POLICY BRIEFING

Biodiversity Net Gain, Construction and the Circular Economy

Executive Summary

The UK is among the world's most nature depleted countries. Construction is a significant driver of biodiversity loss through habitat and ecosystem degradation, and without urgent action, will continue to hinder the UK's ability to reverse biodiversity loss and improve its resilience.

New Biodiversity Net Gain (BNG) Legislation is positive, but its targets are limited to considering impacts on development projects alone – and not associated impacts or system-wide changes that could strengthen BNG.

We need to make better use of existing building stocks. This includes extending the life cycles of current buildings, reducing waste, and greater reuse of materials – in turn reducing demand for virgin materials, development on green spaces, and pressure on landfills and quarries.

Reducing demolition, increasing retrofit, and expanding design for deconstruction are among methods that could support the transition to a Circular Economy and will deliver long-term impacts – as well as making commitments such as "no net land take" more feasible for the UK.

UKRI Interdisciplinary Circular Economy Centre for Mineral-based Construction Materials

UCL

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BGS

Introduction

Biodiversity, in the broadest sense, refers to the extraordinary number and variety of all life on Earth, from animals and plants to bacteria and fungi. Biodiversity underpins the major processes that sustain life on the planet, providing us with sources of nutrition, medicinal ingredients, potable water and the air we breathe. Without it, life as we know it would become impossible. In the past 100 years, many of the natural assets (e.g., plants, animals, water, soils and minerals) – which we rely on for medicine, shelter, and flood protection – have been in drastic decline. The UK is now among the world's most nature depleted countries[1], with just 53% of original nature left intact[2]. The Dasgupta Review on the Economics of Biodiversity 2021, has shown how the global economic order is at risk of erosion to the point of collapse if our demands on nature continue outstripping its ability to supply them. Now, more than ever, we need to protect and preserve biodiversity and increase interventions that address and reverse its decline.

The Threat of Construction

The construction industry is a significant driver of habitat and ecosystem degradation and destruction. It can divide up land and separate habitats, and noise, light and pollution generated during the building process can disturb wildlife. This can cause fragmentation in natural ecological connectivity, release harmful pollutants into air, and may lead to a decline in some species[3].

At the same time, construction is essential for human well-being and can improve the functioning of human society. Infrastructure projects such as housebuilding, and transport networks are vital for economic growth and improving our quality of life. A more holistic and spatially strategic approach to planning and infrastructure is necessary to ensure that biodiversity and habitat and ecosystem resilience is prioritised. The natural environment should be left in a better state than before a development took place. If a change in our approach to development is not adopted, we will continue to put increased pressures on an already depleted natural landscape.

[1] https://policy.friendsoftheearth.uk/insight/how-well-are-uk-and-eu-protecting-nature#:~:text=The%20Index%20puts%20the%20UK's,for%20all%20nations%20of%2079%25

Biodiversity Net Gain

The introduction of Biodiversity Net Gain Legislation (2024), which requires developers to avoid and reduce any negative impact on nature by delivering at least 10% biodiversity net gain, has been a positive catalyst for change. This mandatory legislation requires developers to leave habitats in a better state than before the development took place. Whilst it is a step in the right direction, the legislation does not address constructions' full impact on biodiversity, including the processes that take place throughout a building's life cycle, from extraction to demolition, to the life cycles of materials used on site[4].

Biodiversity Net Gain (BNG) is a way of creating and improving natural habitats. BNG makes sure development has a measurably positive impact ('net gain') on biodiversity, compared to what was there before development.

Department for Environment, Food & Rural Affairs, 2023

The ***UKRI Interdisciplinary Circular Economy Centre for Mineral Based Construction Materials (ICEC-MCM)*** brings together experts from a range of backgrounds including engineering, geology, accountancy and law – working together to develop solutions for a transition to a circular economy. This multidisciplinary academic team is led by University College London, together with five other UK universities, and supported by a network of more than 60 partners from across industry, government and academia. The Centre has co-designed solutions with Government and Industry partners including through a series of secondments, and co-founded the first ever International Centre of Excellence on Sustainable Resource Management (ICE-SRM) for Circular Economy, backed by the UN.

