Towards the best management of SuDS treatment trains

by

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SUDSnet
12-13 November 2009
Coventry

Overview

- SuDS presentation & Actual design
- Objectives
- Methodology
- Results
- Conclusion
- Further research
- Questions / feedback

The "treatment train"

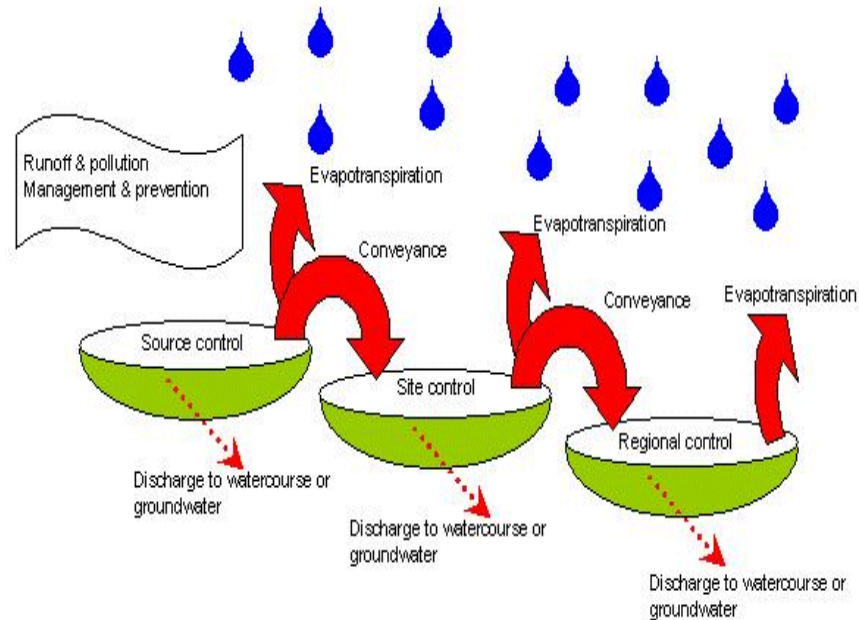Runoff & pollution Management & prevention

Evapotranspiration

Conveyance

Evapotranspiration

Conveyance

Evapotranspiration

Source control

Site control

Regional control

Discharge to watercourse or groundwater

Discharge to watercourse or groundwater

Discharge to watercourse or groundwater
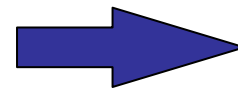
Treatment train
- Mimic natural drainage
- Better treatment
- Risk management
- Avoid shock loads

- Adoption
- Costs
- Land take
- Non integrated approach

Over 70% of SuDS schemes in Scotland are using only a single SuDS device (Wild, 2002)

