



Water & Living Roofs

Where are we Heading?

Phil Henry
Market Development Director

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Polypipe Terrain –Our Partners



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BREEAM®

www.breeam.org



Industrial Strategy: government and industry in partnership



Construction 2025

July 2013



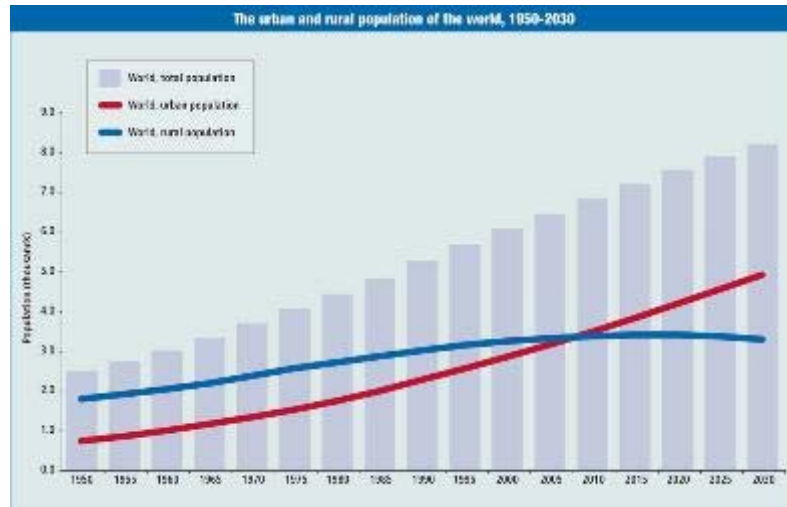
Resilience –Water & modern city development



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Global urbanisation



- World population is moving to cities
- Growth, (re-)development and intensification of urban areas leads to:
 - increase in built and hardscaped areas
 - loss of urban green space

