UK GBC

Together for a better built environment

## INNOVATION INSIGHTS:

# NATURE-BASED SOLUTIONS & CLIMATE RESILIENCE

# Foreword

Bringing innovative solutions to the built environment has never been more critical, with mounting environmental, economic, and societal pressure to transition towards a resilient and net zero future.

We need to take a collaborative approach to recognise the challenges in doing this, and to increase the speed at which we identify and adopt the solutions that already exist today.

This report is just the first step – please absorb it, pilot the solutions that will deliver the greatest impact through your work, and share your story with us to help inspire others to do the same.

**Lucy Rees – Senior Advisor, Insights & Innovation, UKGBC**

Extreme weather events resulting from climate change are noticeably intensifying and are expected to become more common and extreme in the future. For the built environment, this poses problems for both built assets and their supply chains. We need to ensure that buildings, infrastructure, and communities are designed and retrofitted to weather the shocks and stresses that these changes will bring.

The good news is that innovative solutions, especially nature-based solutions, are out there. They are vital in addressing these problems, enabling us to create climate resilient developments and assets that provide a multitude of co-benefits.

So please explore the solutions provided in this report, consider how you could use them within and without your organisation, and think innovatively – how can you begin to adapt the built environment for the future?

**Hannah Giddings – Resilience & Nature Advisor, UKGBC**

# Introduction

## UKGBC Solutions & Innovation

A step change in the property and construction sector's environmental and social impact is required to achieve the UKGBC vision for a sustainable built environment. This requires innovation in technology, business models and ways of operating, but innovation in the sector can be slow. UKGBC's focus on solutions and innovation aims to help address shared sustainability challenges within the sector by showcasing practical solutions available today and enhancing collaboration between innovators and corporates.

## Innovation Challenges

By running time-bound innovation challenges in collaboration with our members, UKGBC uses its unique convening power to identify and profile impactful sustainability solutions.

## Resilience and Nature-Based Solutions Challenges

It is now unequivocal that human influence has warmed the planet, resulting in widespread and rapid changes affecting many weather and climate extremes across the globe[1]. The most recent assessment of UK climate-related risks and opportunities found that nearly 60% need to be addressed urgently, and that the gap between risks and adaptation actions is widening[2]. It is not enough to mitigate against future climate change, we also need to adapt to the inevitable impacts we are locked into.

In Autumn 2019, UKGBC published an ambition for the industry that "by 2030, all built assets should be climate resilient and maximise environmental net gain through the prioritisation of nature-based solutions". In the same year, UKGBC started work on the IGNITION project to develop financing solutions for Greater Manchester's green infrastructure. UKGBC's Resilience and Nature programme continues to enable built assets to be climate resilient and maximise environmental net gain by:

1. Defining ambitious and consistent commitments and standards.
2. Identifying challenges, solutions, and best practice.
3. Increasing knowledge and skills.

Solutions to enable climate resilience within the built environment already exist, but they aren't always common knowledge or well understood. In response, UKGBC ran two climate resilience challenges between the 19th of January and 8th of February 2022, searching for impactful solutions in need of greater profiling and adoption:

**Challenge Statement One:** How can communities and local authorities implement, maintain, and assess the impact of nature-based solutions to enhance climate resilience?

**Challenge Statement Two:** How can existing buildings be made more resilient to climate change, with as little disruption to their occupants as possible, by 2030?

[1] IPCC (2021). Sixth Assessment Report WGI – The Physical Science Basis

[2] CCC (2021). Independent Assessment of UK Climate Risk

# Judging Panel

To assist with these challenges, a group of UKGBC members with expertise in resilience and NBS were convened to take part in a Judging Panel. The role of this group was to:

- Help refine the two challenge statements to ensure they are relevant, real-world issues faced by UKGBC's membership.
- Encourage industry to engage with the challenges.
- Evaluate the solutions sourced.
- Participate in a UKGBC showcase event, providing feedback on solution pitches.

## Judging Panel

Kulbir Bhatti, Sustainability Manager - GPE

Lea Vavrik, Sustainability Analyst - GPE

Juliet Staples, Senior Project Manager URBAN GreenUP - Liverpool City Council

Gillian Dick, Manager Spatial Planning: Research & Development - Glasgow City

Robert Winch, ESG Consultant - Hoare Lea

GPE.

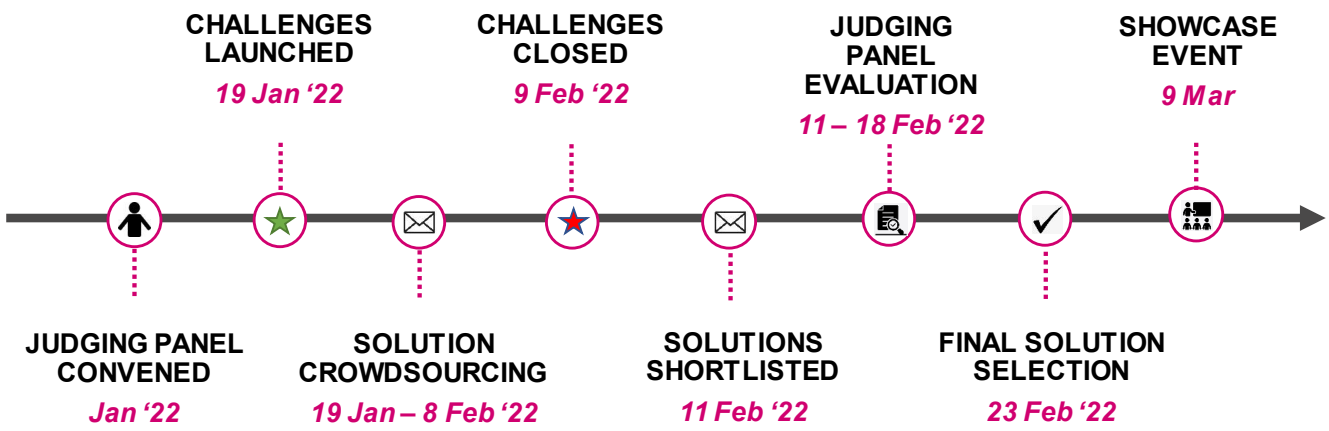
Liverpool City Council

Glasgow CITY COUNCIL

HOARE LEA

# Challenge Process

The timeline below indicates the process and key milestones in running these challenges:



# Solution Identification

Potential solutions to these challenges were crowdsourced through a combination of awareness raising activities with industry and desktop research. Submissions were made via the UKGBC website and were then evaluated by UKGBC and the member Judging Panel.