Encourage move away from "end-of-pipe" techniques

Optimise management trains for different developments

Catchment and site characteristics

Land use

SuDS characteristics

Selection of potential source and site SuDS
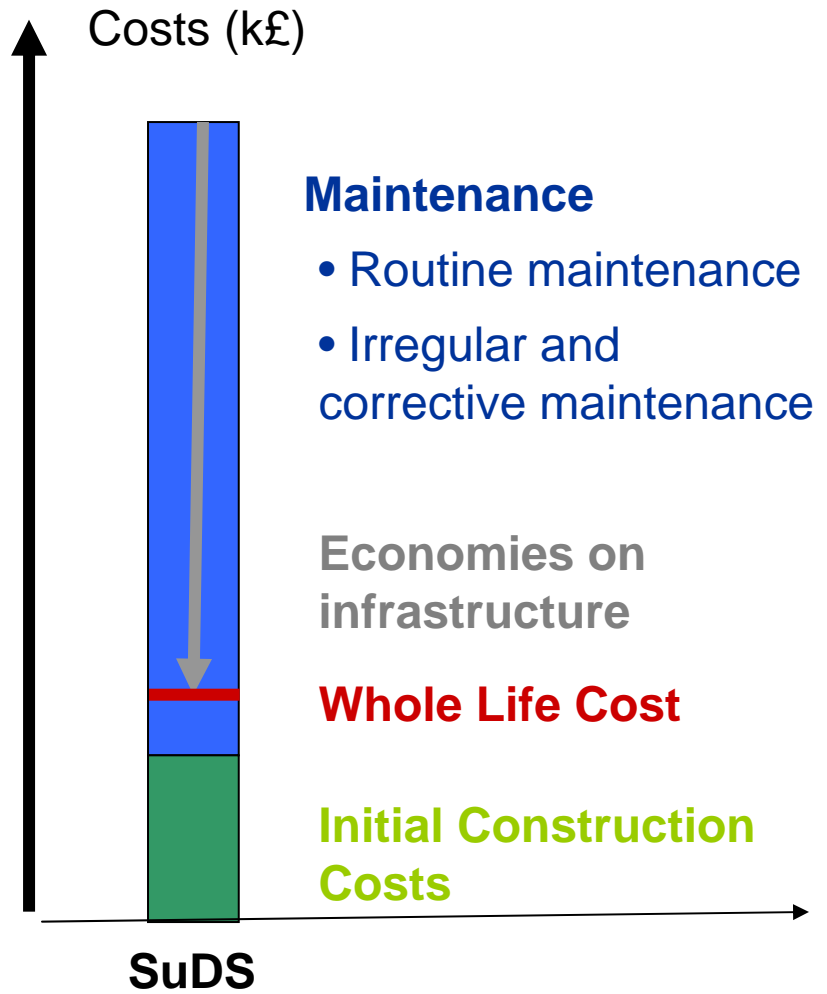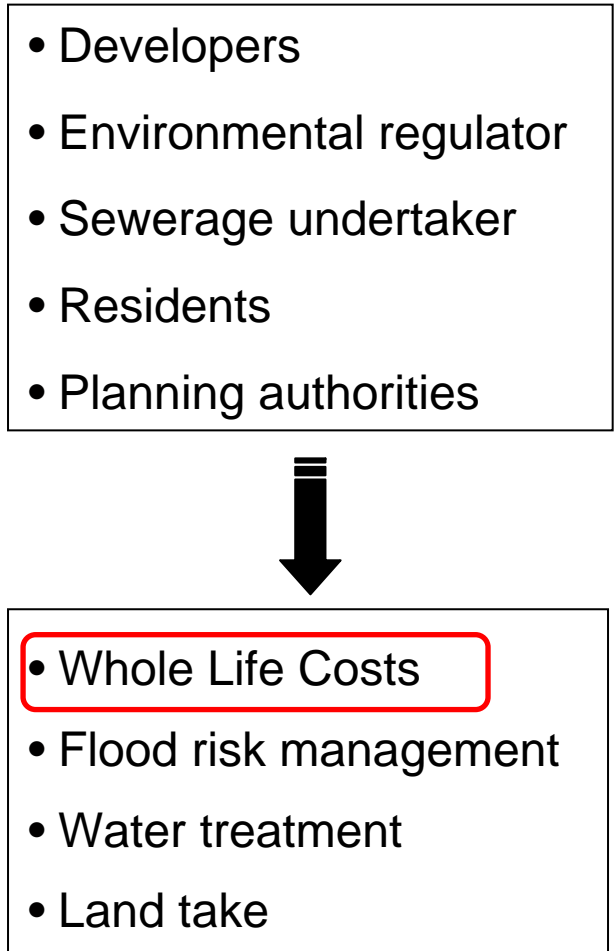
Holistic assessment of SuDS in series

- Developers
- Environmental regulator
- Sewerage undertaker
- Residents
- Planning authorities

- Whole Life Costs
- Flood risk management
- Water treatment
- Land take

Costs (k£)

