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Title:
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Date:
2025-12-01

Citation:
Humphrey, J. E., Selinske, M. J., Garrard, G. E., zu Ermgassen, S. O. S. E., Addison, P. F. E., Kiss, B. M., Burgass, M., Chimbwandira, S. J., Connop, S., Duffus, N. E., Hartwell, R., Moberly, R. L., Nash, C., Nolan, P., Staples, J. & Bekessy, S. A. (2025). How do we achieve nature positive? A vision and targets for the UK residential and commercial development sector. Npj Urban Sustainability, 5 (1), pp.14-. https://doi.org/10.1038/s42949-025-00204-0.

Persistent Link:
https://hdl.handle.net/11343/363357

npj | urban sustainability

Article

Published in partnership with RMIT University

https://doi.org/10.1038/s42949-025-00204-0

# How do we achieve nature positive? A vision and targets for the UK residential and commercial development sector



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The Kunming-Montreal Global Biodiversity Framework's 2050 Vision depicts a world living in harmony with nature where "biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people". To achieve this vision, alternatives to business-as-usual are urgently needed, especially in the highest impacting sectors. Here we demonstrate the use of visioning and target setting to create an actionable roadmap to a 'nature positive' future for the UK residential and commercial development sector. During an online workshop, ten expert participants defined a shared vision for the development sector in 2050, and worked collaboratively to identify interim targets required to achieve that vision. The resulting roadmap highlights the need to improve biodiversity monitoring and assessment methods, strengthen Biodiversity Net Gain metrics, increase ecological literacy and conservation funding, and enhance community access to, and connection with, nature.

The Global Biodiversity Framework agreed to by 196 governments in Montreal, 2022, explicitly calls for action to halt and reverse biodiversity loss by 2030, and to create a society where "biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people" by 2050[1]. This has amplified discussion around the concept of 'nature positive', especially in the private sector and government. The term nature positive refers to the goal of having greater biodiversity in the future, compared to a baseline of 2020[2,3]. To achieve net positive biodiversity by 2030 and the Global Biodiversity Framework's 2050 Vision for Biodiversity, alternatives to business-as-usual approaches are urgently needed in the highest impacting sectors[4]. It is critical to reach these goals if we hope to recover threatened species, maintain the ecosystem services society depends on, mitigate climate change and minimise its impacts globally. However, the pathway to a nature positive future is still unclear, and has generated multiple questions around where to invest resources, what actions should be prioritised, how to measure impacts on biodiversity, and who the important actors are for realising the Global Biodiversity Framework's 2050 Vision[5,6].

The Global Biodiversity Framework's Target 12 aims to "enhance green spaces and urban planning for human well-being and biodiversity" by increasing "the area and quality, and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably"[7]. This target is particularly important for the residential and commercial development sector as the expansion of urban areas is one of the largest contributors to biodiversity loss globally[8]. Urban development influences biodiversity directly via (i) vegetation clearing, which reduces the extent, quality and connectivity of habitat[9–11], and (ii) the construction of infrastructure, which is associated with increased threats and disturbances from people, domestic pets, vehicles, anthropogenic noise and artificial light at night[10,12–16], and indirectly through (iii) the extraction of raw materials,

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production of building supplies and related supply chains, and carbon emissions which exacerbate climate change[17–20]. Considering the global population is projected to increase by almost two billion people by the year 2050[21], these impacts are likely to increase significantly in the coming decades.

Despite the many threats posed by residential and commercial development, urban areas can represent critical habitat for biodiversity[22], including threatened species[23,24]. Research has shown that the provision of quality habitat in cities, such as native vegetation, mature trees, biodiverse gardens, riparian corridors and freshwater ecosystems, can help promote the occurrence of individual species and the diversity of multiple taxonomic groups, including birds[25–28], insects[29–31], mammals[28,32,33], and amphibians[34–36]. Such actions may enable the conservation of species in modified environments, while also providing benefits for people in the form of improved physical health, mental wellbeing, and the provision of key ecosystem services[37–39]. For example, neighbourhoods with high levels of greenery are associated with a reduced risk of cardiovascular disease and mortality[38], and children in more biodiverse childcare centres and schools often have healthier skin and gut microbiota, improved lung function, and fewer allergies[40–42]. Further, urban areas with more trees and vegetation cover, a greater abundance and diversity of birds, and more natural green space are correlated with improved mental health outcomes[37,43,44], greater life satisfaction[45], and stronger social relations among residents[46]. The inclusion of biodiversity in residential neighbourhoods can also help deliver key ecosystem services that support human habitation, such as shade and cooling, air and water filtration, and carbon sequestration[39,47,48].

Given the need to conserve species in cities and the importance of nature for human health and wellbeing, it is imperative that the development sector integrates biodiversity into their decision making. Whilst the mitigation hierarchy is widely championed as the appropriate framework for alleviating biodiversity loss associated with new developments, in practice, there is limited evidence for robust application of the avoidance step and frequent suggestions that offsetting has become the default option[49–51]. A reliance on offsetting presents multiple challenges to achieving no net loss of biodiversity[52–54]. With land scarcity limiting available options for offset sites, in some jurisdictions it may be physically impossible to continue to offset biodiversity loss and achieve the Global Biodiversity Framework nature positive 2030 goal[55]. Additionally, capacity constraints weaken the regulatory system so that it can be exploited by developers with financial and political resources[56]. The way in which biodiversity value is assessed also varies considerably, from simple measures of habitat area and condition to more functional, ecological metrics such as species diversity, habitat suitability and landscape-level connectivity[57–60]. Ensuring that offset projects deliver equivalent conservation values to those lost due to development is therefore complex, especially considering factors such as ecological processes, spatial and temporal dynamics, cumulative impacts, and equity considerations such as separating people from the nature that existed at a site[61]. Previous research has found that offsets tend to facilitate the relocation of biodiversity away from urban areas and areas with higher land prices[62]. This can lead to the loss of critical ecosystem services in the places where people live, work and play, thereby compromising the climate resilience and sustainability of urban communities.