*UKGBC and the Steering Group undertook the assessment based on information supplied to UKGBC by the solution providers. No further due diligence was undertaken and UKGBC offers no commercial endorsement of individual solutions mentioned.*

## Solutions:

- Must address the defined challenges, but do not have to do so on their own. They may be part of a bigger picture suite of solutions that come together to solve the challenge.
- Must be possible to implement now, not be hypothetical ideas or concepts.
- Do not necessarily have to be something new, they could be a novel or less well-known application of an existing product or principle.
- Could be a technology or product, but also a service, a process, an operating or financial model, government policy or regulation.
- Could be from anywhere around the world.

## Solution Evaluation Criteria:

- How well overall the solution addressed the specific criteria set out by the challenge.
- How impactful the solution is.
- How easy to implement, and scalable, the solution is.
- How acceptable the cost-benefit of the solution is.

# Outcome of the Challenges

A virtual solution showcase was held by UKGBC on 9th March 2022. Six of the highest scoring solutions were invited to pitch and receive feedback from a live audience and the Judging Panel members. This publication now details the wider range of solutions sourced and evaluated as able to significantly address the challenges.

All the solutions detailed in this report have also been included in UKGBC's Solutions Library; an ever-expanding resource of solutions and case studies helping to address shared sustainability challenges across the built environment industry.

Solutions are showcased as a source of inspiration, with the intention that organisations follow up with solution providers relevant to them, pilot their innovations, and let UKGBC know the results so we can help share success stories and learnings.

Challenge

01

# Enabling Local Implementation of Nature-Based Solutions

How can communities and local authorities implement, maintain, and assess the impact of nature-based solutions to enhance climate resilience?

## Challenge Context

The benefits of using nature-based solutions (NBS) across the built environment have been highlighted through work such as the IGNITION Project. But we need to raise awareness of the practical solutions available today to ensure they are adopted at scale and pace. This challenge sought not only to identify key enablers that facilitate this adoption, but also to discover ways to facilitate the stewardship of NBS, and the ongoing monitoring of environmental, social, and economic impacts. This challenge focused on solutions available at the local level, not large-scale interventions such as afforestation. It intended to complement UKGBC's previous report on 'Principles for Delivering Urban Nature-based Solutions'.

## Solutions

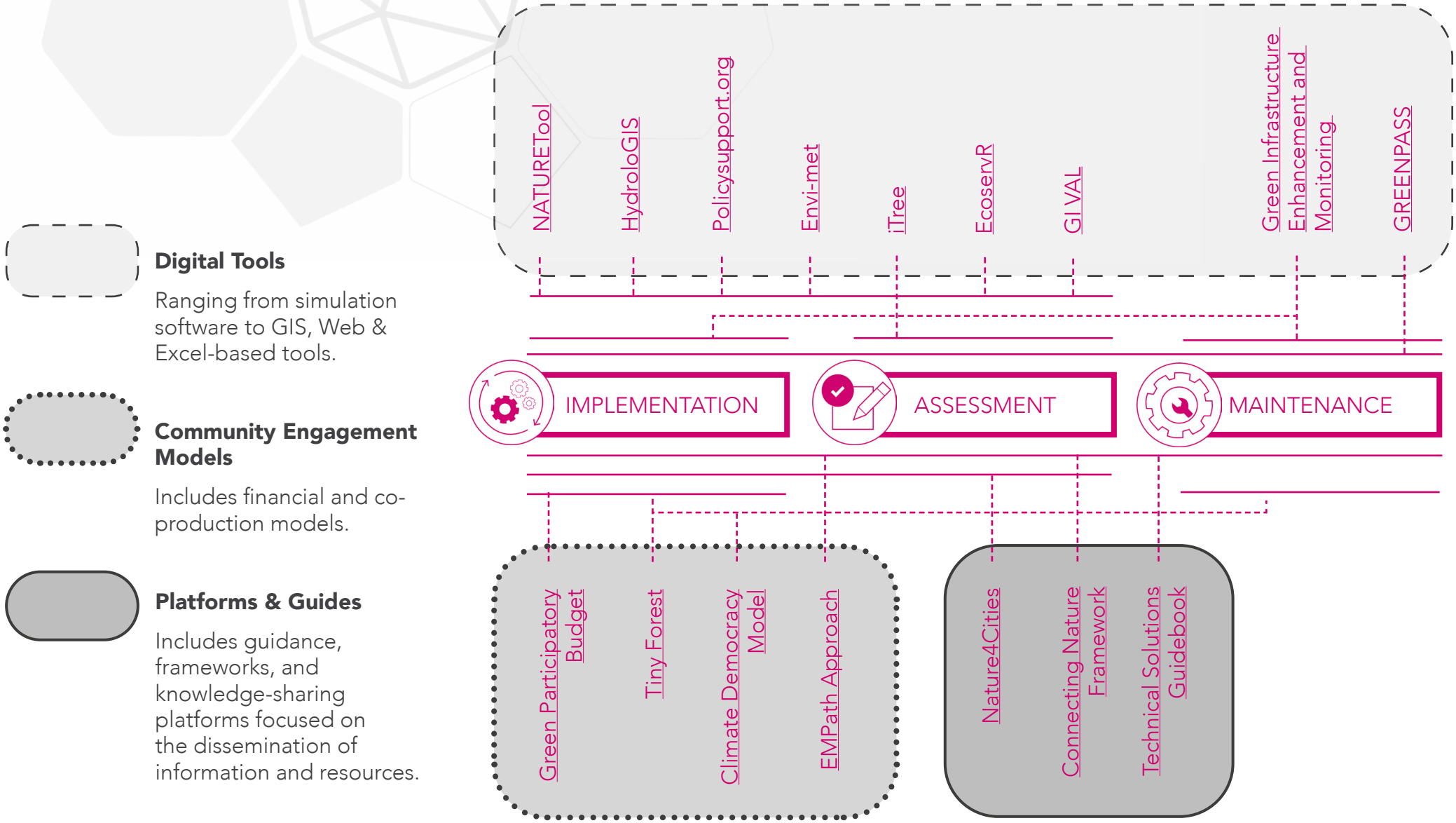
This challenge had three key focus areas: implementation, maintenance, and impact assessment. Most solutions received were in support of NBS implementation and impact assessment, with significantly fewer maintenance solutions being put forwards.

