

# A Guide to SuDS in the Urban Landscape

Authors:

**Prof Richard Ashley**  
Sheffield University  
EcoFutures

**Sue Illman**  
Illman Young

**Alex Stephenson**  
Hydro International



**illmanyOUNG**



[Link to authors biographies.](#)

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## Introduction

**The opportunities for Sustainable Drainage Systems (SuDS) to improve our urban environments are already beginning to drive the UK policy agenda – but there is a still a long way to go.**

Sustainable surface water management measures can help create a more balanced and natural ecology in our towns and cities. Embracing the principles of SuDS can open a gateway towards a much more far-reaching and transformational urban landscape in future.

For too long, we have paved over green spaces and treated the resulting surface water run-off as a problem or waste. Stormwater has been transported 'out of sight, out of mind' into an overloaded sewerage infrastructure. A lack of run-off management at-source, through approaches like infiltration, has limited groundwater recharge and contributed to lowering of river levels.

Yet a creative approach to planning for water above ground – in which stormwater is seen as a resource providing multiple benefits - can help make the urban landscape a more balanced, healthy and enjoyable place to live.

Make no mistake, the challenge to 'do things differently' is not an idealistic aspiration: doing nothing or carrying on as we have always done is not an option. More sustainable approaches to urban water management are essential not least in helping address the need for adaptation responses to climate change.

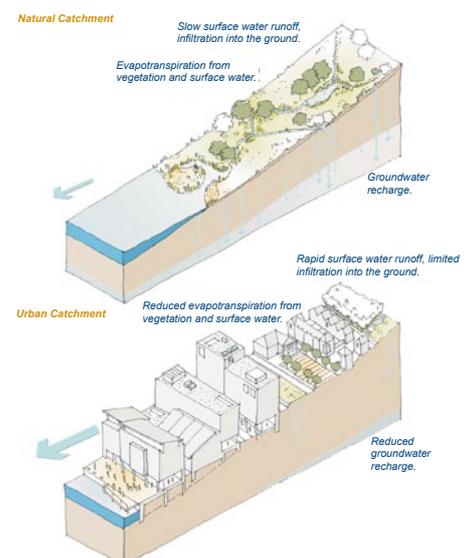


Figure 1.1 Effects of urbanisation on the water cycle.

Image courtesy of CIRIA

## Drivers for Change

Progress made following the [Pitt Review](#) and the implementation of the [Flood and Water Management Act 2010 for England and Wales](#), the [Flood Risk Management \(Scotland\)](#) and [Water Environment and Water Services \(Scotland\) Acts](#) are significant drivers for change and have been widely welcomed.

The [European Water Framework Directive](#), associated River Basin Management plans and daughter directives including those covering priority hazardous substances and groundwater are setting high standards for treating diffuse pollution in surface water run-off towards a goal of achieving 'good' water quality status by 2015.

The Government is due to consult on new National Standards for SuDS in England and Wales. Whilst the emphasis is likely to be on managing higher flows of urban runoff, there will also be important requirements for water quality and treatment. The standards are likely to present a framework for designing SuDS schemes and selecting components, with developers and local authorities expected to work together to plan SuDS schemes for new

development. The standards are likely to build on the design guidance found in the [CIRIA SuDS Manual \(C697\)](#).

Many local authorities have formal development plans that encourage the use of SuDS in new developments, but this is by no means national. Some are already well prepared for their role to promote, control and maintain SuDS in their communities. All have an opportunity to develop good practice by linking SuDS design guidance to local planning policy or other requirements around biodiversity and amenity. [CIRIA's SuDS website](#) has links to guidance including some of the documents developed by local authorities.

The Engineering Nature's Way initiative is also providing a central resource for news, views and guidance on SuDS and flood risk management in the UK. [Visit the website](#).

All these initiatives are helping to lay the foundation for local communities to exploit the multi-value that natural drainage systems can offer at a range of spatial scales.



Photo courtesy of Illman Young



SuDS Beneath Amenity Area



## SuDS and Ecosystems Services

Historically, green space in our urban neighbourhoods has all too frequently been perceived as a liability and a net cost in terms of management and maintenance. As a result, these areas have often been neglected.

