

Blue-Green Perspectives: Adapting to Climate Change Impacts NOW! [Abridged Version]



CIBSE Resilient Cities ‘The Heat Is On’ Seminar, September 29th 2020

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www.bluegreenuk.com & The Blue Green Economy

Time of changing climate: Mindsets

‘Money Makes the World Go Round’

Liza Minnelli, Cabaret, 1966

‘It’s the economy, stupid’

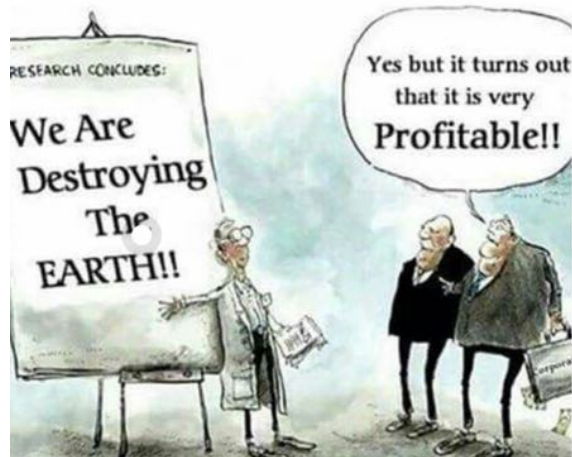
Clinton vs Bush campaign, 1992

‘It’s the environment, stupid’

2008?



"We have lost the way. Greed has poisoned men's souls"



**The economy is a wholly-owned subsidiary of the environment, not the other way round.
Green Recovery Years**

Time of changing climate: Politics and activism

April & October 2019



- Greta & Extinction Rebellion (XR)
- UK Government declares climate emergency in May

September 2020



- XR supporting 'UK Climate and Ecological Emergency Bill'
- Progressiveness of version passed by our government ?

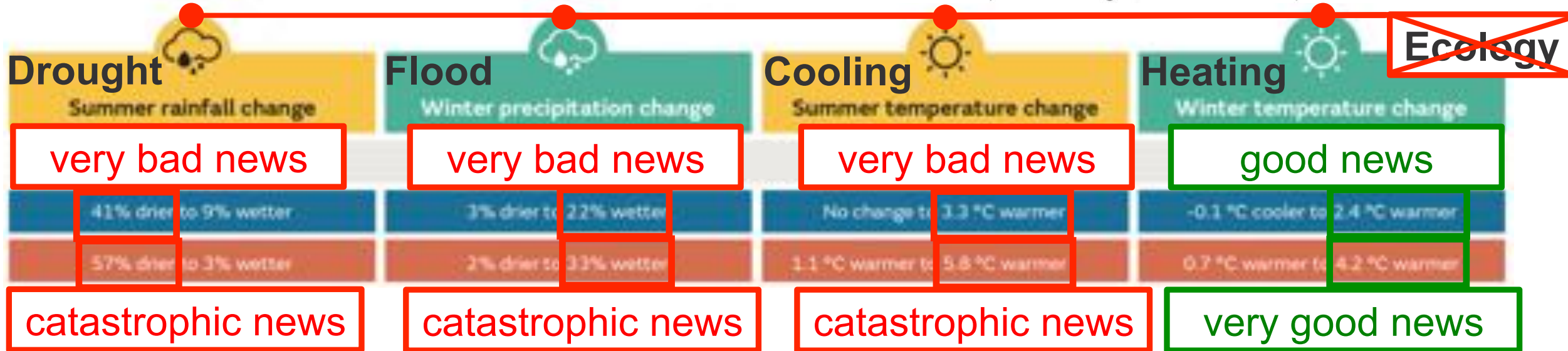
Time of changing climate: Climate change UKCP18 projects greater chance of hotter, drier summers and warmer, wetter winters

For Central England

Summer and winter changes by the 2070s

■ Low emission scenario ■ High emission scenario

*All results are for the 10th-90th percentile range for the 2060-2079 period relative to 1981-2000

