UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

Business Briefing

Decision Making in a Nature-Positive World:

Nature-based Solutions for the Built Environment and Linear Infrastructure Sectors

The University of Cambridge Institute for Sustainability Leadership

The University of Cambridge Institute for Sustainability Leadership (CISL) partners with business and governments to develop leadership and solutions for a sustainable economy. We aim to achieve net zero, protect and restore nature, and build inclusive and resilient societies. For over three decades, we have built the leadership capacity and capabilities of individuals and organisations and created industry-leading collaborations to catalyse change and accelerate the path to a sustainable economy. Our interdisciplinary research engagement builds the evidence base for practical action.

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About this brief

This business briefing highlights nature-based solutions (NbS) as an effective strategic approach for developers and construction companies, architects and engineers seeking to future-proof their businesses against the growing impacts of climate change and biodiversity loss. NbS work by protecting and restoring nature whilst providing a solution to a business and societal need. These emerging solutions can deliver real and tangible benefits to people, nature and the global climate, and have a pivotal role in the business transformation needed to deliver a nature-positive world.

The brief first describes the regulatory, policy and operational imperatives that support the adoption of nature-based solutions at scale. It then highlights the business case for the sector and provides proven approaches to cost-effective, nature-based measures and successful UK projects. Finally, it explores common challenges to adopting NbS, and how co-benefits can be leveraged by working across sectors.

This is one of a series of sector specific business briefings that CISL has produced to support effective decision making in a nature-positive world. The other sectors covered include Finance, Water, and Food and Beverage.

What are Nature-based Solutions?

There are many definitions of NbS, but all focus on natural systems and ecosystems to address environmental and societal challenges. Typically, a range of partners, including ecosystem services providers (such as farmers) and buyers (such as water companies), adopt nature-based schemes at a water catchment or landscape scale.

CISL defines NbS as "ways of working with natural systems to strengthen them while solving broader problems such as climate change, health, social inclusion, and more." Nature-positive is the term used to describe a world where nature – species and ecosystems - is being restored and is regenerating rather than declining.

1. Context

The Built Environment sector constructs, maintains and operates the buildings that make up villages, towns and cities. The Linear Infrastructure sector operates in parallel, providing the roads, rail, power lines, pipe networks and other architecture that enable society to function. Closely integrated, these two sectors account for a large share of any country's carbon footprint and impact on nature. At the same time, they offer significant opportunities to strengthen the resilience of human society, maximise shared social benefits and create safe, secure and enjoyable futures for all.

Cities consume 80 per cent of global energy and generate 70 per cent of greenhouse gas (GHG) emissions alongside vast amounts of waste and pollution. Urban sprawl leads to poor living conditions and loss of natural habitats, making many city residents vulnerable to climate change. By 2050, as much as 70 per cent of the global population will live in cities, underscoring the urgency of acting now to make urban environments more compact, low-carbon, resilient and inclusive.[i]

The companies that make up the built environment (BE) and linear infrastructure (LI) sectors are critical to addressing the dual climate and biodiversity crises and achieving net zero economies. Adopting nature-based solutions (NbS) offers opportunities to cut costs and build business resilience and reputation. Yet, these construction industry and infrastructure firms – including architects, engineers, developers, builders and road, railway and utility construction companies – are not as advanced as other sectors in addressing energy and carbon inefficiencies and biodiversity loss. While policy and regulation are now nudging such firms toward more sustainable and resilient outcomes, more corporate leadership is needed.

Regulatory and policy drivers provide both incentives and deterrents.

In the UK, national regulations and policies are setting the stage for mainstreaming nature-based solutions into these sectors' corporate strategies.

The government's 2021 Net Zero Strategy: Build Back Greener sets out "policies and proposals for decarbonising all sectors of the UK economy to meet our net zero target by 2050". A heat and buildings strategy, published at the same time, lays out how the government aims to decarbonise UK homes and commercial, industrial and public sector buildings[ii] [iii] through mass investments in state-of-the-art energy efficiency and clean heat solutions. Subsidies and grants will provide significant incentives for building owners and developers, and boost the sector with new skilled jobs.

