



Climate Adaptation for the Built Environment

Herefordshire & Worcestershire Constructing Excellence (HAWCE)

Bethany Haskins-Vaheesan & Mike Webb WMCA



What is climate risk and adaptation?



Latest News (13th March 2024)



“The evidence of **the damage from climate change has never been clearer, but the UK’s current approach to adaptation is not working.....”**

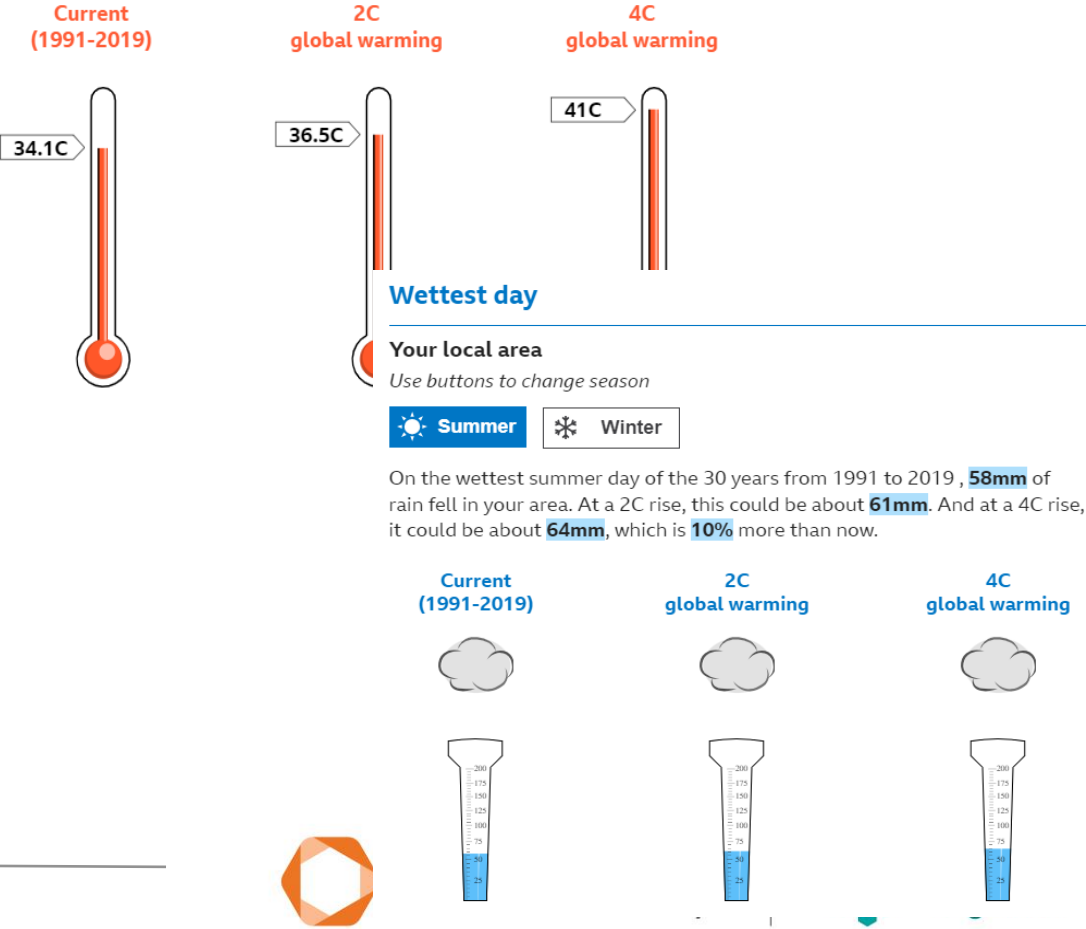
Baroness Brown, Chair of the Adaptation Committee

Climate change & its impacts

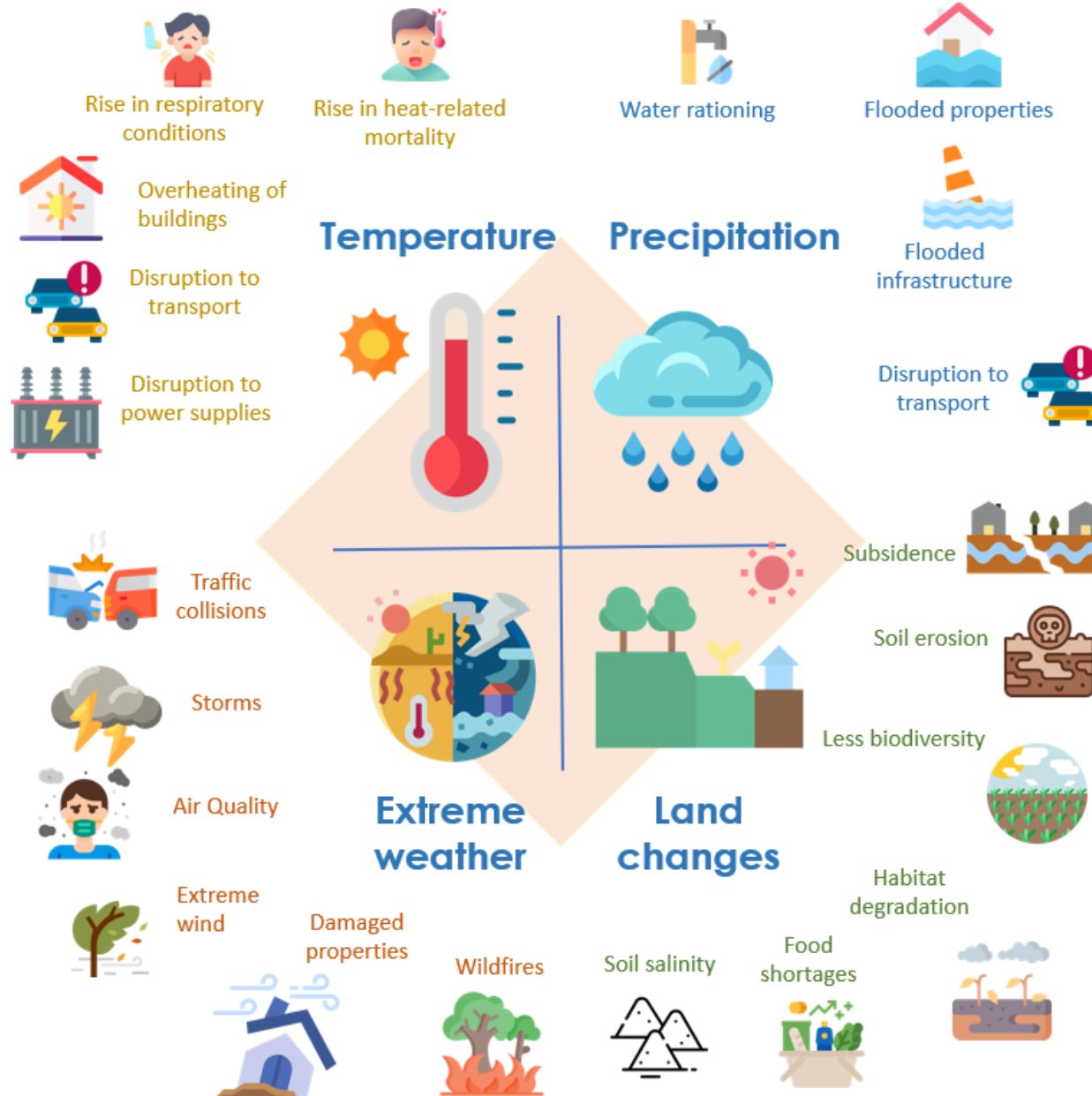
- Under current policies and actions **by the end of this century** warming will be as high as **2.9C**.
- Increasingly hotter, drier summers & warmer, wetter winters + more extreme weather events.
- Climate change focus has been on net zero & carbon reductions.
- Increasing importance on the need for adapting to climate risks and opportunities.

