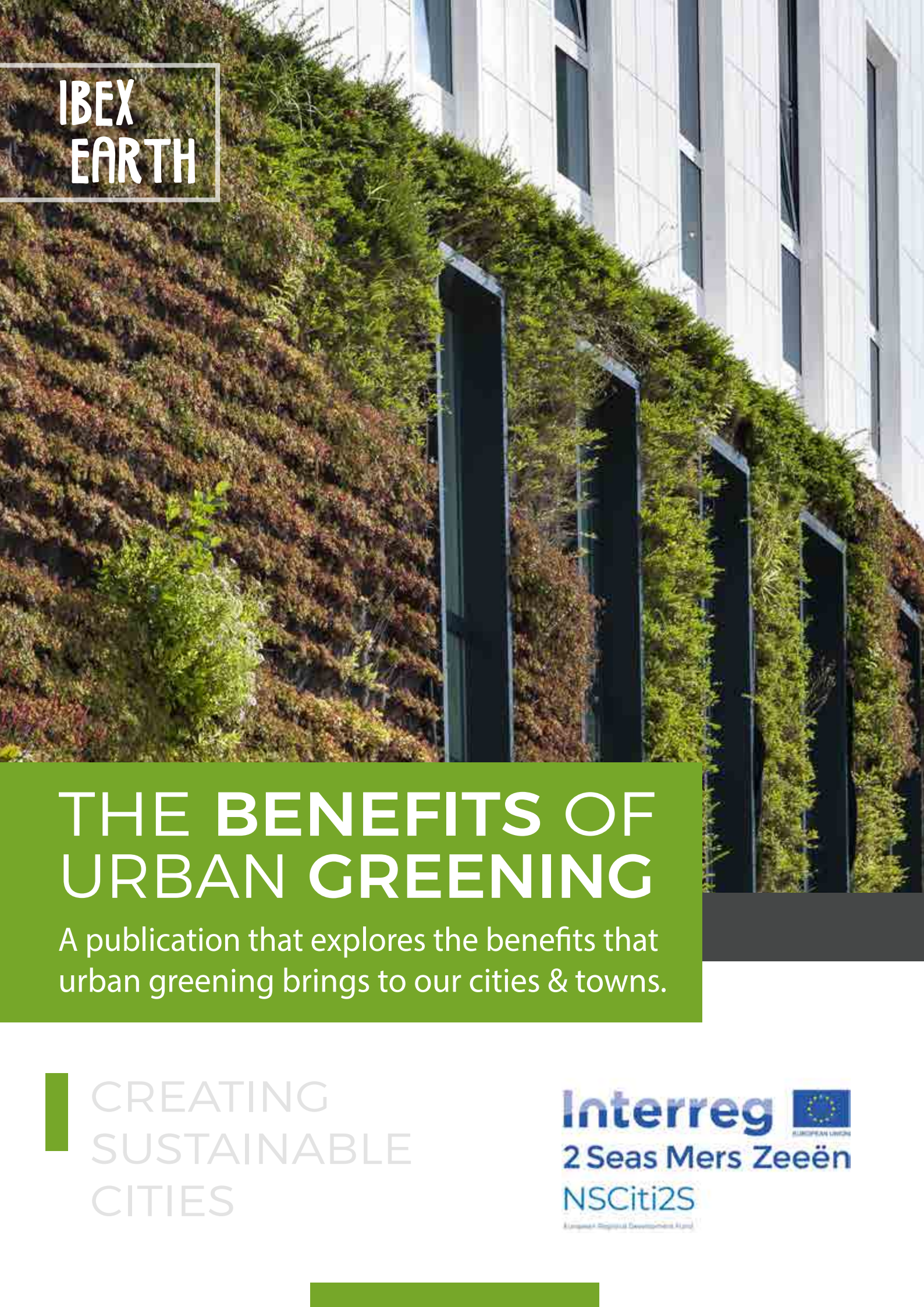




IBEX
EARTH

THE BENEFITS OF URBAN GREENING

A publication that explores the benefits that urban greening brings to our cities & towns.

