RESILIENT LONDON

Confronting Climate Change

Despite the advancements towards the net zero agenda, climate adaptation strategies are still lagging behind, with a lack of understanding from the industry and ineffective policies at both local and central levels.

This NLA research paper reviews the status of climate resilience strategies and action plans across the capital, the ability and skills the built environment sector needs for building and designing for a changing climate, and the barriers that we face to implement effective resilience approaches in the capital.

We present ten priorities for London's climate resilience.

Net Zero Champions

Net Zero Supporter

This report was published by New London Architecture (NLA) in October 2021. It forms part of NLA's year-round Net Zero programme.

nla.london | #NLANetZero

The UN Climate Change Conference COP26 is taking place in November 2021 in Glasgow. For the first time there will be a Cities, Regions and Built Environment Day.

Cities account for over 70 per cent of global emissions and consume over two thirds of the world's energy. Over half of the total cities' emissions come from buildings, while transport (primarily road transportation) accounts for about a third of emissions. For too long the built environment sector has been a low priority in climate negotiations, despite accounting for around 40 per cent of global emissions.

NLA has joined a coalition of over 100 organisations, under the secretariat of the UK Green Building Council (UKGBC), to support the delivery of a Built Environment Virtual Pavilion at the UN's COP26 Climate Summit which aims to give the sector a voice and generate a reach and legacy that can stretch beyond COP itself.

This report aims to contribute to the discussion by raising awareness about the urgency to take action in tackling the impact of climate change. We demonstrate the central role of the built environment sector in providing solutions and argue that more political support and adequate funding are needed to implement and speed up actions.

Contents

Foreword

Lord Deben, Chairman, Climate Change Committee

London has a pivotal part to play in creating a resilient UK capable of adjusting to the climate change that is inevitable — while at the same time cutting our emissions to Net Zero to prevent even more disastrous damage. Adaptation and mitigation go hand in hand. As the driving force in the British economy, London must set the pace for its transformation. Climate change has forced that pace but the direction is clear and beneficial.

In our battle against climate change we are building a cleaner, greener, kinder world. We have had to come to terms with the damage we have done to the planet and in correcting that we are recovering much that we have lost. Restoring the abundance of our biodiversity; the fertility of our soils; the purity of our air and water; and establishing a sense of our human interdependence both here at home and in our planet as a whole.

Of course there will be many false steps on the way. Human beings have not suddenly become perfect! However, in responding to the challenge of the climate emergency, we have been forced to reconsider our attitudes to each other and to the planet that gives us life. We have to learn again to become stewards and not rapists of our soil; protectors and not despoilers of our air; guardians and not polluters of our water. Sustainability has to become our watchword as we recognise that the resources of the world are not infinite and that for our own and our children's good we must begin to live within its capacity.

So that does mean using the power and strength of our capital city to grasp the opportunities of this new world. We must build homes and offices, warehouses and factories that use little energy and no fossil fuels; we must retrofit our housing stock to give people cleaner warmer and better ventilated homes; we must recover our green spaces, both parks and private gardens, and stop the hitherto inexorable march of concrete. City living must once again become an aspiration not something to be eschewed. It is a noble and infinitely exciting prospect with an urgency and immediacy that we cannot ignore. London must lead the way and fulfil its historic role as the driver of change and innovation.

Executive Summary

Climate mitigation must go hand in hand with climate adaptation. The effects of climate change in London cannot be ignored, with increased flooding, heatwaves and extreme weather events causing disruption and impacting the health and wellbeing of all of us, but affecting disproportionally those more vulnerable and with fewer means.

Reducing carbon emissions is critical, but so is the need to implement strategies that will make our city resilient to future climate change so that London can continue to thrive as a world leading global city.

This report is a call to the industry and the built environment sector to take climate resilience as a serious and urgent matter.

- We need urgent action to address the impact of climate change in London.
- The capital is expected to experience hotter drier summers and warmer wetter winters over the next three decades, with more frequent extreme events such as heavier rainfalls, alongside other global threats such as sea levels rising.
- Summer temperatures are predicted to rise in the city as much as 10° higher than in the surrounding countryside due to the urban heat island effect.
- Over 37,000 homes are at risk due to river flooding, with over 80,000 properties at high risk of surface water flooding.
- Despite tangible advancements in the net zero agenda in the past two years, climate adaptation strategies are still lagging behind, with a lack of understanding from the industry, ineffective policies and inadequate funding at both local and central levels.
- London needs a joined-up, integrated approach that brings together the public and private sectors and focuses resources toward climate resilience.

Ten Priorities for London's Climate Resilience

1

Upskill the public sector and the industry on climate adaptation

2

Develop a common framework for quantifying climate risks and mobilise stakeholders and funding towards climate resilience

3

Design all buildings to adapt to future weather conditions — a key consideration should be given to overheating

4

Retrofit old building stock to meet both the net zero and the adaptation agendas

5

Increase the adoption of SuDs across London to mitigate the risks of flooding while supporting biodiversity

6

Embrace nature-based solutions and maximise the environmental net gain in all new developments

7

Unlock funding to implement adaptation measures at local level

8

Engage with communities and support bottom-up, community-led projects that promote social cohesion, empowerment and people's wellbeing

9

Increase access to green and blue spaces in areas where this is lacking

10

Develop cross-sectoral partnerships to enable effective implementation of resilience actions

Introduction

London must align, act and adapt. The message from the UK Climate Change Committee's June 2021 report is clear: the pace of climate change is outstripping actions to adapt. While extreme weather events across the globe — from flooded subway carriages in central China to winter ice storms in Texas and catastrophic flooding in Germany — might have been possible to dismiss, repeated incidents of severe summer thunderstorms in London brought the message home with flooded underground and DLR stations, as well as streets and basements knee-deep in water from Nine Elms to Hackney Wick.

In the two years since Greta Thunberg announced to the world from her UN podium that 'our house is on fire', climate activism and awareness in the UK's built environment sector have surged. Operational and embodied carbon targets, as set out in the London Energy Transformation Initiative (LETI) Climate Emergency Design Guide and the RIBA 2030 Climate Challenge, are starting to appear in design briefs as benchmarks. UK Architects Declare has more than 1,100 signatories and has sparked a companion global movement, Built Environment Declares. Upskilling in climate literacy has led to a more nuanced understanding of sustainable design across the industry.

Perhaps surprisingly, this intensity of climate activism does not appear to have waned during the pandemic. Yet the focus of both industry discourse and action remains squarely on net zero. Net zero is indeed critical, and, as highlighted in the 2020 NLA report *Zero Carbon London*, there is still a long way to translate targets to actions. We must reduce our ecological footprint, yet we also need to address the environmental crisis and ecosystem destruction holistically. We need to rethink and restructure our cities so that we can live alongside nature.

London's climate resilience is an urgent matter. As highlighted in the Greater London Authority's (GLA) London City Resilience Strategy (2020), the capital is expected to experience hotter drier summers and warmer wetter winters over the next three decades, with more frequent extreme events such as heavier rainfalls, alongside other global threats such as sea levels rising. Summer temperatures are predicted to resemble those of Barcelona by 2050 with temperatures in the city as much as 10° higher than in the surrounding countryside due to

the urban heat island effect.[1] Janet Laban, Senior Sustainability and Lead Environmental Resilience Officer, City of London, explains that ‘the threshold for tarmac melting comes at around 30 to 33 degrees. We're already seeing that and so we are looking to trial different types of road surfaces and pavements that would help alleviate that risk.’

‘The threshold for tarmac melting comes at around 30 to 33 degrees. We're already seeing that and so we are looking to trial different types of road surfaces and pavements that would help alleviate that risk.’

In this context, resilience for London is primarily about anticipating and preparing for this future climate. A resilient capital city is critical to the nation’s health and wealth because London accounts for almost a quarter of the UK’s economic output.[2] Yet as Ashley Bateson, Chair of the NLA Expert Panel on Net Zero and Head of Sustainability at Hoare Lea observes, 'we haven’t been taught to design for resilience; it’s not the same skill set as designing for compliance.

What does ‘resilience’ mean?

‘Resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and thrive no matter what kinds of chronic stresses and acute shocks they experience.’

100 Resilient Cities, pioneered by the Rockefeller Foundation

‘Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks (economic, environmental, social & institutional). Resilient cities promote sustainable development, well-being and inclusive growth.’[3]

Organisation for Economic Co-operation and Development (OECD)

Whilst planning aims to reduce carbon emissions, we need to be more outcome-focused and design buildings that will cope with future conditions.'

‘Councils are bringing in staff to deal with their net zero policies but adaptation is still lagging quite far behind. It’s a different skill set. It’s risk management and it’s harder to measure.’

Kristen Guida, Partnership Manager, London Climate Change Partnership, Greater London Authority concurs, ‘councils are bringing in staff to deal with their net zero policies but adaptation is still lagging quite far behind. It’s a different skill set. It’s risk management and it’s harder to measure.’ Mitigation is easier to target, quantify and implement, while resilience requires a long-range mindset and a longer financial return.

Resilience is crucial because focusing exclusively on short-term impacts will not deliver the UK’s net zero targets. Mitigation is critical because if emissions keep increasing, the amount of adaptation required remains a constantly moving target. Conversely, adaptation is essential to ensure resilience and avoid ‘maladaptation’, being locked into longterm decisions with adverse climate impacts.

According to the Climate Change Committee and the Intergovernmental Panel on Climate Change (IPCC), the 2020s is the decisive decade for action.[4] Mitigation and adaptation must go hand in hand. The moment to mainstream resilience in London is now.

Adaptation vs Mitigation

Climate mitigation **refers to measures or strategies that aim to limit emissions of greenhouse gases that cause climate change**

Climate adaptation **refers to measures or strategies that aim to limit the negative impacts of climate change**

London's biggest climate risks

The UK Climate Change Risk Assessment 2017 identified the top six major risks for the country to be: flooding; risks to health from high temperature; risks of water shortages; risks to natural capital; threats to food production and new diseases. These are also the risks which London is facing. This report focuses primarily on the four main areas of climate risk which relate most directly to the built environment:

- Flooding (type, frequency and severity)
- Overheating
- Water shortage
- Aging infrastructure

As highlighted by the flooding that affected parts of the capital in summer 2021, the handling of surface water is London's number one issue.[5] Insufficient drainage capacity, combined with pressure on the sewer system due to the capital's increased population and the proliferation of impermeable surfaces throughout the city are all compounding factors that affect the capacity to respond effectively to storms and extreme rainfalls. Flooding causes massive disruption to streets, power suppliers, train and tube services and people's homes, alongside affecting safety and security of people's lives. In July, the London Borough of Kensington and Chelsea had to relocate 120 residents to emergency hotel accommodation.[6]

In addition, according to the London Environment Strategy, almost one fifth of London is within the Thames floodplain with over 37,000 homes at medium or high risk of fluvial flooding. By the end of the century, the level of the Thames in central London is expected to rise by 0.9m which means that flood defences must be raised.

Flooding is closely followed by extreme heat as a future climate threat to London with serious health impacts for the most vulnerable, the elderly, those with chronic or severe illnesses and the very young. 2020 witnessed the wettest February on record, one of the sunniest springs during the pandemic and record temperatures of 37.8 degrees at Heathrow in July. This means ensuring that buildings we design and retrofit today will still be comfortable as summer temperatures increase.

Ironically given London's wet climate, the capital also faces a risk of drought with a projected water deficit of 400m per day by 2040.[7] The effects of climate change will make rainfall more seasonal (wetter winters, drier summers), with almost a third

1/5

of London is within the Thames floodplain with over 37,000 homes at medium or high risk of fluvial flooding

40%

of London's surface is impermeable

less rain in summer by 2080.[8] This makes the need to conserve and store water essential.

Two additional overarching factors need to be considered alongside these physical risks:

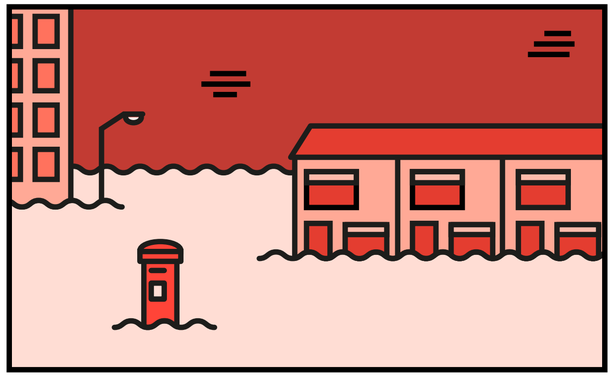
- Social cohesion
- Governance

It is widely understood that the physical risks of climate change are likely to disproportionately affect the most disadvantaged and vulnerable groups of society, as was so evident in events such as Hurricane Katrina in New Orleans. Social resilience is a complex and yet fundamental element to take into consideration in resilience strategies, as this report highlights in current initiatives and emerging solutions across the city.

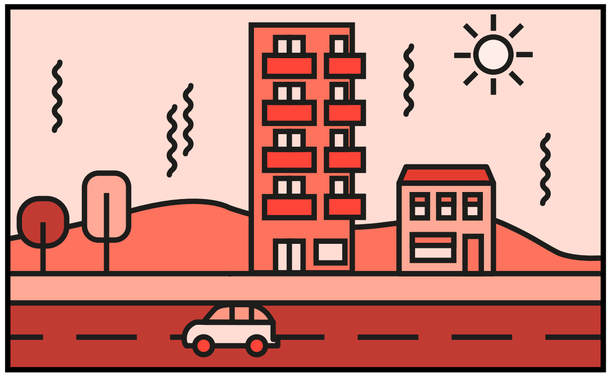
The challenge of disjointed governance crops up repeatedly in conversations with leading experts about London's resilience. Successful adaptation demands close collaboration and buy-in from a wide variety of stakeholders in the public, private and voluntary sectors as well from Londoners themselves. Governance plays a key role in implementing successful resilience approaches.

The Mayor's London City Resilience Strategy 2020, released in February on the brink of the pandemic, addresses resilience both in terms of emergency preparedness to sudden shocks such as terrorism or threats to cybersecurity as well as the systemic risks listed above that relate directly to the built environment. The Mayor's resilience 'actions' are split into three areas: people, place and process (governance), highlighting the fact that physical resilience measures must be accompanied by social resilience and joined up governance.

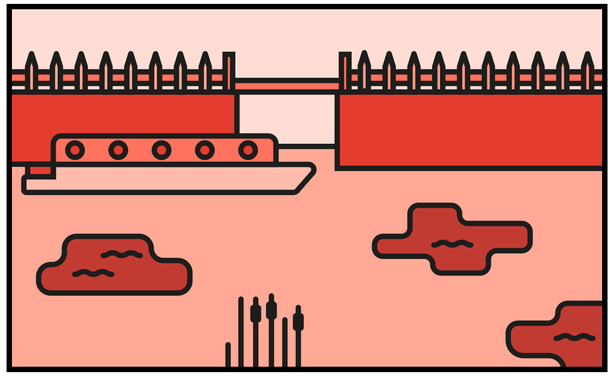
What are London’s biggest climate risks?



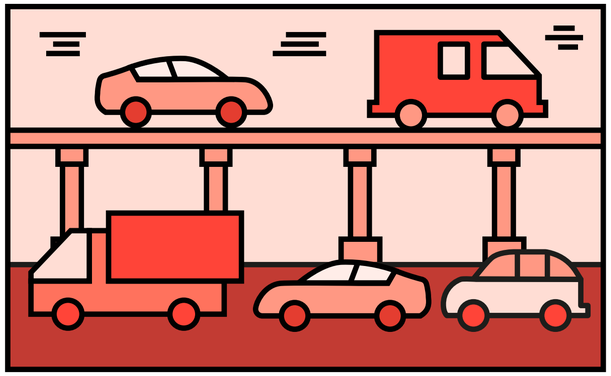
Flooding



Overheating

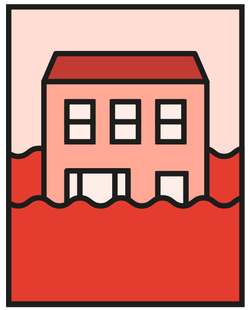


Water shortage



Aging infrastructure

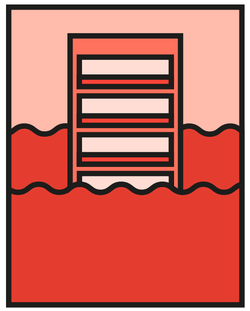
How many properties are at risk of surface water flooding in London?



Residential Properties

68,499 at high risk

164,546 at medium risk



Commercial Properties

12,148 at high risk

25,623 at medium risk

High = (1 in 30 year event)
Medium = (1 in 100 year event)

Resilience strategies across London

How is the capital preparing for future climate events? The Mayor of London declared a climate emergency in December 2018 which has been echoed by 28 London boroughs. At the time of writing, 24 boroughs have adopted Climate Action Plans. But what are the policies and initiatives that are promoting climate resilience in London?

This section provides an overview of resilience initiatives within the Greater London Authority, London's boroughs, and how the third and private sectors are responding to the challenge.

Greater London Authority

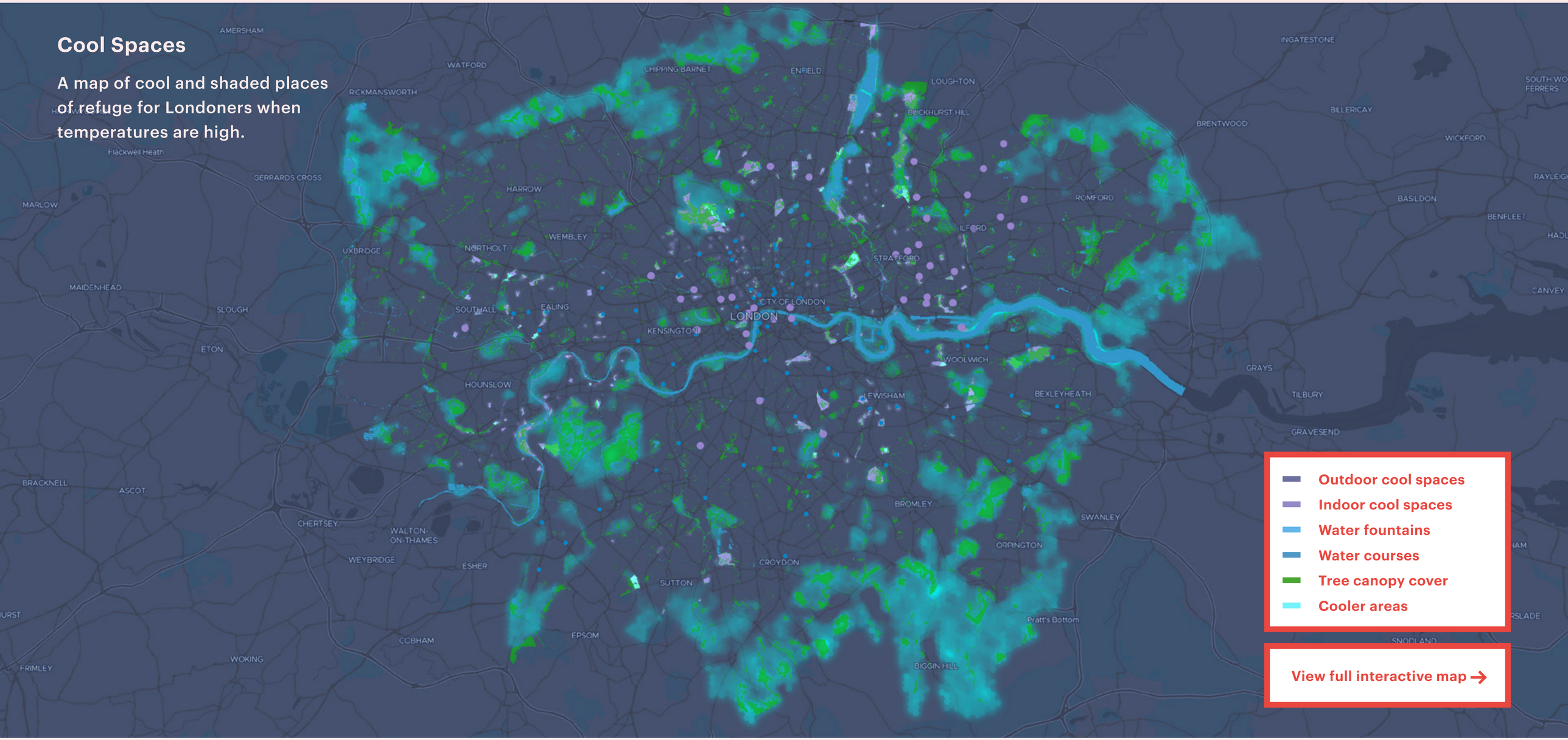
The London City Resilience Strategy, the London Environment Strategy, the London Transport Strategy and the London Plan all include policies that address different aspects of resilience. For what concerns climate resilience, the London Climate Change Partnership (LCCP) based within the Greater London Authority (GLA), is London's centre of expertise on climate change and the first port of call for current projects and initiatives.

Supported by Bloomberg Associates and LCCP, the GLA released updated Climate Risk Mapping in March. This spatial analysis maps exposure to flooding and extreme heat along with social vulnerability metrics including income deprivation, percentage of social renters, English proficiency and age. The outputs are three interactive maps: overall climate risk, flood and extreme heat risk which the GLA uses to target resources.

Delayed by the pandemic but launched earlier this year, Cool Spaces, is another GLA mapping initiative which identifies more than 25 outdoor and indoor spaces where Londoners can take refuge in extreme heat. Partnering with Thames Water, the GLA is installing more than 100 drinking fountains across the city.

Cool Spaces

A map of cool and shaded places of refuge for Londoners when temperatures are high.



Source: Greater London Authority

Sustainable drainage systems

In a partnership with the Environment Agency and Thames Water, the GLA recently undertook a comprehensive study and hydraulic modelling maps of Sustainable drainage systems (SuDS) potential in six London boroughs to explore the extent to which SuDS can address surface water management. The report describes SuDS as 'a highly scalable and adaptable strategy, applicable to the diverse and dense urban environments in London ... that should be considered an engineering cornerstone to address the resilience challenge.'[9] Stephen O'Malley, Founding Director, Civic Engineers agrees, 'the incorporation of SuDS is absolutely critical but they require space. We've got to thin out the amount of vehicles, private vehicles especially, to free up space for SuDS. There needs to be more courage and more ambition in the application and deployment of these techniques.'

The GLA can now overlay SuDS opportunity mapping with its infrastructure mapping application (IMA) to identify where road works will be taking place so that SuDS can be incorporated at the same time. A SuDS installation that was identified by overlaying these maps is underway in Enfield. Nonetheless, SuDS suffers from numerous barriers: uncertainty around costs (for both construction and maintenance), the scope of its potential benefit and Londoners' lack of awareness of SuDs as a part of their daily urban fabric.

Marylebone Low Emission Neighbourhood includes permeable materials and rain gardens

Green infrastructure

The pandemic highlighted the critical importance of access to green space. In response the Mayor, in his Manifesto, committed to no Londoner living more than 800m, or a 10-minute walk, from a public open space, a modification of the London Plan benchmark of 400m.[10] As a result, the GLA's Green Infrastructure team is currently mapping areas of deficiency.

The London Green Spaces Commission (LGSC), a temporary entity established by the Mayor to review the city's park and open spaces prior to the pandemic, has called for 'a step-change in investment in this core infrastructure for an inclusive, healthy and resilient city.'[11] Public spending on London's green spaces dropped by 30 per cent over the last decade. The London Green Spaces Commission Report looked at how the funding and management of London's existing parks and green spaces could be enhanced, and its two key recommendations, the establishment of a centre for excellence for London's parks and a green skills academy, are now underway.

How do green spaces and trees contribute to climate resilience?

£133m

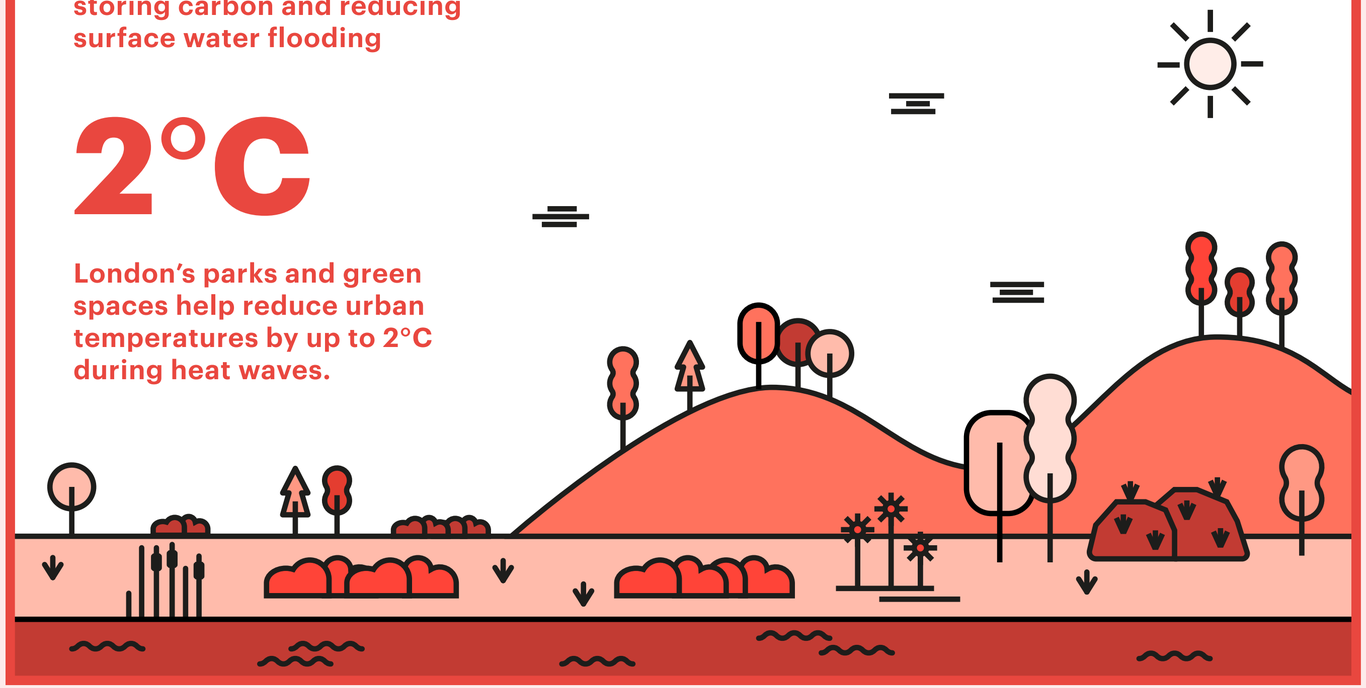
London's approximately eight million trees provide at least £133m of economic benefits a year by removing pollution, storing carbon and reducing surface water flooding

£950m

London's green spaces cover almost one fifth of the city and save £950m per year in avoided health costs.

2°C

London's parks and green spaces help reduce urban temperatures by up to 2°C during heat waves.



Current GLA programmes focused on green infrastructure and social resilience

£3m Future Neighbourhoods 2030

is a multiyear programme targeting London's most climate-vulnerable areas to promote community initiatives in sustainable placemaking.

£4m Green and Resilient Spaces Fund

seeks to support social housing providers with proposals to transform the open spaces on their estates to productive resilient green spaces with the involvement of residents.

£2.1m Green capital grants

for six green infrastructure projects, part of the £12m Greener City Fund targeted at increasing London's green spaces to 50 per cent by 2050 as part of its designation as a National Park City.

£1.2m Grow Back Greener Fund 2021

Partnering with Thames Water, this fund supports community projects which improve access to green space or address climate resilience and water.

£4m High Streets for All Challenge

includes a climate component which could support initiatives such as a climate emergency centre in a vacant building with activities such as Library of Things and workshops on cycle repair or draughtproofing to promote reuse and the sharing economy.

Greener Together,

a pilot project in the London Borough of Newham to build community through gardening, cooking and fitness.

London Boroughs

Recent polling by London Councils, a cross-party organisation that represents London's 32 borough councils and the City of London, showed that 87 per cent of Londoners are 'motivated to help prevent climate change'. To promote urgent action and collaboration, London Councils established seven cross-borough working groups to develop action plans on specific topics, ranging from retrofit to renewables. 'Resilient and Green', the working group that addresses adaptation, is seventh and last in the list, reflecting the, perhaps, relatively lower priority in the political agenda and the challenge of incorporating adaptation measures into borough action plans. In 2020, LB Southwark was appointed lead borough for working group #7, and its action plan for a Resilient and Green London is due for release later this year.

Kate Hand, Head of Climate Change at London Councils, explains that 'resilience policies address a number of technical disciplines, and many interventions need to be delivered across administrative boundaries. For example, flood alleviation schemes can take a long time to design and deliver and will involve many stakeholders. They can also span a large geographical area, depending on the local circumstances.

'Part of the challenge is that local councils have very limited funding to meet national net zero targets. Additionally, while the boroughs have responsibilities to reduce flooding as Lead Local Flood Authorities, parks for example are not a statutory service. In the context of overall funding reductions of around 25 per cent since 2010, and significant new financial pressures from COVID-19 amongst London boroughs, the long range nature — one to two decades or more — of resilience measures makes them particularly challenging.'

A London Councils survey of more than 20 borough Climate Action Plans provides a snapshot of climate initiatives across the capital and reveals that just 14 per cent of actions tackle resilience. Of those, the vast majority (83 per cent) involve tree planting (in woodlands, parks, streets and private gardens) followed by SuDS at 40 per cent. 'Tree planting is always popular because it is visible, sequesters carbon and is good for public engagement,' says Hand.

London Council's preliminary list of proposed actions for a Resilient and Green London[12] chime with many of the actions and emerging solutions in this report:

87%

of Londoners are 'motivated to help prevent climate change'

A London Councils survey of more than 20 borough Climate Action Plans provides a snapshot of climate initiatives across the capital and reveals that just

14%

of actions tackle resilience

- Map climate change vulnerabilities and adaptation opportunities, including flood risk and overheating analysis
- Support delivery of SuDS and urban greening
- Expand the network of open green spaces (and avoid loss of green space)
- Improve environmental practices in park maintenance
- Require developers to improve site biodiversity

City of London

While most London boroughs have by now adopted Climate Action Plans, the City of London has already funded its Climate Action Strategy 2020 – 2027, with £15m of its £68m budget allocated specifically to climate resilience. The City's initial workstreams focus on 'cool streets' and greening the public realm as well as increasing staff awareness about resilience.

Working with Buro Happold, the City has developed an adaptive pathways approach to resilience, pioneered by the Thames Estuary Plan 2100. This entails making assumptions about the likely timeline of climate disruptions based on future weather data, identifying the lead time of potential solutions in order to establish a programme for interventions. For example, London is likely to hit the 32° heat threshold in 2050 when the City will need more shade. Because trees take 20 to 25 years to mature, that means that to be effective, any tree planting needs to be done as part of the City's current programme of works. As part of this workstream, the City has developed an interactive catalogue of 35 different resilience measures hosted on the City's intranet.