Solutions could then be broadly categorised into three types:

1. Digital tools. Including web-, GIS- and Excel-based solutions.
2. Guidance, frameworks, and knowledge-sharing platforms focused on the dissemination of information and resources.
3. Community engagement and co-production solutions

# Solution Overview

The below diagram categorises the solutions sourced to this challenge in relation to their type and whether they help with the implementation, assessment or maintenance of NBS.




**Digital Tools**

Ranging from simulation software to GIS, Web & Excel-based tools.

**Community Engagement Models**

Includes financial and co-production models.

**Platforms & Guides**

Includes guidance, frameworks, and knowledge-sharing platforms focused on the dissemination of information and resources.

# Digital Tools


**NATURE Tool** - watch UKGBC's Solutions Showcase recording to find out more!

The Nature Assessment Tool for Urban and Rural Environments (NATURE Tool) is an Excel-based tool that assesses the benefits of natural capital interventions at the project scale. The natural capital impact is assessed across 17 ecosystem services including flood risk regulation, air quality regulation, carbon storage, recreation, and educational benefits.

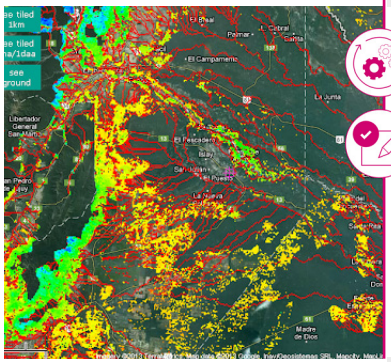
The NATURE Tool is not just an assessment, but also a management tool. Its main purpose is to quantitatively assess the impact and benefits of natural capital and NBS on people's wellbeing. By quantifying the benefits nature and NBS provide, it helps to reveal trade-offs and enables the tool user to objectively demonstrate net gains for the environment from a project.

WSP is a UKGBC Member and led on the development of the tool with the Ecosystems Knowledge Network.


**HydroloGIS** - watch UKGBC's Solutions Showcase recording to find out more!

HydroloGIS identifies, ranks, and prioritises the best interventions, and where to create them, to maximise the provision of NBS to address local problems. The solution 1) Shows which parts of the landscape are working hardest to provide the specific benefits in their current state; 2) Identifies where the largest increases in service provision can be achieved; 3) Decides on an optimal NBS type to place in these gaps to maximise benefits delivered.

It is unique in mathematically calculating the current and future ability of every 'pixel' across a region to mitigate problems such as surface flooding, sewer flooding, water quality, erosion, and infrastructure damage. The value of a whole range of benefits – such flood damages avoided, or carbon captured – can be calculated in statistical, physical, or financial terms.



**Policysupport.org**

Policysupport.org offers a suite of tools that provide rigorous spatial evidence in development decision making. Three are spatial policy support systems that bring together the best available spatial data to help understand 1) The impact of development on Nature and of Nature on development (Co$tingNature tool); 2) The impact of development on Water resources and water risk (WaterWorld tool) and 3) The impact of development and climate change on flood risk (EcoActuary tool).

Policysupport.org also hosts the tool FreeStation; a suite of designs for self-build low-cost internet-of-things monitoring devices and associated build, maintenance, and deployment guides for monitoring the effectiveness of NBS at spatial or temporal scales too fine - or situations too complex - for modelling.

# Digital Tools

## ENVI-met

ENVI-met is a high-resolution microclimate modelling system designed to simulate the surface-plant-air interactions in urban environments with a typical resolution down to 0.5m in space and 1-5 seconds in time. Standard areas of application are Architecture, Landscape Architecture, Building Design or Environmental Planning.

The three-dimensional model allows users to design, simulate and analyse the impact of different NBS on the urban microclimate for any urban setting and for any climate zone around the globe. The effects are shown in various parameters such as wind field changes, radiative fluxes, air temperature, humidity, or outdoor thermal comfort, just to name a few. The tool helps to demonstrate how nature-based solutions can offer a low-energy approach to improve outdoor microclimate conditions.

## GREENPASS

GREENPASS is a Software-as-a-Service tool for evaluating, optimising, and certifying the urban environmental impact of real estate and open space holistically. GREENPASS supports climate-resilient urban planning and architecture by providing tailored tools for the urban planning process for new developments or retrofit – at thee building plot, district, or entire city level.

