Blue-Green Perspectives:
Adapting to Climate Change Impacts – NOW!

Furlough College / The Engineering Club, July 2nd 2020

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bluegreenuk.com / Thames Blue Green Economy

Contents

- Time of changing climate. It’s the environment, stupid!
- Blue Green London Plan in response to our changing climate
- ‘Net-zero’ trees and declared ambitions
- Hot / dirty air versus cool / clean air in our cities
- Resurfacing London and reducing our flood risk
- Using current technologies and knowledge
- Transparent decision-making guided by the science
- Time to generate new headlines using a revised future vision

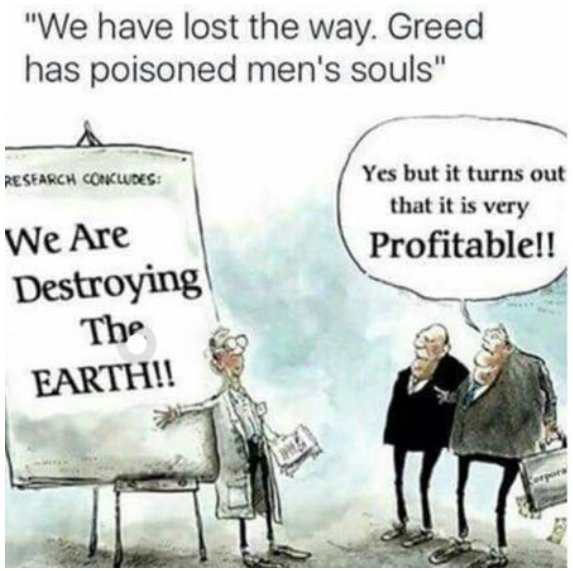
[Questions on electric vehicle (EV) risks and opportunities]

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?



