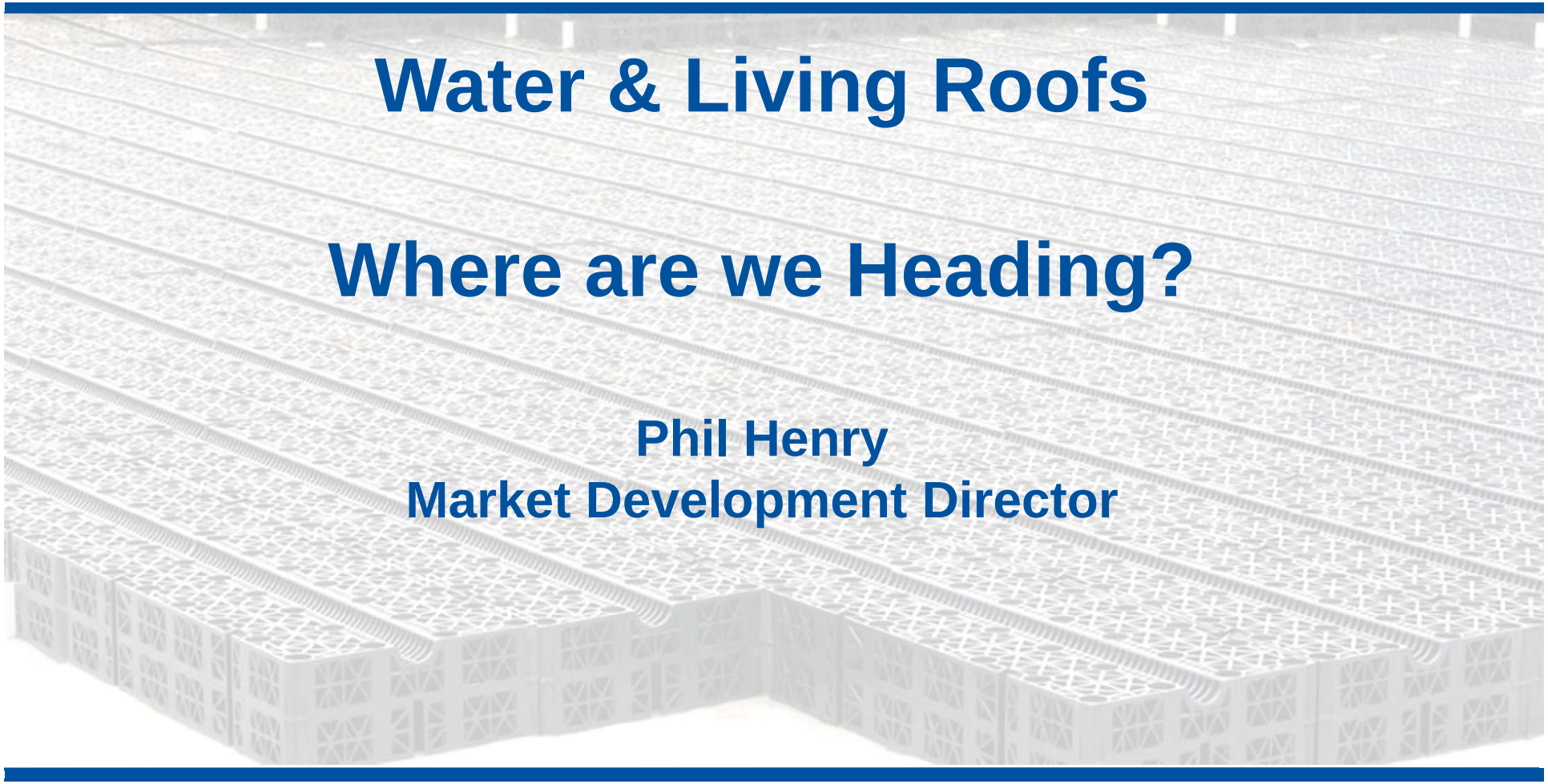

# Water & Living Roofs

# Where are we Heading?

**Phil Henry**
**Market Development Director**

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# Polypipe Terrain –Our Partners

construction products association

BSRIA Member

CONSTRUCTING EXCELLENCE in the built environment

BritishExpertise promoting professional services worldwide

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HM Government

Industrial Strategy: government and industry in partnership

Construction 2025

July 2013

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# Resilience –Water & modern city development

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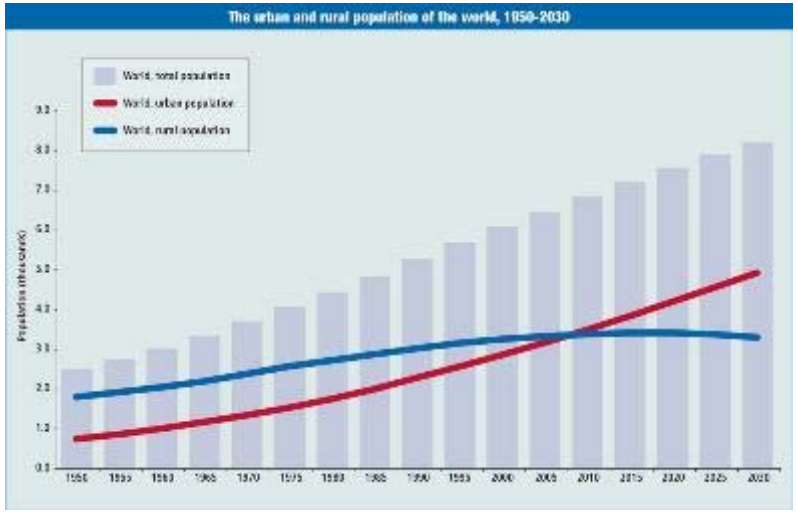
# Global urbanisation




