



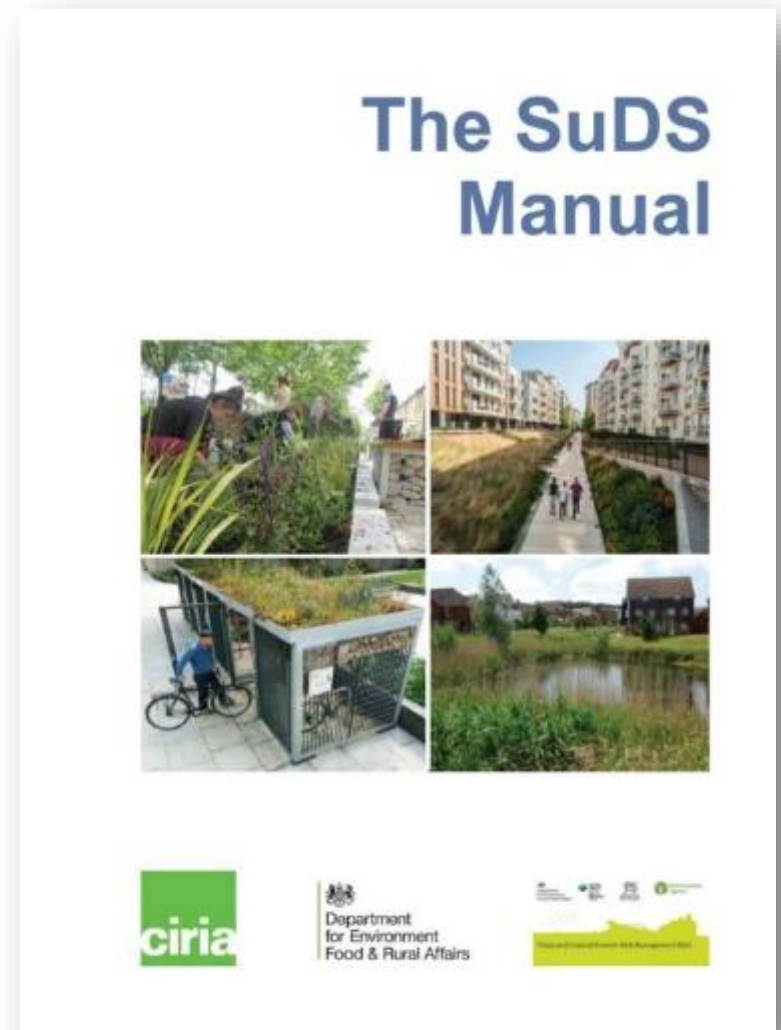
**Delivering & valuing the multiple
benefits of SuDS**
Paul Shaffer, CIRIA & Chris Digman, MWH

Elvetham Heath, Hampshire

This presentation



1. SuDS – What and why
2. Overview of SuDS Manual
3. Key messages from the SuDS Manual
4. Overview of BeST
5. BeST in practice





CIRIA is a neutral, independent, not-for-profit organisation. We facilitate a range of collaborative activities that help improve the construction industry.



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Planning advice for integrated water management

The University of Cambridge Institute for Sustainability Leadership, is publishing planning advice for integrated water management. [Read more](#)

Trees in Hard Landscapes: A Guide for Delivery out for consultation

Upcoming events

RPIE 2014

MO	TU	WE	TH	FR	SA	SU
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

Forum

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Resource of the month

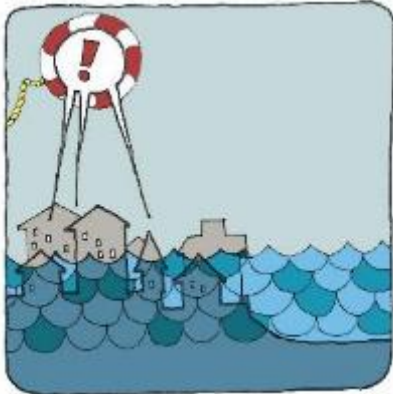
CIRIA



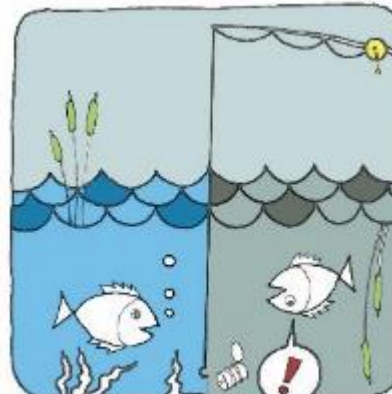
- Founded 1960
- Independent / collaborative approach
- Member-based, around 500 corporate members
- Focus on performance improvement
- Cross sector / inter disciplinary

Why bother

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Flooding – people and property



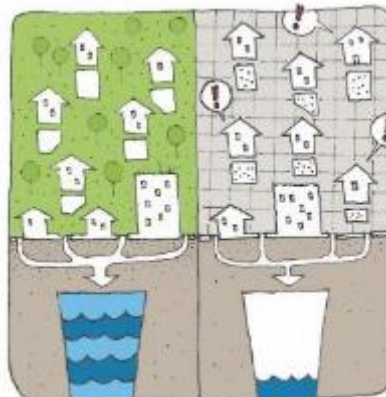
Water quality of urban watercourses



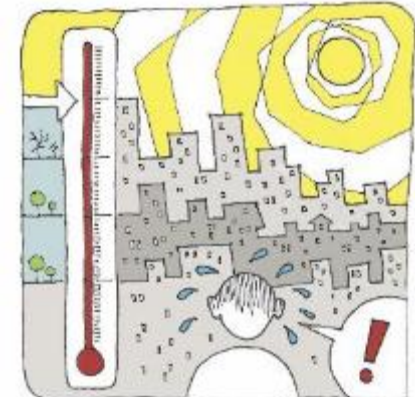
Connecting with water (on the surface)