The tension between residential and commercial development and biodiversity policy is particularly strong in the United Kingdom. England (environmental policy is devolved in the UK) has committed to a legally-binding target to halt wildlife declines nationally by 2030[63] and, since April 2024, has mandated that all new developments—with a few exceptions—achieve a 'Biodiversity Net Gain'[64]. At the same time, it has committed to ambitious targets for expanding housing infrastructure, aiming to deliver 1.5 million new homes in the next five years[65,66]. Housing infrastructure remains one of the largest drivers of biodiversity loss in England[67]. Mitigating the potential trade-offs between residential infrastructure expansion and biodiversity will require a mixture of sound ecological compensation policy and changes in socio-political conditions that allow underutilised housing stock to help meet housing demand (e.g., through policies that tackle inequalities in the consumption of floor space (see[68])).

England's Biodiversity Net Gain (BNG) policy stipulates that new developments must leave biodiversity in a measurably better state by providing a 10% BNG[64]. This equates to a 10% increase in biodiversity units (a habitat-based proxy for measuring biodiversity[69]) post-development, achieved by following the mitigation hierarchy, and offsetting any residual losses by enhancing habitat on-site (i.e., within the development footprint), or off-site as a last resort.

BNG has increased the consideration of biodiversity in the planning process and the biodiversity metric promotes adherence to the mitigation hierarchy by assigning high scores to priority habitats, making them costly to offset. However, the use of a simple habitat proxy has led to criticism as it may undervalue habitats that are important for biodiversity[70]. Evaluations of the metric have found that it does not correlate to other biodiversity metrics, such as the occurrence of species of conservation concern[71,72]. This has led to concerns that BNG may not fully compensate for losses of biodiversity from development. Governance presents an additional challenge. It is estimated that 27% of biodiversity units delivered are at high risk of non-compliance as they are delivered on-site (i.e., within the development footprint) where they are unlikely to be monitored[73]. Indeed, a recent report estimated that just 53% of the promised ecological features were present in new developments across the UK[74]. Although BNG is a significant step forward for reconciling biodiversity and planning, there are still important considerations around whether we are using robust metrics and ensuring the system is subject to good monitoring and governance.

Transforming the impact of the residential and commercial development sectors on biodiversity is an extremely challenging task. These sectors drive economies, are major employers, and have political capital due to lobbying and housing shortages. Further, cognitive biases such as confirmation bias - the tendency for people to focus on information that supports what they already believe and ignore information that contradicts it[75]—can make it difficult for stakeholders to comprehend such a large, insurmountable problem[75,76]. At present, there is no clear plan for transforming the development sector, and further research is urgently required to better define the concept of nature positive development and identify a viable pathway forward. Future visioning and target setting is a form of backcasting which can help stakeholders identify a desired future[77], and then break it down into discrete, time-bound goals[78,79]. Such an approach may help stakeholders to see beyond problems and solutions that are constrained by business-as-usual thinking, in order to articulate the parameters of a nature positive society and development sector and then map out a viable pathway to that future. While this method has been used to envision climate change mitigation and adaptation pathways[80], it is yet to be widely applied to biodiversity conservation[77], especially in the context of nature positive transitions.

This study examined how changes in the residential and commercial development sector can contribute to achieving the Global Biodiversity Framework's 2050 Vision for Biodiversity and a nature positive future, using the United Kingdom as a case study. This is the first study, to our knowledge, to employ future visioning and target setting in the context of nature positive development. During an online workshop, we tasked a group of ten experts to define a 2050 vision for the UK residential and commercial development sector, propose relevant time-bound targets for three time points (2050, 2040 and 2030), and discuss the immediate actions and relevant actors required to achieve this vision. We aimed to: (i) demonstrate the application of future visioning and target setting in a nature positive context; (ii) identify the key themes emerging from expert discussions; and (iii) map out a pathway for transitioning the UK residential and commercial development sector towards a nature positive future.

## Box 1 | Participant developed vision statement

"By 2050, the development sector recognises people spaces as nature spaces, whereby nature is comprehensively valued as an asset, nature-based approaches are embedded in development, and nature has a prominent place in decision making across the development cycle. Developments maximise the benefits to people and nature, creating connection with nature, and normalising nature protection, regeneration and stewardship."

## Results

### Reflection on the application of future visioning and target setting

We conducted a single day, online workshop with ten expert participants. The workshop employed a backcasting approach and the established methods of future visioning and target setting[78,79,81]. Rather than forecasting a potential future based on current settings, the participants started with a desired end point for 2050 and worked backwards to 2030, allowing them to break down the nature positive transition into discrete, achievable steps. The workshop was divided into three stages in which participants were encouraged to: (i) envisage a desired future for 2050 and collaboratively draft a vision statement; (ii) work backwards to define interim targets (2050, 2040 and 2030) required to achieve that future; and (iii) identify any actions and relevant actors necessary to achieve them.