[2] https://data.nhm.ac.uk/dataset/bii-bte?_gl=1*126npsd*_ga*MTc2Njc4Nzk4MC4xNzIxNzQ0MTY0*_ga_PYMKGK73C4*MTcyMzYyOTgxNC4zLjEuMTcyMzYzMDExNy4wLjAuMA..

[3] http://www.businessandbiodiversity.org/construction.html#:~:text=Noise%20and%20light%20generated%20during,habitats%20which%20were%20previously%20adjacent

[4] https://expedition.uk.com/project/embodied-biodiversity-impacts-of-construction-materials/

Design for End of Life

In the UK, around 50,000 buildings are demolished every year[5]. The impact of demolition on biodiversity is significant. Tearing down existing structures generates dust and waste, as well as potentially hazardous substances like asbestos, which can contaminate surrounding surfaces and create ecological stress to local vegetation and plant species[6]. The negative consequences of demolition can be minimised by extending the lifespan of buildings and re-using components and materials to minimise waste, and by designing with End of Life (EoL) in mind. There are several options available:

1. **Refurbishment over demolition** typically causes less disruption to tenants and surrounding wildlife and habitats. Since much of the building fabric remains on-site, it offers reductions in new material use and embodied carbon. It can be a faster and more efficient way to improve the energy efficiency of buildings, for example through retrofitting, or repurposing components for new uses. Though it may not be suitable for all buildings, it offers a sustainable way of refreshing buildings with less waste and disturbance.

Case study – Increasing the Reusability of Modern Methods of Construction

Currently, there is no benchmark for assessing the sustainability of used Modern Methods of Construction (MMC) components. Current efforts are focused on recycling used MMC materials but neglect their reusability. This leads to additional waste and the production of new materials, to the detriment of biodiversity. ICEC MCM researchers have developed a framework to assess the reusability of used MMC components and classify them based on their expected performance, similar to what happens with second-hand white goods or cars. Researchers will work with industry to identify opportunities for collaboration and information sharing and create storage and repair facilities for used MMC components, to enhance their safety and quality assurance.

2. **Design for Deconstruction and Reuse (DfDR)** is one method which considers the entire life cycle of buildings from inception to the final stages. It prioritises materials that can be reused or refurbished in the future and selects components that can be disassembled. Accelerated development of Modern Methods of Construction in the UK, including off site factories to manufacture components in a controlled manufacturing environment with improved working conditions, will reduce waste and enable DfDR.

Case study – DfDR of Lightweight Exterior Infill Walls

Lightweight infill walls composed of steel, insulation, plasterboard and cladding are commonly used in multi-storey framed construction. Infill walls were found to make up 22% of an example building's carbon footprint and reusing them can reduce it. Components of lightweight exterior infill walls are usually designed based on a linear economic model, but ICEC-MCM researchers have demonstrated they have the potential to be designed for deconstruction and reuse. Researchers have shown that introducing bolted and screwed connections in the panels of exterior infill walls can enable disassembly without damage, and reassembly of components in a new application, resulting in embodied carbon reductions by 5%. Design of lightweight exterior infill walls for deconstruction and reuse is therefore possible and can avoid negative impacts on biodiversity by reducing CO_2 emissions alongside reductions in virgin material extraction.

Soil Degradation

Soils are essential to biodiversity. Healthy soils are vital for food production, water purification and play a key role in reducing flooding and drought. Soils are also the second largest carbon sink after the oceans and play an essential role in climate change mitigation. Our ecosystems, including

[5] https://www.ryegroup.co.uk/blog/demolition-blight-or-blessing/
[6] https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf

agricultural ecosystems that deliver food security, are unable to function without healthy soils. However, due to poor planning and waste management, the construction sector contributes to soil degradation. For example, mixing of construction materials with soil on brownfield sites has a detrimental effect on its properties. Meanwhile, over 50% of soil extracted during construction and demolition projects is landfilled each year in England[7]. Although in some instances waste soil is contaminated from construction and poses a risk to people and the environment, in most cases it is perfectly safe and can be reused again. A new approach that values soil as a resource, and does not classify it as waste within the construction sector is urgently needed. A complimentary briefing on soil can be accessed here, highlighting how we can reduce the amount of soil being lost to landfilling, through the introduction of a novel soil reuse and storage system, including soil 'hotels' and 'hospitals'.