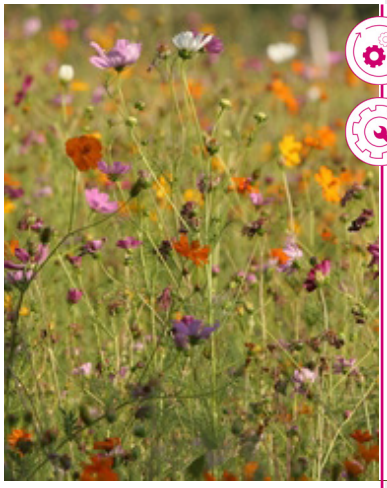
The data-driven and unique solution (powered by ENVImet) considers more than 50 scientifically accepted KPIs within 6 urban challenges: climate, water, air, biodiversity, energy & cost. GREENPASS helps planners, developers and municipalities take the best decision for each phase of urban planning and development to optimize the environmental impact and cost/benefit efficiency of NBS to enable livable cities.

## GI-VAL

The Green Infrastructure Valuation toolkit (GI-VAL) provides a set of calculator tools to assess the value of a green asset or a proposed green investment. Where possible, the benefits of green infrastructure are given an economic value. Other quantitative contributions (e.g. number of jobs) and qualitative contributions (e.g. case studies or research) can also be provided to give a complete view of the value of an asset.

The toolkit uses standard valuation techniques to assess the potential benefits provided by green infrastructure within a defined project area. These benefits are assessed in terms of the functions that the green infrastructure may perform, support, or encourage, depending upon the type of project.

# Digital Tools



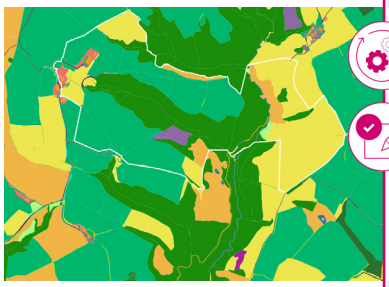
## Green Infrastructure Enhancement and Monitoring

Driven by a passion for biodiversity, GENTIAN Ltd have designed a new way to conduct ecological surveys in a reliable and timely manner, using satellite imagery. This can provide detailed information on blue-green infrastructure and locate buildings suitable for retrofitting with a green or biosolar roof. The use of satellite imagery means that any area can be surveyed, small or large, and detailed results are presented in an easy-to-use format. This is useful for baselines, evidence gathering, compliance checking or monitoring and reporting. The method for conducting remote ecological surveys has been intensively tested and the output stringently validated by industry experts, to ensure that information provided is accurate. The following surveys are available, with more coming soon:

1: Identification of green infrastructure, especially buildings with green roofs. The system detects different types of green roof: intensive/extensive/astroturf.

2: Identification of buildings suitable for retrofit with green or biosolar roofs.

Gentian is a UKGBC Innovative-Start-up Member!



## EcoservR

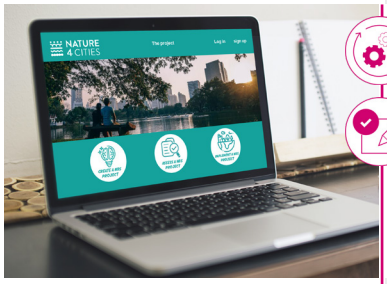
EcoservR is a tool for mapping natural capital assets and ecosystem services developed as an open-source, free-to-use R package. EcoservR takes data from nationally available datasets to create a detailed habitat map. From this habitat map and supporting data, EcoservR measures supply for seven ecosystem services, and demand for four. A powerful application of is to calculate the change in ecosystem service supply pre- and post-intervention, to predict the potential impact of a design. This change can be calculated at any geographic extent, from site to landscape-scale. By overlaying supply and demand maps, users can also identify areas of opportunity where NBS would improve capacity and/or answer demand for ecosystem services.

## iTree Eco

iTree Eco is a software application designed for urban forest assessment. It uses field data from complete inventories or randomly located sample plots, along with hourly air pollution and meteorological data. It quantifies the structure and environmental effects of urban forests (for trees and shrubs) and calculates their value to communities. This includes information on urban forest structure, air pollution removal, rainfall interception, carbon sequestration and storage, and resource value.

Tree data is collected and entered into the software. A series of scientific algorithms calculate structural and functional information about the value of each tree or an estimate for the total tree population.

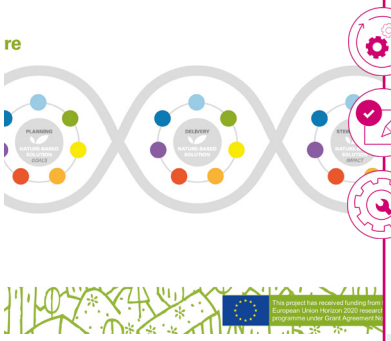
# Platforms & Guides




## Nature4Cities

Nature4Cities is a Horizon 2020 EU-funded Research & Innovation project, which has resulted in a comprehensive reference platform for NBS. The platform offers technical solutions, methods, and tools to empower urban planning decision making.

The different modules available include: 1) A database of generic NBS and associated environmental economic and social performances; 2) An observatory of NBS best practice projects; 3) A set of innovative business, financial and governance models for the deployment of NBS in a range of different contexts; 4) A NBS project impact assessment toolbox.



## Connecting Nature Framework

The Connecting Nature Framework places NBS at the core of an interactive process. It is a suite of tools that provides rigorous spatial evidence in development decision making, to navigate the path towards the large-scale implementation of NBS. The process runs through three distinct phases of development: planning, delivery, and stewardship.

