

1.1 Overview

Biodiversity underpins the ecosystem services that we need to survive and thrive. Unlike carbon, it cannot be accurately measured. The construction industry not only impacts but depends directly and indirectly upon biodiversity and ecosystems, although these interdependencies are often intangible. It is this complexity that has pulled focus from the immediate crises; however, it is just this complexity that delivers resilience, stability, productivity, and sustainability.

Our ecosystems are already at, or potentially beyond, the critical thresholds. We need to maximise every opportunity to deliver biodiversity and restore ecosystems by delivering environmental net gain to restore these systems so that we can mitigate and adapt to climate change, and all enjoy the quality of life in the future that we have today.

This piece sets out how the Green Construction Board - Biodiversity and Environmental Net Gain Working Group intends to support the industry to meet these challenges.

1.2 Context

Biodiversity continues to be lost at alarming rates and previous targets and agreements have not halted the loss. In addition, we are now seeing further pressure on biodiversity because of climate change.

We have reduced the amount of biodiversity in our built environment not only by land use change due to the required building footprint but by using traditional grey infrastructure and the over consumption of natural resources.

The value of biodiversity and ecosystem services within in our built environment is often not understood and is only considered at the end of a project for aesthetic value. The benefits of biodiversity and its value needs to be understood within the whole value change, if we are going to see the changes that are needed, to halt biodiversity loss and to enable nature to recover.

1.3 The Vision

Imagine tree lined streets with Sustainable Drainage Systems (SuDS) and connecting pocket parks. Our water purified using constructed wetlands and our buildings cooled and noise reduced using green roofs and walls. Nature-based solutions (NbS) such as green infrastructure are cheaper to install and manage than grey infrastructure and they deliver multiple benefits. Not only do they deliver biodiversity but they create a more resilient, flexible and healthier built environment in addition to delivering environmental targets including net zero carbon goals.

By designing and delivering solutions with nature at their heart we will have healthier soils, prevent flooding, provide clean air, reduce resource over exploitation, clean our water, and cool our streets. Our overall wellbeing is improved and providing more pleasant environments also encourages active travel, community participation and healthier lifestyles. This has direct benefits for business but also reduction in societal pressures on health and social services plus the creation of healthy jobs.

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1.4 The business case

Climate change, biodiversity loss and pollution are the interlinked triple planetary crises the world is currently facing¹, as shown in figure 1. They are costing human life and reducing profitability through overheating, famine, flooding, pollution, increased storm events etc. The loss of biodiversity reduces our ability to mitigate and adapt to climate change and pollution. In 2021, climate change disasters cost the world over \$100 billion² impacting food, water and energy security whilst disrupting the global supply chains and damaging the local and global infrastructure (e.g. power grids, ports).

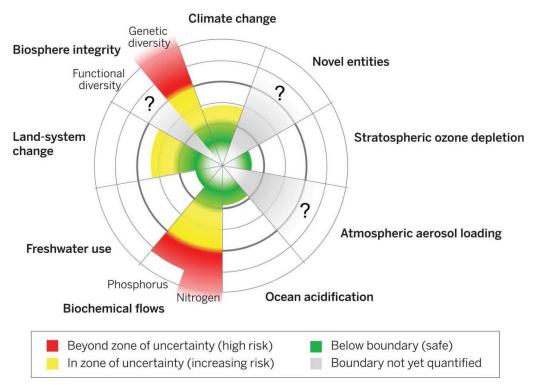


Figure 1: Nine planetary boundaries (Azote for Stockholm Resilience Centre, based on analysis in Wang-Erlandsson et al 2022)

Under current policies, the total cost of climate change damages to the UK are projected to increase from, 1.1% of GDP at present to 3.3% by 2050 and 7.4% by 2100³.

These triple threats to business can be presented as operational (supply chain disruption) regulatory (compliance in an uncertain regulatory future), reputational (having one's licence to operate removed and/or devalued) market (consumer preferences) and direct financial impacts (losing access to cheap finance, rising costs and lowered returns).