Legislation and planning



Support growth – population & economy



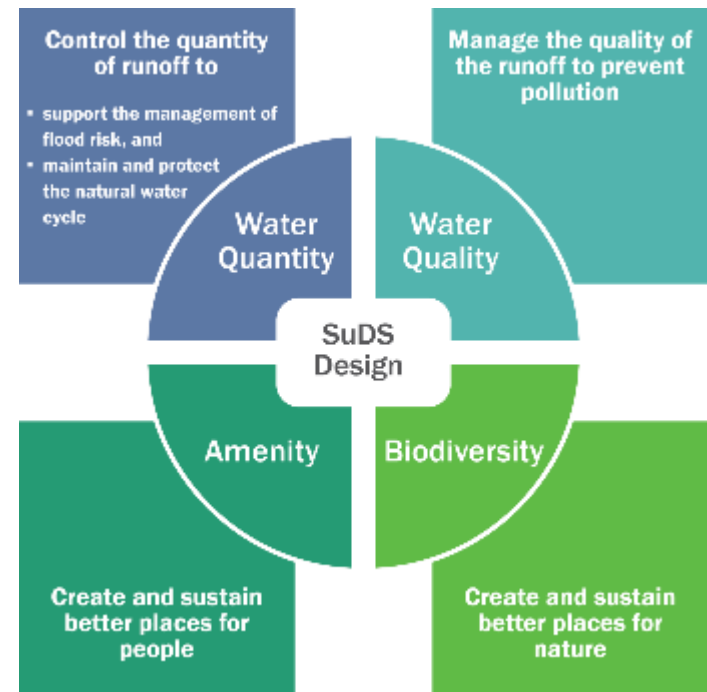
Liveability – quality of life

How do we change



Sustainable Drainage Systems objectives manage the impacts from development on the quantity and quality of runoff and are environmentally beneficial.

- Manage flood risk
- Manage diffuse pollution
- Provide amenity
- Enhance biodiversity



SuDS components

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What can SuDS deliver?



Why bother?



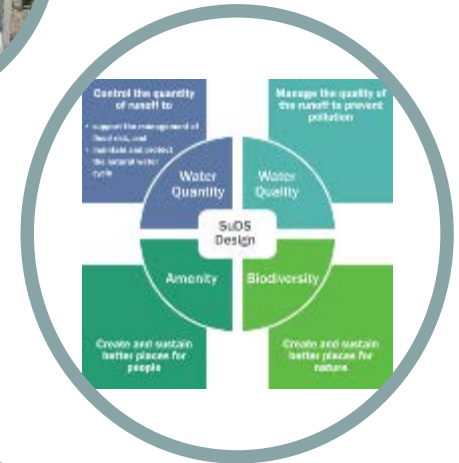
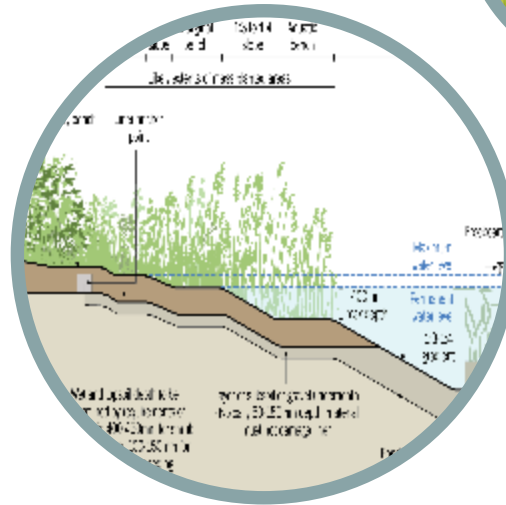
- Review and use evidence and experience
- Support evolving legislation
- Support those involved in SuDS delivery
- Encourage practitioners to maximise SuDS benefits
- Support the delivery of cost-effective SuDS schemes
- To inspire and support change



Aims of the manual



- Technical leadership
- Motivational
- Supportive
- Interdisciplinary
- Comprehensive
- Inspirational



Who is the SuDS manual for?

