

A photograph of a modern building with a white facade and large windows. A lush vertical garden is growing on the building's exterior, featuring a variety of green plants and some small red flowers. The garden is composed of several rectangular planters stacked vertically. The text "The (many) Benefits of Urban Greening" is overlaid on the image in a large, white, sans-serif font. A solid green vertical bar is positioned to the left of the text.

The (many) Benefits of Urban Greening



A summary of the many social, environmental and economic benefits that urban greening can bring to our cities and towns.

Social Benefits:

Public Health: Access to green spaces has been linked to improved physical and mental health. It encourages physical activity, reduces stress and enhances overall well-being. Studies have shown that proximity to green space can lower the incidence of conditions, such as, obesity, cardiovascular conditions and depression.

Community Cohesion: Green space provides an area for social interaction and community activities, which strengthen social ties and promotes a sense of togetherness among communities.

Creating Aesthetic & Recreational Value: Greening programmes enhance the aesthetic appeal of urban landscapes, making them more attractive for residents and visitors. They also provide recreational spaces that improve quality of life.

Environmental Benefits:

Climate Mitigation: Urban greening helps in reducing the heat island effect, where urban areas are significantly warmer than their rural surroundings due to human activity. Trees, vegetation

and green spaces lower temperatures through evapotranspiration and provide shade.

Stormwater Management: Vegetation in cities and towns can help manage stormwater and reduce flood risks by absorbing rainwater, reducing runoff and slowing the general flow of water. Green roofs, permeable paving and rain gardens are all effective tools in this regard.

Air & Water Quality Improvements: Green spaces contribute to better air and water quality by absorbing pollutants like nitrogen oxides and particulate matter. This leads to healthier urban environments.

Economic Benefits:

Property Value Increase: Properties located near green spaces often have higher market values. The increase in property value can contribute to economic growth and increased municipal revenues for local authorities.

Cost Savings: Urban greening has been shown to reduce energy costs by lowering the need for air conditioning over summer months. It also reduces the costs associated with healthcare by making improvements to public health.

Tourism & Economic Activity: Attractive green spaces have a positive impact upon local tourism and boosting local business activities.

Greening our Cities

As the UK's urban populations grow, greater pressure is placed on existing green space to accommodate new homes, roads and other infrastructure that is essential to modern life. When we lose green space, we also lose the tremendous benefits that it brings to urban environments.

Around 7% of land in the UK is taken up by urban landscapes, whilst in England this figure is as high as 10%. The centres of many towns and cities have doubled over the past two decades, while the UK population overall has increased by only 10% ¹. By 2030, we will see the UK's urban population increase from 83.9% (2020) to 92.2%.

Due to population growth and urban sprawl we are losing large areas of green space across the UK. An aerial survey of the UK in 2015 ² showed that between 2006 and 2012 over 22,000 hectares of green space - including 7,000 hectares of forest and 14,000 hectares of farmland - was converted to 'artificial surfaces'.

There has been a detrimental impact to the UK's parks. An investigation by the BBC ³ in 2018 revealed that more than half of local authorities in the North West of England were considering selling parks or transferring the management of parks to others. The investigation also found that 60% of local authorities had cut their park budgets since 2015.

The loss of green space is not just happening to the UK's parks, forests and farmland, it is a pattern that is being repeated across privately owned front gardens. Two RHS-commissioned Mori Polls in 2005 and 2015 found that three times as many front gardens had been paved over in just a decade. One in four UK front gardens (that's 4.5 million) are now completely paved over ⁴.

Why does this matter? For starters, green space is vital if we are to create more resilient, healthier and 'liveable' cities and towns for future generations. It delivers enormous benefits - it can improve people's mental and physical health, reduce flood risk, improve air and water quality, boost tourism and cool cities during hot summer months.

During the Covid-19 pandemic there has been a surge in appreciation for green spaces and the benefits that they bring locally to cities and towns ⁵. Now is the perfect opportunity to reassess the importance of green space and take action to make UK cities and towns greener and healthier places to live.

1. Centre for Cities, 2018.
2. University of Leicester, 2015.
3. BBC Inside Out North West, 2018.
4. Royal Horticultural Society, 2015.
5. Office for National Statistics, 2021.