Maintenance
- Routine maintenance
- Irregular and corrective maintenance

Economies on infrastructure

Whole Life Cost

Initial Construction Costs

SuDS

SuDS presentation

Objectives

Methodology
- Selection
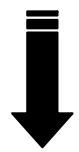- **Holistic assessment**
- Case study

Results

Conclusion

Further research

Questions

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- Whole Life Costs
- **Flood risk management**
- Water treatment
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Environmental regulator	Local authoirities

Impact on watercourse water quality and channel hydrology	Risk of downstream flooding

- No attenuation
- Limited attenuation (30 years)
- Robust attenuation (100 or 200 years)

SuDS presentation

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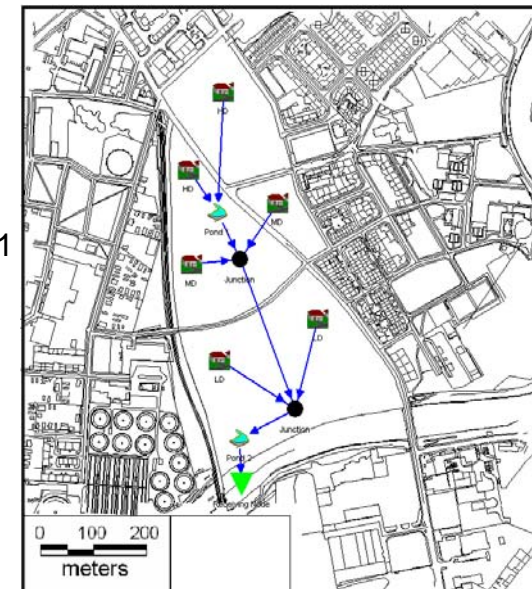
Parameters influencing SuDS water quality performance:

- Influent water quality

- SuDS ability to remove pollutants

- Residence time

- Area of facility

Model for urban stormwater improvement conceptualisation: MUSIC

Input:
M1-60 event
TSS 160 mg.l^{-1}
TN 2.63 mg.l^{-1}
TP 0.35 mg.l^{-1}

- Developers
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Design based on guidelines available in the UK:

- CIRIA , 2007. The SuDS Manual

- Scottish Water, 2007. Sewers for Scotland, 2^d edition

SuDS presentation

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Questions

Clyde Gateway SWMP:

- 339 Ha redevelopment
- 16 Ha allocated to regional SuDS controls

Dalmarnock Road area:

- 20 Ha development
- 5000 m² for regional control

- Catchment and site characteristics
- SuDS characteristics
- Land use
- Potential amenity – biodiversity / density
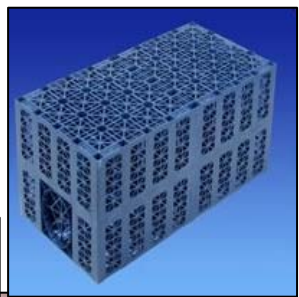
23 treatment trains