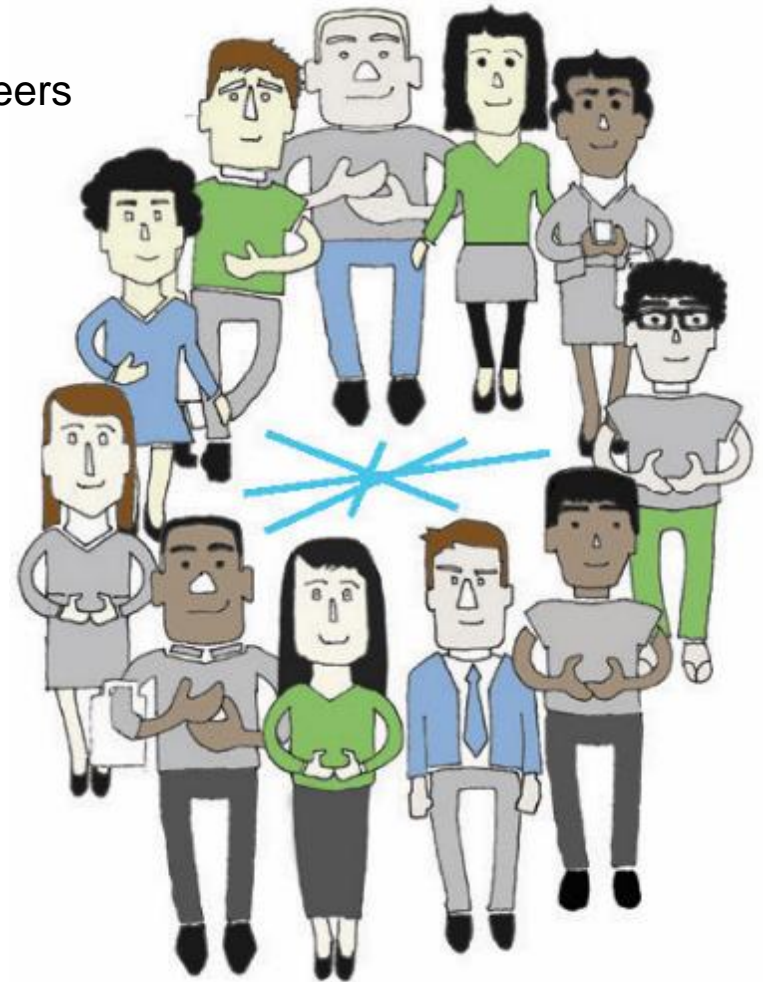


■ Disciplines

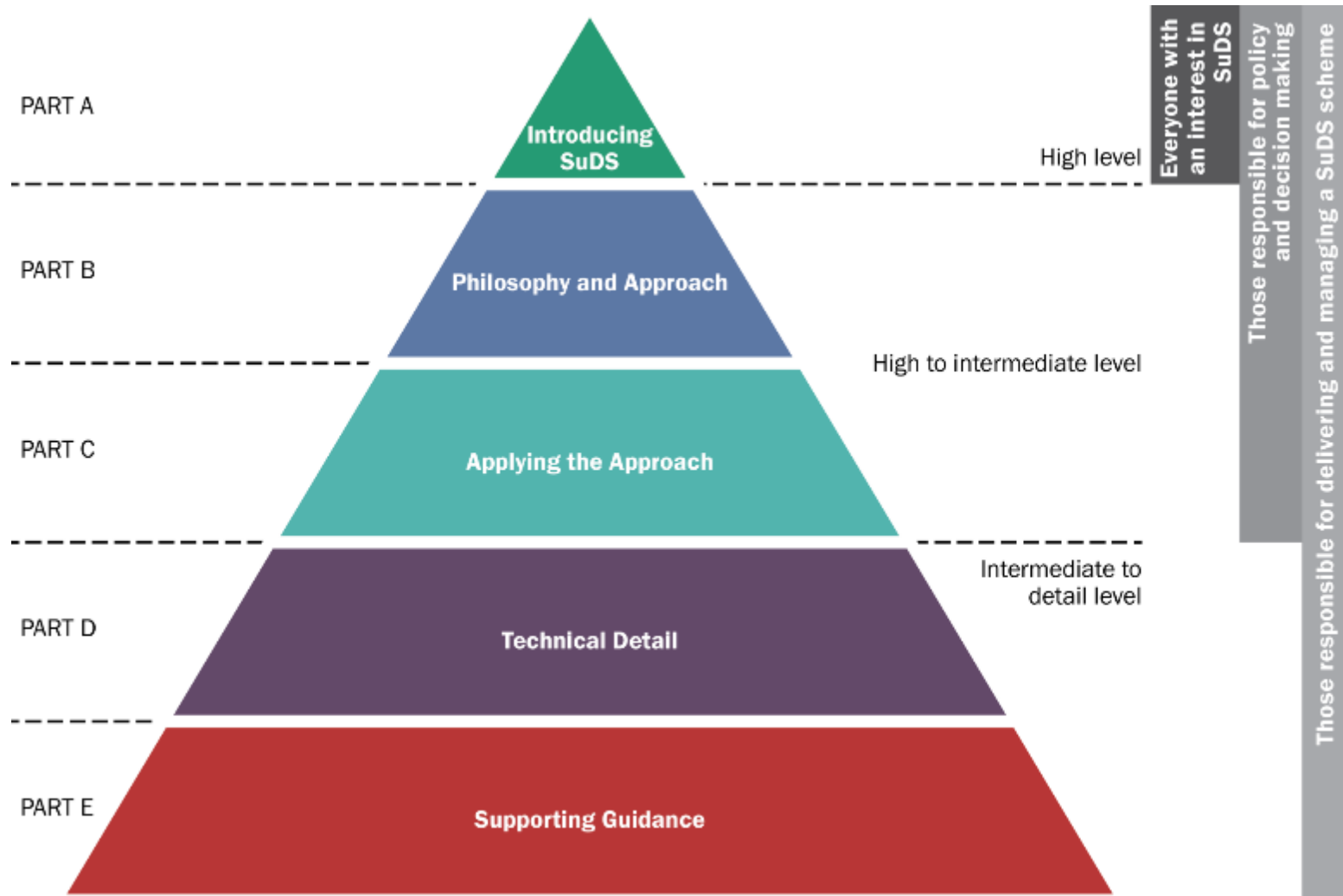
- Drainage and flood risk management engineers
- Landscape architects
- Planners
- Urban designers and architects
- Ecologists

■ Organisations

- Local authorities
- Environmental regulators
- Highways and road authorities
- Sewerage undertakers
- Site owners and developers
- Drainage and landscape contractors
- Proprietary drainage and other product manufacturers



Structure of the SuDS manual



SuDS Manual contents



Principles	Planning
Process	
Engagement	
Overcoming challenges	
Costs and benefits	
Submissions	

Criteria	Design
Methods	
Detailed component design	
Materials	
Inlets and outlets	
Landscape	

Planning	Construction
Processes	
Programming	
Method statements	

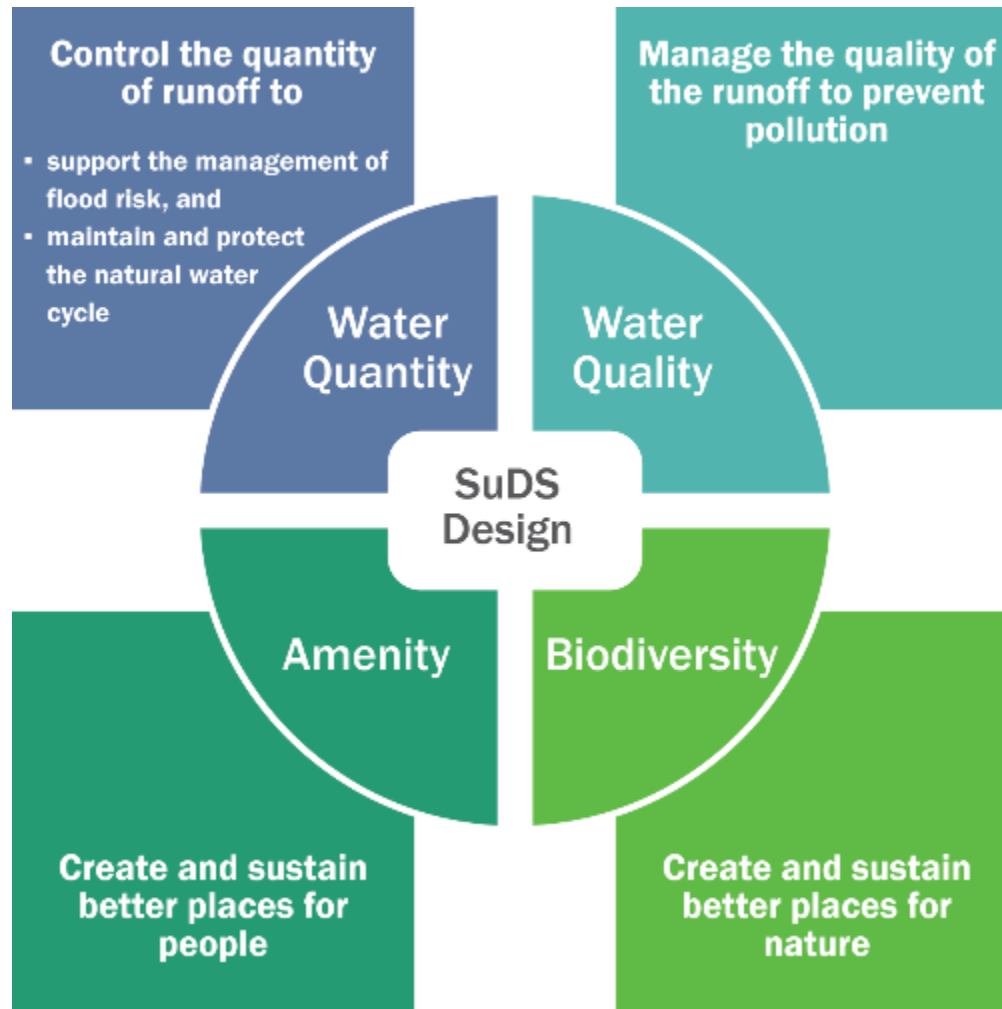
Objectives	Maintenance
Waste management	
Activities	
Frequencies	
Specifications	
Maintenance plans	