Summer Winter

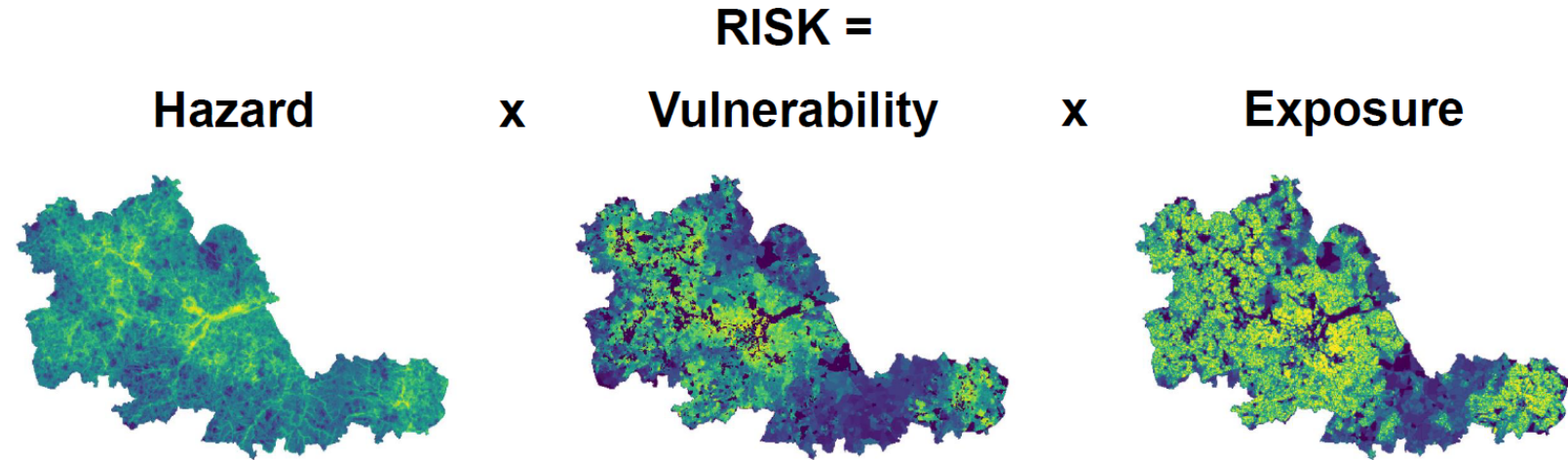
The hottest summer day in the 30 years from 1991 to 2019 near you was **34.1C**. If global average temperatures increase 2C above pre-industrial levels, the hottest summer day could be about **36.5C**. If global temperatures rise by 4C, it could be about **41C**.



Climate Impacts facing the West Midlands



Climate Risk & Vulnerability Assessment (CRVA) mapping



A combination of the following data at 100x100m resolution:

- Air pollutant concentration (nitrogen dioxide)
- Fine particulate matter concentration
- Surface water flood risk
- Flood risk from rivers
- Lack of large, open green space
- Lack of other green spaces (e.g. gardens)
- Lack of cover and shading from trees
- Average summer surface temperature
- Building form, height and density

A combination of the following data at 100x100m resolution:

- Household deprivation by employment
- Household deprivation by education
- Household deprivation by health & disability
- Household deprivation by housing
- Population of minority ethnicity
- Population whose main language is not English
- Households with dependent children under 15 years of age
- Households of single occupancy over 65 years of age
- Households with no access to a car or van
- Households who do not own their property outright
- Average annual salary
- Average net disposable income
- Average % of income that is disposable
- Average % of income spent on travel to work

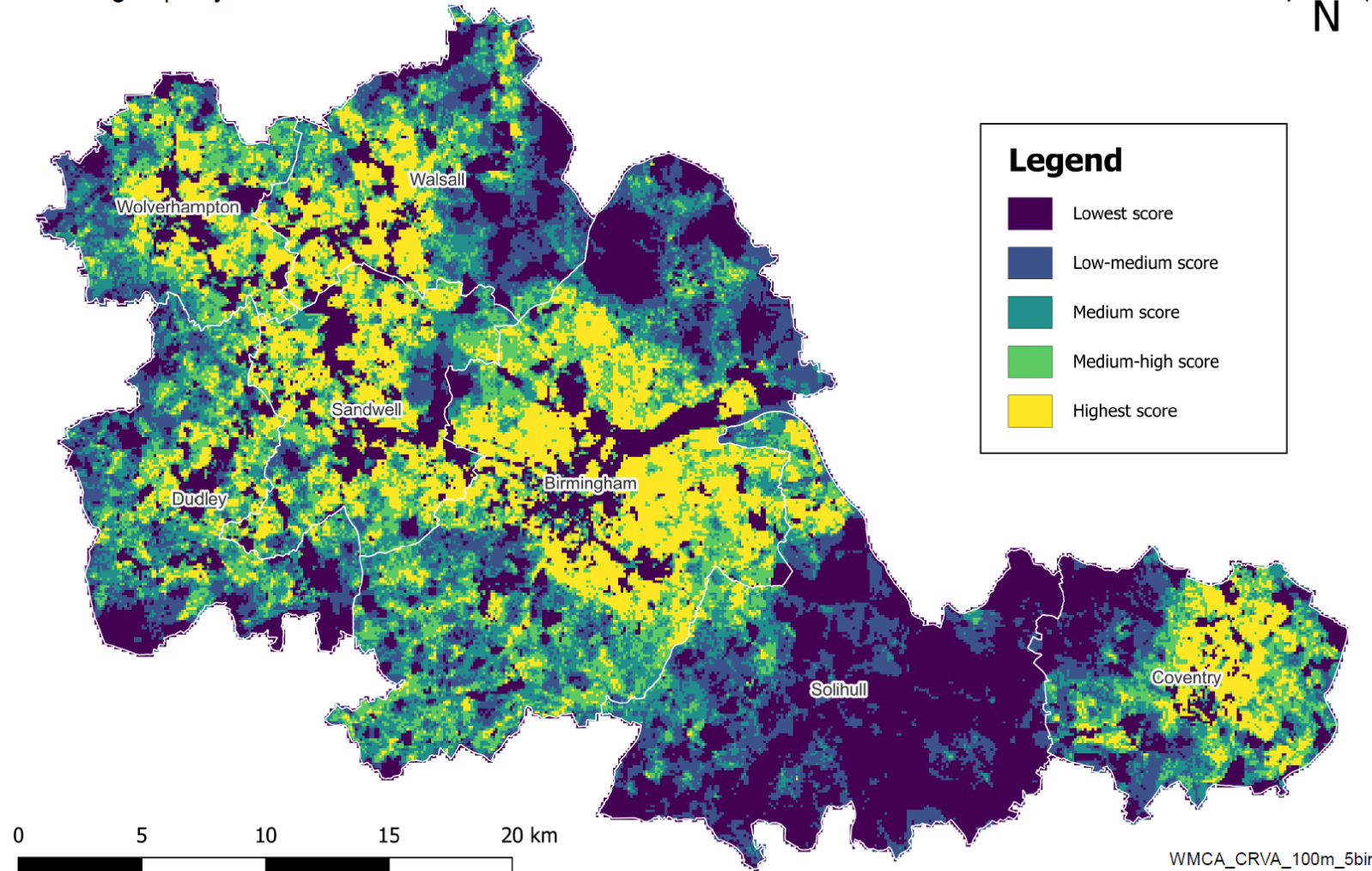
The following data at 100x100m resolution:

- Population density

Climate Risk & Vulnerability Assessment (CRVA) mapping

Climate risk and vulnerability scores for the West Midlands

100m resolution
5 colour groups by score



Examples of impacts already being felt ...



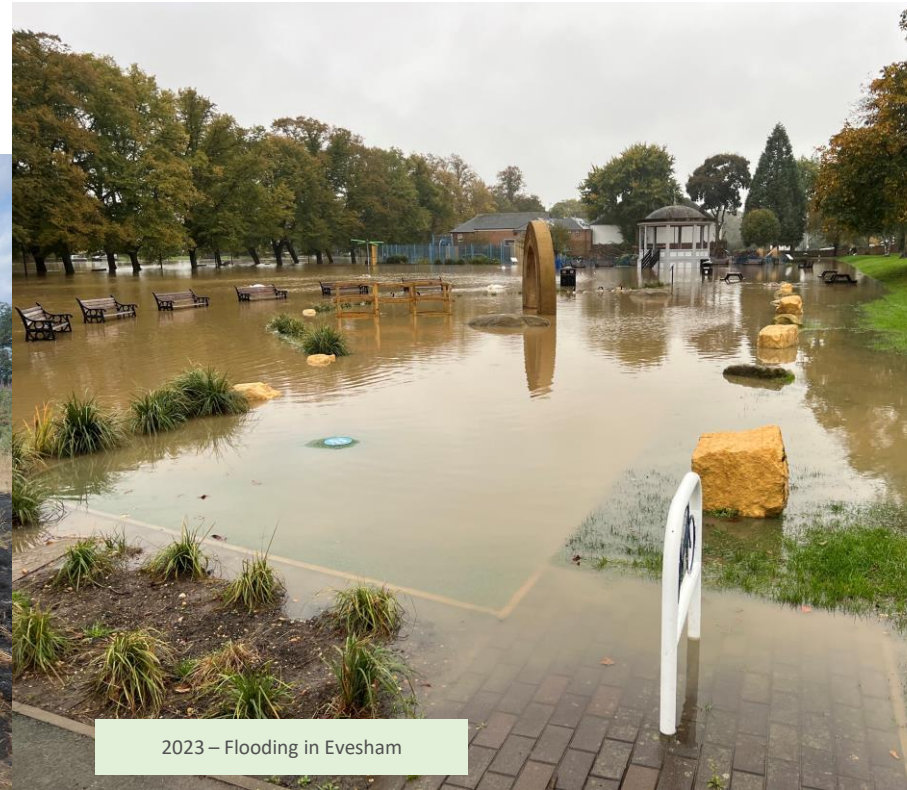
Flooding and a stranded resident in Alum Rock, East Birmingham (2019)



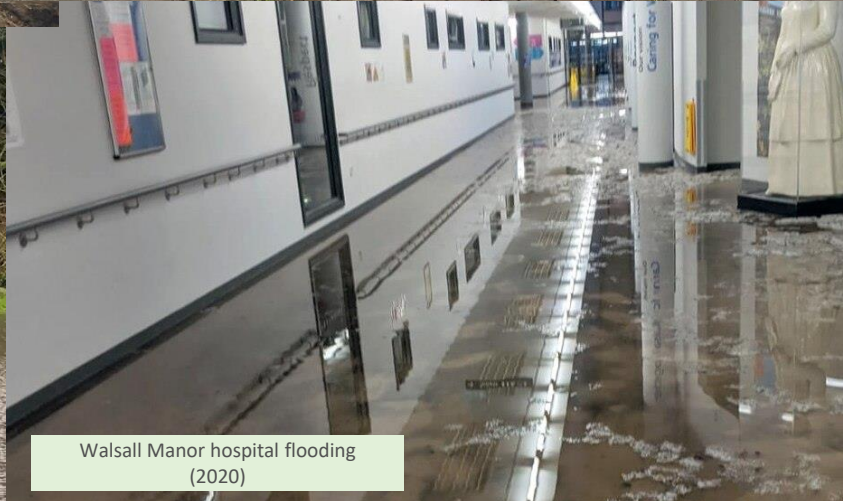
Drought in Edgbaston Reservoir (2018)



Flooding in Catherine de Barnes, Solihull, from Storm Dennis (2020)