Boosting Health & Well-Being



A substantial evidence base already exists that demonstrates how exposure to green space is very good for us. Living in a greener environment is associated with better mental health and lower all-cause mortality, from conditions such as circulatory disease and asthma, whilst cutting obesity levels through encouraging physical activity.

In England, just 35% of households with an annual income of below £10,000 are within a 10-minute walk of a publicly accessible natural green space ⁶. The Covid-19 pandemic has heightened inequalities in accessing green spaces. People on lower incomes, with lower levels of education or who live in deprived areas visited natural spaces less often than usual, while other groups visited more often ⁷.

A study by Aarhus University in Denmark found that children raised in areas with the most restricted access to nature were up to 55% more likely to suffer from stress related issues, depression and other mental health disorders than those in greener areas ⁸.

At the launch of the Environment Agency's 'State of the Environment' Report in July 2021, its Chief Executive, Sir James Bevan, stated that "the NHS could save over £2 billion in treatment costs if everyone in England had access to good quality green space".⁹

Green space encourages people to get outside and take part in physical activity. It provides an environment to exercise and be more physically active. Research has shown that there is an increase of up to 83% of more social activity in green spaces

as opposed to sparsely vegetated or grey urban landscapes ¹⁰.

According to Public Health England, people in the UK are around 20% less active now than in the 1960s ¹¹. If this trend continues, then that figure will reach 35% by 2030. In the UK just a third of the population achieves the recommended level of daily exercise ¹² - the impact of this on health is estimated to have a direct economic cost of £1 billion per year ¹³.

Spending time in nature, even for a short time, produces chemicals in the brain that are linked to reducing stress levels and helps to lower blood pressure. There is clear evidence that exposure to green space improves our mental well-being and reduces the need to treat mental health conditions, such as depression and anxiety ¹⁴.

There have been a series of successful trials in Scotland where doctors started prescribing nature to their patients. In July 2020, England launched a £5.77 million scheme for a cross-government project aimed at preventing and tackling mental ill health through green social prescribing. The evidence is abundantly clear - green space is incredibly beneficial for people's health and well-being.

6. RSPB., 2020.

7. Armstrong et al., 2021; Korpilo et al., 2021; Reinwald et al., 2021; Ugolini et al., 2021.

8. Aarhus University., 2019.

9. Clean Up, Green Up and Level Up: how to build a future city. Sir James Bevan's speech., 2021.

10. Defra., 2010, Khalilnezhad et al., 2021, Ugolini et al., 2021, Marchi et al., 2022.

11. Public Health England., 2016.

12. Department of Health., 2011.

13. Scarborough et al., 2011.

14. Braubach et al., 2017; Hartig et al., 2014; Bratman et al., 2015, Meyer-Grandbastien et al., 2020, Jabber et al., 2021.



Did you know? That cities in Europe could prevent up to 43,000 deaths each year if they achieved the WHO recommendations around access to green space.*

* In 2021, the Barcelona Institute for Global Health analysed 1,000 cities in 31 European countries and found that up to 43,000 premature deaths could be prevented each year if cities were to follow World Health Organisation (WHO) recommendations relating to residential proximity to green space. The recommendation is that there should be an area of green space that is at least 0.5 hectares in size at a distance of no more than 300 metres from every home.

Economic Growth & Regeneration

Greener cities and towns create opportunities for economic growth and regeneration. New York's hugely successful High Line project cost US\$153 million to turn an old elevated rail line in Manhattan into a new park. This might seem like a large investment, but it now attracts over 5 million visitors a year and kick started US\$2 billion in new developments.

The High Line project is a fantastic example of how carefully planned and implemented green infrastructure projects can result in significant economic benefits for urban areas. For example, 12,000 jobs have been attributed to the New York High Line alone. In 2021, New York governor, Andrew Cuomo, announced plans for two separate expansions of the elevated park. The first phase would cost an estimated US\$60 million and be used to "jumpstart the private market" post-lockdown.

Cities around the world have begun to try and replicate the success seen in New York, in what has been dubbed as the 'High Line effect'. There have been ambitious urban greening programmes in cities like Paris, Manchester, Madrid and Singapore. A charity¹⁵ in London that is looking to fund a 1.2km long high line in Camden, where 39% of residents do not have access to a private green space.