The 2021 Environment Act makes parallel commitments to protecting and enhancing nature by mandating Biodiversity Net Gain for specified construction developments through amendments to the Town and Country Planning Act. Due to become law in 2023, the regulation will require a 10 per cent Biodiversity Net Gain for development sites in England, including Nationally Significant Infrastructure Projects. Industry trade associations such as CIRIA have published good practice guidance for planners, architects and designers, project managers, and local authorities on how to deliver on-site ecological improvements by creating or improving habitats. These improvements will be measured by applying a Natural England designed Biodiversity Metric[iv].

The government is a major landowner and has set estate sustainability targets, known as Greening Government Commitments, which require relevant departments and agencies to contribute to a national

Nature Recovery Network. The goal is to designate 500,000 hectares of additional wildlife habitat by 2025[v], which will require the involvement of built environment and linear infrastructure firms.

Globally, leading companies across a range of sectors are making commitments to reduce their impacts on biodiversity and natural resources. Over 1,000 companies are calling on governments to adopt policies to reverse nature loss this decade, and some are setting science-based targets for nature (SBtN). Of these, only two are from the Built Environment and Linear Infrastructure sectors - Heidelberg Cement and Tata Steel. While the Built Environment and Linear Infrastructure sectors have tended to lag on such commitments, 135 firms, including Arup, British Land and the Crown Estate, have signed on to the World Green Building Council's commitment to reduce all operational carbon emissions by 2030[vi]. In addition, the building industry has widely adopted voluntary green building certifications such as LEED and BREEAM, which support concrete progress on sustainability.

The industry is shifting its philosophy and approach to operations.

Against this backdrop, there is growing recognition that new construction, including commercial developments, housing estates, infrastructure and public sector projects, have an important role in minimising damage to nature and reducing the use of carbon rich resources[vii]. In response, industry bodies have developed 'working with wildlife'[viii] training courses and more firms are incorporating habitat creation into construction, development, regeneration or maintenance projects. These projects vary depending on location, ranging from regeneration and nature restoration in rural areas, to wildlife corridors alongside highways and green spaces in urban areas.

For example, Network Rail, one of the largest UK landowners, is creating biodiversity hubs and "mini-parks" along its railway lines[ix]. The UK-based global design and engineering firm Arup has made commitments to achieving net zero emissions across its operations by 2030 and to 'work in tune with natural systems' as part of its climate change strategy[x].

Such nature-based solutions (NbS) bring multiple benefits to business, society and the environment. They can improve local communities' physical and mental health, reduce noise pollution, contribute to better air quality and support corporate net zero commitments. A growing public focus on well-being, including green space, in the wake of the global pandemic adds further momentum for the Built Environment and Linear Infrastructure industries to embrace NbS.

There are early moves to more collaborative solutions

Municipal authorities are leading the way on sustainable and nature-based solutions, often in partnership with innovative designers, developers and infrastructure firms. For example, cities such as Copenhagen and China's Sponge Cities[xi], have created sustainable green spaces and drainage systems, New York built the above ground High Line gardens and London launched its National Park City scheme.

Global networks of cities and local governments, including C40 Cities, ICLEI and the GEF Sustainable Cities programme are driving action on low emission, equitable, nature-based approaches to urban planning, development and living. The GEF programme aims to reduce greenhouse gas emissions by more than 250 million tons and support the sustainable management of nearly 1 million hectares of land across 17 countries.

Such collaborative nature-based solutions can be affordable and scalable in the UK and globally. They have a critical role in decarbonising the built environment and addressing water challenges while supporting nature restoration and regeneration.

> *"A sustainable built environment achieves positive outcomes. This can be described as creating buildings and places that repair and restore nature, improve resiliency to a changing climate, enable greater equity within society and achieve the best possible health and well-being outcomes for people."*
>
> Munish Datta,
> Director, UK Green Business and CISL Fellow

2. The business case for the Nature-based Solutions

There is growing recognition in these sectors that nature can provide more capital efficient solutions to key issues such as water management and treatment for buildings and flood protection for housing and infrastructure. By adopting such solutions, firms can potentially cut costs, providing the opportunity to invest elsewhere.

Key opportunities for firms that invest in nature-based solutions include:

- Reduce costs by realising operational efficiencies from more effective and efficient use of nature, including energy, water, and waste. Includes both technical solutions and customer behavioural change.
- Enhance reputation, resulting in competitive advantage, improved potential for repeat business, and the power to influence client decision making.
- Increase resilience by improving organisational capability to manage negative future scenarios, including minimising the risk of unplanned, disruptive events in land management, supply chains and operations.