Designing and implementing NBS on a scale that delivers economic, environmental, and social co-benefits, builds resilience, and benefits biodiversity is complex with many different issues to consider. To mainstream NBS processes, it is likely that significant governance and investment changes will be required. This Framework provides guidance on how this can be developed and achieved.

## Technical Solutions Guidebook

Technical Solutions is one of the Elements of the Connecting Nature Framework. This Guidebook specifically supports practitioners in navigating the technical components of planning, delivery, and long-term stewardship of NBS. This includes which type of NBS to select, consideration of local circumstances, stewardship or ongoing management of NBS, and how to feed the results of evaluation and on-going measurement into the project.

The Technical Solutions Guidebook supports practitioners in asking the right questions when considering social, environmental and economic benefits, needs and trade-offs. It builds on the generation of knowledge about local needs and the local context. It also considers impacts, synergies and trade-offs across scales and time.

# Community Engagement Models


## Climate Democracy Model

The Model is a response to gaps witnessed in pan-European efforts to democratise climate action. The Model is a compass, not a map – it makes users think about and commit to steps that can be taken towards climate resilience, democratically. In the context of NBS, The Model provides language and tools for cities and regions to explore this question at a local level, to show, assess and celebrate progress, and reveal possibilities for changes in direction. It includes six tools for practical application, and through practice, it draws users towards the social, as well as physical, resilience NBS provide. The Model has been used to date by local authorities to understand the underlying conditions for climate resilience in a city, which efforts and resources should be explored, and where there is a need to readjust activities for better impact.

## Tiny Forest

An innovative tree planting initiative that establishes accessible, nature-rich green spaces in towns and cities. Tiny Forest's approach is about planting 'the right trees in the right places'. It works with local authorities to identify locations that will maximise value by planting in areas of high deprivation, creating green corridors and greening schools. In addition to the physical creation of the forests, Tiny Forest empowers local communities to care for and maintain the forests, as well as partaking in scientific research at every forest planted, to assess the impacts they have over time and between forests.

## EMPath Approach

EM|Path is a not-for-profit social enterprise that uses people-centred co-production and engagement techniques to support sustainable community development and environmental protection. It is a co-creative, arts-based engagement process to support cities in the design, delivery, and stewardship of NBS. The EM|Path Approach uses several methods – memory work, immersion in nature, embodied reflection, eco-therapy, and body mapping – to help capture lived experiences and build stories in and with nature. It works with communities and stakeholders to co-create meaningful connections through emotional mapping, empathetic connections, embodied reflections, embedding shared learning and knowledge and empowering communities.

## Green Participatory Budget

In 2008, Lisbon was the first European capital to adopt participatory budgeting (PB) at municipal scale, empowering its citizens to use parts of the Council's annual budget for projects that benefit their community. In 2020, the City Council decided to focus its PB process "exclusively on proposals that contribute to a more sustainable, resilient and environmentally friendly city" – creating a Green PB. The total budget for the Green PB process is EUR 5 million to support climate change mitigation and adaptation projects selected by local citizens, such as tree planting for street heat reduction, or water capture and storage.

Challenge

02

# Retrofitting Resilience

How can existing buildings be made more resilient to climate change, with as little disruption to their occupants as possible, by 2030?

## Challenge Context

Existing and heritage buildings can play a leading role in reducing carbon emissions. However, we must also make our buildings ready for the inevitable impacts we are undeniably already facing and are locked into. This challenge looked to uncover what can be done to reduce the impact of climate change on existing buildings - commercial or residential - mindful of the challenges associated with retrofitting older building stock and a need to minimise disruption to occupants. We were looking for solutions that address all types of physical climate risks to buildings. Examples might include, but were not limited to:

| | |
|---|---|
| Heat Stress and Heat Waves | Storm |
| Temperature variability | Drought |
| Changing wind patterns | Water Stress |
| Changing precipitation | Heavy precipitation |
| Sea Level Rise | Flood |
| Cold/frost wave | Subsidence |
| Wildfire | |

## Solutions

The broad scope of this challenge attracted a wide range of solutions. The evaluation process gave priority to those that could be implemented with minimal disruption to existing building occupants, while maximising effect. Most solutions sourced focused on adapting to the impacts of flooding or overheating, risks particularly pertinent to the UK. However, many also had knock-on benefits in addressing other hazards such as drought and extreme cold.

One solution focused on identifying climate risk on built assets more generally, but otherwise, solutions could then be broadly categorised into four types:

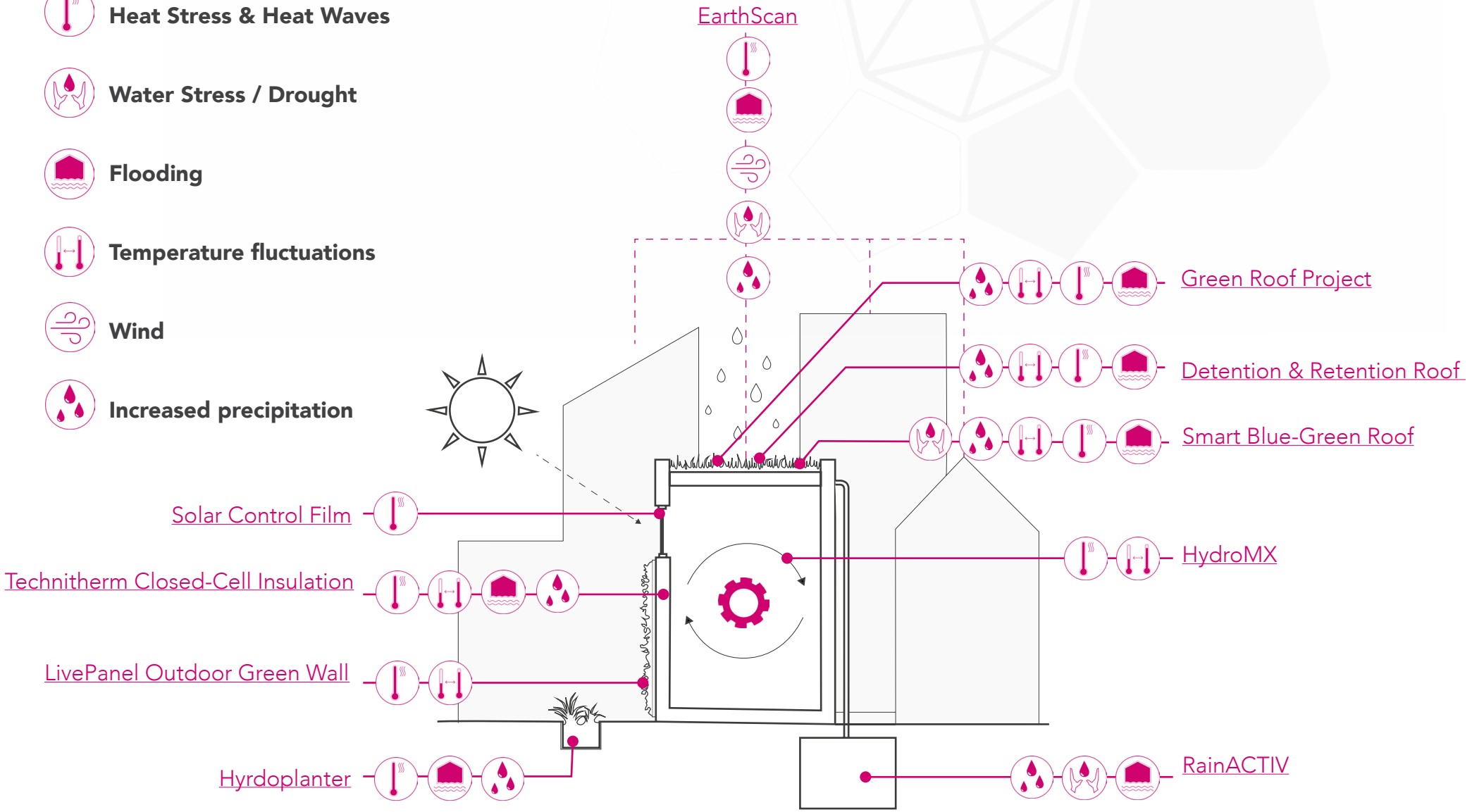
- Solutions installed at the building roof level
- Solutions installed to the building façade or exterior walls.
- Exterior / landscaping solutions.
- Solutions applicable to building systems.

# Solution Overview

The diagram below indicates where solutions sourced to this challenge can be implemented on a built asset, and the climate risk that they increase resilience to.

## Climate Risks

- Heat Stress & Heat Waves
- Water Stress / Drought
- Flooding
- Temperature fluctuations
- Wind
- Increased precipitation



# Climate Risk Insight


**EarthScan -** watch UKGBC's Solutions Showcase recording to find out more!

EarthScan is a science-backed- and AI-driven Climate Intelligence platform that enables users to discover, quantify and share climate risks on assets they own, manage or rely on. Bringing together earth science, data modelling, and machine learning expertise, EarthScan provides critical analysis and insight into the probabilistic likelihood of climate shocks and stresses such as flooding, heatwaves, and drought.

EarthScan displays granular insights across multiple risks, timeframes, and emissions scenarios simultaneously – going back 50 years to 1970 and looking ahead 80 years to 2100 – that enables users to baseline, monitor and forecast risk across their entire portfolio. This produces a complete picture of climate risk to inform risk mitigation and resiliency plans and protect the top and bottom line.

EarthScan is cloud-based with on-demand insights available so users can explore their climate risks, time horizons or scenarios at the asset and portfolio level; understand customised risk ratings, and generate and share standardised risk reports.

Cervest is a UKGBC Member.

# Roof Solutions


## Smart Blue-Green Roof - watch UKGBC's Solutions Showcase recording to find out more!

This two-year research programme is assessing how storing and reusing rainwater at roof level can reduce the volume of run-off entering the sewer network, whilst simultaneously enhancing biodiversity. Unlike conventional green roofs, which use a drainage layer to remove rainwater, this 525m2 blue-green structure is retrofitted to store rain beneath the planted surface where it lands. Advanced passive irrigation components within the attenuation layer draw water up through the structure to the underside of the green roof substrate to support surface planting.

The technology protects green areas during drought, reduces potable water demand during hot weather and enhances biodiversity by maintaining flora in optimum conditions. The roof and its outlet are cloud enabled, linking stored volume to high resolution weather data that maps storm events. Before a storm arrives, volume is safely released to accommodate rainwater, avoiding surcharging of local and downstream drainage networks.

Bruntwood is a UKGBC Member.

## Green Roof Project

The Green Roof Project is, in effect, a takeover of rooftops for people and nature that involves the creation of green spaces to support community cohesion, raise awareness and demonstrate the benefits of green roofing.

The Green Roof Project combines both product (green roof, roof garden and growing spaces) and service (installation, training, and outreach) to pioneer the retrofit potential of green and blue roofs in towns and cities. Green roofs are an established solution, but this project seeks to overcome some of the issues of tangibly demonstrating and raising awareness of their benefits.

## Detention Roof

A lightweight, green roof stormwater management solution that works on existing buildings and new build roofs with a slope of up to 2o. The system ensures that rainwater runoff is temporarily detained and slowly drained, delaying run-off by up to 24 hours. A sedum vegetation blanket forms the top layer, which also helps to mitigate excessive rainfall by evapotranspiration. Thanks to its unique construction layers, the Detention Roof can fully buffer new downpours, even when saturated, and to drain them in a controlled manner. Additional benefits include increasing local biodiversity, extending the lifespan of the roof covering, and cooling the indoor and outdoor areas.