These risks are currently exacerbated by an uncertain regulatory environment that is likely to focus around targets (such as the recent targets based around mandatory 10% BNG and challenging wider targets on biodiversity, air quality, water and resource efficiencies⁴) some of which are clearly messaged with sufficient preparatory time and support to deliver, however, emerging

¹ What is the Triple Planetary Crisis? | UNFCCC

² Climate disasters cost over \$100 billion in 2021 | Popular Science (popsci.com)

³ What will climate change cost the UK? Risks, impacts and mitigation for the net-zero transition - Grantham Research Institute on climate change and the environment (Ise.ac.uk)

⁴ DEFRA ISSUES ENVIRONMENTAL TARGETS | Herbert Smith Freehills | Global law firm

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requirements such as nutrient and water neutrality can be extremely disruptive to an unprepared market.

Enhanced biodiversity and the use of nature-based solutions (NbS) can deliver resilience to climate change in addition to delivering the ecosystem services we need to thrive and improve the quality of life. For example, woodland, wetland, peatland and marine restoration can sequester and reduce carbon emissions (one-third of carbon reductions needed in the next decade could be achieved by NbS⁵) this can also deliver clean water, flood resilience, heat attenuation, social cohesion, health and wellbeing, sustainable food, timber, bamboo and other natural supplies. These NbS can also be integrated into the built environment in the form of pocket parks, community gardens, street trees, streetscape SuDS, green roofs, green walls etc.

The return on investment for such NbS can be 10 to 1 and can be funded by grants and/or credit markets, co delivered by partners or delivered by access to cheap finance. These financial benefits will continue to increase in a market with diminishing land availability and exacerbating energy and other climate defence costs.

Biodiversity underpins the functionality of these NbS. Through enhancement of biodiversity and use of NbS business benefits are:

- Operational (lower capital and management costs, provision of multiple benefits and offer a climate and future proof resilience that single purpose grey infrastructure does not),
- Regulatory (accelerating consents and at lower costs by positive design and management)
- Reputational (stakeholder relations, improving social cohesion and opening access to land and long-term community management support)
- Market (brand value and new revenue streams)
- Financing (access to more favourable loans, grants, co-delivery and resource efficiencies).

Barriers to achieving these benefits are often cited as the decision makers having a poor understanding of risk and returns with regards to NbS, it is difficult to understand and measure due to its complexity, and there is a lack of existing standards and confidence in performance in NbS.

There is an urgent need to improve and drive uptake of biodiversity enhancement as well as a standardised way of delivering and measuring the benefits of NbS whilst improving understanding of biodiversity risks, interlinkages of the triple planetary crisis and how it should inform decision making. NbS can provide multiple benefits, but to secure the necessary funding for nature recovery, there needs to be greater clarify on fundable benefits stacking and the additionality required⁶. That is, were different benefits such as, nutrient neutrality, water neutrality, carbon sequestration and biodiversity net gain, can be stacked to help to unlock delivery by providing multiple funding solutions for NbS.

This piece outlines the support to the industry that could help accelerate the change from grey to green and to deliver a more certain sustainable future.

1.5 Partners and stakeholders

There is an acknowledged skill shortage throughout the system for those who understand biodiversity impacts, dependencies and NbS. There is also a requirement for collaboration top

⁵ Biodiversity - our strongest natural defence against climate change | United Nations

⁶ STACKING & BUNDLING (cdn-website.com)

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down, bottom up and laterally, to transfer knowledge, embed the goals, and deliver the vision. Knowledge building and strong working relationships are essential. Collaboration is critical as NbS require skills in designing for complexity rather than simplification that has traditionally been undertaken within professional remits.

Innovation is also required, this can happen from anywhere, at any management level and from any profession. This does not sit solely within traditional ecological and environmental disciplines, there are multiple stakeholders and players that have different roles and relationships to help deliver natures recovery in the built environment. Creative thinking and blurring of professional silos help with wider engagement. However, there is often a leakage of value through our current system when top-down systems are imposed, see figure 2.