CREATING
SUSTAINABLE
CITIES

Interreg 
2 Seas Mers Zeeën
NSCiti2S
A European Regional Development Fund

Abstract:

‘The Benefits of Urban Greening’ is the first in a planned series of publications by Ibex Earth’s Creating Sustainable Cities initiative that will be delivered in partnership with the Interreg 2 Seas funded project Nature Smart Cities (NSCiti2S).

The publication has been written for a local authority audience and sets out to provide a high level overview of the many benefits that urban greening can bring to Europe’s cities and towns.

With special thanks to The Centre for Environmental Policy, Imperial College London for their contribution to this publication.

A copy of this publication is also available for free through the following website:

www.creatingsustainablecities.org.uk

The Benefits of Urban Greening



More and more people are choosing to live in cities and towns. Almost three quarters of Europe's population live in urban areas, whilst in the UK that figure is expected to reach 92% as early as 2030. As urban population grow, greater pressure is placed on green space to accommodate new housing and infrastructure that is essential to urban life.

Around 7% of land in the UK is taken up by urban landscapes, whilst in England this figure is as high as 10%. Due to population growth and urban sprawl we are losing large areas of green space across the UK. This trend is mirrored across Europe, with over 80% of people expected to live in urban areas by 2050.

An aerial survey of the UK in 2015 ¹ revealed that over 22,000 hectares of green space was converted to 'artificial surfaces' between 2006 and 2012. More than 7,000 hectares of forest was felled, 14,000 hectares of farmland lost and 1,000 hectares of wetland was drained in order to provide more space for households and urban sprawl.

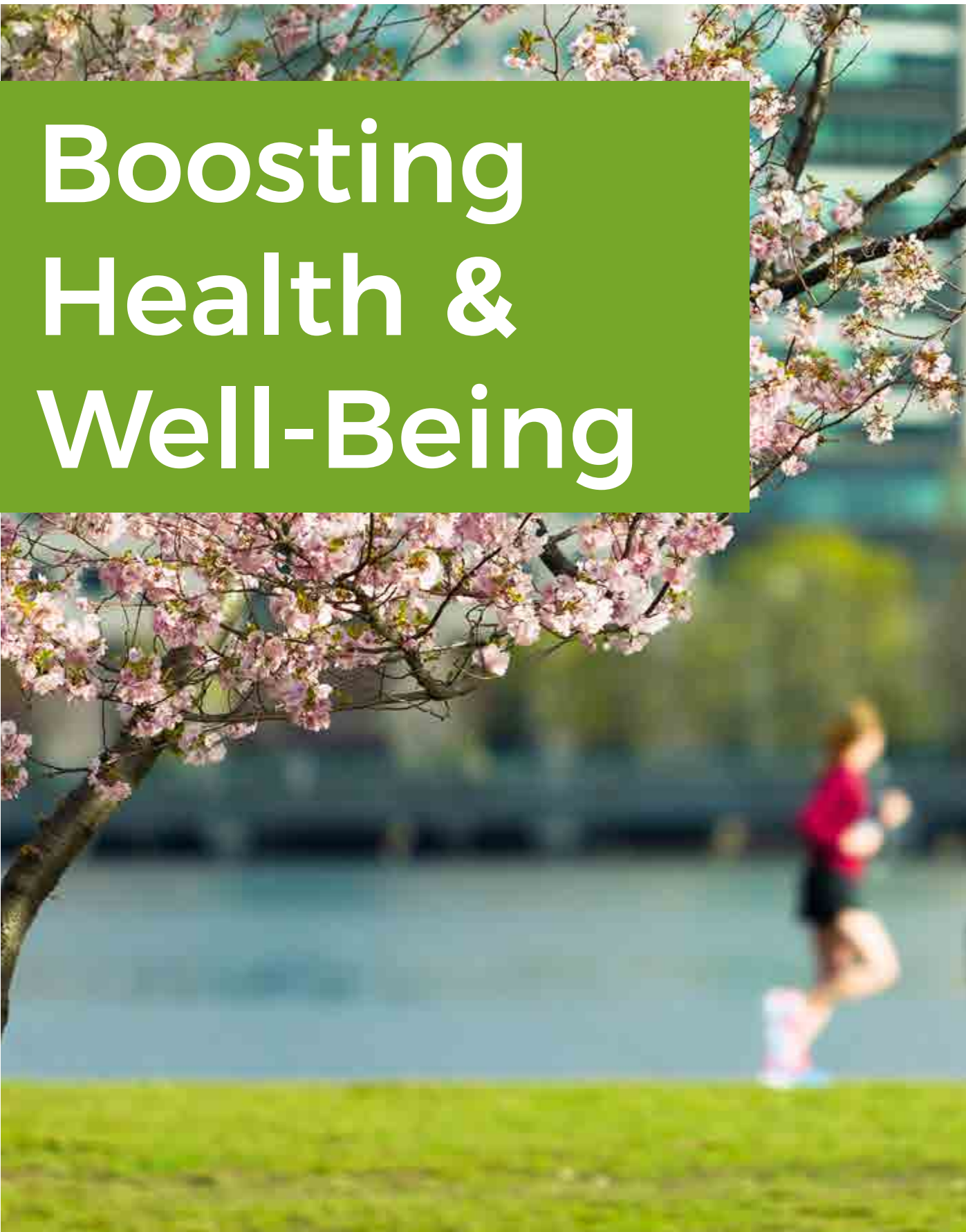
A review in 2014 ² concluded that 45% of local authorities were considering either selling parks and green spaces or transferring the management of parks to others. This could result in the loss of more parks and other green spaces. Furthermore, 86% of park managers reported a reduction in budgets since 2010, a trend that looks set to continue.