The workshop proved to be a novel and effective approach to co-design, with academics, industry, government, and non-government organisations represented. Participants found the method of starting with a vision for 2050 and working backwards to 2030 to be effective in helping them to think long term. One participant stated that "*it is often challenging to think long-term like this at work as I am focused on the day-to-day and short-term priorities*".

### Overview of workshop outputs

Our expert participants developed a broad vision for how the UK residential and commercial development sector could contribute to the Global Biodiversity Framework's 2050 Vision and a nature positive future (see Box 1). The full vision statement is available in Supplementary Material 1.

During workshop discussions, the participating experts identified 53 time-bound targets spanning ten different themes, namely: (1) Biodiversity Net Gain and supply chains; (2) Nature-based solutions; (3) Community stewardship and connection to nature; (4) Management of waterways; (5) Community access to nature; (6) Corporate governance and leadership; (7) Government budgets; (8) Ecological literacy and education; (9) Biodiversity monitoring and evaluation; and (10) Land-use planning (see Table 1; Fig. 1).

Experts also identified 22 actions and 17 actors which accompanied the targets (see Table 2). The majority of actions discussed (19/22) were focused on immediate priorities for the current decade (i.e., 2030 targets). In our opinion, this is a strength of the backcasting approach. Future visioning enables identification of desirable futures and interim targets that are not constrained by business-as-usual; short-term action planning enables identification of the key actions we need to undertake now to set us on the pathway towards the first and subsequent targets.

The ideas and concepts communicated by the participating experts were summarised as a potential roadmap to a nature positive future (see Fig. 1), and visualised in a pair of landscape renders depicting aspirational urban environments (Fig. 2).

### A roadmap for nature positive development

The synthesis of workshop discussions and outputs resulted in the following narrative descriptions for each time point along the roadmap (Fig. 1).

By 2030, more meaningful and holistic methods must be established and implemented to monitor biodiversity and assess the biodiversity impacts from supply chains across the development sector. Innovators and early adopters within the industry will have pledged to stop clearing vegetation for development. All schools, libraries and government buildings should be retrofitted using nature-based solutions to enhance biodiversity and deliver vital ecosystem services for people and nature. These public buildings will lead the way with positive messaging on the benefits of urban greening and help educate the wider community. By the close of this decade, all local authorities in the UK will employ an ecologist or natural environment expert and should have completed a natural capital assessment to establish a baseline and track progress. One quarter of corporate boards will include a voice for nature that is informed by diverse cultures and perspectives.

By 2040, developers in the UK will have ceased clearing vegetation and all new commercial and residential developments will deliver a BNG of at least 20% within the development footprint. Collectively, this will eliminate the need to offset any operational impacts on biodiversity. The inclusion of green walls and/or biosolar roofs on infrastructure, and street trees, rain gardens and other nature-based solutions in public spaces, will ensure that all new developments are multi-functional and provide amenities for people and nature (see examples in Fig. 2). Every UK local authority will use natural capital accounting to understand trends in their natural capital and inform local decision-making.

By 2050, the biodiversity impacts from supply chains will be significantly reduced relative to the 2030 baseline. Rivers and freshwater bodies in the UK will be swimmable following upgrades to surface water drainage systems. All residents should have immediate access to nature where they live, and easy access to quality natural green space via public transport, active paths and cycleways (Fig. 2). Following the implementation of an ecological literacy programme for development stakeholders and urban biodiversity-focused curricula for school students, all citizens will feel connected to nature and will act positively for nature. Finally, all corporate boards will have a voice for nature represented and a minimum of 20% of the UK government budget will be spent on nature conservation.

## Discussion

The nature positive agenda includes a call for *transformative change*, acknowledging that approaches that support 'business-as-usual' will not work[82,83]. Achieving nature positive outcomes in cities will demand innovative approaches to design, construction and governance such that development not only minimises harm to biodiversity, but actively enhances and restores ecosystems, aiming for a net positive impact on nature. In this study, we demonstrate a practical method for envisaging a nature positive society and development sector in the year 2050, and eliciting the time-bound targets required to move from business-as-usual to that desired future. The diversity of solutions generated by our approach was expansive, targeting actions in settings as contrasting as school yards and corporate boards. The importance of community engagement was also highlighted, including designs that encourage active stewardship of nature, as depicted in Fig. 2. Here we describe the key themes that emerged from expert discussions, as well as the challenges to implementing nature positive interventions. We also reflect critically on the method and discuss the next steps in achieving real world change.

The vision statement agreed upon by our expert participants was comprehensive and extended beyond the realm of the residential and commercial development sector. Represented in this vision were aspects of all three perspectives, or value systems, identified in the Urban Nature Futures Framework, namely: Nature for Nature, Nature for Society, and Nature as Culture[84]. Utilitarian values associated with Nature for Society[84] were particularly dominant amongst our participants, with many targets and actions focused on the co-benefits that urban biodiversity and nature-based solutions can bring to society via improvements to human health, mental wellbeing and connection with nature. Setting a future vision unconstrained by status quo settings enabled participants to identify immediate actions to assist in industry transformation that may not otherwise have been salient to them.