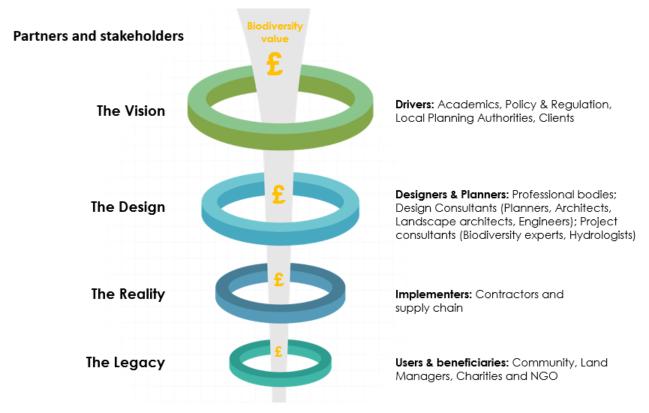


Figure 2: The current system

Much like the complexity of biodiversity and ecosystems, stakeholder relationships need to be interconnected to deliver cumulative benefits which deliver more than the sum of their parts, see figure 3. These roles and interrelationships have been outlined below. The diagram outlines how greater collaboration and feedback is need at each stage to create a web of knowledge exchange and to deliver value at all stages.

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Drivers: Academics, Policy & Regulation, Local Planning Authorities, Clients



Designers & Planners: Professional badies; Design Consultants (Planners, Architects, Landscape architects, Engineers); Project consultants (Biodiversity experts, Hydrolaaits)



Implementers: Contractors and supply chain



Users & beneficiaries

Charities and NGO

Community, Land Managers,

Value

Figure 3: Increasing value through the collaboration

The partners and stakeholders are key in delivering more nature into the built environment. The pressures and recommendations have been outlined in appendix 1.

1.6 The solutions

Nature can provide the solutions that are needed but as a built environment industry we need to put nature at the centre of our designs. We also need to stop the utilisation of finite natural resources, in a circular economy the built environment becomes a source of materials as well. Mandatory biodiversity net gain is a small step the first step on this journey, ultimately, we need to deliver environmental net gain. The road map developed by this working group aims to showcase the key steps that are needed to embed NbS.

We have identified three key areas of opportunity:

- 1. Leadership, ownership and policy
- 2. Strategy, design and delivery
- 3. Measurement, management and monitoring
- 4. Educating, upskilling, recruitment and engagement
- 1. Leadership, ownership and policy

Leadership

Nature's recovery needs to be championed at all different levels from local community groups to Government.

Government needs to provide the right frameworks and policies, with clear targets, to ensure that nature is considered from the start of a development and within our built environment. The mitigation hierarchy should be followed and opportunities should be maximised. It should not be development or nature; they should be delivered together. The construction industry has the opportunity to improve and help deliver many of the enhancements we need to halt biodiversity

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loss. The mechanisms should be put in place to ensure construction provides the solutions and delivers for nature and people.

At a local level government should ensure that the right habitats are enhanced and delivered on new sites. These habitats should also support local species. At a local level there should be advice and guidance to provide the best solutions and the understanding that construction can help to deliver multiple benefits by supporting and enhancing nature.

Ownership

Clear actions attached to targets are essential, but they also require ownership. It must be clear who is responsible for the delivery of targets. Funding for NbS should be attached to the demonstration of benefits, that are linked to national and local targets.

Policy

Policy must be clear, concise and directional regarding our use of the environment. Policy must be accompanied by clear action plans, with geographical information to support placemaking and design for implementation, for example, Sustainable Drainage Solutions Plans outlining where such NbS would be effective. Barriers to successful implementation of policy are currently worsened by the lack of skilled resources in the local authority planning system to ensure compliance.

2. Strategy, Design and Delivery

Strategy and design

NbS should be a clear part of any strategy for the built environment. There needs to be strategic alignment of targets in the design for both maintenance of existing sites and for new sites. Alongside this there needs to be clear strategies in place at the local and national level to encourage the update of schemes to deliver NbS such as Urban Greening Factor and BNG.

Delivery

In order to implement nature-based solutions (NbS) there needs to be a strategy that incorporates a delivery model which includes capital and operational funding and collaborative delivery. Funding opportunities need to be readily available to those who would use NbS to replace grey infrastructure. This would be facilitated by enabling stacking and/or bundling of multiple environmental benefits.

