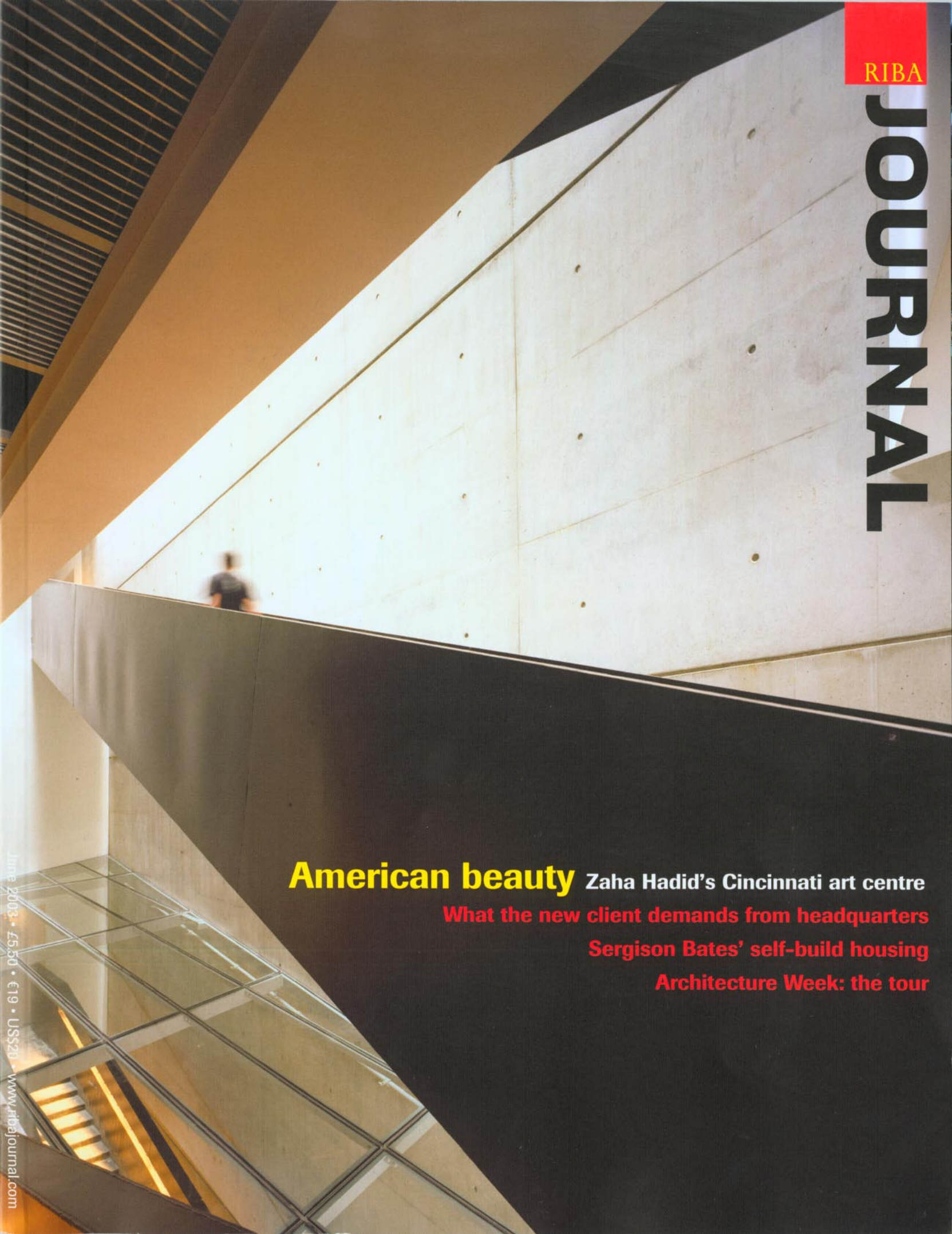

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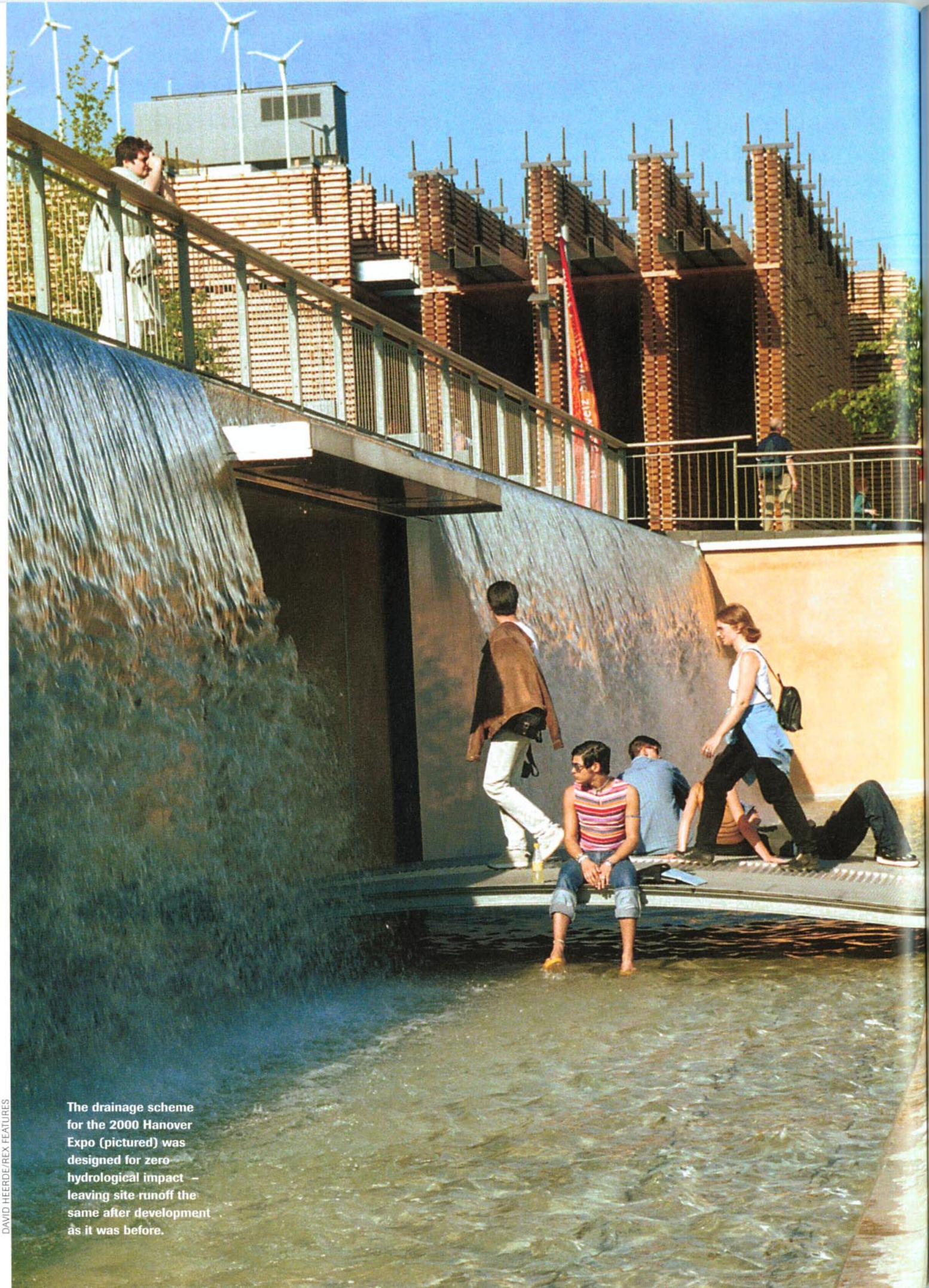


The drainage scheme for the 2000 Hanover Expo (pictured) was designed for zero hydrological impact – leaving site runoff the same after development as it was before.

DAVID HEERDE/REX FEATURES

Peter Wilder of Derek Lovejoy Partnership explains the importance of designing for zero hydrological impact.

Not just a pipe dream

Drainage may not seem the most newsworthy of subjects, but floods across Europe last August caused £3.4bn worth of damage and showed how destructive water can be. They highlighted the importance of long-term strategies to deal with increasing development pressure on urban drainage. The notion of sustainable urban drainage (known as SUDs) arose from the need to address the effects of development on urban watercourses. SUDs schemes to remove the concrete encasement of streams and tributaries have enhanced the capacity of catchment areas to absorb peak flows (and so reduce flooding) and release water slowly to prevent low base flows during dry periods. They have also increased the biological diversity of river ecosystems.