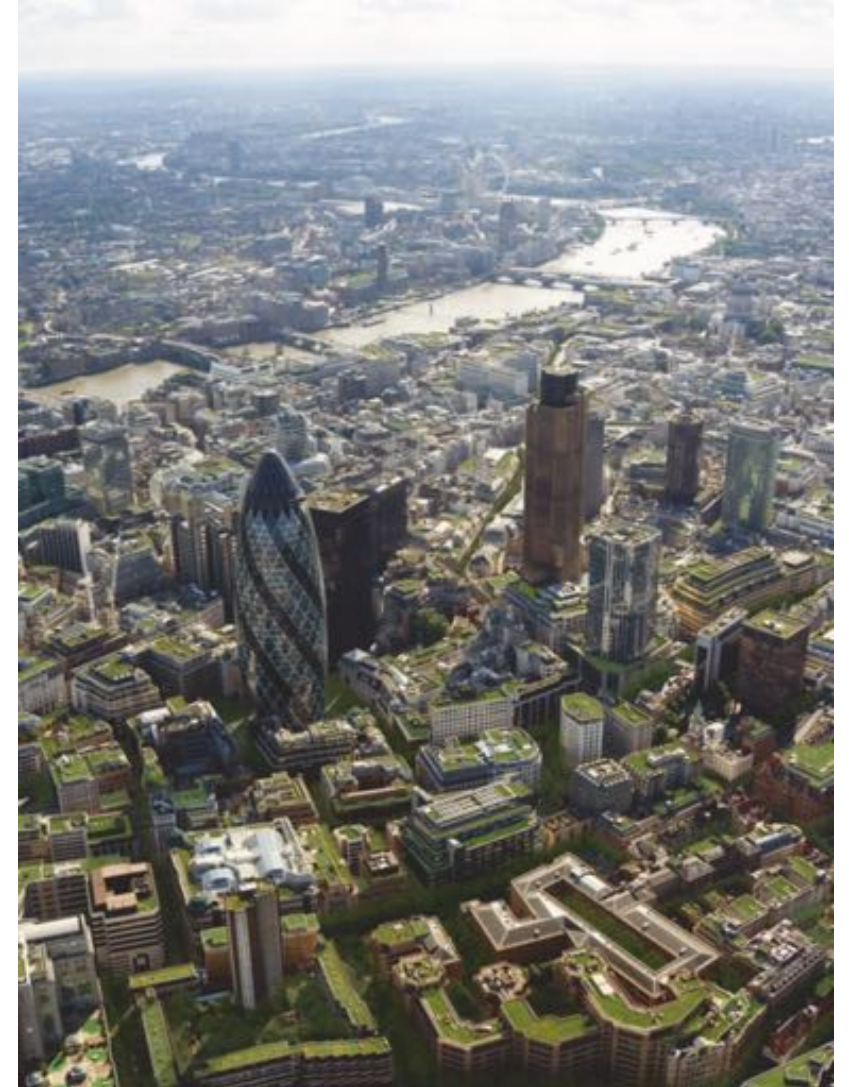


Acceptable balance (risk vs effort)? Joined up thinking?

Time for a Blue Green London Plan

What is blue (water) green (vegetation)?

- Blue Green = Climate change resilience for city living (currently 75% of Europe's population live in cities)
- 21st Century natural climate solutions integrated into the built environment
- Replacing hard, impermeable surfaces with urban green space and natural habitats
- A surface water, heat wave and air pollution management system
- Natural Health Service for humans, biodiversity provider for non-humans



An integrated future?