3. Measuring, managing, and monitoring

Measurement and metrics

Baselining and monitoring are essential to confirm that environmental benefits are delivered and that value is maintained. Ideally there would be simple metric/s within a single platform but also incorporating the efficiencies and financial aspects of NbS. There are several emerging metrics, with different levels of measurement. While the Biodiversity Metric 4.0 is being used, this is only agreed for England and there is no single environmental metric emerging for the quantification of ecosystem services, although there are a lot of differing approaches. Lessons from BNG have indicated that a single, agreed, metric is required to drive focus, and to demonstrate that targets have been achieved, this could be focussed on key environmental targets.

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While the Environmental Benefits from Nature tool is a helpful design influencer, it does not quantify ecosystem services, nor have any monetary component which is necessary to drive the adoption of NbS. Monitoring needs to be coordinated and consolidated into a central database where the improvements in biodiversity are readily tangible.

Management

While the focus is on new development, there are huge gains to be made, or lost, by the management of existing natural resources and green infrastructure. Much of our green estate is short mown amenity grassland surrounded by concrete and gravel. By creatively managing these areas, biodiversity enhancement, carbon reduction and climate resilience could be achieved, combined with education, recreation and physical and mental wellbeing, all while delivering healthy green jobs.

4. Educating, upskilling, recruitment and engagement

Educating and upskilling

To deliver the required changes we first need to upskill the existing work force so that they understand the importance of biodiversity and it can be incorporated it into our built environment to ensure it thrives. This needs to start from the land acquisition, to the early design stages through the construction process and finally to understand how it is maintained. It is also a cross sector requirement that should not be siloed within the traditional ecological and environmental professions.

Recruitment

We have seen a huge loss of biodiversity and environmental professionals from Local Authorities, many of whom do not even have a biodiversity officer, support for them to assess the applications will empower them to request the required compliance and collaborative working to deliver more for biodiversity and the community.

In the environmental sector we have too few experienced people and they are largely from an aging and narrow socio economic and ethnic background. We must recruit more young people from diverse backgrounds into the industry, that has traditionally been less attractive due to the real and perceived lack of financial rewards and career progression opportunities.

Engagement

Our construction and supply chain also require support to keep pace with the rapidly changing compliance landscape and the aspirations of delivering environmental net gain using NbS.

We can work with professional bodies to promote the industry, support apprenticeships schemes, knowledge share and work in collaboration to deliver holistic schemes that benefit from NbS that provide multi benefits for people and the environment.

We also need support from the public and land/asset managers to driver the delivery and maintenance of these NbS. There is still a perception of green infrastructure being difficult to manage.

1.6 Conclusion

This piece has set out the challenges and discussed some of the solutions that are needed within the industry. The next step is to engage with industry to get senior level leadership and to deliver

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the solutions. The working group has developed the roadmap for delivering more nature in the built environment.

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Appendix 1 - Stakeholder and partners - Pressures and

recommendations

Stage	Players	Pressures	Recommendations
Vision	Academia	Evidence for nature's value is clearly understood, but getting individuals, businesses and stakeholders to understand this is tricky - not least the language of this evidence has not been consolidated and is not easily digested (with time constraints) by the majority of the industry.	Be clear and consistent in the language and evidence to ensure multiple audiences across the industry can understand it. Clear communications with consolidated information using engaging graphics should be prioritised. Acceptance that proxy measurements will be required and collaboration on those measurements to provide "a single voice" that non-technical experts can understand.
	Policy and regulation	Regulatory bodies can be constrained by frameworks and the delivery of traditional outcomes. Grey infrastructure is business-as-usual so is seen as less risky and is clearly understood. Innovation does happen and can have large scale, positive impacts but this can be limited and often requires individuals to champion the approach across the project team.	Collaboration with academia, consultants, clients and contractors to develop NbS that the industry has confidence in for creation and management in the long term. The setting of clear targets with ownership are also required to support in industry with delivery.
	Local Planning Authorities	LPA are governed by politics but need to be delivering multi-functional benefits for the local community. They have multiple pressures as their residents' needs are complex, resource intensive and far-reaching. Their land is finite and has complex competing spatial pressures. Their experience and flexibility are limited due to traditional working patterns. Nature based solutions should provide multiple benefits for LPA but a lack of knowledge, skills and understanding can often result in it being too complex and or there is a complete lack of specialists to implement existing policies.	academia and industry to seek the best support for policy implementation.
	Client	Nature-based solutions are not always a top priority because of other pressures and a lack of consistent, industry accepted, evidence of their benefits and therefore access to funding. The terminology used	Educating clients on the benefits of NbS is needed. This is largely a consultant role. This messaging needs to be bolstered by sound financial advice on the costs and benefits of NbS linked to legislative and policy

