

The urgent need for living roofs in London

Can green roofs keep our feet dry and help us not to lose our cool? – asks Liam Foster, following up Zoë Cooper’s article in the last issue.



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May 2007 proved to be a wet month across the country but by and large our infrastructure coped better with the rain than it had previously, due to the emphasis placed on better asset management by water companies, local authorities and more stringent restrictions on development.

However, as flood risk still exists in many areas and somewhere across the country (as the residents of Birmingham and York, amongst others experienced in mid June), an urban environment and more importantly, the local population and businesses will unexpectedly suffer at the hands of surface water flooding, thereby destroying livelihoods and possibly resulting in unnecessary loss of life.

London is unique in that it has been protected by the visionary work of Joseph Balzagette following the 'Great Stink' of 1858 and the large sewerage system that resulted. This network has stood the test of time despite the increase in the urbanised area over the past 150 years. However, London now faces an uncertain time as it learns to live with the impacts of climate change combined with the effect that future development will have on storm water discharges.

Typically, new developments in London can add significant flows of both foul and surface water flows to existing combined sewerage systems where new developments are of greater density than pre-existing usage. This both exacerbates the pressure on the capacity of the existing sewerage system and ignores the benefits of surface flows which should be regarded as an asset.

The only currently available solution to meet European Directives on river water quality and to assist with achieving better storm water management is a scheme of the scale of Balzagette's nineteenth century 'collect and convey' system that still

"The most serious impact (of climate change) for Britain is flash floods. The Victorians left us with a drainage infrastructure that is good for soft rain, but with torrential down pours it can't cope" Professor Sir David King (Chief Scientific Advisor to H.M. Government) June 12th 2007

water within regional spatial planning and to do this now! Government planning policy such as PPS25 Flood Risk and Developments is already driving this change towards regional strategies for managing flood risk and surface water. The policy also provides guidance on how to better manage the contributions of individual developments in a way that replicates the natural environment.

Further national guidance is emerging all the time and we will need to see an alignment of local authority responses to these changes, following initiatives, such as Defra's *Making Space for Water*.

underpins London's sewerage today.

However, alongside this, the opportunity is there to question the sustainability of the solutions that are promoted as a result of these Directives, and perhaps encourage a 'greener' long-term approach to changing the way we manage climactic alterations to storm water (higher intensity events are becoming more common in the UK than previous) which is - to promote more effective management of surface

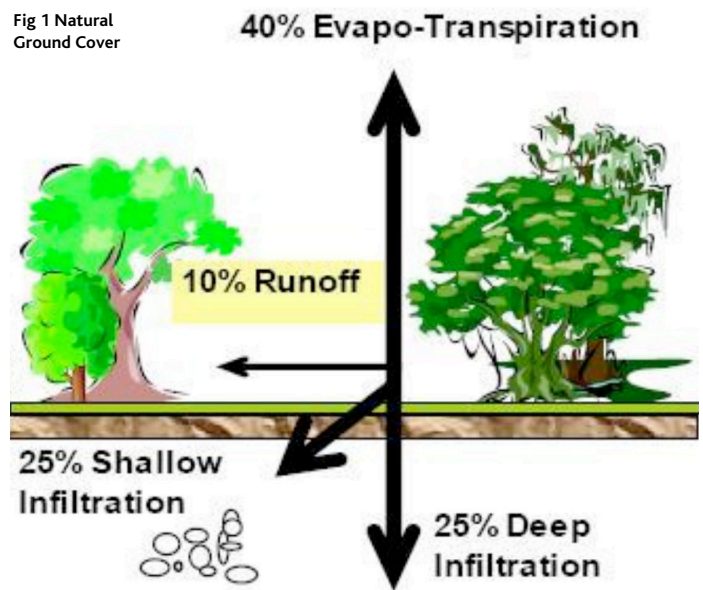
Development pressure

The pressure for continued development in London and the South East is only exacerbating the effect on the hydrological cycle by shedding more surface water faster, which leads to problems if it is not managed correctly i.e channelled away safely from developments. Such developments demand additional water resources and rather than treat storm water as a nuisance, it could and