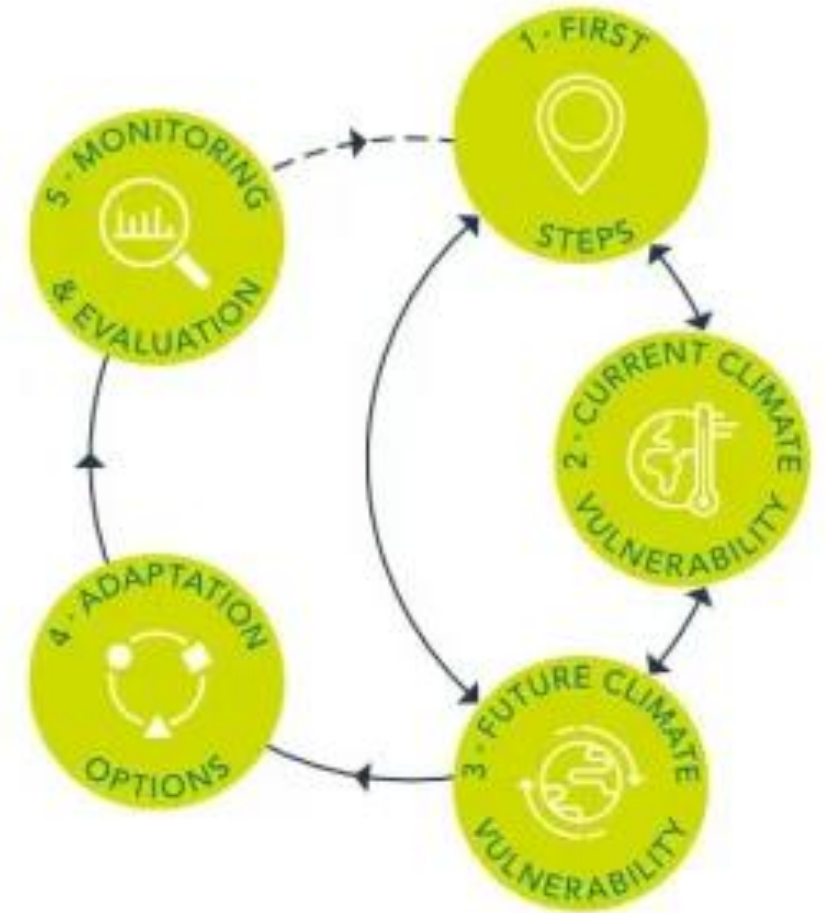
2023 – Flooding in Evesham



Walsall Manor hospital flooding (2020)

The Adaptation Process

- **Current vulnerability** – a baseline assessment
- **Future vulnerability** – assess risks under specified timelines (2030 & 2080) and warming scenarios (2C & 4C)
- **Adaptation options** – risk thresholds, cost-effectiveness, co-benefits, material performance
- **Monitoring & evaluation** – responsibility, maintenance, metrics and indicators



Climate adapted and resilient building stock & construction

Risks to building fabric from moisture, wind and driving rain

- Deliver more proactive measures
 - A measurement of indoor environmental quality
 - Predictions of risks like subsidence
 - Siting
 - Orientation
 - design and materials should be given ahead of construction.
- Integrated design of energy efficiency, overheating prevention and ventilation for new builds.

Risks to people, communities and buildings from flooding

- Understand at-risk areas
- Is risk and mitigation information publicly available?
- Justification for and cost-savings from Sustainable Drainage System (SuDS)
- Changes to water tables affect excavation, tunnelling and flood risk.

Risks to health and wellbeing from high temperatures

- Combined decarbonisation strategies with adaptation measures
- Prioritise green infrastructure
- Educational work for building owners and users

Further considerations: risks to construction

- Supply chain disruptions
- Utility dependencies – water and energy shortages
- Workforce disruptions and safety
- Market changes – prices of materials and insurance

Source: [CCRA3-Briefing-Housing.pdf \(ukclimaterisk.org\)](#)

Climate adapted and resilient building stock

Passive heating/cooling:

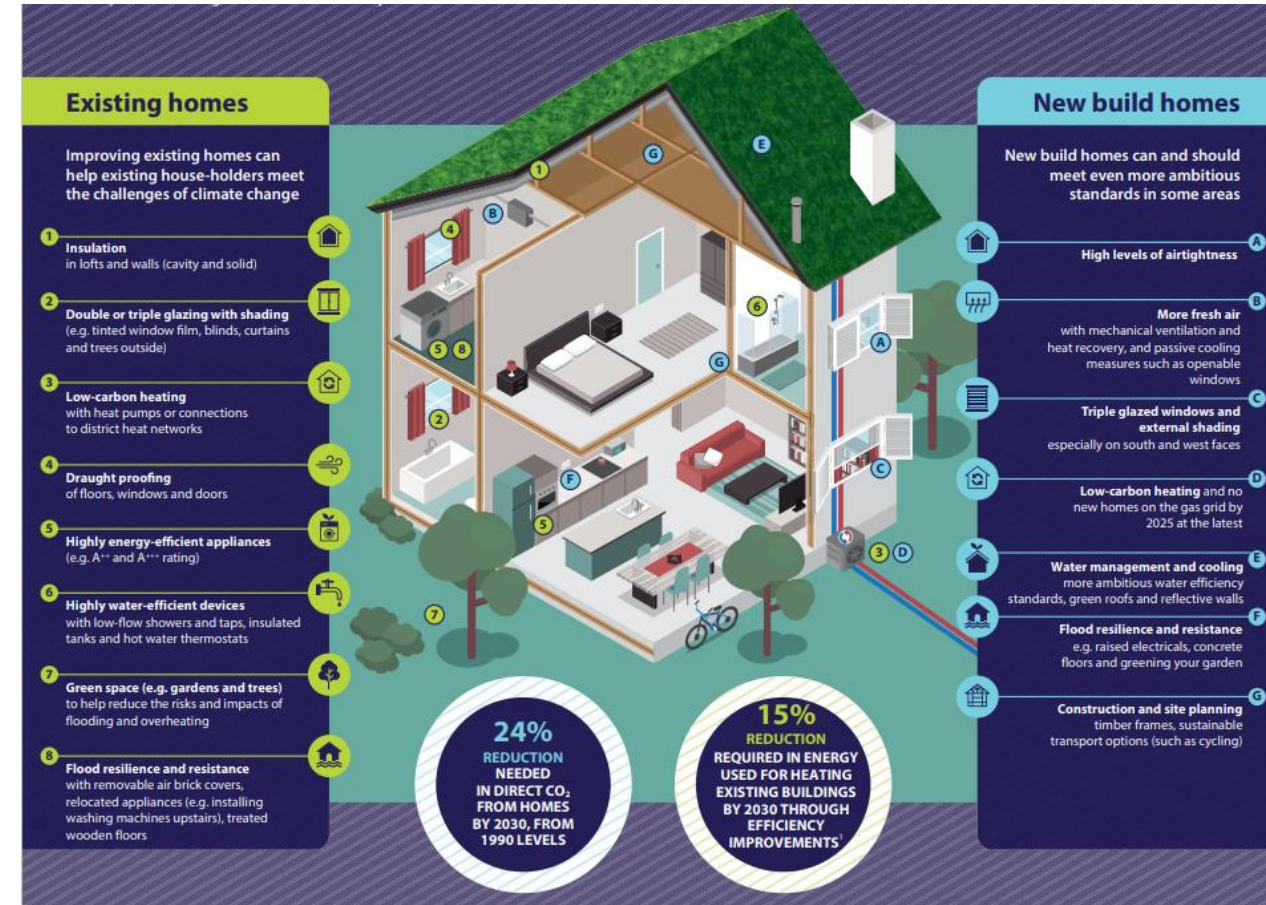
- Reflective walls and rooves
- Indoor window treatments: curtains, blinds
- Cool flooring (timber)
- External shading: shutters, overhangs, trees & vegetation
- Thermal wall and loft insulation
- Communal heating systems: pipe insulation, ventilation of service voids
- Behaviour change: opening of windows, use of 'cool rooms'

Active heating/cooling:

- Mechanical ventilation
- Ceiling fans
- Air conditioning units

Nature-based solutions:

- Sustainable urban drainage systems (SuDS)
- Tree and vegetation planting
- Greening rooftops