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

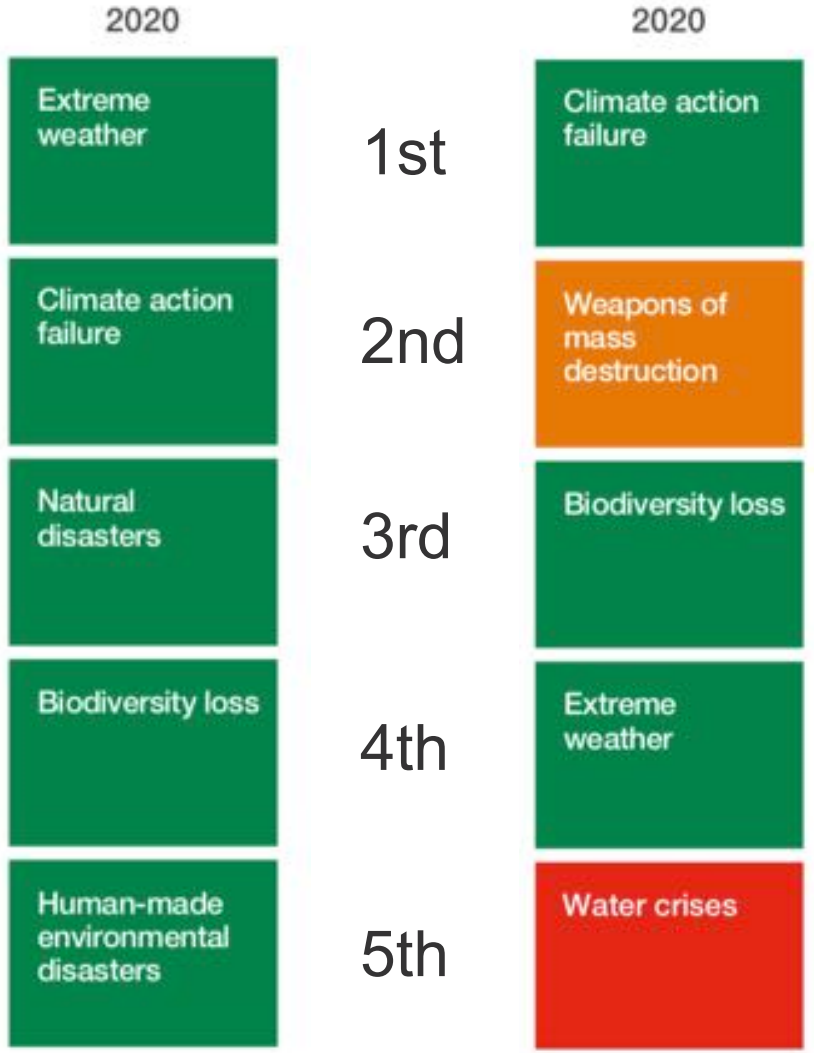
Time of changing climate: Economists

Climate change is striking harder and more rapidly than many expected

The resilience decade

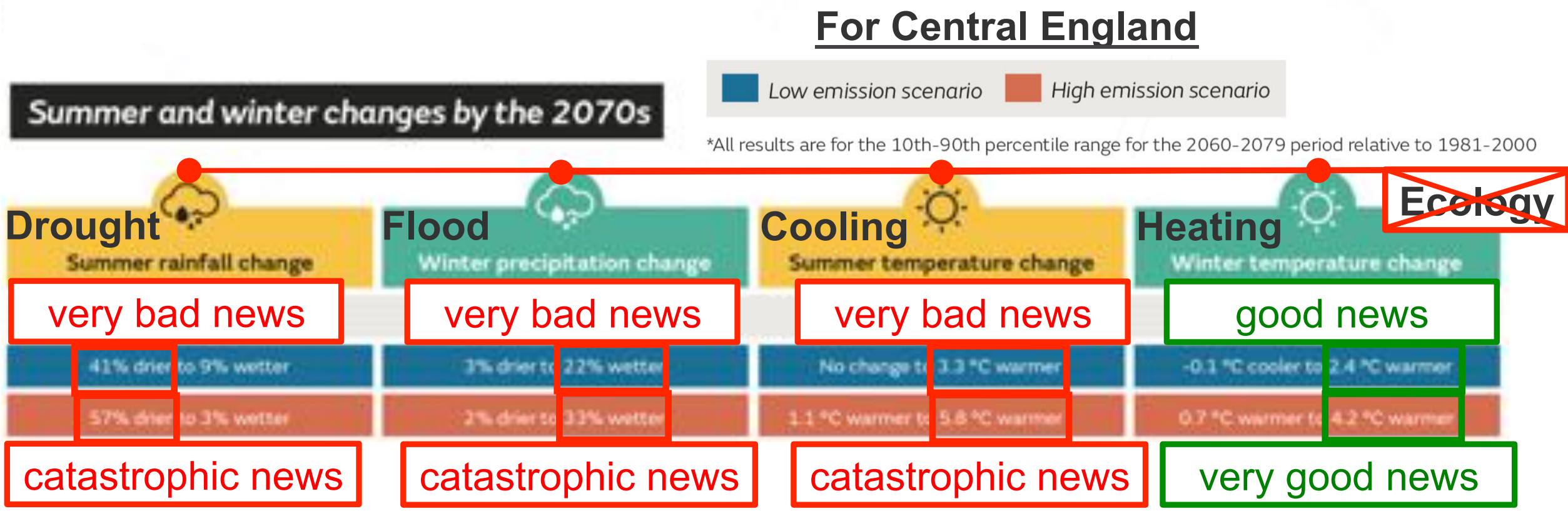
The next 10 years will shape the outlook for climate risk for the rest of the century.

Economic Environmental Geopolitical Societal Technological



Time of changing climate: Climate change

UKCP18 projects greater chance of hotter, drier summers and warmer, wetter winters



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

Highlights

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

[Note: London = key to the world]

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]

[Additional note for all solutions: Performance is reliant on good design and sufficient scale in application]

Time to declare…

UK Parliament declares climate change emergency

1 May 2019

RIBA declares climate emergency

27 JUNE, 2019 • BY WILL HURST

Structural engineers declare climate and biodiversity emergency

JUL 2

Launch of the UK Climate Emergency Network

Public · Hosted by Climate Emergency UK

Time to declare… Trees in London

30,000 free trees *by ballot*
(fixed vs need-to budgets)

Mayor of London Sadiq Khan inviting citizens across the capital to apply for 55,000 free trees

PUBLISHED: 16:00 03 October 2019 | Matthew Clemenson

Thousands of trees will be planted across London. Picture: PA/ Chris Ison

THE TREE COUNCIL

National Tree Week

‘170,000 trees planted in just three years’

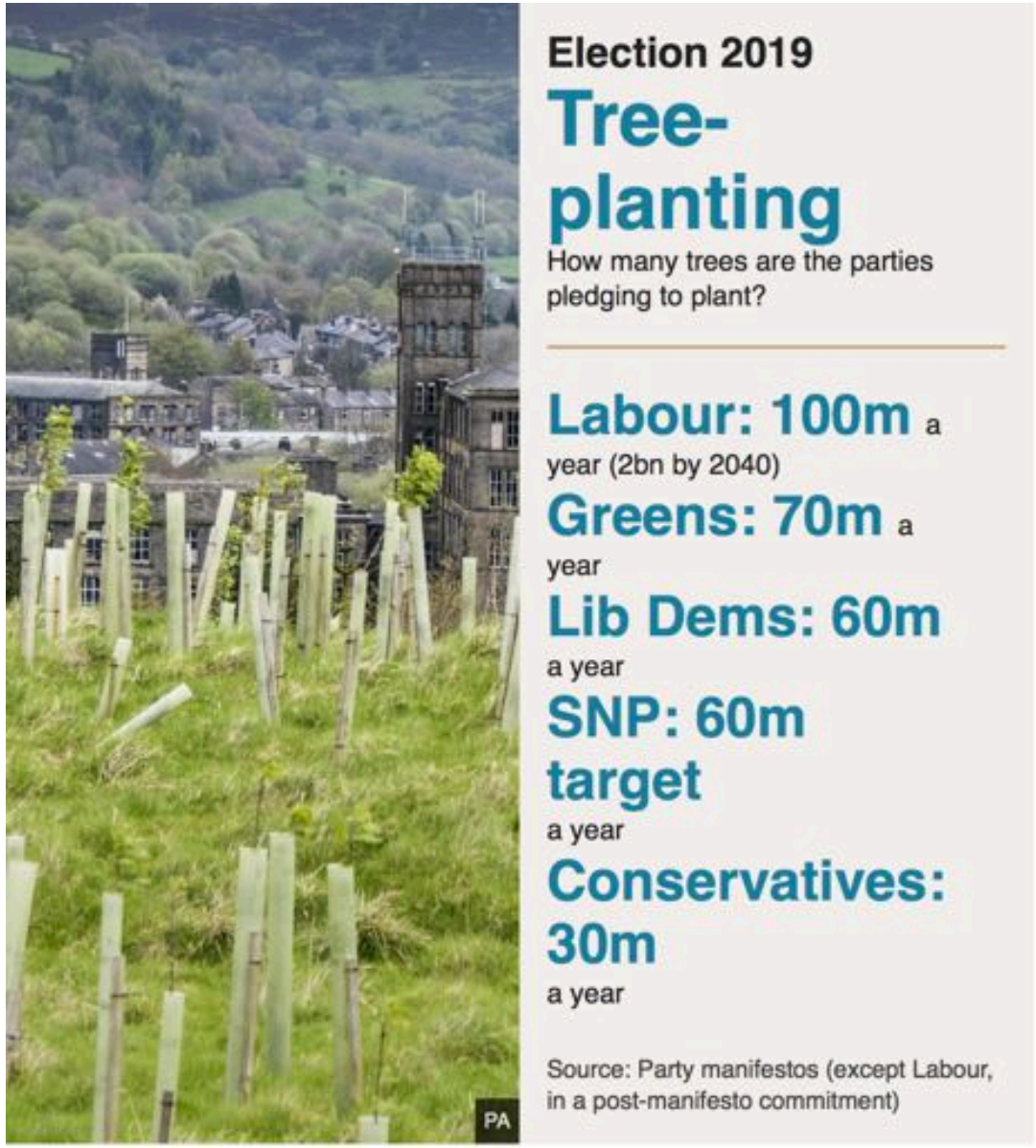
Mayor hosts summit as London becoming world’s first National Park City