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

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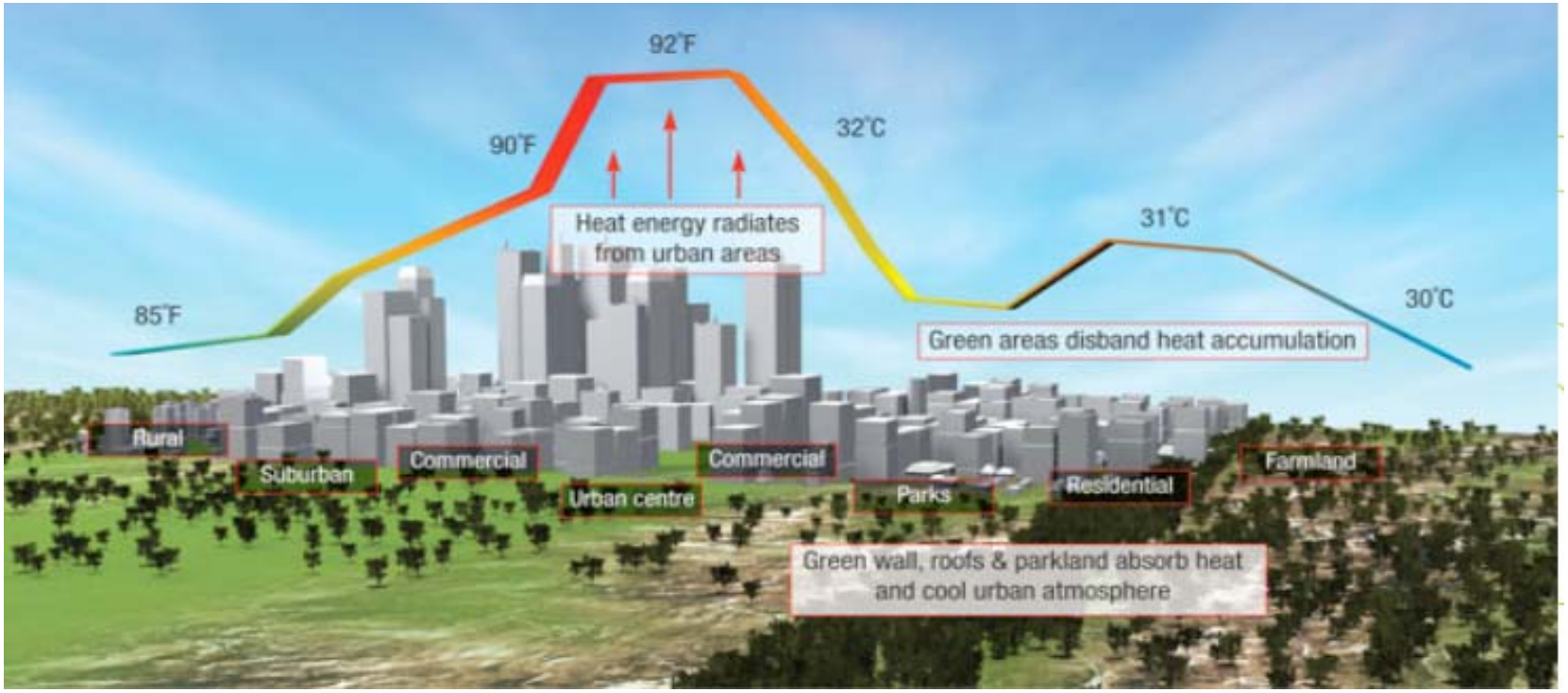
# Heat island threat

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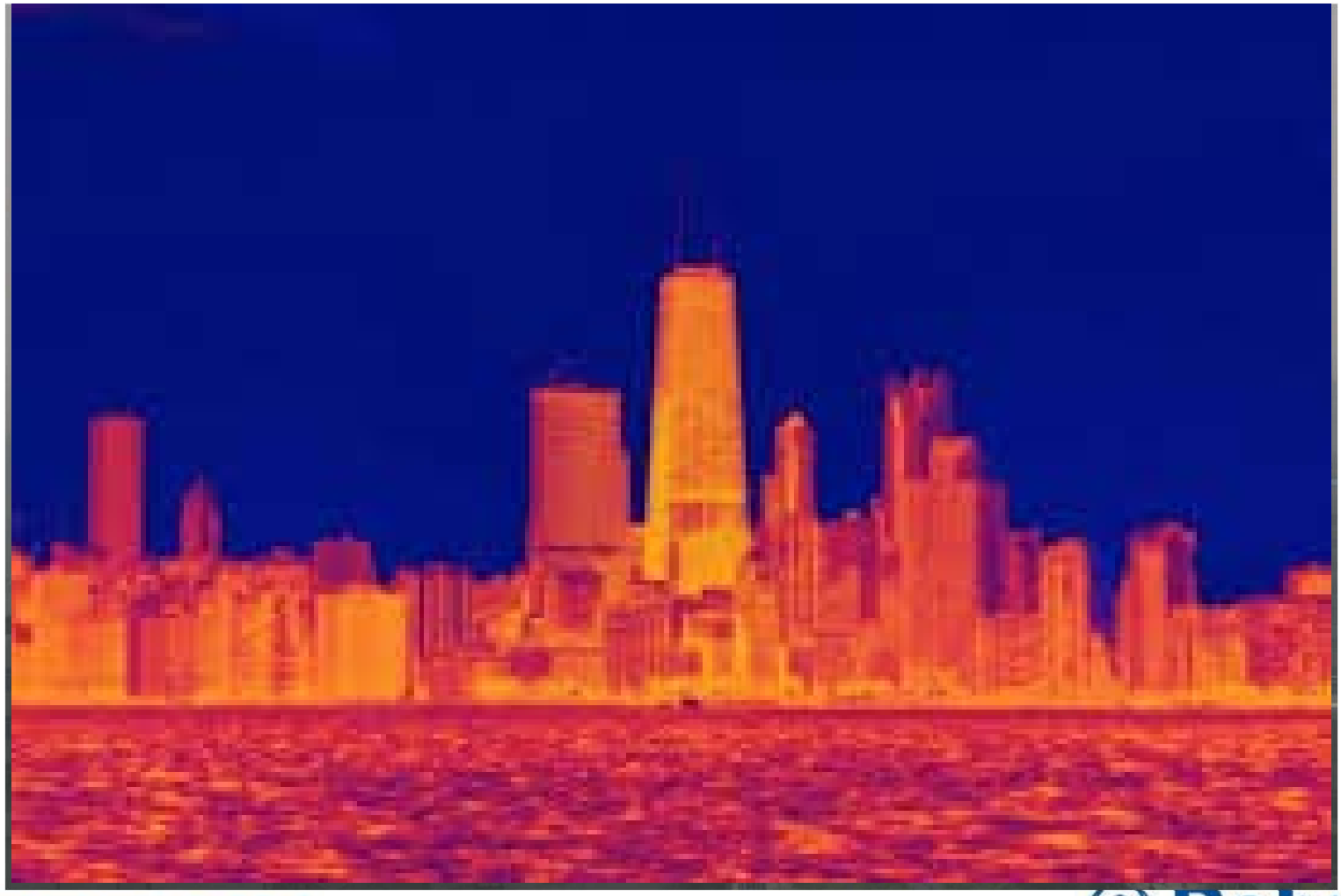
# Urban heat island



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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