Find out more about the value of roofing solutions here: Building resilience of roofing technologies in a changing climate, National Federation of Roofing Contractors (NFRC).

# Façade Solutions

## Solar Control Film

Solar window film is an effective solution for reducing heat gain and glare, reducing infra-red radiation and ultraviolet rays without reducing outward vision through windows. It can be retrofitted to existing windows as a cost-effective way of managing temperature and glare associated with rising temperatures.

The film is a thin laminate that can be installed to the interior or exterior of glass in both commercial and residential buildings. The installation process involves the use of a self-adhesive polyester film which is applied to the glass to act as a sunscreen, regulating the levels of heat and light passing through it.

## LivePanel Outdoor Green Wall

LivePanel Outdoor is a modular green facade system with exchangeable plant cassettes. Each row of plant cassettes is placed in a gutter profile that also serves as a water reservoir. The system helps lower local temperatures through evapotranspiration during even the warmest part of the day.

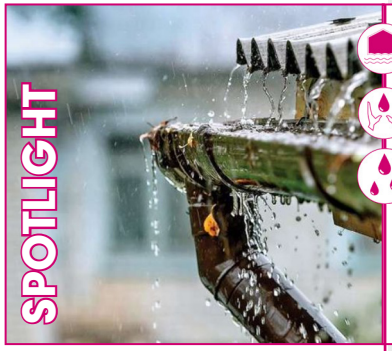
On a city-wide scale, the introduction of vegetation can have a dramatic effect on reducing the extremes of the urban heat island effect. The living wall covers the building surface with a heat-absorbing canopy, creating a shading effect that prevents the building surface from absorbing solar radiation and re-radiating it back into the surrounding environment. The living wall will have an ameliorating effect as a buffer against both high summer temperatures and the cold of winter.

## Technitherm Closed-Cell Insulation

Technitherm is the only cavity wall insulation to pass the BRE Flood Resilience Test. It offers a solution to stabilise and strengthen property walls in preparation for flood risk, enabling them to withstand greater pressures from exerting flood water and debris.

Technitherm will resist the passage of flood water ingress through the cavity wall, and the insulation will remain serviceable after the flood water is gone. It can be sprayed into cavity walls with minimal intervention, expanding inside the cavity to create a robust, water impermeable and energy-saving area. It is suitable for all masonry cavity walls with cavities ranging from 40mm – 200mm wide.

# Exterior, Landscaping & Building Systems Solutions




**Rain Activ** - watch UKGBC's Solutions Showcase recording to find out more!

Rain Activ is an ultra-low discharge storm attenuation device that can be retrofitted to provide a peak discharge rate as low as 0.05 litre/second. This SuDS solution can be used independently or in conjunction with rainwater harvesting to allow the controlled release of attenuated water into the network. This reduces pressures on an already stressed system, prevents localised flooding, and allows local water authorities to capture more water to be treated.

Rain Activ is a notably impactful solution for sites with less permeable soil, limited space, a high water table or where a soakaway is not viable, low storm water discharge rates stipulated in planning conditions, greenfield areas, and where connection to the storm drain is allowed but maximum flow rates have been stipulated.

**Hydroplanter**

A modular, bioretention rain garden system, manufactured in the UK from 100% recycled material. The HydroPlanter is a stormwater management solution that can be retrofitted into developments of any size. It is a 'plug and play' sustainable urban drainage solution that can attenuate and cleanse storm water and provide amenity and biodiversity to new and existing spaces.

The modular characteristics with pre-calculated hydrological performance statistics mean that specification and design is adaptable for any catchment area. Modules are filled with a particular soil specification and planted with wildflowers and biodiverse grasses.

**HydroMX**

HydroMX® is a safe nanotech heat transfer fluid that replaces the water or water/glycol mixes used in heating, cooling and heat recovery applications. Energy saving as a result of improved heat transfer is typically between 20% and 35%.

HydroMX® protects against system damage from corrosion and calcification as well as providing complete freeze/ burst protection. HydroMX® performance has been independently verified to ISO standards through the LCA, EPD, and LEED programme and by a number of universities including Harvard, Thessaloniki and Swansea.

Numerous case studies illustrate product effectiveness in a wide range of applications globally including hospital space heating, commercial space heating and cooling, hospital cooling, heat recovery and space heating in social housing. HydroMX is a retrofit solution for existing systems with no modifications required. The product carries a 20-year warranty

# From Insights to Action

UKGBC hopes that the solutions presented here help inspire further innovation and action to improve the resilience of our built environment. This is just one part of our work on solutions, and we encourage our members and wider industry to collaborate on our future challenges and work to help accelerate the transition.

This report covers solutions that are available today, but the success of their application and tomorrow's innovations are up to you.

**Here is what you can do now to contribute to a sustainable future:**

- Show this document to colleagues, clients, and suppliers, as a snapshot of innovation today
- Contact those solution providers who are relevant to you and your organisation and pilot their innovations.
- If you are a UKGBC member and have project demonstrating best practice in sustainability please submit it as a case study.
- Submit, or recommend, further solutions and innovations that we can help profile through UKGBC's Solutions Library.
- Suggest future challenges we can run based on the barriers you experience in your work
- Look out for future innovation challenges to share and discover more ideas.
- Consult and deploy our Open Innovation Levels Framework to help create a culture of open innovation in your organisation
- Use our Sustainable Innovation Manual to create new concepts and solutions
- Look out for UKGBC's future challenges and innovation workshops to collaborate and share ideas
- If you are an innovative start-up, apply to become a UKGBC member to raise your profile and expand your network and participate in our Innovative Start-Up Forum.