Whole Life Cost
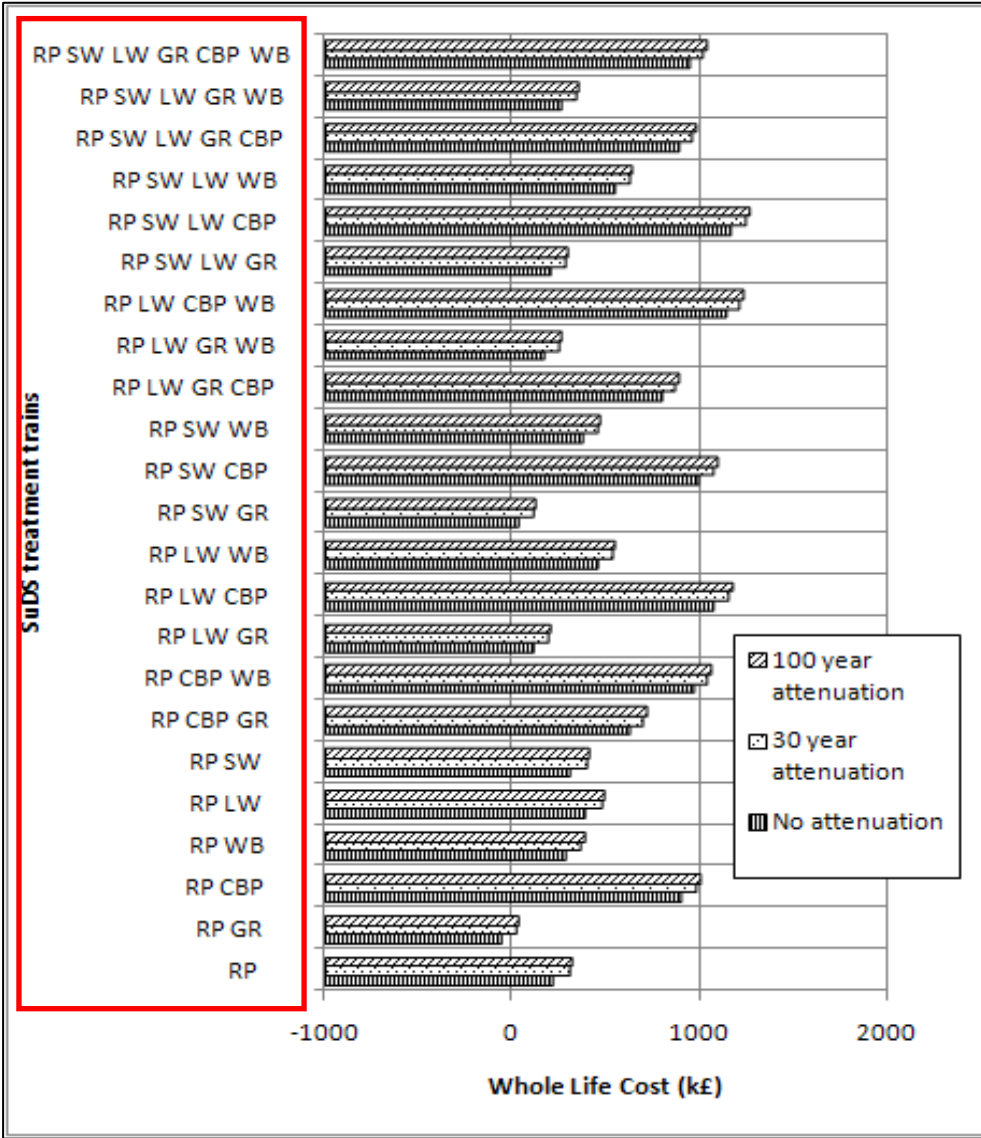
RP Regional Pond
GR Green Roof
CBP Concrete Block Pavement
WB Water Butt
SW Swales
LW Linear Wetland

A few interesting solutions:

- Green roofs
- Swales
- Linear wetland
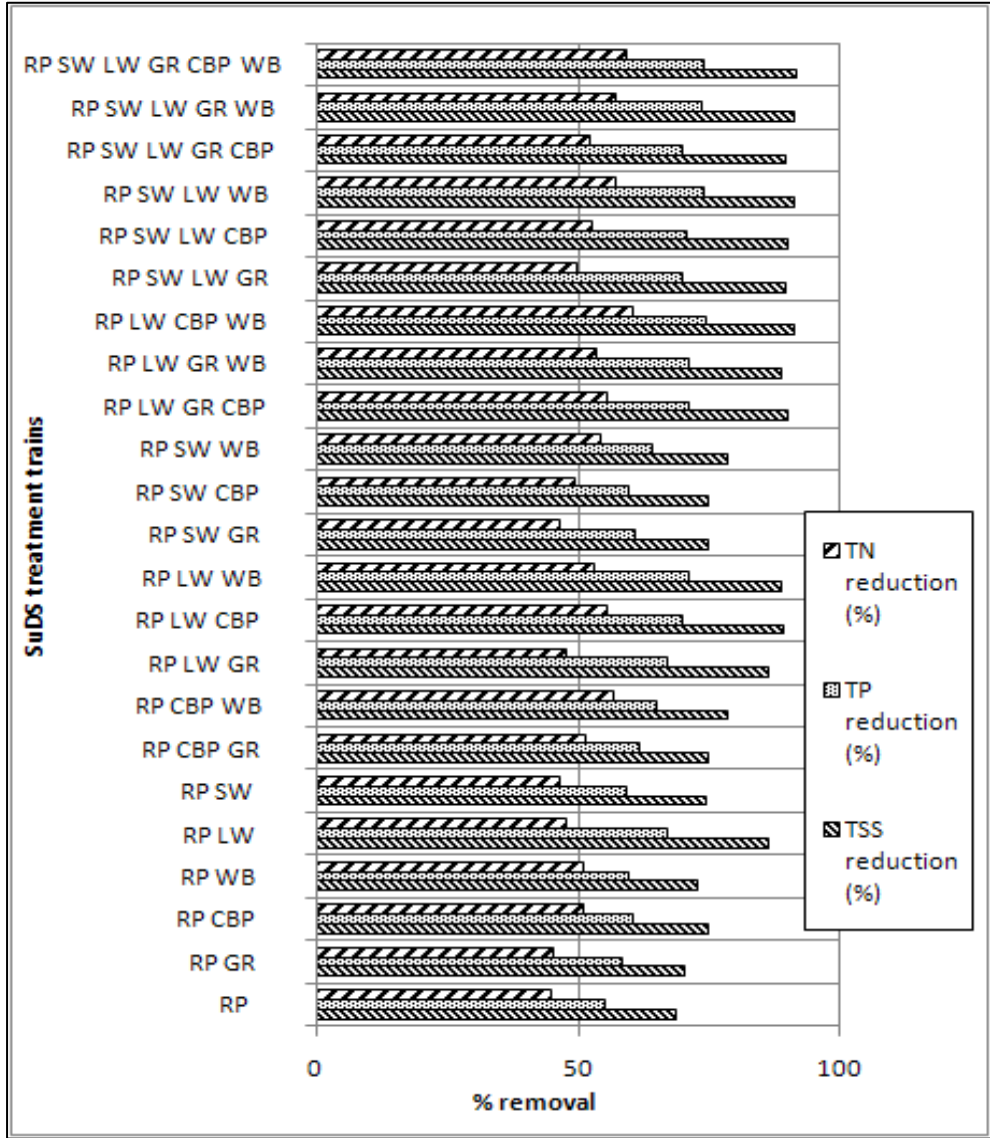
SuDS presentation