The Lawton Report [Making Space for Nature](#) concluded that the UK's natural environment has become fragmented and fragile. The UK [National Ecosystems Assessment \(NEA\)](#) demonstrated how placing a market value on the natural resources we use and sell has led to the decline of some ecosystems and habitats. The NEA proposed new approaches to measure the value of Ecosystems Services in economic, health and social terms.

The concept of Ecosystems Services has provided a means of re-evaluating Sustainable Drainage Systems in terms of the multiple value that they can offer local communities. The NEA supported the release of Government's [Natural Environment White Paper](#). Ecosystems Services are described as 'products of natural systems from which people derive benefits' and which can be given an economic value.

Sustainable Drainage Systems are identified in the White Paper as a 'regulating service' helping to achieve ecological balance. They provide an opportunity to deliver multiple benefits, related to broader quality of life indicators whilst increasing flood resilience.

The Mayesbrook catchment restoration project in Barking, East London, serves as a national exemplar of the multi-value approach to regenerating urban green infrastructure and in a 'retrofitting' context. The project used a Payments for Ecosystem Services model to successfully identify both delivery and funding mechanisms to lever private investment for catchment restoration.

A clear shared vision from the main partners involved has resulted in an exciting project for the restoration of an urban river catchment and parkland in a socially-deprived area. By delivering multiple functions, the Mayesbrook scheme will achieve better flood resilience and water quality, improved recreation and amenity for local people, new and restored wildlife habitats and contribute to urban regeneration. The project is also seen as a UK first in adapting urban green space to the impacts of climate change. [Read more about the Mayesbrook project.](#)



Photo courtesy of Illman Young



Urban Wetland

Photo courtesy of Illman Young

## Green Infrastructure

The Natural Environment White Paper presents a vision to join up green spaces and create a countrywide green infrastructure with more balanced ecosystems and enriched biodiversity. Urban green infrastructure links into a national ecological network, enabling flora and fauna to move around, within and between towns and countryside as illustrated in the [Foundation for Water Research report](#).

SuDS can help local authorities, planners, architects and developers meet the growing demands on them to deliver green infrastructure by creating green open spaces which can encourage biodiversity and habitats, as well as meeting the requirements for flood and water quality control.

Green Infrastructure (GI) is a strategically-planned and managed network of green spaces, water and other environmental features in both urban and rural areas. It is often used in an urban context to cover benefits provided by trees, parks, gardens, green roofs, road verges, allotments, cemeteries, woodlands, rivers and wetlands. Link: [Landscape Institute: Green Infrastructure](#).

Linking surface water management with the value of GI has become standard practice in much of the USA and examples are showing how to get more for less in managing surface water and natural ecosystems together in urban areas. This interaction is yet to be fully embraced

in the UK, although responsibility for these aspects reside with local authorities. Add to this the design of our urban roads and there are countless opportunities to be exploited. New ideas have also emerged in the UK recognising the contribution of GI adaptable systems for dealing with climate change. Link: [The Green Infrastructure Valuation Toolkit](#).

In the USA the definition of SuDS has developed to mean the integrated planning and management of stormwater within the urban landscape, known as Low Impact Development (LID). More recently GI is being used synonymously with LID. Link: [US Environmental Protection Agency: Managing Wet Weather with Green Infrastructure](#).

So-called 'soft' SuDS elements can provide a useful component for achieving GI in an urban environment, breaking up hard landscapes with more vegetation and trees. These more natural measures to manage surface water include using trees and tree pits, rain gardens, bioretention systems, swales, basins, and ponds.



## Linking 'Blue' to 'Green'

The concept of blue infrastructure provides an opportunity to extend the concept of GI to embrace the idea of blue/green infrastructure. This comprises a network of water bodies and the green spaces around them that link urban and rural environments creating a series of connections and spaces from city to village, and from countryside to sea. The importance lies in the potential to achieve much more than the sum of the parts when these two aspects are brought together effectively.

Whilst the name may be modern, the concept has been around in the planned environment from the earliest planned towns and cities located on river banks, where avenues, parks and gardens linked and punctuated the urban fabric.

Today blue/green infrastructure offers wide opportunities as a multi-functional landscape in which to live, work and play, which at the same time, stores and cleans water whilst controlling flood flows.

Using SuDS in the context of blue/green infrastructure offers opportunities to create attractive vegetated open space and blue corridors for water above ground. On their own such measures may be small, but the compound benefits could make a huge environmental contribution.