20 July 2019

Time to declare… Trees in UK (2019 election)

30-100 million per year declared

- Now on course for planting 30 million trees per year?
- Actual planting over 2-year period (2017 to 2019)
  - England 3.6 million trees / 2,300 hectares
  - Scotland 18,300 hectares



Time for world-leading ambition

Ethiopia

4,000 million in 6 months (completed)

Pakistan

2,000 million for 5 years

10 Billion Tree Tsunami

Pakistan's LARGEST ever tree plantation drive

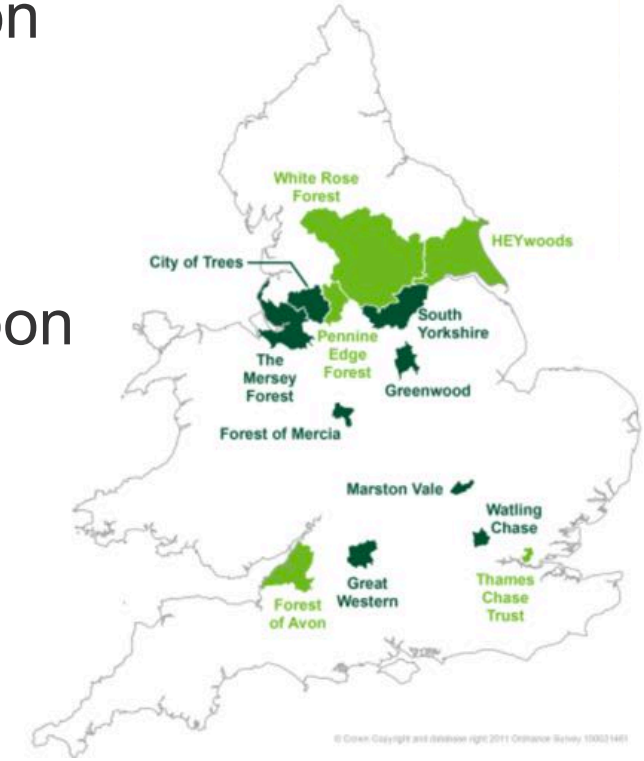
- Cost and availability of land???
- For urban (local) trees:
  - Increase asset value
  - Real loss in function, e.g. crossing a road?

Time to adapt in London (as well as mitigate)

Mitigation (Northern Forest)

Remote London impact via net-zero targeting / ***global*** carbon reductions :

- 30++ years (?)
- Air temperature only
  - ***Increase* of 0.5 to 1.0°C** from now at best depending upon actions by others (plus 3°C strategy needed)
  - Tipping points and climate surprises?



Adaptation with some mitigation (Blue Green London)

Local London impact via natural climate solutions:

- Immediate positive benefits that increase with plant growth
- Multi-benefits dependent on scale and design quality
  - Air temperature: ***Reduction* of 4.0°C** (possibly more??)
  - Air quality, flood risk, health and productivity, crime, biodiversity, noise, building design opportunities

Time for clean air

The Mayor of London, Sadiq Khan:
“London’s filthy air is a public health crisis that leads to thousands of premature deaths in the capital every year as well as stunting the development of young lungs and increasing the number of cases of respiratory illness.”

London Borough of Hammersmith & Fulham air quality report:
“Almost 1 in 4 deaths can be attributed to air pollution, which is an important risk factor in heart disease, stroke, lung cancer and respiratory diseases, as well as being associated with cognitive impairment and Type 2 diabetes.”
Recommends ‘**washing down** of streets and pavements in areas of high particulate matter pollution.’

Time for clean air

Why 'green' infrastructure is critical for improving air quality

- 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
- Correlation between air pollution and Covid-19 death rate – unhealthy population

Time for clean air

For electric vehicles (EV)

- Gaseous emissions (e.g. NO_2) **down**
- Particulate emissions **same or up**
- **Not clean** (tyres, brakes, road wear)

