



Sustainable drainage in the UK

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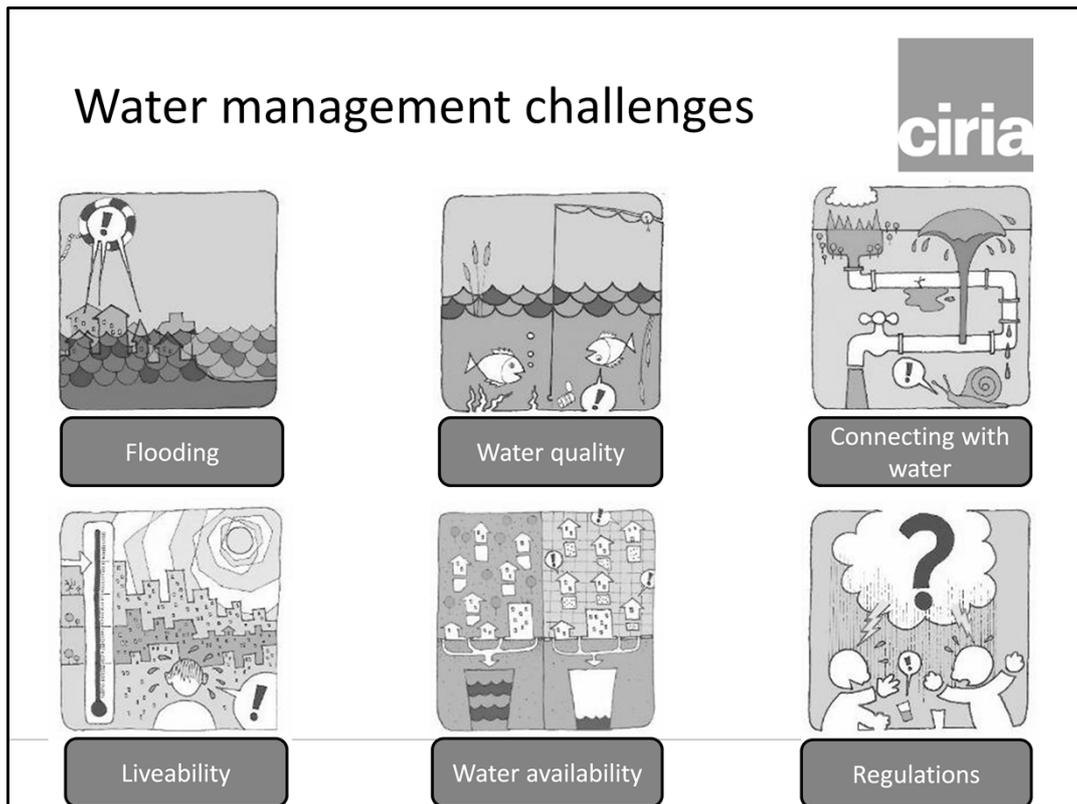


CIRIA



- Founded in 1960
- Not for profit organisation
- Independent /collaborative approach
- Focus on performance improvement
- Cross sector / inter disciplinary
- Provide free support
 - www.susdrain.org
 - Guidance
 - Training

- Ciria has been around since 1960, originally it was very focused on civil engineering, but it has moved on to also include green infrastructure.
- Our outputs are independent and objective, using collaboration to look at opportunities and constraints in the built environment.
- Increasingly, over the past 20 or so years Ciria has been engaged in Suds and green infrastructure with a particular focus on the science and practicalities of surface water management.
- We are committed to improving performance through producing and sharing guidance, training, seminars, conferences and networking.
- We bring together different disciplines in the area of Suds with the intention delivering multiple benefits. We bridge science and practice, as well as policy and practice to deliver these different outcomes and respond the changing drivers.