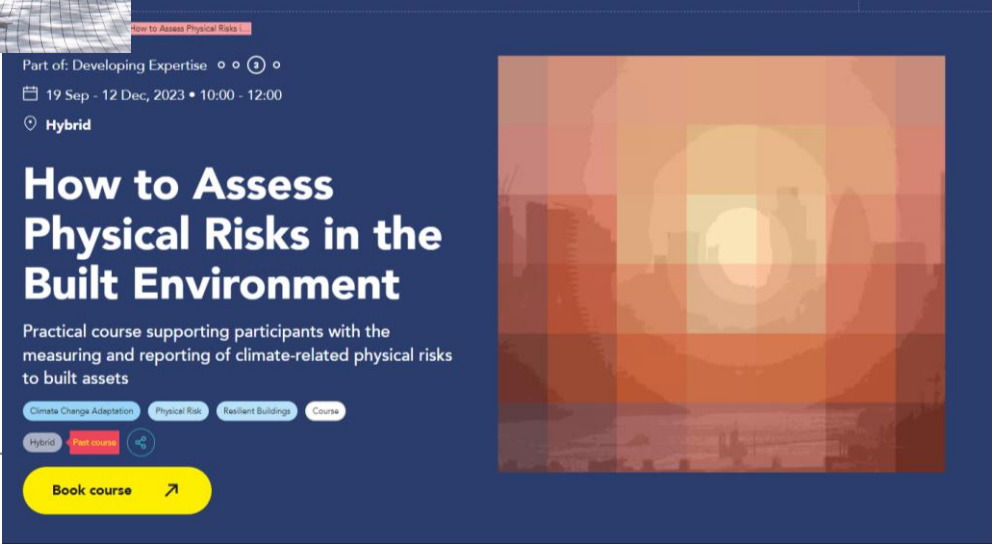
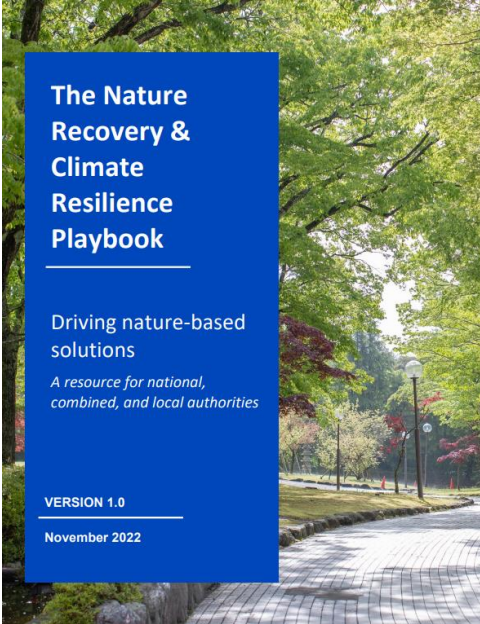


Guidance & Resources

Implementation of adaptation in the building sector

Different stakeholders have different responsibilities and requirements as we transition to deliver more resilient buildings.

- Designers & architects
- Local authorities
- Asset owners
- Developers
- Insurers
- Investment community



Nature-based solutions (NBS) for the built environment

SuDS
Sustainable drainage systems



Urban parks
and green spaces



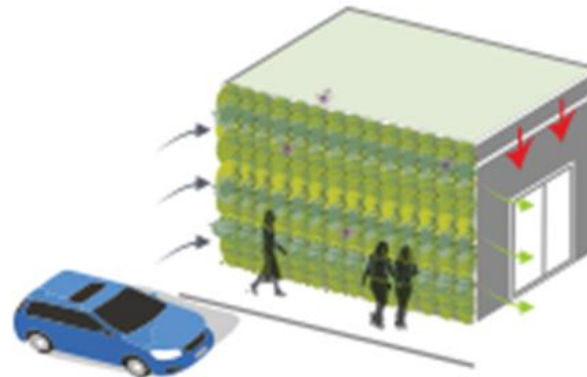
Street trees



Green roofs



Green walls



Street Trees



Street trees

NO₂ removed per tree annually



0.17kg

PM10 removed per tree annually



0.11kg

Street trees

Carbon sequestered per tree annually



5.5kg

Street trees

Carbon storage capacity per tree



231.6kg



Trees

Street trees / SuDS-enabled
Reduction in surrounding
air temperature



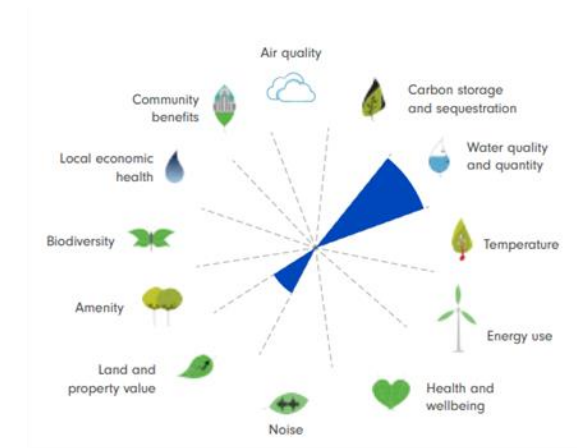
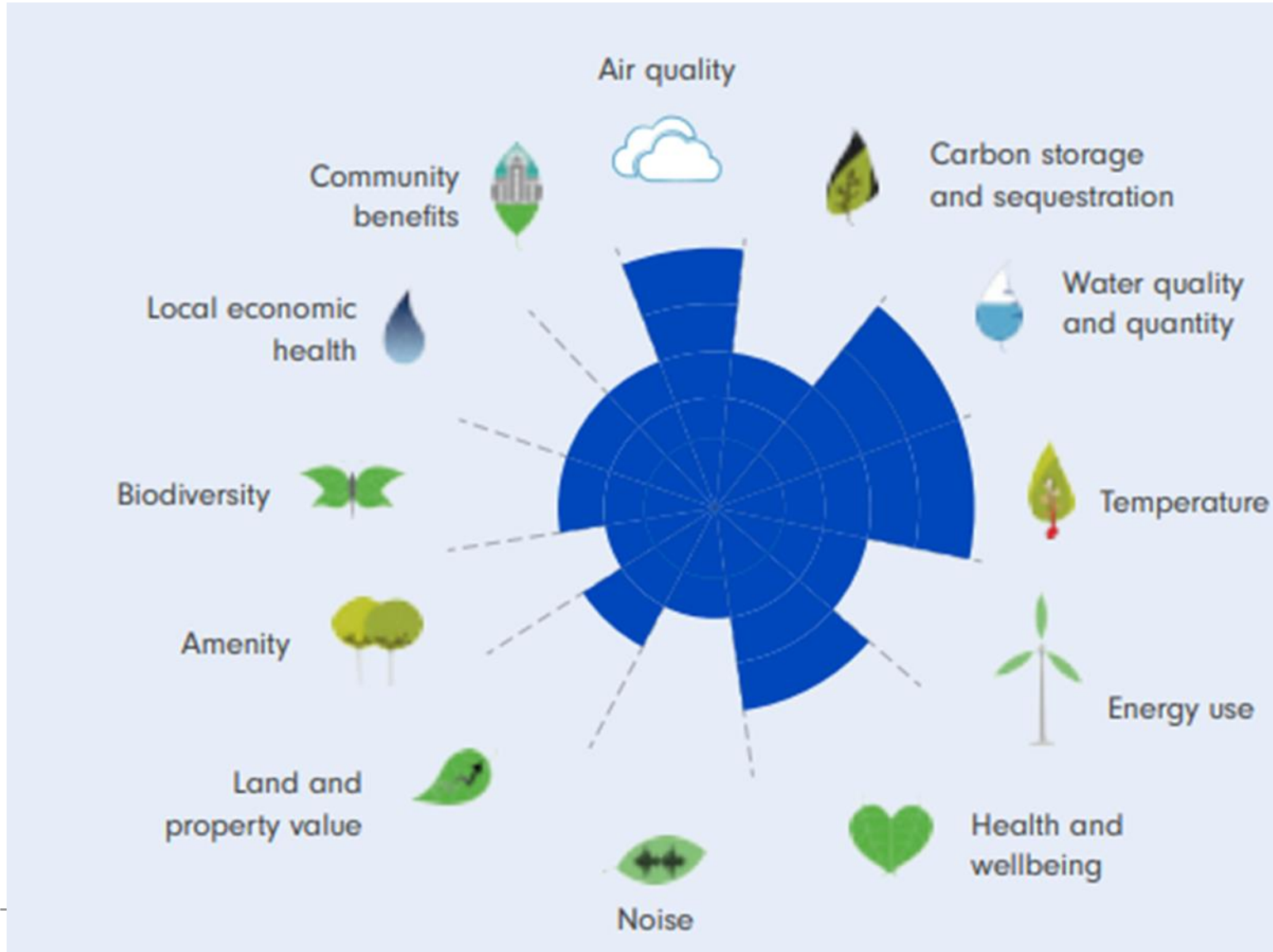
Street trees