Janet Laban, Senior Sustainability and Lead Environmental Resilience Officer, City of London Corporation, points out that 'the City is a tiny authority so we can trial things.'

Other programmes of work include below ground mapping to locate basements and below-grade services to identify opportunities for tree planting and SuDS. Six to eight pilot sites for rain gardens with climate resilient planting are underway.

While resilience has been written into the City's planning policy since 2016, enforcement is the challenge. Laban notes that 'we ask developers to tell us in their sustainability statements how they're going to make their new and refurbished buildings resilient to 2080 – 2100 climate conditions, and we're becoming stricter about making sure they actually do address this.'

London is likely to hit the

32°

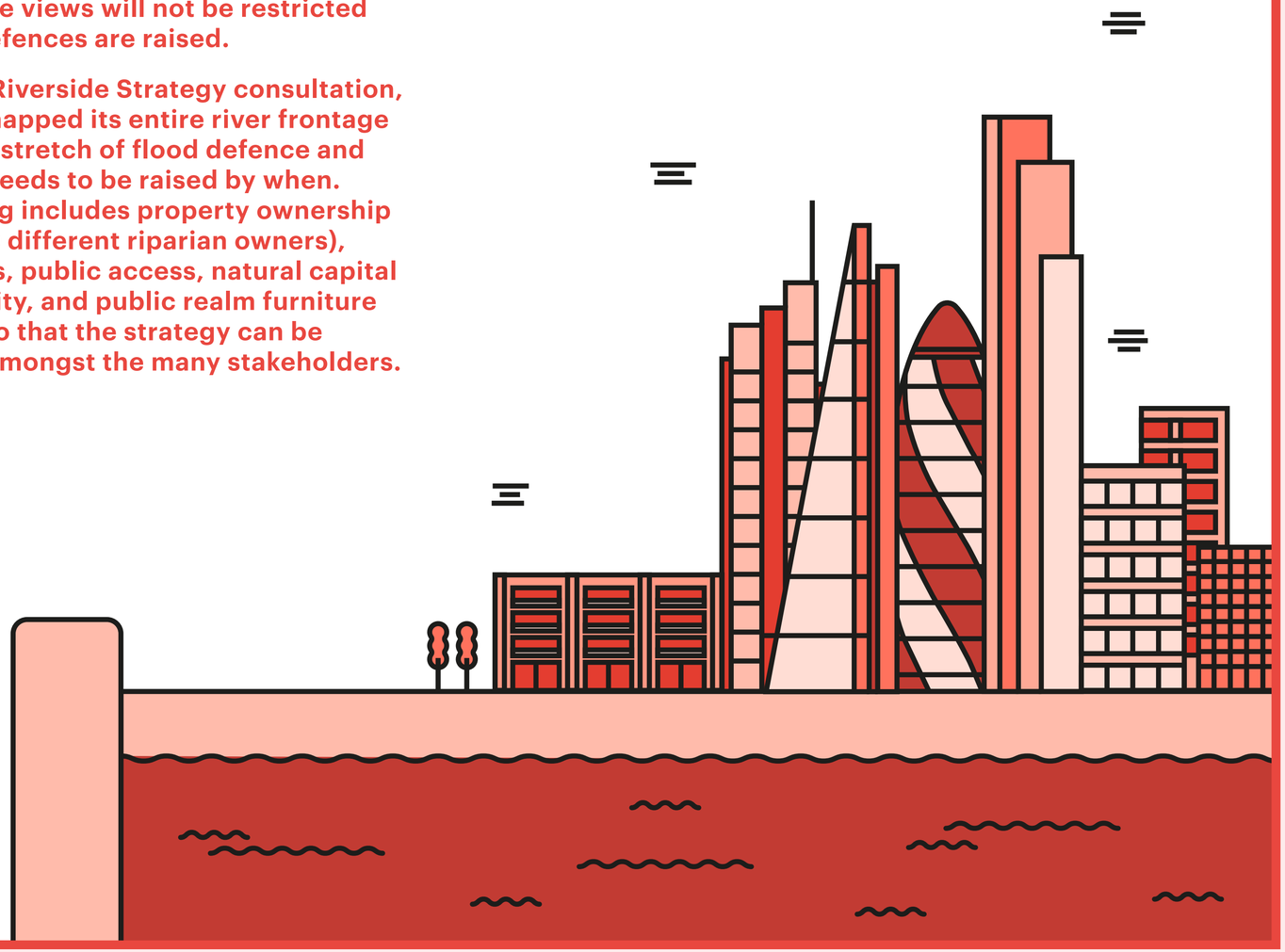
heat threshold in 2050 when the city will need more shade

City of London Riverside Strategy

Addressing sea level rise is another area where the City has taken the lead and its pilot Riverside Strategy — in line with the Thames Estuary 2100 Plan guidance to combine flood protection with enhancement of biodiversity and the public realm — was out for consultation in August 2021. Compellingly described in an online storyboard, the City's Riverside Strategy aims to protect the Square Mile from flooding due to tidal surges through the 21st century and beyond.

The Thames Estuary 2100 plan projects that flood defences within the City will need to be raised to 6.35m above ordinance datum by 2100. This equates to raising parts of the City's flood defences by up to one metre in places, impacting river views, adjacent public realm and buildings. Proactive planning and innovative design now can ensure that raised defences are integrated cost-effectively while simultaneously enhancing people's enjoyment of the river and increasing natural capital. In some cases, new development must be set back from the river so that land required for future flood defences will be available when needed. Any proposal for a new ground floor restaurant with river views is assessed to ensure that the views will not be restricted when flood defences are raised.

As part of its Riverside Strategy consultation, the City has mapped its entire river frontage locating each stretch of flood defence and how much it needs to be raised by when. Other mapping includes property ownership (more than 20 different riparian owners), historic assets, public access, natural capital and biodiversity, and public realm furniture and lighting so that the strategy can be coordinated amongst the many stakeholders.



City of London's Eastern Cluster, 2020 © Jason Hawkes

London Borough of Enfield

Within a decade, Enfield aims to be the capital's greenest borough, exemplifying London's status as a national park city. Adopted in June, Enfield's Blue and Green Strategy (2021 – 2031) sets out baseline targets with performance indicators to measure progress, including:

- A 25 per cent increase in blue/green infrastructure in the next decade targeted to areas of deficiency.
- Blue/green infrastructure within a 15 minute-walk of all homes and businesses.
- Increased resistance to flooding and drought by restoring river corridors through wetland creation and SuDS.

Building on its existing collaboration with the Environment Agency, the GLA and others for flood management, hydraulic modelling and SuDS pilots, Enfield aims to establish cross-cutting partnership of the public, private, and voluntary sectors to deliver its bold blue-green strategy. Rafe Bertram, Sustainability Facilitator in the Place team at LB Enfield, notes that 'joined up and collaborative working with a cohort of other authorities and organisations' is the only way to deliver a project of Meridian Water's complexity.'

Meridian Water

Meridian Water is a Council-led scheme to deliver 10,000 new homes 'resilient to flooding and overheating' and 10 hectares of new parkland and public realm over 25 years on an area prone to flooding along the River Lea between Tottenham and Edmonton. Meridian Water's Sustainability Strategy sets out ambitious standards including a zero-carbon approach based on whole life carbon and in-use impacts, a requirement for a green space 100m from every dwelling and a .5 urban greening target (with a .4 minimum). Climate modelling for strategic infrastructure, drainage channels and SuDS for flood mitigation is based on 2050 and 2100 weather data files.

The Private and Third Sector

In April 2021, the UKGBC's resilience workstream launched Principles for delivering urban Nature-Based Solutions, a report which distils strategic considerations for urban greening as well as detailed guidance on the design, delivery (including short-term funding) and operations of nature-based solutions. A UKGBC Task Force is currently being assembled to focus specifically on the measurement and reporting of the physical risks to built assets from climate change.

The UKGBC also hosts a web-based Climate Resilience Actor and Resource Map developed in 2018 which lays out the key actors and initiatives focused on the three aspects of climate resilience which most directly impact the built environment: flooding, overheating and water scarcity. This interactive mind map serves as a useful resource to understand the key players tackling climate resilience.

The Better Buildings Partnership (BBP) serves as an umbrella organisation for collaboration of the UK's commercial property developers who are leading the way in addressing climate emergency by disclosing the performance of their portfolios. While primarily focused on building performance and delivering net zero, the BBP's 5-point Climate Commitment, which currently has 26 signatories with more than £375BN AUM, requires members to develop 'comprehensive climate change resilience strategies' by 2022. BBP signatory British Land's Sustainability Brief (Nov 2020) sets out a climate resilience checklist itemised by RIBA stage which requires a nominated climate resilience champion for every project.

Thamesmead

At Thamesmead in Greenwich, Peabody is taking a whole place approach and is promoting multiple nature-based solutions across all areas including the Thamesmead Waterfront, a joint venture with Lendlease which will deliver new housing on a 100ha site along the river frontage. Dr Phil Askew, Director Landscape & Placemaking at Peabody, notes that 'we own and manage 240ha of blue and green spaces in Thamesmead, which includes five lakes, seven km of canals and 53,000 trees. To meet the challenges of climate change, habitat loss and provide healthy living environments, we need to share best practice and unlock the untapped potential in our parks and waterways across the UK.'

Within the existing South Thamesmead Estate, Peabody is participating in the EU's Clever Cities programme through a pilot project with the GLA co-designing nature-based solutions with residents and using technology to track outcomes. Askew describes the existing estate, which was built within the flood plain, as 'a giant SuDS project,' however its lakes and green spaces, while vast in scale, currently suffer from poor access and orientation and feature limited activities to attract residents. The proposed interventions are intended to bring nature to residents' doorsteps and test participatory techniques and digital platforms to capture residents' views and track outcomes. In another initiative, Peabody is surveying Thamesmead 53,000 trees to document existing species and plan for succession planting with species that are resilient to climate change.

The Thames

The Thames is central to both London's identity and its built form and has been so since the Romans established Londinium. As Greg Clark observed, it was the combination of an east facing tidal river and a prevailing westerly wind that gave rise to Britain's maritime prowess, while today the Thames has the opportunity to play a similarly defining role, acting as 'a catalyst for London to excel on addressing 21st century imperatives, including global warming, rising sea levels, resource scarcity and the search for healthy lifestyles and experience-based leisure.'[13]

London is currently protected from tidal surges by the Thames Barrier and other outer estuary defences. In the decade after it was completed in 1981, the Thames Barrier was closed ten times. In the last decade, that figure jumped to 80 closures. According to current projections, even a replacement barrier which could potentially be built, would not adequately protect London beyond 2100. This means that flood defences in central London must be raised to protect the capital and to allow the Thames Barrier to be closed only for extreme high tides.

Thames Estuary 2100

Launched in 2012, the Environment Agency's Thames Estuary 2100 (TE2100) plan sets out how flood risk will be managed to the end of the century and beyond. Using an adaptive pathways approach, it recommends what actions need to be taken in the short term (the next 25 years), medium term (the following 15 years) and long term (to the end of the century) to protect Londoners from flooding. Abby Crisostomo, Project Director for TE2100's London Area Team, Environment Agency explains, 'This is one of the first times we've used the adaptive adaptation pathways approach. We don't know what the future is going to be like, but we need to start acting now. So how do you do some 'no regrets' actions now?'

TE2100 incorporates an integrated delivery programme of capital works to manage and extend the life of existing assets. 'Aging infrastructure is a huge challenge for us so we have a process where we inspect everything and rate the condition of all our flood defences and target improvements accordingly,' says Crisostomo.

One of the main challenges of maintaining adequate flood protection for London is the fact that the Environment Agency owns only twelve per cent of the flood defences in the Thames Estuary, and the responsibility for maintaining — and raising them based on the deadlines set out in in TE2100 plan — rests with the riparian owner. According to the plan, flood defences in the inner estuary will need to be raised by 2065, though this date may change when the next plan update is released. 'What really needs to happen is that before those defence-raising deadlines happen, owners need to think about how this extra protection is going to be integrated into the built environment,' Crisostomo explains.

'What really needs to happen is that before those defence-raising deadlines happen, owners need to think about how this extra protection is going to be integrated into the built environment,'

The TE2100 plan coined the term Riverside Strategies to address this place-making challenge, and the City of London is the first pilot council to

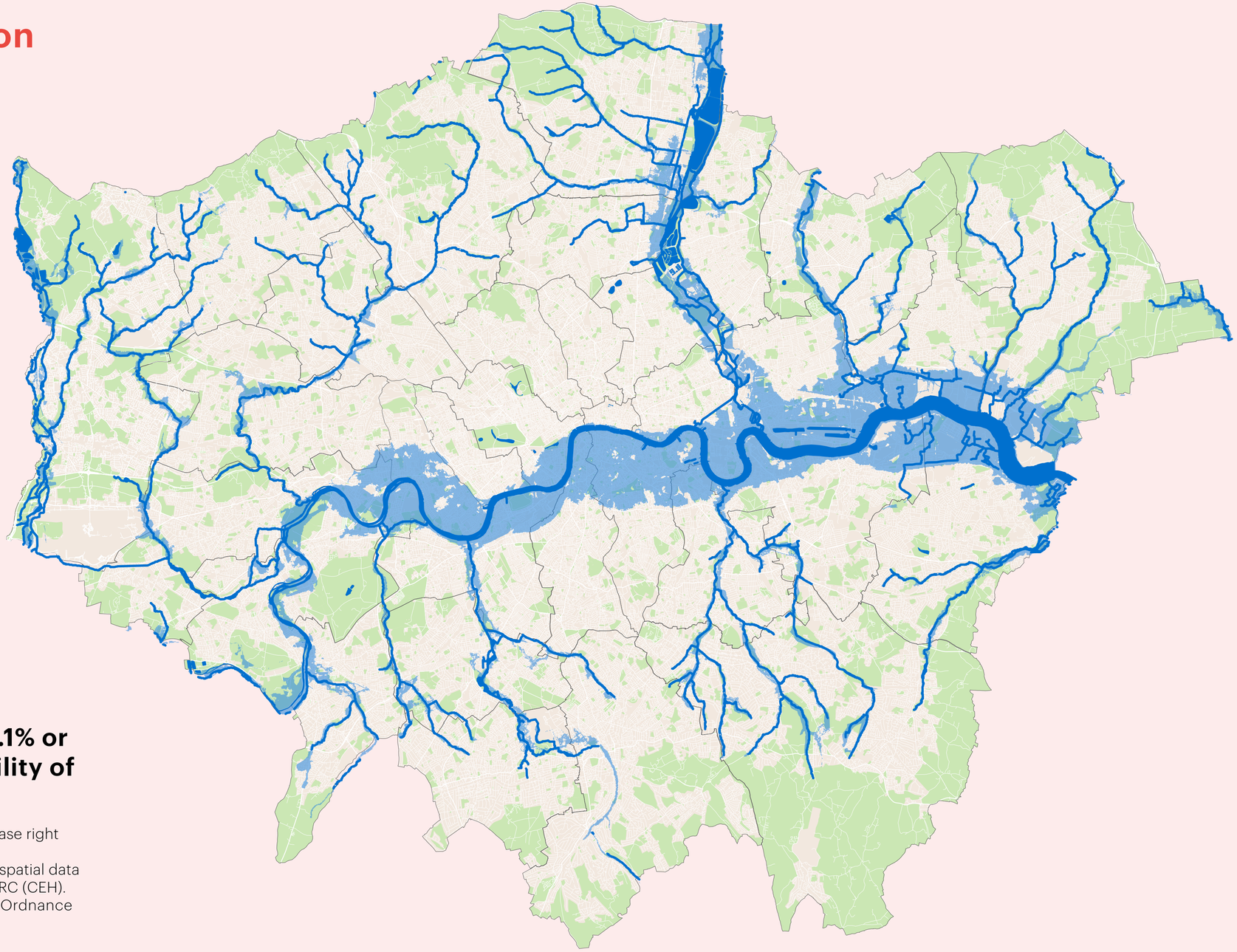
develop a strategy which was out for consultation this summer. Detailed maps locate every stretch of seawall and describe how much it will need to be raised by when. This is relevant to other boroughs with historic assets adjacent to densely developed river frontages to ensure that flood defences can be anticipated, sensitively designed and incorporated into any building or ongoing maintenance works.

In areas of new development, such as Newham where the Environment Agency is working with the Royal Docks Development Corporation, the master plan must embed future flood protection levels, as well as integrating wider benefits, such as greening the river edge. Estuary Edges, a website launched in 2019 by the Thames Estuary Partnership, the Environment Agency and others, provides design guidance and case studies on how to replace existing tidal walls with ecological habitats.

As part of its ten-year update, the Environment Agency has reviewed all the Local Plans and Strategic Flood Risk Assessments within the inner and outer estuary to ascertain to what extent local policies are implementing TE2100 recommendations. Preliminary findings suggest that just half the local authorities with riverside frontage have a robust policy framework. While policies for general flood risk management were generally strong, clear gaps were identified regarding how flood defences should be

The Thames Barrier © Jason Hawkes

Flood Risk in London



Rivers

Flood Zones 2 and 3 (0.1% or greater annual probability of river or sea flooding)

Thames Tideway Tunnel

Due to complete in 2025, the £4.1 billion Thames Tideway Tunnel is 7.2m in diameter and stretches 25km from Acton to Abbey Mills. Addressing the issue of London's ageing Victorian sewer network, it will help stop tens of millions of tonnes of raw sewage spilling into the Thames annually by diverting it into Beckton Sewage Treatment Works.

The Tideway offers numerous benefits in terms of improved capacity of the sewer system during heavy storms as well as improved water quality in the Thames. Importantly, Tideway's central portion between Wandsworth and Blackfriars will deliver eight public realm projects designed by Hawkins\Brown with Gillespies. However, the Tideway was conceived, funded and executed as traditional grey infrastructure without capturing potential wider co-benefits.

Harbinder Birdi, Partner, Hawkins\Brown and Principle Architect for the central section of Tideway, observes 'We have to embrace the tunnel as a piece of London's infrastructure, it is not however a silver bullet. It addresses the management of discharging water and sewage safely, however the cities boroughs need to ensure that they are providing new sustainable solutions for water management locally, which often provides opportunities for public realm and local amenities.'

Chelsea Pathway by Hawkins\Brown

Emerging solutions

Co-benefits is an important concept which cuts across all scales of resilience planning. This means assessing benefits not only in terms of technical problem-solving, but also in terms of integrating nature and wider social benefits.

Infrastructure

Infrastructure is simultaneously the most complex and the most urgent area for embedding resilient design due to the scale of investment and its long life. The Thames Estuary 2100 Plan's alternative pathways approach, now adopted by the City of London, explains the importance of getting the big moves right in order to avoid maladaptation. Its Riverside Strategy approach embeds placemaking and greening along with raising flood defences in long range planning to ensure that it is incorporated in any upgrade work and maintenance cycles.

London's critical infrastructure includes power, transport, water and waste. At King's Cross, developer Argent installed a district energy system to build in future resilience. Robert Evans, Joint Managing Partner at Argent and CEO of King's Cross, explains that this approach ensures flexibility because 'the front end can easily be changed as a site-wide solution.' Earlier this year, Argent switched the fuel supply for the 67-acre estate from natural gas to biogas, predicted to reduce the development's annual carbon footprint by as much as 50 per cent.

The immediate risk of surface water flooding, the most critical flooding issue facing the capital, was brought home to Londoners in July 2021 when intense rain closed nine DLR and underground stations, captured on Twitter at Pudding Mill Station. This led many to query what measures Transport for London (TfL) has taken since The Guardian reported that a 2016 study found one-third of the system's stations at significant or high risk of flooding. Also in 2016, TfL issued ambitious SuDS guidance prepared by Civic Engineers and J&L Gibbons that explains SuDS as a dispersed approach to surface flood management in granular detail. Stephen O'Malley notes, 'We've come a long way in five years, but there needs to be more courage and ambition, in the application and deployment of these techniques.' The London Plan now includes specific targets for SuDS, yet funding and enforcement rests with boroughs.

Examples of infrastructure measures that address resilience include:

- Riverside walls/ barriers and ecological landscapes
- Green and blue infrastructure in lieu of grey infrastructure (an example would be restoring a culverted river to a natural setting)
- Large-scale SuDS projects
- Floodable landscapes
- Artificial detention basins/ rainwater collection ponds
- Geo-cellular storage systems
- Infiltration trenches
- Natural detention basins

Straussvej, Copenhagen – Courtyard of the future, by WSP

Buildings

Designing buildings that can adapt to future climates should be a priority. The concept of ‘long life, loose fit, low energy’, coined by former RIBA President Alex Gordon in 1974, is more important than ever.

Accessing and interpreting the latest weather files is a major barrier to being able to accurately design for future climate scenarios, according to Joe Jack Williams, Associate and Researcher at FCBStudios. ‘The Met Office produces many standard weather files but it requires technical expertise to apply them. Understanding all the different pathways, and the processes that drive them and what the impact is, is not necessarily easy. We in the built environment industry have to convert them to run design simulations,’ says Williams. He explains, ‘The 2018 files have not been released yet so we’re still relying on 2009 future climate files. CIBSE doesn’t currently have the funding to make those files. This could potentially be led by the GLA or by the Department for Levelling Up, Housing and Communities (formerly MHCLG).’

Various public sector departments, industry organisations and professional institutes are undertaking resilience research into specific

Hackbridge School By Elementa © studiostagg

building types. For example, in 2019 the Good Homes Alliance (GHA) issued a tool and design guidance for mitigating overheating in new homes aimed at designers and planners. This tool enables design teams to understand and analyse the many variables that impact overheating, including facade orientation, U-value of the external envelope, extent and type of glazing, shading and ventilation. GHA guidance is now being written into local authority briefs, such as Enfield's Meridian Water.

CIBSE's School Design Group is working with the Department of Education to monitor the environmental performance of school buildings. The group identified the characteristics of existing schools that make them more resilient, including cross-ventilation, exposed thermal mass, classrooms that aren't too deep. Early findings from a study of almost a dozen recent newbuild schools show that under a 4°C global warming scenario, the majority of classrooms fail BB101 overheating risk assessment and that design strategies such as cross-ventilation improve resilience.[14] In August 2020, the GLA issued a detailed report, How London's Schools and Early Years Settings can Adapt to Climate Change, which itemises specific actions for schools.

Examples of approaches that make buildings more resilient to climate change while reducing carbon emissions:

- Passive design
- Fabric first design
- Thermal insulation
- Bio-solar, blue/green and green roofs
- Solar facade/ cladding
- Window glazing / shading
- Cool materials (facades and roof)
- Solar shading (facade design)
- Solar shading (self-standing structures)

Others measures specifically address flooding:

- Raising habitable spaces above predicted future flooding thresholds
- Rainwater harvesting
- Green walls – Bioactive facades
- Living walls
- Traditional green walls – climbing plants

Nature-Based Solutions

Nature-based solutions are central to addressing climate resilience and awareness of their critical importance has steadily gained currency over the last decade as policy makers and local communities increasingly recognise the importance of addressing both the biodiversity crisis and the health and mental well-being of urban dwellers, heightened during the pandemic due to the pressure on existing parks and open spaces. This means focusing simultaneously on enhancing the role of existing parks and green spaces as well as introducing new green infrastructure through tree planting, SuDS, green roofs and other initiatives.

Trees, both protection of existing and planting anew, is one key strategy for provision of shade and reduction of surface water runoff. London currently has 22 per cent tree canopy cover, which equals to approximately 24,000 trees, and the Mayor's Environment Strategy targets increasing that by one per cent annually. Due to their many co-benefits, it is not surprising that more than 80 per cent of local authorities' resilience initiatives involve tree planting. Both Transport for London and Peabody at Thamesmead are conducting tree inventories as part of planning of succession planting with species resilient to climate change.

Mapping of below ground spaces and services, as currently being undertaken in the City of London, is an important first step in identifying the potential for SuDS.

Nature-based solutions can be really effective in tackling the urban heat island effect that can become dangerous during extreme heatwaves, while providing huge co-benefits to people's wellbeing and supporting biodiversity. The Wild West End in Central London is an initiative connecting green spaces and pocket parks through a combination of green roofs, green walls, planters, street trees, flower boxes and pop-up spaces to support wildlife. It encourages birds, bees and bats back into the heart of London, and creates greater connections with nature for residents, visitors and workers.

Example of nature-based solutions

- Tree planting
- SuDS
- Greening existing streets
- Rain gardens
- Climate resilient planting
- Enhance existing parks and upskill new and existing parks maintenance staff
- Naturalising roadside verges
- Community gardens and allotments
- Permeable paving
- Cool materials (pavements)
- Water bodies – pools & fountains in public realm
- Building with flood resilient materials

St Leonard's Court by Child Graddon Lewis © Alan Williams

INTERNATIONAL EXEMPLARS

New York City

In the decade since Hurricane Sandy, New York City has ramped up its investment in resilience with many numerous physical measures already in place along its 520 miles of waterfront. In September 2020, the NYC Mayor's Office of resilience released version four of its Climate Resiliency Design Guidelines, the culmination of four years of collaboration between 15 city agencies. This report sets out how to incorporate future climate data into the design of all public facilities and introduces reporting requirements. All public assets were divided into four groups according to their typical useful life in order to determine the relevant climate projections, and the report's Appendix includes a useful listing of design interventions for resilience.

Rotterdam

Building on its pioneering floodable urban water squares, Rotterdam launched its ambitious and thorough citywide resilience strategy in 2016 with seven objectives which range from water and climate to infrastructure and cybersecurity. Much can be gleaned from the clarity and detail of Rotterdam's approach. In 2019, Rotterdam followed up with a Weatherwise Urgency Document which focuses on the city's four climate trends (more rain, higher temperatures, drought and rising sea levels). Like London, Rotterdam has mapped climate vulnerability across the city to pinpoint areas of greatest risk. Rotterdam's Weatherwise strategy aims to widely engage citizens in 'risk dialogues' to determine what resilience measures are most appropriate in each city district. The key message of this approach is that effective resilience must be a partnership between the public and private sectors and residents.

INTERNATIONAL EXEMPLARS

Barcelona

The pandemic has accelerated Barcelona's plans for urban greening and in November 2020, the city released an ambitious 38m-plan for retrofitting the city's densely urban street grid with 21 green streets and neighbourhood squares, including 6.6 hectares of greenery. Similar to the London mayor's Manifesto promise for all residents to have access to public open space within 400m, Barcelona has pledged the creation of a square or small park within 200m of every resident.

Particularly relevant for London is Barcelona's approach to introducing greening in dense urban areas despite controversy over restricting vehicular use.

Tirana

As part of its Green City Action Plan, the city of Tirana has proposed planting an Orbital Forest of 2 million trees encircling the city to both contain urban sprawl and provide a natural lung for the city to address the urban heat island effect, flowing and biodiversity loss. In order to qualify for multilateral development bank funding, Tirana used natural capital accounting to quantify the multiple benefits tree planting would bring to the city, an approach that should be more widely used by funding partners to prove project viability.

Barriers

While extreme weather events, climate protests and increased media coverage have greatly increased public awareness of climate change in general, understanding of resilience remain vague. This is true both for the general public and for many in London's built environment sector who are focused primarily on delivering net zero.

Why has the issue of climate resilience been so slow in emerging as a priority and what are the main factors that make it difficult for local administrations and built environment professionals to address it with effective strategies and actions?

We have identified some common barriers that need to be addressed in order to advance the resilience agenda within the built environment sector.

'You need a policy framework as a starting point. Without the policies, there is a vacuum. And you've got to look at how the budgets are allocated right from the top. This means examining what outcomes those budgets are targeting. Those targets and briefs must be holistic and integrated.'

Stephen O'Malley, Civic Engineers

Lack of industry understanding of the critical importance of resilience and the nuanced differences between mitigation and adaptation hinders action, policy and investment. There are however some good initiatives that are trying to address this gap, such as the C40 Adaptation Academy in Rotterdam that offers guidance and workshops on this issue.

Lack of common measures to quantify climate risks to built assets impacts the ability to build a stronger business case to invest on climate adaptation.

Uncertainty about the scope of adaptation required is another barrier. This is exacerbated by the complexity of forecasting future weather scenarios and translating climate projections into a format useful for designers. The adaptive pathways approach pioneered in the Thames Estuary 2100 Plan and now adopted by the City of London is an effective approach to dealing with climate uncertainty.

Lack of expertise within local authority planning departments makes it difficult to ensure that proposed schemes adequately address resilience. Identifying and prioritising the most effective measures to address resilience is a rapidly evolving policy area, but there are still very few exemplars to point the way.

The cross-cutting nature of resilience lead to no clear accountability, this is exemplified by different departments within local authorities working in isolation. At London level, the governance with its limited mayoral power and shared accountability with the boroughs exacerbates this complex policy area. In addition, short electoral cycles create political incentives for short term projects with immediately visible results.

Lack of policies and regulations specifically targeting resilience measures means that strategies and targets lack teeth. An example is the proposed Future Buildings Standard which don't go far enough to enforce adequate targets to avoid overheating in new buildings.

Finite public resources due to the twin impacts of a decade of austerity combined with expenditures related to the COVID-19 pandemic have meant that short-term investment in mitigation generally takes priority over long term action for resilience. According to a recent Climate Policy Initiative report, adaptation represented only five per cent of climate finance globally.[15]

Recommendations

The 2021 United Nations Climate Change Conference, also known as COP26, provides an opportunity for London to focus its climate resilience initiatives. This must start with building awareness, strengthened by a cross-cutting approach to resilience through coordinated governance.

Here we present a list of ten priorities for the capital:

1. Upskill the public sector and the industry on climate adaptation
2. Develop a common framework for quantifying climate risks and mobilise stakeholders and funding towards climate resilience
3. Design all buildings to adapt to future weather conditions — a key consideration should be given to overheating
4. Retrofit old building stock to meet both the net zero and the adaptation agendas
5. Increase the adoption of SuDs across London to mitigate the risks of flooding while supporting biodiversity
6. Embrace nature-based solutions and maximise the environmental net gain in all new developments
7. Unlock funding to implement adaptation measures at local level
8. Engage with communities and support bottom-up, community-led projects that promote social cohesion, empowerment and people's wellbeing
9. Increase access to green and blue spaces in areas where this is lacking
10. Develop cross-sectoral partnerships to enable effective implementation of resilience actions

The built environment sector plays a key role in building, improving and maintaining a city for the people that live in it today, and the ones that will live there in the next 50–100 years or more. NLA will support these ambitions by facilitating knowledge sharing, supporting the industry to innovate and acting as broker between the industry and governance to influence change. This ten priorities for London will inform NLA's New London Agenda, a multi-year project aimed at mobilising London's built environment industry to affect and influence change at decision-making level.

Final Word

While climate ranks high on London's policy and planning agenda, the focus to date has been primarily on mitigation, with two notable exceptions: the Thames Estuary 2100 Plan and the City of London Corporation's Climate Action Strategy (2020 – 2027). Austerity in local government funding, heightened by the pandemic, has meant that the short term wins of cutting carbon emissions have consistently trumped the wider longterm benefits of adaptation.