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Water quality

Significant water quality improvements

E.g. TSS improvement up to 25%.
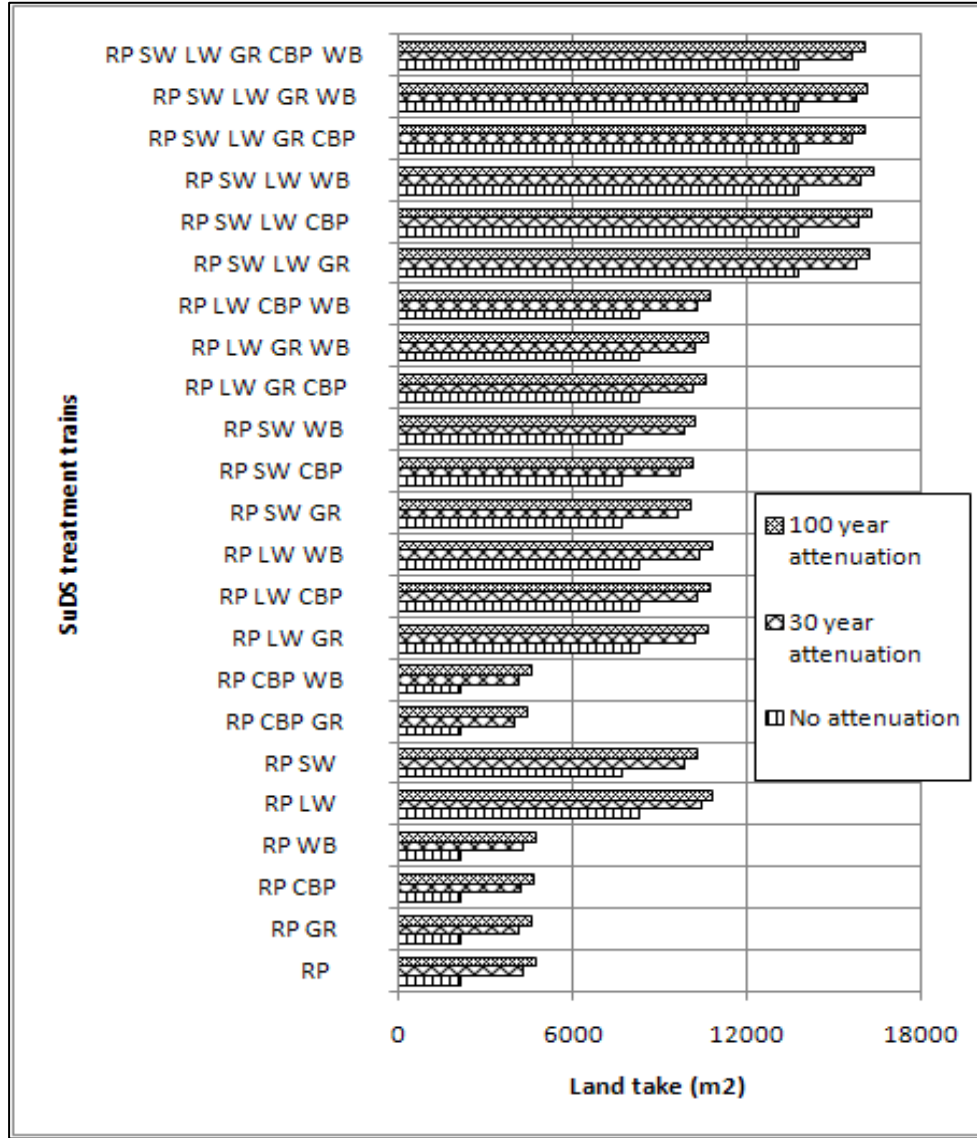
Land take

A few interesting solutions:

- Concrete Block Pavement
- Green Roofs

Opportunity to reduce land take based on:
- Reduction of attenuation volume
- Reduction of permanent pool

Land take reduction: permaenent pool reduction

SuDS Treatment Trains	Achievable reduction of regional SuDS land take (%)	Achievable reduction of SuDS treatment train's land take (%)
RP	0	0
RP GR	0	0
RP CBP	20	20
RP WB	13	13
RP LW	100	27
RP SW	20	6
RP CBP GR	20	20
RP CBP WB	33	33
RP LW GR	100	27
RP LW CBP	100	27
RP LW WB	100	27
RP SW GR	20	6
RP SW CBP	20	6
RP SW WB	26	7
RP LW GR CBP	100	27
RP LW GR WB	100	27
RP LW CBP WB	100	27
RP SW LW GR	100	16
RP SW LW CBP	100	16
RP SW LW WB	100	16
RP SW LW GR CBP	100	16
RP SW LW GR WB	100	16
RP SW LW GR CBP WB	100	16