The loss of green space is not just happening to parks, forests and farmland, it is a pattern that is being repeated across privately owned front gardens. A report commissioned in 2012 ³ concluded that the number of houses with completely paved over front gardens almost doubled in the UK between 1991 and 2011.

But why does this matter? For starters, green space offers far more than being a desirable feature in a city or town, or an area that people can utilise for recreational activities. Carefully planned urban greening programmes that enhance the quality of green space across an urban landscape have been shown to deliver an array of benefits.

These include building climate resilience to flood risk and heat stress, improving air and water quality, whilst delivering a series of health and well-being benefits for citizens. Urban areas should strive to increase the volume of green space and those that do will reap the rewards and boost local economies.

1. University of Leicester, 2015
2. Heritage Lottery Fund, 2014
3. RAC Foundation, 2012



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.

Incredibly 1 in every 15 deaths across Europe is due to a lack of physical activity⁴. In the UK, only 1/3rd of the population achieves the recommended level of exercise⁵ - the impact of this on health is estimated to have a direct economic cost of £1 billion per year⁶.

Green space encourages people to get outside and take part in physical activity. It provides an environment to exercise and be active. Research has also shown that there is an increase of up to 83% of more social activity in green spaces as opposed to sparsely vegetated or grey areas⁷. Green infrastructure has a huge impact upon building community cohesion and generating a greater sense of social inclusion.

People have been shown to recover faster in hospital when they are given a room that has a landscape view, rather than seeing the adjoining buildings⁸. In October 2018, doctors in Scotland started prescribing nature to their patients as part of a project run by NHS Shetland and RSPB Scotland. A study has also linked a reduction in antidepressant prescription rates with urban street tree density⁹.

Spending time in nature - even for a short time - produces chemicals in the brain that are linked to reducing stress levels, whilst helping to lower blood pressure too. 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 anxiety¹⁰.