**Table 1 | A summary of the targets that emerged from the workshop for 2030, 2040 and 2050**

| Theme | 2030 | 2040 | 2050 |
|---|---|---|---|
| **Theme 1: Biodiversity Net Gain (BNG) and supply chains** | 75% of new commercial and residential developments deliver a BNG of at least 20% within the development footprint (exceeding the mandatory BNG of 10%).<br>Methods are established for assessing biodiversity impacts from supply chains, and baseline measurements are obtained for the UK residential and commercial development sector.<br>50% of UK developers pledge to stop clearing trees during the development process. | 100% of new commercial and residential developments deliver BNG of at least 20% within the development footprint, eliminating the need to offset operational impacts on biodiversity.<br>50% reduction in biodiversity impacts from supply chains across the development sector, relative to the 2030 baseline.<br>100% of UK developers pledge to stop clearing trees during the development process. | 100% of new commercial and residential developments deliver BNG of at least 20% within the development footprint and surrounding the site, across the lifecycle of the build, eliminating the need to offset supply chain impacts on biodiversity.<br>100% reduction in biodiversity impacts from supply chains across the development sector, relative to the 2030 baseline. |
| **Theme 2: Nature-based solutions** | 100% of public buildings (e.g., schools, libraries, governments) are retrofitted using nature-based solutions to enhance biodiversity.<br>Public buildings lead the way with positive messaging on the benefits of urban greening and nature-based solutions. | 100% of new residential and commercial builds in the UK include green walls and/or biosolar green roofs.<br>100% of new residential developments incorporate nature-based solutions in shared public spaces (e.g., street trees, rain gardens). | 100% of public buildings, private buildings and shared public spaces enhance biodiversity via nature-based solutions.<br>Nature-based solutions are seen as critical infrastructure in the development process including the building materials, design, architecture, engineering, building lifecycle and supply chain. |
| **Theme 3: Community stewardship and connection to nature** | 50% of UK citizens are connected to nature i.e., have measurable connection to nature; (e.g.[112]) and act positively for nature.<br>50% of natural green spaces have dedicated community groups to support biodiversity management. | 75% of UK citizens are connected to nature and act positively for nature.<br>75% of natural green spaces have dedicated community groups to support biodiversity management. | 100% of UK citizens are connected to nature and act positively for nature.<br>100% of natural green spaces have dedicated community groups to support biodiversity management. |
| **Theme 4: Management of waterways** | 50% of farms adjacent to waterways are implementing nature-based solutions like buffer strips.<br>25% of rivers and waterbodies in the UK are swimmable. | 100% of farms adjacent to waterways are implementing nature-based solutions like buffer strips.<br>50% of rivers and waterbodies in the UK are swimmable.<br>50% of surface water drainage systems in the UK are upgraded with nature-based solutions approaches to better manage water flows during storm events, and improve water quality and biodiversity outcomes. | 100% of rivers and waterbodies in the UK record reduced levels of pollutants, so they are no longer considered harmful to human health or natural ecosystems.<br>100% of rivers and waterbodies in the UK are swimmable.<br>100% of surface water drainage systems in the UK are upgraded with nature-based solutions approaches to better manage water flows during storm events, and improve water quality and biodiversity outcomes. |
| **Theme 5: Community access to nature** | 50% of UK residents have immediate access to nature due to the provision of trees, vegetation and natural green space.<br>50% of UK residents can access quality natural green space via public transport. | 75% of UK residents have immediate access to nature due to the provision of trees, vegetation and natural green space.<br>75% of UK residents can access quality natural green space via public transport. | 100% of UK residents have immediate access to nature due to the provision of trees, vegetation and natural green space.<br>100% of UK residents can access quality natural green space via public transport. |
| **Theme 6: Corporate governance and leadership** | 25% of UK corporate boards have a voice for nature represented.<br>100% of corporate boards have an increased diversity of board members, relative to 2023, to ensure a broader diversity of cultural perspectives on nature. | 75% of UK corporate boards have a voice for nature represented. | 100% of UK corporate boards have a voice for nature represented. |
| **Theme 7: Government budgets** | 1% of the UK government budget is spent on nature conservation. | 5% of the UK government budget is spent on nature conservation. | 20% of the UK government budget is spent on nature conservation. |
| **Theme 8: Ecological literacy and education** | 100% of UK local authorities employ an ecologist or natural environment expert.<br>25% of stakeholders involved in urban development projects have attended an ecological literacy programme.<br>25% of UK school children have completed biodiversity-focused curricula, including a specific unit on the value of urban nature. | 75% of stakeholders involved in urban development projects have attended an ecological literacy programme.<br>75% of UK school children have completed biodiversity-focused curricula, including a specific unit on the value of urban nature. | 100% of stakeholders involved in urban development projects have attended an ecological literacy programme.<br>100% of UK school children have completed biodiversity-focused curricula, including a specific unit on the value of urban nature. |
| **Theme 9: Biodiversity monitoring and evaluation** | 100% of UK local authorities have completed a natural capital assessment.<br>More meaningful, holistic and independent methods are established by the national Government and implemented by 75% of local authorities and developers to monitor biodiversity. | 100% of UK local authorities use natural capital accounts to understand trends in natural capital and inform decision-making.<br>The established independent, national methods are implemented by 100% of local authorities and developers to monitor biodiversity. | The monitoring and evaluation of biodiversity is a mainstream and independent process. |
| **Theme 10: Land-use planning** | Land-use planning in the UK takes a more holistic approach and considers all land-uses, including land for biodiversity and agriculture. | 100% of urban spaces are designed to be multi-functional and provide amenities for people and nature. | Nature is afforded legal person status in the UK. |