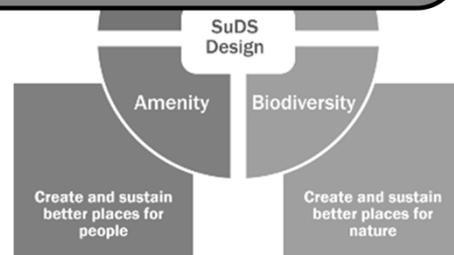
- Suds won't prevent flooding but it can help manage it. In the UK around 4 million properties are at risk of surface water flooding.
- Suds can also reduce the impact of pollution from runoff by providing some level of treatment. In cities we're affected by surface water picking up pollutants from our urban surfaces. We're also impacted by our combined sewer systems being designed to overflow into rivers and streams to manage their capacity.
- Suds through improved biodiversity and amenity can improve our places and spaces as well as health and well being of communities. We can connect people to water on the surface.
- Suds can reduce the impact of urban heat stress through the cooling impact of water and vegetation.
- Suds can also help support water availability, in terms of flooding (as mentioned before) and water scarcity. Supporting housing growth by providing capacity in sewer systems.
- We have some regulations suggesting we need to manage water better, but they are not very strong.

Sustainable drainage systems (SuDS)



Sustainable Drainage Systems manage the runoff impacts from development and are environmentally beneficial.

Surface water runoff managed for maximum benefit



- Sustainable drainage is a philosophy where the surface water runoff from developments is managed to reduce flood risk, pollution and also enhance biodiversity and amenity. Providing environmental benefits.
- These four objectives are referred to as the four pillars, and it is recognised that the ability for all four objectives to be achieved will be dependent on site opportunities and constraints. Each pillar has a set of design criteria to ensure designers provide the right outcomes.
- Suds is a common sense approach to mimic natural drainage, using a variety of methods, – I'll discuss some of these later.
- It requires different disciplines to work together to deliver better outcomes. While there are some challenges (perceived, and real) there are some great examples of suds being delivered in the UK.

The overall objective is to manage surface water runoff for maximum benefit.

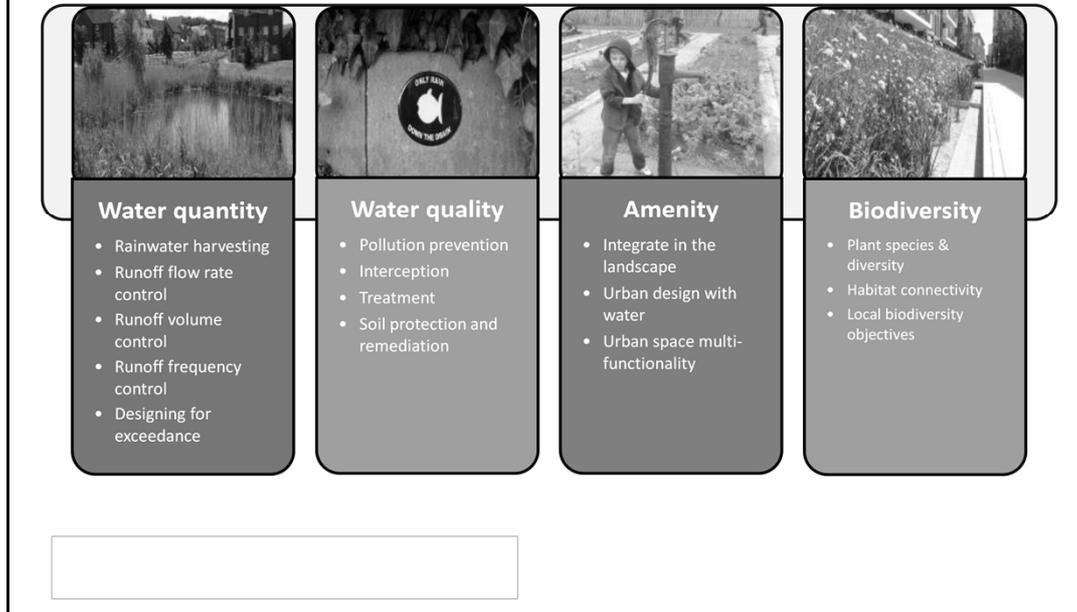
Suds is different, rather than difficult. It requires a new way of thinking.