For more extreme flows the blue/green network model also holds true, using an interconnected blue/green corridor to integrate surface water management measures that can manage wider flood risk.

Defra's scoping report [Developing Blue Green Corridors](#), published in March 2011, provides a new way of thinking in managing urban flood risk. In Urban Blue Corridors, development is set back from, or planned around, watercourses, overland flow paths and surface water ponding areas to create a network of urban corridors designed to facilitate natural hydrological processes. In this way, flows in excess of the capacity of urban drainage systems can be designed to pass safely through built-up areas.



A Canal in a High Density Housing Development, Stamford, England  
(Roger Nowell)



Photo courtesy of Illman Young

## Water Sensitive Urban Design

**Water Sensitive Urban Design (WSUD) is a concept which originated in Australia. Like blue/green infrastructure it describes an approach to urban water management that is sensitive to natural hydrological and ecological cycles, and begins with good urban design and planning practice.**

WSUD goes further, however, to offer a more integrated approach to urban water cycle management considering the management of potable water and wastewater treatment alongside stormwater utilisation and treatment. Link to [Melbourne Water](#).

WSUD offers a strategic, holistic approach to good urban design in the context of urban water management, liveability, ecosystems and landscapes. From the perspective of SuDS, it's an important reminder that planning for stormwater should also be about water conservation and about reducing wastewater conveyance and treatment.

While Water Cycle Studies developed by some UK Local Planning Authorities explore the potential for managing the water cycle, very few developments have truly considered water efficiency, water supply and SuDS as an integrated approach from the masterplanning stage. Viewed from the WSUD perspective, this is a glaring missed opportunity. Rainwater harvesting for example can simultaneously provide stormwater attenuation, whilst contributing to water efficiency and availability.

With its holistic approach, WSUD offers an attractive model for integrated urban design and development in future. There are opportunities for those interested in sustainable water management in the UK to champion WSUD and [CIRIA is currently fundraising a scoping study to explore its role in the UK.](#)

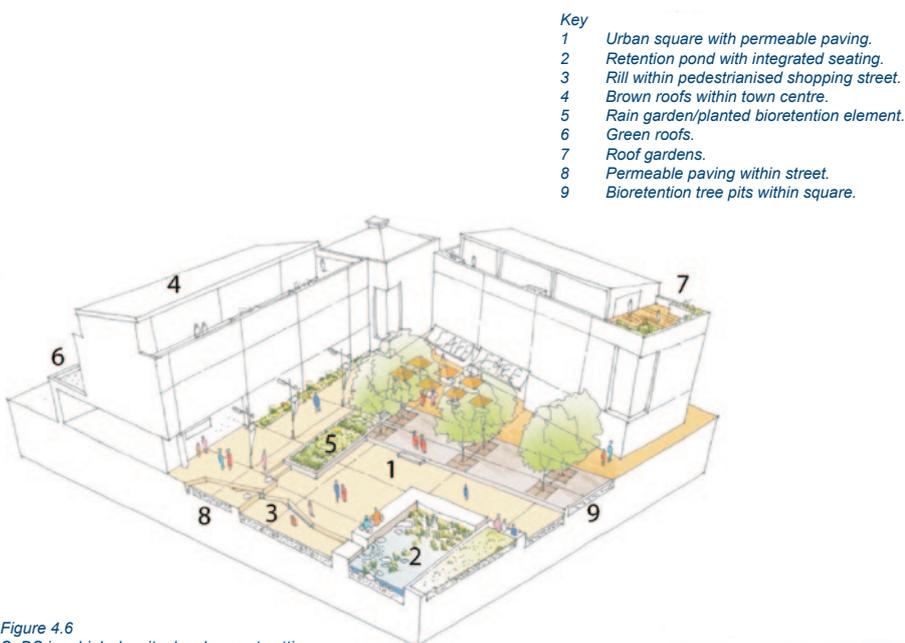


Figure 4.6  
SuDS in a high density development setting.