- **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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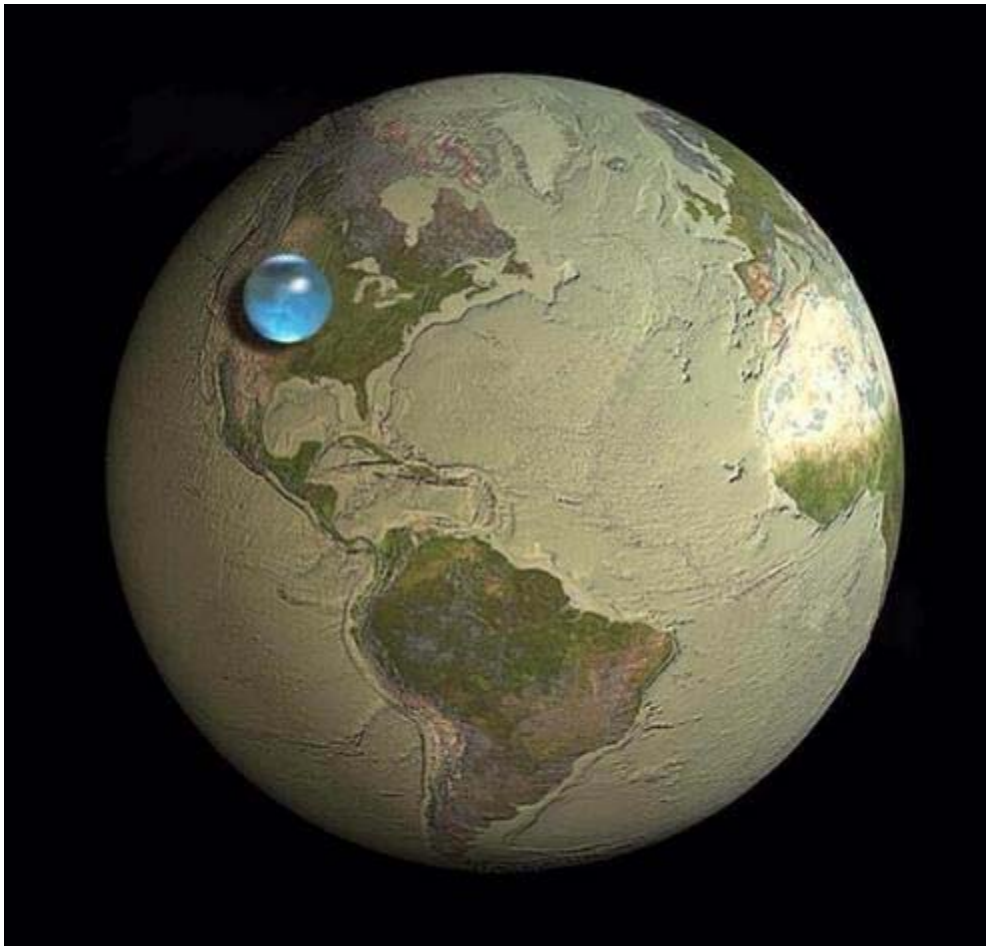
# Potable water



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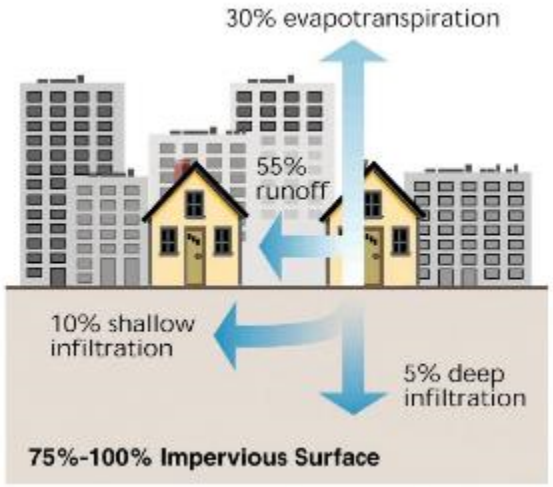
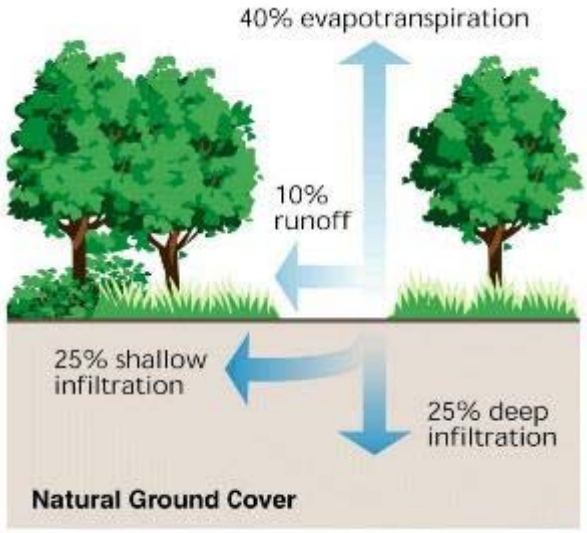
# Loss of habitat

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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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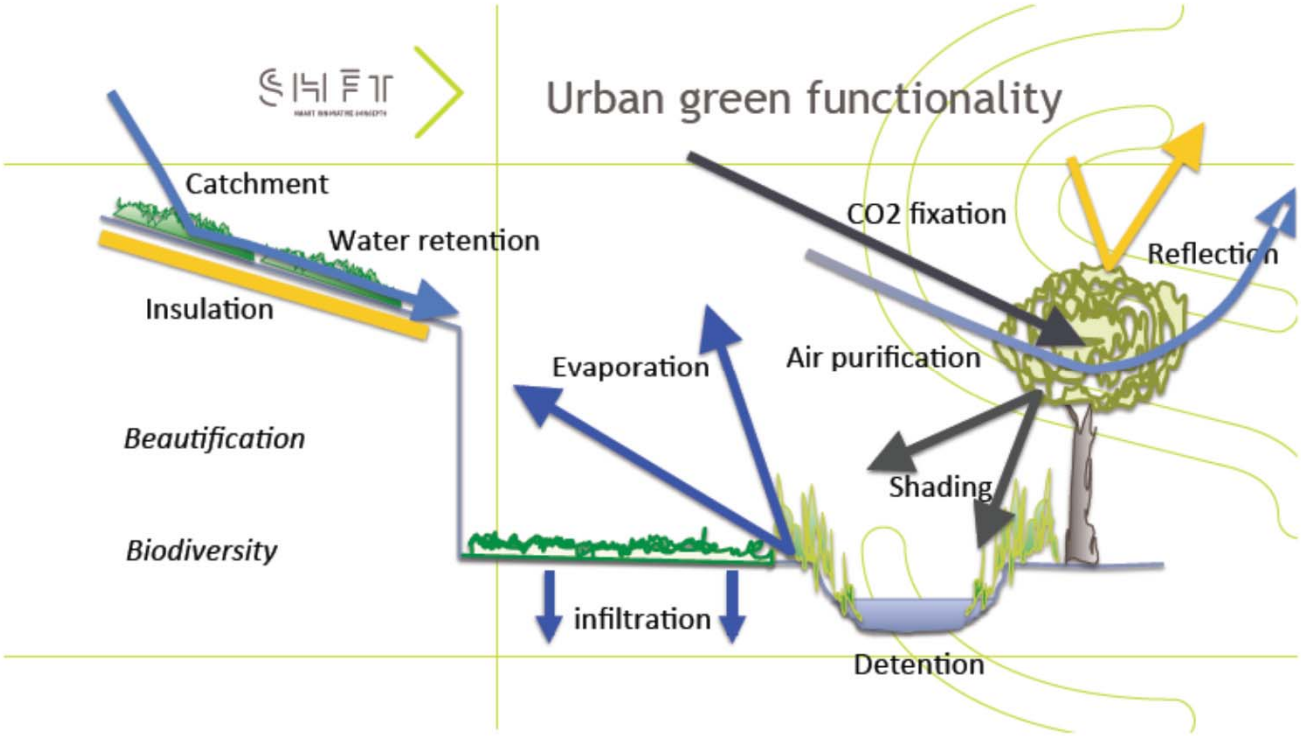
# Urban green cycle