A recent study at 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 areas¹¹. Previous research has also demonstrated that children who grow up in areas of green space have better attention and improved memory skills.

Finally, the benefits of green space have been shown to be greatest for people from lower socio-economic groups, where health inequalities related to income deprivation are actually lower in populations that live in the greenest areas of an urban environment¹². Europe's urban landscapes need more green space.

4. Ekelund et al., 2015

5. Department of Health., 2011

6. Scarborough et al., 2011

7. Defra., 2010

8. British Medical Association., 2011; Cooper., 2005

9. Taylor et al., 2014

10. Braubach et al., 2017; Hartig et al., 2014; Bratman et al., 2015

11. Aarhus University., 2019

12. Dadvand et al., 2015

13. Mitchell et al., 2015; Roe et al., 2013; Beil and Hanes., 2013

Economic Growth & Regeneration



Greener cities and towns create opportunities for economic growth and regeneration. New York's hugely successful High Line project cost \$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 \$2 billion in new developments.

The High Line project is one of the best examples of how carefully planned and implemented green infrastructure projects can result in significant economic benefits to a city or town. Whilst this project is unlikely to be replicated by many urban environments in Europe, it demonstrates how enhancing an urban area with more green space can act as the catalyst for economic growth, investments, tourism growth and new regeneration schemes ¹⁴.

Research has shown that there is an economic uplift on developments and regeneration schemes that prioritise and invest in green infrastructure. On projects of around £20 million, an investment in green infrastructure would deliver a ten fold increase on the investment. So, if a developer invested £200,000 in green infrastructure, it would result in a net uplift in value of around £2 million ¹⁵.

On a smaller scale green infrastructure has been shown to have a similar impact in terms of economic benefits. For example, residential property can increase in value somewhere between 15-25% due to the provision of trees and other vegetation ¹⁶.

A report by DEFRA in 2010 ¹⁷ 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.

There are also economic benefits for the retail sector in association with urban greening - studies have shown that greener high streets and shopping centres attract more shoppers to an area, spurring economic growth. Whilst, a report published in the Journal of Forestry demonstrated that consumers have a 12% higher willingness to pay for goods and services in retail areas that have green streetscapes, or pocket parks ¹⁸.

Small businesses have also indicated that proximity to green space is one of the most important factors in selecting a new business location, which in turn can also boost worker productivity ¹⁹, reducing the amount of sick leave in the process.

Urban greening presents a fantastic opportunity to drive economic growth, help businesses thrive and boost tourism.

14. City Lab, 2017; Virginia Cooperative Extension, 2016

15. BE Group, 2014

16. Council of Tree and Landscape Appraisers, 2003; Wolf, 2005

17. Defra, 2010

18. Crompton, 2001; Tyrväinen and Miettinen, 2000

19. Gearin and Kahle, 2006

Reducing the Impact of Flooding



20. WWF-UK, 2017

21. Jongman, Hochrainer-Stigler et al., 2014

22. European Commission, 2018

23. Konrad, 2016

24. Hill et al., 2017

January 2014 was the wettest January ever recorded in Britain, with more than three times the average amount of rain falling in that month - flooding caused over €1.5 billion worth of damage. By 2050, the frequency of severe flooding across Europe is expected to double, with annual economic damage predicted to be as high as €961 billion by 2100.

A 2017 report ²⁰ commissioned by the charity WWF concluded that a similar flood event in 2050 would result in £2.2 billion worth of damage. Across Europe it is expected that there will be close to a fivefold increase in the annual economic losses resulting from floods, rising to a staggering €23.5 billion per year by 2050 (between 2000 and 2012 the average economic loss was €4.9 billion) ²¹.

This increase is due to a combination of population growth, future predictions of rainfall due to climate change and a lack of investment taken by cities and towns to build climate resilience across their urban landscapes. In 2018, the EC's Joint Research Centre estimates that annual flood damage would be up €961 billion per year by 2100.