Individually or collaboratively, the benefit for firms from taking action through nature-based solutions is strong and falls into the following areas.

Improving operational resilience

Nature-based solutions represent an effective alternative to 'hard' engineering approaches traditionally deployed by built environment practitioners. In particular, they can promote resilience to current and intensifying climate impacts on buildings and infrastructure, such as overheating and flooding.

Most buildings' impacts on nature are determined in the design phase when decisions are made on which materials to use, what resources will be consumed during operations, the potential for recycling and the lifetime of structures. Although sustainable design can significantly reduce a development's impact on climate and nature, the planning policy incentives for doing so are often weak.

Using blue and green infrastructure (see box) in the built environment bolsters operational resilience and cuts business costs while supporting the delivery of better health and well-being outcomes for communities. For example, in peak sunshine, shade thrown by trees can reduce the temperature of buildings and pavement by up to 20 degrees Celsius[xii]. Other nature-based solutions, listed on page 10, can improve building air quality, water quality and quantity, energy use, noise levels, biodiversity and recreational opportunities.

Blue Infrastructure: *the use of blue elements like rivers, canals, ponds, floodplains, wetlands and water treatment facilities in urban and land-use planning.*

Green Infrastructure: *the use of green elements such as trees, forests, fields and parks in urban and land-use planning.*

"Incorporating blue-green infrastructure elements in our designs will help to build more sustainable infrastructure, which is also resilient to climate change and the resulting changing weather."

UK Institution of Civil Engineers (ICE)

Managing business risk

Risks related to nature are a key consideration across the life cycle of building and infrastructure projects. Both sectors typically take a short-term risk management approach in assessing their existing assets and projects, focusing on climate, temperature risk, water security and managing extreme weather events such as flooding. To respond effectively to the growing climate and nature crises, longer term considerations should be incorporated to strengthen the adaptability and resilience of buildings and infrastructure.

By integrating nature-based solutions into new projects, assets and refurbishments, firms can prepare developments to withstand current and future risks while also delivering benefits for nature. Examples of NbS that designers and developers can consider at different project stages are described below.

1. Initiation
   Relevant risks during a project's start-up phase include securing land with demonstrated adherence to nature priorities, demonstrating local species protection and addressing local risks such as floods. Natural flood risk management using measures such as wetland restoration, vegetative swales (shallow channels) and permeable pavements help address flooding issues.

2. Operations
   During the operating life of buildings and infrastructure, managing temperature rises, flood risk and the costs of cooling, water and waste processing will be increasingly crucial. Constructing reedbed wetlands can reduce these risks by cleaning and reusing wastewater and mitigating flooding, while tree planting and green roofs can provide natural shade for cooling. Such investments are long-lasting and often involve low capital cost compared with hard infrastructure alternatives.

3. Project-long risks
   To meet stakeholders' expectations, including government regulators, local authorities and communities, and the wider public, firms need to mitigate risks by supporting carbon reductions and enhancing natural surroundings and people's well-being. To mitigate environmental and

reputational risks, firms should develop and act on a strong understanding of the risks related to a building's early years – focused on construction materials and activity – and over its expected lifespan. This life cycle analysis should include calculating the building or infrastructure's footprint from raw materials through design, construction and operation (impacts of water, insulation, heating etc.). By developing a proactive approach to managing nature and climate impacts, firms can engage stakeholders and may boost both their sales and reputation.

4. Post-completion/end of life
   With increased regulation on the horizon (see page 4), and exposure to intensifying risks, both the built environmental and linear infrastructure sectors are pivoting to build more obsolescence into projects. By proactively investing in nature-based solutions today, firms can avoid significant costs of conducting mandatory retrofits in the future.

Wider business and environmental benefits

Integrating nature into the built environment can deliver transformational benefits for human enjoyment on top of essential ecosystem services such as carbon sequestration and flood mitigation. Providing access to healthy living environments, green and community spaces and clean air not only improves the health, well-being and sense of place enjoyed by local communities but also provides opportunities for a vibrant social, sports and tourism sector.

Recognising this, both sectors are increasing their investments in health and well-being and taking a more holistic approach to project design and development (see West Carclaze case study on page 11).

3. Nature-based Solutions in action

Interest is surging among the private sector, local authorities, farmers, and other land owners to collaborate on solutions that respond to regulatory and policy drivers to combat biodiversity decline and climate change. The Built Environment and Linear Infrastructure sectors have an integral part in preparing the UK for a more resilient and sustainable future.