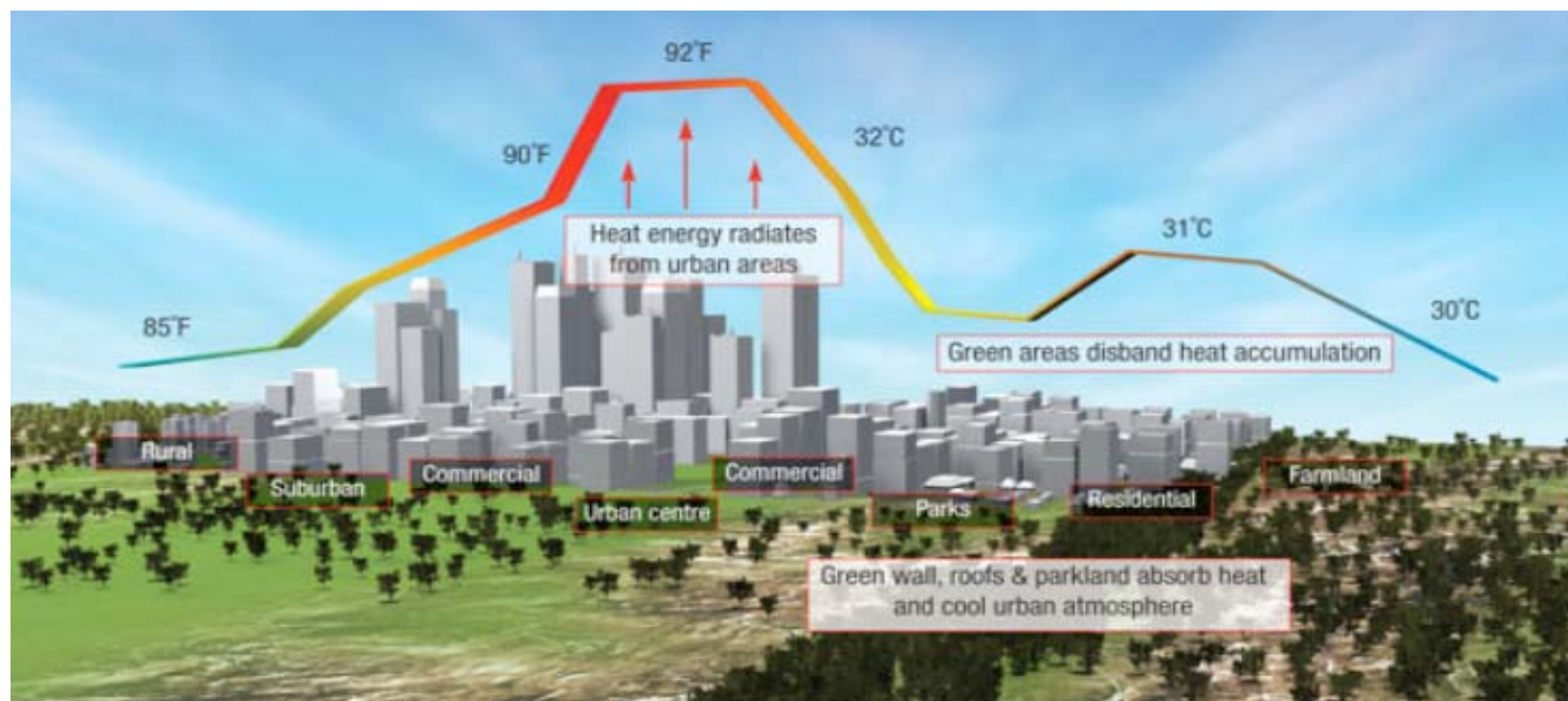


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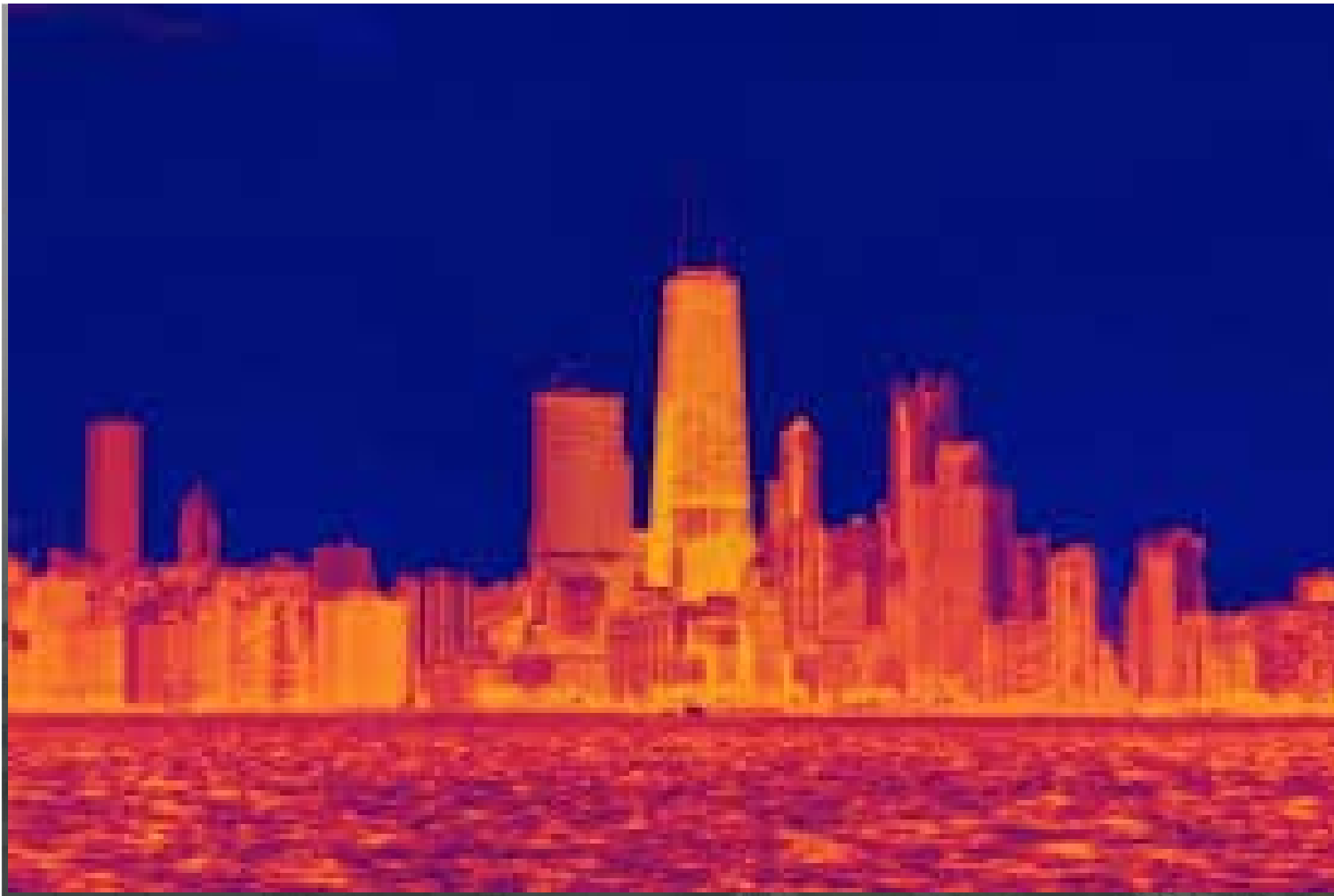


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Heat island threat



Urban heat island



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Water -BS 8582 :2013



- Maximizing the potential societal and environmental benefits arising from the:
- Use of surface water run-off to protect and enhance local water resources and supplies
- Contribution of surface water management systems in mitigating climate risk
- Integration of surface water management systems with planning processes and urban design in delivering amenity and community value

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- **BS 8582:2013, COP for Surface Water Management for Development**

- Planners and drainage approval bodies: in setting consistent drainage criteria and principles (for new developments and redevelopments) that deliver effective surface water flood risk management as sustainably as possible while contributing towards the delivery of relevant environmental, sustainability and urban design planning objectives for the site and local area.



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Sponge city



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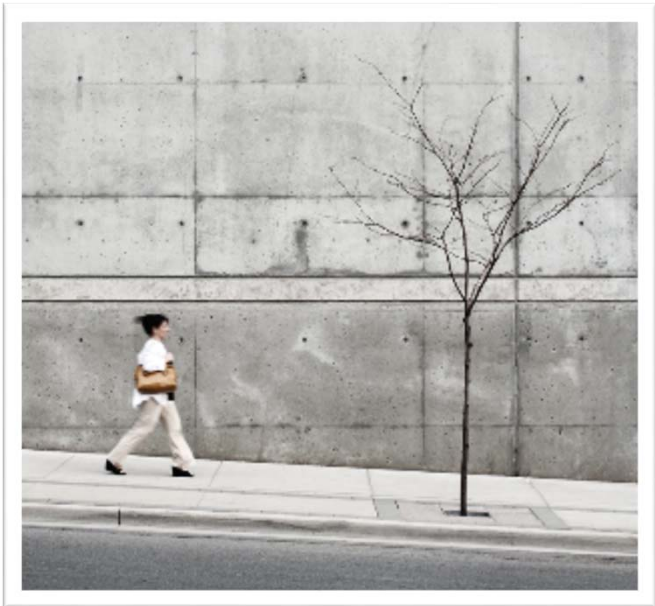
Potable water



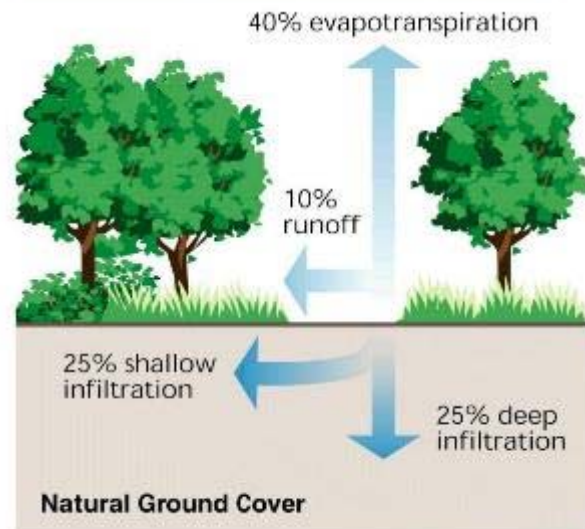
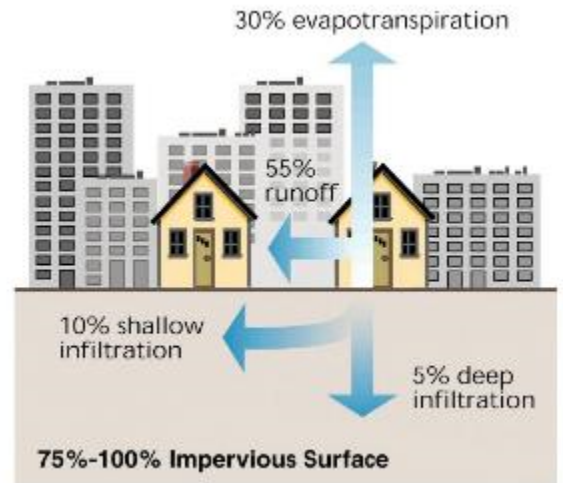
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Loss of habitat