The key principle

The logo for Ciria, consisting of the word "ciria" in a white, lowercase, sans-serif font, positioned within a solid green square.

Surface water runoff should be managed for maximum benefit

What is good SuDS design?



SuDS design criteria



Water quantity

- Use surface water runoff as a resource
- Support the management of flood risk in the receiving catchment
- Protect morphology and ecology in receiving surface waters
- Preserve and protect natural hydrological systems on the site
- Drain the site effectively
- Manage on-site flood risk
- Design system flexibility/adaptability to cope with future change

- Flood risk
- Water resources
- Protecting water bodies

Water quality

- Support the management of water quality in the receiving surface waters and groundwaters
- Design system resilience to cope with future change

- WQ protection

Amenity

- Maximise multi-functionality
- Enhance visual character
- Deliver safe surface water management systems
- Support development resilience/adaptability to future change
- Maximise legibility
- Support community environmental learning

- Urban living
- Quality of life
- Climate resilience

Biodiversity

- Support and protect natural local habitats and species
- Contribute to the delivery of local biodiversity objectives
- Contribute to habitat connectivity
- Create diverse, self-sustaining and resilient ecosystems

- Ecological diversity
- Resilience
- Value

Delivery mechanisms



Water quantity

- Rainwater harvesting
- Runoff flow rate control
- Runoff volume control
- Runoff frequency control
- Designing for exceedance

Water quality

- Pollution prevention
- Interception
- Treatment
- Soil protection and remediation
- Waste management

Amenity

- Integrate in the landscape
- Urban design with water
- Urban space multi-functionality

Biodiversity

- Plant species and diversity
- Habitat connectivity
- Local biodiversity objectives

What does the manual look like?



CIRIA SuDS Manual 2015

SECTION A

SECTION B

Figure 10.20 Typology 1 – Small residential in-fill

Chapter 10: Designing for urban areas

25

CIRIA SuDS Manual 2015

CASE STUDY Derbyshire Street

The eastern end of Derbyshire Street was a dead-end road that only served as a space for 12 parking bays, suffering from fly-tipping and providing opportunities for anti-social behaviour. The pocket park concept was developed to provide a stronger social function with a cycle lane and an outdoor cafe space. Core to the design philosophy was managing surface water runoff within the park and, in turn, reducing the potential for flooding locally and within the wider catchment area.

- A planted rain garden receives surface water runoff from the hard surfaces running the length of the street and provides a physical barrier between the cycle lane and the outdoor cafe space.
- Downpipes have been redirected into attenuating planters, providing water storage as well as overflowing into the rain garden.
- Permeable paving with infiltration into the ground is provided within the outdoor cafe space, allowing it to soak into the ground, as well as providing a physical barrier between the cycle lane and adjacent residential flats.
- Green roofs have also been installed to provide interception and attenuate runoff, attracting birds, butterflies and bees.

LOCATION: London, UK
DESIGNER: London Borough of Tower Hamlets

Chapter 10: Designing for urban areas

45

Infill

Typically this type of housing is in rear gardens, on-street parking between public and private spaces, based on the street, providing SuDS opportunities. As SuDS design should be based on the street, providing SuDS opportunities. As SuDS design should be based on the street, providing SuDS opportunities.

Chapter 10: Designing for urban areas

45

Chapter 05

Designing for amenity

This chapter explains the objective of designing for amenity, and the design criteria that should be followed to deliver this objective.

- ▶ *This chapter should be read alongside Chapters 3, 4 and 6 to understand how the different SuDS design criteria relate to each other, and Chapter 7 to understand when and how to apply these criteria.*
- ▶ *Further discussion on designing for amenity specifically within the urban context can be found in Chapter 10.*

5.1 AMENITY DESIGN OBJECTIVE

Create and sustain better places for people

Good urban design aims to deliver attractive, pleasant, useful and above all “liveable” urban environments that support and enhance local communities (Box 5.1). Water is a valuable natural resource, and the management of rainfall and runoff can form a key part of an urban vision. Designs using surface water management systems to help structure the urban landscape can enrich its aesthetic and recreational value, promoting health and well-being and supporting green infrastructure. Water managed on the surface, rather than underground, can help to reduce summer temperatures, provide habitat for flora and fauna, act as a resource for local environmental education programmes and working groups and directly influence the sense of community and prosperity of an area. SuDS can provide opportunities for water to be visible and audible as it travels through the landscape – the places where water flows, stills, trickles or splashes are often where it is experienced and valued the most.

BOX 5.1 Amenity, place-making and liveability

Amenity may be defined as “a useful or pleasant facility or service”, which includes the tangible (something that can be measured in terms of use), and the less tangible (something that can be experienced as pleasure or aesthetic appreciation).

This definition is particularly relevant for describing the multi-functional opportunities associated with SuDS designs, and it provides a link to the concept of **place-making**, now commonly used in describing the quality of a space in urban design.

Amenity also covers **liveability**, which is associated with factors that improve the quality of life for inhabitants. Liveability encompasses the well-being of a community and of individuals and comprises the many characteristics that make a location a place where people want to live and work.

