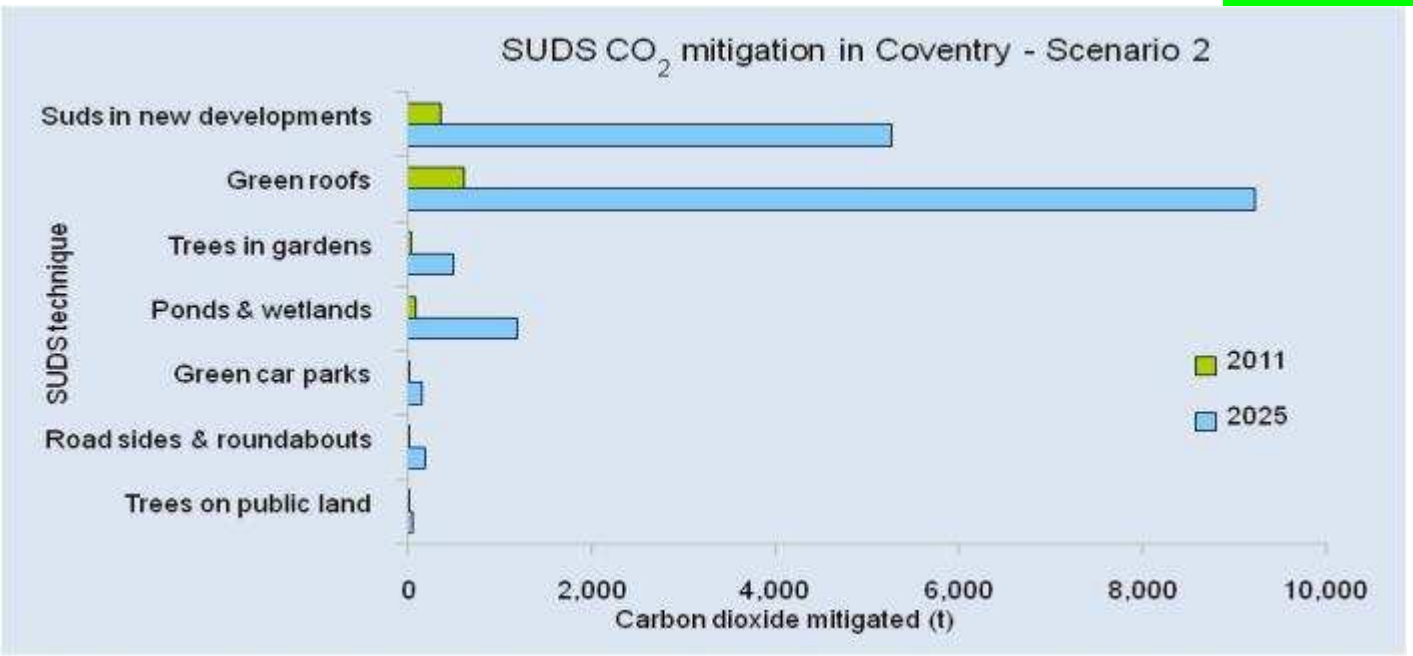
SUDS type	Scenario 1 (optimistic)	Scenario 2 (v.optimistic)
SUDS in new developments	Development rate 0.5% p.a. 10 15m^2 ponds 10 2000m^2 pocket parks	Development rate 1% p.a. 20 15m^2 ponds 20 2000m^2 pocket parks
Green roofs	Green roofs on 65% of roofs over 200m^2	Green roofs on 50% of all roofs in the city
Trees in gardens	1 additional tree in every garden	2 additional trees in every garden
Ponds	Double area of existing ponds	Quadruple area of existing ponds
Green car parks	Increased vegetation in/on public car parks	Increased vegetation in/on public and private / company car parks
Road sides & roundabouts	10% of impermeable area converted to vegetation	20% of impermeable area converted to vegetation
Trees on public land	10,000 additional trees p.a.	20,000 additional trees p.a.