Time for a Blue Green London Plan

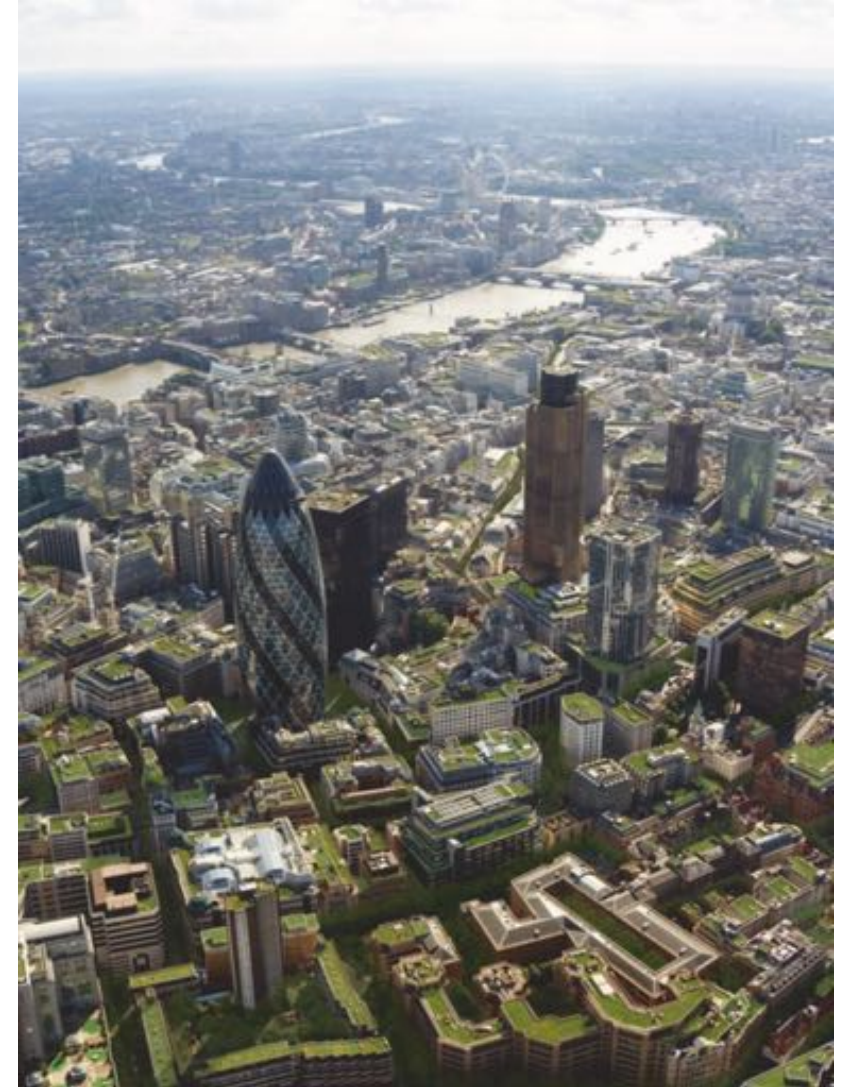
Local trees (one element)

- Reduce air temperatures
- Reduce air pollution levels
- Reduce flood risk
- Increase climate change resilience

Note: London = key to the world

For blue green solutions:

Performance is reliant on good design
and sufficient scale in application



Time for world-leading ambition – Tree planting

UK

30 million per year by 2025
(2019 general election pledge)

Ethiopia

4,000 million in 6 months
(completed)

Pakistan

2,000 million per year for 5 years



Time to adapt in London (as well as mitigate)

Mitigation (Northern Forest)

Remote London impact via net-zero but *global* carbon targets:

- 30++ years dependent upon action by others (?)
- **Increase in air temperatures of 0.5 to 1.0°C from now** (equivalent to 1.5 & 2.0°C 'pre-industrial' Paris Agreement limits)
- Committee on Climate Change - *plus 3°C from now* strategy
- Tipping points (e.g. Siberian permafrost) and climate surprises?