Ultra Low Gaseous Emissions Zone

Time for clean air

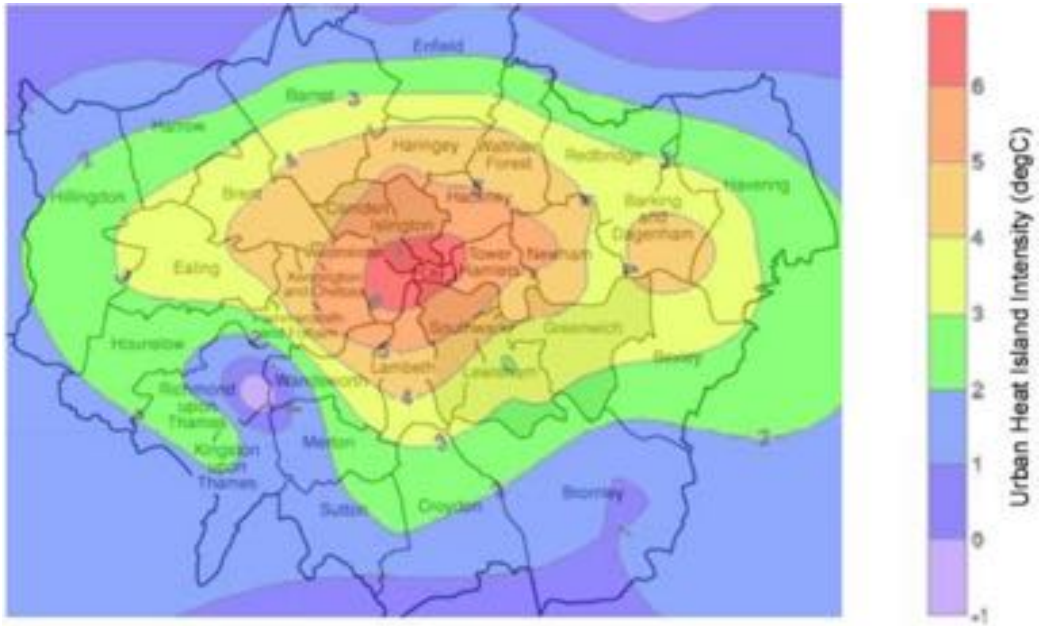
- *Includes* solution for particulate matter
- Exposure **down** through
  - **local designs** for trees & vegetation barriers
  - encouraging ‘distance from source’
  - greater *dispersion* by wind

Beneficial plant properties (direct capture / *deposition*):

- small leaf size
- high foliage density
- long in-leaf periods (evergreen or semi-evergreen)
- micro-characteristics (leaf hairiness)
- GM or non-native species to increase removal efficiency?

Time to keep cool

- 2003 heatwave:
  - Central London areas up to 10°C higher than surrounding greenbelt
  - Caused 35,000 deaths in Europe
- July 2018: St James Park similar temperatures to 2050 medium emissions future climate projections
- UK heat-related **premature deaths** increase from 2000/yr now to **7000/yr** in 2050
- Urban greenspace in England has dropped from 63% to 55% since 2001



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

Time to keep cool

Trees could replace air con: buildings around trees are cooler, study by Forestry Commission finds

- Areas with many trees up to 4°C cooler than areas without vegetation
- Shading alone reducing total cooling energy savings by 10-35%

or

?

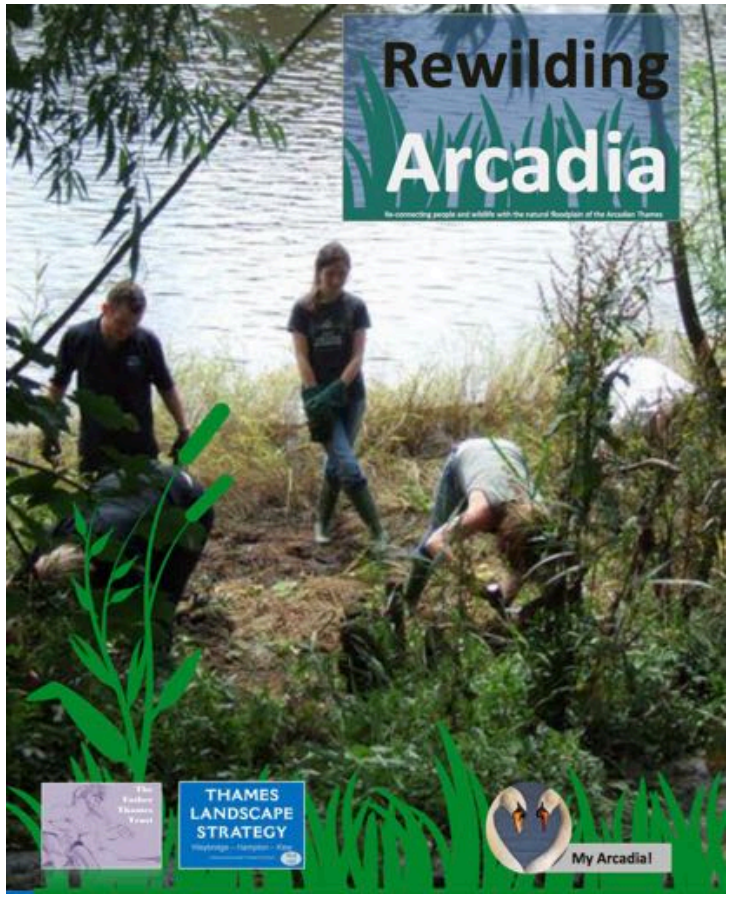
- More energy / carbon emissions
- More heat rejection / UHI effect

Time to reduce flood risk

- Climate change impacts
  - Uncertain and unpredictable
  - Will exceed historical levels due to higher tides and increased fluvial flows
- London's primary tidal risk solution (Thames Barrier)
  - Exceeded planned life
  - Under severe pressure
  - Not to be superseded for many years
- 18% of London GDP at risk (10th worst of 301 major cities)