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# 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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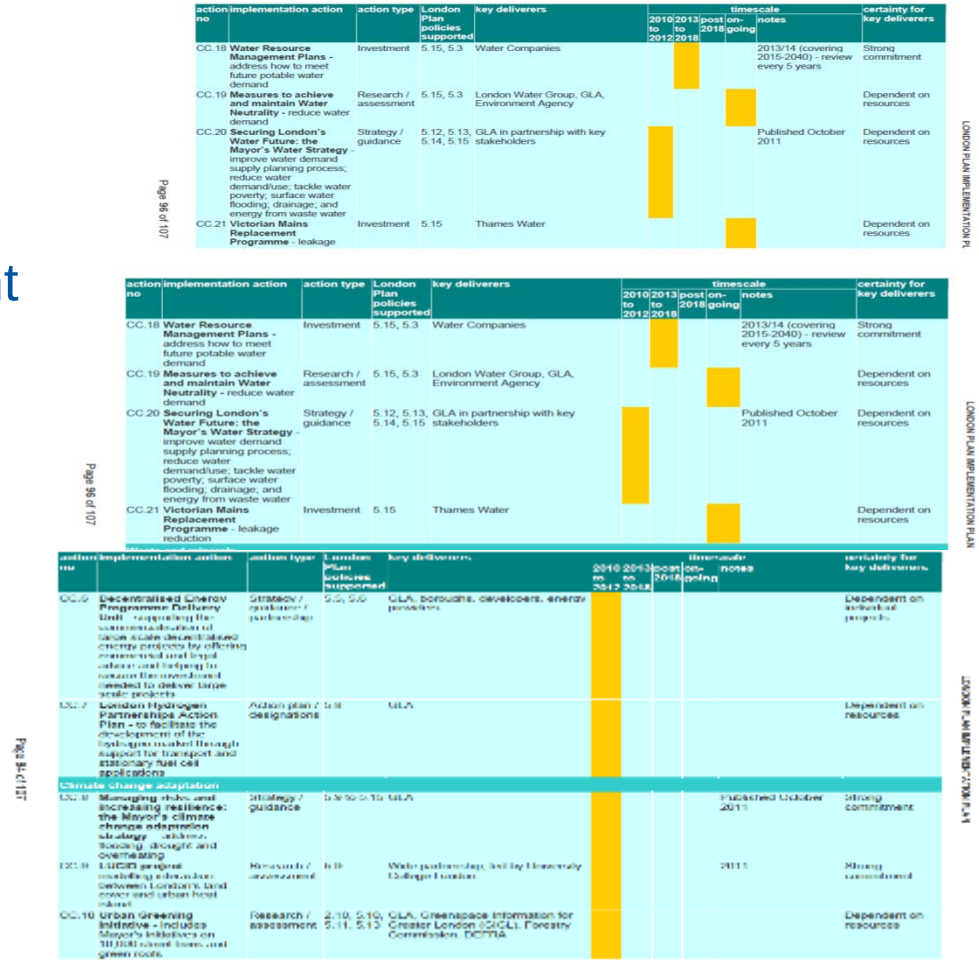
# The London Plan -Key implementations

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



| action no | implementation action | action type | London Plan policies supported | key deliverers | timescale: 2010 to 2012 | 2013 to 2018 | post 2018 | on-going | 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/use; 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 reduction | Investment | 5.15 | Thames Water | | | | | | Dependent on resources |





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# 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

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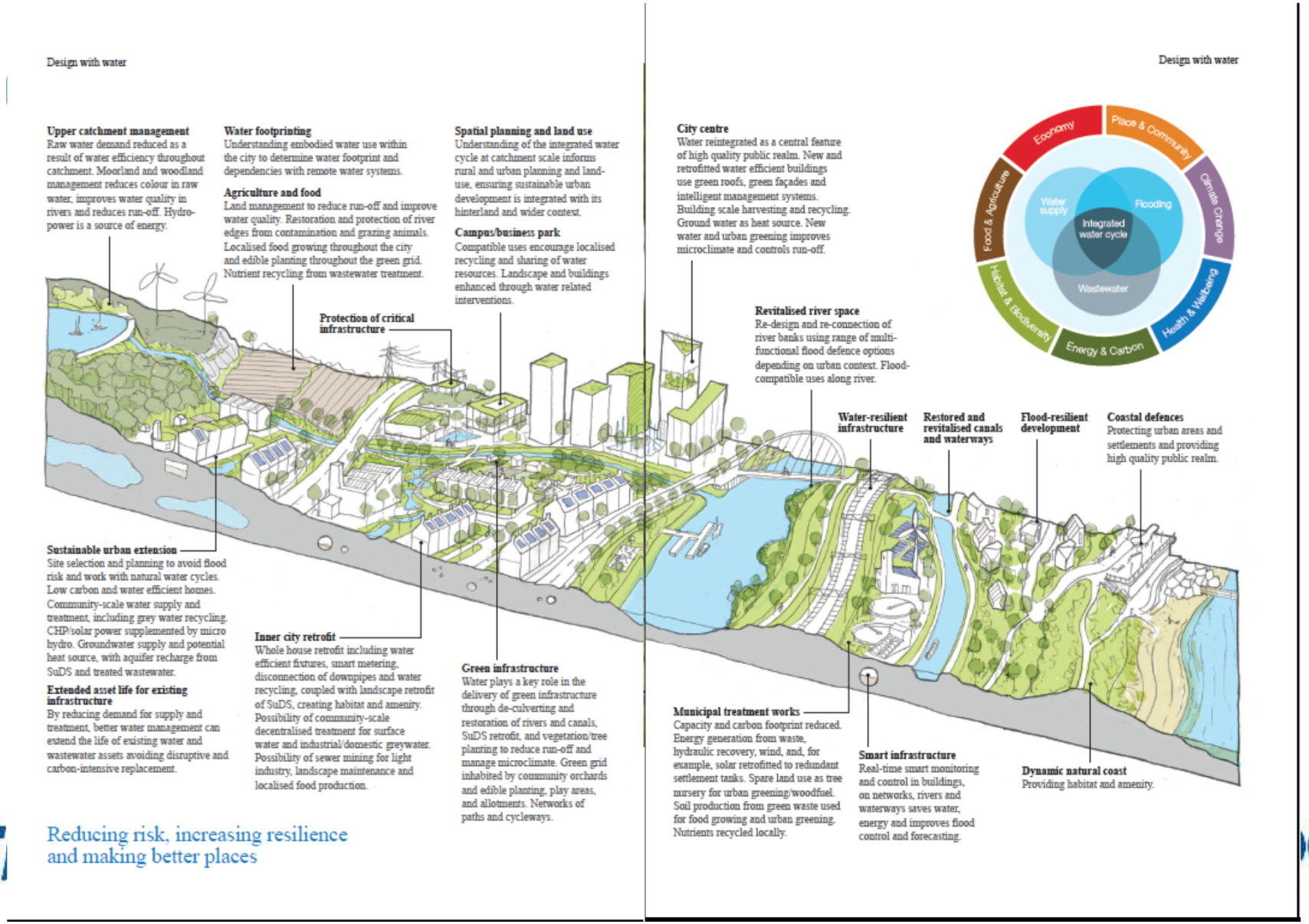
# Industry Response