There are many amenity benefits that are intrinsic to SuDS – good SuDS design often provides amenity benefits while delivering water quantity, water quality and biodiversity benefits.

Where the concept of “creating and sustaining better places for people” is embedded in

CASE STUDY 5.1 The Triangle, Swindon



Figure 5.1 The green

The Triangle is an award-winning development of 43 low-cost properties (2, 3 and 4 bedrooms) for social housing in Swindon. The design looked to conserve 50% of the area for contiguous open space as a multi-functional landscape. The integrated plan combined social requirements with water attenuation and storage, biodiversity and edible streets and gardens.

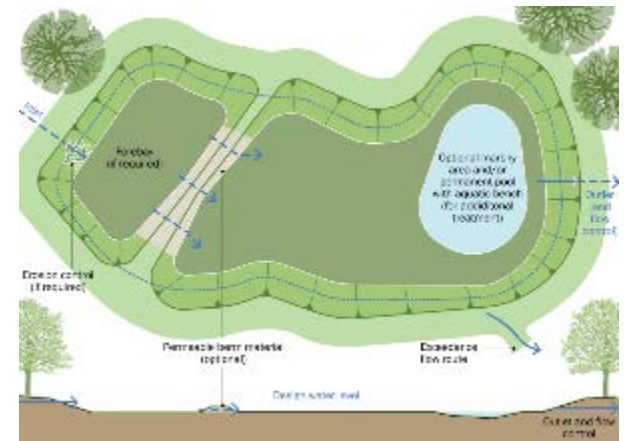
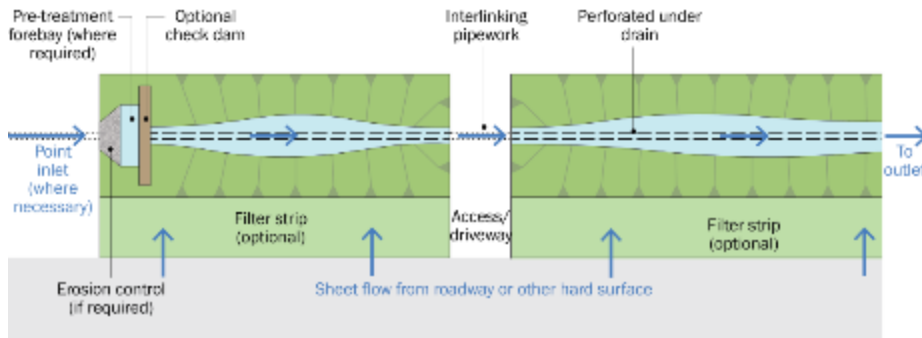
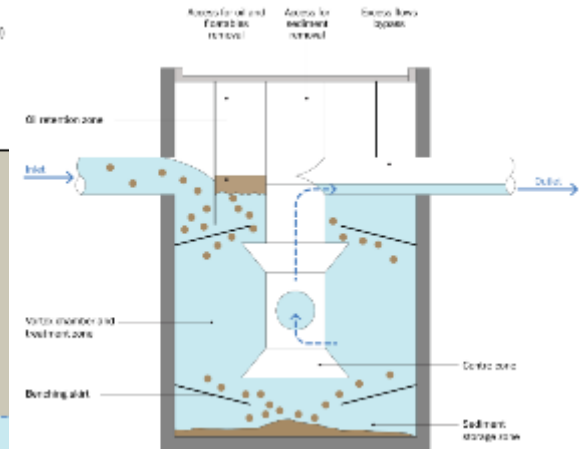
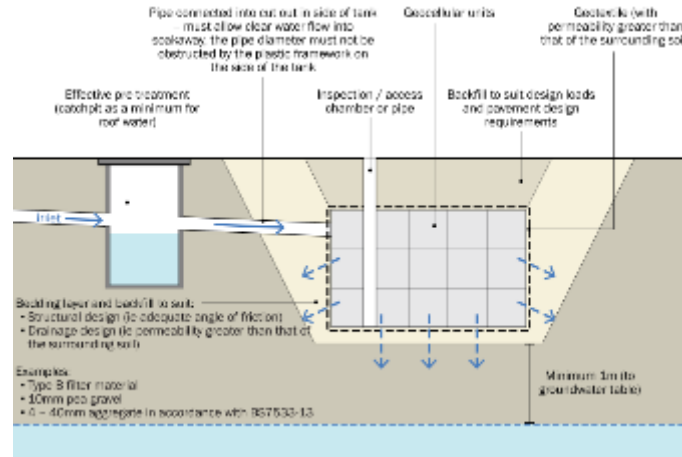
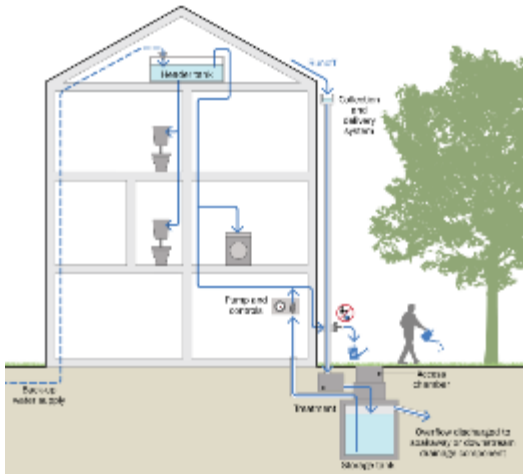
All roof water is harvested and stored in underground tanks located in two kitchen gardens, accessed by hand pumps to irrigate vegetables and fruits. Surface water is attenuated in porous paving on all car park spaces, and the home zone street water is conveyed by a wide dished granite sett channel that clearly shows water moving towards a bioswale on two sides of the central triangular green. The base of the swale is planted with white willows and damp meadow species for biodiversity, water treatment, air improvement, urban thermal regulation and aesthetic amenity, making reference to the landscape signature of this clay lowland. It is a place for playing in, with stepping and balancing logs and bridges, and it forms a barrier for cars that might be tempted to park on the green.

Water filtered by vegetation is conveyed to a geocellular storage tank under the green, and a hand pump linked to a rill carved in a tree trunk allows kids to play with water. Finally, any excess water from the storage tank can be stored in oversized storm drains under the road, a requirement of Thames Water.