- Not all data readily obtainable



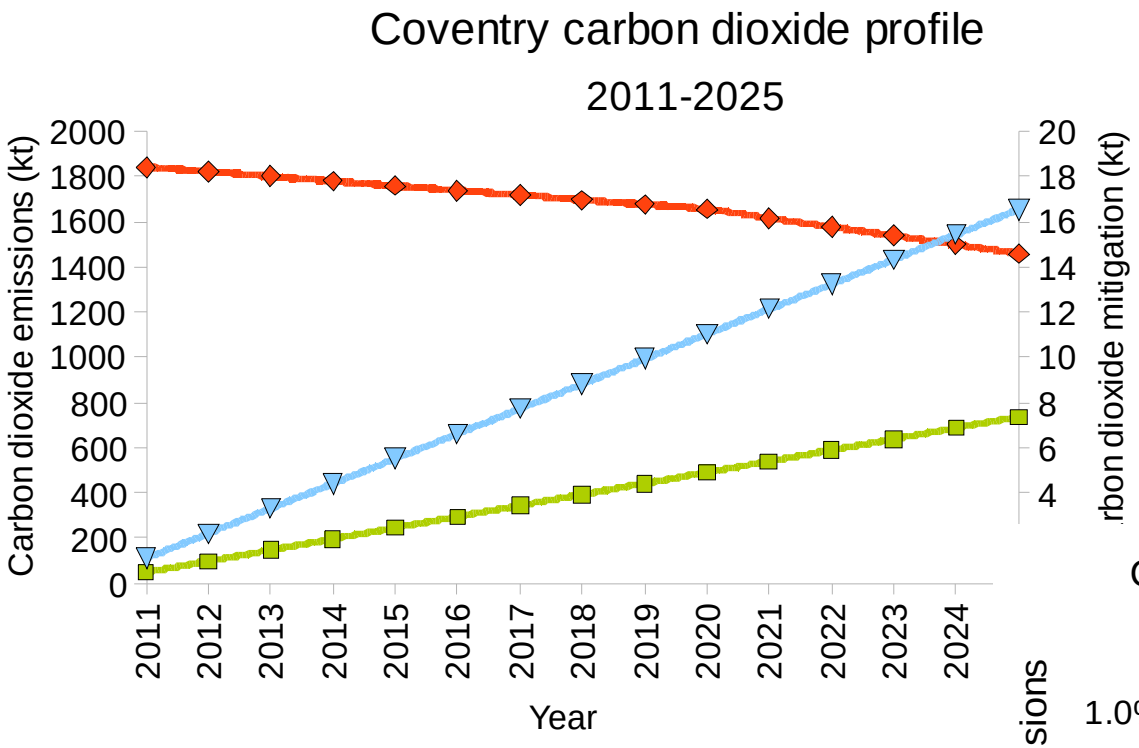
Retrofit contributes 64%

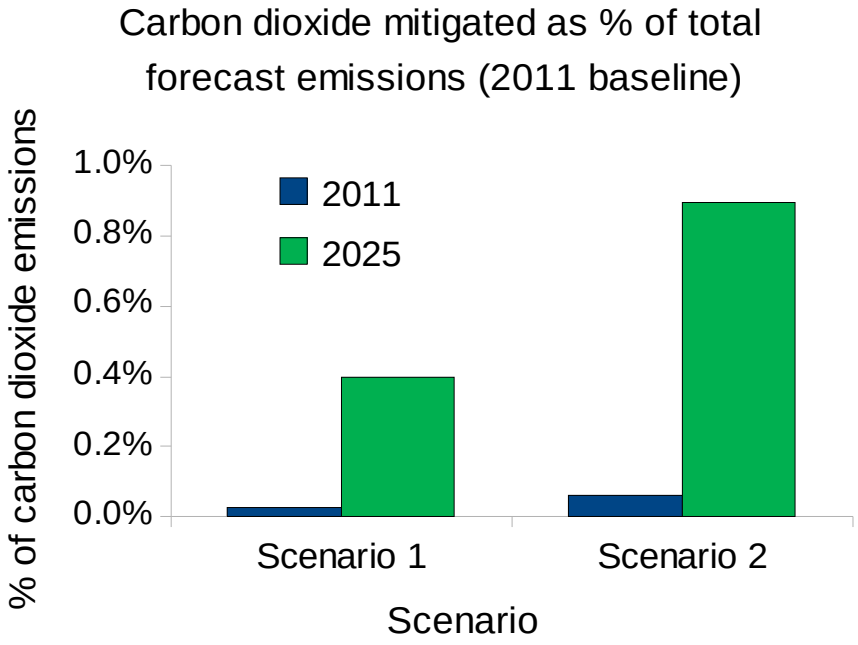
Use of SUDS for CS



Retrofit contributes 68%

SUDS contribution to mitigation





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Not addressed

- CO_2 emissions from some devices
- Life cycle
- C footprint of maintenance activities e.g. mowing, disposal of mowings
- Embedded C in e.g. tree pits, geotextile

- Reduction in CO_2 by shading and insulation
- Reduction in SW flow
- Economic value (e.g. reduction in energy use, improvement in air quality, reduced water usage)

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NB! Always look on the bright side….

Summary

- SUDS are flexible, multiple-benefit
- *In addition to other benefits*, SUDS devices sequester C
- Green roofs and new build SUDS contribute the most in this urban example
- Trees are emphasised in Coventry's climate strategy, but integration into urban areas difficult
- *Retrofit* of e.g. green roofs should be prioritised
- More research needed into carbon sequestration by SUDS

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Thank you!

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