The High Line project demonstrates how green space can be used as a catalyst to drive economic growth, regeneration and tourism. But it has created problems for long-term residents who cannot afford the increasing cost of living and instead move to areas that are more affordable, with less green space - arguably, it's success hasn't helped the people it set out to help.

In 2019, the Office for National Statistics (ONS) analysed the impact on property prices for homes close to parks, gardens, playing fields and other accessible green spaces in urban areas. Houses and flats within 100 metres of public green spaces were found to be £2,500 more expensive (on average) than they would be if they were more than 500 metres away.

A report by DEFRA in 2010¹⁶ showed proximity to a well managed green space - a park or woodland - would result in average property premiums ranging from 2.6% - 11.3%. The closer to the green space, the higher the premium.

A Harvard study found that building design not only plays a huge role in our professional life, but can also have an impact on our well-being when we get home as well. It emerged that when we work in 'green certified offices', there is a 26% boost in cognition, and 30% fewer sickness related absences. What's more, respondents also reported a 6% rise in their sleep quality¹⁷.

An Exeter University study found that employees were 15% more productive when working in a 'green' office than their peers in more spartan environments¹⁸, whilst walkable, green streets attracts young talent to urban areas¹⁹.

15. www.camdenhighline.com

16. Defra, 2010

17. Spengler et al., 2017

18. Knight et al., 2014

19. Environmental Protection Agency, 2023.

Reducing the Impact of Flooding

The UK is experiencing more extended periods of rain and more intense precipitation. Longer periods of extreme winter rainfall, such as that experienced in 2013-2014, and the record rainfall in 2015-2016 is now part of an ongoing trend that cities and towns must respond to. Seven of the eleven wettest years on record have occurred since 1998.

January 2014 was the wettest January ever recorded in Britain, with more than three times the average rain falling in that month. The Environment Agency revealed that the winter floods of 2013-2014 caused damage in England and Wales costing at least £1.3 billion ²⁰. whilst 2023 was Britain's wettest ever recorded winter ²¹.

The 2013-2014 floods caused damage to 10,465 residential properties and nearly 5,000 businesses, incurring costs of around £590 million. Damage to transport infrastructure cost £290 million (roads £180 million, railways £110 million) ²².

Yet, these damages could get far higher in the future - according to the WWF report ²³, a repeat of the 2013/14 winter floods in 2050 would be much worse. costing some £2.2 billion in economic damage and impacting 2.5 million homes if a 'business as usual' approach continued.

Increases in both the frequency and intensity of extreme weather events raise the risk of surface water flooding. To compound the problem, cities and towns are becoming ever-more populated and impermeable (e.g., new buildings, roads, pavements), which makes urban areas increasingly vulnerable to stormwater runoff

flooding ²⁴. Whilst analysis by insurance giant Aviva has shown that 1 in every 13 homes built since 2014 is located within a flood zone - that's 110,000 households! ²⁵.

Altering the natural environment in this way means that the drainage capacity of an area reaches capacity far quicker, resulting in floods ²⁶. It also leads to sewage systems becoming overloaded, which has a negative impact on public health ²⁷.

Permeable green space can reduce the volume of surface water runoff by storing and intercepting rainfall. For example, green roofs have the capacity to capture 70% of rainfall over a given time ²⁸. The use of sustainable drainage systems (or SuDS) are becoming an increasingly popular means of reducing the volume, frequency and flow rate of surface water runoff during heavy rainfall events ²⁹.

In terms of coastal flood risk, a 2015 study showed that in regions such as Kent and South London there will be an 80% - 100% increase in annual economic damages by 2050 under a 'business as usual' emissions pathway. This will see annual economic damage rise from £33 million to between £60 - £66 million by 2050 (a figure that increases to £100 million by 2080) ³⁰.

20. Environment Agency., 2016

21. Met Office, 2024

22. Environment Agency., 2021

23. WWF-UK ' Developing and Piloting UK Natural Capital Stress, 2017

24. Feng et al., 2021, D'Ambrosio et al., 2023, Twohig et al., 2022

25. Aviva., 2024

26. Konrad., 2016

27. Sojobi et al., 2021

28. Hill et al., 2017

29. Zimmerman et al., 2015

30. Sayers and Partners., 2015

Providing Relief to Heat Stress

In June 2021, the Committee on Climate Change (CCC) released its Independent Assessment of UK Climate Risk. It stated that in the 5 years prior to the publication, “over 570,000 new homes have been built that are not resilient to future high temperatures”. The CCC warned that over 4,000 heat-related deaths had occurred in England since 2018.