Time to reduce flood risk

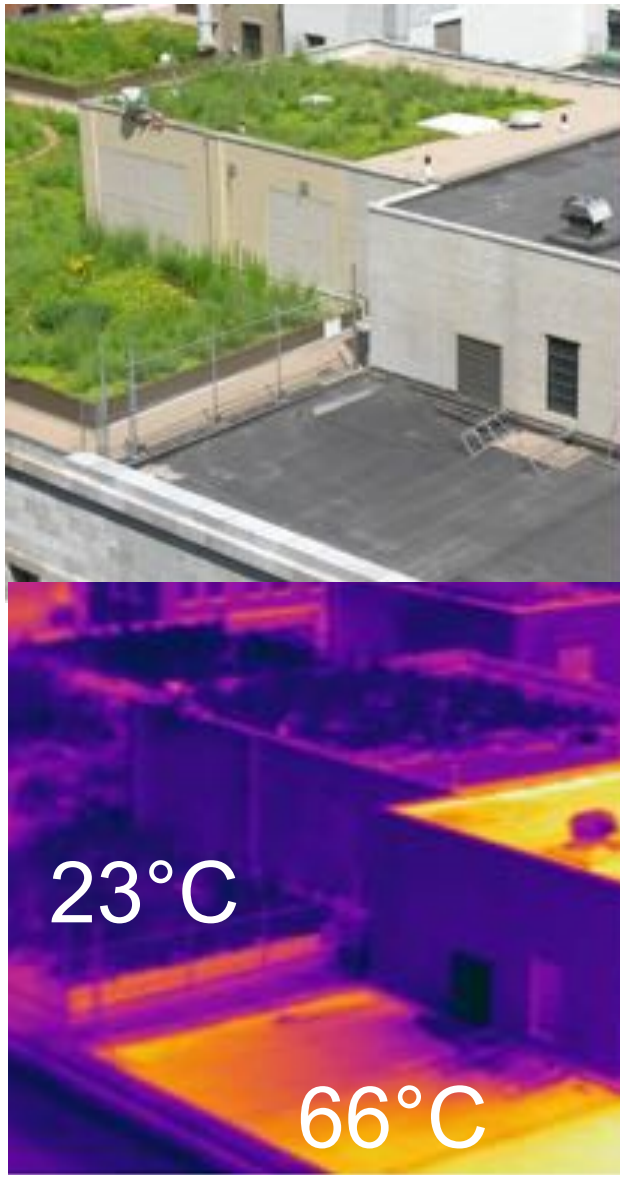
- Attenuation and filtration provide more time for water to move into our tributaries and rivers after the storm has passed reducing flood risk
- In support of hard infrastructure, blue green solutions - ‘Making Space for Water’ - generate an ***immediate and flexible*** increase in urban water storage capacity and storm water attenuation
- Recognising impact of canalisation and new developments, *rewilding* increases water storage capacity and storm water attenuation as well (upstream and around key risk areas)



Time to resurface London

Green roofs

- Reduced overheating risk with top floor summer heat gains 60% less and *inside* air temperatures up to 4°C less
- Increased insulation with winter heat loss 20% less
- Possibly avoid need for HVAC systems and associated heat rejection / adding to UHI effect
- Within 6km of Trafalgar Square current coverage ≈175,000m^2 (estimated 10,000,000m^2 **opportunity**)
- Design optimization (plants/substrates) to balance storm water run-off and energy savings
- Positive overall cost-benefit calculation (including energy demand and longer life expectancy of roof)



Time to resurface London

Blue green roofs

- Deeper substrate / more water storage
- Additional vegetation options
- Storm water attenuation
  - Up to 8 hours storage for heavy rain
  - Peak run-off reduced by up to 85% or more (depends on design and storm event)
- Reduced UHI effect with increased evapotranspiration
- Increase in biodiversity / supporting ecosystems
- Better solar panel efficiency when housed in a cooler roof environment (increase up to 20%)

Before

After

Time to resurface London

tbge
thames blue green economy

‘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%’

Positive benefits for

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

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

Guide for new developments (retrofit?)

Time to resurface London

Storm water attenuation and quality

- Most streets in London are local and can be made less traffic-dominated
- Tree-lined streets can reduce storm water run-off by up to 8%
- Tree pits – microplastic removal rate of 95% or more
- Permeable asphalt allows water to infiltrate
  - No ponding for cyclists
  - All-year use of sporting facilities