SuDS components

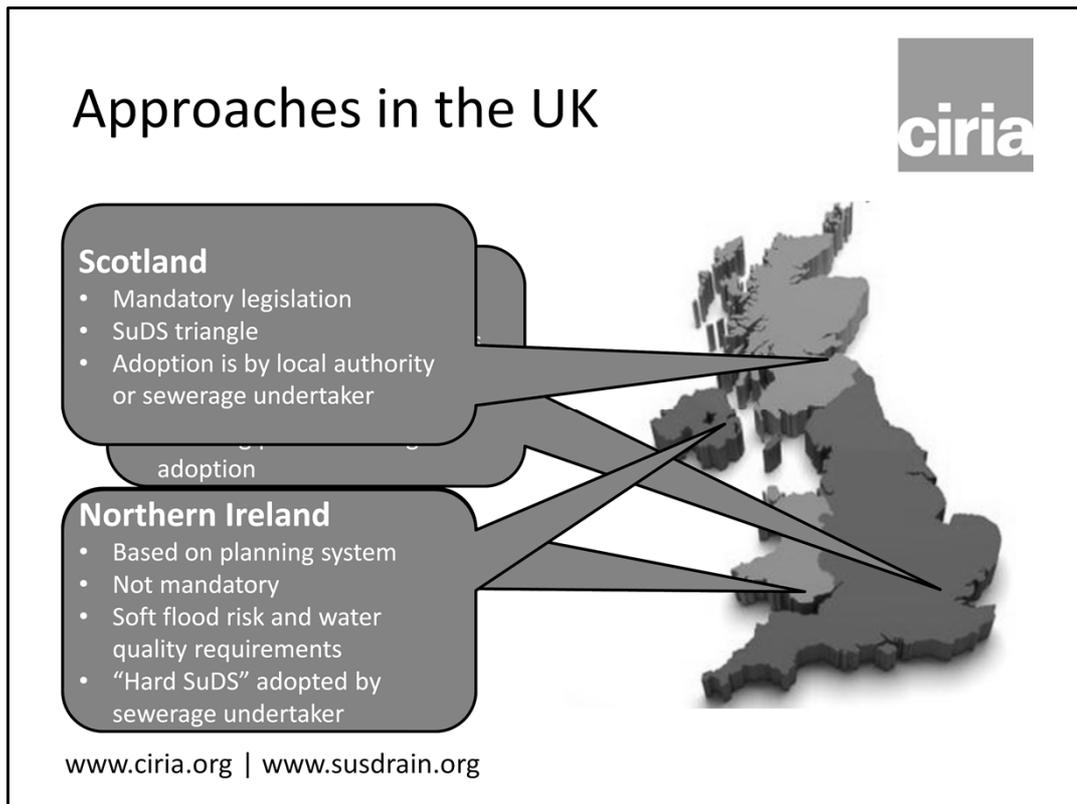


- With early and effective engagement of the right design team, that often includes engineers and landscape architects and the correct consideration of the diverse approaches and components of SuDS it can be implemented on any site. The different SuDS components enable water to be:
 - **Infiltrated** into the ground below.
 - **Stored** in surface components like ponds, or underground tanks. They can also be **attenuated** by slowly releasing water.
 - They can also be **conveyed** in pipes or open channels.
 - They can be hard, soft, green, grey, manufactured or vegetated systems.