The way that cities and towns are designed sees a high concentration of heat absorbing surfaces, which also reduce air flow. Roads, paths and buildings all contribute to keeping urban areas 3-4°C warmer than a surrounding countryside. This figure can be as high as 12°C at night ³¹.

This is known as the ‘urban heat island’ effect. It occurs because the dense, dark surfaces that make up a city or town, both attract and store heat during the day and then release it at night. During hot summer evenings heat struggles to escape. This exposes people to prolonged periods of excessive heat, which exacerbates health problems ³².

People in the UK are already at risk of illness and death from high temperatures, particularly in older people and those with underlying illnesses. Health impacts can include an increased risk in skin cancer and sunburn, heat stroke, heart attacks and even organ failure ³³.

Met Office projections show that the UK is expected to experience summers with extreme heat every other year by 2050 ³⁴. The CCC have warned that this could triple the number of heat-related deaths from around 2,000 per year to around 7,000 ³⁵.

The public health burden of heat is likely to increase dramatically in the next few decades as a result of climate change ³⁶ and will be felt most by highly vulnerable social groups, such as people with low income or who lack access to public areas ³⁷.

Extreme heat also has a negative impact upon buildings, roads and infrastructure. Tarmac can melt and the foundations of buildings can become more vulnerable to subsidence and soil shrinkage ³⁸.

Vegetation cover and albedo (the ability of surfaces to reflect light) are two of the most important factors that determine the strength of the urban heat island effect. The absence of vegetation makes heat stress far worse in urban areas ³⁹.

Trees and other vegetation provide a natural cooling system to the air around them. This is due to direct shading that they can provide, together with evapo-transpiration and the conversion of solar radiation to latent heat ⁴⁰.

Careful consideration by urban planners must be taken when designing urban greening programmes to ensure they can help protect the most vulnerable, limiting the health impacts and exposure to heat.