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Green Space

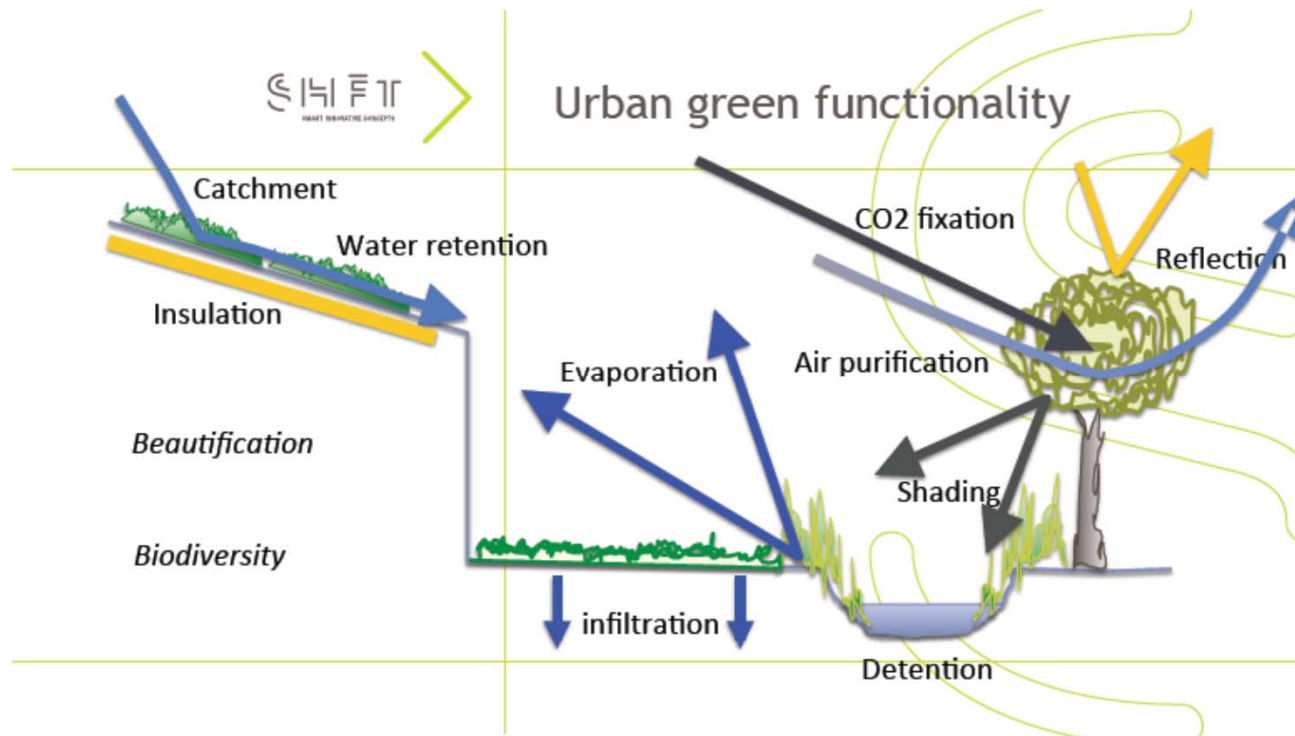
- Proven health benefits – healthier/happier
- Relaxing effect
- Restorative effect
- Inspiration to go outdoors and move



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Urban green cycle



Industry drivers -The London Plan

- The London Plan (SPG)
- Use of SuDS measures for undeveloped sites
- Storm period returns
- Open space greening
- Climate change factors
- Wider sustainability issues; cooling urban space
- The Environment Agency
- Water Authorities / Port of London Authority
- CIRIA guide 976
- BREEAM
- FORS
- Commercial floor space rents
- BS 8582 :2013
- Other cities –Holland

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LONDON PLAN IMPLEMENTATION PLAN 1

JANUARY 2013

LONDON PLAN 2011
IMPLEMENTATION FRAMEWORK

MAYOR OF LONDON

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The London Plan - Key implementations

- Surface water management plan
- Water security
- Its not just water !
- Green infrastructure
- Open space strategies

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action/implementation action no	action type	London Plan policies supported	key deliverers	2010-2013 to 2012-2018	2013 post-on-going to 2018	timescale notes	certainty for key deliverers
CC.18 Water Resource Management Plans - address how to meet future potable water demand	Investment	5.15, 5.3	Water Companies			2013/14 (covering 2015-2040) - review every 5 years	Strong commitment
CC.19 Measures to achieve and maintain Water Neutrality - reduce water demand	Research / assessment	5.15, 5.3	London Water Group, GLA, Environment Agency				Dependent on resources
CC.20 Securing London's Water Future: the Mayor's Water Strategy - improve water demand supply planning process; reduce water demand; tackle water poverty, surface water flooding, drainage, and energy from waste water	Strategy / guidance	5.12, 5.13, 5.14, 5.15	GLA in partnership with key stakeholders			Published October 2011	Dependent on resources
CC.21 Victorian Mains Replacement Programme - leakage	Investment	5.15	Thames Water				Dependent on resources

LONDON PLAN IMPLEMENTATION PLAN

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LONDON PLAN IMPLEMENTATION PLAN

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action/implementation action no	action type	London Plan policies supported	key deliverers	2010-2013 to 2012-2018	2013 post-on-going to 2018	timescale notes	certainty for key deliverers
CC.9 Decentralised Energy Programme Delivery Unit - supporting the sustainable use of local scale decentralised energy projects by offering commercial and legal advice and helping to secure the conditions needed to deliver large scale projects	Strategy / guidance / partnership	5.5, 5.6	GLA, boroughs, developers, energy providers				Dependent on resources
CC.7 London Hydrogen Partnerships Action Plan - to facilitate the development of the pathways needed through support for transport and stationary fuel cell applications	Action plan / design	5.11	GLA				Dependent on resources
Climate change adaptation							
CC.8 Managing risks and increasing resilience: the Mayor's climate change adaptation strategy - advice, funding, drought and covering	Strategy / guidance	5.9 to 5.15	GLA			Published October 2011	Strong commitment
CC.9 EUFIP project involving collaboration between London's land cover and urban heat island	Research / assessment	5.11	Water partnership, led by University College London			2011	Mixed commitment
CC.10 Urban Greening Initiative - includes Mayor's initiative on 10,000 more trees and green roofs	Research / assessment	2.10, 5.10, 5.11, 5.15	GLA, Greenspace Information for Greater London (GIGL), Forestry Commission, DCFLA				Dependent on resources

LONDON PLAN IMPLEMENTATION PLAN

The Environment

- Development Size
- Peak flow rates
- Limited discharge rates
- Green field run off rate
- Permeability issues
- National Planning Policy Framework
- Carbon cost for RWH report



Industry Response

Design with water

Upper catchment management
Raw water demand reduced as a result of water efficiency throughout catchment. Moorland and woodland management reduces colour in raw water, improves water quality in rivers and reduces run-off. Hydro-power is a source of energy.

Water footprinting
Understanding embodied water use within the city to determine water footprint and dependencies with remote water systems.

Agriculture and food
Land management to reduce run-off and improve water quality. Restoration and protection of river edges from contamination and grazing animals. Localised food growing throughout the city and edible planting throughout the green grid. Nutrient recycling from wastewater treatment.

