

# **WATER MANAGEMENT IN A CHANGING CLIMATE**

MAINSTREAMING SUSTAINABLE  
DRAINAGE SYSTEMS IN OUR  
TOWNS AND CITIES



## ADAPTING TO CLIMATE CHANGE SO PEOPLE AND NATURE THRIVE

Climate change is set to have significant and lasting impacts on water – both in terms of its availability, and the management of changing patterns of rainfall. Safeguarding freshwater ecosystems, securing water supplies and managing floods are among the biggest climate change adaptation challenges we face.

Our environment is already suffering. Pollution associated with increased surface water is a serious issue. It threatens precious biodiversity that needs clean water to survive. People are affected too. The Environment Agency suggests more than 3.9 million properties in England and Wales are at risk of surface water flooding.<sup>1</sup>

During heavy rainfall, surface water can overwhelm the existing sewer system and exceed capacity at sewage treatment plants. This results in Combined Sewer Overflows (CSOs) where untreated sewage is directly discharged into rivers or the sea. These can contain significant loads of pollutants including bacteria and viruses, oxygen-demanding and toxic pollutants, and persistent materials such as heavy metals.

Even when discharged over infrequent short periods, such pollutants can seriously affect the health of rivers and the sea. In some cases, discharges result in fish mortalities, shellfish unfit for human consumption, and public health hazards. In 2008, in England alone there were over 14,000 consented CSOs.<sup>2</sup>

There are other sources of surface water pollution too. In 2009, the ecological status of 120 water bodies in the Thames River Basin district (20%) were deemed at risk from urban diffuse pollution. Sources of pollutants included misconnections (e.g. washing machines incorrectly plumbed into the surface water sewer); dog fouling; garden fertilisers; and a variety of pollutants from roads (including contaminated sediment, metals and organic substances)<sup>3</sup>.



Photo courtesy of CABE

**SuDS such as swales and ditches can be retrofitted in business parks and housing estates to store excess surface water**

## THE LIMITS OF URBAN FLOOD DEFENCES

Over the last century we have increasingly urbanised our landscape. This has meant that natural flood defences, such as floodplain wetlands, have either been damaged or disappeared altogether. In response, we built a new system to manage storm water: pipes to move water away from vulnerable, valuable places as quickly as possible; and concrete defences, water storage areas and overspill pipes to cope with peak flows. However, during heavy downpours, this artificial system can reach breaking point.

Climate change models suggest that future winter rainfall events could cause more frequent and bigger floods.<sup>4</sup> By the 2080s, many areas of the UK could see an increase of 20-40% in rainfall depths.<sup>5</sup> The Environment Agency suggest that adapting to climate change using 'hard-engineering' approaches (e.g. by 'upsizing' sewers and increasing storage) would cost £15 billion.<sup>6</sup>

## 21ST CENTURY WATER MANAGEMENT: THE ROLE OF SUSTAINABLE DRAINAGE SYSTEMS

The costs and limitations of these approaches to surface water management are increasingly being recognised.<sup>7,8,9</sup> A more sustainable approach is needed, using the natural capacity of the environment to manage heavy rainfall and associated flooding. Sustainable Drainage Systems (SuDS) that work with nature can provide multiple benefits for people and ecosystems.

Typically, SuDS mimic natural processes – by slowing water flows or providing natural storage and filtration areas – and limit the need for water to enter a built sewage or drainage system. Examples of SuDS include constructed wetlands, ponds, grass filter strips and other porous surfaces designed to take overflowing water from impervious roads and drains, clean it and release it back into rivers and aquifers<sup>10</sup>. Meandering rivers and wetlands – such as those planned at Mayesbrook Park, London – benefit wildlife, store floodwater, improve water quality, and improve the landscape. They can also provide recreation opportunities, and can be used to raise awareness of flooding issues in local communities.<sup>11</sup>

A modern approach to water management demands a 'twin track' approach, with SuDS helping to reduce the strain on built flood management systems. WWF's report *Slowing the Flow* emphasised the importance of an integrated, catchment-wide approach. It concluded that working with nature to reduce surface water run-off from the upper parts of a catchment reduces the risk of flooding and the need for concrete defences. This can be achieved at roughly a tenth of the cost of more extensive hard engineering.<sup>12</sup>