Yet the findings of this report are encouraging because they show that London has a wide range of resilience studies and policy initiatives already in place. Numerous reports outline measures that are both tangible and achievable to prepare the capital's built environment for the changing climate of coming decades.

These findings are supported by the project showcase, collated from a call out to the NLA network, on the following pages that highlight emerging trends including: widespread retrofit, extensive use of timber, green roofs and greening of the public realm. Partnerships, such as the proposed LowLine, are one way to engage the multiple stakeholders required to effectively deliver climate resilience.

In order to succeed and to build social cohesion, the buy-in and commitment of Londoners is essential. Community resilience projects must build on the fragile local networks established at the height of the pandemic. In order for these initiatives to gain meaningful traction, they must be accompanied by education and awareness raising within local authorities, with the general public and in schools to lay the foundation with the next generation.

Crowd-funding is a rapidly growing model that has recently expanded as a way to support urban improvement projects, and which could be replicated for funding adaptation measures. However, most crowdfunding projects remain small and it is unclear whether the model will effectively scale up. Arup landscape architect Dima Zogheib notes that Rotterdam has used this approach effectively to crowdfund Luchtsingel, a pedestrian bridge connecting different spaces in the city. In Hamburg, a rainwater tax is applied to all non-permeable surfaces in the city and which generates some revenue that gets invested in climate adaptation measures. Could a simple measure such as adding an optional £1 resilience contribution to Council tax bills, dramatically boost London's adaptation financing, even if only half of

Londoners participate? The role of borough carbon offset funds, similar to the Camden Climate Fund, could be enhanced so that developers are taxed according to the embodied carbon of their projects and funds could be targeted to resilience measures.

To be resilient means to be robust. To date, progressive consultancies, isolated pockets within local government and the third sector are spearheading London's resilience agenda. In line with COP26, what is needed now is bold leadership with a longterm vision to join up public initiatives and private partnerships that can drive London's resilience forward.

Elephant Park

VIEWPOINTS

Rewilding cities – London as National Park City

Ben Smith, Director, Energy, Cities and Climate Change, Arup & Trustee, London National Park City

How can we make London's buildings resilient to climate change?

By Clara Bagenal George, Associate, Elementa Consulting & founder of LETI

Making Infrastructure fit for the future: A Resilient Railway

By Frank Anatole, Principal Architect, Network Rail

Inclusive climate adaption: why building social cohesion is key to confronting climate risks in cities

By Heeral Dave, Manager, Ernst & Young (EY)

Rewilding cities – London as National Park City

Ben Smith, Director, Energy, Cities and Climate Change,
Arup & Trustee, London National Park City

Cities around the world are having to respond to the impacts of climate change, whether due to extreme rainfall, flooding and landslide or extreme summer temperatures, overheating and water scarcity. A common response is to promote nature-based solutions (NBS) — because turning grey spaces green can deliver multiple resilience benefits.

Urban greening in old parking lots, on roof gardens and created wetlands can provide flood attenuation, shade, and offer refuge for endangered plant and animal species. Importantly, in cities, these projects can help connect people to nature — with likely consequential learning and health benefits.

Fostering this connection to nature in a way that is inclusive, inspiring and which helps to build a movement of people that can work together to make a city greener, healthier and wilder is the central construct of the National Park City vision.

London was declared as the World's first National Park City in July 2019, after a six-year long citizen-led campaign. The concept is now embedded in all the strategic planning documents of the Greater London Authority (GLA), having also gained significant business, community, and political support.

In London the National Park City initiative has already catalysed new urban greening and community projects, driven investment and forced a myriad of connections through events, festivals and through a network of 110 London National Park City Rangers. The National Park City Foundation has recently launched a journey book for aspiring National Park Cities globally, having received contact from more than thirty cities interested in adopting the model.

The actions that the National Park City movement is working to promote — like urban greening, more active travel, tree planting, food growing, recycling, community participation, street art and outdoor recreation — are actions that directly respond to the climate and ecological crisis. Although these interventions can be small and local — in gardens, community spaces and streets — they can be replicated and scaled and cumulatively have a big impact. It is well known that barriers to action in these areas include low levels of engagement,

lack of human resource and skills, lack of data and information and lack of funding. The National Park City Foundation is making important contributions to respond to each of these barriers.

Public engagement and support for the National Park City vision in London offers great hope, but the National Park City is a long-term vision and there is always more that can be done.

The National Park City vision can be better translated into guidance and standards for new development—work that has already been started through the National Park City Developer Network. More can be done to make connections between business and community groups and the 400+ environmental charities active in London, to ensure the National Park City movement is representative of Londoners and to establish partnerships and business cases that will attract significant new funding.

Greening cities has many benefits: increasing air quality, improving health and wellbeing, supporting biodiversity, mitigating the effects of climate change, cooling the city and absorbing rainfalls, providing amenities for leisure and community activities, creating more inclusive spaces for participation and engagement.

London National Park City map by Charlie Peel at Urban Good CIC © Paul Cochrane

How can we make London's buildings resilient to climate change?

By Clara Bagenal George, Associate, Elementa Consulting & founder of LETI

Net Zero and climate resilience are inextricably linked, the higher the carbon emissions of our built environment the more they contribute to global warming, and the higher the likelihood of extreme weather conditions. Some of the key climate risks facing our existing and new buildings in London are heatwaves and flooding. Buildings that align with zero carbon can also be resilient, especially when they meet the LETI space heating targets and Energy Use Intensity targets.

A resilient building needs to be able to adapt easily to changes in the future and needs to support its inhabitants in times of crisis, be this a flooding event or heatwave. Buildings are key to a resilient city and need to be part of the solution. Resilient buildings are those that can support London through crisis, now or in the future, and so those that don't need to be demolished and rebuilt.

The current barriers that affect London's ability to deliver climate-resilient buildings include a lack of joined-up thinking, the use of a compliance approach, and that climate-resilience is not explicit in policy. There are some good examples of policy guidance from other cities that provide a more solid framework to climate resilient. Such as The Toronto Zero Emissions Buildings framework includes a Climate Change Resilience Checklist for New Developments.

LETI have been progressing this agenda and propose the following recommendations:

- Fabric first — an ultra-low energy fabric — this reduces space heating demand, and thus reduces electricity loads on the grid, this helps the grid decarbonise, and increases passive survivability if there is a power cut in winter. The LETI Climate Emergency Design Guide include new build targets, and the upcoming Climate Emergency Retrofit Guide for targets relating to existing homes.
- Eliminate fossil fuels in buildings
- Mitigate overheating — using passive techniques: sensible glazing ratios, solar shading, louvres and others. This reduces heat stress and increases passive survivability if there is a power cut in summer in addition to reduced energy

and carbon associated with active cooling.

- Demand-side response or energy flexibility measures — such as batteries and thermal storage and smart controls.
- Local renewable energy generation
- Buildings should be adaptable for future uses — this could include soft spots in the structure and future-proofed riser space and central plant space. This increases resilience, adaptability and reduces embodied carbon.

There are other features of resilience that LETI has not focused on yet, including, green infrastructure, rainwater collection and local food growth, local energy generation and social aspects of resilience.

Climate resilience and net-zero solutions should be more integrated within design, policy, and practice. This can be done by following the principles in the LETI Climate Emergency Design guide. Adopting the design guide principles and integrating the guidance as standard is the only way we will as an industry meet our collective responsibilities in our climate crisis.

Hackbridge School © studiostagg

Making Infrastructure fit for the future: A Resilient Railway

By Frank Anatole, Principal Architect, Network Rail

Network Rail own and operate Britain's rail infrastructure of over 20,000 miles of track, including more than 2,500 railway stations which would cover an area about the size of central London. Key sections of London's railway network service the major stations of Waterloo, Kings Cross, St. Pancras, Victoria, and Liverpool Street. These are critical transport hubs, and the interdependent nature of the UK's railway system means that asset failure near or at these nodes can quickly propagate throughout the network, causing extensive delays, passenger dissatisfaction, and a disproportionate additional cost compared to that of the original fault itself. For example, engineers can repair an electrical failure near Waterloo in six minutes, but this can result in a total delay of three hours elsewhere. Consequently, understanding the nature of climate related incidents (heat, flooding, ground slip) along particularly critical sections of track is essential.

Network Rail's annual operational and supply chain carbon emissions are equivalent to 1.9 million average UK homes — equivalent to more than the cities of Birmingham, Liverpool, Bristol, Manchester, Sheffield, Leeds, Leicester, and Coventry combined. Emissions from operating and constructing our buildings and infrastructure comprise more than a third of this footprint.

Network Rail's Environmental Sustainability Strategy is a roadmap to a Net Zero Carbon organisation by 2050. Over this same period, climate change trends project warmer, wetter winters and hotter, drier summers, with an increase in the frequency and intensity of extreme weather events. Sea levels are projected to rise significantly across the whole UK coast. These rises combined with changes in storm intensity and frequency increase the risk of storm flooding across the UK, already being seen in London, with areas in the east of the city being particularly at risk.

Network Rail's Buildings and Architecture team's published a central strategic policy which is one of stewardship, safety, satisfaction, and sustainability — the four S's. We have an ongoing commitment to design quality. We believe commitments to climate action and design quality are mutually supportive. A low emission design is a quality design, and a well-designed railway is a resilient railway.

As an example, our soon to be published Climate Action Design Manual for Buildings and Architecture makes key recommendations for resilience that include:

- Setting ground floors and operation-critical equipment heights above projected flood levels.
- Examining greater use of solar shading, light coloured paint and heat-resistant materials.
- Looking at off-site construction solutions like our current small station programme.
- Adopting lean start, long life, loose fit initiatives for the more flexible buildings we must design, adapt or build.

We are also focusing on the spaces around our stations and their exposure to flooding with new Public Realm Design and Mobility & Parking Guidance Manuals in production highlighting areas such as Sustainable Drainage Solutions (SuDS), biodiversity, heat-resistant and permeable alternatives to asphalt, and other green infrastructure.

Our mantra for replacing assets in the future will be ‘replace like with better’ rather than ‘replace like for like’. This change will mean we will continually seek to improve the network, making it more resilient for our customers and passengers.

Top: biodiversity in rail | Bottom: flooded tracks

Inclusive climate adaption: why building social cohesion is key to confronting climate risks in cities

By Heeral Dave, Manager, EY

Climate change is on track to widen inequality based on class, disability, race, gender, and wider socioeconomic factors. Low-income countries such as Bangladesh, with little contribution to emissions, are on the frontline of natural disasters: one in seven of the population are estimated to become climate refugees by 2050, breaking up communities. And communities that exhibit resilience and cohesion are shown to improve societal outcomes. COVID-19 demonstrated the ability for communities to self-organise under immense pressures, delivering effective, local solutions, such as mutual aid groups. It is therefore critical to acknowledge the interdependencies between social cohesion, and both climate risks and solutions.

The built environment matters: in London, there is already a lack of adequate, affordable, accessible housing for people with disabilities, let alone access to green spaces and the ability to afford increased costs to implement sustainability measures. In the US, natural disasters are compounding the negative impacts of historically discriminatory housing practices. Known as 'redlining', these forced low-income and/or Black communities to housing in areas of cities deemed 'undesirable', in part, because they were built on areas with higher flood risk. Formerly 'redlined' homes are now 25 per cent more likely to be flooded than non-redlined homes, risking housing security for disadvantaged populations. How can we ensure climate adaption in London remains accessible and inclusive?

This isn't just an inequality issue; evidence shows tight-knit resilient social groups can more effectively tackle the climate risks they are faced with. Developing our collective resilience will build capacity into us and future generations to confront whichever changes come our way. The Black and Green initiative in Bristol is a great example of a Black and minority ethnic-led organisation running environmental equality initiatives aimed at local Black, Asian and Minority Ethnic communities, building both knowledge and resilience.

However, implementing change inevitably faces barriers — from lack of political will due to short term thinking, to a lack of funding due to difficulties

in demonstrating benefits. As society begins to understand issues of inclusion though, we are seeing a movement to defining value in a broader sense than GDP (e.g. through ‘ESG’ metrics), with government, investors and consumers pushing for change too.

So, what should be done? It is important to think beyond ‘net-zero’, defining goals around a more holistic view with people and planet at the centre, focusing on environmental justice. Learn by listening to a variety of people with lived experiences, including marginalised groups. Ensure representation so your organisation mirrors the society you serve, checking who holds the power and capital.

And critically, start re-imagining the future of cities, challenging the status-quo, designing inclusive built environment that is environmentally and socially resilient. And then, let’s get moving, voting, spending, and working, towards that vision!

Nourish Hub is a community space where to learn about cooking and healthy eating while connecting with diverse cultures.
By RCKa architects © Shukri Elmi

PROJECTS

The following showcase provides a snapshot of London projects that demonstrate sustainable environmental approaches and take into consideration climate resilience. The showcase also includes a selection of international exemplars as well as a section including concepts, tools and research that contribute to advance the climate agenda.

All projects featured in this showcase were submitted via a call for entries conducted by NLA in summer 2021.

Project index

Buildings

Masterplans and public spaces

UK and International projects

Concepts, Technology & Research

Buildings

Blackhorse Yard

Waltham Forest | Status: **Planning Granted** | Completion: **2024**

Client: **Swan Housing Association, Catalyst Housing, Greater London Authority (GLA), LB Waltham Forest** |
Architect: **C.F. Møller Architects** | Engineer: **Heyne Tillett Steel**

- Targeting BREEAM Excellent
- SuDS and nature and nature-based solutions
- Blue roofs, green roofs, permeable paving
- 100% affordable housing

Blackhorse Yard is a new mixed-use regeneration development in Waltham Forest, comprising affordable housing, extensive new public realm as well as 2,596sqm of retail units, allotments and creative workspace.

Backed by the Mayor of London and the GLA, the site will be the first to deliver the Mayor's 100 per cent affordable housing initiative. The scheme will create 359 high-quality, one, two and three bedroom apartments which are available to buy as Shared Ownership homes to help address local housing need. The residential units have been designed to accommodate future flexibility to ensure that the community and placemaking which underpins the development will continue to thrive with the changing needs of the residents.

The proposals look to address the different neighbours across the site. Alongside stepping of housing to meet the adjacent Victorian terrace grain, retail spaces are located at Blackhorse Lane to activate a vibrant urban frontage and 3,000 sqm of new creative workspaces aim to connect the new development with the wider creative community.

The site sits within a rich and diverse environment and aims to integrate with the established community through the creation of an eclectic series of character areas. The public realm provides continuity across the site and the landscape acts as a necklace of interlinked small parks, connecting locals, pedestrians and cyclists.

Blackhorse Yard contributes to London's climate resilience through innovative SuDS strategies and integrating nature and nature-based solutions. The site is in a low-lying area which is at high risk of surface water flooding. The use of hydraulic modelling identified a surface water culvert crossing the site, which with climate change is considered at high risk of over-topping. To mitigate the risk the culvert will be opened up, providing significant ecological benefits and creating a landscape feature running through the heart of the site.

To further mitigate against extreme weather risks, SuDS have been incorporated into the fabric of the buildings and landscaping, with blue roofs, green roofs, permeable paving and swales proposed throughout the site. At source collection of rainwater is proposed for the majority of hardstanding areas and pollution control is achieved through the permeable paving and swales.

'Since Heyne Tillett Steel was formed in 2007 we have championed the retention of existing structures and the use of low embodied carbon to provide sustainable and healthy buildings. We were one of the first engineering practices to sign up for both the Structural and Civil Engineers Declare initiatives and have adapted and extended these commitments both for our approach to design and as an office.

We are NLA Net Zero Programme Champions for the second year and members of the UK Green Building Council and LETI. We have several Pioneer Projects with the UKGBC and LETI and are working to achieve the RIBA and LETI 2030 goals by reducing carbon emissions across all projects using sustainable materials and modern methods of construction.'

← RESILIENT LONDON ← PROJECT INDEX

Building F, The Bermondsey Project

100 Drummond Rd, Bermondsey, Southwark SE16 4DG | Status: **Planning Granted |** Completion: **2024**

Client: **Grosvenor Britain & Ireland** | Architect: **Kohn Pedersen Fox Associates (KPF)** | Landscape Architect: **Arup** | Structural Engineer: **AKT II** | M&E / Sustainability Engineer: **TFT** | Transport Consultant: **WSP** | Planning Consultant: **Gerald Eve** Visualiser: **Plomp** | MEP/Vertical Transportation/Accoustic Consultant: **Hilson Moran**

- Targeting BREEAM Excellent (offices)
- Urban Greening Factor 0.3 over 5.4 hectare site (masterplan)
- Operational energy: Achieving 55% reduction against part L
- An embodied carbon aspiration of 300-400kg/CO2e/m2

A central component in the Bermondsey Project masterplan, Building F is a former biscuit warehouse, constructed in the 1970s. It is being retained and repurposed as a mixed-use hub, adding 165 residential units above the existing roof line, creating retail and employment space on the lower floors, and extending the public realm.

The Grosvenor Britain & Ireland's masterplan reimagines an underused factory site in an inner London location, reintegrating it with the surrounding residential area, introducing pedestrianised streets for better connection to sustainable and active transport methods. There will be 1,548 rental homes (35 per cent affordable), a 600-place secondary school and c.14,000 sqm of flexible employment space. The masterplan includes three acres of public and play space, 141 new trees and no private cars on site.

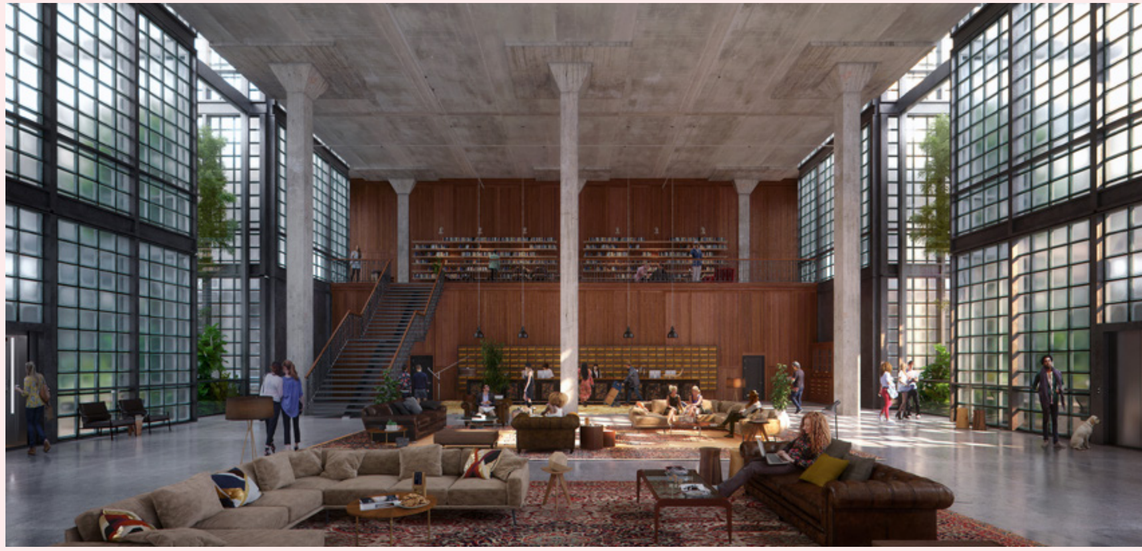
The Warehouse will be a hybrid building, combining reuse with new build. A cradle to practical completion aims for less than 500kg/CO2e/m2 to deliver performance aligned with Grosvenor's 2030 net zero carbon objective and long-term sustainability vision. As part of delivering Grosvenor's Sustainability Development brief, the team is being challenged to provide innovative design solutions to minimise embodied carbon through the building's lifecycle.

The development will also be connected to a district heating scheme with local energy generation, from SELCHP, an advanced Energy Recovery Facility that uses non-recyclable waste to generate electricity, providing low-carbon energy and reducing the pressure on landfill sites.

By retaining the existing warehouse, total embodied carbon emissions are reduced by 16 per cent over the initial baseline model. Upper floors constructed from a CLT hybrid solution significantly reduce embodied carbon. The introduction of a zero-car scheme encourages sustainable travel, whilst the green roofs will contribute to SUDS, improving air quality.

The development embraces low carbon energy, working towards a net zero-carbon balance. Connection to SELCHP sources heat from waste diverted from landfill and there is also passive ventilation, combined with MVHR, to reduce energy use.

'The current design significantly improves on the LETI 2020 embodied carbon target (500kg/CO2e/m2) for residential development with further opportunities being explored to deliver against LETI 2030 target of 300kg/CO2e/m2. This demonstrates the progressive journey and step change from traditional construction methods towards net zero carbon developments and delivering against Grosvenor's 2030'



← RESILIENT LONDON ← PROJECT INDEX

EDGE London Bridge

53 St Thomas Street, Bermondsey, Southwark SE1 3QX | Status: **Proposed |**
Completion: **2024**

Architect: **Pilbrow & Partners** | Structural Engineer: **AKT II** | M&E / Sustainability Engineer: **Atelier Ten**

- 55% reduction in operational carbon emissions, against Part L
- BREEAM Outstanding
- WELL Platinum

EDGE London Bridge, located next to London Bridge Station, will be the most sustainable office tower in London through its design and use of state-of-the-art technology. The new building will have a vibrant and publicly accessible ground floor which in combination with a lush green garden will add to the ongoing transformation of this dynamic part of London's South Bank. The character and activation of the building's base marks a radical departure from that of a traditional London office building. The base of the building will be multilevel inclusive public space where community facilities and flexible workspace animate the public realm, engaging with the surrounding neighbourhood.

The design of the building marries wellbeing and productivity with broader social and environmental sustainability goals. The office space has been designed to meet the needs of a range of businesses from small start-ups in flexible working environments to larger more established companies. Glulam and timber soft spots are integrated across the height of the building to allow expansion and interconnection between floors, marrying reversible adaptability to a variety of material and spatial configurations and enhancing the building's longevity. Terraces on the north elevation of the building are designed to provide a green outlook from the adjacent office spaces whilst creating an external environment which can be used for informal meetings as well as a break-out space. Openable facade elements on each level offer the potential for natural ventilation whilst smart technologies within building such as the chilled ceiling panels with integrated lighting, sensors and other services help create a workplace that supports productivity and human comfort with minimal environmental impact.

EDGE London Bridge will be London's first multi-tenant building to achieve BREEAM Outstanding and WELL Platinum accreditations. Each design decision has been considered to minimise carbon in construction and operation.

To reduce operational carbon emissions, high tech solutions are combined with common sense and advanced building physics models. Natural ventilation, uncommon in most towers, will be possible at the building's perimeter, linked via sensors to shut down the fresh air system when windows are open. Radiant heating and cooling will be provided by ceiling panels, decoupling thermal conditioning from the air supply. Heat rejected as a by-product of providing cooling to meet IT loads will be used in meeting the hot water demand.

The wellbeing of occupants was a key focus before the current pandemic; the design provides enhanced levels of fresh air, which should keep occupants healthier and reduce the spread of airborne diseases.

'EDGE London Bridge has adopted aspirational standards for sustainability, far exceeding local requirements. The project will reduce on-site carbon emissions by more than 55 per cent, and is targeting BREEAM Outstanding and WELL Platinum — the very best scores in industry-respected sustainability benchmarking. Brown roofs, vegetated terraces and an urban garden enhance the local biodiversity. Reduced water demands alongside rainwater and greywater recycling, allowances for cyclists and a green travel plan contribute to ensuring EDGE London Bridge will tread lightly on the planet.'

Atelier Ten and Pilbrow and Partners

← RESILIENT LONDON ← PROJECT INDEX

Roots in The Sky

1 Pocock Street, Southwark SE1 0BU | Status: **Planning Granted |** Completion: **2024**

Developer: **Fabrix London** | Architect: **Studio RHE** | Architect: **Gardiner & Theobald LLP** | Architect: **Sheppard Robson** | M&E / Sustainability Engineer: **Atelier Ten** | Landscape Architect: **Harris Bugg**

- BREEAM Outstanding
- WELL Platinum
- WiredScore Platinum
- 100% Renewable Energy

Roots In The Sky will be London's first office building to deliver a 1.4-acre urban forest rooftop with extensive access for the local community and general public. The project will deliver community space, accommodate collaborative neighbourhood uses, a rooftop restaurant, bar, swimming pool and terraces, all alongside one of the largest roof gardens in Europe, providing cooling shade, fresh air, and access to nature. The building will make a significant contribution to London's ambitious targets for greening, biodiversity, and sustainability—providing space for nature, not just humans.

The radical repurposing of the former Blackfriars Crown Court into a next-gen workspace will deliver 385,000 sq ft of contemporary and sustainable office, commercial and community space. The existing 1960s structure provides the blank canvas to develop a forward-thinking office building that replaces an urban heat island with a genuinely living rooftop.

The project team have designed a lightweight hybrid steel and CLT frame, reducing embodied carbon and providing the ability to support an urban forest with 1,300 tonnes of soil. Internally, the building's intuitive environmental strategy not only exceeds the highest sustainability accreditations but seeks to further enhance occupiers' wellbeing with a passive ventilation strategy, openable windows maximising access to fresh air, and a full-height feature atrium which facilitates the extraction of waste heat from the building.

We have covered our cities in concrete—how do we respond? The rooftop and building landscaping, designed by landscape design practice Harris Bugg, exceeds the urban forest criteria set out by the UN with canopy cover of 23 per cent, provided by over 100 established trees and 10,000 plants. Technical aspects of the roof are also ground-breaking, such as the design of a passive water capture system which will irrigate the planting above on demand, reducing the net external water demand of the building.

Uncertain, extreme weather is facing London; this building was designed with adaptive flexibility in mind. An openable facade provides natural ventilation, and urban greening of the terraces gives shade in summer, reducing local temperatures by up to 8°C.

An all-electric building, wastewater heat recovery and air source heat pumps further reduce reliance on the grid.

Embodied carbon has been thoughtfully considered in material selection, utilising timber within a steel frame with high recycled content. Rainwater is recycled for irrigation, alleviating pressure on water infrastructure, with 1,300 tonnes of absorbent soil providing a natural water buffer, protecting against flash flooding.

'Roots In The Sky is a next-generation workspace that through optimised passive design, use of energy efficient active systems, responsible material selection and creation of accessible nature, will help to contribute to London's climate resilience and zero-carbon future. The adaptive nature of the building will cater for wider variations in weather extremes and evolving working practices, in readiness for the challenges of a changing world. We hope that Roots in the Sky demonstrates the value of sustainable, community-led development.'

Clive Nichol, CEO, Fabrix

The Forge

31 Priory Road, Newham E6 1DN | Completion: 2019

Client: **Telford Homes** | Architect: **RM_A |** M&E / Sustainability Engineer: **Mendick Waring** |
Structural Engineer: **Powell Tolner & Associates**

- Passive design
- Green roofs encourage ecological diversity, reduce urban heat gains and provide amenity for residents
- Communal heating system, rooftop PVs

A new tree-lined public street, a collection of communal gardens and a series of blue and green roofs are the key highlights of this scheme which has delivered 192 new homes, including a terrace of unique townhouses and a 14-storey tower. The project incorporates 35 per cent affordable homes, with the remainder of the site let as a Private Rental Scheme supported by communal facilities such as a residents' lounge, gym and generous garden spaces. A limited material palette, of predominately buff and white brickwork, is offset by playful accents of yellow metalwork and feature brickwork detailing.

The massing of the buildings on the site has been carefully considered so that this is concentrated in a north south linear spine block, roughly down the middle of site, to minimise shading of the new public street and the communal garden spaces on either side. East-west orientated finger blocks are positioned perpendicular to this spine and set down toward the western boundary. These blocks provide shelter and enclosure of the courtyard gardens. These blocks are orientated with apartments on the southern side, overlooking the garden spaces, or Priory Park to the south, and with communal circulation on the northern side.

Good passive design principles extend to the design of the townhouses. Like the main apartment blocks on the opposite side of the new street, this terrace is orientated north-south against the existing eastern site boundary, minimising its shading impact. Each house is orientated looking directly south, with the main living room and terrace raised to first floor level above a private parking garage. The massing of the second storey of each house is set back at the rear and onto the eastern boundary to the side, in order to further limit the shading and impact on the house behind, or adjacent existing neighbouring gardens.

The scheme is located within a critical drainage area which resulted in a particularly onerous planning restriction on the maximum surface water discharge rate from the scheme of 3.5 litres a second. This is 60 per cent of the equivalent greenfield runoff rate, on a contaminated urban site that previously comprised 87 per cent hard-standing or non-attenuated roofs. An innovative blue roof system has been combined with green roofs, ground level soft landscaping and below ground attenuation tanks and a 'hydrobrake' to achieve this restriction. These green roofs also encourage ecological diversity, reduce urban heat gains and provide amenity for residents.

Blue and green roofs, below ground attenuation tanks and ground level soft landscaping combine to massively reduce the surface water discharge rate from the site to 60 per cent of the equivalent green field discharge rate. This is a significant achievement on a tight urban contaminated site.

'Passive design principals were a key concept of the scheme design, particularly the massing of the different buildings on the site to limit shading of amenity spaces or neighbouring dwellings, whilst allowing suitable enclosure and passive surveillance of the public and semi-public realm. The scheme includes a communal heating system, roof top PVs and excellent building envelop thermal performance. Green and blue roofs and soft landscaping encourage ecological diversity, reduce urban heat contribution and limit surface water discharge rates.'

← RESILIENT LONDON ← PROJECT INDEX

The Marq

94 Jermyn Street, City of Westminster SW1Y 6JE | Completion: 2016

Client: **The Crown Estate** | Architect: **Rolfe Judd** | Contractor: **Skanska Construction**

- BREEAM Excellent for the retail units, and 'Outstanding' for the office component
- 60% improvement against building regulations targeting CO2 emissions
- WELL Gold shell and core

This new contribution to St James's Conservation Area sits on a prominent corner site just off Piccadilly. The completed building ('The Marq'), comprising 46,000 sq ft new office floors, retail and restaurant space for The Crown Estate has now settled into its context and become a strong but playful addition to Jermyn Street, a historic part of the West End.

Jermyn Street and the surrounding area is well known for its association with fine tailoring, food and wine merchants, restaurants and art galleries. The building is therefore finely detailed and 'tailored' with attention to every detail to befit its historic location. Just like Beau Brummell, the streets original Dandy and whose statue greets visitors, The Marq continues to turn heads and capture the attention of on lookers, with its gilded corner artwork and striking entrance gates.

What is not immediately apparent from the outside is the building's remarkable performance credentials. For the client, health and wellbeing are central guiding principles to their purpose. In response, the building has been designed in collaboration with Watermans Structures and Watkins Payne Partnership, specifically to achieve a Gold rating for WELL Shell and Core Certification. The Marq is one of only two completed WELL 'Gold' shell and core buildings in the UK.