Rainwater runoff retention

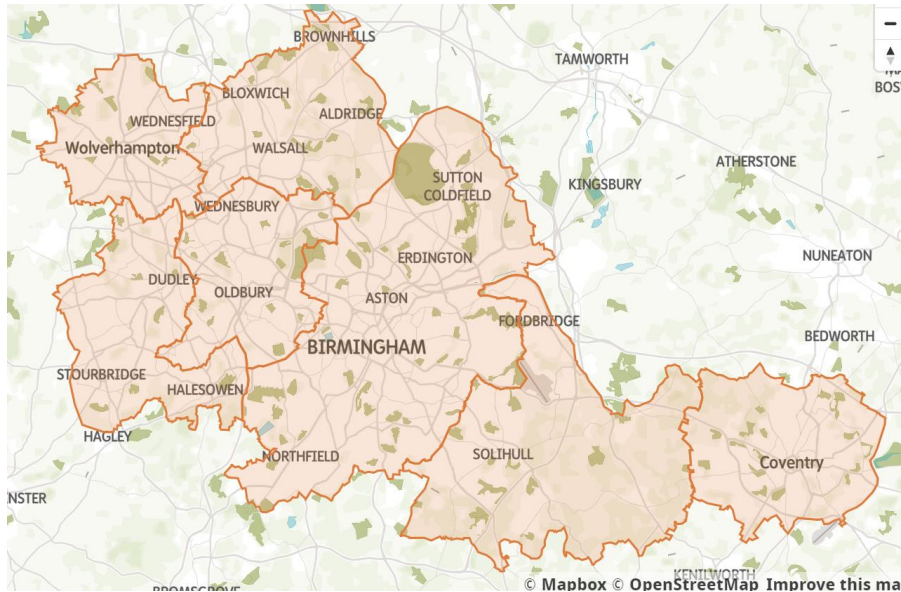


43%

Street Trees



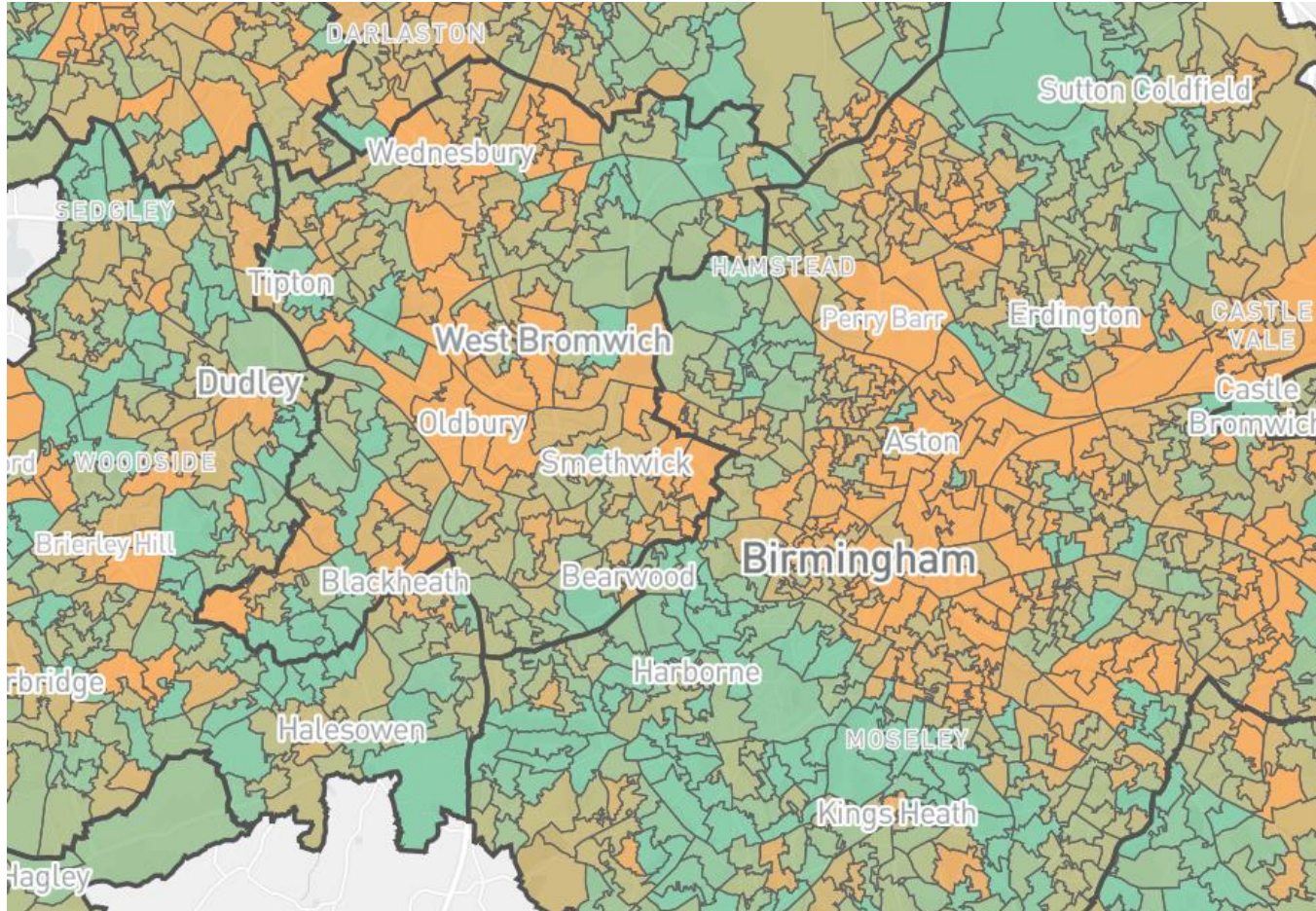
West Midlands iTree Survey



- Over 2000 sample plots
- Estimated to be 4,918,000 trees
- 14.4% canopy cover
- English Oak (8.36%), Silver Birch (7.76%), Ash (7.19%)