Flood events by 2100 were also likely to directly impact up to 3.65 million people per annum, compared to 102,000 currently ²².

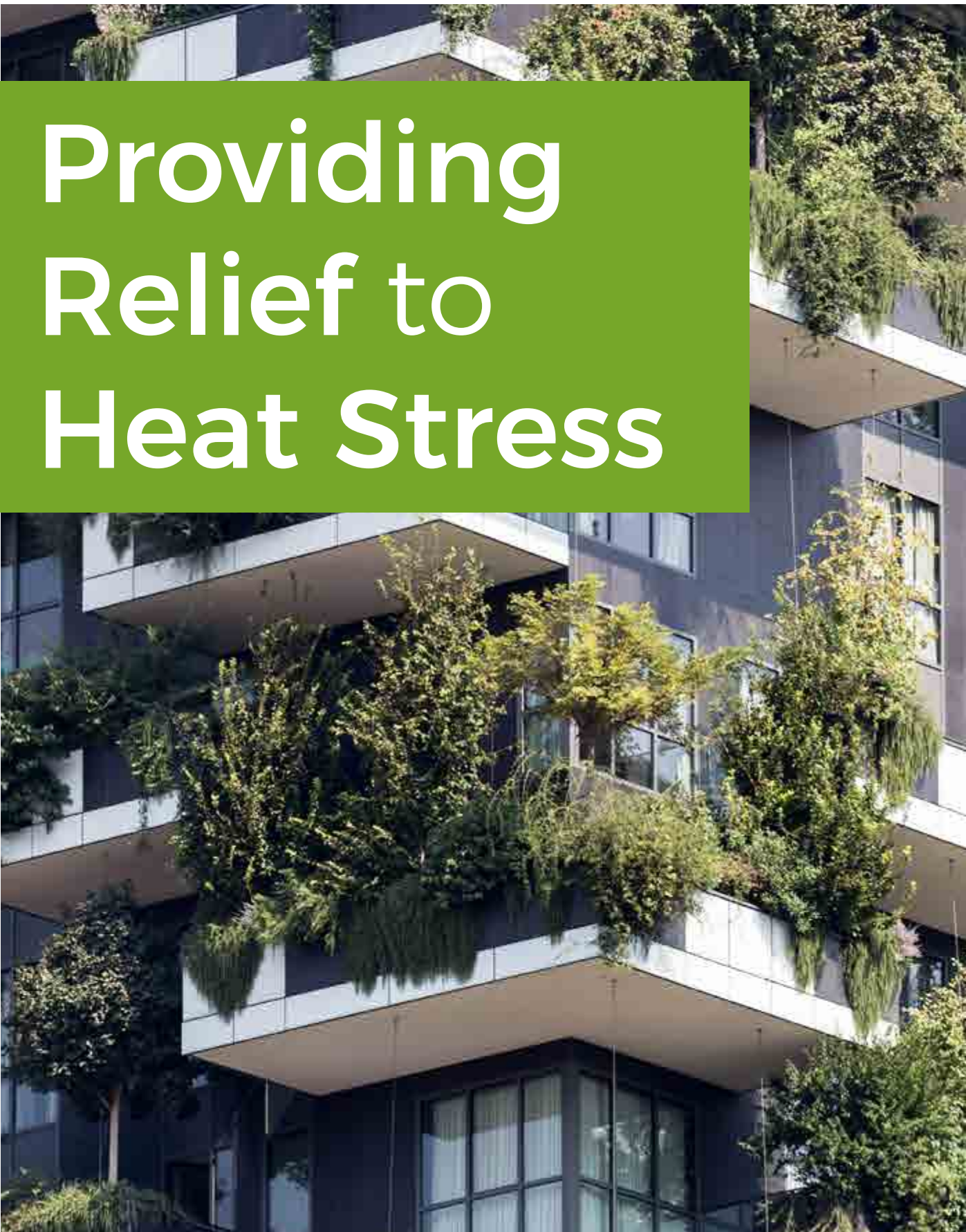
There would also be a significant increase in the numbers of roads, railway lines, schools and emergency services (including police stations and hospitals) that would be exposed to a high risk of flooding.