Healthy Streets for London

Prioritising walking, cycling and public transport to create a healthy city

MAYOR OF LONDON

TRANSPORT FOR LONDON

TfL guidance

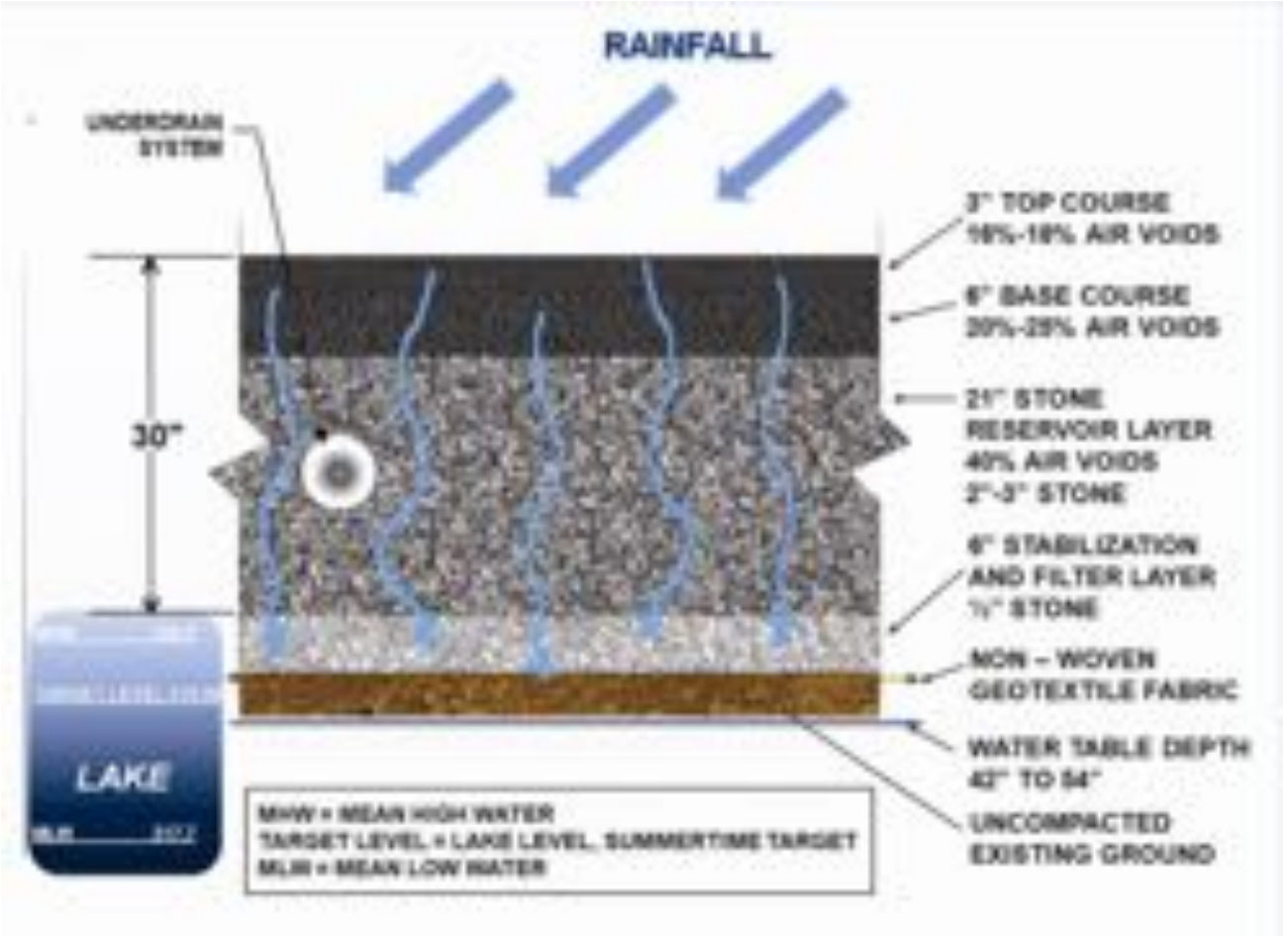
Time to resurface London

Porous asphalt

- Micro-organisms remediate up to 70% of contaminants
- Particulate matter washed away (not lifted into air by wheels and wind)

Cool & reservoir pavements

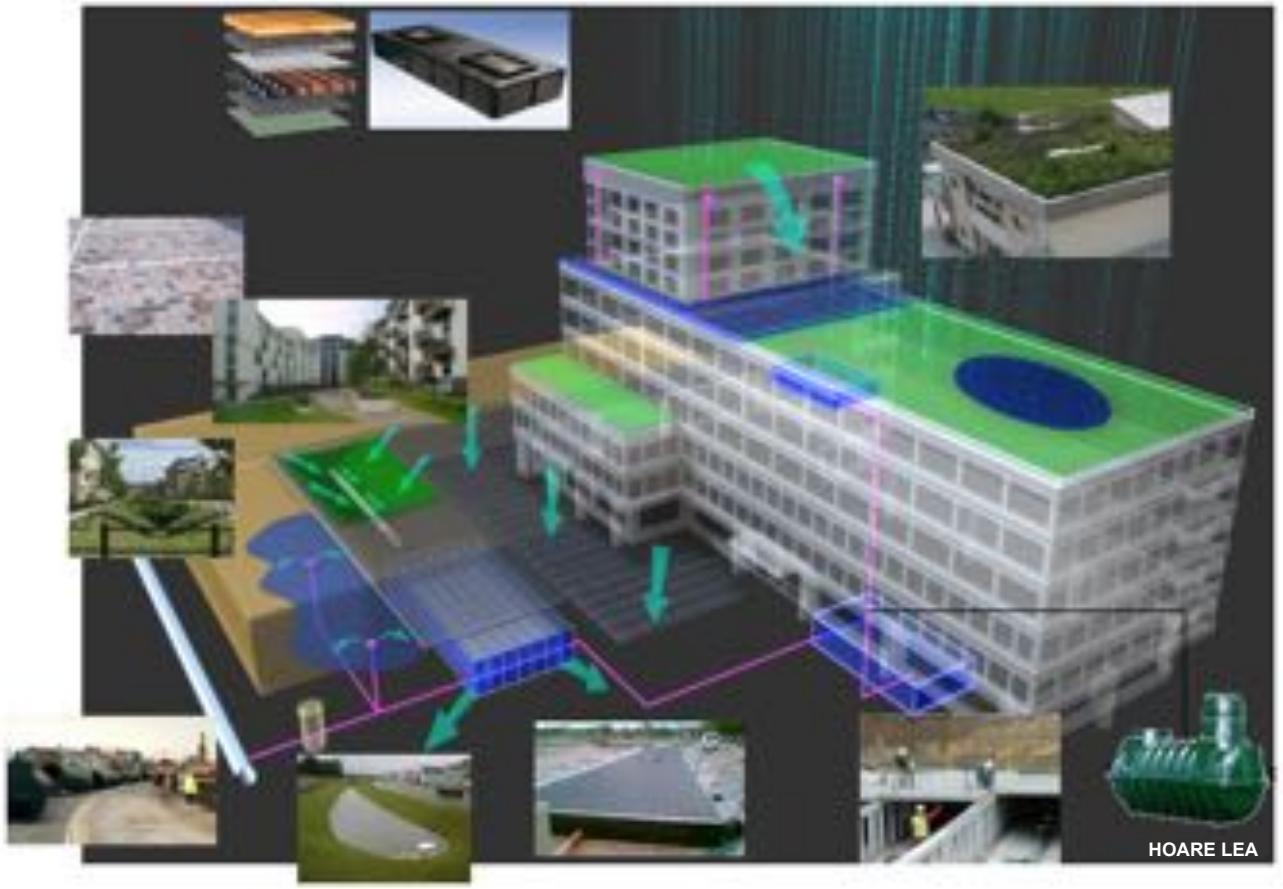
- Reduced UHI effect with lower surface temperatures (up to 12°C less)
- Rain water harvesting opportunity



Time to resurface London

New developments

- Design for all horizontal / vertical surfaces and additional subterranean volumes
- Integrated with more traditional systems, e.g. rain water harvesting, to take advantage of multi-benefits
- Water stress per capita in London is worse than Madrid
- Drought risk - 5% of London GDP at risk (5th worst globally)