Figure 5.2 Play pump (a) and

Component design



Thanks to the funders for the Manual



Department
for Environment
Food & Rural Affairs



Llywodraeth Cymru

CampbellReith
consulting engineers



grant associates



HR Wallingford
Working with water

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Stormwater
MANAGEMENT





The benefits of BeST

Benefits of SuDS Tool

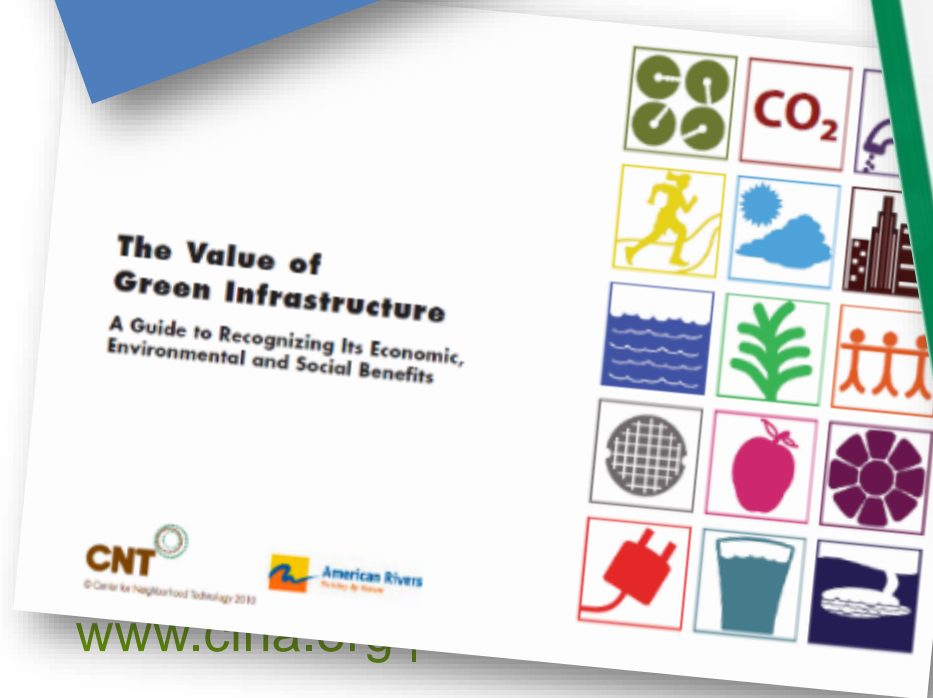
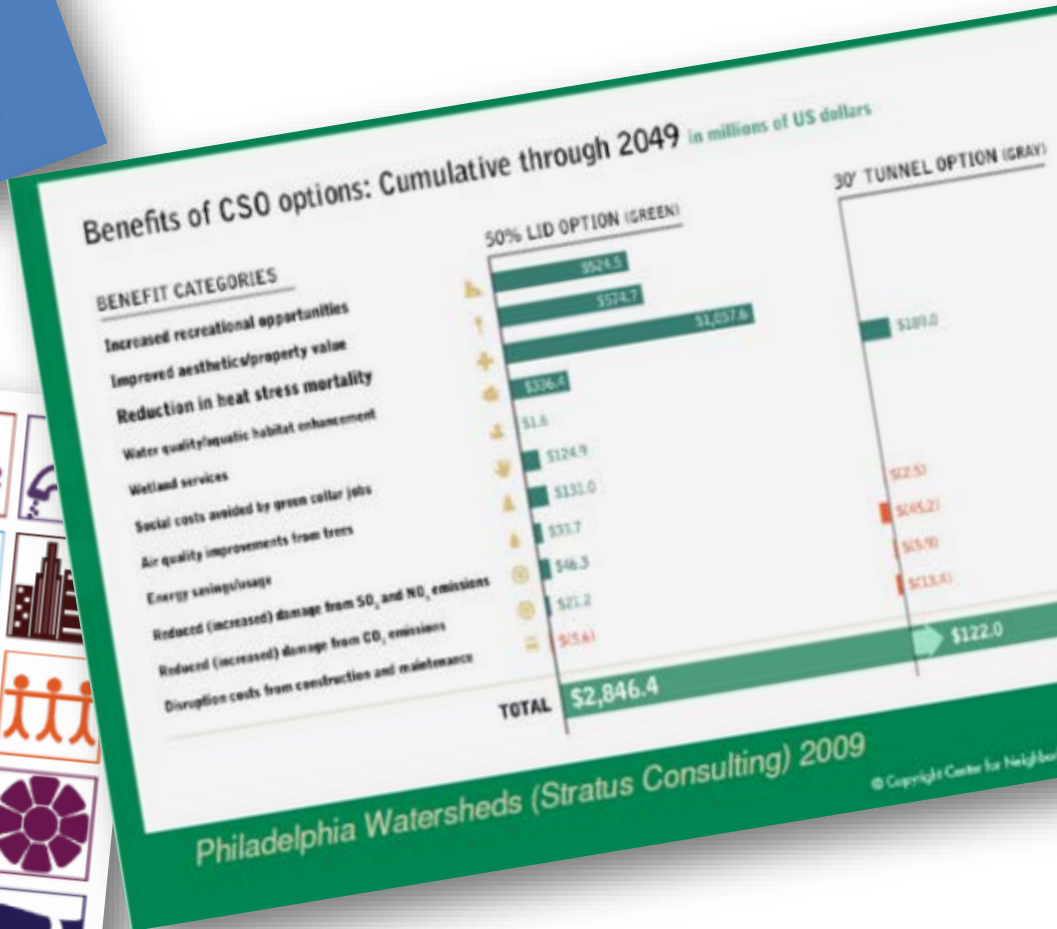
Evaluating the benefits unlocks the potential for...



- Fairer comparisons
- Better decision making
- Meeting funding requirements
- Enabling conversations
- Delivering SuDS



Some tools exist but.....



Overall aim of BeST



“The overall aim of this proposal is to collate and evaluate potential methodologies for assessing the benefits of SuDS, develop approaches accepted by relevant stakeholders and using available data develop a tool to estimate the multiple benefits of SuDS”.