Figs 1 & 2: © California Water and Land Use Partnership 2005

Liam concentrates on providing sustainable and integrated water cycle management solutions for a range of clients. Liam led the study - Groundwork Birmingham & Solihull - providing evidence for encouraging the uptake of living roofs by developers as a package of measures and policies to sustainably redevelop an area of 170ha to the east of Birmingham City Centre over the next 25 years.

Fig 1 Natural Ground Cover



should be used to help reduce the pressure on this most important natural resource.

Urbanisation affects the way that the landscape reacts to the rainwater falling on the ground. Under natural conditions, as seen in Figure 1, trees and vegetation manage rain and snow, by allowing it to both infiltrate into the ground where it falls and through evapo-transpiration. Typically, runoff from these environments is 10 per cent of the rain falling. Development impacts this by preventing the rain from infiltrating into the ground and increasing surface water runoff five fold (as shown in Figure 2). Even low levels of urbanisation have been shown to have seriously detrimental impacts on the environmental quality of rivers and the local catchment.

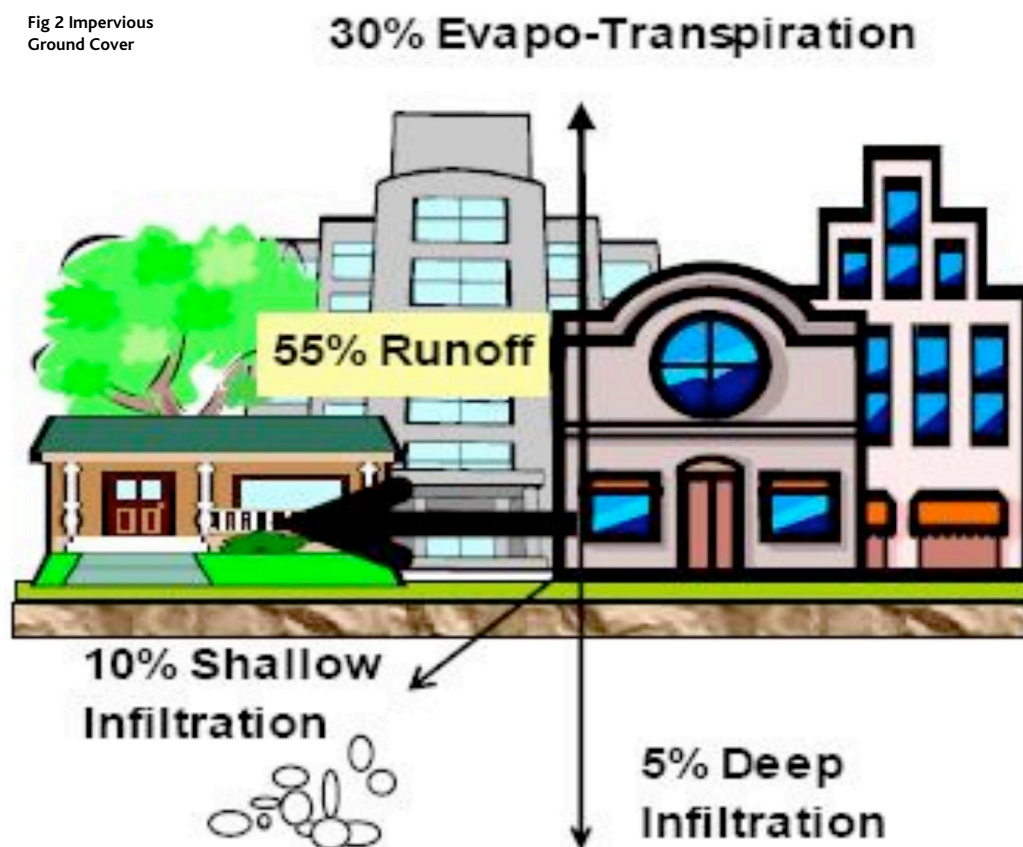
The greatest threat to the long-term future of our sewerage infrastructure and ability to improve the health of our water environment is occurring with very little control and involves the increase in impermeable area through paving of front gardens across the country to provide off street parking. A recent study undertaken by the Greater London Authority highlighted that an area 22 times the size of Hyde Park had been paved over, placing a huge additional burden on London's overstretched Victorian infrastructure, destroying important wildlife habitats and creating streets that are more noisy, dusty and windy.