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Stage	Players	Pressures	Recommendations
		changes often, leading to mixed messages being received.	compliance with the potential for additional funding and opportunities for co delivery at lower cost.
The Design	Professional bodies	The ecological and environmental profession has historically been viewed as an unregulated industry which has varying degrees of expertise and has often been perceived to only be interested in nature at the expense of client's needs. The term "tree hugger" and "bunny lover" are unfortunately still used. The relatively poor pay and unsociable hours have also excluded many from the industry.	Professional bodies need to continue to work to raise standards and improve the reputation of the industry along with the financial rewards and better working conditions. Guidance accompanied by accreditation, support of education and promotion at school and universities and advocacy on behalf of environmental professionals is required to make this a desirable profession that attracts the best candidates from the most diverse backgrounds.
	Design consultants (Planners, Architects, Landscape architects, Engineers, Ecologists)	Other consultants, for example, drainage engineers are key to NbS, but it is not traditionally part of their role. They can help to really bring out the synergies and benefits for nature in the built environment. It is not part of their business-as-usual approach so can be seen as an additional cost and out of their scope. There is still a large amount of siloed working. Those with the biodiversity and ecosystem services skills are often locked out of the design and decision-making discussions.	Greater responsibility for the delivery of NbS is given to multi-disciplinary design teams where biodiversity experts are included. NbS are integrated into the responsibilities of the whole design team. This may be achieved by working on ecosystem service and natural capital principles to better integrate the design team with the environmental professionals.
	Project consultants (Biodiversity experts, Hydrologists etc.)	There has traditionally been a separation from survey work presenting constraints, to the integration of nature into the design. Environmentalists have been perceived as people who stop development happening. The lack of provision of financial implications within constraints reports and lack of participation in financial decision making by environmental specialists has led to inappropriate decision making that has resulted in a poorer outcome for all.	Biodiversity consultants need to move from a constraints-driven to opportunity-driven, advisory market in a dynamic and uncertain legislative f framework. Consultants need to message, deliver and measure the benefits from biodiversity. To collaborate with multiple stakeholders to develop strategies, create multifunctional spaces, support decision making and deliver a legacy of benefits for biodiversity, the client and people. It is an opportunity for environmental

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Stage	Players	Pressures	Recommendations
			specialists to become more embedded in early design and financial decision making.
The reality / Delivery	Contractors	Delivering a high-quality product is getting harder, with material and labour costs rising and availability of supply falling. The regulatory framework is dynamic, complex and often unclear. There are often directly competing KPIs within any contract that are impossible to co deliver for the value provided.	are factored. Contractors need to be supported by the designers and planner of their obligations and any
	Supply Chain	Supplies are increasing in cost and lessening in availability, suppliers are also facing increased scrutiny and requirements for compliance with non-biodiversity regulations, such as embodied carbon, often taking precedence. The impacts of the supply chain are complex, indirect and global. This can result in a lack of consideration and transparency.	There are a lot of existing and developing accreditations and certifications that do include biodiversity. There is a role for consultants, clients and academics to ensure that we chose the most relevant requirements and message these to the industry. This includes emerging issues such as import of plant pathogens within supplies.
The Legacy	The Community	There is growing recognition of the benefits of nature but if can be difficult for the local community to understand how it can influence and support the change. There can be a lack of knowledge, or lack of clarity from local authorities. Also there tends to be the focus on the immediate rather than the long term.	
	Charities	Charites and NGO's often have expertise on how to deliver solutions for nature but they are often constrained by resource issues and cannot deliver to the	Charities and NGOs to be engaged beyond business as usual to help deliver the high value outputs of nature-

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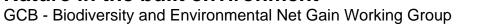
Stage	Players	Pressures	Recommendations
			any scheme, this has the ability to ensure that they are delivery partners providing their expertise and adding value rather than objectors.
	Managers	Often management is focussed on low cost, easy maintenance undertaken by non-specialists with a visual driver of "tidiness". All of these factors drive the environment to its lowest value.	Empower managers to change maintenance to add