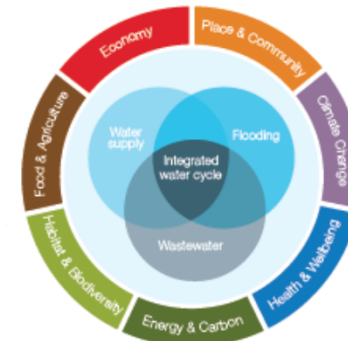
Spatial planning and land use
Understanding of the integrated water cycle at catchment scale informs rural and urban planning and land-use, ensuring sustainable urban development is integrated with its hinterland and wider context.

Campus/business park
Compatible uses encourage localised recycling and sharing of water resources. Landscape and buildings enhanced through water related interventions.

City centre

Water reintegrated as a central feature of high quality public realm. New and retrofitted water efficient buildings use green roofs, green façades and intelligent management systems. Building scale harvesting and recycling. Ground water as heat source. New water and urban greening improves microclimate and controls run-off.

Revitalised river space
Re-design and re-connection of river banks using range of multi-functional flood defence options depending on urban context. Flood-compatible uses along river.



Design with water

Sustainable urban extension
Site selection and planning to avoid flood risk and work with natural water cycles. Low carbon and water efficient homes. Community-scale water supply and treatment, including grey water recycling, CHP/solar power supplemented by micro hydro. Groundwater supply and potential heat source, with aquifer recharge from SuDS and treated wastewater.

Extended asset life for existing infrastructure
By reducing demand for supply and treatment, better water management can extend the life of existing water and wastewater assets avoiding disruptive and carbon-intensive replacement.

Inner city retrofit
Whole house retrofit including water efficient fixtures, smart metering, disconnection of downpipes and water recycling, coupled with landscape retrofit of SuDS, creating habitat and amenity. Possibility of community-scale decentralised treatment for surface water and industrial/domestic greywater. Possibility of sewer mining for light industry, landscape maintenance and localised food production.

Green infrastructure
Water plays a key role in the delivery of green infrastructure through de-culverting and restoration of rivers and canals. SuDS retrofit, and vegetation/tree planting to reduce run-off and manage microclimate. Green grid inhabited by community orchards and edible planting, play areas, and allotments. Networks of paths and cycleways.

Municipal treatment works
Capacity and carbon footprint reduced. Energy generation from waste, hydraulic recovery, wind, and, for example, solar retrofitted to redundant settlement tanks. Spare land use as tree nursery for urban greening/woodfuel. Soil production from green waste used for food growing and urban greening. Nutrients recycled locally.

Smart infrastructure
Real-time smart monitoring and control in buildings, on networks, rivers and waterways saves water, energy and improves flood control and forecasting.

Dynamic natural coast
Providing habitat and amenity.



Reducing risk, increasing resilience and making better places



CIRIA RP 976



ice
Institution of Civil Engineers

Landscape
Institute
Inspiring great places



RTPI
mediation of space - making of place

URBAN
DESIGN
GROUP

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INTRODUCING WATER SENSITIVE URBAN DESIGN



water sensitive urban design

05

Water Sensitive Urban Design is the process of integrating water cycle management with the built environment through planning and urban design.

Two principles are essential to its application:

- 1 All elements of the water cycle and their interconnections are considered concurrently to achieve an outcome that sustains a healthy natural environment while meeting human needs. This includes managing:
 - a Water demand and supply
 - b Wastewater and pollution
 - c Rainfall and runoff
 - d Watercourses and water resources
 - e Flooding and water pathways
- 2 Consideration of the water cycle is made from the outset, and throughout the design and planning process. Accordingly, water management solutions seek to meet the expectations and aspirations for design of successful places, such as:
 - a Celebrating local character, environment and community
 - b Optimising the cost-benefit of infrastructure and built form
 - c Improving quality of life for communities
 - d Providing resource security and resilience in the future.

Living roofs - Green, Blue, Yellow roof design

WHAT COULD A WATER SENSITIVE BLOCK OF FLATS LOOK LIKE?

URBAN FORM:

High-rise flat
Public spaces are dull and unused

WATER CONTEXT:

Next to river with variable level
High water stress area
Combined sewer system at capacity

COMMUNITY CONTEXT:

Amy and Jeremy rent a flat for themselves and their two children
Tight budgets
Communally managed flats
No good recreation space for adults or children

GREEN ROOF

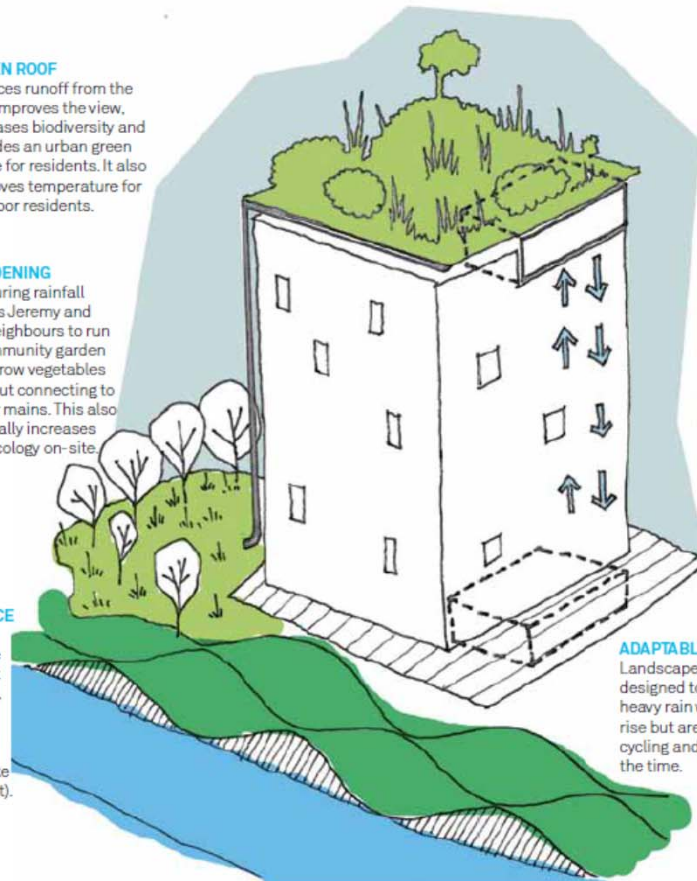
Reduces runoff from the roof, improves the view, increases biodiversity and provides an urban green space for residents. It also improves temperature for top floor residents.

GARDENING

Capturing rainfall allows Jeremy and his neighbours to run a community garden and grow vegetables without connecting to water mains. This also naturally increases the ecology on-site.

QUIET GREEN SPACE

Converting paved area to green space provides a pleasant space for residents, reduces runoff and reduces the urban heat island effect (where materials like concrete retain heat).



GREYWATER RECYCLING

Greywater from flats is recycled reducing water bills and the amount sent to sewers and treated. The building manager runs a communal system.

GROUND FLOOR RESILIENCE

The ground floor should be designed or retrofitted to be flood resilient and with an appropriate low-risk use to mitigate any damage that might occur if flooding does happen.