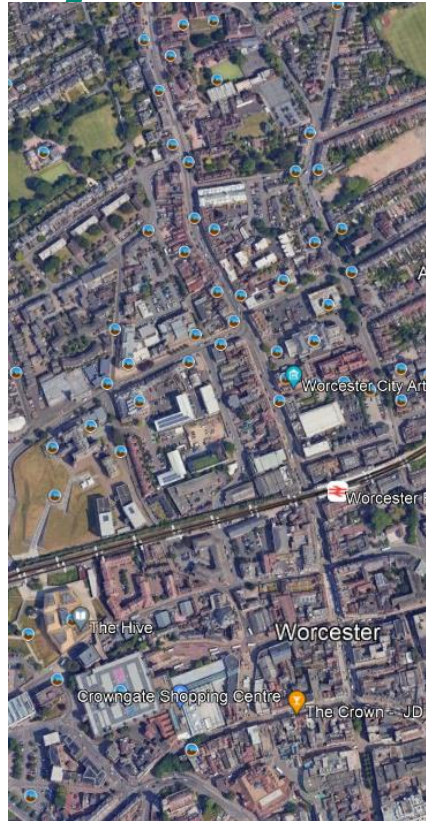
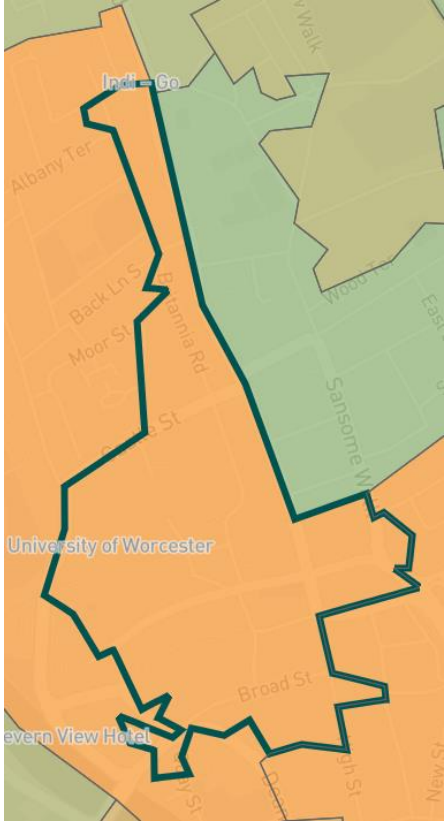
WMCA's Ecosystem Services Headline Figures		
Total Carbon Storage	1,912,000 tonnes	£1.86 billion
Annual Carbon Sequestration	57,620 tonnes	£55,980,000
Annual Pollution Removal	206 tonnes	£14,965,000
Annual Avoided Runoff	1,551,000 m ³	£2,501,000
Total Annual Benefits	£73,446,000	

Not all equal though



- Central Birmingham 2% canopy cover
- Edgbaston 37% canopy cover
- Typically, those places with low canopy cover are most deprived