Reducing risk, increasing resilience
and making better places

# CIRIA RP 976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# CIRIA RP 976

## INTRODUCING WATER SENSITIVE URBAN DESIGN


**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.

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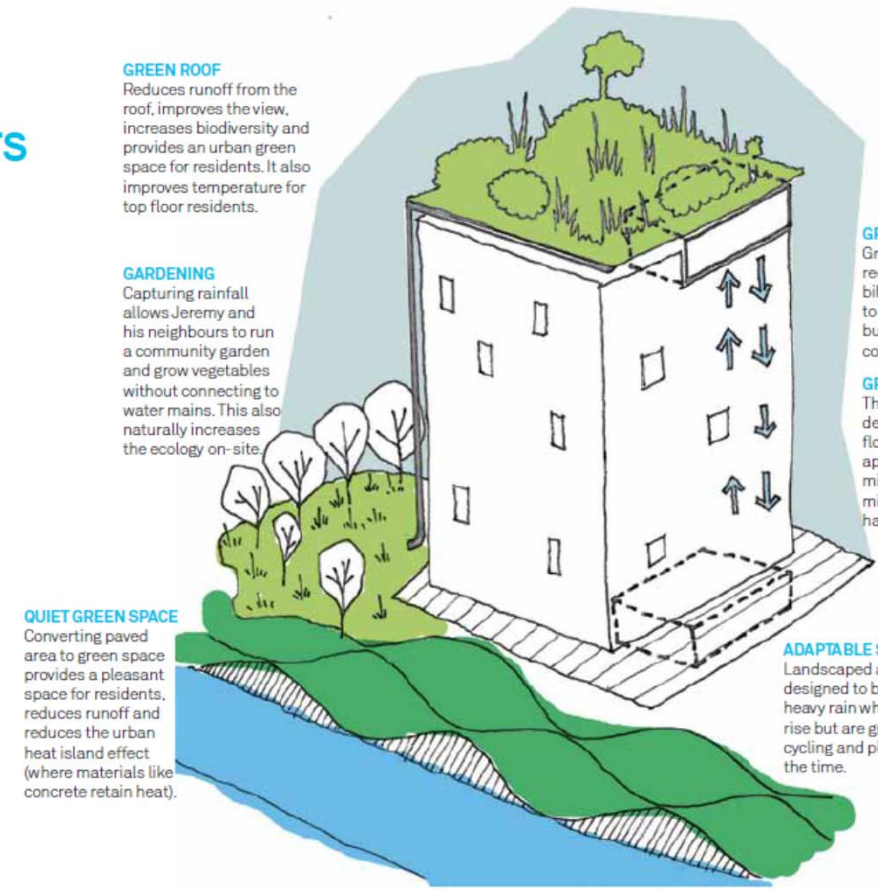
# Living roofs - Green, Blue, Yellow roof design

## 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


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# Living roofs 12km2 =1 billion Euro investment value


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Source GLA Report

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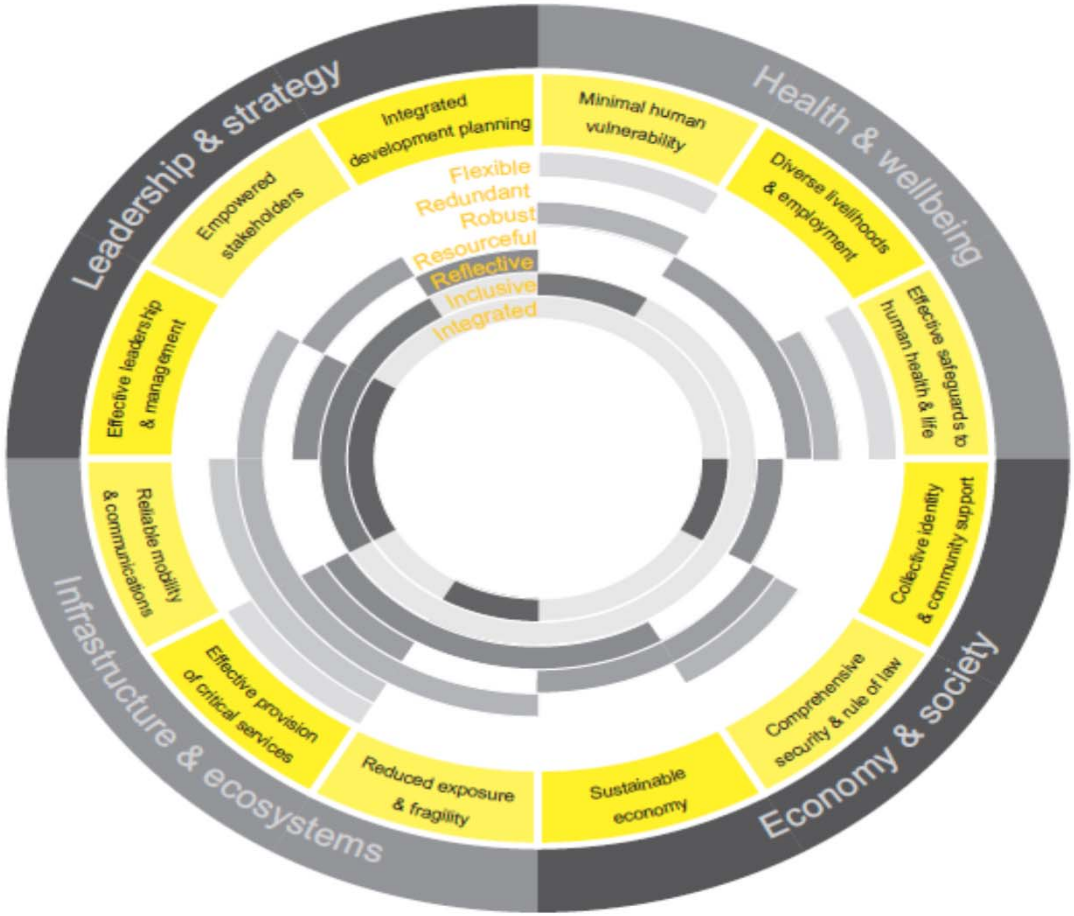
# Calculation tool

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Arup & Rockefeller Foundation

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# 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