The Marq achieved BREEAM 'Excellent' for the retail units, and 'Outstanding' for the larger office component, as well as a 60 per cent improvement against building regulations targeting CO2 emissions. Roofs are landscaped with biodiverse planting, bird and bat boxes. Rainwater is harvested, filtered, and reused to supply all WCs for flushing purposes throughout the building. Renewable technologies consisting of air source heat pumps, photo voltaic and solar thermal panels contributed towards The Marq's EPC A.

Rolfe Judd remain committed to developing beautiful buildings, working with their client's and industry professionals to illustrate how excellent design, technology and development can become carbon neutral.

High efficiency MERV 13 equivalent filters are used within the fresh air handling unit. A fully automated building energy management system allows full integration of the plant operation and energy meters with consumption of fuel, power and water being monitored throughout the building. There is a facility to remote monitor the system.

All the elements have low or zero VOCs. This is crucial to ensure high air quality within the building. An extensive process with the client and design team was required for material selection. Rigorous reviews, mock ups and sampling has resulted in a high quality end product.

'Sustainability was high on the agenda from conception and the building has shown a 60 per cent improvement against Building Regulation Part L2A:2013 target CO2 emission rate. The Marq, has become the first new-build project in the UK to achieve both a BREEAM New Construction Outstanding rating for its shell and core and the WELL Gold Certification. The double-certification recognises The Marq as a building which has been designed to enhance health, wellbeing and productivity, as well as deliver the highest environmental performance.'

22 Park Crescent

22 Park Crescent, London W1B 1PD | Completion: **2021**

Architect: **PDP London** | Structural Engineer: **AKT II** | Planning Consultant: **DP9** | Services Engineer: **Hilson Moran**

- Grade I listed retrofit with thermal upgrade to the envelope comprising the roof, windows and walls
- Fabric first approach
- Increased thermal performance has led to significantly reduced energy bills for residents

One of the magnificent Grade I listed crescents, which were originally designed by John Nash, has been rebuilt as the front elevation to a range of new residences. Behind the heritage facade is a new contemporary design. Radiating out from, and adjoining the main curved building are two existing buildings with 92 apartments that were originally built in the 1960s. These have been retrofitted and upgraded with a fabric first approach while the residents remained in occupation.

The transformation of these two buildings is truly remarkable, demonstrating how a failing building with spalling and cracking masonry can be saved and given a new lease of life for many decades to come. Of typical design and construction of the time, they were fitted with a large proportion of single glazed Crittall windows. Apartments were cold in the winter and overheated during the summer months.

A total retrofit overclad solution was conceived with thermal upgrade to the envelope comprising the roof, windows and walls. At eight storeys and 22 metres high, the design team needed to make very careful product decisions in terms of combustibility. Although prior to the recent new regulations, it was decided that products in line with the more rigorous standards would be selected.

The new warm jacket consists of a mineral wool, rendered wall insulation, selected for its high energy saving performance with aluminum faced timber windows to provide acoustic attenuation from the site conditions and traffic. Thermal bridging was checked at all key floor and window junctions, and fire and cavity barriers were installed.

The increased thermal performance has led to significantly reduced energy bills for residents, with studies of the savings in progress. More importantly is perhaps the much higher comfort levels with overheating considerably reduced and acoustics improved.

The structure of these two 1960s buildings was failing, the performance in terms of comfort for occupants was poor and energy bills high. If left, the buildings would continue to deteriorate giving an uncertain future for the residents. Given the significance of the connecting building, and the decision to demolish and rebuild this, the blocks also could have been a candidate for demolition. Instead, through respectful design, the buildings are saved and renewed, reducing landfill and saving carbon.

POE is in progress, data is currently being analysed and the results are looking very promising, it will encompass energy use, occupants reaction to the buildings in use and performance as resilient buildings for each season. The key issue was community involvement and that continues.

'The sustainable retrofit of these two 1960s buildings is complimentary to the Regent's Crescent development. The method of construction resulted in a successful approach to secure future climate resilience of London building stock. They contribute to London's zero carbon aspirations by taking an opportunity to update large areas of failing masonry bringing them into the realm of carbon reduction. The future benefit of this careful design will endure for the occupants and indeed they have already responded positively.'

Iain McLellan, Associate, PDP London

458 Oxford Street

458 Oxford Street, City of Westminster W1C 1AP | Status: **Proposed |** Completion: **2026**

Architect: **Pilbrow & Partners** | M&E / Sustainability Engineer & Structural Engineer: **Arup** | Project Manager: **Gardiner & Theobald** LLP

- **Targeting BREEAM Outstanding, WELL Platinum, and WIRED Platinum certification**
- **Blue and green roofs with 0.4 Urban Greening Factor and ground floor trees for storm water attenuation, with 40% additional rainwater volume allowance**
- **Resilience against storm events, increased ground water levels, heat waves and high wind loads**

The new store on 458 Oxford Street will be a BREEAM Excellent flagship for the M&S of the future, focused on flexible and innovative retail, backed by smart infrastructure and carbon neutral operations. Complementing the retail, the proposals deliver a generous workplace, the first multi-tenant development in Westminster to target BREEAM Outstanding, WELL Platinum, and WIRED Platinum certification. Each design decision has been considered to minimise carbon in construction and operation, with the energy and carbon targets for the project driven by London Energy Transformation Initiative guidance and the UK Green Building Councils framework definition for Net Zero Carbon buildings.

The need for change on Oxford Street is urgent and compelling—its condition does not match its international status. The growth of online retail & Covid-19, alongside the climate emergency, has created a rapidly evolving landscape for retailers where an inviting environment is more critical than ever. 458 Oxford Street, the home of M&S's Marble Arch Store, offers a positive vision—driven by the UN Sustainable Development Goals—for Oxford Street's future environmental, cultural, and economic sustainability. The proposals reaffirm the raison d'être of the city centre as a place of creative exchange vital to our human needs and communal spirit, where connected and culturally proliferating density is favoured over isolated, one dimensional continuous sprawl.

The proposals deliver multi-faceted transformation to the public realm, reintroducing historic permeability through a new arcade, developing a pedestrian focused secondary street network for the district. They make valuable contributions to strategic greenways through a new landscaped oasis space, avenues of trees on Oxford and Orchard Streets and generous greenery to upper levels with an Urban Greening Factor in excess of 0.4.

This rich spatial experience provides the doorstep to a fit for purpose retail environment that retains M&S' presence as an anchor tenant in the district.

'Our designs for 458 Oxford street will deliver a workplace that is BREEAM Outstanding, WELL Platinum, and WIRED Platinum certified. Our energy and carbon targets align with those of LETI- 55kWh/m2.yr energy consumption, and embodied carbon <600kgCO2/m2 through a fabric first approach and use of passive design. The proposals will meet predicted changes in climate within London at both 2050 and 2080, with urban greening in excess of a 0.4 Urban Greening Factor, enhancing biodiversity through drought tolerant and seasonal landscaping supplemented by generous bluroof attenuation. The use of renewables delivers an additional 44,000kWh of energy per year.'

← RESILIENT LONDON ← PROJECT INDEX

Timber Square

5–11 Lavington Street, Southwark SE1 0NZ | Status: **Proposed**

Architect: **Bennetts Associates** | Client: **Landsec** | Structural Engineer: **Heyne Tillett Steel** | M&E / Sustainability Engineer: **Hoare Lea**

- UKGBC Net Zero Carbon Buildings Framework
- Targeting BREEAM Excellent
- Embodied and whole-life carbon assessment
- Carbon offset strategy for emissions associated with manufacturing and construction

Timber Square is a landmark commercial development comprising the repair, refurbishment and expansion of an existing print works as well as the new-build construction of a 15-storey office. The project will deliver a Net Zero Carbon building in operation and construction, in line with the UKGBC Net Zero Carbon Buildings Framework.

The design centres around a number of key concepts for the office of the future: sustainability, adaptability and offsite construction. To deliver a truly sustainable development, the new superstructure for both buildings will be constructed from a hybrid CLT and steel frame. This not only reduces the embodied carbon of the overall development but also creates flexible and future-proofed space owing to the long spanning timber panels. The environmental performance is further enhanced through off-site construction methods, lowering transport emissions associated with construction as well as reducing noise, pollution and traffic.

An embodied and whole-life carbon assessment has been undertaken from the project's inception, and the building will also act as a pioneer project for the 'Design for Performance' initiative, which sets verifiable operational energy performance targets.

Designed with wellbeing in mind the existing commercial building has been creatively remodelled to deliver open-plan floors with high levels of natural light. Each floor will feature open access to a green roof terrace while the interiors will be finished with natural softwood materials, providing significant biophilic benefits. With flexible floor plans and break out spaces, the building will cater for a new generation of enterprises, from global corporations to small start-ups. The building's lower floors will feature a mix of retail and leisure facilities, rejuvenating the space in-between the surrounding buildings.

Once complete, Timber Square will deliver a sustainable model for future office developments which aim to exceed the industry's Net Zero targets.

'As an industry, we know that embodied carbon is the elephant in the room which requires urgent attention. We therefore decided to make this a key focus of our design from the outset and have achieved an extremely collaborative relationship with the entire design team. HTS were instrumental in the retention of much of the existing structure and making the case for Cross Laminated Timber as a building material, slashing the emissions associated with the structure. This project embodies Landsec's approach to sustainable developments and we hope that it sets a new standard for low carbon design.'

Alexia Laird, Sustainability Manager, Landsec

© Bennetts Associates

← RESILIENT LONDON ← PROJECT INDEX

The Wilds

Barking | Completion: **2023**

Architect: **Jestico + Whiles** | Engineer: **XCO2**

- Targeting BREEAM Excellent
- 37.3% CO2 savings over an equivalent Part L compliant scheme
- Sustainable waste management technology

The Wilds Ecology Centre and Envac Waste Collection Station are part of the Barking Riverside masterplan for over 10,000 new homes, as well as education, retail and workspace. The development is a designated Healthy New Town under NHS England's flagship programme to promote healthier communities.

The masterplan incorporates 29 hectares of open parkland consisting of a mosaic of habitats. The Wilds serves as a gateway and focal point for the parkland and habitat areas.

The building consists of 1,350 sqm of accommodation arranged over three levels. The lower storeys of the building contain an innovative vacuum waste collection system, the largest of its kind in the world, serving the new homes at Barking Riverside. The upper storey contains the ecology centre, consisting of a multi-purpose exhibition space and workspaces which are available for hire and use by the community for events and co-working.

The first floor roof terrace connects via gentle ramp and steps to the terraced, walled wildlife-focussed garden containing a mosaic of habitats including reedbeds, wildflower and wet meadows, marginal and ornamental grasses and woodland as well as climbing planting on the terraced gabion walls.

Material selection has been chosen to give the building a grounded appearance in the landscape. The gabion walling and weathering steel cladding provide a robust, long-life and low-maintenance external skin to the building and enhance the earthy, grounded aesthetic of the building.

The Wilds stands as the meeting point between sustainable infrastructure, ecology-focussed building, and responsible urban living. Key features include:

- Use promotes ecological education, highlights importance of making space for other species.
- Showcases sustainable waste management technology, reducing exhaust pollution and disruption from refuse vehicles.
- Building superstructure formed from mass timber, reducing embodied carbon as well as sequestering carbon for the lifecycle of the structure and potentially beyond. Timber frame is exposed internally, enhancing user's connection with natural materials, avoiding additional finishes.
- Durable and low-maintenance gabion and weathering steel cladding materials. Self-finished materials are more easily recycled and re-used at the end of their lifespan and avoid the need for applied chemical coatings and preservatives.

'The Wilds ecological centre and Envac waste collection station has reduced operational carbon emissions through the be lean, be clean and be green energy hierarchy, implementing high fabric standards and renewable and low-carbon technologies. Embodied carbon is reduced through the mass timber frame selection.

The building use places ecological enhancement and education at the top of the agenda and the landscape design actively encourages wildlife regeneration through the introduction of a mosaic of habitat types.'

Warwick Court

Paternoster Square, City of London EC4M | Status: **Under Construction |** Completion: **2022**

Client: **Stanhope plc** | Architect: **Fletcher Priest Architects** | Structural Engineer, Building Services Engineer: **Waterman Group**
Project Manager: **REAL PM** | Cost Consultant: **Alinea** | Contractor: **Mace**

- **BREEAM Excellent**
- **44.5% reduction in operational carbon emissions**
- **The building will be fossil fuel-free and incorporate new air source heat pump technology and intelligent LED lighting**

Major refurbishment of Warwick Court transforming the dated commercial premises into 180,000 sq ft of prime office space. The redevelopment will substantially upgrade the existing eight-storey building. Through comprehensive refurbishment and targeted interventions, which include a full reconfiguration of the ground floor, the scheme will extend the operational life of this 18-year-old building and transform it to meet today's expectations for flexible and adaptable office spaces, with the aim of achieving a 'platinum' WiredScore rating.

Working alongside Fletcher Priest Architects, Stanhope and Mace, Waterman's multidiscipline team is providing mechanical and electrical, structural and sustainability services to sensitively update the building. The entire ground floor is being significantly improved to provide an attractive frontage, offering a mix of retail uses with the main office entrance from Paternoster Square remodelled to provide a generous and welcoming space.

With a focus on wellness central to the redevelopment's ethos, the scheme improves access to the new cycle and shower facilities on the lower ground floor and basement levels. Designed to maximise the uptake of active travel methods, the proposals provide 210 cycle spaces along with ample changing facilities. In a further boost to wellness, Warwick Court's occupants will benefit from increased external amenity space, with two high quality terraces at levels six and eight offering expansive views of St Paul's Cathedral. Coupled with the upgrade of the existing external spaces at levels four and five, the building will now offer 6,000 sq ft of outside amenity space.

Originally designed for a single tenant, the building has now been remodelled to welcome multiple occupiers, with shell and core upgrades incorporating new MEP systems and enhanced on-floor WC provision throughout. The ground floor through to the fifth floor will be fitted out to Cat A, with subdivisions allowing joint tenancies on each floor.

Waterman's sustainability team have carried out a whole life carbon analysis of the refurbishment. The building will be fossil fuel-free and incorporate new air source heat pump technology and intelligent LED lighting. The majority of the building will use green refrigerant with low global warming potential (CO2 and R-1234ze). Carbon reductions will be achieved through a number of measures including prioritising reuse during the strip-out, use of 50 per cent GGBS in the concrete, reuse of the Capri stones, reuse of the roof paving and the anticipated use of 100 per cent renewable electricity during the construction phase by the principal contractor.

'The project team took full advantage of the opportunity to explore the best ways to reduce the building's carbon footprint and enhance the energy performance of the existing building. We analysed the impact of the different phases of the whole life carbon assessment and identified key areas where carbon savings could be made through the design and procurement process. With carbon a key metric in the decision making process alongside conventional considerations such as cost and aesthetics, we prioritised the areas to focus on in terms of carbon reduction both elementally and through life cycle stages for the 60-year reference period.'

Mark Terndrup, Managing Director, Building Services, Waterman Group

← RESILIENT LONDON ← PROJECT INDEX

Agar Grove Estate Redevelopment

Murray Street, Camden NW1 9QZ | Status: **Under Construction |** Completion: **2025**

Client: **LB Camden** | Architects: **Hawkins\Brown and Mae Architects Ltd |** M&E / Sustainability Engineer: **Max Fordham** | Passivhaus Consultant: **Max Fordham** | Passivhaus Architect: **Architype** | Landscape Architect: **Grant Associates** | Contractor: **Hill Partnership** | Project Manager: **Arcadis** | Structural Engineer: **Stantec**

Agar Grove is a 507-home estate regeneration scheme in Camden, London. 80 per cent of the homes will be built to a Passivhaus standard, the largest development of its kind in the UK. Comprehensive resident consultation has been central to the design. Construction has been carefully phased to allow most residents to remain on-site during the works, to maintain the community spirit into the new neighbourhood. All Phase 1a dwellings are dual aspect, enabling cross ventilation for effective natural cooling as temperatures increase. The communal MVHR system allows Camden to introduce air cooling in future, which could be powered by the on-site PV array.

- 507-home estate regeneration scheme in Camden
- 80% of the homes will be built to a Passivhaus standard
- Tackling fuel poverty with an estimated 90% reduction in energy bills for residents

Axion House

Lewisham | Status: **Planning Granted |** Completion: **2023**

Client: **London Square** | Architect: **PRP Architects** | Engineer: **Heyne Tillett Steel**

Axion House is a mixed-use development adjacent to the Ravensbourne River and two major rail lines. The concertina structure rises to nine and 16-storeys creating two towers, with a 3.5m cantilever forming the striking entrance. Creative public realm design mitigates flood risk and includes raised boardwalks which cascade down to the riverside. Significant planting creates spaces that maximise benefit to wildlife. The complex nature of contaminated brownfield site with the Ravensbourne River and two rail lines forming three boundaries made it essential that future climatic conditions were considered from the outset.

- Targeting BREEAM Excellent
- The building has been elevated above the modelled flood levels to ensure safe access for residents in the event of increased flooding in the future
- 95% reduction in surface water compared to the equivalent existing 100-year storm

Barbican Podium Phase 2

Beech Street, Barbican, City of London EC2Y 8NH |
Status: **Proposed |** Completion: **2024**

Client: **City of London Corporation** | Project Manager, Landscape Architect, Structural Engineer, Heritage Consultant: **Atkins** | Quantity Surveyor: **Stace** | Communications: **Comm Comm** | Access: **Andrew Lord**

The public walkways across the podium deck of the Grade II listed Barbican Estate are leaking into the occupied spaces below. In response to the City of London's Climate Action Strategy and in consultation with Historic England and residents a greener approach is being devised to repair the drainage and replace the waterproofing membrane. This builds on Chamberlin, Powell and Bon's original vision for the Barbican and increases the extent of greening across the podium, increasing in biodiversity, improved water management and mitigation of solar radiation.

- Increasing greening, biodiversity, improved water management and mitigation of solar radiation

Belgrove House

King's Cross, Camden NW1 | Status: **Proposed |** Completion: **2024**

Client: **Precis Advisory** | Architect: **Allford Hall Monaghan Morris** | Acoustic Consultant: **Sandy Brown** | Approved Inspector: **Bureau Veritas** | Cost Consultant: **Alinea** | Ecology Consultant: **PJC Consultancy** | Facade Engineer: **FMDC** | Fire Consultant: **Bureau Veritas** | Heritage Consultant: **Peter Stewart Consultancy** | Landscape Architect: **Bradley-Hole Schoenaich Landscape** | M&E / Sustainability Engineer: **Atelier Ten** | Planning Consultant: **Gerald Eve** | Community Consultation Consultant: **London Communications Agency** | Services Engineer: **Atelier Ten** | Structural Engineer: **AKT II** | Transport Consultant: **TTP**

Located at the centre of the Knowledge Quarter opposite King's Cross and St. Pancras stations, Belgrove House will be a new specialised office and laboratory building for the life sciences sector. It is designed to be innovative, highly sustainable, and an example of carbon emissions reduction in construction, operation, and future refurbishment. The proposal was developed within the framework of an extensive series of sustainable design measures, including the reuse and choice of materials with low embodied carbon, heat recovery from lab exhaust system, and a whole life cycle carbon assessment informing the design.

- Targeting BREEAM Outstanding
- Designed to be WELL enabled
- 43% reduction in regulated operational carbon emissions
- 95% of construction, demolition and excavation waste will be reused or recycled

135 Bishopsgate

135 Bishopsgate, City of London EC2M 3YD | Status: **Under Construction |** Completion: **2021**

Client: **British Land** | Architect: **Fletcher Priest Architects** | Contractor: **Sir Robert McAlpine**

The existing building is part of a 300 metre setpiece along one of the City's major thoroughfares. Designed and completed by SOM in the late 1980s, the building sits over Liverpool Street Station. Fletcher Priest have refurbished the building by opening up the frontages and public realm, with newly serviced and finished workspaces and garden terraces. By retaining the structure and 90 per cent of the envelope, the embodied carbon impact is very low (the retained steelwork alone equates to half an Eiffel tower) with the building achieving BREEAM 'Excellent'.

- 90% of the envelope retained
- BREEAM Excellent

155 Bishopsgate

Broadgate Business Centre, City of London EC2M 3TQ | Status: **Under Construction |** Completion: **2021**

Client: **British Land** | Architects: **Fletcher Priest Architects** and **Skidmore Owings & Merrill**

The project's unique challenge was to carry out the refurbishment while still occupied by half its tenants. By choosing refurbishment, we have ensured the carbon embodied in the structure does not get released. New windows and improvements to the building fabric allows the building's energy performance to meet contemporary standards while allowing us to retain 90 per cent of the original envelope. By opening up the plinth with wide, cascading stairs we invite the public into the previously underused retail spaces. The reconfiguration of the street facing lobby into a bar/café opens up a through-route to a pedestrian pathway at the back of the building.

- Refurbishment
- Retain 90% of the original envelope

Bloom Clerkenwell

50 Farringdon Road, Islington EC1M 3HE |
Status: **Under Construction |** Completion: **2021**

Client: **HB Reavis** | Architect: **John Robertson Architects** | MEP and Facade Consultants: **Arup**

Bloom Clerkenwell houses 18,100 sqm of wellness focused office accommodation, landscaped roof terraces, an in-house gym, and amenity retail. The new office building for HB Reavis is situated over the Crossrail station at Farringdon West and has outstanding links with the city and beyond. The use of red terracotta is a reference to the adjacent transport infrastructure with the faience and aluminium giving Bloom a contemporary identity. The project is on course to achieve WELL Platinum and BREEAM Outstanding and has achieved WiredScore Platinum.

- Targeting BREEAM Outstanding
- Targeting WELL Platinum and Wirescore Platinum
- EPC rating of B
- Net zero carbon in operation
- 100% green energy

Bracken House

1 Friday St, City of London EC4M 9BT | Completion: **2019**

Architect: **John Robertson Architects** | Client: **Obayashi Corporation** | Engineer: **Arup**

The refurbished Grade II listed Bracken House now provides an enlarged entrance hall, new internal courtyards linking the central office space with the 1950's wings, and a landscaped roof garden with running track. The offices have been modernised with a new energy efficient air conditioning system, state-of-the-art LED lighting and additional daylight introduced into the atrium. The vast majority of the project was retained, including all of the structure and external envelope giving the building an extremely low carbon footprint.

- BREEAM Very Good
- Retained structure and external envelope
- Landscaped roof garden

Brunel Building

33 North Wharf Road, Paddington, Westminster W2 1AY | Completion: **2019**

Client: **Derwent London** | Structural Engineer, Facade Engineer, Transport Consultant: **Arup** M&E / Sustainability Engineer: **Cundall** | Quantity Surveyor: **Arcadis** | Project Manager: **Gardiner & Theobald LLP** | Approved Inspector: **MLM** | Contractor: **Laing O'Rourke** | Landscape Architect: **Plincke / Barton Willmore**

The Paddington Basin site of the Brunel Building presented significant challenges, immediately adjacent to the 200 year old canal and above two Bakerloo Line tunnels. Working with Arup engineering, the innovative exoskeleton structure mitigates those challenges while providing column-free floorplates and 20 per cent shading to the facade, helping to reduce energy demand. The building features an aquifer heat storage/exchange system which reduces its energy use by 70 per cent compared to conventional buildings. The project also included significant public realm improvements and provision of hospitality spaces on the ground level.

- BREEAM Excellent
- LEED Gold
- 20% passive solar shading
- 70% reduction in energy use

Buckingham Green

65 Buckingham Gate, London SW1E | Completion: **2018**

Client: **London & Oriental** | Architect: **Fletcher Priest Architects** | Project Manager: **Gardiner & Theobald LLP** | Quantity Surveyor: **Gardiner & Theobald LLP**

The scheme consists of a refurbished Miesian tower alongside two new buildings, comprising offices, retail and 65 apartments for London & Oriental. Buckingham Green sets new standards for public realm in this part of London, close to Parliament and Westminster Abbey, allowing greater pedestrian access and permeability, as well as extending ground-level activity throughout the site while keeping 70 per cent of the existing building fabric intact, and is now 80 per cent more efficient than the original tower. New trees were planted to mark the new route through the site.

- 80% more energy-efficient
- 70% of the original building fabric retained
- Pedestrian access and permeability and new trees planted

Bureau, 90 Fetter Lane

90 Fetter Lane, Holborn, City of London EC4A 1PT | Completion: **2018**

Client: **Evans Randall Investors** | Architect: **John Robertson Architects** | Facade Engineer: **Neil Murphy Studio** | Structural Engineer: **Heyne Tillett Steel**

Bureau, 90 Fetter Lane, redevelops an existing 1980s office building offering flexible retail and café opportunities on Norwich Street and prime office on Fetter Lane. Carbon savings were made by reusing the building and conducting a Life Cycle Assessment to select low carbon materials that could be recycled and reused. Sustainable features include new full-height glazing, maximising natural light, and market-leading cycle facilities to support low-carbon travel. The new plant created efficient heating, cooling and lighting, controlled by a Building Management System.

- Wired Score Platinum
- WELL Standard ready
- BREEAM Excellent

77 Coleman

Coleman Street, City of London EC2R 5TA | Completion: **2020**

Client: **Kajima Properties** | Architect: **BuckleyGrayYeoman** | Engineer: **Heyne Tillett Steel** | Cost Consultant: **Exigere** | Contractor: **VolkerFitzpatrick** | M&E / Sustainability Engineer: **GDM Partnership**

77 Coleman involves the comprehensive redevelopment of an existing building that fronts onto two major thoroughfares within the City of London, and demonstrates an approach to retaining and refurbishing a building rather than knocking it down and starting again. Overall, we retained 78 per cent of the original concrete frame including foundations (by volume), equating to around 13,200 tonnes of concrete and 3,522 tonnes of embodied CO2 retained. As a result, the finished building still feels new, with generous floor-ceilings.

- BREEAM Excellent for the new elements
- BREEAM Very Good for the existing structure
- 78% of the original concrete frame including foundations retained
- 3,522 tonnes of embodied CO2 saved

Dulwich College - Junior and Lower School

Southwark | Status: **Under Construction |** Completion: **2022**

Architect: **alma nac Ltd** | Structural Engineer: **engineersHRW** | Quantity Surveyor: **Quantem Consulting LLP** | Acoustic Consultant: **Max Fordham** | M&E / Sustainability Engineer: **Max Fordham**

The development at Dulwich College includes both new build and refurbishment elements, with a new library, ICT classrooms, wellbeing and admin facilities and hall connecting to exiting classrooms which are to be refurbished. From the outset, Dulwich College prioritised the sustainability aspirations of the project and have set the aspiration to be net zero carbon in both construction and operational energy. The building does also include standard window openings, but these are intended to only be used to manage more extreme weather scenario, when occupants will be more than willing to trade some acoustic comfort for thermal comfort.

- Aiming to be net zero carbon in both construction and operational energy

Ebury Edge

44 Ebury Bridge Road, Westminster SW1W 8QY | Completion: **2020**

Client: **City of Westminster** | Architect: **Jan Kattein Architects** | Structural Engineer, M&E / Sustainability Engineer, Planning Consultant: **Arup** | Cost Consultant: **Gardiner & Theobald LLP** | Contractor: **H A Marks Ltd**

Ebury Edge is a temporary work and community space at the heart of Westminster, providing affordable workspace and retail units, a cafe, community hall and public courtyard. As part of the redevelopment of Ebury Bridge Estate, Westminster City Council was keen to give the local community an immediate sign of the regeneration. The meanwhile buildings include a community hall, cafe and workspace and will be in place while the renewal of the estate progresses for about five years.

- The timber frame has been designed to be disassembled and reassembled no less than 5 times within a 50 years design life
- Concrete Mix for the foundations used 40% Cement Replacement
- Cooling and heating is provided by Air Heat Source Pumps
- The building is 100% electric

The Everglades & Orchard Road

Hounslow | Status: **Planning Granted |** Completion: **2023**

Architect: **BPTW**

Orchard Road provides five affordable homes, while The Everglades delivers 33 affordable homes through the demolition of an existing block and the creation of three flat blocks on infill sites. Both sites have been designed to incorporate fabric-first and Passivhaus principles helping to achieve a zero-carbon development at Orchard Road and a 94 per cent reduction in carbon emissions at The Everglades. Sustainable technologies including air source heat pumps, PV panels and MVHR systems have been integrated into both schemes.

- Zero-carbon development
- Fabric-first and Passivhaus principles
- 94% reduction of CO2 emissions
- Heat pumps, PV panels and MVHR systems

Grain House

12 Dryden Street, City of Westminster WC2E 9NA |
Status: **Planning Granted |** Completion: **2023**

Client: **Hines** | Architect: **Barr Gazetas** | Structural Engineer: **Elliott Wood** | Contractor: **Knight Harwood** | M&E / Sustainability Engineer: **Scotch Partners** | Project Manager: **Rise Management Consultancy** | Cost Consultant: **Gardiner & Theobald LLP** | Light Consultant: **Hoare Lea**

Grain House is a heritage-led refurbishment that combines five buildings, providing retail, restaurant, and gym use at basement/ground floor and flexible office space above. The existing buildings have a varied history, having housed a seed merchant company, a brass and iron founders, and non-conformist chapel. The design draws heavily on this light industrial heritage and the characterful nature of Covent Garden. All facades have been retained, with a mixture of historic and contemporary extensions to complement its rich and varied context.

- Retain and enhance approach, based around circular economy principles
- Targeting BREEAM Excellent
- WELL Platinum accredited and Wired Score certified

The Gramophone Works

The Base Station, 326 Kensal Road, Kensington and Chelsea W10 5BZ | Status: **Under Construction |** Completion: **2022**

Client: **Resolution Property** | Architect: **Studio RHE** | Structural and Civil Engineer: **Heyne Tillett Steel** | M&E / Sustainability Engineer: **Dowds** | Contractor: **Graham**

The Gramophone Works is a new landmark commercial development comprising refurbished, extended and new-build contemporary office spaces for the creative industries. The building features large, open plan working areas, a canal-side café, communal facilities and green areas at ground and roof levels. The existing concrete-framed building has been repurposed and a new-build extension created from structural timber, using low carbon construction techniques. By adopting a sustainable approach to design, construction and operation, the project is an exemplar of low carbon development.

- Repurposed concrete-framed building with CLT extension
- Embodied carbon was reduced to 152kgco2e/m2 for the structure

Hackbridge Primary School

45 Hackbridge Road, Hackbridge, Wallington, Sutton SM6 7AY | Completion: **2019**

Architect: **Architype** | Quantity Surveyor: **Synergy** | Structural Engineer: **Price and Myers** | M&E / Sustainability Engineers: **Elementa Consulting**

Hackbridge is the UK's first true net zero carbon, 'PassivHaus plus' certified, primary school. Careful consideration has been taken to select materials that are healthy, have low embodied energy and are easy to construct and maintain. Triple glazed windows enhance thermal comfort, a highly efficient ground source heat pump system with inter-seasonal heat storage meets space heating demands, and a rooftop PV array provides renewable electricity to offset 100 per cent annual energy demands, with solar thermal panels meeting 80 per cent of hot water needs.