The participants in the workshop shared inspired and innovative solutions. One of the more unexpected and novel ideas was to ensure the interests of 'nature' are represented on corporate boards. Over the past decade, there has been considerable academic and practical efforts given to granting nature legal rights[85], or even legal personhood (e.g., the Whanganui River in Aotearoa[86]). This requires a person or group of people to act on behalf of nature, providing guardianship over its interest. Less attention has been given to consideration of the environment as a stakeholder, or as our

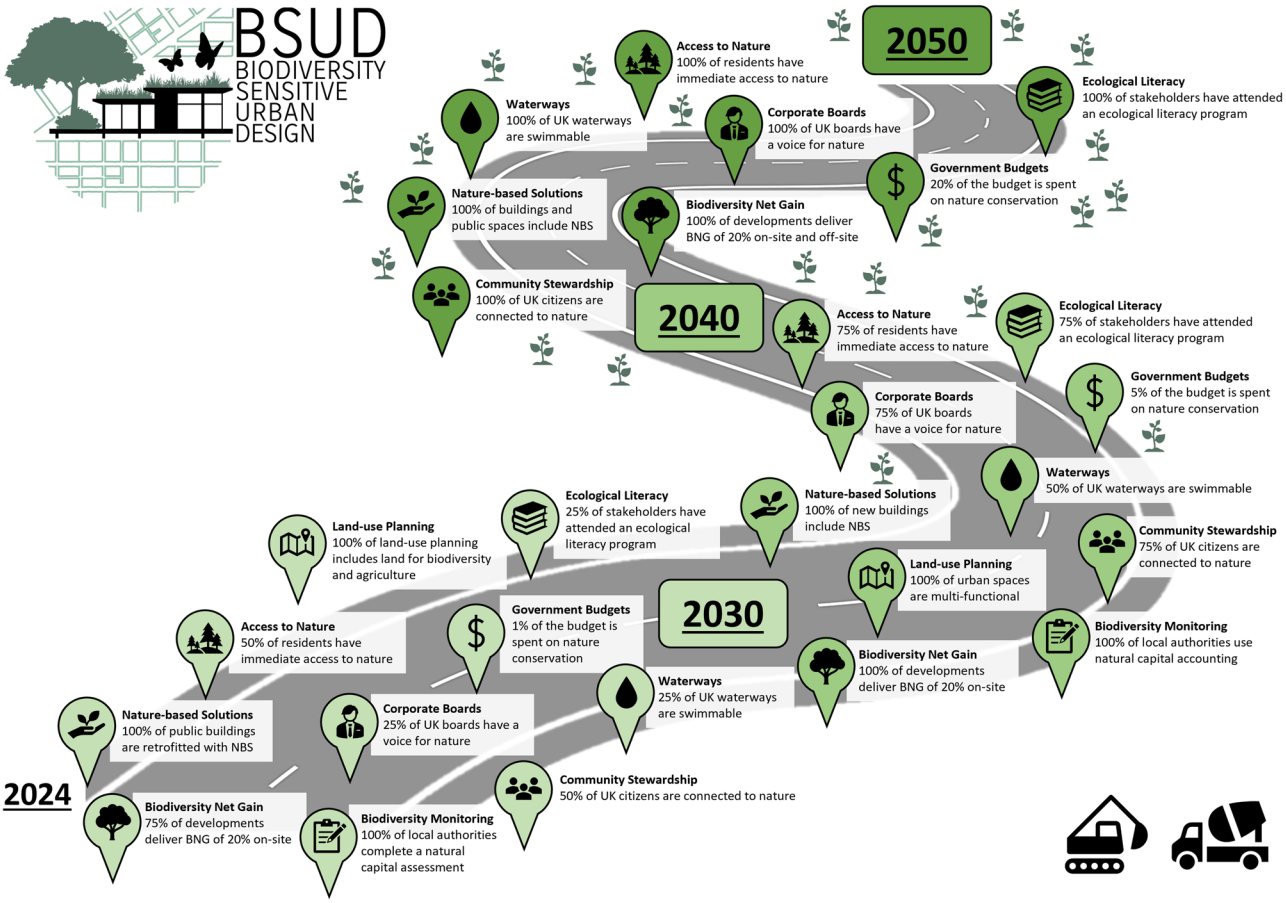


**Fig. 1** | A roadmap to a nature positive future for the UK residential and commercial development sector.

participants suggested, giving a voice to nature on corporate boards[87]. This was a widely supported suggestion, not only for development companies but across all sectors to generate broad transformative change. The impetus for this radical move was the belief that it could mainstream environmental considerations through a top-down process. While this may be deemed idealistic, there is at least one instance where a similar approach has been successful in influencing company decisions: Faith In Nature was the first organisation to give formal representation to nature on their board of directors[88] and now considers potential environmental impacts in all company decision-making[89].

Increased funding was raised as a necessity for transitioning to a nature positive future. Our workshop participants set targets to substantially increase the funding that flows to nature over the coming decades from the UK government and the private sector, via blended finance schemes. By supporting any gains made through the development sector, increased funding for nature can catalyse a transformational change in society's relationship for nature. The State of Finance for Nature report released by the UNEP estimates that US$200 billion of public money was spent on nature-based solutions in 2023; one-third of what is needed by 2030[90]. Greater investment could come from reversing harmful public subsidies that generate negative impacts on biodiversity[91], such as construction, electric utilities, real estate, oil and gas, tobacco, and some fisheries subsidies, and by identifying cross-sector investment wins (e.g., investing in biodiversity for environmental, public health and social benefits). Part of this funding could be invested in community stewardship groups and green corps to help manage natural assets and create green jobs.