With further European legislation in the form of the Water Framework Directive (in place since 2000), aiming to achieve good chemical and ecological status in rivers, there is an added incentive to improve water management in urbanised areas for the sake of the rivers and those that live, work and play on them.

Sustainable alternatives

Sustainable drainage solutions are

Fig 2 Impervious Ground Cover



a means of attempting to engineer urban developments to replicate the natural environment better and these are now being promoted as good practice worldwide. The best means of achieving surface water management more sustainably is to allow the rainfall to infiltrate naturally where it falls allowing a more gradual release of the water to the environment (i.e. controlling surface water at source). Reductions in the overall rainfall contribution to the network can then be achieved by releasing water to the ground or to evaporation.

Green open spaces allow this to happen and should be planned for and designed into a development from an early stage to encourage reductions in flood risk both locally and for downstream environments.

Safely retaining as much water as possible offers protection for existing developments and could assist with avoiding the need to spend additional money, on replacing and supplementing our existing sewerage system with huge conventional hard-engineering solutions.

This is where Living Roofs help

In highly urbanised areas, living roofs represent an attractive means to take Sustainable Urban Drainage Systems (SUDS) off the ground and into the actual structure of the development, allowing land lift to be minimised. A well-designed roof achieves a variety of benefits for not only the developer but for the wider community.

Living roofs are not new but they

can help us adapt to future uncertainties such as the impacts of a changing climate. Despite the existence of large volumes of research detailing the individual benefits of living roofs, lingering perceptions of difficulties and increased costs are preventing a wider uptake.

Further evidence to counter these views has come from a recent study undertaken in the centre of Birmingham, as part of the planned sustainable redevelopment of the Eastside Regeneration Zone. This has shown that if living roofs are incorporated early in the design process, designed properly from the outset and retained through the life of the planning process, rather than being axed, they can help protect urbanised areas by mimicking nature.

Living roofs store and partially cleanse of the water falling on the roof, delaying the flow from reaching overloaded sewerage systems, permitting reductions in terms of infrastructure required to drain an area, and providing huge savings to developers in the investment required by water companies and drainage authorities.

Interestingly, living roofs can assist in reducing the volume of water reaching the sewerage system as rain water is held within the matrix of the roof allowing nature to deal with the water through evapotranspiration into the atmosphere. A useful side effect of this process is that it also cools the local area.

Policy framework

Incorporating living roofs and SUDS into local area policies and actually adding incentives to developers to use them creates a number of direct and indirect public benefits. They reduce storm water volumes, reduce energy usage during summer months and recreate lost habitats and 're-green' the urban environ-

ment. There is a long history of progressive policies assisting their uptake and also in producing global benefits. Portland, Oregon, in the United States and Berlin have on a municipal level, both actively encouraged reductions in impervious area through greening, producing massive storm water savings, and reducing areal flood risk.