- PassivHaus Plus certified primary school
- Zero Carbon
- One Planet Living Strategy
- Heat pump, inter-seasonal heat storage, rooftop PV array
- Renewable electricity to offset 100% annual energy demands

7 High Street

International House, 7 High Street, City of Westminster W5 5DB |
Status: **Proposed |** Completion: **2024**

Client: **British Land** | Architect: **Barr Gazetas** | Structural Engineer: **Evolve**
M&E / Sustainability Engineer: **Insignis** | Quantity Surveyor: **Gardiner & Theobald LLP**
Transport Consultant: **Stantec** | Project Manager: **RPP** | Landscape Architect: **MacGregor Smith**

High Street comprises the complex refurbishment of five floors to create over 15,000 sqm of flexible office accommodation, set above a live shopping centre and wrapped around two vibrant, central courtyards. The new main entrance establishes a stronger public presence. A unique and welcoming arrival experience will greet visitors, as they are whisked to the upper reception on escalators lined with growing walls. The new atrium reception opens directly onto the courtyard 'secret gardens' at the heart of the building.

- Targeting BREEAM 'Outstanding'
- Targeting WELL Platinum rating
- 70% CO_2 improvement on PART L 2013 of Building Regulations baseline
- 30% of materials are designed for disassembly and reuse

7 Holbein Place

7 Holbein Place, City of Westminster SW1W 8NR |
Status: **Planning Granted |** Completion: **2022**

Client: **Grosvenor** | Architect: **Barr Gazetas** | Structural Engineer: **Heyne Tillett Steel** |
M&E / Sustainability Engineer: **Hurley Palmer Flatt** | Project Manager: **Capital & Provincial** |
Quantity Surveyor: **Leslie Clark** | Planning Consultant: **Gerald Eve** | Landscape Architect: **Todd Longstaffe-Gowan Landscape Design**

Holbein Gardens transform an outdated office into an exemplary zero carbon workspace. Adding an additional floor to the retained four-storey structure, as well as reusing materials and introducing extensive greening, results in 25,000 sq ft of high-quality flexible workspace. The project will provide an all-electric building with biodiversity at its heart and a range of innovative materials and technology. The design has a 69 per cent operational carbon saving against a typical office building. Facade retention will save 39 per cent embodied carbon compared to a new facade solution. Furthermore, an all-electric clean energy supply enables the scheme to be net zero carbon by 2030, and 99.95 per cent of strip out waste has been diverted from landfill.

- BREEAM Outstanding
- WELL Gold and Wired Score Gold
- 69% operational carbon saving vs a typical office building
- 39% embodied carbon saving through re-purposing and upgrading the existing facade
- 100% renewable energy

← RESILIENT LONDON ← PROJECT INDEX

King's Cross W3

York Way Freight Lane, Camden N1C 4AU |
Status: **Planning Granted |** Completion: **2023**

Client: **Argent** | Architect: **Haptic Architects**

Part of the wider Kings Cross regeneration area, W3 is a community building, whose structure and main facades are all made from engineered timber. A combination of sustainably sourced building materials (both structure and facade are mainly engineered timber), passive design features, highly efficient building services and a low carbon centralised energy supply will ensure that W3 will have a significantly reduced carbon footprint, both in production and in use. A green roof, with a mix of bird and bat boxes will establish space for biodiversity.

- Targeting BREEAM excellent
- 370 sqm of green roof
- CLT structure

33 King William Street

City of London EC4R 9AS | Completion: **2017**

Client: **HB Reavis** | Architect: **John Robertson Architects** | Structural Engineer: **Waterman Group** | Landscape Architect: **Townshend Landscape Architect**

33 King William Street is a new landmark office development situated on a prominent site in the City of London. Existing elements of the site were extensively reused, all 160 piles, the reinforced concrete raft slab and drainage system were salvaged whilst increasing the area of office space by 65 per cent. Sustainably manufactured new materials were also specified that at end of use can be recycled, for instance the natural terracotta faience cladding. The terrace features high performance photovoltaics which are particularly effective on an island site. All furniture uses FSC timber and the planting was selected to create a biodiverse environment with native wildflowers encouraging bees and insects.

- BREEAM Excellent
- Reuse of existing elements including all 160 piles, the reinforced concrete raft slab and drainage system
- The terrace features high performance photovoltaics

© Stale Eriksen

LABS at Victoria House, Bloomsbury

30 Bloomsbury Square, Camden WC1A 2RJ | Completion: **2020**

Client: **LABS** | Architect: **Hutchinson & Partners** Limited | Contractor: **TSK** | Heritage Consultant: **LABS** | Cost Consultant: **RLB** | Lighting Designer: **Light Bureau** M&E / Sustainability Engineer: **Scotch Partners** | Project Manager: **Alpha Projects Group** | Fire Consultant: **Astute Fire**

Victoria House is a Grade II listed building in the heart of Bloomsbury. Hutchinson & Partners have recently reimagined the building's fabric as a contemporary reinterpretation of the character of the remaining historic spaces, calling upon a complimentary palette of natural hard-wearing materials and evoking the elegant proportions of the original building. Programmatically the spaces aim to enhance the social aspect of the workplace through the introduction of a series of informal lounges and meeting spaces and flexible floor plates. In terms of the material approach, the focus was on the use of robust, hard-wearing natural materials, and a heavy usage of recycled or upcycled materials where possible.

- Long-life, loose-fit approach
- Refurbishment of Grade II listed building
- Recycled or upcycled materials

© Charles Hosea

100 Liverpool Street

100 Liverpool Street, City of London EC2M 2RH | Completion: **2020**

Client: **British Land** | Architect: **Hopkins Architects Limited** | Interior Designer: **Universal Design Studio** | Supporting Services: **Veretec** | Landscape Architect: **HED** | Structural Engineer: **AKT II** | Services Engineer: **Chapman BDSP** | Principal Designer & Transport Consultant: **Arup** | Facade Engineer: **Billings Design Associates** | Lighting Designer: **Speirs & Major** | Project Manager: **M3 Consulting** | Contractor: **Sir Robert McAlpine** | Cost Consultant: **MACE** | Access Consultant: **David Bonnett Associates** | Facade Access Consultant: **Hilson Moran** | Sustainability Consultant: **Greengage** | BIM Consultant: **GRFN** | Technology Consultant: **Cordless Consultants** | Security Consultant: **QCIC**

100 Liverpool Street is the radical redevelopment of an iconic 1980s scheme to create over 520,000 sq ft of contemporary office space, with retail and public realm, in the heart of the City. Creatively re-imagining the outdated building rather than adopting a demolition and new build strategy; the existing substructure and 50 per cent of the existing superstructure was retained, saving over 7,500 tonnes of carbon. A contemporary aesthetic has been achieved, with a curved glazed facade, landscaped external terraces, and flexible lobby spaces.

- BREEAM Outstanding
- WIRED Platinum and WELL Gold
- Existing structure and 50% of substructure retained
- Over 7,500 tonnes carbon saved

Lock Keepers

Mill Mead Road, Haringey N17 9FG | Status: **Proposed |** Completion: **2022**

Architect: **R_MA** | Planning Consultant: **Montagu Evans** | Landscape Architect: **BDP** | Project Manager: **K2 Consultancy**

The scheme occupies a unique but challenging strip of land between watercourses, adjacent to canal locks at Tottenham Hale and is overlooked by significant towers and developments to the east and west. The scheme plugs into a neighbourhood district heating system in an adjacent development. Mixed building uses maximise consistent energy demands and efficiency throughout the day. Cascading blue and intensive green roofs incorporate significant planting, rainwater attenuation and habitat generation. Soft and hard landscaping will enhance the public and semi-public realm at the building's base.

- Neighbourhood district heating system
- Green roofs incorporate significant planting, rainwater attenuation and habitat generation

The Sound Lounge, Sutton

216–220 High Street, Sutton SM1 1NU | Status: **Completed |** Completion: **2020**

Client: **LB Sutton**

The Sound Lounge on Sutton High Street has become the UK's first Carbon Neutral live music venue. Situated in a former bank that was refurbished by LB Sutton in 2020, the Sound Lounge has embedded climate change mitigation in all aspects of its operation which combines live music, plant-based kitchen, community garden, cultural events, and education. The project is designed to diversify Sutton High Street, deliver social value and act as a catalyst for wider Town centre sustainability improvement.

- 100% renewable energy
- 100% food composted on site
- Zero plastic packaging, compostable disposables, and 100% non-toxic cleaning
- Locally supplied plant-based menu including produce grown in their on-site garden

© Blackpoint Design

Marjorie McClure School

Bromley | Status: **Planning Granted |** Completion: **2022**

Client: **Galliford Try, DfE, LB Bromley** | Architect: **Haverstock** | Contractor: **Galliford Try** | Structural Engineer: **AKSWard Limited** | Mechanical & Electrical Engineers: **Elementa Consulting UK** | FFE Consultants: **Space Zero** | Landscape Architect: **Ubu Design Ltd** | Superstructure: **Innovaré Systems**

The project is part of the DfE's Sustainability Pilot Scheme. The proposals utilises modern methods of construction which will reduce the construction impact on the local community. The passive design of this building, through enhanced thermal insulation and air tightness provides a 15 per cent reduction on energy consumption, the application of renewable energy, a combination of PV panels and Air Source Heat Pumps provides a further 48 per cent reduction in energy usage, giving a combined improvement when compared to Building Regulations compliance of 63 per cent.

- Passive design, thermal insulation and air tightness providing 15% reduction on energy consumption
- Renewable energy, a combination of PV panels and Air Source Heat Pumps provides a further 48% reduction in energy usage

81 Newgate Street

St. Paul's Station, City of London EC1A 7AW |
Status: **Planning granted |** Completion: **2024**

Client: **Orion Capital Managers** and **Pella Real Estate Managers** | Architect: **Kohn Pedersen Fox Associates (KPF)** | Structural Engineer: **AKT II** | MEP: **Hilson Moran** | Planning Consultant: **Montague Evans** | Environmental Advisor: **Trium Environmental Consulting** | Ecology: **Aspect Ecology** | Landscape Design: **Tom Stuart Smith**

The transformation of an outdated 1980's office into a sustainable, mixed-use building and a new destination on London's 'Culture Mile'. Through extensive retention of the existing structure and reuse of existing facade limestone, the project offers the lowest impact development for the site, saving up to three years of demolition/new construction and reducing overall embodied carbon. Alongside a net zero operational carbon strategy, the project minimising waste using modular construction, low carbon materials and a zero to landfill plan. The project has been designed to be climate change resilient, with rainwater attenuation, material resilience and thermally comfortable adaptive environments.

- Target a BREEAM rating of Outstanding
- Reduction of 52% can be achieved over Part L compliance
- Aim to enable a Well v2 Standard rating of Platinum
- Embodied Carbon results: 21% Improvement over RIBA 2030 Targets
- 76% of the existing structure retained and reused

3 Shortlands

3 Shortlands, Hammersmith & Fulham W6 8DA | Status: **Proposed**

Client: **Romulus** | Architect: **Fletcher Priest Architects** | Contractor: **Red Construction Group**

This multi-phase refurbishment of a 1970s office complex reimagines the site as a new mixed-use part of the city. The completion of the final phase will see the complex more than double in lettable area, as well as adding a hotel, public swimming pool and gym, and new public realm. The scheme is an example of a multi-phase, deep retrofit. The load-bearing structure of the original building will be retained, while the facade will be upgraded to improve its performance and allow for natural ventilation and very low energy cooling in the next phase of the project.

- Deep retrofit
- Natural ventilation and low energy cooling

© Hopkins Architects

South Molton Triangle

4 Davies Mews, City of Westminster W1K 5AG | Status: **Proposed |** Completion: **2026**

Architect: **Hopkins Architects Limited** | Structural Engineer: **AKT II** | Planning Consultant: **Gerald Eve**

The South Molton Triangle is a new redevelopment proposal by Grosvenor Britain and Ireland to transform a prime, but underutilised, Mayfair area into a high-end retail, office and leisure community provide approximately 150,000 sq ft of prime office space combined with 58,000 sq ft of new shops, restaurants and cafes. The scheme centres around the adaptive re-use of existing listed buildings. The site covers two acres within the Mayfair Conservation Area and is part of the Grosvenor Estate.

- BREEAM Outstanding and WELL Platinum (North & South Block offices)
- BREEAM Excellent (Retail & Hotel)
- CO2 reduction over Part L/ existing buildings: New build: 37%, Non domestic Refurbishment: 66%, Domestic change of use: 49%

Southworks

19 Rushworth Street, Southwark SE1 ORB |
Status: **Under Construction |** Completion: **2021**

Developer: **MiddleCap** | Architect: **SPPARC** | M&E / Sustainability Engineer: **Norman Disney & Young** | Structural Engineer: **MLM** | Contractor: **HG Construction** | Cost Consultant and Project Manager: **Quantem** | Planning Consultant: **Brunel Planning** | Acoustic Consultant: **Hann Tucker**

Southworks includes 70,000 sq ft of Grade A commercial office space spanning over seven floors. It's architecture is inspired by a warehouse aesthetic, with concrete columns, large factory-style windows and a feature double height entrance portal formed from hand crafted Italian glass bricks—the first glass brick facade in the UK. The highest standard of wellbeing is achieved through a combination of natural elements, such as natural light, fresh air through the openable windows and the latest technology. Technology monitors density, inside and outside air quality and noise levels.

- Targeting BREEAM Outstanding
- Platinum Smart Building Certification - first building in the UK
- WiredScore Gold
- CyclingScore Platinum

15 & 17–33 Southwark Street

Southwark Street, Southwark SE1 | Status: **Planning Granted |** Completion: **2024**

Developer: **U+I** | Developer: **TfL** | Architect: **Allies and Morrison**

Approved plans, designed by Allies and Morrison on behalf of U+I and Transport for London, will transform an underutilised site near London Bridge station to provide more than 200,000 sq ft of commercial space, including affordable workspace and retail units, as well as 36 new homes of which 50 per cent will be affordable housing. The scheme will also safeguard Crossbones Graveyard and Memorial Garden and bring a range of public realm improvements, such as new cycle parking and pedestrian routes.

- Net zero carbon in operation
- BREEAM Excellent (office); Very Good (retail)
- WiredScore Platinum
- WELL ready

St Leonard's Court

9 New North Road, N1 6JB, Hackney | Completion: **2020**

Architect: **Child Graddon Lewis** | Structural Engineer: **Corbett & Tasker** | M&E / Sustainability Engineer: **Ramboll** | Landscape Architect: **Townshend Landscape Architects**

Hallmarked by a tenure-blind design that ensures no visual distinction between private & affordable properties, the scheme featuring 71 new homes, with over 32 per cent affordable, provides the opportunity to be part of a true, mixed-tenure community. The project fundamentally promotes the health and wellbeing of its residents. All have universal access to the surrounding picturesque views and the sensory-rich experience created by the shared central courtyard and roof gardens—a genuine urban oasis of biodiversity.

- Highly insulated building fabric
- Energy efficient community heating and domestic hot water
- Car free development

TBC.London

224 Tower Bridge Road, Southwark SE1 2UP |
Status: **Planning Granted |** Completion: **2022**

Developer: **FORE Partnership** | Architect: **Stiff + Trevillion**

TBC.London is a 110,000 sq ft work environment on the bank of the Thames next to Tower Bridge. FORE Partnership is transforming the existing 1990s office building through a deep refurbishment, designed by Stiff + Trevillion. FORE is targeting BREEAM Outstanding, EPC A and WELL Platinum for the building, which will be 100 per cent electric and zero carbon in operation, using air-source heat pumps and in-floor cooling which are 30 per cent more efficient than traditional systems.

- BREEAM Outstanding
- EPC A
- WELL Platinum
- 100% electric
- Net zero carbon in operation (NABERS)

Triangle House

6 Anglers Lane, Camden NW5 3DG | Completion: **2020**

Architect: **Child Graddon Lewis** | Structural Engineer: **Conisbee** | Contractor: **PG Building Services Ltd**

- Retrofit and extension of a small infill site

Triangle House is the retrofit and extension of a small infill site in Kentish Town, transforming a gloomy and disused office into a bright, three-storey and three-bedroom house. Embracing the triangular footprint and existing character of the site, the building makes efficient and functional use of space and natural light. Alongside delivering a 'hidden home', the external form, detail and scale of the design compliment the street elevation, while ensuring the building enjoys a unique character in its own right.

97–107 Uxbridge Road

CP House, 97–107 Uxbridge Road, Ealing W5 5TL |
Status: **Planning Granted |** Completion: **2023**

Client: **Spaceworks** | Architect: **Hutchinson & Partners Limited** | Planning Consultant: **DP9** | Structural Engineer: **Heyne Tillett Steel** | M&E / Sustainability Engineer: **Thornton Reynolds** | Transport Consultant: **Steer**

- BREEAM Very Good
- 43% Regulated Carbon Dioxide Savings
- 100% Renewable Energy

Hutchinson & Partners have designed a major new workplace in the heart of Ealing's Office Quarter. As well as significantly reducing carbon emissions through the use of renewable energy, the overarching approach is one of long-life loose-fit, in line with the practice's ethos to design new buildings that are inherently sustainable through their adaptability and robustness, and therefore longevity of use by generations to come. The proposals include affordable workspace and flexible uses connected to a newly extended public realm.

Westmead

19 Tavistock Road, City of Westminster W11 1AS |
Status: **Planning Granted |** Completion: **2021**

Client: **City of Westminster** | Architect: **Child Graddon Lewis** | Structural Engineer: **CR8**

Westminster City Council's first residential development that achieves Passivhaus energy standard, providing 65 new sustainable homes—with over 40 per cent genuinely affordable. This scheme, comprising generous public open space, provides a blueprint for introducing low energy principles to social housing-led design. The design utilises a complex combination of studies that assessed the composition, form, glazing and heating strategies of the building. The principles of low energy design will provide low bills for residents, utilising sustainable and renewable energy sources for all energy usage.

- Passivhaus certified
- Low energy principles to social housing-led design

Woodward Road

Barking | Status: **Under Construction |** Completion: **2022**

Client: **LB Barking & Dagenham** | Architect: **Morris+Company** |
M&E / Sustainability Engineer: **Max Fordham**

Woodward Road is a development of 56 affordable homes and 650 sqm of community space, designed for Be First. The residential development will be a mixture of low-rise typologies of three-storey mews houses and three to four storey apartment blocks. The project was designed to Stage 3 and is now under construction by a D&B contractor. Woodward Road has been designed to enhance residents' comfort in hot summer spells, by incorporating several different shading devices to shade dwellings from hot sun.

- Deeper external window reveals
- Brise soleil incorporated on the south-facing windows
- Adjustable, single leaf shutters incorporated on the south side of the east and west-facing windows
- Velux roller shutters on roof lights within mews houses
- Fully electric, heat pumps provide low-carbon hot water and heating to each dwelling

YY London

30 South Colonnade, Canary Wharf, Tower Hamlets E14 5HX |
Status: **Under Construction |** Completion: **2022**

Architect: **Buckley Gray Yeoman** | Client: **Oaktree Capital** | Client: **Quadrant** | Project Manager: **Avison Young** | Quantity Surveyor: **Quantem Consulting** | Structural Engineer: **Waterman Group** | Planning Consultant: **DP9** | Landscape Architect: **Townshends Landscape Architects** | M&E / Sustainability Engineer: **Hilson Moran**

The striking reimagination of YY London will create a NIA 408,000 sq ft building that increases ground-level activation across the lower floors, provides 25 per cent more office and retail space, articulates a bold new façade and avoids the need for demolition over water. Altogether, the overall energy demand of the building will be reduced by 62 per cent, whilst avoiding demolition is estimated to save 10,260 tonne CO2e—equivalent to planting 51,300 trees.

- 25% recycled aggregatein concrete and steel specification
- Thermal storage optimises the operation of the heating and cooling systems to reduce energy consumption and carbon emissions
- All electric solution, PV on the roof

Masterplans and public spaces

Elephant Park

Elephant and Castle, Southwark SE1 6TG | Status: **Under construction |** Completion: **2025**

Architects: **Make, Maccreanor Lavington, a-project, Panter Hudspith Architects, AHMM, HTA Design LLP, HAK, Hawkins\ Brown, Arney Fender Katsalidis, Morris+Company, Gillespies** | Developer and Asset Manager: **Lendlease**

- 27 retained, mature trees and 19 new trees, chosen for their suitability to conditions, resilience to climate change, and diversity of species
- SUDS strategy

The Park is the centrepiece of Elephant Park, a revitalisation of Elephant & Castle by Lendlease and Southwark Council, setting new benchmarks in urban living. At two-acres, it's an inclusive and sustainable community space featuring expansive lawns, colourful rain gardens, the landmark water playscape, Elephant Springs, and walkways nestled within naturalistic planting. The development aims to be net zero carbon in operation by 2025.

A central feature, Elephant Springs is a rocky, water-world of fountains, waterfalls and sandy beaches. Created from 300 tons of Italian porphyry stone, chosen for its hard wearing and slip-resistant properties when wet, Elephant Springs is somewhere for people of all ages and abilities to enjoy.

Designed by Gillespies, the Park provides a green oasis in London's zone one where the local community can relax, play, exercise and socialise. It includes 27 retained, mature trees and 19 new trees, chosen for their suitability for conditions, resilience to climate change, and diversity of species to mitigate biosecurity issues and deliver more comprehensive ecological value to the Park. The wider planting strategy has a mix of native and non-native species to maximise diversity and create a spatially complex planting cover that, according to many academic studies, has the most significant impact on supporting biodiversity.

The Park's rain gardens are a vital part of the SUDS strategy, infiltrating surface water runoff from hard paved areas into the underground aquifer rather than overburdening London's combined sewer system.

Enveloping one of the mature London Plane trees is the Park's pavilion building. Comprising a community space, café kiosk and publicly accessible elevated terrace, the building is constructed from predominantly low carbon cross laminated timber.

Pedestrian and cycle routes connect it to the surrounding areas of Southwark and the public transport network, encouraging green, sustainable methods of travel to and from the area.

Retaining the 27 mature, existing trees, has a huge impact in carbon fixing and storage. Their extensive canopy cools the air, mitigates pollution and provides microclimatic improvements alongside habitats for wildlife. The design focused on maximising planting and reducing hard paving, allowing all opportunities where possible for the carbon sequestering properties of soil. The main paths are paved in self-binding gravel, a material with a lower carbon footprint, and where natural stone paving is used for areas of heavy footfall, such as Elephant Springs, European stone has been selected for its lower shipping impact.

'Elephant Park is setting new standards for sustainable city living. In 2013 we committed to be net zero carbon in operation by 2025, at a time when climate change was not as high on the agenda as it is today. We aim to be among the most sustainable urban regeneration projects in the world. In practice, this means a low-carbon piece of city that improves air quality, becomes a healthier place to be and significantly reduces the use of non-renewable resources.'

Kristy Lansdown, Lendlease Project Director of Elephant Park

King’s Cross

Camden, N1

Client: **King’s Cross Central Limited partnership (KCCLP)** | Developer: **Argent**

- 20 green roofs
- Each roof contributed to buildings achieving BREEAM (seven of which achieved BREEAM Outstanding) or Code for Sustainable Homes certification.
- More than 600 species of plants
- 400 trees

King’s Cross is a 67-acre mixed-use regeneration project in central London, as such it presents a unique opportunity to improve what was contaminated former industrial land, with no green space, into a resilient neighbourhood in which people can flourish alongside nature.

At ground level 400 trees have been planted, a new park created with Lewis Cubitt Park and ribbons of green and blue run through the site alongside the restored segments of the Regents Canal.

At roof level, King’s Cross is evolving into an oasis for nature away from the hustle and bustle of the street. In doing so, it is providing an important wildlife corridor connecting King’s Cross to surrounding green spaces while attenuating water and decreasing the temperature of the surrounding environment.

Across the roofs of the 20 new buildings that have been delivered on the estate so far, 40 per cent is dedicated to green roofs, some four acres of green space which are home to more than 600 species of plants. The joined-up approach to green roofs was developed by the London Wildlife Trust (LWT) to create a roof space that’s greater than the sum of its parts.

The ambition set by the strategy has led to King’s Cross creating one of the world’s most diverse urban roofscapes with a mosaic of habitats that maximise ecological value; from a rooftop wetland to wildflower meadows integrated with solar panels.

Green roofs can’t always be left to their own devices and LWT have been retained to monitor the health of the roofs and their ecological value. This process has shown how the roofs are being used by nature, from ducklings fledging their rooftop nests to peregrine falcons using the roofs as feeding spots.

It is well understood that greening roofs is one of the most effective ways in which a typically underutilised space can be transformed into a powerful tool towards making urban spaces more resilient to climate change. As well as ecological value they can reduce ambient temperatures by 5°c and absorb more than half the annual rainfall to reduce the urban heat island and decrease flood risk.

However, to ensure this happens, the roofs need to be correctly specified, designed, delivered and importantly monitored to ensure their on-going health and functionality. In recognition of this, a green roof strategy developed by London Wildlife Trust has been followed and they have been retained to annually monitor the health of the roofs.

‘If London is to meet it’s net zero commitments and become more resilient to the inevitable impacts of global heating it must change it’s grey, lifeless roofscapes that absorb heat while discharging rainfall into ones that are vibrant, green landscapes that absorb rainfall and cool the surrounding environment. I think the King’s Cross joined-up approach to green roofs provides a template of how this nature-based solution can be delivered to maximise ecological value while contributing to the resilience of the city.’

Low Line Commons

London Bridge, Southwark | Status: **Proposed |** Completion: **2021**

Architect: **PDP London** | Landscape Architect: **Macfarlane + Assocs Ltd** | M&E / Sustainability Engineer: **Greengage** | Ecology Consultant: **Studio 4215**

- 50,000 sqm biodiverse roofs
- 500 new trees
- 30 SuDS raingardens, 10,000 plants, 100 new wildlife habitats,
- 1,000 sqm wildflower meadows
- 500 sqm 'grey to green' de-paving projects, 30 pocket spaces supporting social interaction
- 3.5 km carriageway transformed to support green business and active travel

This sustainable vision and strategy is part of the Low Line scheme to create a green corridor along the Victorian railway viaduct meandering through Bankside, London Bridge and Bermondsey. The Low Line Commons, commissioned by Low Line partners, will connect people with nature and increase environmental resilience along its length by promoting innovative greening and sustainability projects that mitigate climate change. It celebrates the diversity and heritage of each neighbourhood with a series of hubs to encourage communities to unify and share a 'sense of place'. The strategy will tie streets and spaces around the viaduct that currently are divided and disconnected, while celebrating the diversity and unique characteristic of each area.

A toolkit solution of 12 components is designed to be used to provide the best response to each unique neighbourhood. The elements all centre around establishing biodiversity and ecological connectivity, building climate resilience and connecting people with each other and nature. Responding to scale is also important so spaces can be knitted together to function as a coherent place. The toolkit includes pocket parks, wildlife micro habitats, SuDS, planters and street trees, overhead habitats, productive private green spaces, sensory play areas, pedestrian priority, lighting, canopies, seating and pop-up uses.

Whether large or small, by great visionary designers or through local acts of love and care, together they can make up a 3.5 km natural, cultural resource as large as the 25 ha Southwark Park. The value of which is the Commons approach, where residents and businesses coexist because they are supporting each other.

In addressing the climate challenge, Low Line Commons will provide an inspiration for other parts of London. With hotter peak summer temperatures, rainfall and storm events, the vision is designed to provide refuges away from the heat with 'Blue Green Streets' enabling safer, cooler walking routes and lower exposure to air pollution. Extensive urban greening will cool the air naturally; urban forests will slow the rainfall before capture in raingardens in both vertical and ground level design areas. A native planting palette will contain lower maintenance species that are drought, shade and pollution tolerant.

The project is a toolkit for all with an interest along this rail corridor. Shared action by the Low Line Partners—Better Bankside, Team London Bridge, Blue Bermondsey, Southwark Council and The Arch Company—with Friends of the Low Line, residents, businesses, landowners and developers, can deliver this coherent 'green seam.' The ambition is for 50,000 sqm biodiverse roofs, 500 new trees, 30 SuDS raingardens, 10,000 plants, 100 new wildlife habitats, 1,000 sqm wildflower meadows, 500 sqm 'grey to green' de-paving projects, 30 pocket spaces supporting social interaction and 3.5 km carriageway transformed to support green business and active travel.

'This is a bold vision for greening, wildlife and opportunities for people and nature along the route of the viaducts from Southwark to Bermondsey. It will be part of London's National Park City, helping make half of London green by 2050. It creates a natural resource as large as Southwark Park, a cultural resource that offers value comparable to the River Thames, and community spaces where residents and businesses coexist because they support each other, underpinning environmental and social sustainability.'

Prachi Rampuria, Senior Urban Designer, PDP London

← RESILIENT LONDON ← PROJECT INDEX

Grosvenor Square Gardens

23a Grosvenor Gardens, City of Westminster SW1W 0BP | Status: **Proposed |** Completion: **2026**

Client: **Grosvenor** | Architect: **Tonkin Liu** | Urban Horticulture: **Nigel Dunnett** | Blue and Green Infrastructure: **Gary Grant** | Structure & Civic: **AKT II** | MEP: **Integration** | Light Consultant: **Seam Design** | Project Manager: **Gardiner & Theobald LLP** | Planning Consultant: **Gerald Eve** | Sustainability: **Cundall** | Engagement Consultant: **New Practice** | Youth Engagement Consultant: **2–3 Degrees**

Minutes from Oxford Street in the heart of the West End, Grosvenor Square is one of London's oldest and largest garden squares. Together with local communities and people across London Grosvenor is developing plans to transform this little-known square into an extraordinary urban garden with ground-breaking environmental credentials. Over 2,500 people have participated to date, sharing over 7,000 ideas for how green spaces in cities can work harder for nature and the wellbeing of those who rely on them.

- Transforming a little-known square into an extraordinary urban garden
- Biodiversity and natural habitat

Harrow Road

Warwick community Hall, 300 Harrow Road, City of Westminster W2 5HG | Status: **Planning Granted |** Completion: **2022**

Architect: **Child Graddon Lewis** | M&E / Sustainability Engineer: **Stantec** | Contractor: **Willmott Dixon** | Project Manager: **WSP** | Landscape Architect : **Allen Pyke Associates**

A residential-led, mixed-use scheme for Westminster City Council, Harrow Road is an ambitious regeneration project comprising of three blocks and extensive landscaping, allowing for the re-provision of existing community facilities, a nursery, new public realm, commercial spaces, and 112 new homes. The project is based around a new green heart at the centre of the scheme. Designed as a playable landscape that links the new amenity to the existing canalside park, these new facilities will provide an attractive focal point for the local community. The passive design of the dwellings has been developed to balance daylighting, heat losses and heat gains. An Air Source Heat pump (ASHP) is sized to meet 60 per cent of the heating demand, with gas-fired boilers meeting the residual 40 per cent.