During the workshop, offsetting came up as a surprising point of tension amongst participants. Some experts advocated for off-site biodiversity gains via offsetting, citing the potential benefits aligned with UK Biodiversity Net Gain (BNG) policy. Others felt that offsetting should be eliminated entirely (preferably by 2030) and that nature positive outcomes could only be achieved through on-site gains. This was one area of discussion where participants struggled to reach a clear consensus, especially when discussing specific targets (e.g., the percentage of BNG to be delivered). Ultimately, through discussion, there was agreement that a nature positive society required the gradual phase out of offsetting policies and, alongside this, a commitment to eliminating on-site biodiversity losses altogether. There was also a belief among participants that biodiversity loss would no longer be accepted in a future society. The gradual phasing out of offsetting is reflected in the targets proposed in Table 1, by first eliminating their use to offset direct development impacts and then phasing out their use in offsetting supply chain impacts. Given the current lack of transparency of supply chains, this will be a large undertaking, but there have been recent advances in directly measuring and developing proxies for supply chain impacts[92].

As it stands, the BNG metric is inadequate[70] and may result in unintended biodiversity loss. This is likely similar across multiple contexts where biodiversity gain calculators exist[93], but the UK context is unique as the government plans to assess the current offsetting policy in six years (2030), as well as the metric that underpins biodiversity gain (or loss) measurements. One of the more actionable targets emerging from the workshop was to support a more holistic measurement of the environment and biodiversity to include additional elements such as water, soil and social benefits (e.g., benefits related to human health and connection to nature).

Participants expressed a number of potential broad and specific challenges to the targets identified. A concern for any greening project is appealing to the broader public preferences for nature in urban environments. This requires implementing creative solutions that blend biodiversity interventions with functionality. For instance, biodiverse green walls and roofs have the potential to provide habitat and connectivity for native

**Table 2 | A summary of the immediate actions and relevant actors required to achieve the identified targets**

| Category | 2030 | 2040 | 2050 |
|---|---|---|---|
| **Actions** | Advocate for stronger BNG metrics and supply chain measures. | Establish an ecological evidence-base and fill knowledge gaps to inform future decision making. | Develop a portfolio of stewardship investment approaches including funding from public, private and partnership investments. |
| | Establish a working group to develop a more holistic, independent BNG measurement. | Advocate for corporations and governments to view every surface as a potential space for nature. | Mandate corporate investment in biodiversity conservation and/or climate change mitigation. |
| | Devise a new BNG measurement that considers individual species and ongoing maintenance and monitoring. | | |
| | Develop investment models to fund the retrofitting of nature-based solutions into existing developments. | | |
| | Allocate sufficient funding to support local stewardship programs (e.g., through local authorities). | | |
| | Develop a plan to upgrade every surface water drainage system in the UK by 2050. | | |
| | Compile and roll out a communications plan which highlights case studies of corporations making nature positive changes, and others that have been 'busted' for environmentally damaging practices. | | |
| | Establish an alliance of NGOs to coordinate advocacy and communications for better board representation. | | |
| | Legislate TNFD or another form of mandatory disclosure for all corporations in the UK. | | |
| | Redirect harmful subsidies to nature conservation programs across the UK. | | |
| | Establish blended finance schemes (public and private investment) to adequately fund the Nature Positive transition (e.g., UK Nature). | | |
| | Develop and roll out a corporate nature literacy program aimed at urban development professionals. | | |
| | Introduce a new policy, backed by adequate funding, to require all local authorities in the UK to employ sufficient natural environment expertise to meet demand. | | |
| | Regulate the profession of ecology by requiring all ecologists employed in England to be accredited with the Chartered Institute of Ecology and Environmental Management. | | |
| | Incentivise and promote environmental consulting as a career path for graduates. | | |
| | Synthesise information and raise the profile of the economic cost of inaction. | | |
| | Shift the burden of proof to focus on the value of a natural capital approach, rather than the cost of implementing changes. | | |
| | Legislate mandatory contributions from relevant government departments to natural capital accounts. | | |
| | Develop tools to collect, store and publicly share nature-based information to inform future decision making. | | |
| **Actors** | Ecologists, soil scientists, water specialists, social scientists, health scientists, environmental practitioners, communications and marketing specialists, governments (national and local), financial investment firms, educators, local communities, homeowners, developers, landscape architects, urban planners, green space designers, maintenance contractors. | | |

species[94,95], while also enhancing local air quality, property value and building cooling, leading to energy savings[96]. Given societal preferences, biodiversity integration into urban environments should appear intentional with cues to the public that it is a managed intervention[97] that provides benefits for people and nature. Similarly, efforts will be needed to manage the expectations of the public to understand the timeframes associated with biodiverse plantings increasing amenity value, and the need to continue to fund and maintain such projects in the long-term.

Whilst not discussed in detail during our workshop, an increase in biodiversity in cities can result in negative human-nature interactions[98]. For example, urban greening initiatives may lead to an increased abundance of insects, which could evoke feelings of fear and disgust among the public[99]. Plantings may also exacerbate allergy symptoms for some people[100], result in more wildlife-vehicle collisions by providing habitat for fauna[101], and contribute to the spread of zoonotic diseases[102]. These trade-offs must be considered and addressed as they have the capacity to influence the feasibility and acceptance of nature positive development interventions (such as those depicted in Fig. 2[103]).