Delivery mechanisms



- In effect good Suds can be delivered by managing runoff close to where it falls, and wherever possible on the surface.
- **Achieving the management of water quantity,**
 - Managing water close to the source, and on the surface. Trying to prevent runoff from the smaller events, called interception losses.
 - Making use of the surface water, rainwater harvesting and infiltration into the ground.
 - Discharge to the ground and surface water is prioritised over pipes.
 - The rates and volumes of runoff are controlled by Suds components.
 - Extreme rainfall is considered and exceedance routes and/or sacrificial storage areas are included in designs.
- **Achieving the management of water quality,**
 - Good site management and housekeeping to prevent runoff picking up pollutants.
 - Managing runoff from the smaller rainfall events (interception) should help manage most occurrences of pollution.
 - The inclusion of the appropriate treatment to manage the potential pollution risk from runoff.
- **Improving amenity,**
 - Look at integration with the existing site to deliver multi-functionality. We need to consider how the site is used and opportunities to maximise connectivity to water.
- **Improving biodiversity,**
 - There are synergies with amenity, and similarly it needs to be considered early in the design process.
 - The plant species and habitats in a Suds scheme need to support the local objectives, contribute to diversity.
 - Wherever possible the Suds scheme should provide green fingers and habitat. connectivity.



The countries in the UK are at different stages of the Suds journey. They all have a different emphasis, England tends to be flood risk management and Scotland tend to be driven by water quality. Wales has ambitious proposals to deliver the 4 pillars and they are the closest to delivering Suds that are more consistent with the principles of green infrastructure.

The greatest challenge is around adoption of Suds, i.e. who will undertake the maintenance. None of the countries resolve this. Although Wales might!

England

- After flooding in 2007 there was proposed legislation to make SuDS mandatory and resolve adoption.
- However concerns expressed by housing developers stopped this and no mandatory requirements were introduced and the standards were watered down.
- There is only focus on flood risk (reducing volumes and flows). However, if Suds is thought to be too difficult traditional drainage can be used,

Scotland

- Scotland was the first to start out the Suds journey.
- They have mandatory requirements on the back of the Water Framework Directive.
- Adoption is a mixture of local authorities and sewerage undertaker (can lead to confusion).

Wales

- They are currently consulting the legislative approach the English abandoned
- They're looking to make the standards more comprehensive and stronger with adoption being undertaken by the local authorities.
- The Welsh standards are very closely aligned to the SuDS Manual

Northern Ireland

- This is linked with the planning system.
- Difficult to understand the requirements but they wish to obtain outcomes for flood risk and water quality.
- Hard Suds, ie large pipes will be adopted by the sewerage undertaker.

Summary and overview



- View it as an opportunity
- Provide confidence & inspiration
- Encourage early engagement
- Provide mechanism for long term maintenance
- Clarity and consistency
- Provide funding



- To summarise, there are a number of key elements required to make Suds happen, we're realising that it takes a lot to change hearts and minds. Some key considerations include:
- Considering surface water runoff management is an opportunity, rather than a challenge. Surface water can be harvested and managing water at the surface, or close to it enables other benefits to be provided.
- Approaches like Suds and green infrastructure are different, not necessarily difficult. As a result stakeholders and disciplines need confidence and inspiration from those in charge. Practitioners need confidence that systems work, they're cost effective, that they can perform well and risks can be managed.
- The best schemes use a mixture of components to effectively integrate into the spaces and places, particularly when retrofitting schemes. This needs effective engagement with those that design and use the spaces and places. In the UK integration is vital, as it's easier to promote Suds on the basis of the additional benefits, that is to say, not just relying on the flood risk management benefits to sell the Suds concept.
- There needs to be clarity on the required outcomes and how they can be met through design and delivery. All stakeholders need to have clarity on what is expected from them.
- Developers need to have certainty as said before, they also want to be able to develop and move on to the next project without needing to worry about how they get paid for maintenance. There needs to be a clear approach to adoption of maintenance.
- Sufficient funding is required for a variety of different stakeholders, this enables effective approval, monitoring and maintenance of Suds and green infrastructure.