In May 2022, the UK Green Building Council published a comprehensive report on nature-based solutions and benefits for the sector. The table below highlights these solutions, with some additions from CISL. While presented in relation to buildings and infrastructure, many of these outcomes can also provide co-benefits to other stakeholders and industries, such as the water and leisure sectors. The table is followed by a case study development showcasing NbS in action.

Built Environment Nature-Based Solutions

Air Quality	NbS, such as green spaces, can improve air quality by trapping fine particles and filtering pollutants such as sulphur dioxide and nitrogen dioxide[xiii].
Carbon Storage and Sequestration	Trees, plants and soil sequester carbon in varying amounts.
Water Quality and Quantity	**Water quantity:** NbS such as permeable pavements that retain rainwater and shallow vegetative channels known as swales can hold or slow the flow of rain and surface water, reducing strains on municipal drainage systems and enhancing flood resilience. **Water quality:** Constructed wetlands such as reed beds can maintain and increase water quality by filtering, while enabling developers to avoid high capital investment costs.
Temperature	NbS such as tree planting can reduce temperatures through shading and evaporative cooling, which in turn combats urban heat island effect and cuts building energy costs.
Energy Use	NbS such as green roofs can act as an additional layer of insulation, particularly on roofs and walls, lowering energy demand in adjacent spaces.
Health and Well-being	More exposure to nature provides people with many mental and physical health benefits.
Noise	NbS, such as free standing living walls or vertical greening systems, can absorb more noise than grey infrastructure surfaces, providing audible protection for people and wildlife and enhance visual appearance and absorb storm water[xiv].
Land and Property	Biophilic buildings that incorporate nature are already in high demand and expected to sell for higher prices and retain value better than assets which do not have such design features or natural surroundings nearby.
Amenity Access	Green spaces and biodiverse habitats boost opportunities for recreation and leisure, supporting good health and wellbeing and contributing to a sense of place among communities.
Biodiversity	NbS enhance biodiversity by providing habitats for flora and fauna.
Local Economic Health	NbS can increase footfall and patronage for local businesses and attract more visitors to economic centres.
Community Benefits	Parks and other green spaces act as community hubs and can support initiatives like community gardening and farming. Developments incorporating public transport hubs, walking paths and bike lanes improve quality of life while reducing car-related impacts on nature.

Source: The Value of Urban Nature-Based Solutions - UKGBC - UK Green Building Council

Case Study: West Carclaze Garden Village: Nature as a Way of Life

West Carclaze Garden Village in Cornwall is one of the first new garden villages in a generation, enhanced with 21st century technologies and thinking, and developed in sympathy and harmony with nature, existing communities and local culture. A progression from the original garden cities of Letchworth Garden City and Welwyn Garden City in Hertfordshire, the housing development is centred on green infrastructure, well-being and nature.

The 500-acre site includes a 350-acre country park, managed by a new trust, with a mix of open access tended and wilder areas. Homes of various sizes sit along a connecting spine that links five lakes and the historic Sky Tip with recreational spaces, village hubs and public gardens. The environment is built into everyday life with edible hedgerows, fruit trees, community allotments, and a biodiverse environment.

The 1,500 homes exceed national regulations for air tightness and insulation and will draw power from an on-site solar farm as part of a target to reach net zero carbon emissions by 2050. As the site's 500,000 trees mature, over 1.1m tons of carbon will be saved by 2122.

4. Accelerating adoption of Nature-based Solutions

Companies in the linear infrastructure and built environment sector, along with other sectors reliant on natural resources, have a timely opportunity to solve strategic business and environmental challenges by embracing nature-based solutions at scale.

As described above, when companies put resources into an NbS project, they are choosing to work with nature to address current or expected challenges to their business model and operations, such as flooding, drought, or the need to increase carbon sequestration. An NbS project might be an alternative to a conventional (possibly high carbon) approach to the challenge or an investment in improving the business's resilience. However, in CISL's experience, when organisations have yet to embark on this journey, they typically face common internal and external challenges.

While NbS can deliver clear benefits, it is still a relatively new approach, and corporate proponents often have to work hard to get the support to implement them. To help bridge this gap, CISL has published a detailed diagnostic tool to advance organisational understanding of NbS projects and accelerate corporate adoption and implementation. In conjunction with this brief, companies may find *Decision Making in a Nature Positive World: A Corporate Diagnostic Tool to Advance Organisational of Understanding of Nature-based Solutions Projects and Accelerate their Adoption* helpful in moving forward.