Adaptation with some mitigation (Blue Green London)

Local London impact via natural climate solutions:

- Immediate positive benefits that increase flexibly and with plant growth
- Multi-benefits dependent on scale and design quality
 - **Reduction in air temperatures of 4.0°C** (possibly more??)
 - Air quality, flood & drought risk, health and productivity, crime, biodiversity, noise, building design opportunities, low-skilled jobs

Time for clean air

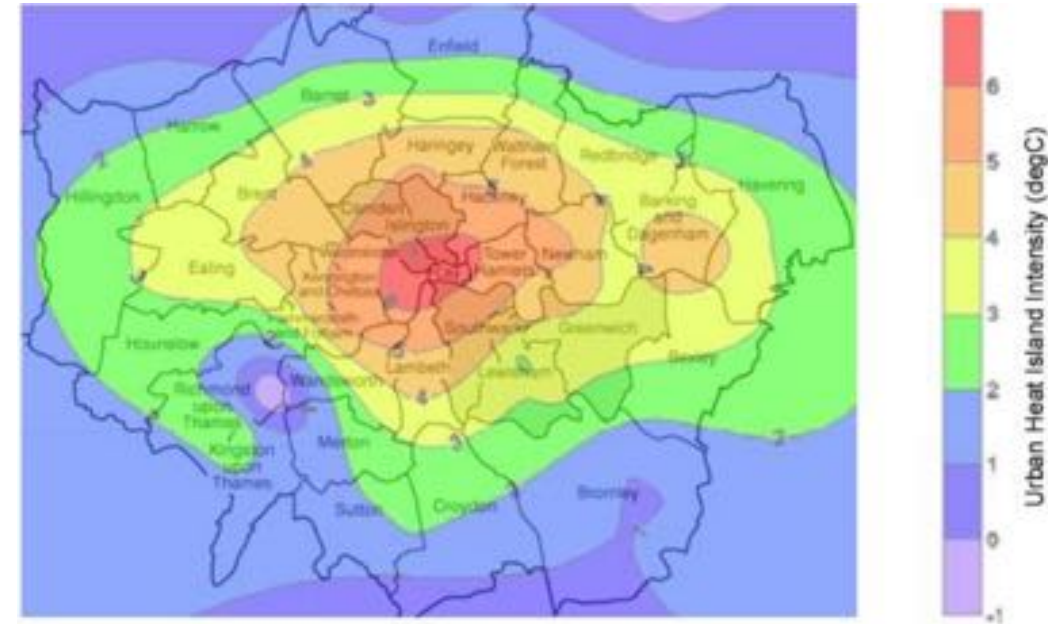
- 90% of world's urban population experiencing air quality exceeding guidelines
- In UK, **40,000 premature deaths per year**
- Costs city-regions over **£20bn**
- 2035 petrol / diesel new vehicle sale ban but still on roads for many years afterwards (2030??)
- Electric vehicles reduce gaseous emissions but *increase* particulate emissions
- Correlation between air pollution and Covid-19 death rate – unhealthy population

- Design for green infrastructure to increase dispersion by wind and deposition onto leaves