31. U.S. Environmental Protection Agency, 2008

32. Lo et al., 2019; Vicedo-Cabrera et al., 2018

33. Ebi, 2021; Kovats et al., 2008; Lundgren et al., 2013

34. Met Office, State of the UK Climate, 2020

35. Committee on Climate Change, 2021

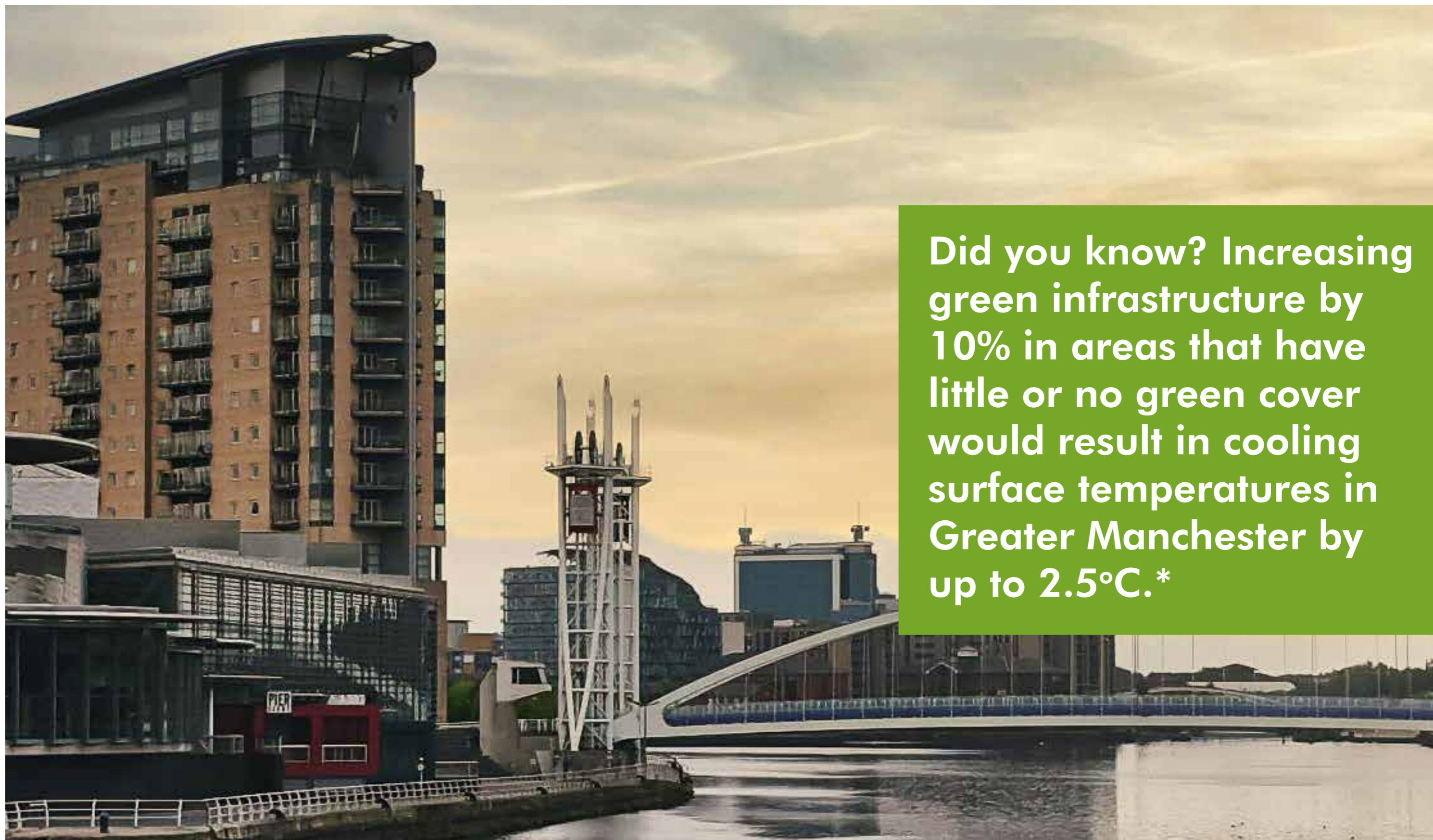
36. Pascal et al., 2021.