Impermeable surfaces, such as buildings, pavements and roads, are a common feature found across urban environments. They prevent rain water being absorbed from surfaces and accelerate the flow of water into gutters and drains ²³. When the drainage capacity of an area reaches capacity flooding occurs and results in economic loss and disruption.

By altering the natural environment with grey infrastructure cities and towns are making their urban environments more prone to flood risk. However, vegetated surfaces reduce the volume of surface water runoff by storing and intercepting rainfall. For example, studies have shown that green roofs have the capacity to capture 70% of rainfall over a given time ²⁴.

Sustainable drainage systems - or SuDS - can also manage rainwater in a 'natural' way and support the services provided by existing drains and sewers.

To reduce future flood risk and build greater climate resilience, the UK's cities and towns must find ways to integrate more green space and vegetation into their urban landscapes.



Providing Relief to Heat Stress



European cities and towns are not always the best designed to cope with rising temperatures and heatwaves. Road surfaces, pathways and buildings all contribute to keeping urban areas 3-4°C warmer than a surrounding countryside - whilst this figure can be as high as 12°C at night. How can urban greening help combat the urban heat island effect?

The urban heat island effect occurs because the dense, dark surfaces such as bitumen on roads and concrete on buildings accumulate and store heat during the day and then release it at night. During hot summer evenings the heat struggles to escape and when people are exposed to prolonged periods of excessive heat it creates health problems.

This problem is made far worse when there is an absence of vegetation ²⁵.

The 2003 heatwave that swept through Europe caused up to 70,000 excess deaths over a 4 month period in Central and Western Europe (mainly old and vulnerable people) ²⁶. Scientists have warned that summers such as the 2003 heatwave will become the norm by the 2040s ²⁷. One solution is to prioritise urban greening programmes to combat heat.

Cities and towns across Europe are going to have to deal with increasing summer heat, more intense and longer heatwaves. Some studies have indicated that cities could experience summer temperatures up to 10 degrees higher than the surrounding countryside by 2100 ²⁸.

It is the elderly and very young (as well as people from lower-income communities that are particularly vulnerable to the negative impacts of heat. These include an increase risk in skin cancer and sunburn, heat stroke, heart attacks and organ failure. Heatwaves can also result in a reduction in productivity in a workplace and can even increase crime rates ²⁹.

Trees and other vegetation natural cool the air around them via direct shading, evapo-transpiration and the conversion of solar radiation to latent heat ³⁰. Studies have demonstrated that green roofs result in up to a 75% reduction in demand for cooling and 10% for heating of buildings, which can support an urban areas climate mitigation strategy ³¹.

A study undertaken in Greater Manchester concluded that if the volume of green infrastructure increased by 10% it could result in cooling of up to 2.5°C (based on the high emissions scenario from the UK Climate Impacts Programme) ³². Other studies have shown that a cooling effect from existing parks and green space extends well beyond the area's boundary ³³.

25. University of Leicester., 2015

26. Heritage Lottery Fund., 2014

27. Met Office., 2014

28. Pope., 2009

29. Kovats., 2008; Costa et al., 2016; Simister et al., 2005

30. Dimoudi et al 2003.,

31. Gill et al., 2007

32. US Environmental Protection Agency., 2008

33. Yu and Hien., 2005; Shashua-Bar and Hoffman., 2000

Improving Air & Water Quality



The use of trees and other vegetation in urban areas provides significant air and water quality benefits. Future urban planning needs to consider how it can design more green infrastructure, such as trees, green walls and hedges into their urban landscapes. Those that do will benefit from improved air and water quality across their city or towns.