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### Heavy rain can overwhelm drainage systems, causing flooding

#### Case study – the impacts of surface water flooding on people

The flooding in Hull in July 2007 was caused when drains and sewer systems couldn't cope with very heavy rainfall. It resulted in one in five homes in the city being damaged, with an estimated cost to the UK insurance industry of £270 million.<sup>13</sup> Within a few days 30,000 people were evacuated from their homes.<sup>14</sup> Many suffered emotional and financial stress, lost personal belongings and faced worries about cleaning up and repairing damage.<sup>15</sup>

#### Sustainable drainage systems can:

- Reduce the amount of storm water and urban run-off into the sewer system, freeing up capacity. This can reduce costs associated with building additional sewer capacity and help prevent untreated sewage from discharging directly to our rivers and sea.<sup>16</sup>
- Provide a means for dealing with urban diffuse pollution, helping to improve water quality.<sup>17</sup>
- Relieve water stress, for instance through use of garden water-butts and rainwater harvesting to store excess water for use in times when it is scarce, or by using porous surfaces to help recharge aquifers.<sup>18</sup>
- Reduce energy expenditure associated with pumping and treating sewage either by reducing the volume of water to treat<sup>19</sup> or using constructed wetlands to treat sewage<sup>20</sup>.
- Enhance biodiversity. Many SuDS, such as wetlands, swales, filter ditches and infiltration ponds, mimic the natural environment. They retain water that will attract wildlife, and create stable habitats and 'corridors' for wildlife.<sup>21</sup>

Though SuDS can provide these benefits, they're not yet in mainstream use. The Flood and Water Management Act 2010 provides a foundation to increase the use of SuDS, with a focus on new developments. It sets out the roles and responsibilities for managing local flood risk, and includes new responsibilities for local authorities in relation to surface water management.

## RETROFITTING SUDS

As a result of the new act, standards for SuDS will be applied to all new developments. But the act does not set out how to deal sustainably with drainage from existing buildings, which comprise the majority of properties.

#### Ways to retrofit SuDS include:

- using permeable surfaces to re-pave large areas such as car parks;
- installing green roofs;
- diverting roof drainage from a combined sewer system into a soak-away; and
- conveying surface water run-off into swales or ponds.

There is huge potential to retrofit SuDS in urban areas across the UK – in our gardens, schools, public parks, businesses, pavements and roads. Much of the technology is available and proven. SuDS could quite literally 'green' our towns and cities.

We will always need some built flood defences. But the use of SuDS would help us to regard water as a vital part of the urban landscape. It will provide benefits for people and nature, and increase our resilience to climate change.



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### Heavy rains can wash pollutants and litter from our streets and into our rivers

#### Case study – the impacts of surface water pollution on nature

In June 2009, heavy rains washed storm sewage, litter and other pollutants from the streets of Birmingham into tributaries of the River Trent, causing the death of thousands of fish.<sup>22</sup> Since then, the Angling Trust and WWF have been supporting Birmingham City Council to investigate Sustainable Drainage Systems (SuDS) to improve water quality and minimise risks of similar damage occurring.

## WWF AND RSA WORKING TOGETHER

RSA and WWF are working together to highlight how restoring nature's capacity to deal with surface water can benefit wildlife and people. We're raising awareness of the many opportunities and advantages of using SuDS in towns and cities. Our particular focus is on retrofitting existing buildings and developments, as part of an integrated approach to modern water management.

**We will publish a full report on this later in 2010.**

Alongside its partnership with WWF, RSA is supporting the local community to deliver an exemplar project at Mayesbrook Park in Dagenham, London. The project is restoring the Mayesbrook, allowing the river to naturally meander across its floodplain – an example of sustainable drainage in action.



**SuDS that work to recreate natural river channels and flood plains can reduce flood risk and provide better wildlife habitat.**

WWF and RSA are partnering for progress in a changing world. Tackling climate change is an increasingly urgent challenge. It is more important than ever that businesses and NGOs work together to drive smart solutions.

For more information on the partnership visit [www.wwf-rsa.com](http://www.wwf-rsa.com)

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