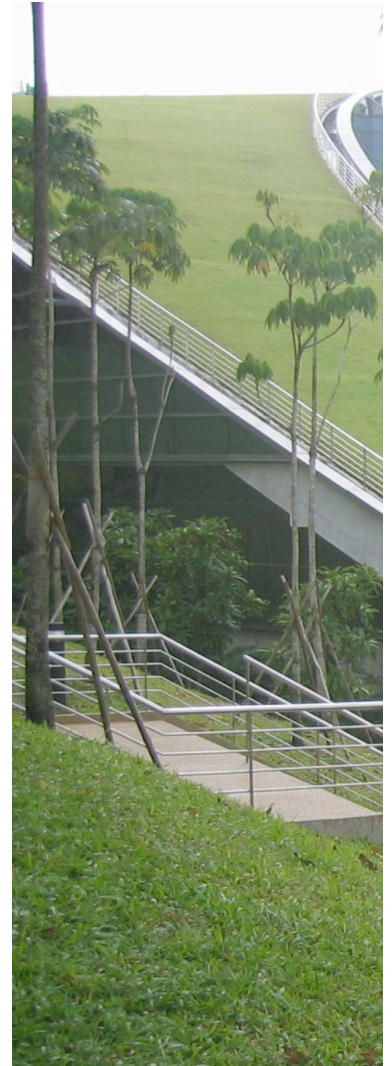
Effective water planning for the future aimed at improving the natural environment and treating surface water as a potential water resource rather than a nuisance is key to helping us all to reduce the current level of flood risk. Development of a policy to encourage and incentivise developers to create wider community benefits will assist us to adapt to climate change better and avoid unnecessary spending from within the public purse. As developments face more stringent sustainability requirements in the form of Building Regulations and the Code for Sustainable Homes, living roofs have a major role to play as an integral part of sustainable solutions for new and existing developments in future.

Part L of the Building Regulations (2006) indicates that more substantial roof structures are now required in order to limit the effect of solar gain on developments and consequently, in the future, the additional costs arising from incorporating a green roof will be minimal in comparison to a holistic approach to the whole development cost.

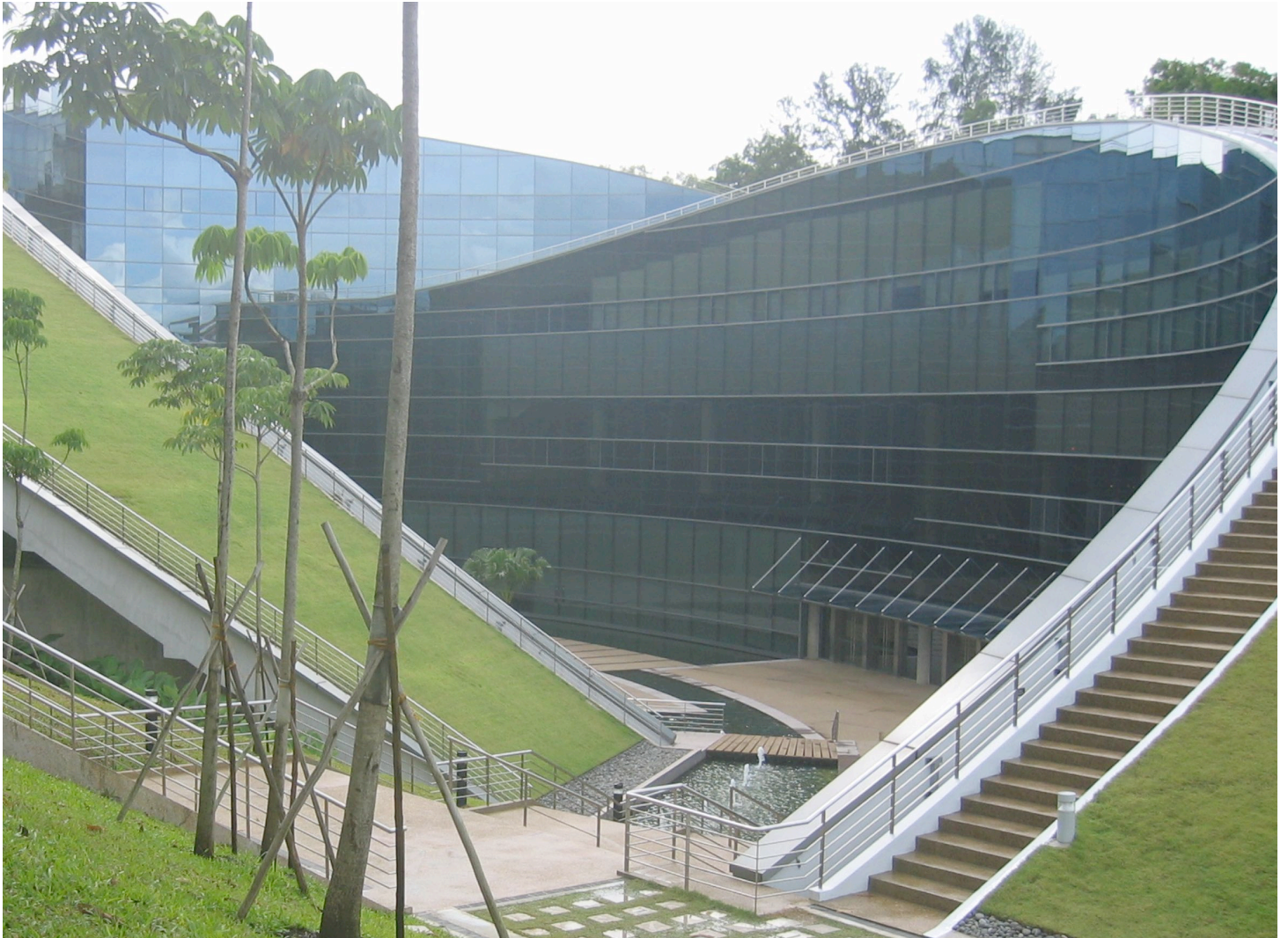
A green roof will also provide great opportunities for re-creating lost habitats and for providing a useful public benefit, in terms of attenuating storm water, which could be used to reduce the need for providing costly and unnecessary below ground attenuation on an individual development level - providing developers with real economic incentives to use living roofs as a means of dealing with an uncertain future.