* Based on TSS removal

Regional control can be significantly reduced

Difficult to offset SuDS treatment train footprint

SuDS presentation

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Establish relationship between:
- Whole life costs
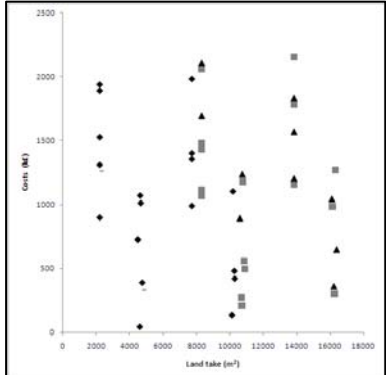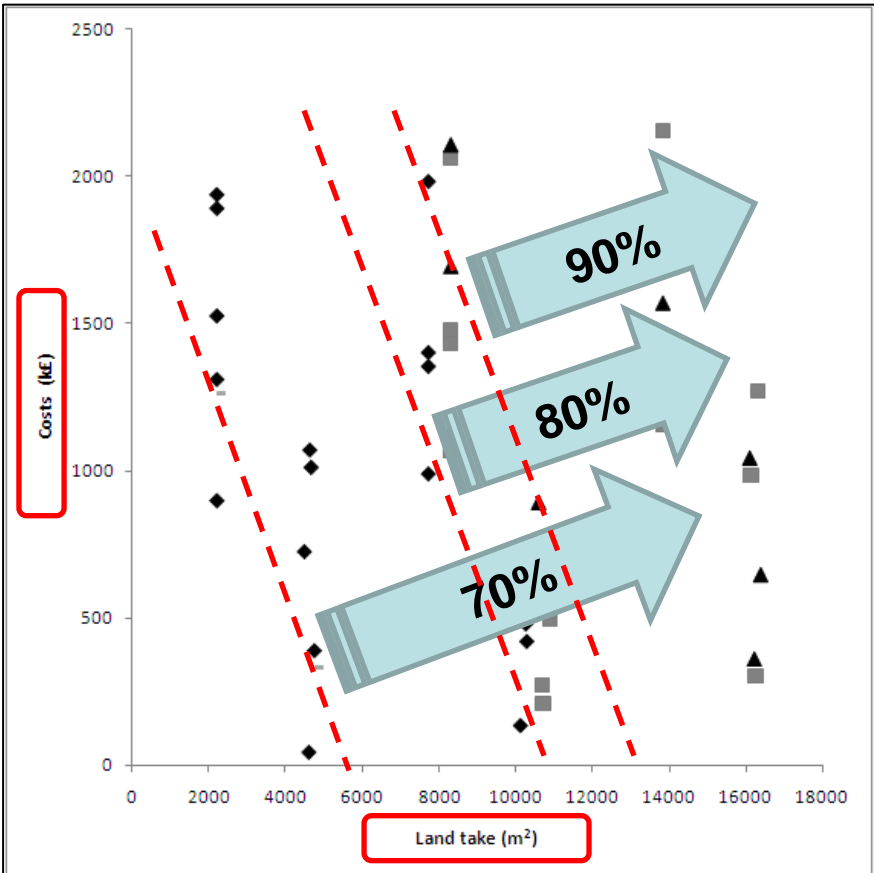- Land take
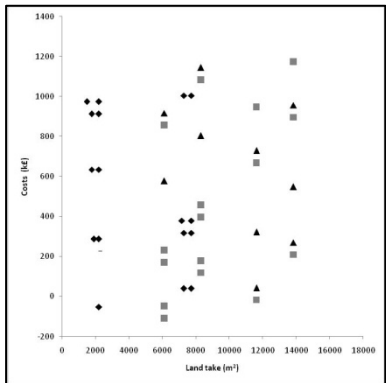- Water quality
- Flood risk management