Image courtesy of CIRIA

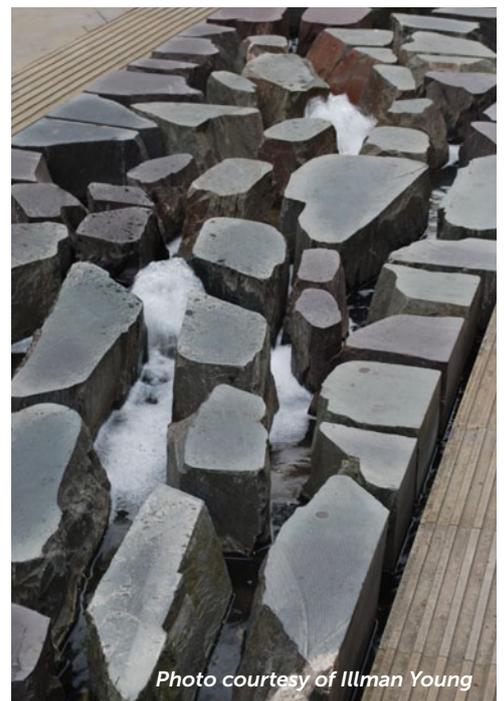


Photo courtesy of Illman Young

## Masterplanning

**The key to successful, practical and sustainable surface water management is to integrate it with the principles of good urban design. For new developments this begins with the masterplanning process, drawing on the outputs of local authority Surface Water Management Plans, accompanying flood risk maps and broader green infrastructure strategies.**

Understanding the geology, topography and the natural water and drainage flows within a site must be the fundamental starting point. These same factors, along with the site's vegetation create its Landscape Character; whether of good quality, reflecting locally typical features, or degraded and in need of enhancement.

Ecology can also play a key role, identifying both existing species for protection and enhancement, but more importantly understanding the potential for appropriate habitat creation as part of the development process, with its benefits to biodiversity. Collectively, these provide the tools and starting point for locally appropriate design.

To be effective, the entire design team must fully engage with and understand what Blue/Green infrastructure means, what it is trying to achieve, and how it should be delivered. A successful project is therefore one that is fully sympathetic with the principles of good urban design. It is therefore important to have leading inputs from both the landscape design and engineering professionals, where each has a full appreciation of the others' discipline. In practice, this can sometimes be a challenge to achieve and it is therefore advisable that a Landscape Architect or urban designer should be one of the main team contributors and take a lead where appropriate.

The design team will comprise a range of professionals, and depending on the nature of the development may include: Hydrologist, Ecologist, Architect, Urban Designer, Civil Engineer, and Quantity Surveyor, as well as the Landscape Architect.

However, this process must also include the end user, as the people who will live or work in this landscape, must also understand why it's designed as it is, and been involved in its development within the design process.

An effective way of ensuring that the team fully embraces the urban design principles is through short design team training presentations. Here, ideally a key design professional on the team, for example the Landscape Architect, should explain both the concept of this design approach, the principles, and use inspirational images to illustrate what can be achieved. An overview of technical matters can usefully also be included. Others within the team may also want to make short presentations regarding their specialisms too, so that there is a mutual appreciation of the contribution each can make to achieve a successful outcome.



Photo courtesy of Illman Young



Photo courtesy of Illman Young

## Retrofitting

Across the UK and driven by regulation, we've made vital progress towards making SuDS compulsory for new development. But new development is just the tip of the iceberg.

A greater challenge is retrofitting surface water management measures such as SuDS to achieve the water sensitive towns and cities we need in future. Retrofitting SuDS into our urban areas is going to be an imperative, if we are to achieve our objectives of flood risk management and water quality, as well as truly using water as a resource to improve the urban environment, promote biodiversity and adapt to climate change.

Generally, there is much less awareness of the opportunities that SuDS can offer to boost urban regeneration and renewal and the part they can play in promoting the quality of life in local neighbourhoods. There is also a lack of inter-connection between local authority 'green' initiatives in urban settings and surface water management – despite the increase in Surface Water Management Plans.

It remains to be seen how much the forthcoming [Water White Paper](#), due to be published in December 2011, will do to bring forward more mainstream approaches to retrofitting SuDS.

Urban regeneration schemes, driven by policy and regulations, will provide opportunities for retrofit SuDS. Others can be introduced as part of strategic flood risk management or pollution control programmes.

[CIRIA's](#) new guidance on retrofitting surface water management measures – due to be published by the end of 2011 – marks a significant step forward in encouraging more innovative approaches to retrofit SuDS. It promises to provide stakeholders involved in retrofitting, particularly Local Authorities, with a framework for retrofit solutions and the tools to challenge the way surface water is currently managed.