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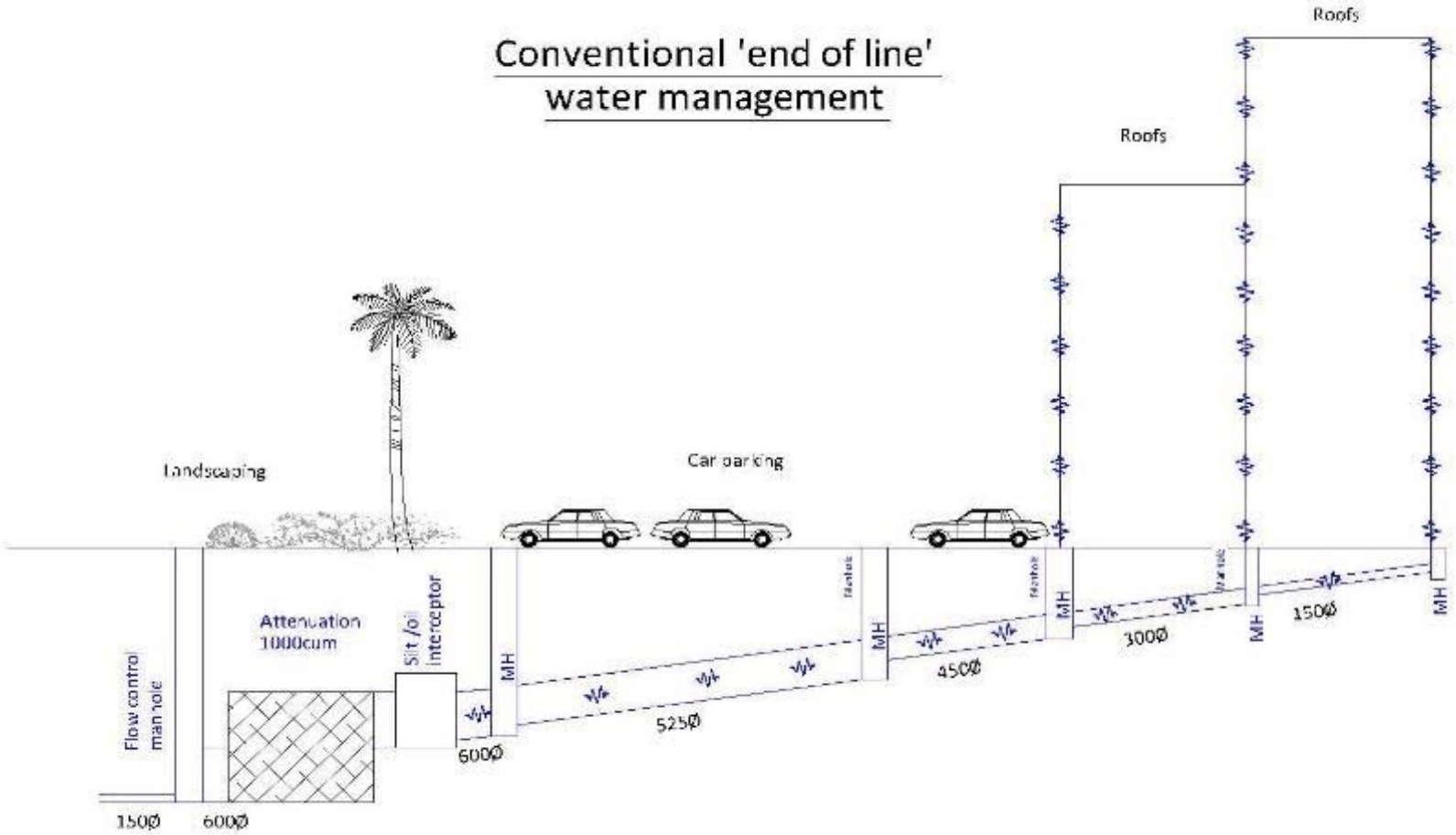
# Traditional End of Line approach

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# 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
- Construction costs and property cost


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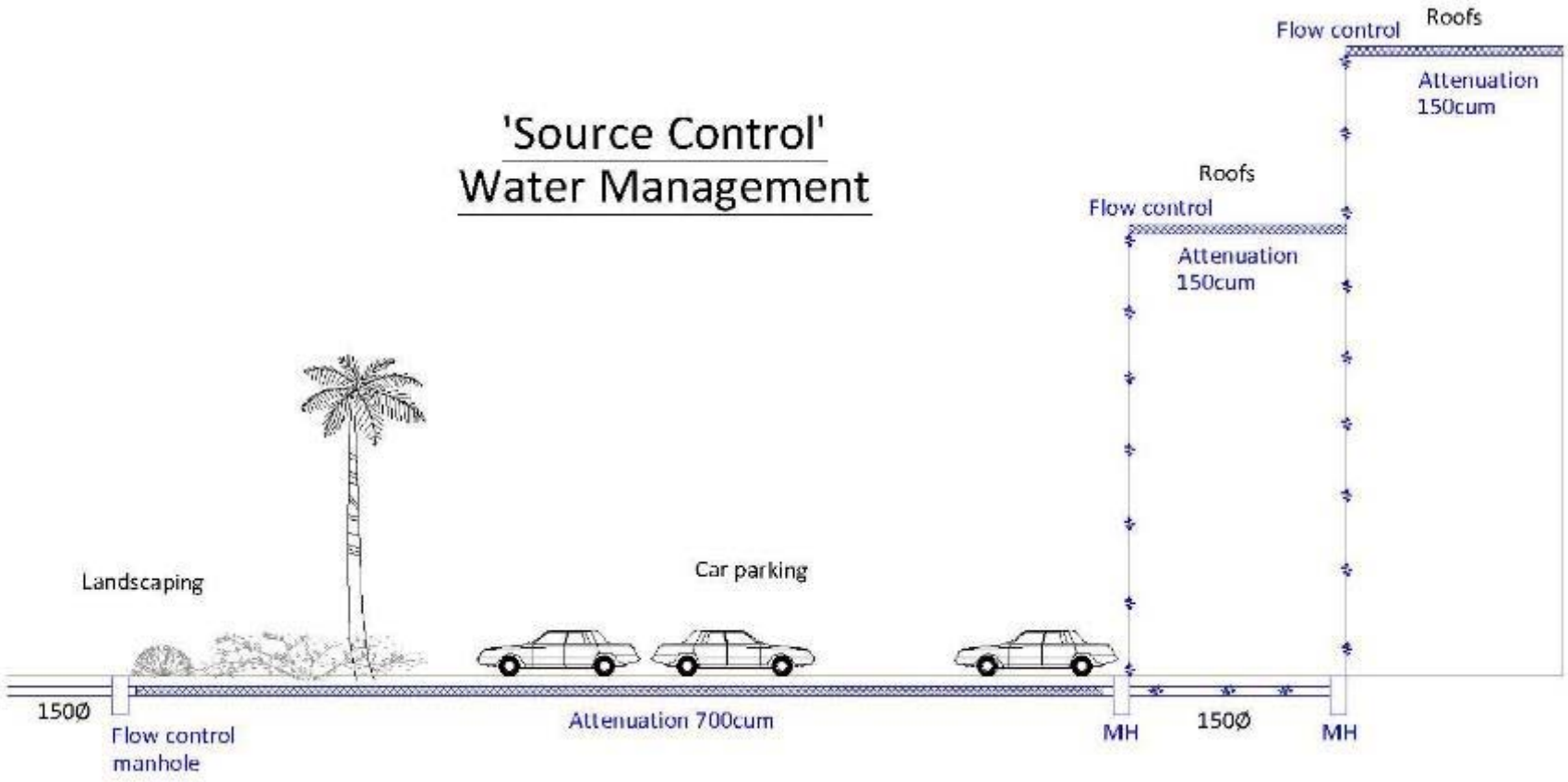
# Source Control Approach