No Land Take

Increasing land use is considered to be one of the most pernicious drivers of biodiversity loss and soil degradation[8]. Land take is not limited to development sites, it is also associated with the extraction, manufacture and disposal of materials as well as waste facilities[9]. We can minimise land take, by adopting more circular approaches. They include:

Reducing demand for virgin materials to reduce demand for new or expanded quarries.

Using life cycle assessments and material flow analysis to expose how materials are being used in the construction supply chain, for targeted interventions to better use materials.

Setting targets to limit how resources are used and recovered, to encourage BNG.

Adopting a UK-wide "No Net Land Take" target to significantly reduce land conversion rates, as already adopted by the European Union. Strong regulatory interventions should be adopted to encourage developers to build on land that has already been impacted and return unused land back to cultivation or to be re-naturalised[10].

[7] https://www.soilstaskforce.com/_files/ugd/7be451_feb5a3d1777640c1ad8ef1eca6c34302.pdf
[8] https://www.nature.com/articles/s41467-022-28245-4#:~:text=Land%2Duse%20(LU)%20is,and%20degrades%20natural%20ecosystems2
[9] https://link.springer.com/article/10.1007/s43615-023-00293-y
[10] https://catalogue.unccd.int/650_no_net_land_take_by_2050.pdf

Recommendations

1 Embed biodiversity considerations in early design and planning decisions.

GOVERNMENT

Introduce new building regulations requiring developers to design structures and buildings for deconstruction and disassembly. In addition, Government can make existing BNG legislation more holistic by asking developers to consider the life cycle of building materials.

INDUSTRY

Embed BNG considerations at the earliest stages of the planning process from choice of materials to building design. This can prevent demolition later down the line, extend the life cycle of buildings, and save critical resources.

OUTCOME

Behaviour change

2 Consider sustainable alternatives over demolition.

GOVERNMENT

Consider issuing planning guidance and mandatory pre-development audits to assess the potential for refurbishment instead of demolition. Government can also require pre-demolition audits, in which developers will be asked to carry out a review of the materials that will arise as a result of deconstruction, to encourage their recovery.

INDUSTRY

Explore design of buildings for 'End of Life', and consider refurbishing existing buildings over demolition.

OUTCOME

Less Waste

Recommendations

3 Reduce demand for virgin raw materials

GOVERNMENT

Nurture and invest in secondary material markets; and provide assurance to industry of the quality of secondary materials e.g., by promoting use of Material Passports, QR codes or BIM systems to show product information.

INDUSTRY

Choose sustainable, ethically sourced materials, and prioritise secondary materials over virgin resources where possible.

OUTCOME

Less extraction

4 Reduce land take

GOVERNMENT

Adopt a "No Net Land Take" target to significantly reduce land conversion rates.

INDUSTRY

Deliver on-site enhancements to land 'taken' for developments to create well-functioning ecosystems that serve both people and wildlife.

OUTCOME

Increased BNG

Further Details

Find us on socials: @icec_mcm LinkedIn
For any additional questions please contact: icec-mcm@ucl.ac.uk or visit: https://www.ucl.ac.uk/circular-economy-centre-for-construction-minerals/ukri-interdisciplinary-circular-economy-centre-mineral-based-construction-materials

What Next?

Complementary to considerations for reviewing constructions' impact on BNG, this Briefing puts a spotlight on a number of research projects and outputs produced by the UKRI Interdisciplinary Circular Economy Centre for Construction Materials (ICEC-MCM) – more detail on which can be found on our website[11]. The ICEC-MCM research that underpins these policy briefs was funded by EPSRC EP/V011820/1.

The Centre has additional research in progress, which could further build the evidence base for policy change – or support how any changes are implemented in future.

To keep updated with progress on this, and other projects, please join our mailing list, get in touch directly – or follow us on socials.

[11] https://www.ucl.ac.uk/circular-economy-centre-for-construction-minerals/ukri-interdisciplinary-circular-economy-centre-mineral-based-construction-materials

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