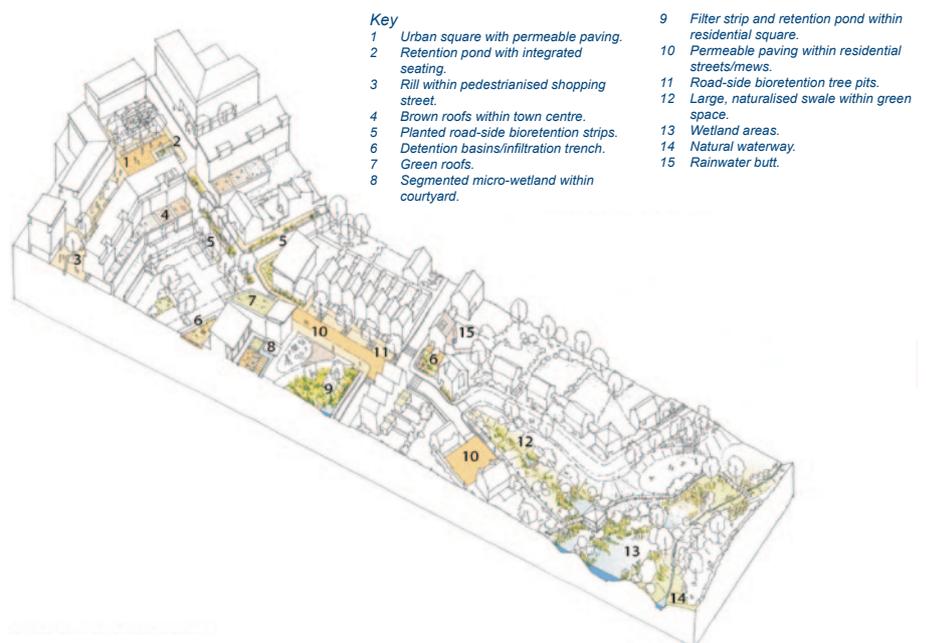


Figure 1.9  
Integration of SuDS into a development.

Planning for SuDS - making it happen.

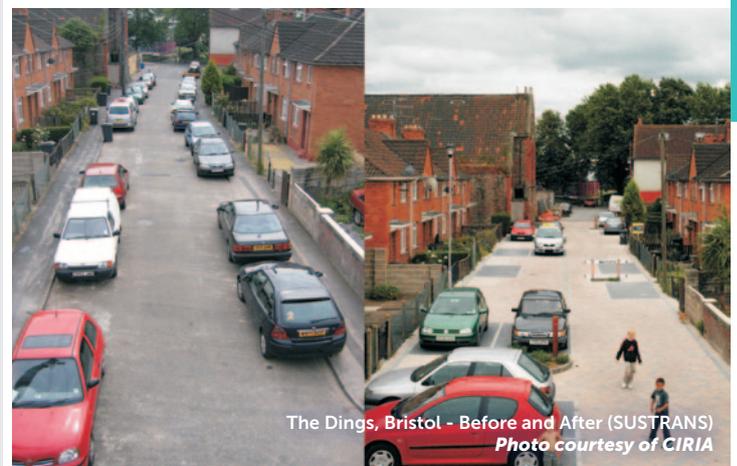
Photo courtesy of CIRIA

## Retrofitting SuDS in Highways

Highways and residential streets provide an important opportunity to introduce green infrastructure measures and retrofit SuDS. Highway run-off is a significant cause of flood risk and water pollution. Yet there are surprisingly few exemplars of strategically-planned SuDS highway retrofit schemes in the UK, to date, especially in residential settings.

The objectives of SuDS resonate well with the principles of the UK Department of Transport's [Manual for Streets guidance](#). Surface water management measures should be at the centre of street design and upgrading. SuDS measures should be considered alongside objectives to 'reclaim' streets from the motor vehicle and introduce more community-friendly environments. The principle of [Home Zones](#), for example, provides a good starting point for incorporating SuDS into residential streets and shared community spaces and should better emphasise the opportunities of using green infrastructure.

North America 'green streets' projects provide excellent examples of what can be achieved. For more information see: [Chicago Green Alley Handbook](#) ; [Portland Green Street Program](#) ; [Seattle green streets](#).