ADAPTABLE SPACE

Landscaped areas that are designed to be floodable during heavy rain when water levels rise but are great for walking, cycling and playing the rest of the time.

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Amsterdam The opportunity

The Opportunity



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Living roofs 12km² = 1 billion Euro investment value



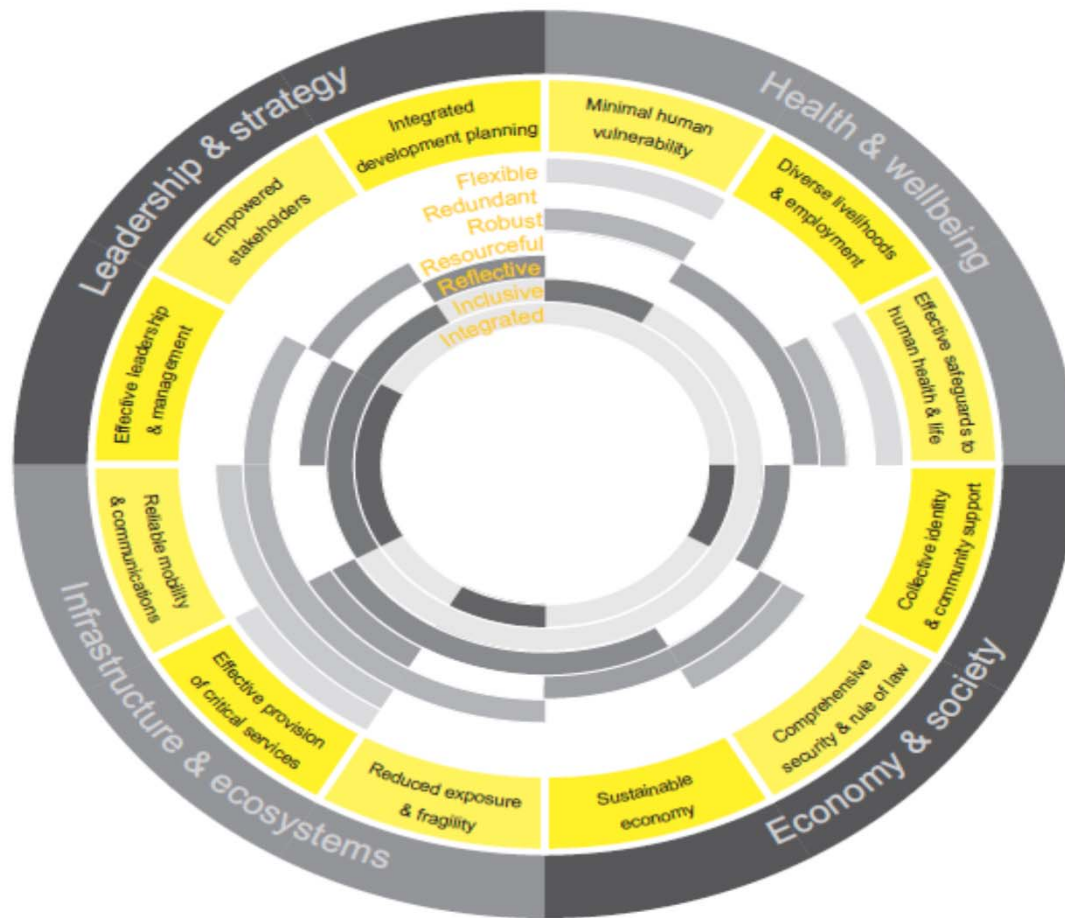
6kWh/M2/Yr.

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Source GLA Report

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Calculation tool



Traditional surface water attenuated solutions

- Above or below ground tanks and pumping requirements
- Sectional tanks in plant rooms
- Infrastructure tanks -Basement locations using valuable area
- Additional pumping to sewers
- Designs not currently working with the built environment –
Greening cooling effect,
amenities Landscaping &
planting, sports pitches, Street
furniture



New thinking-Challenging tradition



- Many projects have under used roof & podium levels with aggregate sub base
- Capital costs exists for the client/developer to hold the surface water run off on site for the project
- Surface water approach “Threat to Asset thinking” -Using stored water at podium to passive irrigate green areas, reduced potable water
- Use of ECA allowance in contracts to non Government clients & corporation Tax payers
- Traditional RWH and pumped units may be not be required

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Challenging Tradition

- Providing design input at FRA stage.
- Design team collaboration Architect, Landscape Architect, Building Services
- Designing out storage tanks in basements if possible
- Basement areas being used for commercial use = rent or cycles & car parks income
- Target additional BREEAM Credits- higher rated buildings - better rent values for client and developer

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- Construction costs and property cost

RESEARCH
February 2014

Low vacancy levels persist throughout much of the Central London office market which has resulted in widespread rent increases during the second half of 2013 - trends that are also likely to be the hallmark of 2014

CARTER JONAS

Commercial edge
LONDON

This document has been prepared by Carter Jonas' Research Team specifically to assist London based office tenants with budgeting and planning for the annual running costs associated with renewing a lease, negotiating a rent review or relocating to alternative premises.

Since publishing our October 2013 Office Market Update the supply of vacant floor space in all the London office sub-markets, save for Docklands, continues to limit tenant choice. The trend for landlords to increase quoting rents and reduce rent free periods, which began in the West End office market in 2010, is spreading to the remainder of the Central London office market, including the City of London, as improving tenant demand erodes the stock of vacant floor space. The current low office vacancy levels are a direct consequence of limited development starts during 2008-2011, due to falling tenant demand and the virtual absence of development funding following the 2008/09 banking crisis, coupled with the increasing trend towards redeveloping office buildings for higher value residential use.

While landlords and developers are reacting to declining vacancy levels and the resumption of rental growth by taking properties back as leases expire to refurbish/develop, the supply of vacant floor space is unlikely to improve appreciably in the short-term given that office refurbishment/development programmes have a duration of, typically, 18-30 months.

Based on the current patterns of demand for Central London office space it is likely that office vacancy levels will continue to fall further over the next 12-18 months which is likely to result in continued rent increases and a shortening of rent-free periods throughout most parts of Central London. This document provides a commentary on our predictions for market trends during 2014.

A guide to office market trends, rents and rent free periods

The London office market in numbers...