A report published in early 2019 concluded that the annual excess mortality rate from ambient air pollution in Europe is 790,000 people, whilst it reduces average life expectancy by 2.2 years³⁴. The main culprits are PM2.5 (particulates in the air that are smaller than 2.5 micrometers) and nitrogen dioxide (NO₂).

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 annually³⁵.

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 million³⁶.

A recent study has shown that placing low hedges alongside roads has a greater impact on curbing pollutants than larger trees³⁷. 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 smog³⁸.

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 risk³⁹.

Green roofs have been found to help improve the quality of water runoff on buildings, when compared to conventional roof spaces⁴⁰. 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 nearby⁴¹.

34. Lelieveld et al., 2019
35. Royal College of Physicians., 2016
36. Treeconomics London., 2015
37. University of Surrey., 2017
38. Leung et al., 2011

39. US Environmental Protection Agency., 2007 and 2017
40. Van Seters et al., 2009
41. Yok Tan and Sia., 2005

Enhancing our Local Biodiversity



Urbanisation is one of the biggest threats to biodiversity globally. Urban decision-makers have a crucial role to play in helping to enhance local biodiversity through the careful management and planning of urban green space. This includes parks, woodlands and gardens through to green infrastructure programmes like green walls and roofs.

Urban green space undoubtedly has a positive impact upon local biodiversity by helping to increase habitat areas or by creating a series of 'wildlife corridors' that can make it easier for species to move between individual green spaces.

Trees and vegetation provide shelter for wildlife and promote biodiversity that might otherwise struggle to survive in an urban environment. A mature oak tree has been shown to support up to 5,000 species of insect and invertebrates ⁴², whilst studies have shown that urban areas may benefit bees more than farmland. This is because urban areas can provide a wide variety of flowering plants and also avoid pesticides that are used in agricultural areas ⁴³.

The green spaces found in cities and towns can form a vital habitat for pollinators, such as bees, butterflies and hoverflies. Urban environments can play an important role in helping to build habitat for these species. This is particularly important now since we have lost 97% of the UK's wild-flower meadows since the 1940s ⁴⁴ and across Europe 1 in 10 species of wild bee are at risk from extinction ⁴⁵.

A key focus area for urban landscapes are lawns, which comprise somewhere between 70 to 75% of worldwide urban green space ⁴⁶. Some 4.5 million front gardens in the UK have been completely paved over since 2005, removing habitats for local wildlife ⁴⁷. Artificial lawns are also adversely impacting upon wildlife. Cities and towns can play a key role in reversing these trends.

Even small areas of vegetation can have a positive impact upon biodiversity, for example, greening roundabouts or roadside verges can support a variety of plants, insects and birds. Pop-up parks are becoming an increasingly more popular means of adding some green into an urban landscape and can be a great addition to a local highstreet or regeneration scheme.

Cities and towns across Europe need to consider how they can help enhance local biodiversity. It can be as simple as encouraging the planting of more native wild flowers, or by taking the decision to allow grass to grow slightly longer to provide an improved habitat for insects. Enhancing existing urban green spaces goes a long way in improving local biodiversity.

42. Forestry Commission (2010)

43. Baldock et al (2015)

44. Fuller (1987)

45. IUCN (2015)

46. Ignatieva et al (2015)

47. Royal Horticultural Society (2015)

Nature Smart Cities:

Nature Smart Cities across the 2 Seas is an Interreg 2 Seas co-funded project to the value of €6,380,472. It consists of a total of 11 Partners from 4 EU Member States, who will work together to develop a business model that local authorities can use to justify the use of 'city finance' to fund their urban greening programmes.

You will be able to find out more about the project at www.naturesmartcities.eu soon.

This publication was written by Ibex Earth as part of its initiative Creating Sustainable Cities, which has set a target of helping to secure £100 million worth of funding for sustainable city projects. Urban greening is one of its four key focus areas.

More information is available about the initiative via the link provided below:
www.creatingustainablecities.org.uk



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