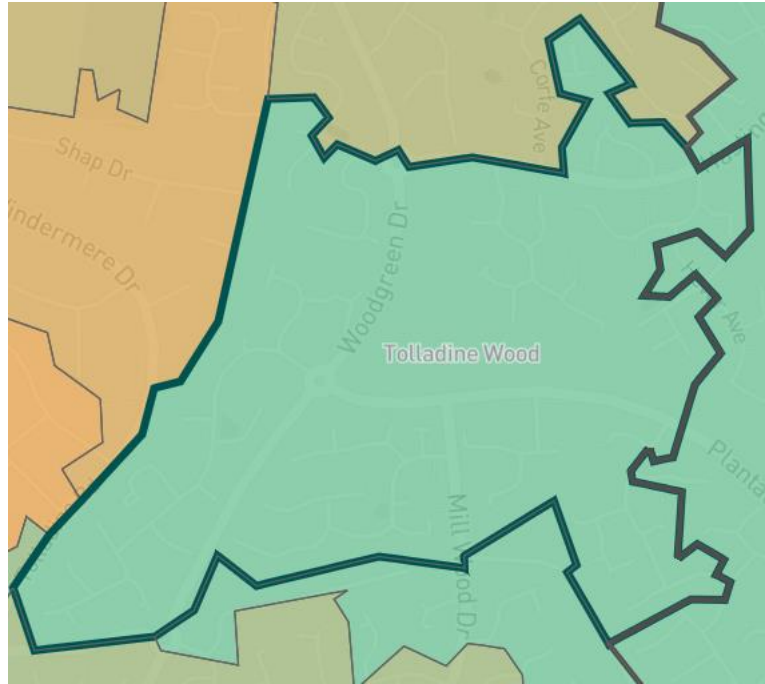
Tree equity in Worcester



City Centre

4% canopy cover

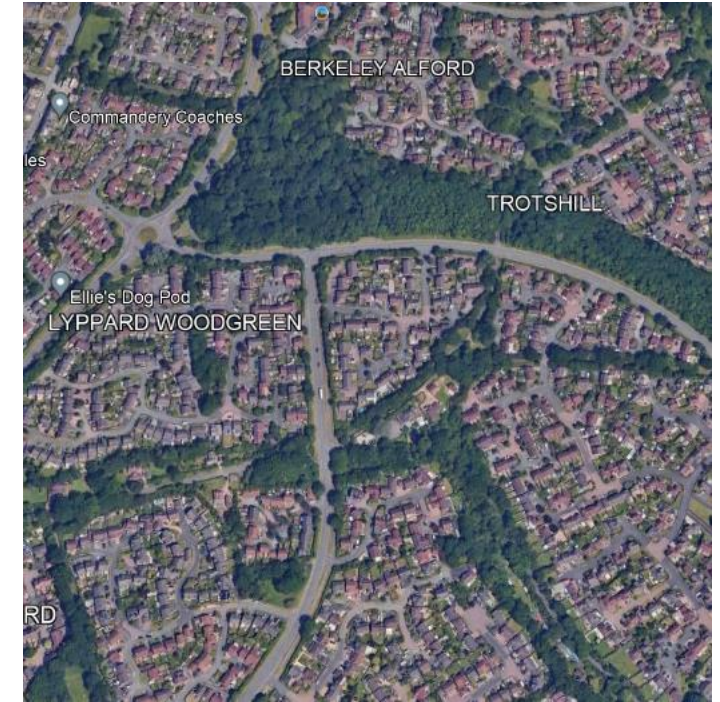
1.71 °C heat disparity



Warndon village

26% canopy cover

-1.85°C heat disparity

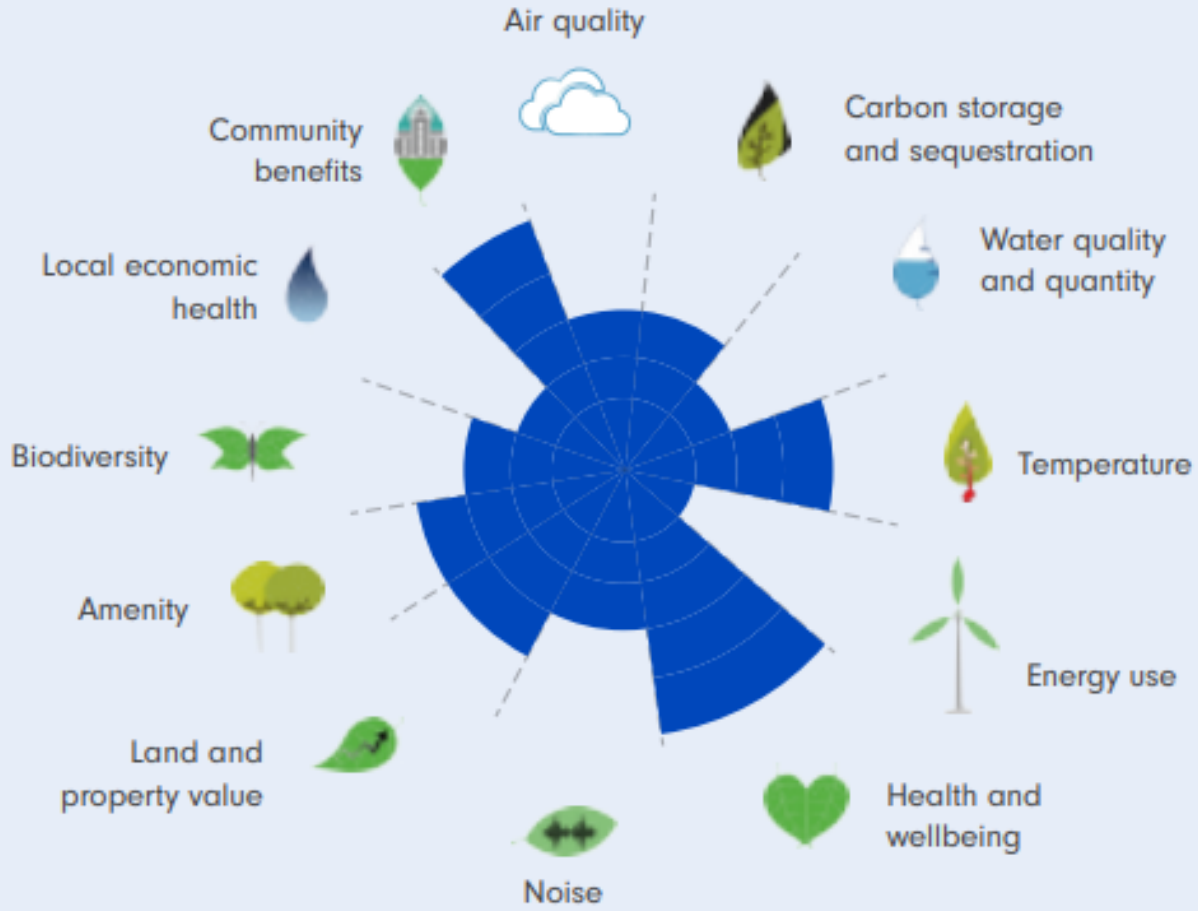


West Midlands
Combined Authority



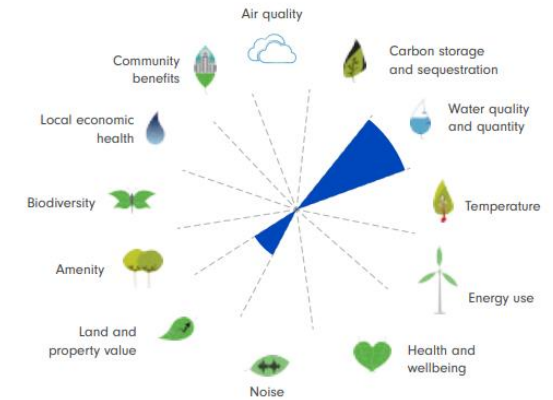
Greener
Together

Greenspaces



Urban parks and green spaces

- Providing recreation space.
- Value increase of properties in the vicinity.
- Counteracting the Urban Heat Island Effect, helping to naturally prevent urban space from overheating.



Green space

Carbon sequestered per m²yr



In vegetation carbon storage capacity per m²



In soil carbon storage capacity per m²



Green space

Rainwater runoff retention



Annual rainfall infiltrated



West Midlands Combined Authority



Wellbeing

- Can reduce airborne particulate matter by between 9% and 24%
- Can cool an urban area by 2-3°C
- Hospital patients with a view of trees recover quicker and need fewer painkillers
- Workers who can see nature while working take less sick leave, and have greater job satisfaction, according to [a 2020 report by Business in the Community](#).
 - *Employees take fewer sick days* - The research showed a 23% decrease in sick leave taken by employees with a view of nature - that's an average of 11 hours less sick leave per year than employees with no view. This equates to an average annual saving of around £1,600 per employee.
 - *Increased productivity* - call centre workers with a view of nature handle calls 6-7% faster than those with no view. This generates annual productivity savings of around £2,400 per employee

Making the case

Meeting targets

- Contribution to Local policies and plans
- Double up as BNG units

Cost saving

- Reducing running costs (energy for heating cooling)
- Avoiding need for expensive water infrastructure renewal/upgrade

Some insights taken from the evidence of NBS generating local economic growth:



Recognising the value of NBS (Business Case)

Land and property value

Green walls

Living wall / Green façade

Increase in property value



Increase in land value



Trees

Street Trees / SuDS-enabled

Increase in property value



Increase in rental value



Green space

Increase in property value when in direct or close proximity to a park



Increase in rental value



Green roofs

Extensive < 150mm / Intensive > 150mm

Increase in property value for non-accessible green roof



Increase in property value for accessible green roof



SuDS

Increase in property value when a small blue space within 200m of a property



Increase in property value when a large blue space close to the property



West Midlands
Combined Authority



Just imagine...



Thank you for listening

Thank you for listening.

For further information:

- Visit www.wmca.org.uk/adaptation
- Or contact: bethany.Haskins@wmca.org.uk or mike.webb@wmca.org.uk