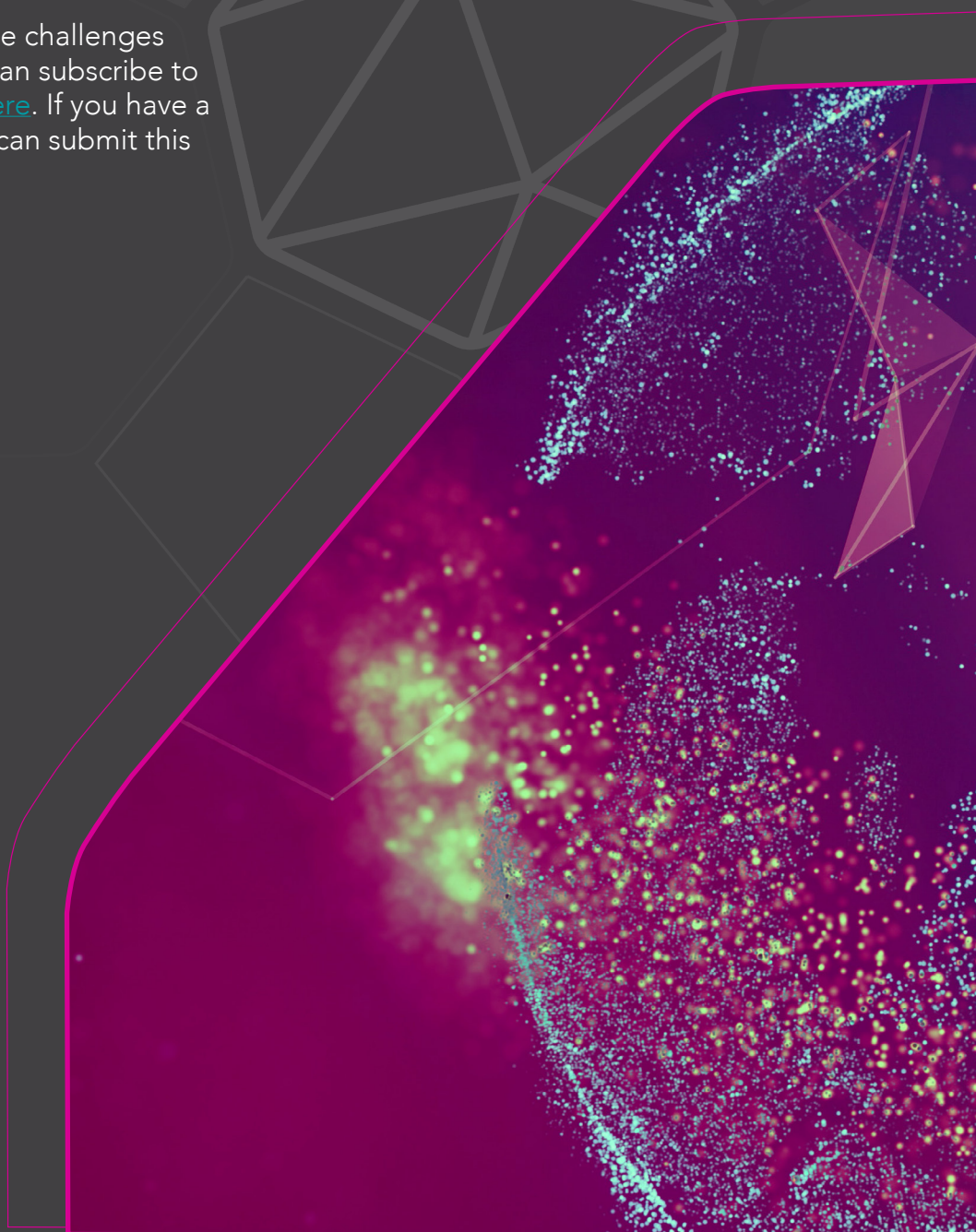
# Future Challenges

Later this year we will run new innovation challenges in support of the implementation of UKGBC's Whole Life Carbon Roadmap, launched at COP26 in November 2021.

The Roadmap seeks to provide a common vision and agreed upon industry-wide actions for achieving net zero carbon in the construction, operation and demolition of buildings and infrastructure in the UK. The Roadmap has identified five key priorities that government and industry need to support and implement across the sector in order to deliver net zero for the built environment:

1. Nation-wide retrofitting of existing homes.
2. Energy performance disclosure for non-domestic buildings.
3. Adoption of a design for performance approach.
4. Whole life carbon measurements and agreed limits.
5. National infrastructure investment based on the net emissions impact.

To be notified of when these challenges launch, UKGBC members can subscribe to our Solutions mailing list here. If you have a challenge suggestion, you can submit this for consideration here.



# Further reading


UK Green Building Council, 2022, A Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets

UK Green Building Council, 2021, Principles for Delivering Urban Nature-based Solutions

UK Green Building Council, 2021, Investing in a Greener Greater Manchester: A nature-based solutions investment guide for local authorities

IGNITION Project, 2020, Nature-based solutions to the climate emergency: The benefits to business and society

UK Green Building Council, 2019, Nature-based solutions to the climate emergency: The benefits to business and society

UK Green Building Council, 2020. Open Innovation Levels Framework

UK Green Building Council, 2019. Sustainable Innovation Manual and Templates

UK Green Building Council, 2019. Innovation Insights: Making space as agile as Technology.

UK Green Building Council, 2020. Circular Economy Innovation Insights: Reuse and Products as a Service.

UK Green Building Council, 2020. Delivering Social Value: Community Engagement Hacked.

**UKGBC offers no commercial endorsement of individual solutions mentioned.**

The selected examples are provided as a source of inspiration, and we do hope that you follow up with the innovators to find out more.

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