BeST: Benefits of SuDS Tool



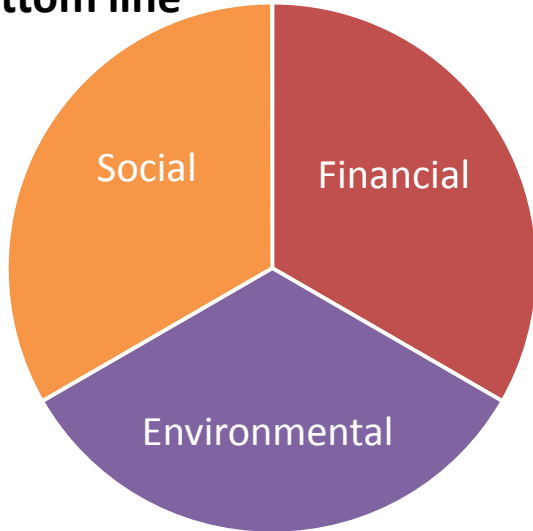
- Collation of evidence (values)
- Structured assessment approach
- Considers confidence
- Support practitioners to qualify and quantify (monetise) benefits
- Compare drainage options
- Provision of detailed audit trail



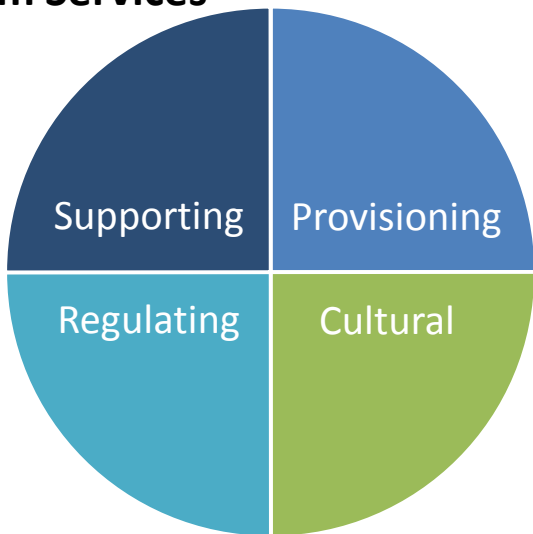
Wide range of benefits



Triple bottom line



Ecosystem Services



Benefit category	Monetised?
Air quality	✓
Amenity	✓
Biodiversity and ecology	✓
Building temperature	✓
Carbon reduction & sequestration	✓
Crime	✗
Economic growth	✗
Education	✓
Enabling development	✓ / ✗
Flexible infrastructure	tbc
Flooding	✓
Groundwater recharge	✓
Health	✓
Pumping wastewater	✓
Rainwater harvesting	✓
Recreation	✓
Tourism	✗
Traffic calming	✗
Treating wastewater	✓
Water quality	✓