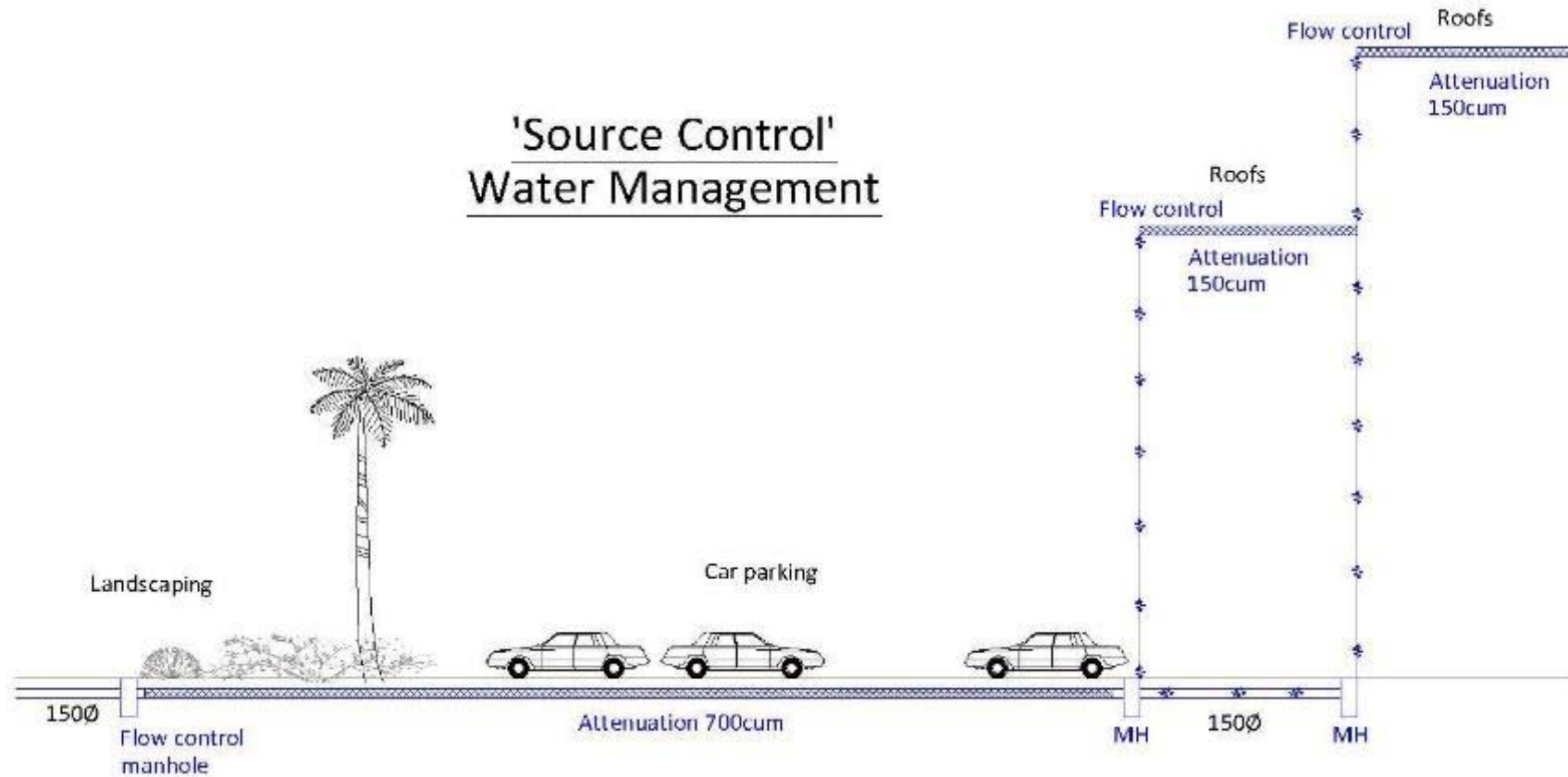
Prime West End office rents have risen between 5% and 9% since Q1 2013 and are now £100-£120 per sq ft per annum
Prime City rents are £55.00-£59.50 per sq ft , and £65.00-£70.00 per sq ft per annum for the upper floors of tower buildings
Discounts on landlord's quoting rents are typically 2.5-5% in the West End & South Bank and 2.5-7.5% in The City
City fringe east and Docklands office rents are some of the lowest in London - typically £30.00 - £40.00 per sq ft per annum for refurbished Grade A space
Central London office rents are predicted to rise between 5% and 9% by Q4 2014
Rent free periods for 5 year leases - up to 12 months (City) and up to 9 months (West End)

carterjonas.co.uk/officeresearch 1

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Source Control Approach

'Source Control' Water Management



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Roof Area



Table 3: Potential Green Roof Area in Four Areas of London

Area	Total Area (m ²)	Potential Roof Area (m ²)	%
Cannon Street	193,000	61,255	31
Oxford Street	143,000	46,330	32
Tottenham Court Road	118,787	49,150	41
Canary Wharf	292,000	70,015	24
Average per cent			32

Roof top parks



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Urban Farming



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Passive irrigation & CO2

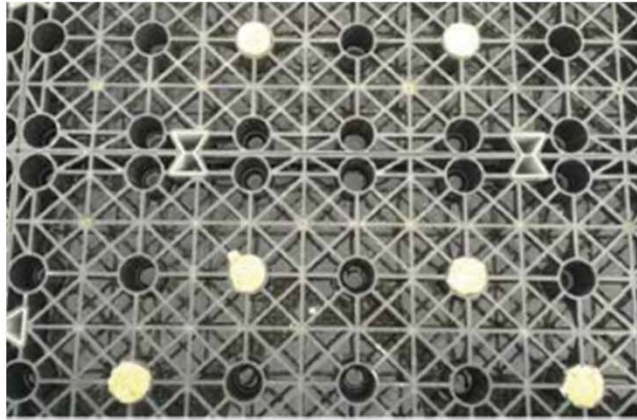
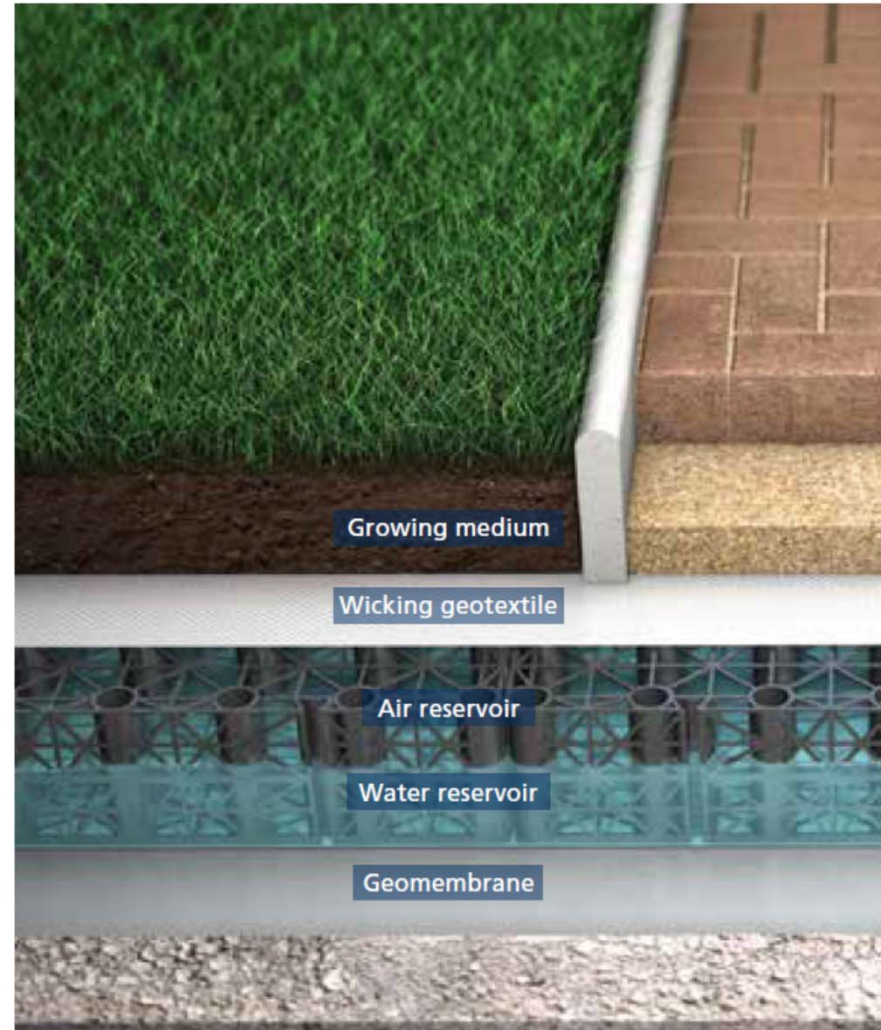