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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** |

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# Roof top parks

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# Urban Farming

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# Passive irrigation & C02

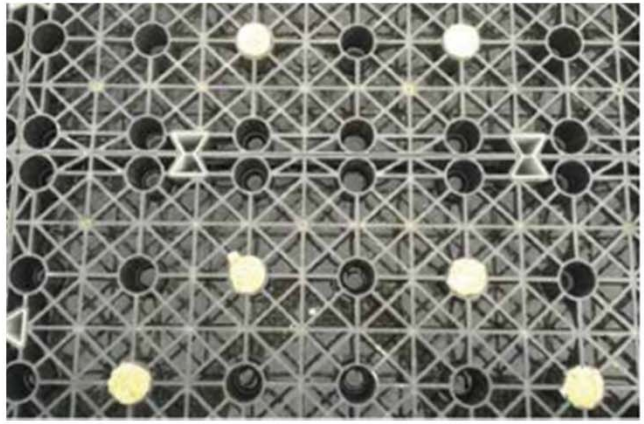
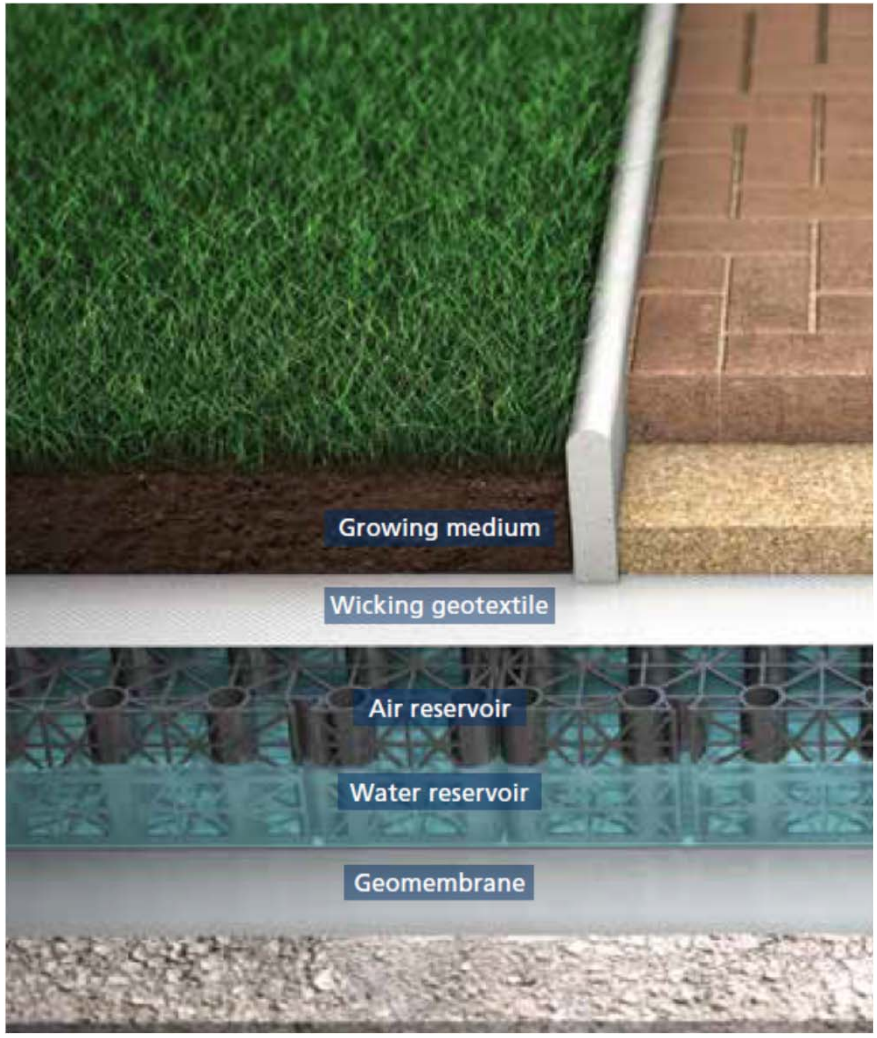


**Table 2: Study of Temperatures Under Membranes of a Conventional and a Green Roof**
(www.greenroofs.co.uk)

| | 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 |

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# Greenwich project

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# Greenwich completed

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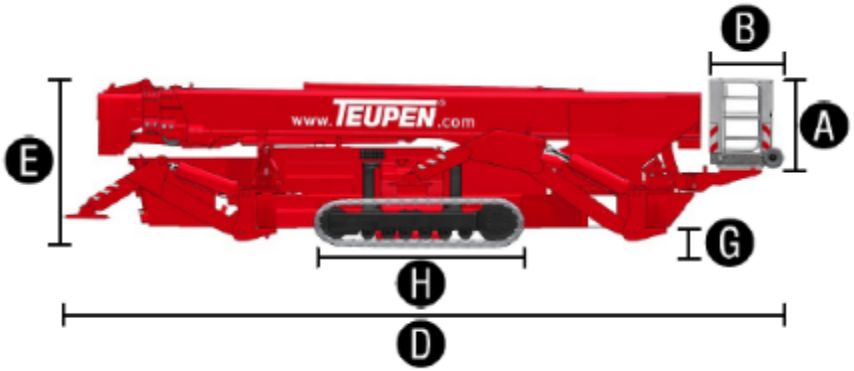
# Design considerations