Case study – urban SuDS retrofit

Queen Caroline Estate, West London



- This is a Suds retrofit project with a climate change adaptation driver that is being delivered through green infrastructure, the project is looking at low cost measures in housing estates that could be replicated elsewhere in the UK.
- This part of the project was undertaken on Queen Caroline Estate, in Hammersmith, West London and it included 260 properties.
- There is a focus on delivering multiple benefits for residents and the local authority.
- There were good opportunities to work with the local authority and residents. They were confident that they could deliver change and a Suds scheme that could be easily and cost effectively maintained.
- The project also considered broader contextual issues around air quality, as it's near major roads. Other considerations included access to play areas, open space and connectivity.



- Within the estate is there is quite a lot of open space. Lots of it (both hard and green) is now unused, it did use to have communal places to dry washing.
- So it had lots of large paved, and therefore impermeable areas that are no no longer used.
- There are also some barriers to use the routes and green space, particularly routes from the river to the main high road. So the project is also trying to improve access and connectivity.
- So there were plenty of opportunities to make an impact.



Discussions with residents

- Problems with water ponding
- Keen to expand food growing
- Desire for more colour & interest in the landscape

- Discussions with the residents through the community engagement activities identified some concerns about the existing estate.
- Some of the site had problems with surface water ponding, made access tricky for some residents with mobility issues.
- Green spaces are fenced off, with signs deterring their use. However, the residents were keen to use the green space for food growing and they wanted better connectivity and access. They also wanted better places and spaces and community cohesion.



- The plans for the scheme were to open up spaces, providing better access and connectivity, especially to the river Thames.
- Other plans included delivering surface Suds components and manage water from the roofs, with green roofs and managing water from the community centre, and other blocks by diverting it into grass areas through detention basins.
- Basins and swales form part of the Suds scheme, some include play features of stepping logs and boulders.
- Hard landscaped basins were also designed, these included fixed materials as residents and the Council were concerned about having loose materials, that could be stolen or worse still, thrown at people.
- They changed pathways to provide more direct routes and access through the site has now been provided.
- Opportunities for urban food growing was also provided.



- **Top left** - runoff from a building being diverted to a swale, down a downpipe, across a private garden, through the hedge, over the footpath onto a swale. The swale is planted with wildflower meadow. The path takes you to the river.
- **Top right** – another picture of the grass and stoney basin, there is a connection between the two basins.
- **Bottom left** - green roofs on pram sheds, bin stores. Provide some greening, and a sustainable drainage process.
- The project is a partnership between an environmental charity and the local authority.
- The social return on investment is 4 to 1, with every 1 pound spent providing nearly 4 pounds in benefit.
- A university is monitoring the site. Performance of the ground-level Suds components is being monitored using weather stations, flow sensors (downpipes), pressure sensors (in basins) and time-lapse photography.
- Thermal imaging is being used to record the cooling effect of both the ground-level Suds components and green roofs – particularly for climate change adaptation.

Examples from London



- Looking at London, with a population of 9 million people. There are 33 London Boroughs, all with their own Lead Local Flood Risk Authority and Local Planning Authority.
- They're in the process of delivering the London Sustainability Drainage Plan, and Transport for London are delivering guidance on Suds and highways, linking it to the SuDS Manual.
- However, there are only a handful of London boroughs aggressively retrofitting SuDS. This slide represents a couple of projects from three of the London boroughs, all of which I've lived in, which is a coincidence!
- The red example, is from the London borough of Haringey. This is an approach to deal with pollution of local watercourse. An environmental charity and the Borough are intercepting runoff from the highway into what they're calling a rain park, rejuvenating some green space, making it more attractive, fun and using it to treat the runoff and reduce the potential pollution.
- The orange box, is from the London Borough of Hammersmith in West London. The image at the top is delivering a rain garden and permeable paving outside a school, managing runoff from the school roof, the highway and the car park. It is actively used by the school children. The case study is available on our website. The pink example, is from the London Borough of Enfield. This project uses rain gardens in the road to treat the pollution in the runoff from the highway, manage flooding. It also serves to slow down traffic outside a school. However, it does reduce car parking – which can be a big issue.
- So I'll end there. Please feel free to speak or contact me, if you want further information.