Table 2: Study of Temperatures Under Membranes of a Conventional and a Green Roof

(www.greenroofs.co.uk)

	Winter	Summer
Mean Temperature	0°C	18.4°C
Temperature under membrane of conventional roof	0.2°C	32°C
Temperature under membrane of green roof	4.7°C	17.1°C



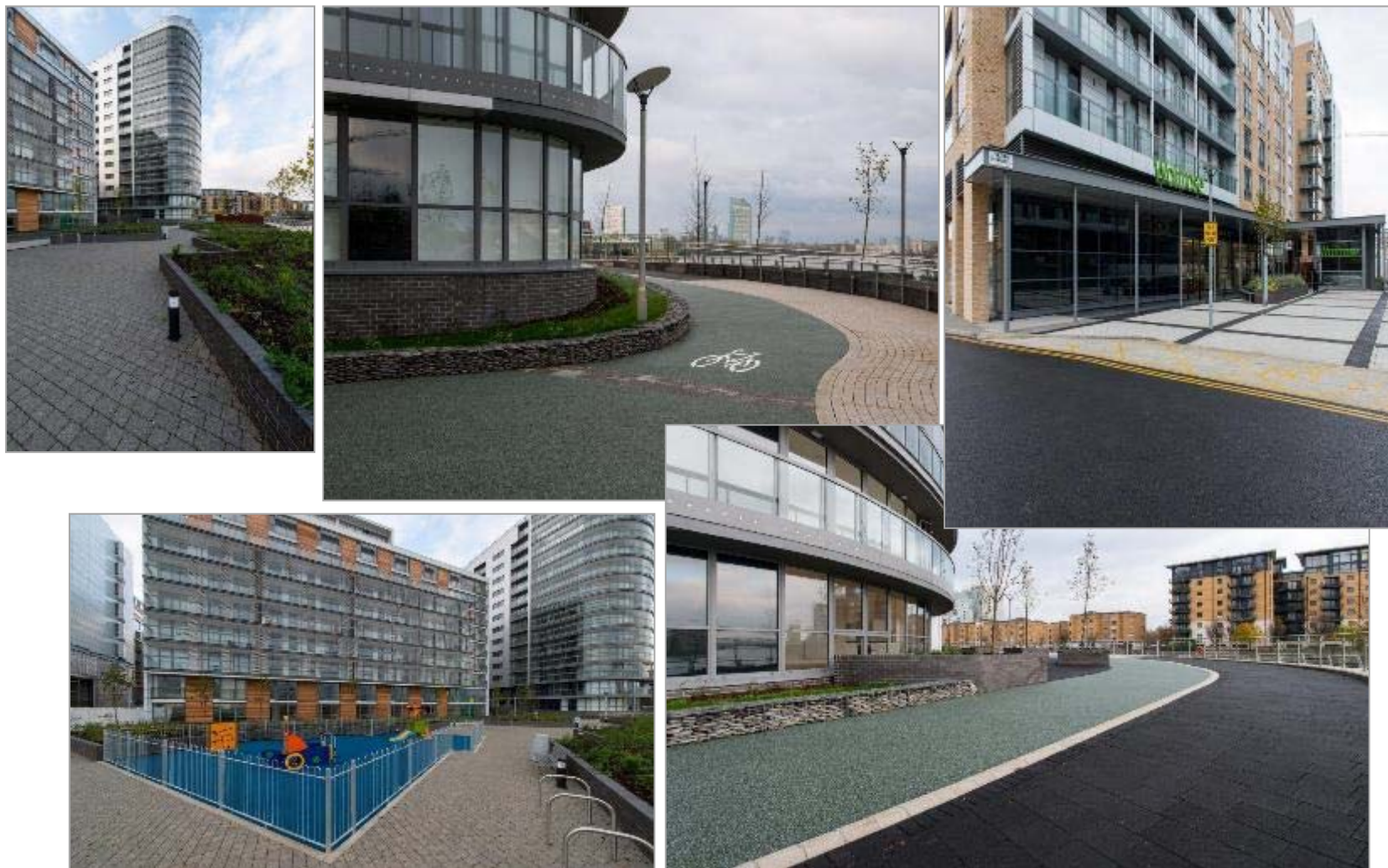
Greenwich project



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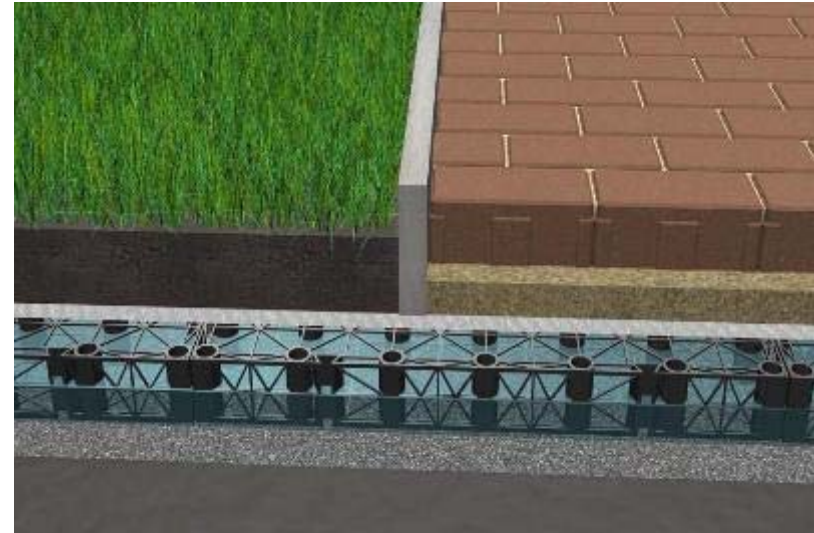
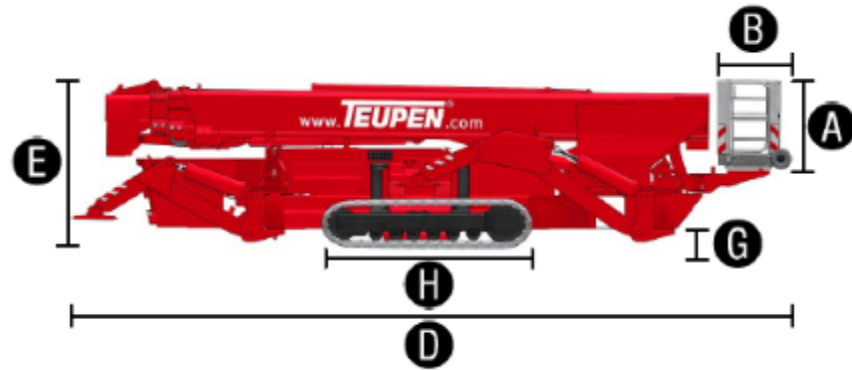
Greenwich completed