Time to keep cool

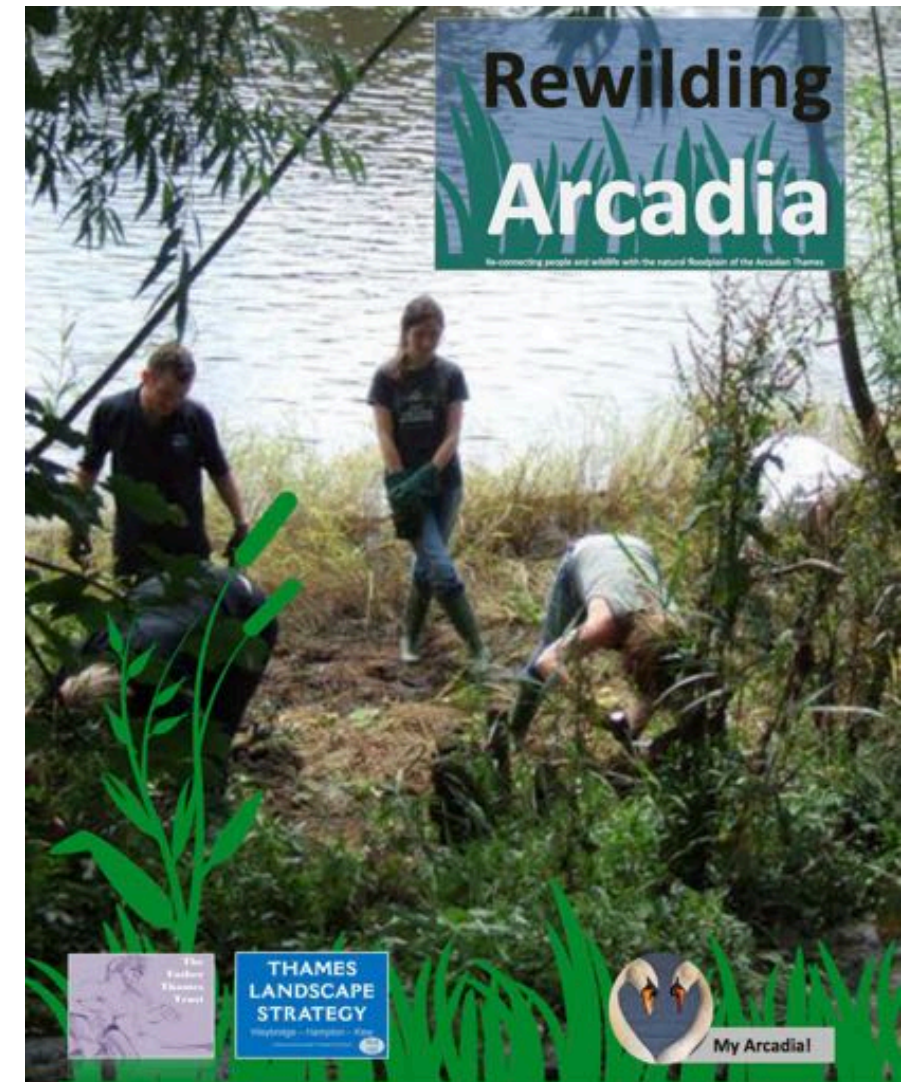
- During heat wave UHI up to 10°C higher
 - UK heat-related **premature deaths** increase from 2000/yr now to **7000/yr** in 2050
 - Urban greenspace in England reduced from 63% to 55% since 2001 (blue green solutions reverse decline)
-
- Areas with many trees up to 4°C cooler than areas without vegetation – potentially replace mechanical cooling
 - Shading alone can reduce total cooling energy savings by up to 35%



Urban heat island (UHI) effect in London
(average on hot day)

Time to reduce flood risk

- Climate change impacts
 - Uncertain and unpredictable
 - Will exceed historical levels due to higher tides and increased fluvial flows
- 18% of London GDP at risk (10th worst of 301 major cities)
- Attenuation & filtration - more time for water to move into our tributaries and rivers after the storm has passed reducing flood risk
- Need to 'Make Space for Water' in our cities - generate **immediate and flexible** increase in urban water storage capacity and storm water attenuation