The tool, illustrated below, helps internal advocates navigate four common obstacles:

- **Dealing with the unknowns** that delay or obfuscate NbS decision-making processes
- **Making the financial case** for NbS benefits, especially when compared to a company's traditional solutions
- **Navigating external and reputational pressures** such as external stakeholders, regulatory compliance, supply and value chain actors, and possible NbS partners
- **Engaging and influencing colleagues** to convince them of the benefits of NbS and convert them from undecided to NbS supporters.

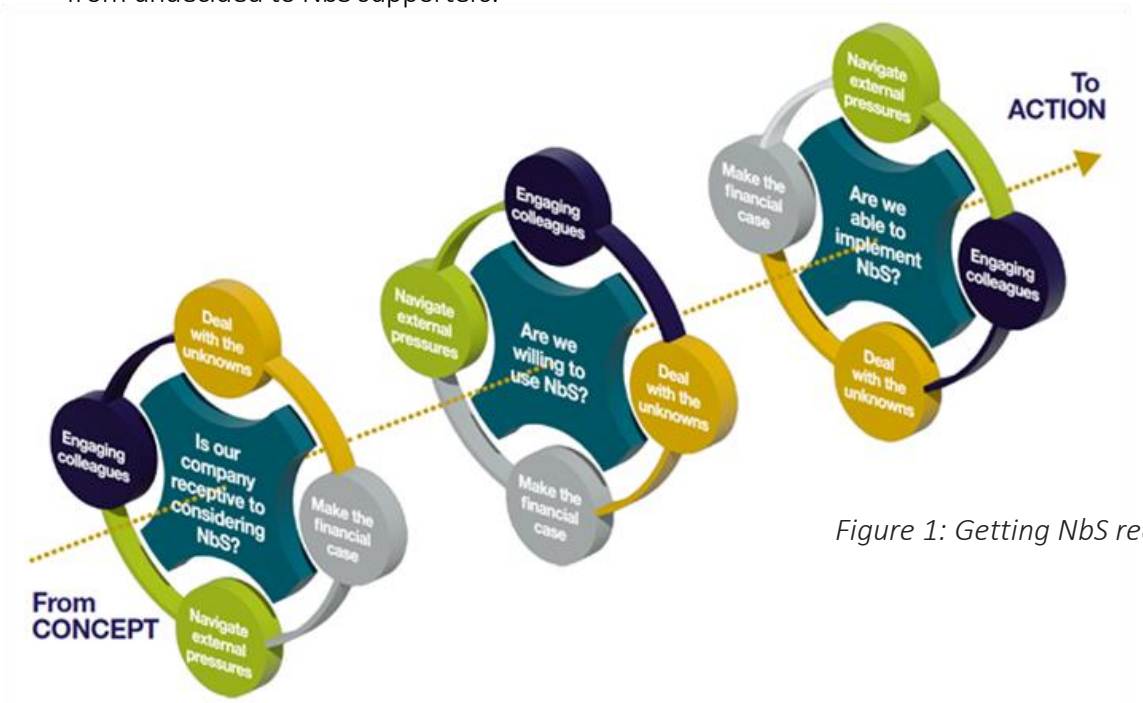

Figure 1: Getting NbS ready.[xv]

Next steps

The time is ripe for UK sectors whose business models and success depend on nature to transform their strategic planning by embracing nature-based solutions at scale. Companies that deliver infrastructure and shape our built environment are among those that can benefit from prioritising NbS as they pursue more resilient and cost-effective operations in response to regulatory pressures, rising risks from climate change and nature degradation, and internal carbon targets.

This business briefing provides a snapshot of how NbS approaches work, the benefits already being generated by existing schemes, and the co-benefits that can be delivered beyond the water sector. Developers and architects, builders and engineers can partner with other stakeholders in ways that harness these benefits collectively, reduce their costs and deliver on a range of outcomes that are broader than their own business objectives.

The Cambridge Institute for Sustainability Leadership (CISL) can assist these companies and other organisations in future proofing their businesses by harnessing the power of nature. For more information on our work in this area, see here and contact business&nature@cisl.cam.ac.uk.

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