37. Petzold et al., 2023

38. UK Green Building Council, 2023, WHO, 2024

39. Rizwan, 2008; Wong, 2013; Aflaki, 2017

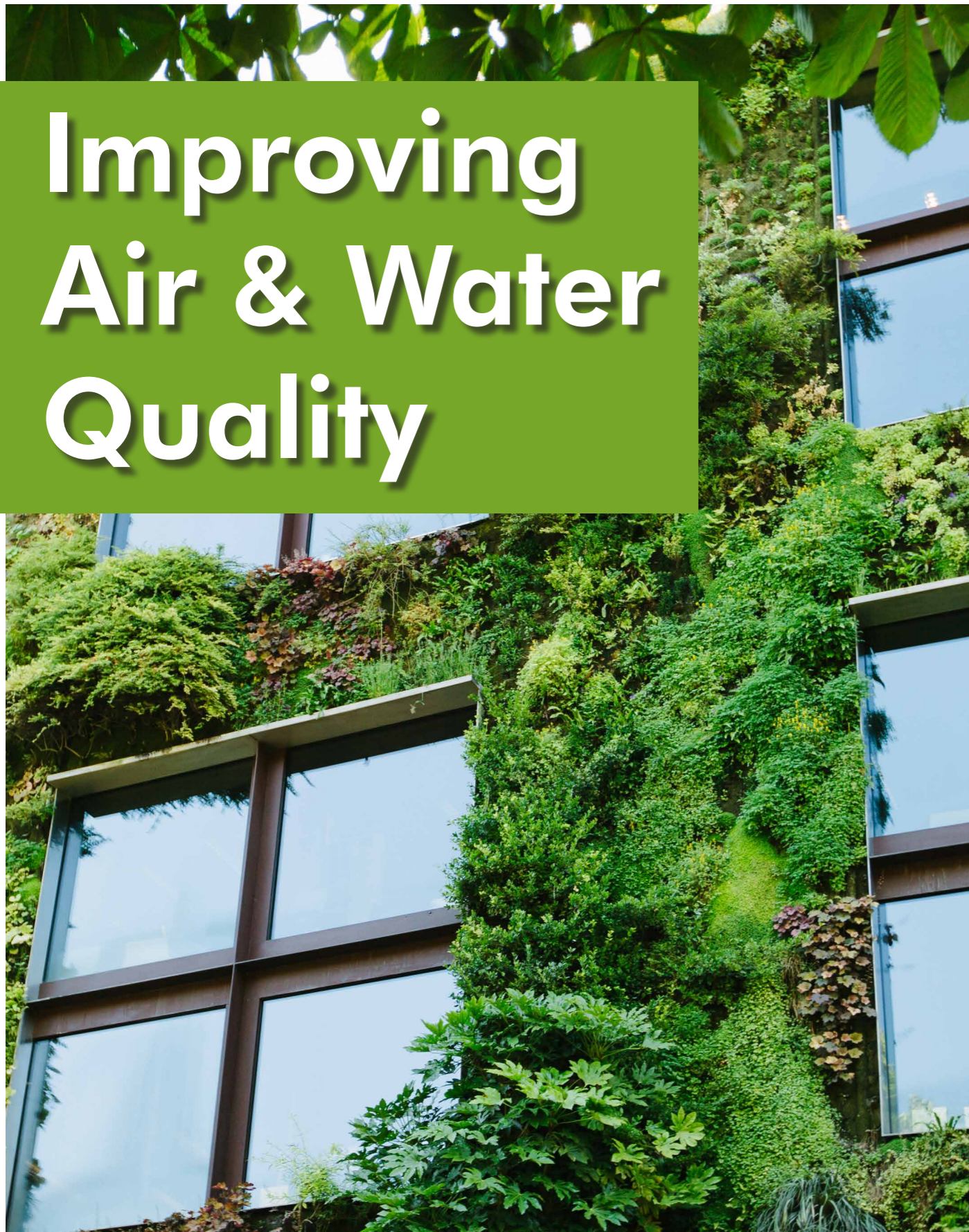
40. Koch et al., 2020



Did you know? Increasing green infrastructure by 10% in areas that have little or no green cover would result in cooling surface temperatures in Greater Manchester by up to 2.5°C.*

* A detailed modelling study carried out by Gill et al. (2007) in Greater Manchester suggested that increasing the current area of green infrastructure by 10% in areas with little or no green cover would result in a cooling of the surface temperature by up to 2.5 °C under the high emissions scenarios based on the UK Climate Impacts Programme (UKCIP02) predictions.

Improving Air & Water Quality



Trees and other vegetation in urban areas have a significant impact on both air and water quality. Trees can affect the concentration of air pollutants that we breathe in directly, removing pollutants or avoiding emissions and secondary pollutant formation in the atmosphere. They can also prevent pollutants entering urban water-ways.

The annual excess mortality rate from ambient air pollution in Europe is 790,000 people. It has the impact of reducing average life expectancy by 2.2 years ⁴¹. The main culprits are PM2.5 (particulates in the air that are smaller than 2.5 micrometers) and nitrogen dioxide (NO₂). The former is estimated to cause up to 10 million excess deaths globally ⁴².

Road traffic also creates many harmful pollutants, including particulate matter, ultrafine particles and gaseous pollutants such as, nitrogen oxides (NO_x), carbon monoxide (CO) and sulphur dioxide (SO₂).

These pollutants have been linked to cancer, asthma, stroke and heart disease, diabetes, obesity and even dementia. In the UK, these costs add up to more than £20 billion annually ⁴³.

Trees and other vegetation act as porous bodies that influence the distribution of pollutants. They help to absorb airborne pollutants through leaves, plant surfaces and even bark. Effectively providing a free air purification service for urban areas, what is this worth economically?

In 2015, London's trees were estimated to have removed 2,241 tonnes of pollution, a

service that was valued at £126 million ⁴⁴. A recent study has shown that placing low hedges alongside roads has a greater impact on curbing pollutants than larger trees ⁴⁵. There is a growing body of evidence that show urban greening can become a major solution to urban air quality issues throughout Europe.

As previously mentioned in this document, urban greening can help to reduce air temperatures. Trees and other vegetation can therefore play a key role in reducing the formation of ground-level ozone and smog ⁴⁶.

Green infrastructure has also been shown to help improve the quality of water and can reduce the volume of pollutants entering water courses. Trees and vegetation are able to intercept large volumes of rain through their canopies and roots, which reduces urban flood risk ⁴⁷.