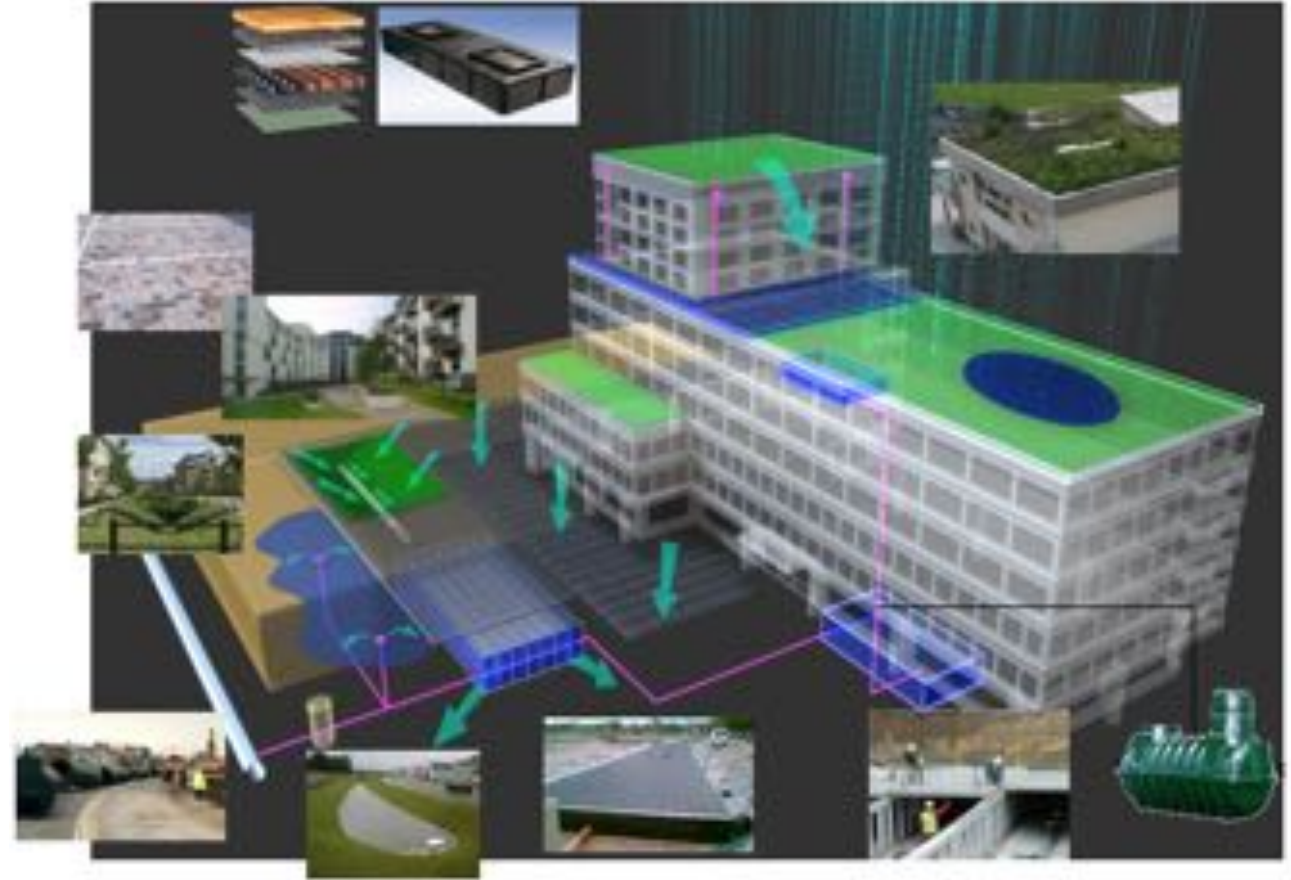
Time to reduce drought risk

- Water stress per capita in London worse than Madrid
- Drought risk: 5% of London GDP at risk (5th worst globally)

For new developments:

- Design for all horizontal / vertical surfaces and subterranean volumes
- Integrated with more traditional systems to take advantage of multi-benefits (e.g. rain water harvesting)

Victorian technology → 21st Century?