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Term	Meaning
Additionality	Is the demonstration of a benefit in the delivery of a service(s) that would not otherwise have been provide, this can be used to procure funding for that benefit and/or accreditation of that benefit.
Attribute	A piece of information which determines the properties of an environmental feature
Benefit	The benefits to people that are obtained from ecosystem services or their wider environment
Biodiversity	Biodiversity is defined by the UN Convention on Biological Diversity (CBD) as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of their functions (i.e. ecosystem function).
Biodiversity Net Gain	Biodiversity net gain (BNG) is an approach to development, and/or land management, that aims to leave the natural environment in a measurably better state than it was beforehand. It is, or is becoming, mandatory on all new developments in England.
Bundling	Packaging the biodiversity and environmental services produced by a nature-based solution on a single area of land and selling the package (typically as a single unit of trade or credit) to a single buyer.
Dependencies	Refers to irreplaceable ecosystem services that are a critical to enabling, enhancing or influencing successful business performance.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Ecosystem asset	The stock of nature which provides ecosystem services and benefits to people. In this report broad habitats are used to define the ecosystem assets. Geodiversity is also considered as a natural asset supporting abiotic and ecosystem services.
Ecosystem engineer	Ecosystem engineers are organisms that directly or indirectly modulate the availability of resources (other than themselves) to other species by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and/or create habitats.
Ecosystem services	The flow of benefits people obtain from ecosystems, which includes timber, fibre, crop pollination, water regulation, climate regulation, recreation, and physical health.
Ecosystem collapse	Refers to a situation where an ecosystem suffers a drastic, possibly permanent, reduction in carrying capacity for all organisms, often resulting in mass extinction.
Environmental Net Gain	Environmental net gain is an approach to development that leaves both biodiversity and the environment in a measurably better state than prior to development – as measured by the biodiversity measures, alongside a broader range of measures of ecosystem services (e.g. recreation, flood protection) and environmental metrics (e.g. air quality).
Flow	The links and provision from ecosystem assets to ecosystem services, benefits and value.
Green Infrastructure	Green infrastructure or blue-green infrastructure is a network providing the "ingredients" for solving urban and climatic challenges by building with nature
Grey Infrastructure	Grey infrastructure refers to structures such as dams, seawalls, roads, pipes or water treatment plants

Appendix 2 - Glossary





Term	Meaning
Impacts	Arise when a company's or project's operations significantly affect ecosystem function quantity or quality.
Indicator	A non-quantitative measure of an environmental property
LEMP	Landscape and Ecological Management Plan which ensures that the value of the designed GI is retained and enhanced throughout the operational phase of the development
Material risk	A financial, operational, reputational or regulatory risk deemed to be significant enough to affect decision making.
Metric	Quantitative measure of an indicator, including the units used.
Natural Capital	The stock of renewable and non-renewable natural resources on earth (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits or 'services' to people. These flows can be ecosystem services or goods and benefits, which provide value to business and wider society.
Nature-based	NbS are infrastructure that use ecosystem services to deliver core services
Solutions	such as clean water, carbon reduction, passive cooling etc.
Net gain	Following completion of a project the biodiversity, natural capital or ecosystem services associated with the project is greater than the previous baseline values.
Stacking	Measuring and accrediting the different types of environmental services from a nature-based project on a single area of land, and selling the services to different buyers, or receiving multiple payments from a single buyer for each service delivered.
SuDS	Sustainable drainage systems are a collection of water management practices that aim to align modern drainage systems with natural water processes. SuDS efforts make urban drainage systems more compatible with components of the natural water cycle such as storm surge overflows, soil percolation, and bio-filtration.
Urban Greening Factor	The Urban Greening Factor (UGF) is a planning tool to improve the provision of Green Infrastructure (GI) particularly in urban areas. It is policy in some planning authorities and can be used to increase biodiversity where the baseline is so low that BNG may demonstrate a meaningful gain.
Value	The value that people place on the well-being benefits obtained from ecosystem services, which can be expressed in both monetary and non-monetary terms.