SUDs are designed to slow down the rate of runoff into surrounding catchments and to allow clean site runoff to infiltrate back into the soil, a process that is vital to recharge the aquifers we rely on for drinking water. This source control – the attenuation, cleansing and infiltration of rainwater on site – offers alternatives to traditional engineering methods of getting rid of water from site as quickly as possible.

It is no surprise that the Environment Agency has given SUDs its full backing and that the processes are gradually being built in at all levels of development control. The agency has to be consulted over planning applications in flood plains and it has been piloting drainage impact assessments for developments. The requirements are written into PPG 25 and Part H of the Building Regulations also offers guidance on disposal of water. Recent documents at EU and government level (DEFRA's *Directing the Flow*, published in November last year, and the EU water framework directive that preceded it) demonstrate the increasing governmental concern about water management. So it makes sense for architects to get their heads around SUDs early in the design process.

The UK has not yet gone as far as Berlin, where the city authorities take the problem so seriously that new developments are required to discharge 80% of rainwater by infiltration, evapo-transpiration or reuse on site for toilet flushing or landscape irrigation. Renzo Piano Building Workshop's Debis Building in Potsdamer Platz has a landscape scheme that uses large underground storage tanks for water collected on site. Some is used to irrigate the extensive roof garden areas where it is absorbed by plants or evaporates, and some for toilet flushing in the building. The rest is pumped into a settling pond where reed beds filter the water before it is discharged.

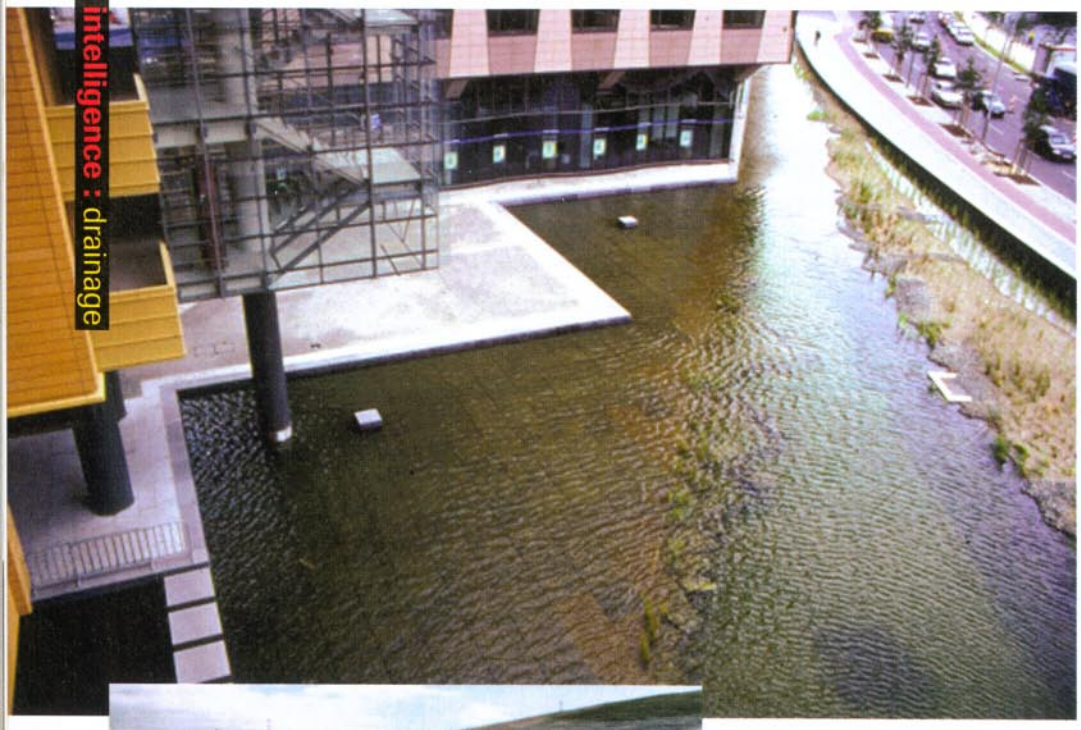
Being able to demonstrate a drainage strategy can help win planning permission in the UK. At Fitzroy Robinson's commercial development at Skew Bridge in Northamptonshire, where the development sat in a flood plain and next to a site of special scientific interest, a sustainable urban drainage strategy developed by my practice helped get it through planning.