Cooling effect

A further public benefit is that living roofs help reduce the heat island effect of our urban centres, which is of becoming a particular concern for the Greater London



Authority (GLA) as hotter summers are predicted in London within this rapidly evolving climate . The GLA is currently drafting some Supplementary Planning Guidance as a means of promoting a stand alone policy on Green Roofs in London to help mitigate the impacts of past and future heat waves. For example, during the heat waves of August 2003 and July 2006, the night time temperatures in London were 6-9°C higher than those recorded for rural locations south of London.



Studies in Toronto, identified that 6 per cent of the city's roof coverage could reduce the effect of Urban Heat Island by as much as 2°C. Living roofs and ground level SUDS represent a powerful weapon in the local authority planning armoury to generate wider beneficial sustainability and environmental savings from individual developments. The promotion of such measures will also assist local authorities to deal with current and future policy drivers such as PPS1, PPS3 and PPS25.

Emerging planning & legislative changes represent a great opportunity to create regional solutions and policies that will derive considerable storm water attenuation. This will help to reduce the pressure on London's existing network, remove storm water from being expensively and unnecessarily collected and treated within the water company's assets, prevent untreated sewage from being discharged to the rivers during periods when the volumes are too great for the network, and could

assist in providing a micro-water resource.

Currently, London undergoes about one per cent of redevelopment annually and should a change of policy promoting living roofs occur then within a short time the public of London would benefit from a cooler environment, reductions in storm water runoff and a more diverse habitats as identified from the Toronto studies.

With every development that proceeds along current out-dated

requirements, the opportunity is being lost to improve our cities' health. If London and its inhabitants are to survive our rapidly changing climate, there is an urgent need for living roofs to be incorporated into an overall strategic green development and storm water vision!

Photos left: Building Energy Research Centre, Tsinghua University, Beijing and above: Nanyang Technological University, Singapore