- Residential-led, mixed-use scheme
- Passive design
- Air Source Heat pump meets 60% of the heating demand

Marylebone Low Emission Neighbourhood

Marylebone High Street, City of Westminster | Completion: **2020**

Client: **City of Westminster** | Landscape Architect: **WSP** | Engineer: **FM Conway**

Marylebone High Street is a high-profile, busy central London retail and restaurant quarter. Climate resilience drove the inclusion of permeable materials and rain gardens that provide alternative drainage solutions. Broad-leafed trees were included to provide natural shading and cooling and improve air quality. Planting was designed to improve biodiversity creating green links that provide opportunities for feeding and pollinating. The planting palette was optimised to support resident wellbeing through year-round positive visual impact. The public realm also increased walking space, safer crossings and the provision of cycle stands to encourage modal shift in a car-dependent area.

- Permeable materials and rain gardens
- Planting improves biodiversity creating green links for feeding and pollinating
- The public realm increases walking space, safer crossings and the provision of cycle stands to encourage modal shift in a car-dependent area.

Meridian Water

Lea Valley Road, Enfield | Status: **Planning Granted |** Completion: **2030**

Client: **LB Enfiled** | Architect: **Karakusevic Carson Architects** | Planning Consultant: **Arup** | Landscape Architect: **Periscope**

Meridian Water is one of London's largest regeneration zones, encompassing 85 hectares of brownfield land. Enfield Council has a bold vision to transform the site over a 25-year period. Aquatic and landscape specialists worked together to reimagine the inert, degraded river channels on site, transforming them back into living systems with meanders and biodiverse wetland flood attenuation areas. These will form part of a public park; accessible during low flow and providing flood risk protection in Waltham Forest and Haringey during higher flow. Restorative design includes significant river re-naturalisation, contributing to on-site biodiversity net gain and flood resilience through the creation of wetland attenuation areas alongside the naturalised channel.

- Restorative design includes significant river re-naturalisation
- Biodiversity net gain and flood resilience through the creation of wetland attenuation areas

Morden Wharf

Morden Wharf Road, Greenwich SE10 0NU | Status: **Proposed |** Completion: **2033**

Developer: **U+I** | Architects: **OMA, Carmody Groarke** | Landscape Architect: **Planit I.E** | Project Manager: **Gardiner & Theobald LLP** | Planning Consultant: **Litchfields** | Engineer: **Ramboll** | Technical Design Advisor: **MSMR Architects**

Morden Wharf is a new mixed-use neighbourhood comprising a large new riverside public park, 1,500 homes (of which 35 per cent will be affordable), and employment space on Greenwich Peninsula. Over 60 per cent of Morden Wharf is dedicated to public realm, including a 3.9-acre public park to address the shortfall of green space and ecological resource on Greenwich Peninsula. Residential buildings feature vertical green facades that will provide natural screening and improve air quality. Communal allotments and gardens encourage outdoor socialising and learning. A new mobility hub promoting low-carbon transport will better connect the neighbourhood to the local area.

- Over 60% of Morden Wharf is devoted to new public realm and green space
- 3.9 acre riverside public park
- Vertical green facades providing natural screening and improving air quality

New Garden Quarter

203 Forrester Way, Newham E15 1GL | Completion: **2019**

Client: **Telford Homes and Notting Hill Genesis** | Architect: **Pollard Thomas Edwards** | Landscape Architect: **Churchman Thornhill Finch**

New Garden Quarter creates a mixed-use community on brownfield land with 471 mixed-tenure apartments arranged around a major new London square. Nearly half of the new homes are large family apartments. The scheme has excellent transport links, on-site energy generation, high-performance fabric, a SUDS strategy incorporating rain gardens, doorstep play, a neighbourhood nursery and extensive new green infrastructure. The design team worked within significant infrastructure constraints to create a new destination for families.

- On-site energy generation
- High-performance fabric, with 35% reduction of carbon emissions beyond the requirements of Part L
- SUDS strategy incorporating a natural wading pond with marsh planting, rain gardens and green and blue roofs
- On-site combined heat and power plant

Old Street Roundabout

Old Street, Hackney | Status: **Under Construction |** Completion: **2022**

Architect: **Weston Williamson+Partners** | Landscape Architect, Engineer: **WSP** | Contractor: **Morgan Sindall**

Known as the silicon roundabout, Old Street is a high profile, pedestrian orientated scheme that converts an existing roundabout island into an urban peninsula with a new entrance for the London Underground station. The design incorporates natural and manufactured climate resilience measures. This includes a flood defence system and the use of materials that enable permeability and provide attenuation, natural interventions like rain gardens and green roof systems also double as a source control mechanism for run-off. This includes photocatalytic paving which uses natural daylight to convert harmful NO2 gases into harmless nitrates that are washed into the rain gardens.

- Converting an existing roundabout island into an urban peninsula
- Flood defence system and choice of materials that enable permeability and provide attenuation
- Photocatalytic paving converts harmful NO2 gases into harmless nitrates

Peel Place

South Kilburn, Brent NW6 | Status: **Planning Granted**

Architect: **Child Graddon Lewis** | Client: **Brent Council & Countryside Properties** | Planning Consultant: **Turley** | Structural Engineer: **Price and Myers** | Transport Consultant: **Markides Associates** | M&E / Sustainability Engineer: **AWA** | Other: **AECOM**

A key development as part of the South Kilburn masterplan in Brent, Peel Place delivers a mix of 308 homes (41 per cent affordable) and community infrastructure, all surrounding a new public square. The design incorporates the redevelopment of a council-owned site, with each block specifically orientated to draw people towards a new market square and inspire a sense of community. The entire scheme is fundamentally designed around the concept of health and wellbeing and further raises the ecological and biodiversity credentials of the site.

- Rddevelopment of a council-owned site, delivers a mix of 308 homes (41 per cent affordable)
- Health and wellbeing
- Ecological focus and biodiversity

Urban Nature Project

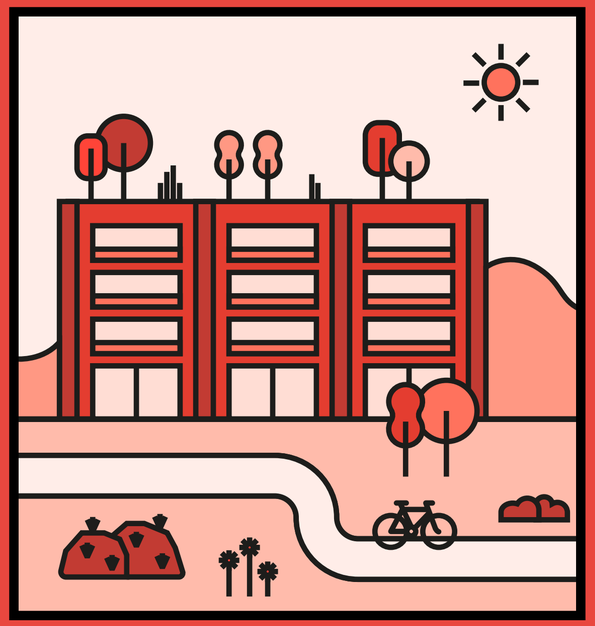
8 Cromwell Road, South Kensington, Kensington and Chelsea SW7 5BD | Status: **Planning Granted |** Completion: **2023**

Architect: **Feilden Fowles** | Project Manager: **MACE** | Landscape Architect: **J&L Gibbons**

The Urban Nature Project reimagines the Natural History Museum's five-acre gardens to increase biodiversity, accessibility, educational opportunities and the usability of the grounds. Part of a national drive to connect people with the natural world, it aims to inform and empower them to take action. The project will create immersive, educational experiences through geology, planting and interpretive exhibits, as well as a new garden building and a learning and activity centre. All surface water will be retained on site and used as part of a site wide water reuse strategy for irrigating plants, in biorentention areas, swales and infiltration basins .

- Planted habitats of seasonal variety to encourage pollinating insects
- Five-acre of areas of habitat and biodiversity, including wetland creation
- All surface water will be retained on site and used for irrigating plants

UK and International projects



Mayfield in Manchester

The Tavern, 75 Piccadilly, Manchester | Status: **Under Construction |** Completion: **2022**

Client: **U+I** | Architects: **Studio Egret West, Bennetts Associates, Gillespies** | Engineer: **Civic Engineers** | Engineer: **Buro Happold**

- 440 linear metres of river edge planting
- 2,400 sqm of new wildflower meadows
- Biodiversity net gain of 7.72 Units
- 'Nature-first' proposals include opening up the River Medlock
- Targeting BREEAM excellent

Mayfield is a large-scale regeneration scheme unlike any other. Under the direction of the Mayfield Partnership — a public-private partnership comprising regeneration specialist U+I, Manchester City Council, Transport for Greater Manchester and LCR — 24 acres of derelict brownfield land in central Manchester are being transformed into a distinctive, imaginative and diverse neighbourhood.

The masterplan capitalises on the site's existing historic assets — the vast Mayfield depot, railway arches and the River Medlock — to create an environment for work, play and living that is rich in local identity.

Overall, Mayfield will deliver 1,500 homes, 1.6m sq ft of market-leading commercial space, 300,000 sq ft of retail and leisure facilities and 14 acres of public realm, centred around the city's first new public park in over 100 years.

Here, 'nature-first' proposals include opening up the River Medlock, which winds through the site but is largely hidden by culverts, to create a biodiverse and tranquil waterway and provide a flood plain that can accommodate climate-change scenarios.

Construction on the first phase of the £1.4bn scheme is now underway, which includes the 6.5-acre Mayfield Park. This will ensure the new neighbourhood is formed around valuable public amenity that serves residents, workers and visitors and offers significant wellbeing benefits. The Mayfield Partnership has also committed to creating a 'park charter' to ensure the delivery of an exemplar urban public green space that endures as a safe, stimulating and sustainable place for everyone in the city long into the future.

The park will neighbour world class residential and commercial buildings, with the latter providing a range of spaces designed to attract both large established and small innovation-focussed businesses, as well as community organisations.

A BREEAM excellent rating is targeted for the buildings comprising the framework. Additionally, the new, sustainable, climate change resilient, privately owned public park in the centre of Manchester provides a significant contribution to the cities green and blue infrastructure. A key part of the design is to open up the previously culverted river, naturalise the river banks, accommodate a 1 in 100 year plus climate change scenario and subtly programme the space through a series of passive and active uses that will appeal to people from all walks of life.

The planting design of the park is being shaped with the future in mind, featuring biodiverse ecological areas and floodable meadows to accommodate climate-change scenarios. With quiet spaces for contemplation and sheltered areas, it will be a community asset which promotes wellbeing in all seasons.

'The development of Mayfield is a real opportunity to use our nature-based engineering methods to reinstate the River Medlock as an authentic geographic feature, especially as it is set in a wider urban landscape. Reusing, repurposing and upcycling the remnants of the different uses and activities that have accumulated on site over centuries, responsibly blended with the natural landscape, has been central to our approach.'

Julian Broster, co-founder, Civic Engineers

Architecturally Driven Winter Gardens – Cambridge

Cambridge | Status: **Proposed**

M&E / Sustainability Engineer, Acoustic Consultant, Services Engineer: **Hoare Lea**

- **Targeting BREEAM Outstanding rating**
- **Nature based solution for green roofs to mitigate heat gains whilst increasing onsite biodiversity**

Analysis Project is a mixed use development to be built in the heart of Cambridge. The proposed development seeks to deliver a comprehensive mixed-use redevelopment of the existing site, addressing the four distinct boundaries, providing significant new public realm at the heart of the proposal, alongside high quality residential accommodation and commercial office space.

It has been proposed to provide circa 130 dwellings, an office building, a creche and retail areas at ground floor level connected to community needs, adding approximately 10,000 sqm of commercial space.

The site comprises of 1.23 hectares and currently accommodates warehouses and hard landscape used for parking and internal circulation. The proposed development brings the site back to the city grid by enhancing the connection with the urban fabric for both pedestrians and cyclists.

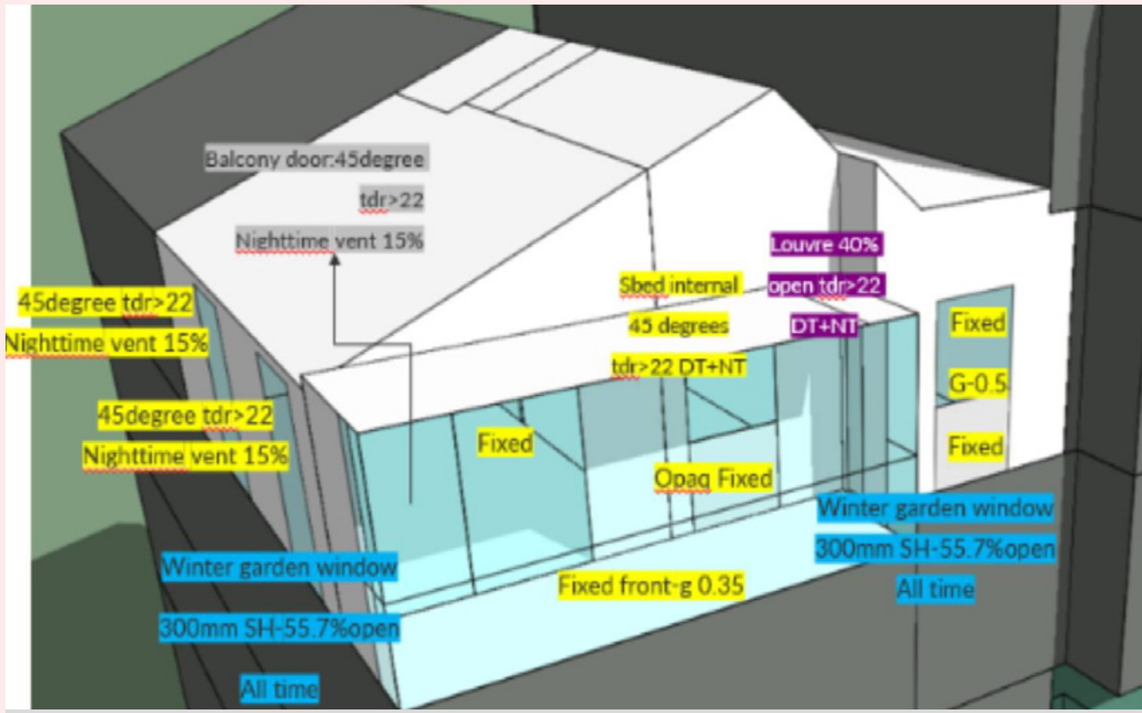
The site location has strong transport links to the train station as well as amenities alongside Mill Road towards to Cambridge city centre. In addition, discussions with Network Rail and Chisholm Trail are ongoing to ensure that reasonable and practical solutions can be found to provide an efficient and safe route for the trail along the site. The Chisholm Trail is a new walking and cycling route which will connect up Cambridge City's two rail stations and the north and south sections of the busway cycleway and which runs along the eastern boundary of the site. The proposed development is applying two robust sustainability credentials; the residential portion is aiming to achieve HQM (four and a half stars), whereas the commercial aims to achieve a BREEAM Outstanding rating.

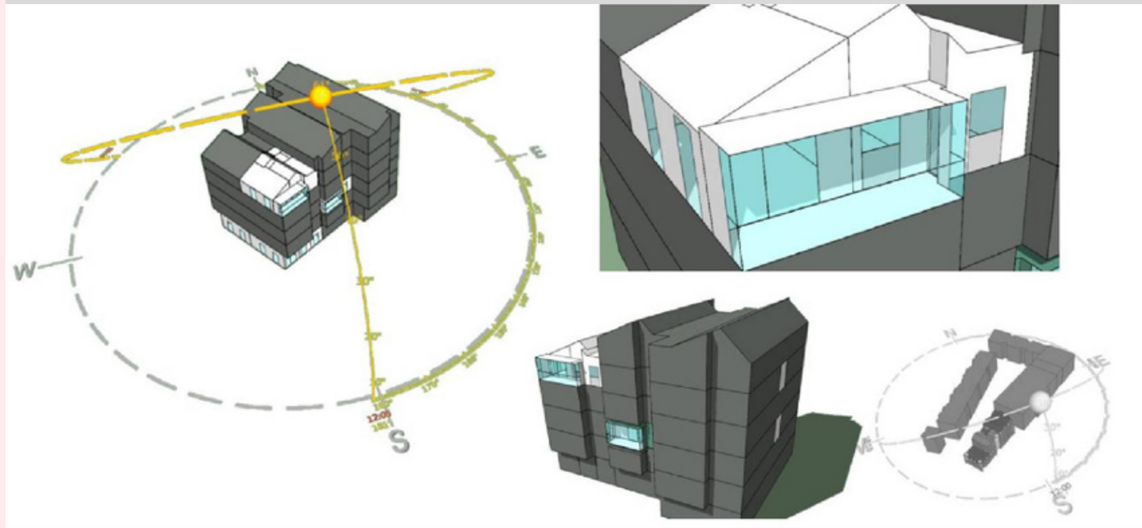
The project scene shares similarities to many London scenarios due to central urban locations associated with noise pollution and heat island effect.

The challenge is ensuring homes don't overheat while achieving thermal comfort through natural ventilation alone to reduce energy use and emissions. The unusual situation is the railway line which makes it more unique.

In response to the acoustic challenge, a winter garden solution was proposed. The winter gardens provide a buffer zone between the rail line and immediate openings facing the rail line. The winter garden's side openings allow cross ventilation into the occupied spaces.

'The project has been designed through 'First Fabric approach' using Future Homes Standard U-value targets. Key aspects for zero carbon are: Embodied Carbon: Module A Whole life carbon GLA guidance used as an aspirational target. Operational Carbon: Residential aligned to LETI net-zero guidance and Commercial aligned to RIBA 2025 guidance. A solar radiation study helped to optimise orientation to integrate PV panels. In addition nature based solution for green roofs helped to mitigate heat gains whilst increasing onsite biodiversity.'





Better Queensway

14 Grange Gardens, Southend-on-Sea | Status: **Planning Granted |** Completion: **2023**

Client: **Swan Housing** | Architect: **drmm** | Engineer: **Civic Engineers** | Landscape Architect: **lda**

- **Sustainable urban drainage system**
- **512 affordable homes: 300 social rented homes and 212 intermediate homes**
- **Tree-lined boulevard, creating space for walking, cycling, parkland and residential development**

Helping to meet the needs of affordable housing in Southend-on-Sea, Better Queensway from Swan Housing will deliver at least 512 genuinely affordable homes via a mix of 300 social rented homes and 212 intermediate homes (shared equity and shared ownership).

The plans will provide a greener and more sustainable Queensway. Not only will every home have its own private outdoor space whether it be a balcony, terrace or garden; there will also be new green spaces including an urban park, 190 new trees and 1,400 metres of new cycle paths along Queensway and Southchurch Road. Electric car charging points, greener energy generation and sustainable construction methods will also improve the overall environmental performance of the development.

Set to bring over £500 million investment into the existing Queensway estate, the re-development will be a catalyst for further improvements to Southend-on-Sea town centre and has been given outline consent for its masterplan, jointly designed by award winning architects dRMM and LDA Design, as well as detailed consent for highway changes by Civic Engineers.

Queensway in Southend is currently an urban motorway, designed to accommodate fast vehicle movements. The design team's proposals are to turn Queensway into a tree-lined boulevard, creating space for walking, cycling, parkland and residential development — 'dwell, play and stay'. Civic Engineers' design started by considering a better balance of movement choices across and along the street, as well as the environmental quality associated with non-vehicular uses.

Repurposing the Queensway underpass as a water storage and attenuation facility will significantly improve the flood risk and the bathing water quality to the seafront area and help to bring the system in line with regulatory standards.

The green and environmental benefits included in plans for the Better Queensway (BQ) redevelopment project include proposals outlining how the £4.2million Government's Get Building Fund (GBF) that has been received for the project, will be spent.

Subject to planning permission, the Better Queensway redevelopment will deliver:

- Upgrades to the local electricity networks so they meet new government guidelines on energy use in new homes and electric vehicle charging.
- The use of heat pumps.
- A sustainable urban drainage system that will help to alleviate the flood risk to Southend-on-Sea seafront. This will include rain gardens and green public spaces.
- A boost to the local cycling and pedestrian network.

'Working as part of the winning Swan Housing bid, we set out a proposal to reduce the highway footprint by 50% and lift the carriageway level with the surrounding landscape, dramatically improving the environmental quality of the neighbourhood, while repurposing the abandoned underpasses as surface water storage as part of a wider SuDS system. This strategy had an important positive impact on commercial viability and deliverability, offering up the opportunity to build an additional 500 new homes.'

Stephen O'Malley, Founding Director, Civic Engineers

Addlestone Town Regeneration Scheme

Addlestone, UK | Completion: **2018**

Architect: **Broadway Malyan** | M&E / Sustainability Engineer: **Elementa** | Developer: **Bouygues UK**

This large scale regeneration project provides Addlestone town centre with a vibrant new leisure and retail hub. The project provides the town with a best-in-class modern facility as the first stage to its regeneration plan. The local council has also acquired a portion of the properties to sell as affordable housing. A central CHP district heating plant provides the council with a steady source of income as well as providing the residents and retailers with competitive energy-efficient heating and hot water.

- BREEAM Very Good
- Low Carbon
- Central CHP district heating plant

Carmelha Tower

Monaco | Status: **Proposed**

Client: **Government of the Principality of Monaco** | Architect: **Bellecour Architectes, Gabriel Viora** | Engineer: **Egis, Elioth, Acoustb** | Engineered Wood: **Simonin** | Sheltered Construction: **Upbrella** | Construction: **Caroli, Emc**

This project is commissioned by the Government of the Principality of Monaco and is part of a national program to provide sustainable and energy efficient state-own housing for the citizen of Monaco. The project highlights the Principality's commitment to carbon reduction and a transition to sustainable and energy efficient buildings. The Carmelha Tower will provide 25 units spread over ten levels with two adaptable units and one adapted unit. The structure is entirely made of locally sourced engineered wood components including three-story high CLT panels for the core and stairwell, a mass timber column and beam exoskeleton, CLT floors and a CLT envelope with a metal rain-guard.

Climate Innovation District - Leeds

Climate Innovation District, 29 Secret Garden, Leeds LS9 8FB | Completion: **2022**

Engineer: **Civic Engineers** | Architect: **White Arkitekter** | Client: **CITU** | Services Engineer: **LEDA**

The £800m Climate Innovation District in Leeds, part of the city's major South Bank Leeds regeneration plans, draws on Scandinavian best practice and harnesses the latest technology to deliver a masterplan incorporating more than 500 new low carbon homes alongside manufacturing, leisure, offices and climate resilient public realm. The project delivers an exemplar model of how to economically build zero carbon neighbourhoods that also provide healthier, smarter and better-connected cities. The electricity for heating and hot water is provided in part by the solar panels on the properties and supplemented by 100 per cent renewable supplier. Citu Homes use a highly efficient timber framed design, which stores 23 tonnes of carbon each house and saves 88 tonnes of emitted CO2 compared to building an equivalent masonry house.

- Rainwater and storm water collection as part of a sustainable integrated urban drainage system
- Green roofs and surfaces increase amenity, biodiversity and reduce flood risk and summer overheating
- Specialist Mechanical Ventilation and Heat Recovery system which reduces heat loss and improves energy efficiency

Liverpool URBAN GreenUp

Liverpool, UK | Completion: **2019**

Client: **Liverpool City Council, University of Liverpool and Mersey Forest** | Landscape Architect: **WSP**

This URBAN GreenUp European research project involves exploring innovative design to create green spaces, improve air quality, increase biodiversity and manage surface water. The Liverpool Urban GreenUP Project has seen the installation of several nature-based interventions on public and private land. Evidence based monitoring has established baseline data and a further two years monitoring of air and water quality, biodiversity and socio-economic impacts, demonstrates the benefits of green infrastructure to landowners and is leading to further similar projects throughout the city.

- Research project and evidence-based monitoring
- Nature-based interventions on public and private land
- Two years monitoring of air and water quality, biodiversity and socio-economic impacts following installation

PianoBau HafenCity

Versmannstraße 23, 20457 Hamburg, Germany | Status: **Proposed |** Completion: **2024**

Client: **Patrizia** | Architect: **Fletcher Priest Architects** | Project Manager: **Drees & Sommer** | Landscape Architect: **Landschaftsarchitektur+** | Structural Engineer: **Ingenieurbüro Abel – Gebhardt Gmbh & Co. Kg** | M&E / Sustainability Engineer: **RMN Ingenieure GMBH** | Other: **Höhler+Partner Hamburg**

PianoBau forms part of the wider redevelopment of the former HafenCity dockyard site. Embodying the principles of the 15-minute city and divided into four interconnected blocks, the mixed tenure scheme contains market-rent apartments, co-housing units and affordable flats, while the ground floors provide retail, co-working and hospitality uses. The building also includes facilities for shared e-mobility, a district heating system using residual heat from a nearby copper processing plant, solar panels on green roofs, and landscaped courtyard spaces to increase biodiversity.

- 15-minute city principles
- Shared e-mobility facilities for residents
- District heating system using residual heat from a nearby copper processing plant
- Landscaped courtyard spaces with biodiversity

The Monash University Woodside Building for Technology Design

20 Exhibition Walk, Clayton VIC 3168, Australia | Completion: **2020**

Architect: **Grimshaw** | Structural Engineer: **Aurecon** | Builder: **Lendlease** | Landscape Architect: **ASPECT Studios**

The Woodside Building for Technology and Design is a transformational learning and teaching building for Monash University. It has been designed with Passivhaus metrics to create an ultra-low energy building with all-electric services, integrating purpose-built immersive and interactive learning and laboratory spaces. Certified as Passivehaus it is Australia's most ultra-low energy educational building with all-electric services. It balances the need for airtightness, insulation and shading from solar gain, while embracing the illuminance of sunlight, and abundance of daylight, view prominence and ground level interoperability.

- Passivhaus certified
- Australia's most ultra-low energy educational building with all-electric services
- All carbon used for construction operations has been offset delivering the first Climate Active certified carbon neutral construction service.

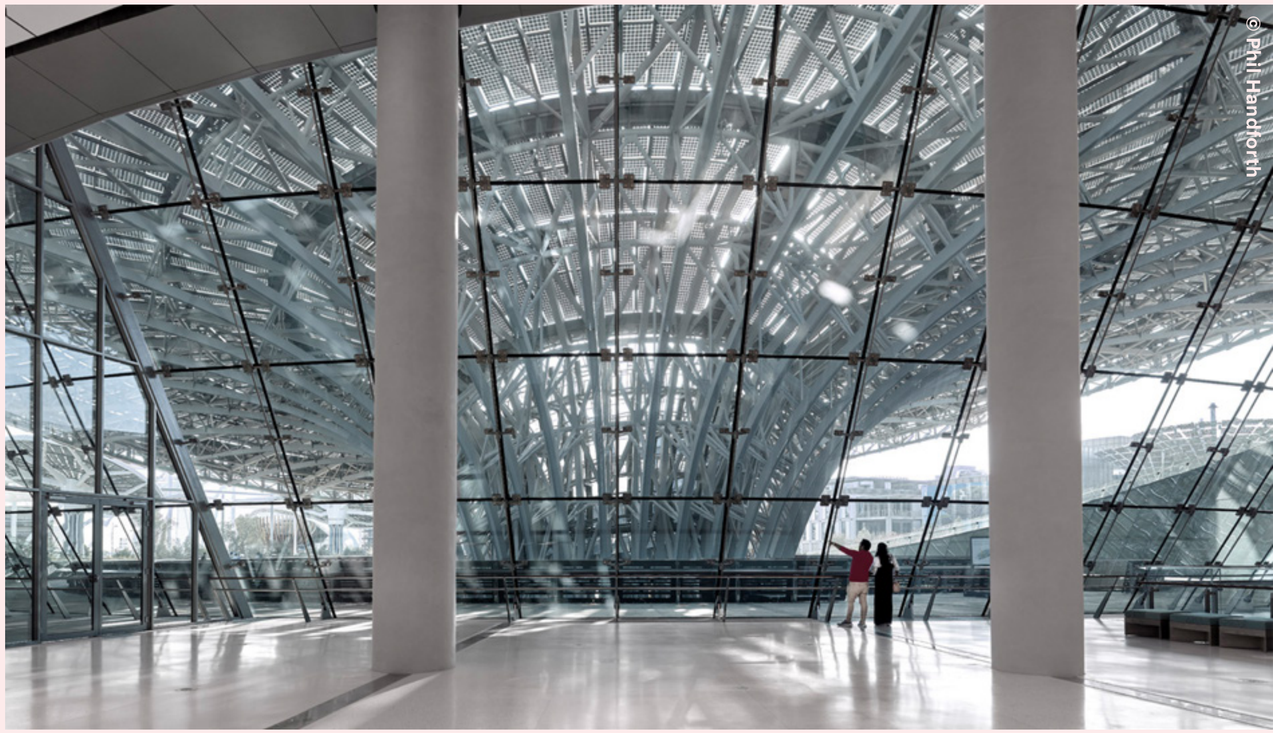
Straussvej – The Courtyard of the Future

Copenhagen | Completion: **2021**

Client: **City of Copenhagen** | Architect: **Lendager** | Engineer: **WSP** | Landscape Architect: **BOGL**

The City of Copenhagen and utility company HOFOR have collaborated with residents to design a lush and green courtyard that, in addition to handling everyday rain, can also handle a once in a century rain event. Rainwater that falls on courtyard-facing roofs and paved areas is held back to form a lake. Water is held in a beautifully designed garden with the lake at the centre. In everyday rain the water will rise for a period, and in high rain events the wall courtyard secures the buildings.

- Rainwater lake with biological purification
- Rainwater harvesting system
- Courtyard designed and built using recycled building materials and emission-free construction site



© Phil Handforth

Terra – The Sustainability Pavilion, Dubai Expo 2020

Abu Dhabi, United Arab Emirates | Completion: **2020**

Client: **Emaar Properties** | Architect: **Grimshaw** | Structural Engineer: **Buro Happold** | Landscape Architect: **Desert Ink**

The pavilion responds to the climate emergency in two ways: achieving net-zero energy and water. The main canopy creates a cool stack effect-induced microclimate, while more than 1,055 solar panels meet the building's energy demands. Tactics such as high air tightness, subterranean ancillary structures and local-controlled ventilation are also employed. 100 per cent of the pavilion's water is from on-site sources and utilises district-scale strategies to mine area wastewater for treatment and reuse on-site and uses 'water trees' to harvest morning dew.