Achieving a transformational change in the development sector and the urban environment will need to coincide with complementary changes across broader society[104]. Many of the targets and solutions that were suggested are outside the scope of both the development industry and urban governance. For instance, making the Thames swimmable would require a basin-wide strategy supporting rural landholders to reduce or eliminate agricultural pollutants from entering into the Thames catchment, while also undertaking an engineering feat similar to that attempted for the 2024 Paris Olympic Games (see[105,106]). But there is substantial benefit to considering these challenges cross-sectorally as the solutions will account for the interconnectivity of the system and the impacts will be amplified. An integrated, systems-thinking approach, underpinned by genuine collaboration and cooperation between governments and the private sector, will be necessary to achieve nature's recovery.

**Fig. 2 |** A visualisation of nature positive development in the UK in the year 2050, capturing the key outcomes identified by expert participants. Renders were generated in MidJourney (version 6) using 35 mm/landscape architecture style, a warm green and orange colour palette, and an aspect ratio of 2:1. Images were then finalised in Adobe Photoshop (version 25.6).

We found the approach of future visioning and target setting to be an effective way of generating novel solutions to a large, complex problem like the nature positive transition. However, our method could be improved in several ways. It is likely that a different group of experts may have derived a different suite of targets and actions, although our participants were quite explorative, and their discussions covered significant ground (as evident by the ten themes identified). The expertise of our participants spanned a wide breadth of topics (see section 4.2 Expert participants); however, despite invitations, we were unable to attract property developers or builders to the workshop. The inclusion of such representatives may have resulted in less ambitious targets, or different targets and actions entirely. Additionally, we had two subgroups of participants focus on different themes. While the resulting targets were presented, discussed and adapted as a single, large group, if the makeup of the subgroups were different it may have resulted in different targets.

Our participants spent longer than anticipated discussing and refining the future vision statement. Whilst this was a beneficial exercise, it left less time for the target setting process, resulting in fewer actions being identified for the 2040 and 2050 targets. Future applications of this method could aim to derive a collaborative vision statement prior to the workshop (via an online collaborative space or email), to maximise the amount of time for the backcasting process.

The next steps in this work are to focus on the actions underpinning targets from later decades (2040 and 2050), and to map out the potential barriers and enablers that may arise during the nature positive transition. The dissemination of our findings to the commercial and residential development sector is also of critical importance. This will require a detailed communications plan and clear identification of key stakeholders in the industry. While this was outside the scope of this work, the visualisations we produced (Figs. 1, 2) may help to communicate the vision and inspire action and real-world change.

The timeframe for halting and reversing nature loss articulated in the Global Biodiversity Framework (2030) is a mere five years away. Approaches to prioritising actions and identifying actors needed to shift society towards this goal are urgently needed. Using future visioning and target setting, we have identified a roadmap to steer the UK development sector towards a nature positive future that is ambitious but realistic and actionable. Visioning and target setting can be powerful and effective tools for enabling the transformative change needed to tackle the biodiversity extinction crisis, together with many other challenges identified under the United Nations Sustainable Development Goals.

## Methods

### Research approach: visioning and target setting

We used future visioning and target setting[78,79,81], a form of backcasting, to generate a shared vision for the UK residential and commercial development sector in 2050, and explore the interim steps required to achieve that vision. During a visioning exercise, participants imagine a desired future state and then collaborate on a shared vision statement that describes that future[81]. The resulting statement is intended to guide the transition from the present to a more desirable future[81]. The process of target setting involves participants working backwards from that desirable future and developing quantitative, time-bound targets to ensure the future vision is achieved.

### Expert participants

Potential expert participants were identified through research and practitioner networks in the UK. We aimed to recruit experts from diverse backgrounds by inviting representatives from academia, local government authorities, consultancy firms and non-government organisations spanning multiple counties.

We contacted 19 potential experts in May 2023; ten accepted our invitation and attended the online workshop held in June 2023. Participant expertise covered the topics of environmental planning, green infrastructure, ecological economics, natural capital accounting, biodiversity offsetting, nature positive transitions, ecology, conservation, forestry, and Biodiversity Net Gain policy.

### Pre-workshop engagement

Prior to the workshop, all participants were provided with a suite of background materials which covered relevant framing material, topics of interest, temporal scope and geographic area to be discussed (see[107]). These materials included: (i) a description of the future visioning and target setting method and each stage of the process; (ii) a discussion of the Global Biodiversity Framework and the concept of nature positive; (iii) a discussion on transformative change which included previous social changes and examples of how our society has changed in the last 27 years (i.e., the same timeframe for achieving the 2050 vision); (iv) research and government data on the state of the environment in the UK, major drivers of biodiversity loss (both past and current), relevant government policies and possible future threats; and (v) some key assumptions for the year 2050 - that we will not be experiencing runaway climate change, and that the global human population will continue to increase before tapering off at 9 billion people.

### Workshop

We used the video conferencing software Microsoft Teams (https://www.microsoft.com/en-au/microsoft-teams) to hold a single day online workshop. Expert participants shared their ideas via the visual work platform Mural (https://www.mural.co/). The workshop involved three stages where

participants were encouraged to: (i) envisage a desired future for 2050 and collaboratively draft a vision statement; (ii) work backwards to define milestones or interim targets (2050, 2040 and 2030) required to achieve that future; and (iii) identify any actions and relevant actors that may arise along the way (see[108]).