Time to plan holistically with symbiotic gearing

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 37

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

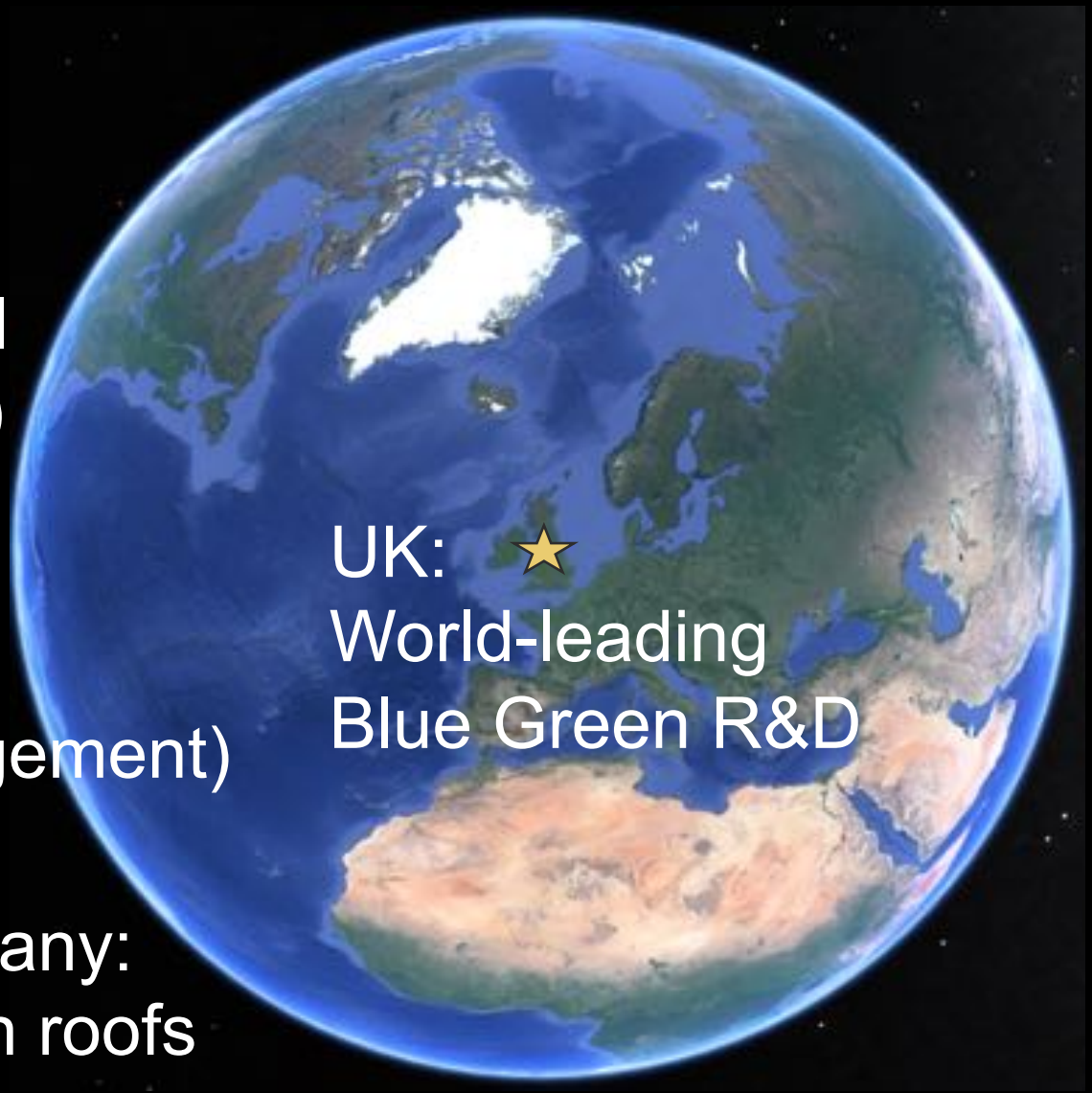
Time for additional focus on adaptation – Now! Urgent! Listen!

CCC Adaptation Progress Report (Aug 2019)

- It is highly likely that average annual temperatures in the UK by 2050 will rise by between 0.5 to 2.7°C above a 1980-2000 baseline period, *depending on the pathway of global emissions*
- Institutional erosion of resourcing & priorities
- It is sustainable development, essential for meeting Government goals on health, biodiversity, and supporting the economy
- 5-year reporting!!!
- **Adaptation should be a no-brainer**

Time to listen, learn and lead

US:
Green New Deal
(economics/jobs)
Philadelphia
(Green Streets /
Integrated Water
Resource Management)



Singapore,
China, Australia,
India:
Water sensitive
cities

Germany:
Green roofs

Time to listen, learn and lead

Case Study: Toronto

- Blue-green infrastructure (BGI) integral component of storm water management system
- Mature deciduous trees intercept 10-20% annual rainfall, coniferous 15-40%
- One 3700m^2 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

Many more examples on www.bluegreenuk.com

Q: River Thames in London – dirty or clean?

MyLondon NEWS IN YOUR AREA SPORT WHAT'S ON SPECIAL FEATURES FOOTBALL LONDON

Sign up today to our daily business email alerts

News > Zone 1 News > River Thames

The River Thames is one of the cleanest rivers in the world [that goes through a major city]

It was once described as 'a badly managed open sewer'

By Louise Cripps

- Declared biologically dead in 1957
- Now cleanest for 150 years

Time to tell the truth

Time to expose:

- Project propaganda (including underselling costs / overselling value)
- Sycophantic, low quality, unscientific, sensationalist reporting
- Undeclared vested interests / ‘old boys’ clubs

Time to promote:

- Independent science with funding checks to determine balance
- Balanced reporting exposing alternative views backed by the independent science

Proviso: No more debate on whether climate change is happening or main source being human-induced. No time. Need to progress.