- Net zero energy design
- Affordable integration of on-site energy generation with passive thermal comfort design for co-optimized design strategies
- Net Zero Water in Expo and Legacy Mode
- Small-scale water treatment plant, reusing water from various sources

Concepts, Technology & Research

RightSizer at Meridian Water

Meridian Way, London, Enfield | Status: **Proposed**

Client: **LB Enfield** | Architect: **Assael Architecture** | Structural Engineer, M&E / Sustainability Engineer: **AECOM** | Care and Operations advisor: **Origin** | Social Value: **Hatch Regeneris** | Landscape Architect: **Exterior Architecture** | Cost Consultant: **AECOM** | Collaborating Architect: **ArchitectureDoingPlace**

- **Conceived to extend a building's life beyond 100 years**
- **Whole lifecyle embodied carbon emissions below 300kgCO2e/m2, closely aligned with LETI 2030 guidance**
- **40% regenerative materials and reclaimed steel**

RightSizer is a sustainable MMC Strategy aspiring to the highest levels of environmental, social and economic sustainability. The RightSizer team asks 'why reinvent the way we build with Modern Methods of Construction, if we don't address the climate emergency?'

The project has evolved out of Meridian Water's Placemaking with Purpose competition in response to the ambitious aims of Meridian Water's Environmental Sustainability Strategy (ESS), and offers a vision and how-to guide to designing buildings for 2030 and beyond, heralding a low carbon world.

Conceived as a building system responding to the needs of senior living residents, RightSizer extends building longevity by enabling an active life with scope for reinvention—in other words, flexibility. The project team, in collaboration with Meridian Water, have expanded the functionality of the system to become a universal construction solution for multiple uses, including office, light industrial, parking and meanwhile uses.

The system comprises a long term 'support' layer, the superstructure, which has been designed for disassembly and reassembly. The support layer allows layout reconfiguration and optionality in terms of ongoing service riser locations. An 'infill' layer comprises non-load bearing partitions, panels and components, the 'stuff' making up the accommodation inside the 'support' system.

RightSizer is an emerging framework to encourage the construction industry to work together to respond to the biggest challenge of our time. The system sets out a roadmap to circular MMC, net zero buildings and a new construction ecosystem through the standardisation of component sizes, interoperable connection and component digital passports.

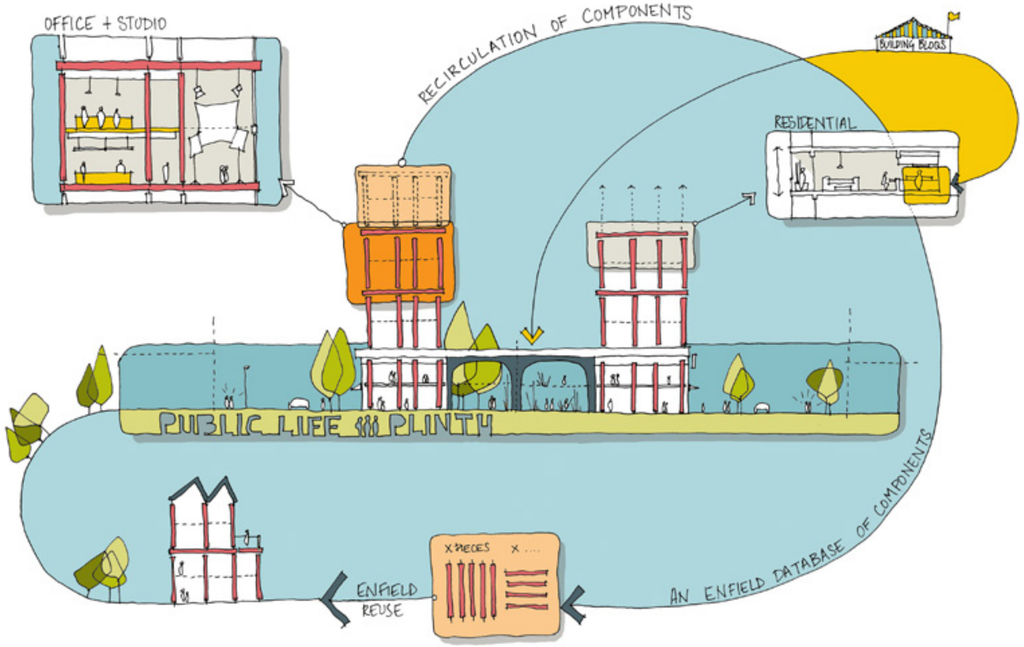
Meridian Water and Enfield Council have identified a land plot at Meridian Water Phase 2 to develop a pilot project using the RightSizer system. Through collaboration with the UKGBC, CIRCuIT, and Futureground, this project sets a precedent for achieving net zero on large-scale developments. RightSizer has been conceived to extend a building's life beyond 100 years, a longevity underpinned by the inherent system flexibility that can accommodate various use scenarios over the years.

Set out by an ambitious client Sustainability Statement, RightSizer targets whole lifecyle embodied carbon emissions below 300kgCO2e/m2, closely aligned with LETI 2030 guidance.

'RightSizer meets these ambitions through applying circular economy principles, including:

- ***using 40% regenerative materials and reclaimed steel sections by sourcing existing donor buildings from within the wider Meridian Water estate***
- ***being highly adaptable and creating removable timber intermediate floors to create double height future-proofing of spaces for building repurposing and change of use***
- ***using radically less 'virgin' resources to hit whole lifecycle energy performance targets including an embodied carbon target of less than 300kgCO2e/m2'***

David Cheshire, Regional Sustainability Director, AECOM



Seeds for Growth

Cannon Dr, Tower Hamlets E14 | Status: **Built |** Completion: **2021**

Lead partner: **BECG** | Client: **Seeds for Growth**

- 1,400 new community gardens
- Annual emissions sequestration of 24,000 tons of carbon dioxide equivalent, annually by 2030

Seeds for Growth's mission is to bring back to life urban communities, isolated by the pandemic, through transforming outdoor spaces.

Neglected and forgotten, there are hundreds of communal wastelands lying dormant in 3,500 London social housing estates, unloved and underutilised by the surrounding residents. Alongside there are hundreds of brownfield sites which should be utilised by and for community greening projects through Meanwhile contracts.

The Seeds for Growth ethos is simple, integrate the local community as our biggest stakeholder and empower them to create something unique. A passionate entourage of volunteers, coupled with the charity experience, working with vibrant neighbourhoods allows a real difference to be made to all generations with a focus on disadvantaged communities.

By transforming forgotten spaces Seeds for Growth charity encourages everyone to take pride in their street whether it be providing a space to picnic or a world of home-grown veg. These open spaces can once again be a cherished place for families.

Seeds for Growth will facilitate the launch of 200 community gardens in London and through Greening Communities Franchises develop a further 1,200 UK wide. A few months prior to the May 2021 London Mayoral and Assembly elections, BECG welcomed a request from Seeds for Growth y to lead their election lobby campaign on pro-bona terms.

London Mayor Sadiq Khan, following the BECG's pre-election dialog, committed powerfully to support Seeds for Growth's mission to green London in his election Manifesto. "I'll support schools and local communities who wish to create or enhance nearby green space. Environment groups, local authorities and housing associations that retrofit housing estates with poor access to green spaces will also be supported."

The BECG campaign also led to half of the elected London Assembly Members signing a pledge to green London and to support Seeds for Growth.

Cities are grappling with the need to mitigate climate change and to address heat islands, habitat loss, biodiversity, pollution and poor air quality. The environmental benefits that flow from new community gardens include:

- Plants transform carbon dioxide into oxygen.
- Insects and bird new habitats
- Pollination.
- Air cooled.
- Noise pollution reduced
- Rainwater is regulated.

In the 1,400 new community gardens at least 10 per cent of the land will be planted with new trees. This will deliver annual emissions sequestration of 24,000 tons of carbon dioxide equivalent, annually by 2030. Calculation by CarbonX.

Greening Communities will develop 1,400 new community gardens of which at least 10% of the land will be planted with new trees. This would deliver annual emissions sequestration of 24,000 tons of carbon dioxide equivalent annually by 2030.

'Seeds for Growth sustainable and regenerative policy commits us to combat climate change and its impacts, including reducing emissions to align with global commitments. To achieve net zero emissions we will:

- ***Implement our office emission reduction action plans as part of our overall environmental management system.***
- ***Disclose our annual greenhouse gas emissions accounts and our residual hard-to-decarbonise emissions.***
- ***Explore science-based targets and seek to set global reduction targets.'***

Gregory Cohn, CEO, Seeds for Growth

South Essex Estuary (SEE) Park

Thurrock | Status: **Proposed**

Landscape Architect: **Alexandra Steed URBAN**

- A network of natural landscapes totalling 23,000 ha.
- 16,000 ha. new green spaces, creating greater accessibility for local residents
- circa 9,200 ha. of newly planted woodlands, achieving significant carbon offsetting, improved air quality, and open spaces
- circa 13,800 ha. of restored marshlands
- Naturally addressing flood management across 12,500 ha., protecting homes, businesses and infrastructure from flood risks

SEE Park will be a single park system encompassing 70,000 hectares of South Essex—set within the Thames Estuary - that sets an ambitious, revolutionary vision for tackling climate change, by creatively utilising green and blue infrastructure at a regional scale. This extraordinary parkland setting will provide an attractive offer for modern living, that supports residents, businesses, industry, tourism, and leisure activities, right on the doorstep of one of the world's greatest cities.

SEE Park will perform as a model of adaptability and resilience and will holistically address 21st century challenges through its green and blue spaces, including: improved health, well-being, and air quality; improved access to open space; restoring biodiversity and ecosystems; mitigating climate change and flooding; transitioning to net zero carbon; generating eco-tourism and green jobs to create a more buoyant economy. It emerges out of a demand for innovative practices of planning, and pioneers a strategic landscape approach that integrates natural systems, built environment and social equity to create an extraordinary place.

SEE Park is not only relevant to South Essex, but significant to London in that it provides a promising long-term solution to managing the effects of sea-level rise on London. The project provides benefits at the local, regional, national and international scale, as an exemplary model of strategic planning especially within estuary environments. (A high percentage of the world's largest cities are located within estuary environments and face similar issues.)

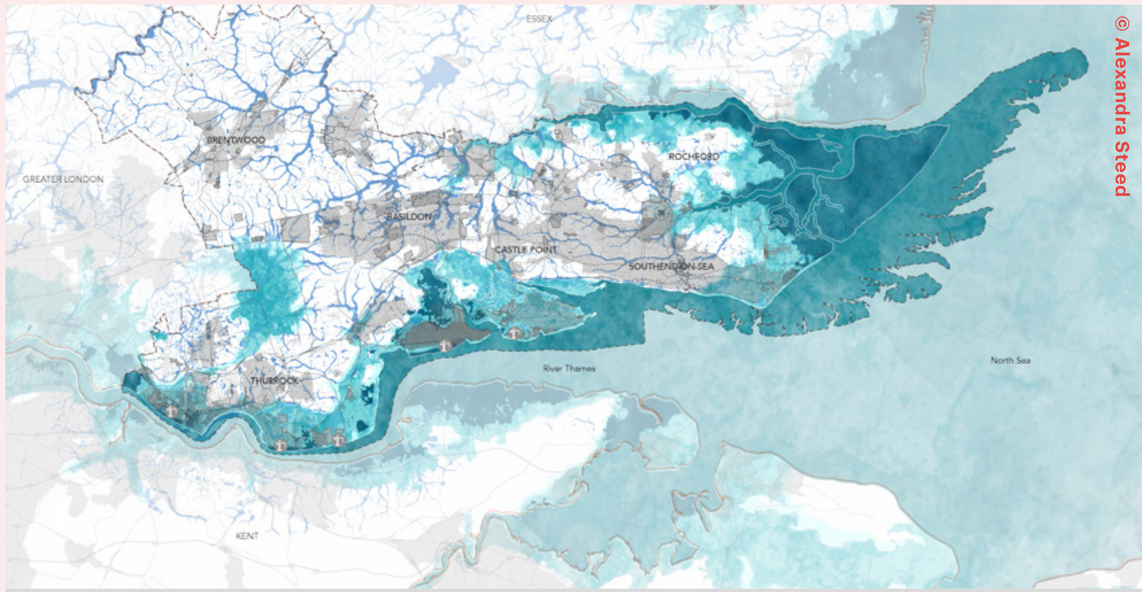
SEE Park has been awarded Excellence in Tackling Climate Change, and Excellence in Landscape Planning and Assessment, by the Landscape Institute Awards 2020, as a brilliant and trail-blazing project. The programme has been officially launched by the Association of South Essex Local Authorities (ASELA) and is currently working with Alexandra Steed URBAN towards the first phase of delivery.

SEE Park provides a promising long-term solution to managing the effects of climate change, and in particular, sea-level rise on London. Some of the climate risks addressed include:

- **Flooding:** natural management through restoration of 13,000 hectares of absorptive marshlands that protect local communities, important infrastructure, significant coastal habitat sites, and which in turn protects London.
- **Biodiversity loss:** safeguarding and restoring 23,000 hectares of natural habitats and ecosystems (including restored marshlands, and woodlands) as part of a Nature Recovery Network.
- **Net Zero Carbon:** Accelerating the transition to net zero carbon and providing many carbon-offsetting opportunities.

'South Essex Estuary (SEE) Park provides a significant contribution towards London's zero carbon ambition and provides a promising long-term solution to managing the effects of climate change, in particular, sea-level rise on London, by creatively utilising green and blue infrastructure at a regional scale to tackle climate change, ecological collapse, while also improving health and well-being. We worked closely with our client to develop this game-changing vision.'

Alexandra Steed, Founding Director, URBAN



© Alexandra Steed

© Alexandra Steed

Thamesmead

Concept

By Peabody

A landscape-led approach means that green and blue infrastructure provides protection from the impacts of the climate crisis. Summer heatwaves will be tempered by biodiverse roofs and broadleaf tree canopy. The restored canals and working landscape with bioswales will clean water and minimise flood risk from summer storms.

Thamesmead will be protected with new flood defences that provide multiple benefits. Tree planting will provide urban cooling, with species selection based on climate change impacts.

All housing design emphasises the outdoors, and the spaces between buildings. Connectivity here originally meant building highways; now it will mean active travel and public transport.

When the Greater London Council decided in the 1960s to reclaim over a thousand acres of marshes in the eastern reaches of the River Thames, the chance was seized to promote an entirely different way of living. Innovative concrete design was integrated with nature and green space. The marshes were channelled to establish large lakes and a network of canals. Environmental conditions were described as 'unmatched by anything that has existed before'.

Thamesmead then experienced decades of neglect, but now its future is once again in the hands of a single organisation. Peabody has become the town's largest landowner, and is intent on reversing decline with a £1bn investment strategy for 200 acres of developable land and large 1980s estates retrofitted for climate resilience. By 2050, the town's population is expected to have more than doubled to 100,000.

Thamesmead was designed to be a pioneer. Peabody wants to channel this spirit by creating a place where people can live far more sustainably. That's why instead of commissioning a whole-town masterplan, they took the bold step of inviting LDA Design to create a framework for landscape and green infrastructure, Living in the Landscape, to speed the transition to climate resilience and carbon-free living.

The climate crisis is one of the key drivers behind the framework. Sea levels are rising, habitat loss is a serious issue and health impacts are increasingly evidenced. The framework draws on expertise from specialist including hydrologist, ecologists and economists to maximise the benefits from Thamesmead's natural assets.

The special opportunity here is for people to become climate aware activists through re-connecting with the extraordinary natural environment on their doorstep. Thamesmead's streets will be overpoweringly green, the water quality of its lakes greatly improved, and the original vision for the canal network is being fulfilled.

Peabody's ambition is to be net zero carbon in its new and existing homes by 2050 and in its day-to-day business activities by 2030.

'Thamesmead is becoming an early adopter of environmental technologies, such as energy from waste and for water management, to support new skills and to minimise expenditure on traditional 'grey' infrastructure. For each element of its zero carbon ambition, Peabody are using a 'Thamesmead Test' to guide new development and building retrofit. The Test encourages developers to respond convincingly to the climate crisis with the most sustainable design and standards for buildings and spaces.'

Phil Askew, Director Landscape and Placemaking, Peabody

Micromobility

Concept

by Momentum Transport Consultancy

The transport sector is one of the biggest contributors of carbon emissions in the UK. As a result, transport is an integral part of the 'Zero carbon London' plan in which the Mayor has set a target to deliver a zero carbon transport system by 2050. Progressive transport planning involves understanding the link between transport and land use, and the future shape of our cities; our role is to consider what a 'decarbonised' future city might look like. In this research we look at how micromobility is a key consideration for cities, transport authorities and people who travel in and around London, from both a design and policy perspective.

Momentum partnered with LSE on a research report on investing in micromobility at stations, highlighting how better micromobility transport at stations could give passengers more options to complete their journeys without necessarily using buses or the Underground.

Micromobility, the use of small, electric, personal transport vehicles, brings a range of benefits when designed carefully. The question at the heart of this research is how passenger micromobility transport can be better planned for — and integrated — at London's rail termini to achieve stronger first and last-mile connectivity. This is not only beneficial to passengers but also to transport operators, which is critical for the long-term resilience of a city's transport network. Put simply, rail and micromobility are naturally complementary: rail transport covers great distances at high speeds, but with limited flexibility running on fixed routes and timetables. Micromobility is limited in practical range but is highly flexible in terms of trip generation, route choice and timing.

Micromobility also offers a valuable opportunity in the suburbs where there is much greater reliance on the car for shorter journeys. Walking and cycling are less attractive and public transport options are often less available and accessible. The research found that micromobility can rival the flexibility of the car, but for more people, while allowing passengers to travel more quickly than walking, and with less effort than cycling. The use of micromobility would allow suburban residents to travel locally without the use of the car. For longer journeys micromobility brings more of the suburbs within the range of a rail station and extends the catchment area of suburban stations.

In order for micromobiilty to fully enrich London's transport network and contribute to the city's climate resilience, the report offers a series of policy and design recommendations to improve the uptake and safety of micromobility — locking in long-term benefits for London.

'Micromobility provides an important opportunity for London to consider a more sustainable and equitable short-distance transport choice, when compared with using the car and private hire vehicles, in particular for outer London and in areas with low PTAL. This joint research provides important proposals for the operation and parking of micromobility at transport interchanges that should be incorporated into our future planning for London to deliver more equitable, flexible, and sustainable zero carbon transport options and to help reduce the level of car use for new homes.'

Roy McGowan, Managing Director at Momentum Transport Consultancy

Recycled aluminium facade technology

Product

by WICONA, Hydro Building Systems UK Ltd

By investing in aluminium and polyamide recycling technology, including using building demolition scrap, this product has a reduced embodied carbon within the facade manufacturing process while providing optimised thermal insulation, natural light, ventilation, weathertightness and acoustic comfort.

Facade, window and door systems are made from Hydro Circal 75R aluminium — reclaimed post-consumer scrap from demolished building facades — along with recycled polyamide insulating strips. The system's design is optimised to minimise the volume of material used, ensure that material is from low carbon sources, and increase the energy efficient of the building façade. By using post-consumer scrap aluminium, the embodied carbon can be reduced to just 26 per cent of the average for aluminium consumed in Europe and just 6 per cent of the average for global aluminium production. The physical properties of the aluminium and polyamide are not impacted, meaning that all the desirable characteristics expected of a facade — high thermal insulation, physical safety, ventilation, natural light, security, and building aesthetics — are unimpaired. Furthermore, at demolition, the ability to recycle aluminium with low energy inputs means that it can once again enter the value chain with low embodied carbon.

EPD certification is available for Hydro Circal 75R aluminium used to manufacture Wicona facade systems confirming embodied CO_2 equivalent of 2.3 kg per kg of aluminium. This compares with the International Aluminium Institute global average of 16.7 kg/kg.

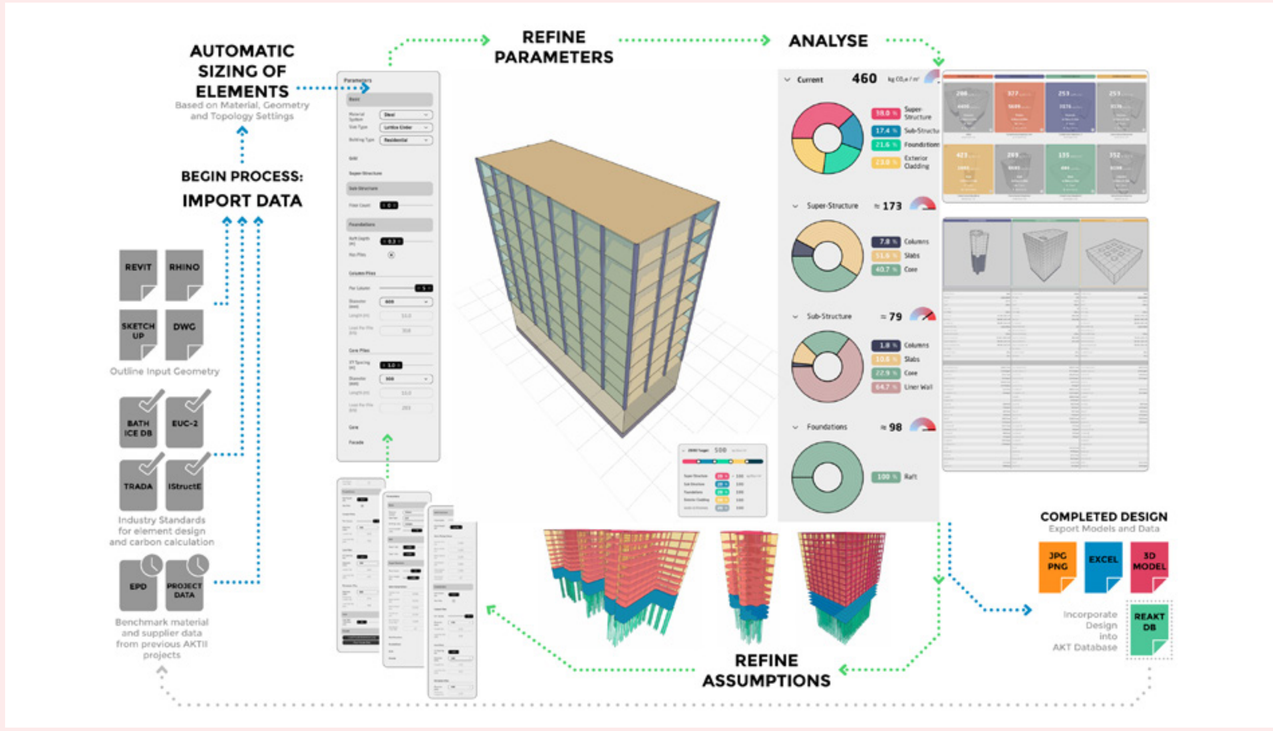
'I am confident that the introduction of Wicona's low carbon, post-consumer recycled materials into efficient façade systems and products which already give class-leading performance on thermal efficiency (including to Passive House levels), and allow both natural ventilation and weather tightness really does mean that London's buildings can be built or refurbished without compromise whilst minimizing carbon at both manufacture and operations.'

Graham Hurrell, Wicona UK Sales Director, Hydro Building Systems UK Ltd

Bioclimatic Toolkit

AKT II

AKT II's Bioclimatic Toolkit is enabling London's designers to understand and optimise our urban microclimate, i.e. the human experience, with unprecedented granularity. The bespoke software suite applies 3D computational analysis, together with climate, product and material data, to simulate and refine all microclimate qualities throughout a development and its existing and planned context. Outcomes are shared to academia and industry, to advance the bioclimatic field universally. Altogether, this is delivering safer environments that are more comfortable, inclusive and equitable, with greater long-term resilience—all of which helps London towards its imperative Net Zero future.



Carbon.AKT

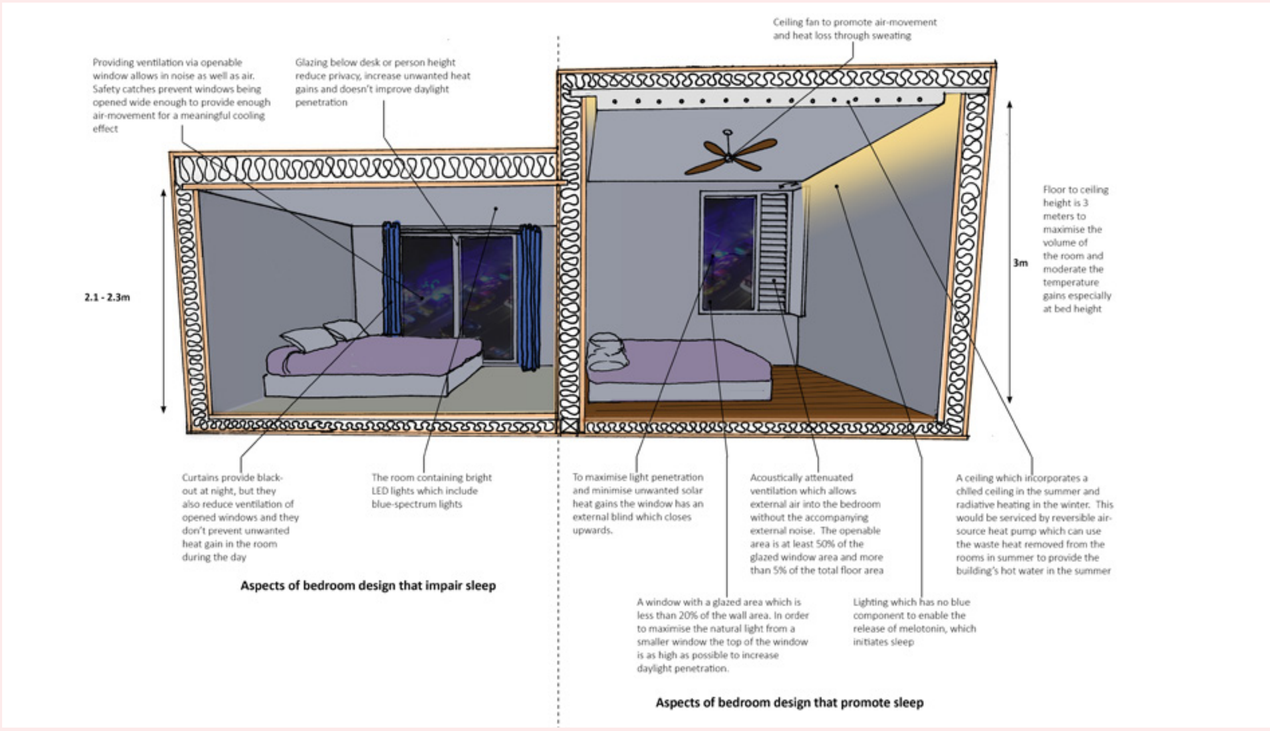
AKT II

AKT II's design tool 'Carbon.AKT' augments the human designer's intelligence with an unprecedented understanding and optimisation of a development's embodied carbon. This bespoke software applies generative parametric modelling to calculate a design's embodied carbon from just the most basic massing information onwards, and enables the designer to parametrically manipulate and refine the design, with live carbon calculation, in real time. Outcomes are shared to the wider industry and academia, to advance the carbon field universally. Altogether, this newly enables carbon-quantified decisions from the project's outset, to help achieve London's imperative Net Zero future.

Connected Kerb EV charging

Connected Kerb Ltd

Toxic air threatens the health of billions of people across the globe. In the UK, road transport accounts for 22 per cent of total UK emissions of carbon dioxide (CO_2). Electric vehicles (EVs) are a keystone in the solution to reducing emissions and improving air quality. Connected Kerb's EV charging solution is a long-life infrastructure asset that has been purposely designed to be deployed at scale and integrate new technologies as they are developed. The solution combines both power and data at kerbside to support enhanced connectivity, including Wi-Fi, 5G and Internet of Things (IoT) technologies, for example, air quality sensors.



Design for sleep guidance

Research by Max Fordham LLP

Max Fordham's design for sleep guidance was developed to help future-proof new residential developments in London. As new homes are designed to minimise carbon emission they become more at risk of exacerbating overheating. Better insulation, airtightness and the inclusion of centralised heating and hot water networks increase the overheating risk. This guidance sets out zero carbon design measures that can be implemented to create comfortable sleeping conditions as summer temperatures in London rise.

© AKT II

Earth Friendly Concrete

Wagners and AKT II

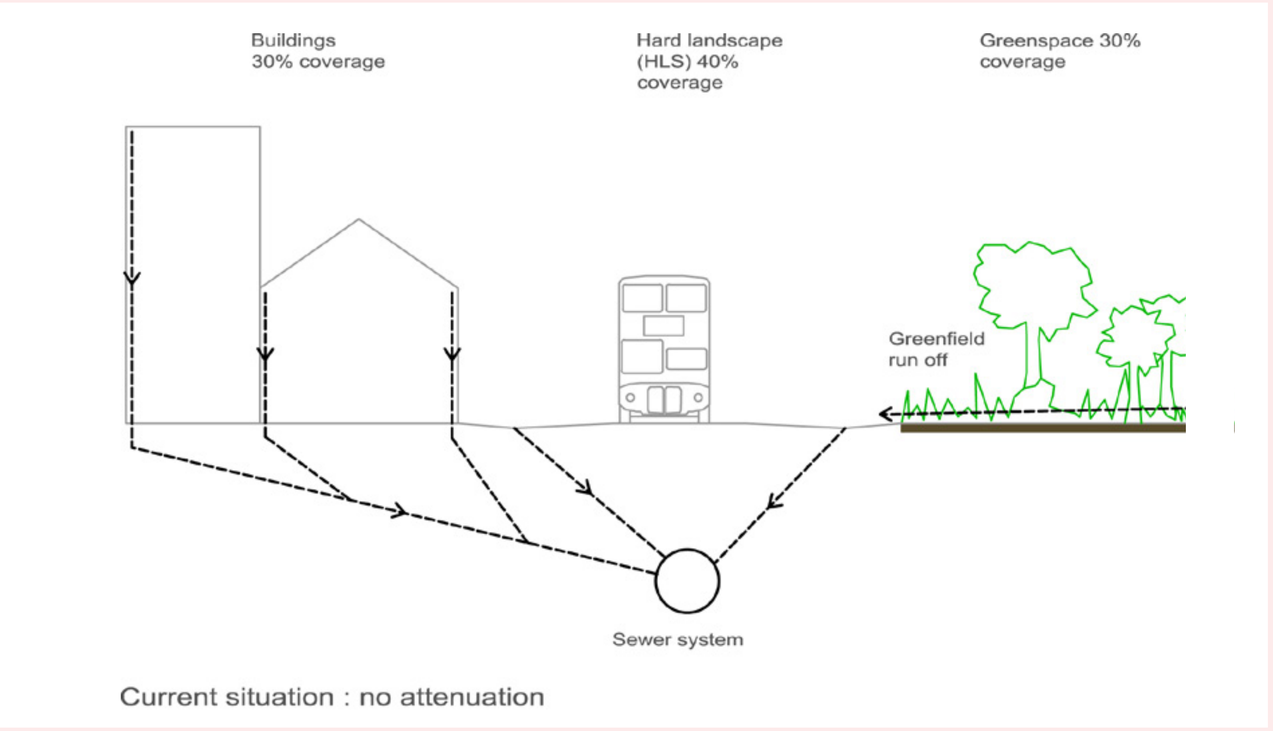
The UK uses roughly 4,000,000 cubic metres of ready-mix concrete every year, which emits 800,000 tonnes of carbon. An alternative low-carbon concrete will therefore be a major step towards meeting our government-instructed, industry-backed carbon targets. EFC is a new class of concrete that is based on Wagners' geopolymer technology. This geopolymer binder system is based on the chemical activation of two industrial waste by-products: fly-ash, and blast-furnace slag. This concrete significantly reduces carbon emissions when compared with traditional OPC-based concrete. EFC is a specialist mix that totally eliminates ordinary Portland cement (OPC), which reduces the concrete's embodied carbon by 80 per cent.