## The Importance of Partnerships

**The Flood and Water Management Act places expectations on local authorities to work in close partnership with all stakeholders in a community, both internally and externally. The development of Local Flood Risk Management Strategies by Lead Local Flood Authorities should help contribute to a more holistic approach to urban water management provided appropriate consideration is also given to water quality and the wider ecosystem services benefits.**

Successful delivery of sustainable urban water management depends on co-ordination and communication between different council departments such as planning, drainage, parks, and highways as well as between Government agencies, water and sewerage undertakers and other private sector stakeholders.

Critically, planning for both new and retrofit urban water management in future should encourage and involve local communities as key stakeholders. There's little doubt that communities value their local landscape. Studies repeatedly demonstrate that houses located near green spaces, ponds or other water features sell more quickly or for higher prices than other properties. In many cases residents have also confirmed their willingness to contribute either practically or financially towards the maintenance and retention of such features.



## Using the Full SuDS 'Toolbox'

For both new and retrofit developments, SuDS provide a comprehensive toolbox to design effective surface water management measures and achieve successful quality, quantity and amenity outcomes. Often they can be more cost-effective and more adaptable than their traditional alternatives.

Even in the most challenging locations, good design solutions can be achieved with SuDS by using a full range of components in combination to mimic natural drainage pathways as closely as possible.

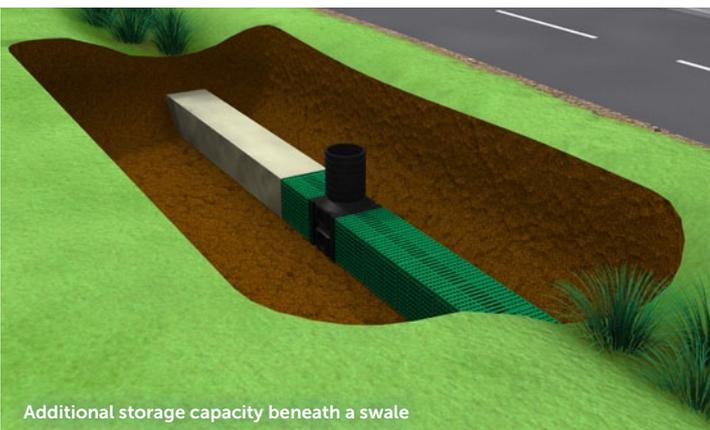
To engineer in nature's way requires the selection of SuDS components in a treatment train, including the consideration of engineered and 'green' features together. Without this understanding many SuDS schemes could be left on the drawing board or fail to perform as anticipated.

Perceived barriers could limit SuDS' potential to contribute fully to blue/green infrastructure. Misperceptions that SuDS

features are purely 'natural' features, that they are always 'space-hungry', or are inappropriate for some ground conditions, could stall progress.

Hidden manufactured systems can make above-ground natural features possible. So, for example, a hydrodynamic vortex separator, such as the Hydro Downstream Defender® may be installed to protect the inlet to a wetland, to prevent build up of sediment, or stop hydrocarbons from highways from reaching a sensitive watercourse.

The flagship [Elvetham Heath development](#) in Fleet, Hampshire is often used as a national exemplar for SuDS in action with an impressive drainage infrastructure of interconnected swales and ponds. It also operates successfully due to the performance of 18 strategically-placed Hydro-Brake® Flow Control devices, to provide balancing and buffering of the surface water runoff.



## Conclusion - Delivering Multi-Value

**Well-designed surface water management measures provide a multiplicity of benefits to urban environments, echoing the principles of blue/green infrastructure and Water Sensitive Urban Design.**

Key objectives for SuDS on any development should begin with improving the quality of life for communities by improving their public spaces, encouraging better ecological outcomes. At the same time SuDS will deliver flood protection, improve water quality and can help contribute to water efficiency.

A correct interpretation of SuDS is one that can be applied to every development. It's simply no longer acceptable to have an 'either or' choice between SuDS or 'not possible'. A range of techniques, natural, manufactured or combined are available to recreate (or improve on) natural drainage paths.

Incorporating SuDS creatively and simply into urban design will deliver low-maintenance and easily adaptable sustainable drainage features for the future. There's still a long way to go but all stakeholders – be they local authorities, government agencies, local communities or water companies - have an opportunity to apply these principles now to the needs of today's urban environments, even where such measures are not yet compulsory.



*Photo courtesy of Illman Young*



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