Time to resurface London

Green roofs

- Top floor summer heat gains up to 60% less
- *Inside* air temperatures up to 4°C less
- Winter heat loss up to 20% less
- Reduced need for mechanical cooling which adds to urban heat island effect
- Within 6km of Trafalgar Square could increase area coverage $\approx 175,000\text{m}^2$ to $10,000,000\text{m}^2$
- Designed for storm water run-off and energy
- Up to 40° slope
- Positive overall cost-benefit calculation



Time to resurface London

Blue green roofs

- Deeper substrate / more water storage
- Reduced storm water run-off by up to 85%
- Reduced UHI effect (increased evapotranspiration)
- Increase in biodiversity / supporting ecosystems
- Increase solar panel efficiency by up to 20%



Before



After

Time to resurface London

'Living wall' could reduce air pollution by a fifth

BEN MORGAN | Monday 31 October 2016 11:50 | [1 comment](#)

'A hedge can cut air pollution by 50%'

Multi-benefits:

- Air quality
- Storm water
- Urban heat island
- Urban noise
- Biodiversity



Green lung: the 80sq m wall features grass, flowers and strawberries ()

Time to resurface London

Streets: Storm water attenuation and better water quality

- Opportunity for most streets in London (less traffic-dominated)
- Tree-lined streets can reduce storm water run-off by up to 8%
- Tree pits can remove 95% or more of microplastics



Time to resurface London

Porous / permeable asphalt

- No ponding for cyclist
- All-year use of sporting facilities
- Removes up to 70% of contaminants
- Particulate matter washes away

Cool & reservoir pavements

- Surface temperatures up to 12°C less (reduced UHI effect)
- Rain water harvesting opportunity



Time to listen, learn and lead

Blue-green infrastructure (BGI) in Toronto

- Integral component of storm water management system
- Mature deciduous trees intercept 10-20% annual rainfall, coniferous 15-40%
- One 3700m² green roof removes 725kg of pollutants from air each year and yields over \$3000 in saved healthcare costs
- Homes near naturalistic spaces valued 8-20% higher and increase life expectancy



Permeable Pavement



Rain Barrels



Bioswales



Downspout Disconnection

Time to plan holistically with symbiotic gearing

MAYOR OF LONDON

Appendix 3

AIMS FOR 2050 Adapting to climate change

London and Londoners to be resilient to severe weather and longer-term climate change impacts. This will include flooding, heat risk and drought.

Contents

Purpose of this Implementation Plan

Air quality

Green infrastructure

Climate change mitigation and energy

Waste

Adapting to climate change

Ambient noise

Low carbon circular economy

Leading by example - GLA group operations

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Deeply flawed?
Currently bottom-up strategic guidance instead of top-down
‘Carry out interdependency mapping in 2019 across sectors and identify opportunities for collaboration’



Time for a new climate resilient plan for London

1. By 2035: Reduce air temperatures by up to 4°C
2. By 2035: Reduce stormwater run-off by up to 80%
3. Reduce by 10 years: Gaseous emissions target timeline
4. By 2030: Reduce particulate emissions at street level by 60%
5. By 2022: GLA/TfL ban on using non-porous hard surfaces including cycle superhighway
6. By 2022: Integrated Water Resource Management (IWRM) for London and Thames Basin [current TBGE initiative via www.bluegreenuk.com website]
7. By COP26: Revise accounting system (cost-benefit) extending to mental health, child lung growth plus many other areas
8. Announced at COP26: Blue Green Commissioner for London & Blue Green London Plan

Summary and conclusions

- **It's the environment, stupid!** Economy is a subsidiary of the environment
- Natural climate solutions integrated locally into the urban fabric generate climate change resilience
- A Blue Green London Plan could provide a template for healthier urban living in many UK and global cities
- Much greater focus needed on adaptation **NOW** as future 'mitigation-only focused' environmental benefits are limited and dependent upon actions by others
- It's now time to listen to the science and account for real holistic value including impacts on health, productivity, crime, economy, jobs and asset value
- It's **NOW** time to resurface London, regulate its temperature, clean its air and reduce its flood & drought risk before it's too late to respond to our changing climate

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Extended version: Obtain Furlough College recorded presentation with associated open access reading list and references from ‘The Engineering Club’ website <http://engineeringclub.org.uk/talk/blue-green-perspectives-adapting-to-climate-change-impacts-now/> (also accessed with pdf version via www.bluegreenuk.com)