The strategy was based on the idea of zero hydrological impact (ZHI). Like designing buildings with zero carbon emissions, the intention is to have no impact, and it drives a whole land planning ethos that architects need to take on board to keep their schemes moving through the planning process and make the best of sites. ZHI has now become the best practice objective of schemes that involve environmental regeneration or land reclamation. On brownfield land it extends beyond controlling the discharge of water to immobilising pollutants in the soil and establishing ecosystems to tie up contaminants within plant systems. On greenfield sites, ZHI design is concerned with attenuation and infiltration of rainwater so that the site runoff is effectively the same as before development, minimising extra flood risk. This was achieved at Hanover in Germany where a site of 130ha was developed, initially for the 2000 Expo but now for 15,000 residents as well. The drainage scheme, designed by pioneering German urban hydrologist Atelier Dreiseitl, uses retention ponds, grass swales and stormwater wetlands to mimic the predevelopment runoff.

At Skew Bridge we used similar strategies, but the attenuation had to be done underground because of the possibilities of flooding of the site. Subterranean storage cisterns will attenuate runoff from hard surfaces, creating a buffer between the development and the river floodplain, allowing slow release of rainwater after storms and the removal of suspended solids and pollutants before the water goes ▸

From Expo to your own back yard

It is not only big projects where sustainable urban drainage can make an impact. When Kiran Mistry bought his new house two years ago he decided to experiment. He was working in the technical services department of Polypipe, giving advice on rainwater harvesting systems. The plumbing had not then been installed in his new house, so he dropped a 1.5m high rainwater tank into his front garden and started measuring his water savings. 'We were just starting a family,' says Mistry, 'so I knew there would be a lot of washing.' As well as the washing machine the recycled water flushes the loo and waters the garden. Mistry even fitted a UV screen so that his daughter would be able to play in the water in her paddling pool. His readings show that the family made a 50% saving on mains water.



Filtration beds at Renzo Piano's Debis Building in Potsdamer Platz (above); lake at Dalton Park, County Durham (left), a former colliery site; and site plan of Skew Bridge in Northamptonshire (below), where a sustainable drainage strategy helped win planning permission for Fitzroy Robinson's commercial development.

into the River Nene. Fitzroy Robinson planned the buildings so that the landscape permeated the architecture – creating an opportunity for grass swales and planting to intercept the silt-laden first flush of rainwater runoff.

Our recently completed scheme at Dalton Park in County Durham involved turning a landscape of 600,000m³ of colliery shale into a retail outlet and park. Shifting so much material created an opportunity to reshape the landscape and to create a diversity of wildlife habitats. Instead of importing topsoil to cap the mainly inert waste on site, sewage sludge cake was incorporated in situ. Woodland and scrubland planting was established to stabilise steeper slopes and intercept silt runoff. Ryegrass provided instant green cover on the slopes to prevent erosion and rapidly absorb any free nitrates that might have leeched out of the sewage. Discoveries of pockets of clay and alluvial sand deposits were set aside for use in lining the ponds and lakes. Runoff from the site, including car park areas, passes through a series of filtration zones, settlement ponds and reed beds before reaching one of two balancing ponds where the attenuation capacity ensures that the discharge rate does not exceed 7.5 litres per second. The presence of open water improves the site's hydrological profile and acts as a catalyst for wildlife regeneration, making it a wonderful place to be.

The development of sustainable drainage is not just a question of securing planning permission, or even reducing floods. It can also create diverse habitats using locally resourced materials that act as a catalyst for economic and environmental regeneration and provide a buffer zone between development and nature. And as Potsdamer Platz showed, these solutions are not just for huge commercial projects – it is only a matter of time before we see our first reed-bed filtration system built on a roof-deck landscape. ■

Peter Wilder is an associate of Derek Lovejoy Partnership London. He is writing a best practice manual for sustainable landscape design.

Links

European Union water framework directive, 2000
http://europa.eu.int/comm/environment/water/index.html

Directing the Flow – Priorities for future water policy
www.defra.gov.uk/environment/water/strategy/index.htm

PPG 25: Development and Flood Risk, 2001
www.odpm.gov.uk/ppg25

Drainage and waste disposal, Approved Document H, 2002
www.safety.odpm.gov.uk/bregs/brpub/ad/ad-h/index02.htm

Environment Agency
www.environment-agency.gov.uk

Scottish Environment Protection Agency water policy
www.sepa.org.uk/policies/index.htm

CIRIA best practice guidance
www.ciria.org.uk/water.htm

Bringing water back home, one-day conference
8 October 2003, RIBA, 66 Portland Place, London
www.lifestyletraining.com/water