Green roofs have been found to help improve the quality of water runoff on buildings, when compared to conventional roof spaces ⁴⁸. A 2005 study demonstrated that there was a reduction of 37% in SO₂ levels and 21% in nitrous acid in the air above a green roof when compared to other air samples taken nearby ⁴⁹.

41. Lelieveld et al., 2019.

42. Burnett et al., 2018, Chowdhury et al., 2022

43. Royal College of Physicians, 2016.

44. Treeconomics London, 2015.

45. University of Surrey, 2017.

46. Leung et al., 2011.

47. Zimmerman, 2016; Kim, 2016; Soz, 2016.

48. Van Seters et al., 2009.

49. Yok Tan and Sia, 2005.

Enhancing our Local Biodiversity

Urbanisation is one of the biggest threats to biodiversity globally. In the UK, thousands of hectares of previously undeveloped land, including farmland, woodland and wetland, are built on every year. Of the 28,294 hectares of land developed in England between 2017 and 2018, 55% was previously undeveloped ⁵⁰.

The growth of the UK's urban area places an ever increasing pressure on existing countryside and undeveloped land. As cities and towns expand and roads carve up suitable habitats there is a direct link to a decline in biodiversity. In many ways cities are extreme environments, they have urban heat islands, artificial light and surfaces, and are polluted and noisy. Yet, while some species decline, others can adapt and flourish in urban environments.

A 2022 study ⁵¹ into UK hedgehog numbers has shown that rural populations have plummeted, whilst there is an upward trend for hedgehog populations that live in suburban and inner-city green spaces. Other species appear to have shifted from their traditional habitats, foxes and herring gulls increasingly occupy UK cities ⁵². This can often be attributed to available food supplies and corridors of green space that connect habitats for wildlife.

Green space found within urban landscapes has a hugely positive impact upon local biodiversity. A study ⁵³ of 61 gardens in Sheffield found over 1,000 species of plants, 4,000 species of invertebrates and 80 species of lichen. Urban trees and vegetation provides a fantastic shelter for wildlife and promote biodiversity that might otherwise struggle to survive in a

city or town. For example, a mature oak tree has been shown to support up to 5,000 species of insect and invertebrates ⁵⁴. Studies have shown that urban areas also benefit bees more than farmland due to a wide variety of flowering plants and the avoidance of pesticides that are used on farms ⁵⁵.

However, the habitats found within urban areas are fragmented and often degraded. The air, noise and light pollution that typifies city-life has an adverse impact on wildlife. New development for housing can cause species to disappear, whilst 4.5 million front gardens have been completely paved over since 2005 ⁵⁶. Polluted water -ways, such as urban rivers, also have a negative impact on plants and animals.

Green infrastructure such as sustainable drainage systems (SUDs) can provide habitat for a wide range of species, including amphibians and invertebrates, but many sites do not fulfil their potential as wildlife habitats ⁵⁷. Pop-up parks, green walls and roofs, and planting more native wild flowers can provide the perfect habitat for pollinators ⁵⁸. Managed and planned correctly biodiversity can thrive in cities and towns, but steps must be taken to maintain, and where possible enhance, green spaces for this to be a reality.

50. Department for Levelling Up, Housing and Communities,. 2020.

51. Wembridge et al,. 2022.

52. State of Nature Report,. 2019.

53. Thompson et al,. 2003, 2004, 2005.

54. State of Nature Partnership,. 2019.

55. Baldock et al,. 2015.

56. Royal Horticultural Society,. 2015.

57. Bellamy et al,. 2017.

58. Ignatieva et al,. 2015.



Did you know? The latest State of Nature Report* indicates that 16% of ALL species in Great Britain are now threatened with extinction - that's nearly 1 in 6 species!

* The 2023 State of Nature report is a healthcheck on how the UK's wildlife is faring. It is put together using wildlife data from a group of 50 conservation organisations. As well as providing an overarching assessment of UK flora and fauna, there are separate reports for England, Scotland, Northern Ireland and Wales that look at each country in more depth. The first State of Nature Report was published in 2013 and followed by reports in 2016, 2019 and 2023.



This is the third edition of 'The Benefits of Urban Greening' publication, which has been updated with the latest research on the social, environmental and economic benefits that urban greening programmes and green spaces within urban landscapes can deliver for our cities and towns.

Author: Chris Livemore, 2024.

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