© Feilden Clegg Bradley Studios

FCBS CARBON

Concept by Feilden Clegg Bradley Studios

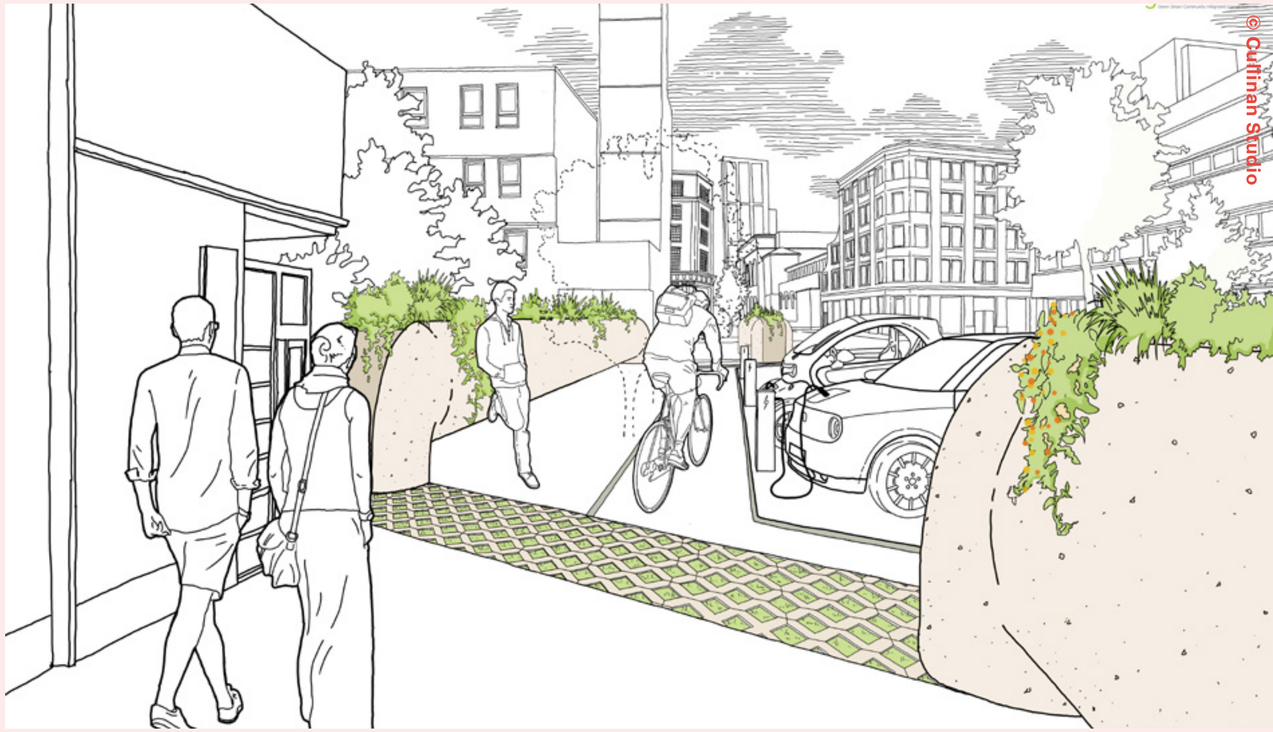
FCBS CARBON is a whole life carbon review tool, designed to estimate the whole life carbon of a building to inform design decisions prior to detailed design. This makes potential carbon impacts clear to the client, architect and the whole design team from the outset of the design process. Using benchmarked data from the ICE Database and EPDs, the tool is designed to give the design team insight into the whole life carbon impact of a building from the very outset of a project.



Greening Cities

Research by Max Fordham LLP

Greening Cities is about environmental, economic and social benefits brought about by increasing the amount of foliage, trees and soft landscaping within urban environments. The MAX:R+I team at Max Fordham LLP examined the opportunities for green infrastructure to contribute to the economic, social and environmental wellbeing of urban developments. The findings conclude that the implementation of sustainable urban drainage systems, such as green roof infrastructure, if installed evenly across 50 per cent of London's rooftops would provide sufficient attenuation so as not to overload the current sewer network in a one in 100-year, 1-hour storm event. Green infrastructure can also help to reduce the Urban Heat Island (UHI) Effect.



GreenSCIES

91 Skinner Street, Clerkenwell, Islington | Completion: **2022**

Funding Body: **Innovate UK** | Architect: **Cullinan Studio** | Local Authority: **London Borough of Islington** | Transport Authority: **Transport for London** | Energy Supplier / Customer Engagment: **E.ON** | Building Services Engineer: **Silver EMS** | Energy Consultant: **Grid Edge** | Energy Consultant: **Consortio** | Local Authority / Project Partner: **West Midlands Combined Authority** | Engagement Consultant: **Carbon Data Resources** | Sustainability Engineer: **Carbon Descent** | Transport Consultant: **Cenex** | Engagement Consultant: **Repowering London** | Sustainability Consultant: **Building Low Carbon Solutions** | Transport Consultant: **Hangar 19** | Research Institution: **London South Bank University**

GreenSCIES is an ambitious two-year InnovateUK funded project to develop a new 5th generation Smart Local Energy System in Islington, delivering a significant carbon saving for local residents, schools and businesses. The network will deliver heating, cooling, power and e-mobility charging powered by renewable energy and waste heat, sourced from the local area. The network will include the installation of seven km of ambient loop, 42 energy centres with 25MW Heat Pump capacity over a 5.2 square kilometre area. Approximate maximum of potential photovoltaics of nine MW and EVs.

HotHob

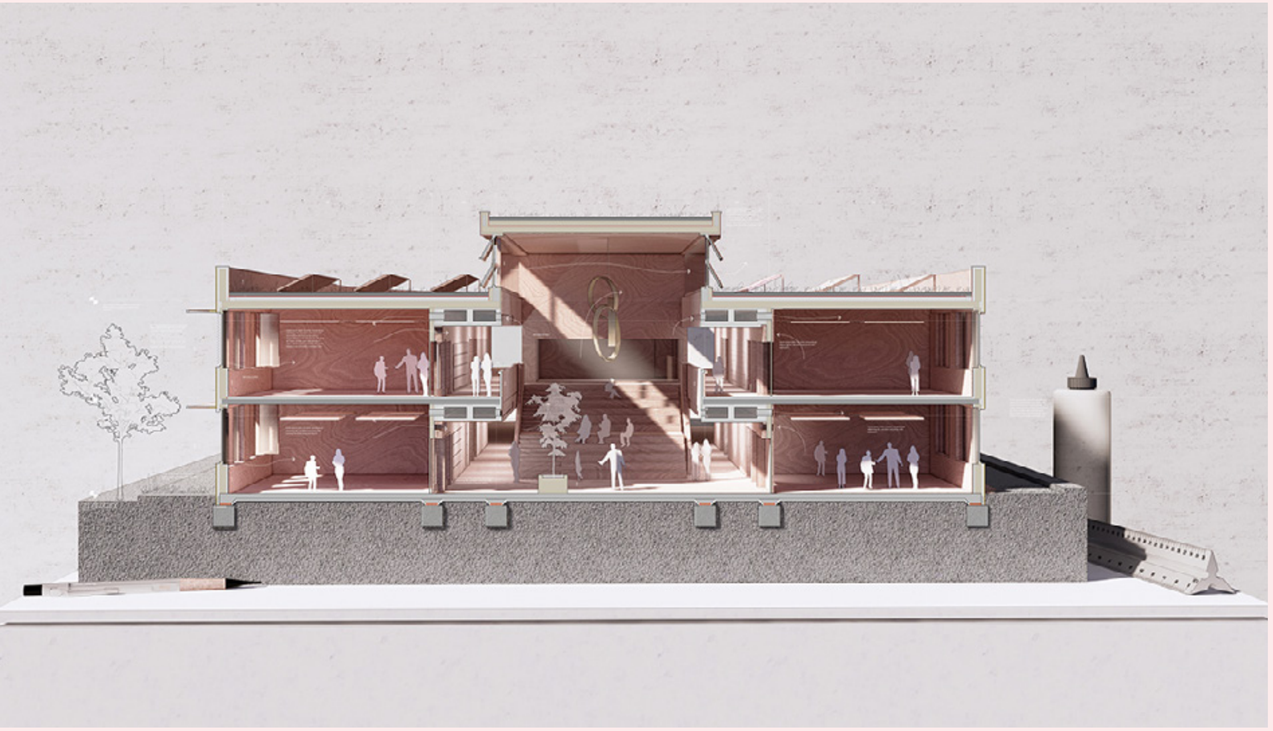
By DP International

HotHob is a case study that examines the viability of using leftover space over railways to address London's chronic housing crisis. The study proposes utilising existing rail infrastructure to create pockets of developable land for housing. The aim of the study is to see how new homes can be created with minimal impact to infrastructure, yet yield the maximum benefit; such as proximity to Central London and buildability. Through the use of DfMA (i.e offsite homes) the initial study (for proof of concept) speculates the potential yield of 7,500 homes over a portion of London's 14 over-ground rail lines. The HotHob project can be rolled out over London with modular housing units that seamlessly integrate into the existing fabric of the city.

Low-Carbon Reusable Cassette

By AKT II

The Low-Carbon Reusable Cassette (LCRC) is a prototype construction product that helps achieve London's imperative Net Zero circular economy. The novel 'kit of parts' floor-plate system applies low-carbon Cemfree-based concrete with integrated 'ConcreteDNA' smart monitoring technology, plus fully demountable steel components, together with BIM-based material passports. Altogether, this enables the reuse of all elements and—compared with an equivalent traditional construction—reduces the structural frame's weight, the structural-steel content, the required site deliveries, and the required prefabrication and construction labour, while also cutting the total embodied carbon by over 40 per cent. This R&D collaboration involves AKT II, UCL, William Hare, DB Group, Converge, and Mace, with UK Government 'Innovate UK' funding.



Net Zero School prototype

By Jestico + Whiles

A prototype school which minimises energy use and carbon emissions, this concept includes: reducing reliance on grid energy through demand reduction, utilising high fabric standards, low energy heat generation with high efficiency heat recovery and maximising on-site renewable energy generation; mitigating risk of future overheating through solar shading, optimised window design, natural cross and stack ventilation with night-purge and exposed thermal mass; mitigating bio-diversity crisis utilising bio-diverse roof and habitat regeneration on-site. The concept has been designed to achieve net zero carbon in operation according to the LETI definition and standards, with energy use intensity of less than 65 kWh/m².yr and space heating demand of 15 kWh/m².yr.

NOW DATABASE

‘Now’ Database

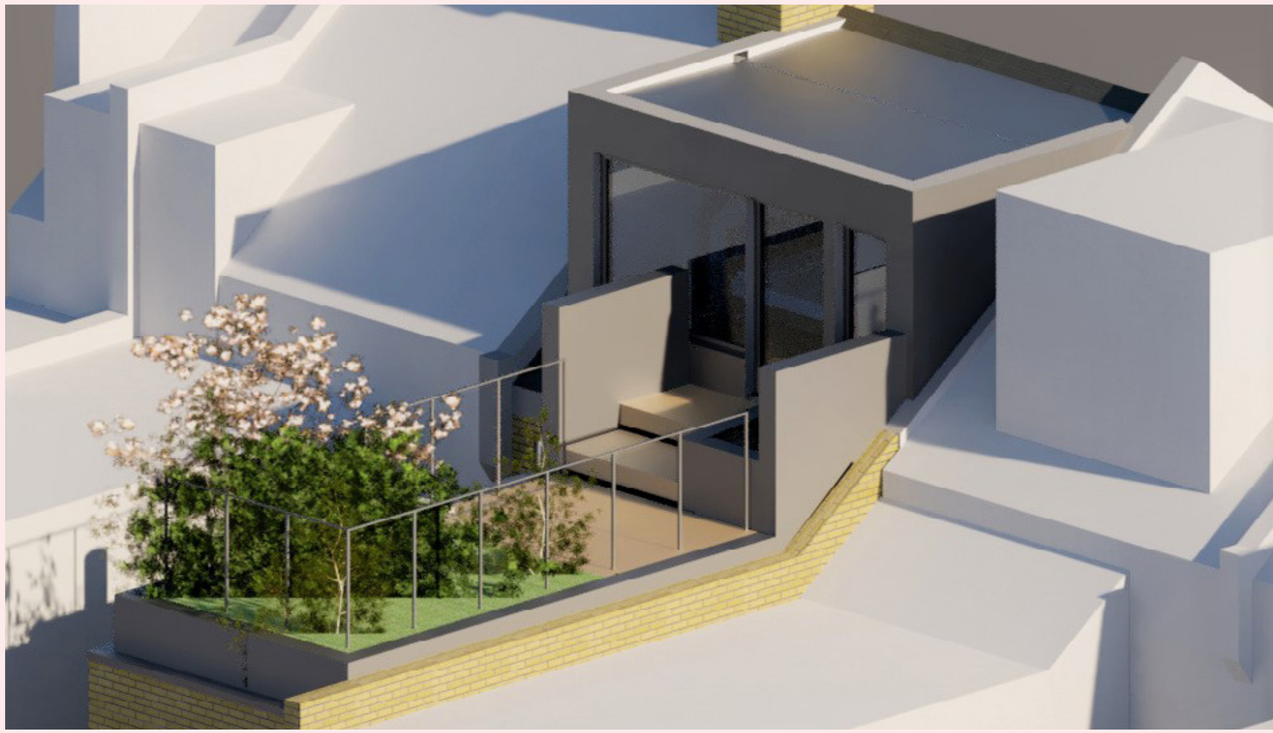
By Perkins&Will

The specification of materials is a key component of designing more sustainable and resilient buildings. Perkins&Will ‘Now’ Database aims to give architects and designers easy access to the market’s most sustainable materials and products. The ‘Now’ Database is a data gathering and scoring system that allows producers to register their materials and products alongside all additional information and EPDs. It was developed to capture products from suppliers of all sizes, ensuring Perkins&Will measure contributions in a fair and equitable way.

Multilume Re:Think

By Fagerhult Lighting

Multilume Re:Think is an easily installed, recessed modular product made entirely of Solid Board, a material that is 100 per cent recyclable, heralding in a new era of renewable, sustainable lighting. Through an innovative choice of renewable materials, Multilume Re:Think reduces the climate impact from the luminaire body by 83 per cent, helping tackles London's Carbon Footprint and use of fossil substances and virgin materials. Designed to last approximately 20 years, more than 90 per cent of the fitting can be recycled into new material, and the luminaire body can be recycled to 100 per cent. When installed within buildings throughout London, the advanced technical solution keeps energy consumption down to a minimum. Optimise with Organic Response lighting control for Smart green buildings that further reduce power consumption only switching on when they are needed.



Purves Road Insulated biodiverse roof

By Patrick Crowe Architects

Encouraging home owners to actively invest in insulating their own homes and to foster biodiverse environments, this project involves insulating a typical London Victorian maisonette roof and overlaying with a biodiverse landscape. A portion of the roof becomes a usable outdoor amenity space which helps justify a homeowner's cost investment of these environmental measures, particularly relevant where Victorian properties perform thermally poorly and offer little or no amenity space.

Soilless

By Flanagan Lawrence

Modular soilless growing systems are touted to use 10 per cent of the normal water to grow the same amount of plants. This is a joint initiative project to develop an integrated modular vertical agricultural system to wrap onto the south facades of industrial sheds in suburban areas. The system is based on a spatial assembly of low impact modular units housing both a de-coupled aquaponic based monoculture, and waterless air driven systems. Closed loop design principles share a host structures resources; power water and the recovery of waste heat. The proposal relies on a mutually beneficial symbiotic relationship between a host structure and the agricultural system.

Green Block

By WATG

Green Block is product prototype developed by WATG: a living, breathing natural filtering system for pollutants that absorbs water in flood-prone areas, creates habitats for pollinators, provides education opportunities, increases curb appeal, and improves peoples' mental wellbeing through the provision of access to green environments—without impacting existing infrastructure. Green Block is a maintenance-free, 100 per cent recyclable modular building material permeated with native species that can, quite literally, be applied anywhere—vertically or horizontally, over existing roads and carparks, and on the sides of buildings, lamp posts, bollards, and more. Green Block is currently a product prototype, with the concept widely endorsed by esteemed organisations including National Parks Research and London Wildlife Trust, and millions of citizens.

© JTP

100 Miles Wilder

By JTP

100 Miles Wilder maps landscape character and Nature Recovery Networks and uses these to inform and determine where nature friendly development might come forward. Establishing, protecting, enhancing and connecting these networks is key to creating a landscape where wildlife is abundant, development is green, cities are wilder, the countryside is buzzing, soils are healthy and water is plentiful and clean. It outlines 10 key solutions for building nature's way which support restorative water management; making space for nature and providing access to it; nature friendly farming; putting development in the right places; and aligning this with an active travel network.

INDEX

Acknowledgements

NLA would like to thank our Net Zero Champions:

Argent, Argent Related, Civic Engineers, Elementa, Heyne Tillet Steel, Hoare Lea, London & Partners, Waterman Group, WICONA by Hydro and contributors whose support made this study possible.

Special thanks to the NLA Expert Panel on Net Zero 2020 panel members and for the following people for sharing their time, expertise and insights, and their own research through interviews, discussion and/or participation in NLA workshops.

Researcher and writer: **Hattie Hartman, Sustainability Editor, Architects' Journal**

Editorial team: **Barbara Chesi** and **Lucie Murray**

Curator-in-Chief: **Peter Murray**

Designer: **Ruby Bergin**

Marketing and communications: **Ilaria Vignolo**

Contributors

Frank Anatole, Principal Architect, Network Rail

Phil Askew, Director Landscape & Placemaking, Peabody

Clara Bagenal George, Associate, Elementa Consulting

Rafe Bertram, Sustainability Facilitator, LB Enfield

Harbinder Singh Birdi, Partner, Hawkins\Brown

Claudine Blamey, Head of Sustainability and Digital Strategy, Argent

Abby Crisostomo, Project Director, TE2100's London Area Team, Environment Agency

Heeral Dave, Manager, EY

Lucette Demets, Head of Sustainability, London & Partners

Kristen Guida, Manager, London Climate Change Partnership, Greater London Authority

Howard Gray, PR & Specification Manager, GreenBlue Urban

Robert Evans, joint Managing Partner, Argent

Kate Hand, Head of Climate Change, London Councils

Emma Harvey, Programme Director, Coalition for the Energy Efficiency of Buildings, Green Finance Institute

Janet Laban, Senior Sustainability and Lead Environmental Resilience Officer, City of London

Fred Labbe, Associate Director, Expedition Engineering

David Leversha, Director, Net Zero Carbon Lead, WSP

Ben Llewellyn, Environment Planning and Engagement Manager, Environmental Agency

Lilian Martins, Associate, Hoare Lea

Owen Richards, Global Environmental Lead, McGregor Coxall

Ellen Salter, Sustainability Consultant, Arup

Ben Smith, Director, Energy, Cities and Climate Change, Arup & Trustee, London National Park City

Chloe Souque, Sustainability Associate Director, Waterman Group

Tom Steel, Director, HTS

Paul Toyne, Practice Leader Sustainability, Grimshaw

Rosie Whicheloe, Landscape Ecologist, London Wildlife Trust

Joe Jack Williams, Associate, Researcher, FCB Studios

Dima Zogheib, Associate, Arup

NLA Expert Panel on Net Zero 2020

Gareth Atkinson, Director, Civic Engineers

Marion Baeli, Partner, PDP London Architects

Ashley Bateson, Partner, Hoare Lea (Chair)

Katie Clemence-Jackson, Principal Sustainability Consultant, Max Fordham LLP

John Davies, Head of Sustainability, Derwent London

Paul Dipino, COO, Joseph Homes

Sonal Jain, Director, Net Zero Carbon, Workplace and Clients, JLL

Nathan Millar, Principal, Sustainability, Elementa

Juliette Morgan, Head of Sustainable Development, British Land

Douglas Phillips, Senior Environmental Analyst, Historic England

Nils Rage, Head, ESG, Stanhope

Craig Robertson, Associate, Head of Sustainability, AHMM

Joris Verhiest, Marketing Director, Hydro/WICONA

Derek Wilson, Senior Sustainable Development Supervisor, Transport for London

Luisa Brotas, Senior Sustainability and Climate Change Officer, LB Hackney

Gary Clark, Principal, Science and Technology Regional Leader, HOK London Studio

Charlie Scott, Director of Waterman Structures, Waterman Group

Tom Steel, Director, Heyne Tillett Steel

Endnotes

1 London City Resilience Strategy, 2020, p.28.

2 London City Resilience Strategy, 2020. p.16

3 London City Resilience Strategy, 2020. p.28

4 Independent Assessment of UK Climate Risk, Climate Change Committee, 2021. https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/ Global Warming of 1.5, IPPC, 2021. https://www.ipcc.ch/sr15/ and Global Warming of 1.5, IPPC, 2021. https://www.ipcc.ch/sr15/

5 https://www.bbc.co.uk/news/uk-england-london-57963856

6 https://twitter.com/BBCRadioLondon/status/1414846763471622145?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1414846763471622145%7Ctwgr%5E%7Ctwcon%5Es1_c10&ref_url=https%3A%2F%2Fdevelopment-3787521218394534603.am-projectnet%2F2108192119000%2Fframe.html

7 London Environment Strategy, 2018. P.342

8 London Climate Change Partnership. http://climatelondon.org/climate-change/drought/

9 London Strategic SuDS Pilot Study, 2020. p1 https://www.susdrain.org/files/resources/evidence/4_appendix_2_lssps_modelling_report.pdf

10 Policy G4: Open Space, Table 8.1. London Plan, 2021.

11 London Green Spaces Commission Report, 2020. p9.

12 London Councils Transport and Environment Committee, March 2020

13 Extract from 'London's DNA is the River Thames' by Greg Clark, unpublished.

14 Quote from Tim Taylor, Faithful+Gould at CIBSE LIVE, BUILD2PERFORM, November 2019. https://www.cibsejournal.com/general/no-time-to-lose-build2perform-highlights/

15 https://www.climatepolicyinitiative.org/wp-content/uploads/2020/12/Updated-View-on-the-2019-Global-Landscape-of-Climate-Finance.pdf, p 11

NLA Net Zero Champion

Argent & Argent Related

Since 1981, Argent has delivered some of the best mixed-use developments in the UK: major commercial, residential, education, cultural and community developments in the country's largest cities.

It is involved in the full development process—from identifying and assembling sites, developing designs and obtaining planning permission through to financing, project management of the construction process, letting, asset management and (sometimes) selling. It also manages and maintains buildings and estate.

Argent has a team of 150 people. In March 2015 it entered into a new long-term partnership with respected US developer Related, forming Argent Related, to pursue future opportunities for urban development, with a focus on the build-to-rent sector.

4 Stable Street
Kings Cross
London N1C 4AB

020 3664 0200
argentllp.co.uk

NLA Net Zero Champion

Civic Engineers

We are engineers with a passion and expertise in the design and delivery of high quality award winning buildings, structures and public spaces.

Our engineering skills cover both structural and civil, including movement, highways, flood risk, drainage, SuDS and earthworks amongst others.

Civic Engineering is the fusion of all these skills. We believe this fusion of expertise is essential to resolving the complex and competing needs of our towns and cities, leading to the design of innovative, sustainable and economically viable structures, neighbourhoods and environments, where we seek to work with the prevailing geography of a place.

Our pursuit of excellence based on the hard earned trust of our clients and partners, allows us to challenge conventions for the benefit of our projects. We take a creative and broad approach that has seen us gain industry recognition for delivering a wide range of challenging, distinctive and critically acclaimed projects, undertaken from our city centre studios in Manchester, London, Leeds & Glasgow.

Reeds Wharf
33 Mill Street
London SE1 2AX

020 7253 2977
Gareth@civicengineers.com
civicengineers.com

Elementa

ELEMENTA

Elementa Consulting is an award winning MEP building services, and sustainability consultancy specialising in low energy building design who have been operating for 30 years and are now a member of Integral Group.

Elementa provides a full range of sustainable design services for projects in the UK, Europe and the Middle East, including MEP systems design, advanced energy modelling, sustainability strategy consulting and masterplan support.

We specialise in the design of simple, elegant, cost-effective systems for high performance building environments and provide comprehensive analyses that help prioritise their energy saving potential and carbon reduction effect. Our vision is to be the leading global deep green engineering practice.

As a member of The Integral Group (of North America), we are part of an interactive global network of design professionals collaborating under a single deep green engineering umbrella. We provide a full range of building system design and energy analysis services, with a staff widely regarded as innovative leaders and experts in their fields.

10 Whitechapel High Street,
London, E1 8QS

020 3697 9300
info@elementaconsulting.com
elementaconsulting.com

NLA Net Zero Champion

Heyne Tillet Steel

Heyne Tillett Steel is a structural and civil engineering practice with a reputation for delivering intelligent low carbon solutions on complex, urban sites.

We combine intelligent engineering with solid practicality and a hands-on approach, getting involved in a project from concept to completion. We are committed to low carbon design and giving new life to existing structures and spaces, as well as making new buildings as efficient as they can be. We are constantly pushing at the limits of emerging materials and technologies and have set up a research division, HTS+, to further our learning.

We enjoy our work, and thanks to our forward-thinking attitude and love of design, people enjoy working with us. Clients and collaborators trust us because we put in the time and effort to work out the best solution for every project. They know that our calm, pragmatic interrogation of the whole design delivers benefits in cost, time and consumption of carbon. And they appreciate that we take the time to consider problems with care and a positive mindset. As an Employee Ownership Trust we invest in our employees and work hard to create a culture of continuous learning which supports, inspires and develops a passion for engineering and the built environment.

16 Chart Street
London, N1 6DD

020 7870 8050
mail@hts.uk.com
heynetillettsteel.com

NLA Net Zero Champion

Hoare Lea

Hoare Lea is an international firm of mechanical, electrical and public health (MEP) consulting engineers. Our client-focused and design-led service is underpinned by our commitment to excellence and our passion for innovative sustainable design.

As the largest firm of MEP consulting engineers in the UK we have experience across all major market sectors. We bring over 150 years of award-winning design experience and have worked on some of the most prominent developments in the industry during this time.

We provide a holistic service and understand the importance of communication, offering services such as digital visualisation, interactive models, and our expertise in BIM. Our MEP engineers and specialists are able to cover the full life cycle from strategic definition and briefing through to occupation and long term building performance.

We strongly believe in collaboration and encourage creative and original thinking within our teams. We're not just about pipes and wires; we know that the best results come from partnering with our project team colleagues from the earliest stages.

Western Transit Shed
12–13 Stable Street
London, N1C 4AB

020 3668 7100
london@hoarelea.com
hoarelea.com

NLA Net Zero Champion

London & Partners

LONDON
& PARTNERS

London & Partners is London's international trade, investment and promotion agency.

We support the Mayor's priorities by promoting London internationally as a leading world city in which to visit, study, invest, grow and meet.

We tell London's story brilliantly to an international audience and focus proactively on the core markets, audiences and sectors that will bring good growth for London.

We promote London across the world; attract overseas organisations, events, students and visitors to the capital; and help to retain and grow London companies.

Our work helps achieve good growth for London and Londoners and has supported over 70,000 jobs since we were founded in 2011.

2 More London Riverside
London SE1 2RR

020 7234 5800
londonandpartners.com

NLA Net Zero Champion

Waterman Group

Waterman Group is a multidisciplinary consultancy providing sustainable solutions to meet the planning, engineering design and project delivery needs of the property, infrastructure, environment and energy markets.

Founded in 1952, the company has since grown into a leading engineering and environmental consultancy with offices throughout the UK, Australia and Europe. Waterman works with government agencies, local authorities, government-regulated industries and private sector clients to provide innovative, sustainable and economic solutions across a wide spectrum of business activities.

The firm has extensive experience in property and buildings, environmental consultancy, power and energy, roads, highways and rail infrastructure, urban and regional planning. Award winning teams provide professional consultancy services throughout the complete life cycle of the asset starting from initial surveys and concept planning, through to design, delivery, project management, supervision and on-going maintenance.

Waterman Group is part of CTI Engineering, the leading Japanese engineering consultancy. CTI provides professional consulting services related to civil engineering and construction works, including planning, research, design, and project management.

Pickfords Wharf
Clink Street
London, SE1 9DG

020 7928 7888
watermangroup.com

NLA Net Zero Champion

WICONA by Hydro

WICONA operates internationally to provide market leading solutions in both unitised and standard curtain walling, supported by an extensive range of door and window systems.

An established global player in façade design and development for over 50 years WICONA provides local expertise to London construction utilising its extensive UK and International project support network

With its rich culture of innovation, WICONA has positioned itself as a leader in providing highly energy-efficient aluminium solutions for sustainable, urban design.

WICONA UK
Hydro Building Systems UK Ltd
Severn Drive
Tewkesbury GL20 8SF

London Office:
The Building Centre
26 Store Street, Fitzrovia
London WC1 7BT

01684 853 500
info.wiconauk@wicona.com
wicona.co.uk

NLA Net Zero Supporter

VU.CITY®

VU.CITY is a game-changing, powerful digital twin of our cities that supports its users in creating, refining, and sharing the journey of city transformation to create the best possible city for all.

Our smart cities currently support built environment professionals, with future growth plans to help all industries that impact our cities by creating holistic space to test, understand impacts in seconds and discover how we can get more from what we already have.

Used across the United Kingdom and Ireland's by architects, developers, planners, politicians and citizens, VU.CITY provides a shared visual perspective to understand the character of a city, facilitating a city-wide constructive narrative and inclusion with change.

The VU.CITY Platform covers the whole of London and the centres of more than 20 major UK and international cities. Through use of 3D technology, tools and data and game engine technology, VU.CITY helps city changers make better design and planning decisions, faster.

The Whitehouse Belvedere Road
London SE1 8GA

020 3889 7030
info@vu.city
vu.city

New London Architecture (NLA) is an independent membership organisation for everyone with an interest in London's built environment, with a clear purpose to improve the quality of people's lives by making London a better place to live, work and visit.

NLA engages the broadest possible audience across government, business and the public to educate, challenge, connect and drive positive change.

NLA's activities include research, events, publications, exhibitions, walking tours, learning programmes, websites and social media platforms, awards and competitions, the world's largest architecture festival and public galleries that feature large interactive scale models of London.

Visit nla.london for more information.

New London Architecture (NLA)
31 Great Sutton Street,
Clerkenwell,
London EC1V 0NA

info@nla.london

nla.london

+44 (0)207 636 4044

@nlalondon

@nlalondon