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Design considerations



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Green Roof 7.1 NHBC

The screenshot shows a PDF document titled 'GREEN ROOF' with two columns. The left column is for 'intensive (requires regular maintenance. Plants contained within soil)' and the right column is for 'extensive (requires periodic maintenance. Plants grown in the sedum blanket)'. Each column contains a cross-section diagram with labels. The intensive diagram labels include: soil and vegetation (up to 1m deep), filter layer, drainage/reservoir layer, protection layer, root barrier, waterproofing, insulation, vapour control layer, screed, and concrete deck. The extensive diagram labels include: sedum blanket, filter layer, root barrier, waterproofing, insulation, vapour control layer, screed, and concrete deck (noted as possibly a profiled metal deck depending on load).

intensive (requires regular maintenance. Plants contained within soil)	extensive (requires periodic maintenance. Plants grown in the sedum blanket)

The Importance of Effective Waterproofing

- Roof waterproofing is essential to protect the structure beneath
- Forms an integral part of effective rooftop SUDS
- Many systems are available to suit client / project requirement
- Essential to select based on key criteria, including:
 - Performance e.g. longevity / lifespan
 - Independent certification (e.g. BBA)
 - Easy of installation (& ease of repair)
 - Environmental credentials
 - Place of manufacture (carbon delivery miles)

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Targeted Sections- Breeam

Pol 03 Surface water run off

No. of credits available:	5
Minimum standards:	No

Aim

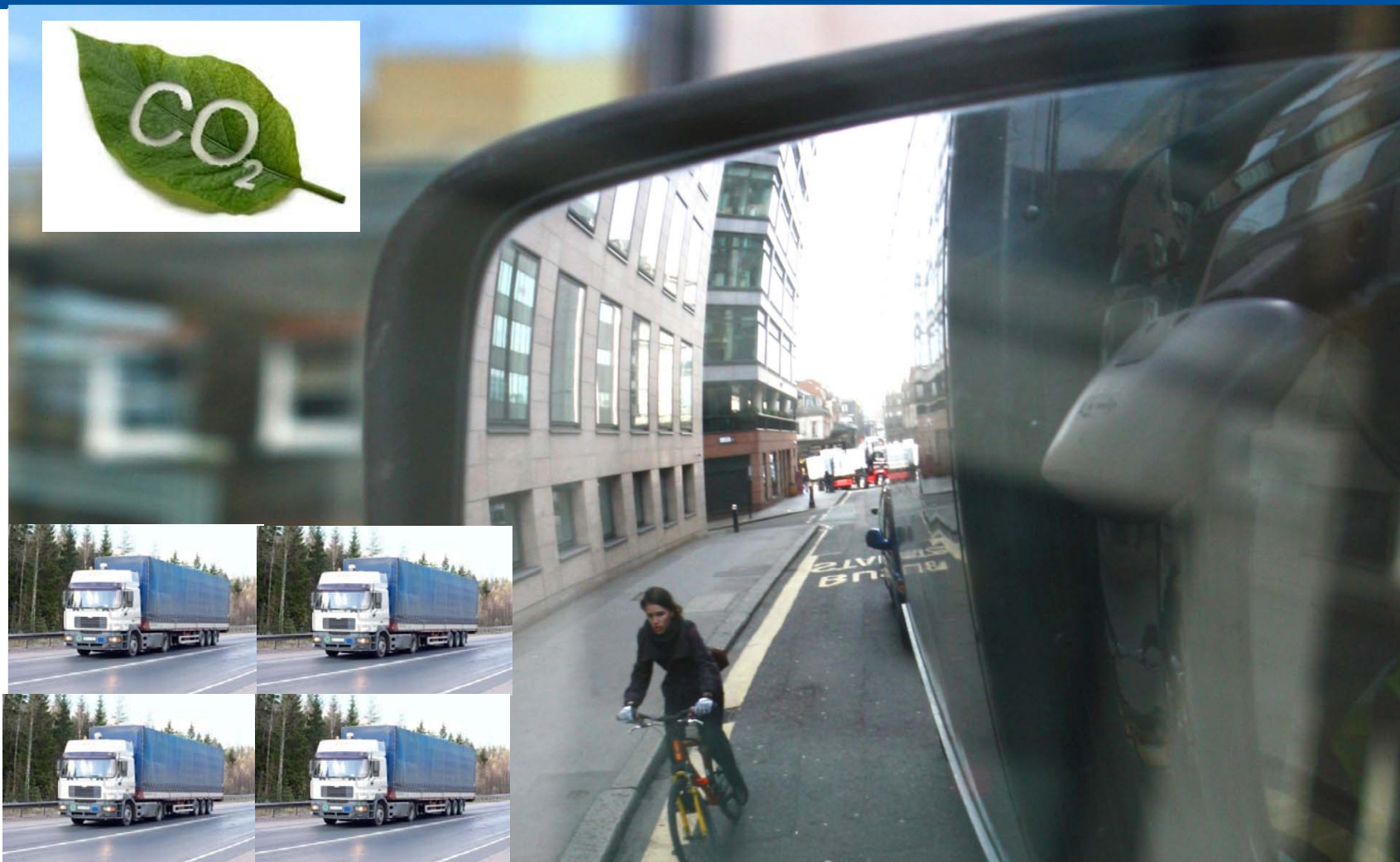
To avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, therefore minimising the risk of localised flooding on and off site, watercourse pollution and other environmental damage.

Assessment Criteria

This issue is split into three parts;

- Flood risk - 2 credits
- Surface water run off - 2 credits
- Minimising water course pollution - 1 credit

Transport 1-21- FORS



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Thank you

■ Questions

References and acknowledgements

- Amsterdam City
- GLA
- TDAG
- Green Audit Land Securities
- BRE
- BAA
- NHBC
- Carter Jonas
- CIRIA
- British Standards

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