Time for a SMART Plan

Be specific!

Is it quantifiable?

Don’t set targets too high

Don’t be too ambitious

Set deadlines

Time for a SMART Plan

Background to plan

- Need wide range of *progressive* experts in same room to define SMART goals
- Top down London-wide environmental targeting with specific targets set for different boroughs
- Bottom up community, groups and council activity in support
- Review of policies, economics and accounting across spectrum to achieve given objectives

Time to convert SMART ideas into a SMART plan

Draft SMART plan

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

Time to listen to the headlines

10,520 views | Oct 8, 2019, 09:05am

The Green New Deal: Jeremy Rifkin And The Coming Collapse

Daniel Araya Contributor
AI & Big Data
Advisor and Policy Analyst

IN QINGHAI PROVINCE,CHINA. GETTY

This economist has a plan to fix capitalism. It's time we all listened

Mariana Mazzucato has demonstrated that the real driver of innovation isn't lone geniuses but state investment. Now she's working with the UK government, EU and UN to apply her moonshot approach to the world's biggest challenges

Tuesday 8 October 2019

Time to generate new headlines

UK host crucial COP26 UN climate summit: Nov 2021

- UK Government has generated a SMART Plan and declares London on the road to becoming the **World's First Blue Green City**!
- New blue green industry jobs gearing up to provide greater stability within and growth to the economy reversing impact of pandemic.

Time to generate new headlines

UK host COP56 UN climate summit: Nov 2051

- UK Government declares all UK cities blue green and 100% of London buildings naturally ventilated.
- UN declares 50% of global cities blue green.
- Asset values, healthiness and productivity in blue green cities double that of non-blue green.

Time for a new vision

A Message From the Future:

7min animated film narrated by Alexandria Ocasio-Cortez

https://www.sunrisemovement.org/green-new-deal

Summary and conclusions

- **It's the environment, stupid!** Economy is a subsidiary of the environment.
- Natural climate solutions integrated locally into the urban fabric promote climate change resilience.
- A Blue Green London Plan could provide a template for healthier urban living in many UK cities and globally.
- Need greater focus on adaptation now as future mitigation-related environmental benefits are limited and dependent upon actions by others.
- Adaptation through blue green solutions provide immediate multi-benefits:
  - Urban heat island effect
  - Air quality
  - Flood risk
  - Health and productivity / crime / economy / jobs / asset value.
- It's now time to listen to the science and account for real holistic value.
- It's NOW time to resurface London, regulate its temperature, clean its air and reduce its flood risk before it's too late to respond to our changing climate.

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EV Questions / Fact Check – Just a stopgap? I

Article 1: Promotes dispersion over deposition:

https://airqualitynews.com/2019/10/04/why-green-infrastructure-is-critical-for-improving-air-quality/

Note: the ban on sales of petrol and diesel vehicles from 2040 [now 2035] will reduce exhaust emissions of, for example, nitrogen dioxide. It will not have the same impact, however, on the emissions of particulate matter, a significant fraction of which come from brake, tyre and road wear. These sources of road transport pollution will be undiminished by electrification, and could even increase due to the weight of electric vehicles.

Article 2: Corrects some of the misunderstanding behind NOx and $PM_{2.5}$ emissions:

https://www.bbc.com/future/article/20191113-the-toxic-killers-in-our-air-too-small-to-see

'90% of all particles by busy roads are nanoparticles below 100nm' which are ***insensitive*** *to $PM_{2.5}$ sensing.*

EV Questions / Fact Check – Just a stopgap? II

- History has proven outcomes from recommendations to buy diesel cars were unexpected and unwanted with respect to air pollution.
- Quality and communication of science is key to positive outcomes through comprehensive, well-considered plans.
- Science behind gaseous *with* particulate emissions unclear or not communicated well.
- Emissions include ultrafine particles not captured by $PM_{2.5}$ sensing.
- Key ultrafine particle sources are brakes, tyres and road wear.
- Little evidence of reduction in these sources through advanced automotive technologies. Source reduction most likely through targeted reduction in distance travelled which is limited in nature.
- Some blue green solutions could reduce this pollution risk – to be further researched and incorporated into holistic designs, e.g. pervious road surfaces and hedges near schools and hospitals as a priority.

EV Questions / Fact Check – Just a stopgap? III

- What is the projected impact of EV transition individually on gaseous (NO_2) and particulate emissions? Note some gaseous transformation into ultrafine particles - not 'sensed' in $PM_{2.5}$ figures as too small.
- How are the limitations in sensing 'warping' the decision-making process?
- What is the true value of EV ('effective emissions') when 4-year average battery lifespan and disposal is taken into account? Value of alternative solutions?
- What is the true capacity of EV transition using *ethical* cobalt mineral source? https://www.newscientist.com/article/2234567-can-we-quit-cobalt-batteries-fast-enough-to-make-electric-cars-viable/
- What is the 'best transition' level for EV noting they cannot be converted from combustion engine vehicles which will still be on roads. Also note hydrogen electric conversion *is* possible but we still need advance in technology.
- Can EV be made truly 'clean', e.g. new battery technology, much lower ultrafine particle emissions (advances in types, brakes and road surface)?
- Is there any research on increased nat vent opportunities in our urban centres due to reduced pollution levels following transition?
- What could be the impact of EV transition on environmental building design?

EV Questions / Fact Check – Just a stopgap? IV

Is a blue-green transition needed **NOW** as part of the ‘green recovery’ to deal with the additional particulate pollution that will be generated by the transition to electric vehicles?

Blue-Green Perspectives:
Adapting to Climate Change Impacts – NOW!

Furlough College / The Engineering Club, July 2nd 2020

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