BeST has a suite of outputs



Tools

W045a
Evaluation

W045b
Comparison

Support

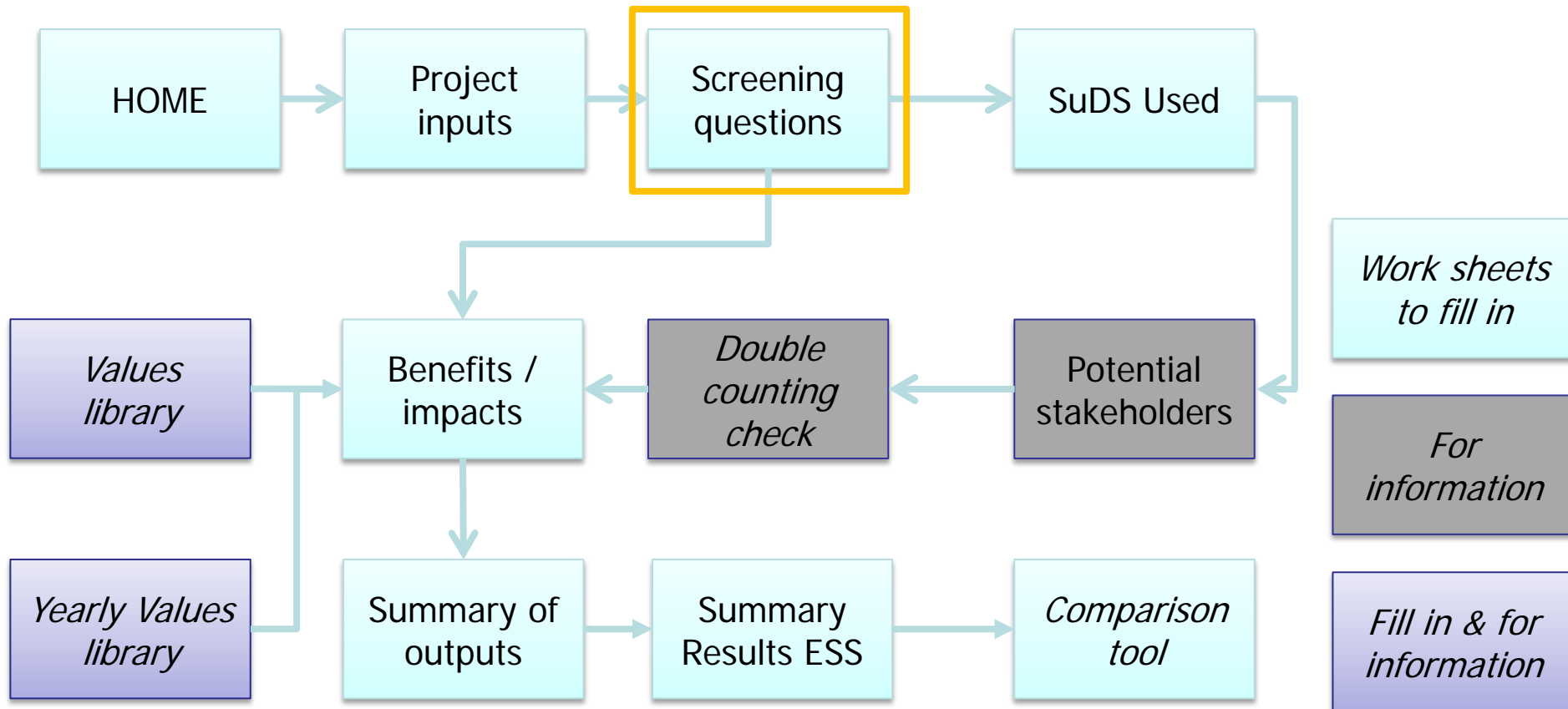
W045c
Technical
guidance

W045d
User manual

Applying BeST – Retrofit Case Study



Methodical approach to assessing benefits starts with screening

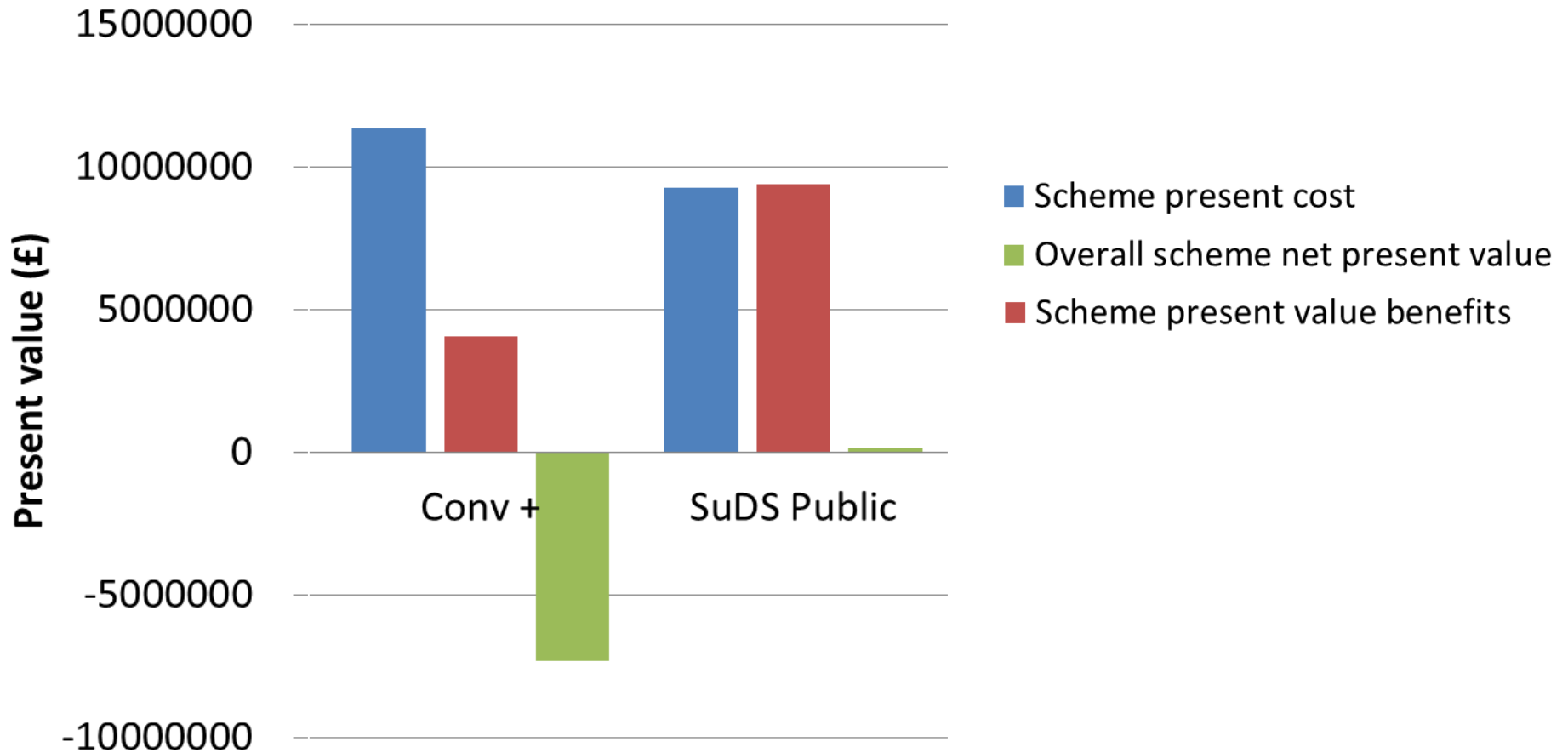


Methodical approach to assessing benefits starts with screening



ciria		Screening Questions and initial qualitative assessment			ENABLE PAGES	
PROJECT DETAILS - No.: 41519913, Name: Developing the business case for SuDS, Assmt. Version: v01, Date: Jun 2015.						
Impact	Question	Further aspects to consider	Likely Impact	Open impact sheet?	Reasons /evidence for choosing the scale of the impact	LINKS
Air quality	Will the drainage / SuDS also change the level of air pollution?	<ul style="list-style-type: none"> - Is the site in an air quality management area? - Will the scheme involve significant 'greening' (e.g. tree planting, green roofs)? - Is the scheme in a populated area or a transport corridor? 		NO	Whilst there is significant planting, this will not make a step change to the air quality.	LINK
Amenity	Will the drainage / SuDS also change the attractiveness of the place	<ul style="list-style-type: none"> - Does the scheme involve significant landscaping or greening? - Is the scheme in a populated area, or an area used for recreation, work, commuting, tourism, etc? - Will SuDS features be visible to those living nearby or passing by? - Could the scheme lead to inconvenience/disruption to residents or others (e.g. during construction)? 	++	YES	Although there are grassed verges, the landscape can be enhanced through appropriate planting with the swales. Current overgrown detention area is small, with trees, steep sloping sides. Proposal would change this appearance into a basin with amenity value.	LINK
Biodiversity and Ecology	Will the drainage / SuDS also lead to a change in habitats for plants and animals	<ul style="list-style-type: none"> - Will the scheme impact on a designated site (e.g. SSSI, SAC, SPA), Habitats of Principal Importance (BAP priority habitats) or a site of local importance for nature? - Will the scheme involve SuDS features that may improve these sites, or create new sites? 	++	YES	Enhanced water quality and increase in flows to watercourse and lake. Provision of GI to enhance connectivity of green spaces.	LINK
Building temperature	Will the drainage / SuDS also change the potential for high temperatures in summer and cold temperatures in winter	<ul style="list-style-type: none"> - Will the scheme involve significant 'greening' (e.g. tree planting, green roofs)? - Is the scheme in a built-up area? - Will the planting provide shading and wind protection to properties? 		NO		LINK

Comparison of costs and benefits using the comparison tool



Thanks to our funders for BeST



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Delivering and valuing SuDS

Comprehensive guidance on:

- How to plan
- How to design
- How to evaluate performance
- How to value the benefit

.....will support practitioners and stakeholders to build SuDS and reap the benefits in the future



Visit susdrain

To download the SuDS manual:

[http://www.ciria.org/Memberships/The SuDs Manual C753 Chapters.aspx](http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx)

To download BeST:

<http://www.susdrain.org/resources/best.html>

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