During the first stage of the workshop, participants were presented with a starting point for their vision: The UK commercial and residential development sector is nature positive, and the UK achieves the Global Biodiversity Framework's 2050 Vision for Biodiversity where "biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people"[1]. Participants were then allocated to one of two breakout rooms, each with five participants and two facilitators. They were asked to independently devise five broad statements that encompassed their desired future vision for the UK residential and commercial development sector in the year 2050. Using the Nominal Group Technique method[109–111], we encouraged each participant to share one or more vision statements with their breakout room. This sharing session was followed by a facilitated group discussion which aimed to collate and summarise each breakout room's collective 2050 vision. Finally, the two breakout rooms came together to report on their respective discussions.

In the second stage of the workshop, the research team condensed the list of future visions down to six broad statements, which were then used to guide the development of potential targets. We allocated three broad vision statements to each breakout room and encouraged the expert participants to work collaboratively to generate relevant targets which could be considered stepping stones to achieving the shared vision. Participants were instructed to think creatively and ambitiously to generate targets for the years 2050, 2040 and 2030. As targets were defined and discussed, participants added them to the Mural platform and grouped them under the relevant year.

In the final stage of the workshop, each breakout room worked collaboratively to list the immediate actions and potential actors required to achieve the 2030 targets they had generated. Any additional actions related to subsequent decades (2040 and 2050) were also noted. All ideas were added to the Mural platform. The process we followed is summarised in Fig. 3.

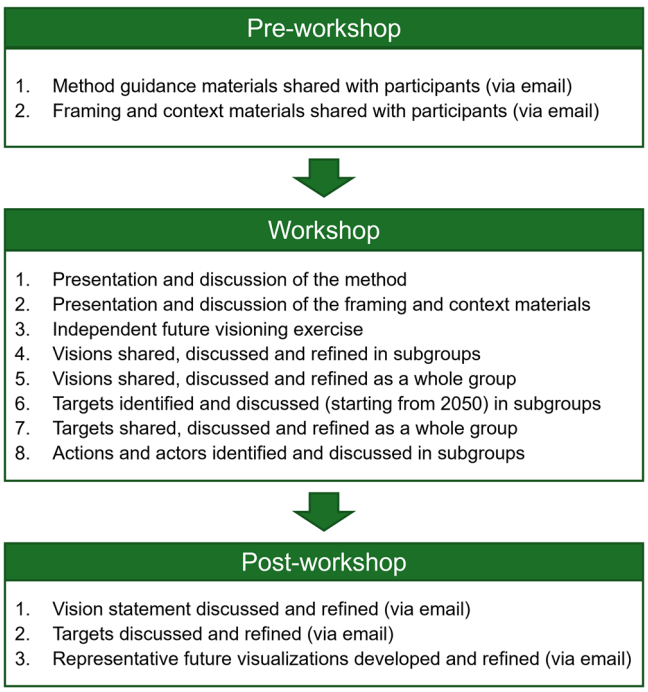


**Fig. 3** | A summary of the method followed to generate a roadmap to a nature positive future for the UK residential and commercial development sector.

### Post-workshop analysis

Following the workshop, we collated all responses on the Mural platform and listened to the workshop recording to identify any points that may have been missed. We integrated the vision themes together to create a single, shared statement which broadly and fully captured the ideas discussed. This was then sent to the participants for two rounds of revisions to derive the final vision statement.

We also identified ten key themes and summarised the targets and key actions proposed by experts in a visual roadmap (see Fig. 1). Finally, we used MidJourney (version 6) and Adobe Photoshop (version 25.6) to generate two landscape renders of the nature positive future described by our expert participants (see Fig. 2): one represented a nature positive suburban housing development, and the other depicted a nature positive urban streetscape.

All participants were given an opportunity to provide feedback on the themes, targets, actions, actors and visualisations that emerged from discussions, and were offered co-authorship on this paper.

## Data availability

The data analyzed in this study will be made available from the corresponding author upon reasonable request.

Received: 15 October 2024; Accepted: 8 April 2025;
Published online: 18 April 2025

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## Acknowledgements

We acknowledge the Wurundjeri People of the Kulin Nations as the Traditional Custodians of the unceded land on which RMIT University stands from where this research was led, along with those of the co-authors of this work, and respectfully recognise their Elders past and present. S.B., G.G. and M.J.S. receive funding from Australian Research Council (DP200103501). S.B., G.G., J.E.H. and B.M.K. are also supported by the Ian Potter Foundation (Grant no. 31110620). The funders played no role in study design, data collection, analysis and interpretation of data, or the writing of this manuscript. Human ethics approval for this project was granted by RMIT University (25547). We thank Associate Professor Shirin Malek Pour and Professor Atte Moilanen for providing support on method development, and Amy Constable who contributed to group discussions during the online workshop.

## Author contributions

M.J.S., G.E.G. and S.A.B. were responsible for the research conceptualization, methodology, investigation and funding acquisition. S.O.S.E.z.E., M.B., S.J.C., S.C., R.H., R.M., C.N., P.N. and J.S. contributed to the online workshop. M.J.S. and J.E.H. summarized the workshop outputs, and J.E.H., M.J.S., S.O.S.E.z.E., N.E.D. and S.A.B. wrote the original draft of the manuscript. J.E.H. and B.M.K. produced Fig. 1, B.M.K. produced Fig. 2, and M.J.S. and J.E.H. produced Fig. 3. J.E.H. and M.J.S. were responsible for project administration, under the supervision of G.E.G. and S.A.B. All authors reviewed and edited the final draft of the manuscript.

## Competing interests

The authors declare no competing interests.

## Additional information

**Supplementary information** The online version contains supplementary material available at https://doi.org/10.1038/s42949-025-00204-0.

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