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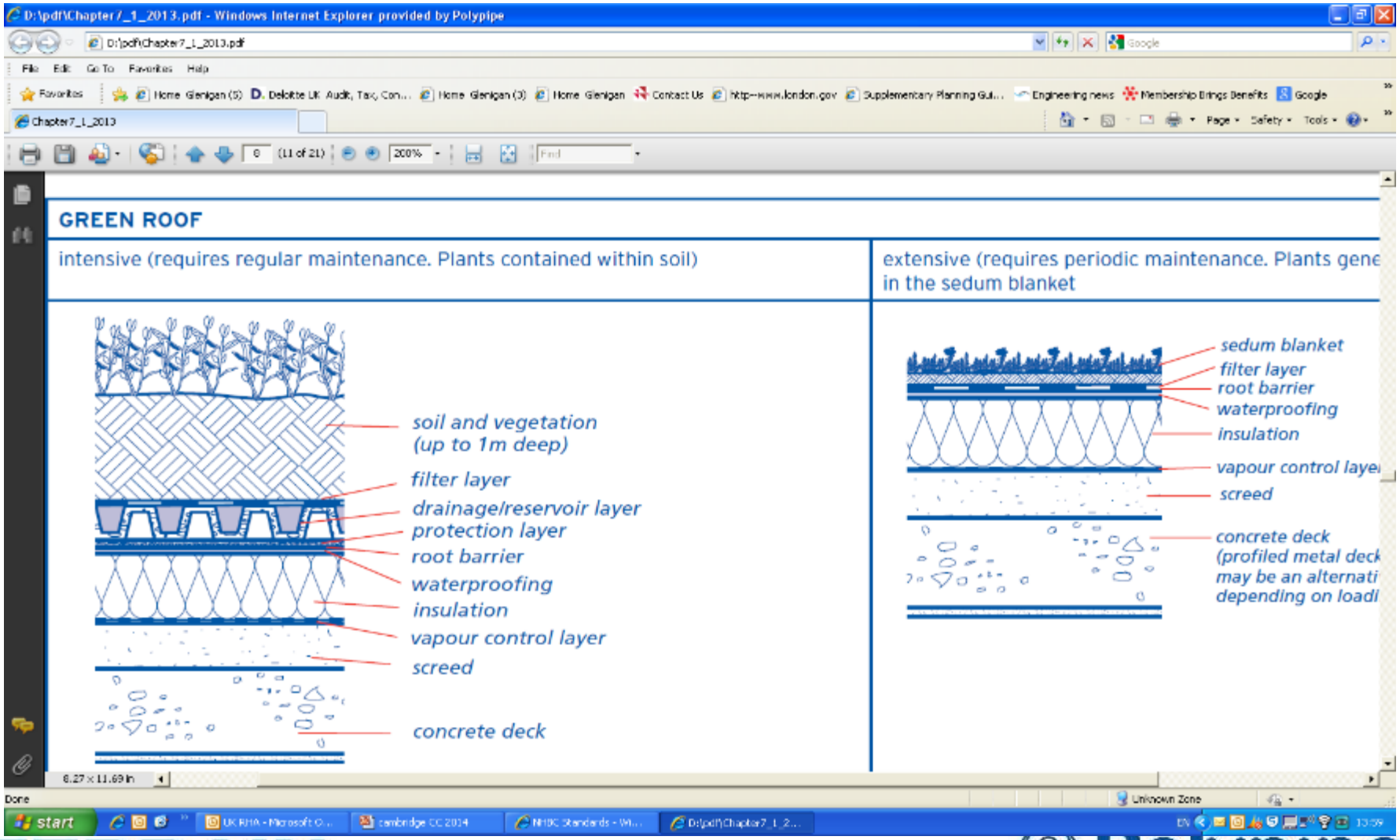
# Green Roof 7.1 NHBC

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# 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)

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

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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

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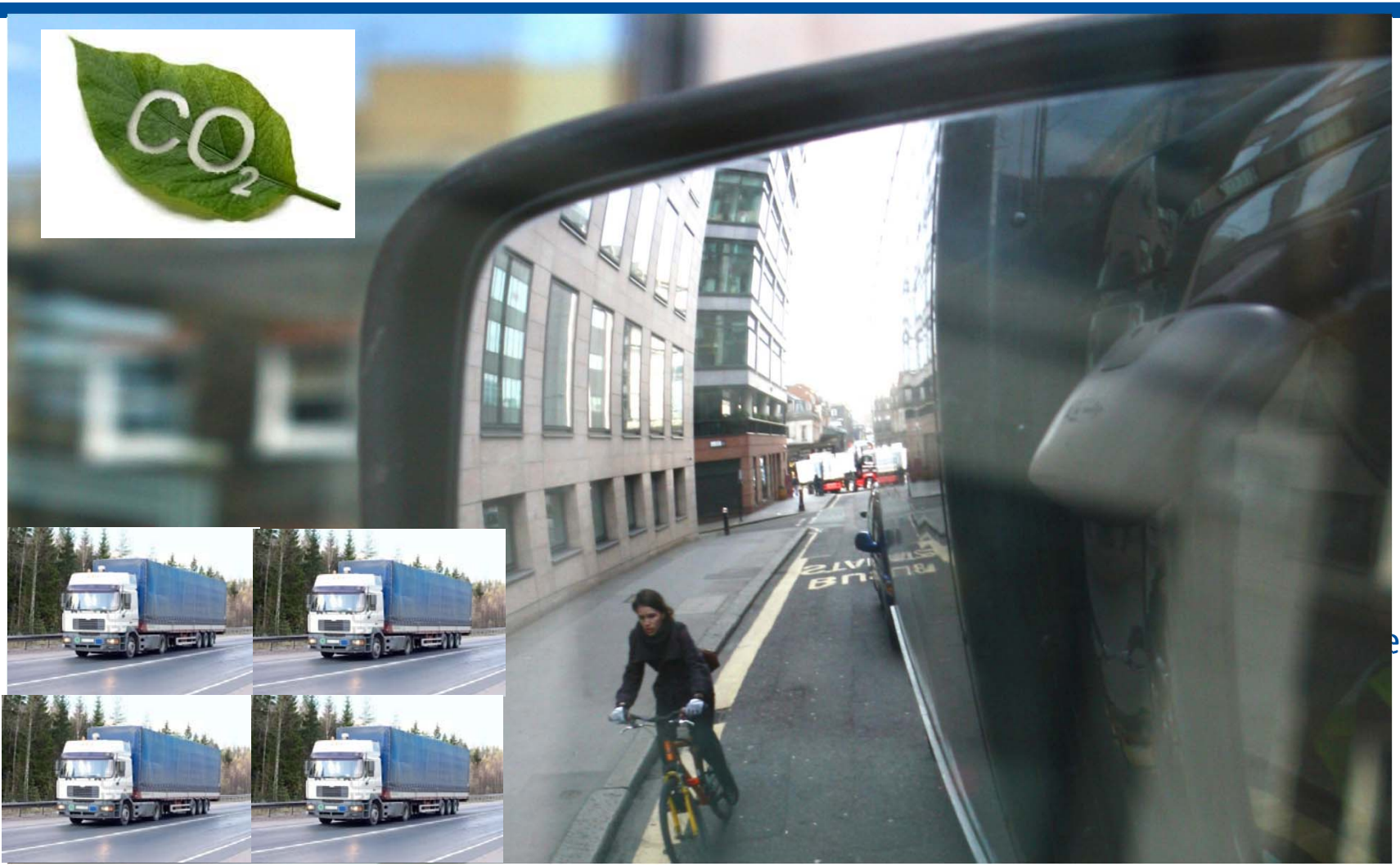
# Transport 1-21- FORS

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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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