Limited retention

Robust retention

- Alternative solutions are existing
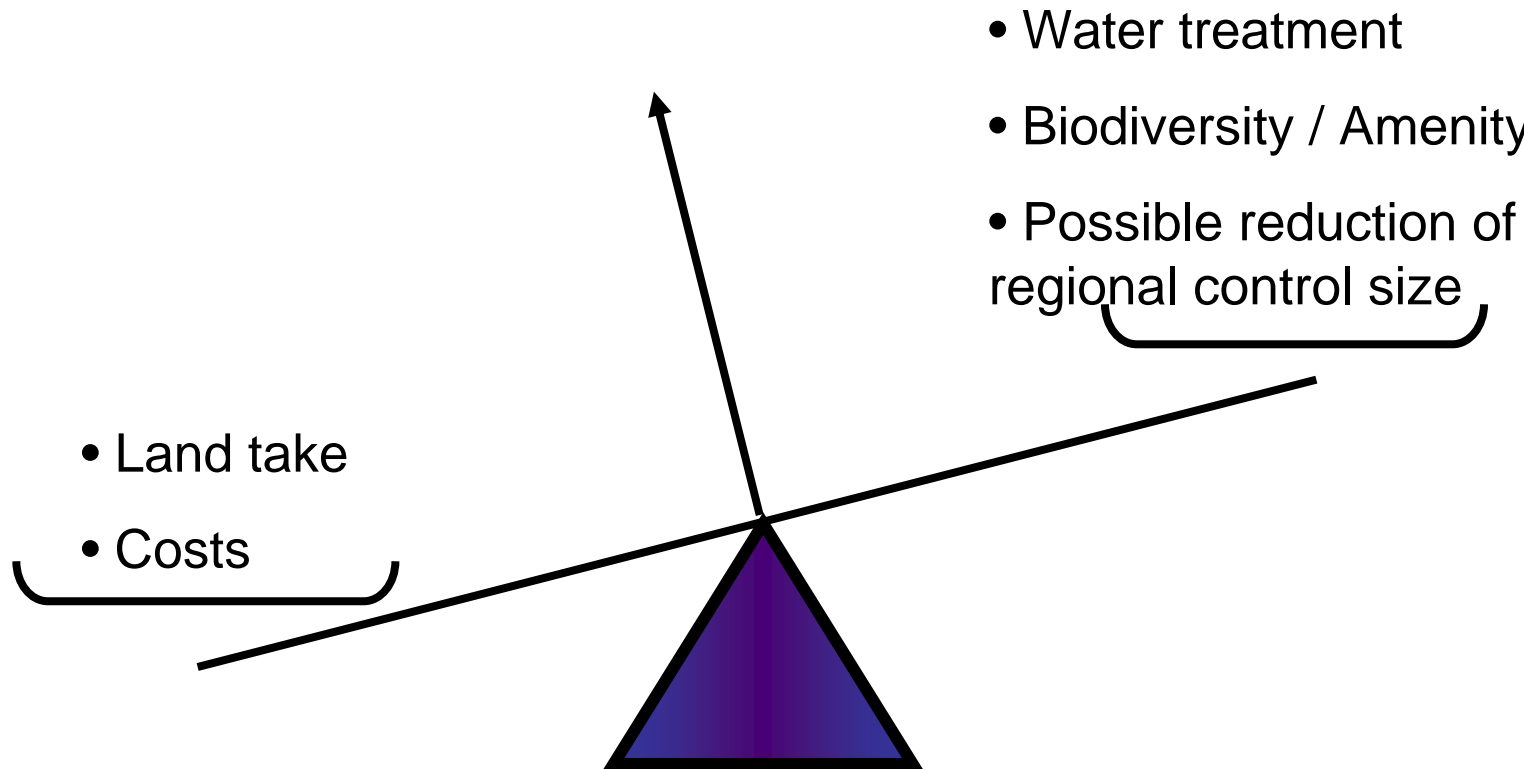
- Water treatment

- Biodiversity / Amenity

- Possible reduction of regional control size

- Land take

- Costs

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- Understand public perception of SuDS

Thank you!

Acknowledgements: