

Measuring biodiversity impacts in construction supply chains



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Can Life Cycle Analysis measure biodiversity impacts in construction supply chains?

This report concludes an internal research project aimed at identifying a robust methodology for quantifying the biodiversity impacts of extracting construction materials (also known as embodied ecological impacts). It is intended for anyone working within the built environment who wishes to understand how to quantify the biodiversity impacts of their projects.



Lead Author:



Grace English
Biodiversity & Ecosystems

Research Co-Leads



Robert Nussey
Biodiversity & Ecosystems UK



Brogan MacDonald
Buildings UK

Reviewers:



Sam Hinton
Compliance, Strategy and Transactions UK



Lora Brill
Buildings (Global)



Vikki Patton
Nature Positive services UK

Contributing Authors:



Tom Harley-Tuffs
Buildings UK



Sara Føns Steffen
Buildings Denmark



Manja Nørrekær Lund
Buildings Denmark

Acknowledgements:



Francesco Castellani
Circular Economy & Resource Management, Denmark



Denisse Kuri
Circular Economy & Resource Management, Denmark

Executive summary

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Biodiversity loss is increasingly recognised as a systemic risk to society, the global economy and the built environment. For the construction sector, attention has historically focused on the operational footprint of buildings, while the ecological impacts embedded in material supply chains have remained largely unmeasured. These Embodied Ecological Impacts (EEI) - including habitat loss, land-use change and ecosystem degradation at extraction and production sites - are now emerging as a material issue for asset value, sustainability reporting and long-term resilience.

As expectations around nature-related impacts intensify - through sustainability reporting requirements, investor scrutiny and emerging nature-risk frameworks - clients are increasingly asking how biodiversity impacts can be measured in a way that is credible, decision-useful and aligned with existing carbon workflows. In response, Ramboll undertook an internal research project to assess whether current life cycle assessment (LCA) approaches - the backbone of embodied-carbon analysis - can be extended to support more robust consideration of biodiversity impacts in construction supply chains.

Building on insights from the UKGBC's EEI workstream and the study Embodied Biodiversity Impacts of Construction Materials [1a], this report evaluates six leading LCA methodologies (ReCiPe 2016, LC-Impact, IMPACT World+, PBF, BIA+, EP&L) and pilots two practitioner-oriented tools (One Click LCA and the Doughnut Biotool) on a reference building. Each approach is assessed against criteria relevant to both designers and clients, including scientific robustness, coverage of key biodiversity pressures, spatial resolution, transparency, data availability and usability in real project contexts.



Executive summary

01

Key findings

- **No single methodology currently provides a comprehensive picture of biodiversity impacts.** All approaches involve trade-offs between scientific depth, transparency and practical applicability for design and procurement decisions.
- **Global Warming Potential (GWP) remains a dominant proxy for biodiversity pressure** in many tools. While climate impacts are relevant, this reliance risks under-representing land-use change, the leading global driver of biodiversity loss, and other non-climate ecological pressures.
- **One Click LCA's Biodiversity Supply-Chain Stress Tool is best suited as an initial screening tool rather than a standalone basis for material or design decisions.** As the biodiversity metric is derived from EPD data and does not include land-use change - the leading driver of biodiversity loss - results tend to correlate strongly with carbon intensity (GWP) rather than direct habitat impacts. Used transparently, the tool can help flag potential areas of interest, but deeper assessments are required to capture land-use and regional ecological factors.
- **The Doughnut Bioutil captures a broader set of biodiversity pressures,** particularly land-use change, than comparable tools. However, its use of non-regionalised data and aggregated metrics limits precision and prevents it from functioning as a fully comprehensive assessment tool.
- **A lack of regional characterisation factors** across methodologies significantly constrains the ability to reflect local ecological sensitivity - an issue of growing importance for both nature-related risk management and asset-level decision-making.
- **Quantitative EEI results cannot yet stand alone.** Meaningful interpretation requires complementary qualitative ecological expertise and transparent communication of assumptions and limitations.

Recommendations for practice

- **Use LCA-based EEI assessments as directional tools,** not absolute measures of biodiversity performance, particularly when informing early design and material decisions.
- **Combine LCA outputs with nature-risk and target-setting frameworks** (such as TNFD and SBTN) to identify potential biodiversity hotspots, dependencies and risks across supply chains.
- **Engage suppliers to improve material-level and regional data,** echoing Expedition Engineering's [1a] call for more reliable, transparent responsible-sourcing information that goes beyond carbon metrics.
- **Advocate for next-generation assessment tools** that integrate land-use change, water stress and ecosystem-service dependencies, gaps consistently highlighted in both this study and UKGBC's EEI research.
- **Supplement quantitative results with expert ecological input,** particularly where project decisions may affect sensitive or high-value ecosystems.

Looking ahead

While current tools remain imperfect, waiting for 'perfect' methods risks leaving significant ecological impacts unmanaged at a time when biodiversity is becoming material to asset value, reporting credibility and long-term resilience. By embedding EEI thinking into design and procurement today, and by using LCA-based approaches transparently and critically, the built environment sector can take a practical step toward projects that are not only net-zero but genuinely aligned with a nature-positive transition.

Executive summary

Recommendations for industry

01

Beyond the UKGBC mitigation hierarchy, this study sets out the following additional recommendations:



Consultants 01

Document and clearly communicate data gaps, normalisation choices and spatial limitations so that results are not misinterpreted as absolute biodiversity values.

Report land-use separately from GWP.

Align model boundaries and assumptions with recognised guidance (e.g., IUCN, TNFD) and reference them in reports.

Share anonymised project data with industry collaborations (UKGBC EEI, BBV) to accelerate method improvement.



Supply-chain partners 02

Make raw material sourcing locations explicit so consultants can apply region-specific characterisation factors.

Provide verified EPDs that include land-use and ecotoxicity characterisation factors, or the underlying inventory data needed for advanced EEI tools.

Engage in pilot studies to test improved datasets in tools such as the Doughnut Biotool, feeding results back to the market.



Clients 03

Foster structured discussions across project and design teams to evaluate EEI methodologies and establish the minimum data quality and granularity required to drive nature positive actions.

Set minimum data-quality thresholds (e.g., traceable sourcing) and budget for data collection where gaps exist.

Incentivise suppliers that provide high-resolution data and demonstrate credible biodiversity stewardship, including offsets for unavoidable impacts.



Academia 04

Deepen and validate EEI models with up-to-date conservation science.

Publish harmonised, open, region-specific datasets for key construction materials.

Advance spatially explicit Life Cycle Impact Assessment (LCIA) methods to capture location-specific biodiversity risks.

Introduction

Biodiversity in crisis

There is international consensus on the five drivers of global biodiversity loss, which may act alone or occur together at any particular location. The drivers are: land, water and sea-use change, overexploitation of natural resources, pollution, climate change and invasive species [1b, 2].

Globally, the built environment [SD1] contributes 40 [NP2] % of global carbon emissions to climate change, 40 % of natural-resource use through extraction and production, and 40 % of waste streams when buildings reach end of life [3, 1b]. These pressures on nature are predicted to increase with population growth, economic expansion and international trade [3, 1b]. The size of the built environment is set to double [SD3] by 2050, driven by a projected 68 % of the world's population living in urban areas—an increase of some 2.5 billion people that will demand additional urban land [3]. This growth not only imposes substantial pressure through urban development itself; extractive industries such as mining and dredging, which supply construction materials, also cause loss or deterioration of natural habitat [4]. These adverse effects, often called the “hidden impacts” of construction, are known as Embodied Ecological Impacts (EEI) or embodied nature [4]. Such impacts typically occur far from the construction site, sometimes in another country or continent [5, 1b]. It is therefore essential to understand the extent, severity and duration of these impacts in their specific contexts. Equally, recognising dependencies on nature for producing and processing construction products is critical to securing future ecosystem services—such as raw materials and clean water—because a healthy environment underpins a resilient business [3].

Organisations’ assessments of biodiversity impacts and dependencies are advancing in response to growing pressure from international agreements—most notably the Kunming-Montreal Global Biodiversity Framework—and regulations such as the EU Corporate Sustainability Reporting Directive (CSRD) [6, 7]. Early movers are also aligning with voluntary frameworks for corporate biodiversity strategy, including the Science-Based Targets for Nature (SBTN) and the Task-force on Nature-related Financial Disclosures (TNFD) [8, 9]. All of these instruments steer organisations and cities toward developing robust biodiversity strategies that address risks and identify opportunities for protection and restoration. Central to credible, effective action is the ability to measure biodiversity accurately, establish baselines and quantify an organisation’s impacts and dependencies [9, 10].

The question for this paper remains, is LCA a reliable method for measuring impacts on biodiversity of the construction materials value chain?

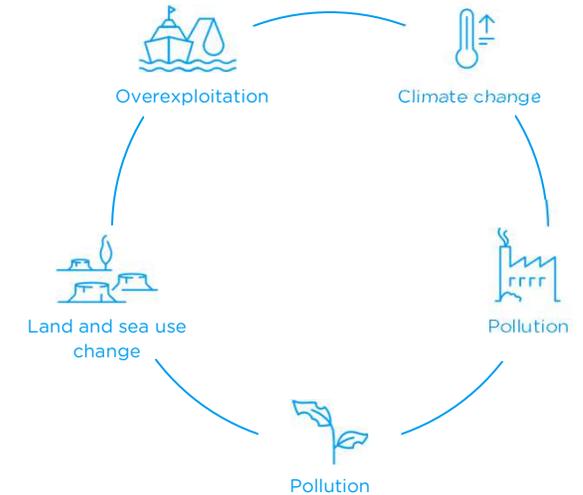


Figure 1: Five drivers of biodiversity loss

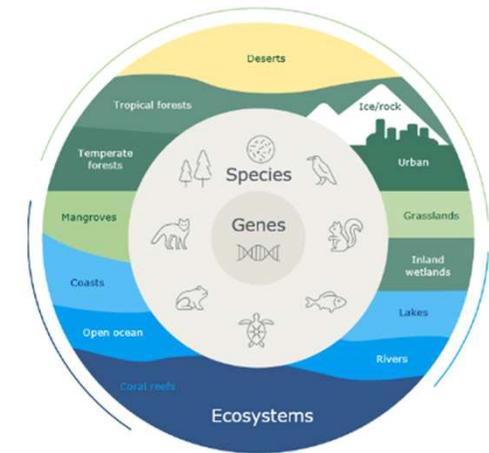


Figure 2: Three levels of biodiversity: genetic, species and ecosystem diversity

Introduction

Biodiversity in Life Cycle Assessments

Life cycle assessment (LCA) provides several methodologies to assess the potential impact to the environment caused by services, buildings, construction products and manufacturing processes [11, 12]. LCAs provide clients with a quantified environmental impact enabling targeted goal setting to reduce those impacts and, where necessary, compensate for adverse impacts (i.e. offset contributions to climate change) [13]. It acknowledges the entire lifespan of a product or service, from raw material extraction to end-of-life, split into life cycle stages (Figure 3) [14].

LCIA methods are often categorised as either 'midpoint' or 'endpoint', referring to where in the cause-effect chain the environmental impacts are assessed (Figure 4) [15]. Midpoint methodologies assess environmental impacts earlier in the chain, by use of characterisation factors with related functional units that allow for the impact to be quantified [11, 12]. The LCIA metrics differ between models in how they measure biodiversity. They often focus on specific elements of biodiversity, such as species abundance, species richness as potentially disappeared fraction (PDF), species extinction risk, monetary value from natural capital [11]. Endpoint LCA methodologies link these midpoint environmental impacts to the damage caused within broader 'Areas of Protection' (AoPs), usually 'human health', 'ecosystem quality', and 'natural resources' [11, 12]. The different approaches mean that LCAs cannot be used interchangeably and must be chosen for each project depending on the question being asked [15].

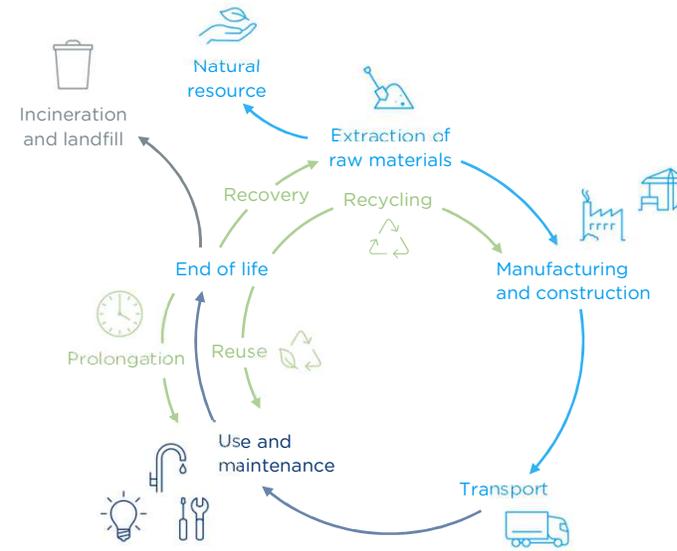


Figure 3: The upstream, core and downstream stages of a LCA for the built environment

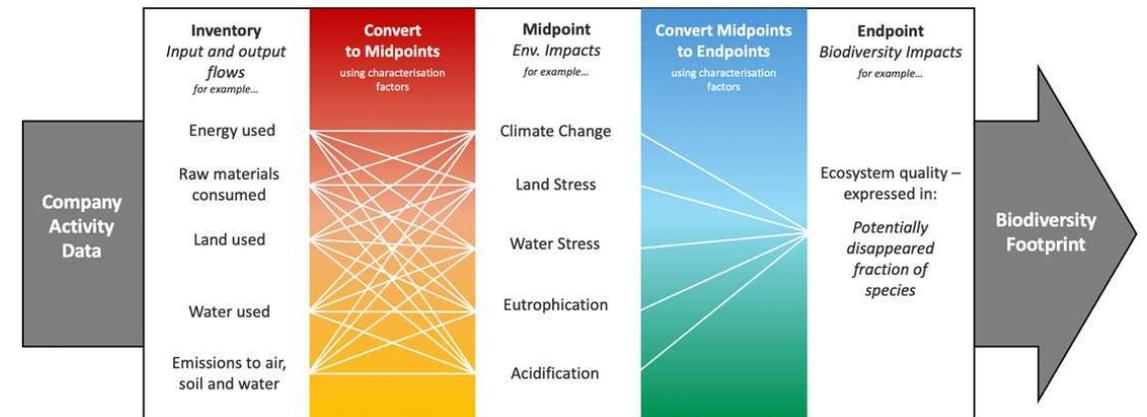


Figure 4: Stages of LCIA (Bromwich et al., 2025).

The study followed a two-phase approach that combined a rapid literature review with a focused tool pilot on a reference building.

Phase 1: Literature Review and Methodology Screening

A structured literature search was carried out in ScienceDirect, Elsevier, Springer and ResearchGate with the objective of producing a high-level overview of biodiversity quantification within life-cycle assessment (LCA). The search produced a long list of LCA methods reported in the literature for their ability to quantify biodiversity impacts across construction supply chains, with particular attention to upstream extraction stages. Methods remained on the long list when they appeared frequently in peer-reviewed articles or reviews and when their metrics addressed a broad range of environmental pressures associated with biodiversity loss [11, 16–20].

The long list was reviewed with the project team, and it was agreed that no more than six methodologies could be examined in depth. The six methods selected for detailed comparison were:

- ReCiPe 2016 [21]
- LC-IMPACT [12]
- IMPACT World+ [22]
- Product Biodiversity Footprint (PBF) [23]
- Biodiversity Impact Assessment (BIA+) [24]
- Environmental Profit & Loss (EP&L) [25]

Each methodology was evaluated against five criteria, outlined in Figure 5, that the literature repeatedly cites as limitations of current biodiversity LCAs: (1) spatial resolution, (2) biodiversity levels represented, (3) drivers of biodiversity loss covered, (4) land-use categories included and (5) species-diversity metrics. The principal scientific paper or methodology report describing each method was critically analysed against these criteria, and the findings were consolidated into a comparative discussion and the summary table presented in Table 1.

Phase 2: Pilot Tool Application

A mid-rise commercial reference building ($\approx 15\,000\text{ m}^2$ GIA) was modelled in accordance with the RICS Whole Life Carbon Professional Statement [26]. Bills of quantities and material specifications were extracted from the BIM model and verified by cost consultants. The analysis adopted a functional unit of 1 m^2 of gross internal floor area over a 60-year service life. The system boundary encompassed RICS life-cycle modules A1–A3 (product stage) and C1–C4 (end-of-life), with operational impacts excluded to isolate embodied effects. Scenario assumptions reflected average European supply chains for concrete, steel and aluminium, the use of FSC-certified timber and RICS default end-of-life recovery rates. During the pilot, only the following tool was run on the reference building model:

- One Click LCA – Biodiversity Supply-Chain Stress Tool (cloud version 2024.1).

After completion of the pilot, the Doughnut Biotool—implemented in the Brightway2 framework [28] using Ecoinvent v3.9 inventory data [27] and ReCiPe 2016 characterisation factors [21]—was added to the study. It was evaluated against the five comparison criteria (spatial resolution, biodiversity levels, drivers of loss, land-use categories and species-diversity metrics) using published documentation and developer interviews; however, no building-specific calculations were carried out with the Biotool within this project.

Methodology (2/2)

Data Quality and Uncertainty Handling

Manufacturer-specific Environmental Product Declarations were used wherever available; otherwise, Ecoinvent averages filled data gaps. Data quality was assessed with pedigree matrices in Brightway2, and sensitivity tests were run on end-of-life scenarios and regional land-use factors. The absence of regionalised characterisation factors in several methods remains a key limitation.

Comparative Analysis

Outputs from all LCIA methods were normalised to a common scale and benchmarked against the Doughnut Biotool, which served as the reference for comprehensive biodiversity coverage. Results were summarised in a heat-map illustrating each method's performance against the evaluation criteria, directly informing the recommendations in Section 4.



Figure 5: Criteria and common limitations for BLCA

Preliminary findings

Phase 1 – Literature review and methodology screening (1/2)

The key findings from the review of six LCA methodologies are presented under the headings of the criteria used for comparison, as follows, and discussed in more detail below:

- Misalignment of spatial resolution and not location specific;
- Limitations in choice of biodiversity metrics;
- Limited range of biological levels represented;
- Limited range of biodiversity loss drivers covered; and
- Limited representation of land use categories.

A comparison of methodologies is presented in Table 1.

Methodology	Spatial Resolution	Biodiversity Levels	Drivers of Biodiversity Loss	Species Diversity Metric	Land Use Categories	Availability
ReCiPe2016	Country, continental, global	1/3: Species only	3/5: Land use change, pollution, climate change	Species richness in <i>species/year</i>	6 land use types	Open-source
LC-Impact	Native, ecoregion, country, global	1/3: Species only	3/5: Land use change, pollution, climate change	Species richness in <i>PDF/year</i> (global)	6 land use types	Open-source
Impact World +	Native, ecoregion, country, continental, global	1/3: Species only	3/5: Land use change, pollution, climate change	Species richness in <i>PDF/m2/year</i>	6 land use types	Commercially available
PBF	Nature, ecoregion, country, global	1/3: Species only	5/5: (2 semi-quantitative)	Species richness in <i>PDF/year</i> (global or regional)	6 land use types (plus 2 subcategories)	Commercially available
BIA+	Country	3/3: Species, genetic and ecosystem diversity	5/5	Species, genetic and ecosystem diversity as concept for expert panel	14 major habitat types	Not fully operational
EP&L	Local, regional, country, global	2/3: Species and ecosystems diversity	3/5: Land use change, pollution, climate change	Monetary value of loss of ecosystem services	6 ecoregions	Open-source
Tools						
OneClick Biodiversity Supply Chain Stress	Global	1/3: Species only	2/5: Climate change, pollution	Species richness in <i>PDF/m2/year</i> (global)	Methodology unclear	Commercially available
Doughnut Biotool BBV	Global	1/3: Species only	3/5: Land use change, pollution, climate change	Species richness in <i>PDF/year</i>	6 land use types	Open source but requires Ecoinvent license to operate

Table 1: Comparison of BLCA methodologies and tools

Preliminary findings

Phase 1 – Literature review and methodology screening (2/2)

Spatial Resolution

Research in biology is generally conducted at high resolution: environmental survey data are typically site-specific, or even habitat- and species-specific (for example, an otter survey along a defined river reach). As the focus moves away from the site, data resolution diminishes from site level to local, national or ecoregional scales and, ultimately, to the global scale. The inability to run an LCA with such high-resolution, site-specific data limits the insights that can be derived, because LCAs are designed to evaluate environmental impacts across many habitats, often at continental or global scales [15, 24].

For best practice in supply-chain impact measurement, the Capitals Coalition recommends collecting company-specific primary data from species and habitat surveys to describe ecosystem extent and condition and—where possible—assessing species-extinction risk at raw-material sourcing sites or, alternatively, at the national scale weighted by sourcing volumes [29]. Approaches that employ high-resolution impact-assessment factors also require inventory data of comparable resolution, which is rarely available owing to time and cost constraints, limiting their practical applicability [24].

Because databases underpin credible LCAs, data quality and representativeness are critical. Inventory data must align geographically with impact-characterisation factors, so methodologies need to be capable of regionalisation to reflect differing impact intensities across locations [25]. Both global and regional scales are necessary to distinguish between permanent and reversible biodiversity loss [29]. Recognising this, many recent LCA methods have begun to incorporate regionalisation (see Table 1), acknowledging that understanding both global and site-specific species loss is essential for effective management strategies.

Biodiversity Metric

There is no consensus on which metrics best capture biodiversity loss across all biological levels [24, 11], and the most suitable metric often depends on project scope and data availability [17]. A key limitation of many LCAs is their reliance on species richness as the principal indicator of biodiversity [24]. Potential Disappeared Fraction (PDF) of species is frequently used, expressing the percentage of species lost per unit area; however, species richness alone does not reflect full species diversity, which combines richness (the number of species) with evenness (their relative dominance) [30]. In addition, PDF calculations often draw on only a few taxonomic groups. As shown in Table 1, uptake of diversity metrics such as PDF varies: some LCA tools integrate regional vulnerability factors to highlight particularly sensitive species, whereas others do not. EP&L, by contrast, quantifies biodiversity loss through changes in ecosystem-service value, which can overlook species with no direct economic utility [25].

Biological Levels of Organisation

Species diversity also only constitutes one of the three levels that define biodiversity as set by the Convention on Biological Diversity (CBD), which also includes genetic diversity and ecosystem diversity [24]. As shown in Table 1, some methodologies like BIA+ cover all levels of biodiversity from the CBD definition—including species, genetic and ecosystem diversity—while others focus narrowly on species richness without addressing genetic or ecosystem variances.

Drivers of Biodiversity Loss

LCA methodologies frequently omit two of the five recognised drivers of biodiversity loss—overexploitation and invasive non-native species—addressing only habitat loss and degradation, climate change and pollution [24]. As shown in Table 1, most methods therefore provide only a partial view of biodiversity pressures. The one methodology that incorporates all five drivers across every biological level, BIA+, relies on expert-panel interviews for each impact category; this makes the approach thorough but labour-intensive and it has yet to become fully operational [24].

Land Use Types

The driver “habitat loss and degradation” is generally represented by the impact pressures “land use” and “water use,” yet even these categories are often treated with a narrow set of land-use types [24]. Focusing only on land-cover change fails to distinguish the varying effects of different management practices on the same land class [23]. The Capitals Coalition therefore recommends that land-use intensity be included explicitly in pressure-response models [29]. Among the methodologies reviewed (Table 1), some consider specific habitat typologies, whereas most treat land primarily in terms of commercial use classes.

Other

Significant variation exists in the impact categories chosen for quantification, and there is little harmonisation across LCA methodologies; moreover, no consistent normalisation references or standards have emerged, making cross-study comparisons challenging [22]. Practical considerations—such as data quality, required expertise and tool availability—further influence the applicability of each method in real-world projects.

Preliminary findings

Phase 2 – One Click LCA Biodiversity Supply-Chain Stress Tool

Overview

The test of the One Click Biodiversity Supply-Chain Stress Tool indicated potential for crude building comparisons and hotspot identification. The baseline Whole Life-cycle Carbon Assessment was undertaken in compliance with the RICS Whole Life Carbon Professional Statement [26] and measured only global-warming potential (GWP). That assessment showed that structural materials such as concrete and steel reinforcement, together with façade aluminium, were the primary contributors to upfront embodied carbon.

Expectations before Testing

Prior to the study it was expected that GWP would be a significant driver of biodiversity loss because the One Click tool does not include land-use change; pollution was anticipated to have a secondary influence. It was also assumed that high embodied-ecological impact would align with (a) high-GWP materials, reflecting energy-intensive or highly impactful extraction processes, and (b) high-mass materials, signalling substantial resource use and potential land-use change.

Observed Results

The pilot confirmed that concrete-related carbon emissions contributed the most significant share of the calculated biodiversity impact. GWP therefore remained the dominant factor in the biodiversity metric, and design conclusions for minimising biodiversity loss were effectively identical to those for reducing GWP. In an autogenerated timber-frame variant, climate change again appeared as the leading driver of biodiversity loss. This outcome contrasts with other building LCAs—undertaken with alternative methods—which typically identify land-use change as the principal driver when large timber volumes are involved [31, 32].

Methodological Limitations

The strong correlation between biodiversity loss and GWP is likely caused by methodological gaps rather than by an overwhelmingly dominant climate effect. One Click relies on Environmental Product Declarations (EPDs), documents that report GWP and a limited set of additional indicators [33].

According to the tool developer, these indicators are mapped to biodiversity drivers via IMPACT World+ characterisation factors [22]; however, EPD data alone cannot establish comprehensive quantitative links, leaving some drivers only partially represented and others uncalculated. Because the calculation method is proprietary, the contribution of non-GWP categories (e.g. pollution, resource use) cannot be verified and appears negligible in the results.

Implications for Practice

With GWP effectively overwhelming the biodiversity indicator, the tool's output largely replicates a conventional carbon assessment and offers limited additional value. In its current form, the One Click Biodiversity module may be used for preliminary hotspot scanning, but it should not inform material selection or biodiversity-related target setting, as it risks misleading users who are unaware of its scope limitations.

Biodiversity loss PDF/m²/yr - Classifications

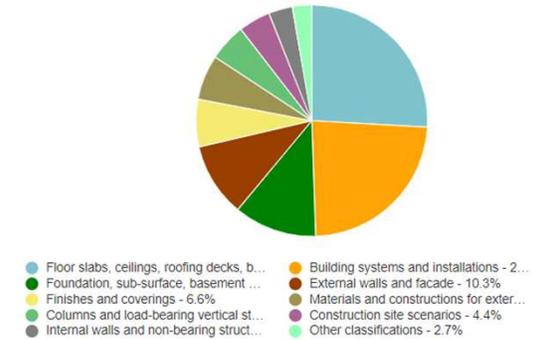


Figure 6: Example graph from OneClick Biodiversity Supply Chain Stress

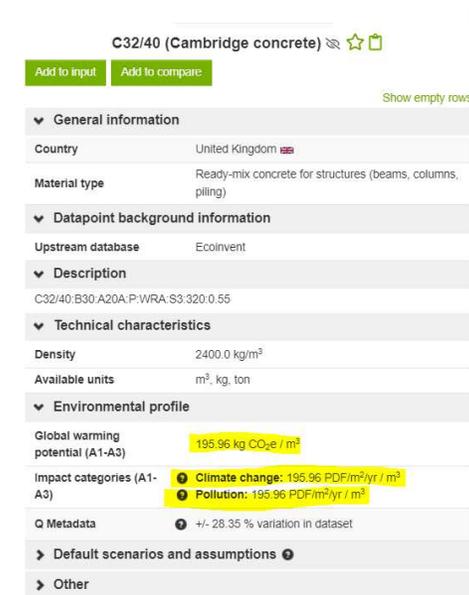


Figure 7: Highlighted results demonstrate PDF = GWP in results for a C32/40 concrete mix

Preliminary findings

Phase 2 – Doughnut Biotool

The Doughnut Biotool is an LCA-based methodology for assessing biodiversity impacts from building projects, both on the construction site and throughout the supply chain [34]. Developed within the Doughnut for Urban Development initiative and released in May 2024, it is open-source but requires an Ecoinvent licence. The initial version applies ReCiPe 2016 factors and expresses local species loss over time in “species-year.” Ramboll Buildings Denmark’s Sustainability Consultancy tested this first release on several projects to explore integration with existing LCA workflows.

Over the past six months the tool has been refined through the Danish industry collaboration “Biodiversity Impact from the Building Value Chain (BBV)” [35]. An updated edition, issued in September 2025, is documented in two companion reports: a study of 50 Danish buildings and a guidance note on embedding biodiversity in construction supply chains [36]. The new release adopts IMPACT World+ because that LCIA method provides the greatest breadth and detail among the databases assessed in the BBV project [31]. Consequently, it inherits IMPACT World+ parameters for biodiversity levels, drivers of loss, species-diversity metrics and land-use categories.

At present the tool employs global characterisation factors; future work will focus on adding regionalised data, differentiating between intensive and extensive forestry and enabling the use of manufacturer-specific inventories [31]. Both versions have been developed for application in the Danish construction context.

It is important to note that, unlike One Click, the Doughnut Biotool was not piloted on the reference building within this study. Instead, it was assessed against the five comparison criteria—spatial resolution, biodiversity levels, drivers of loss, land-use categories and species-diversity metrics—using publicly available documentation and discussions with the development team. No building-level calculations were performed as part of this project.



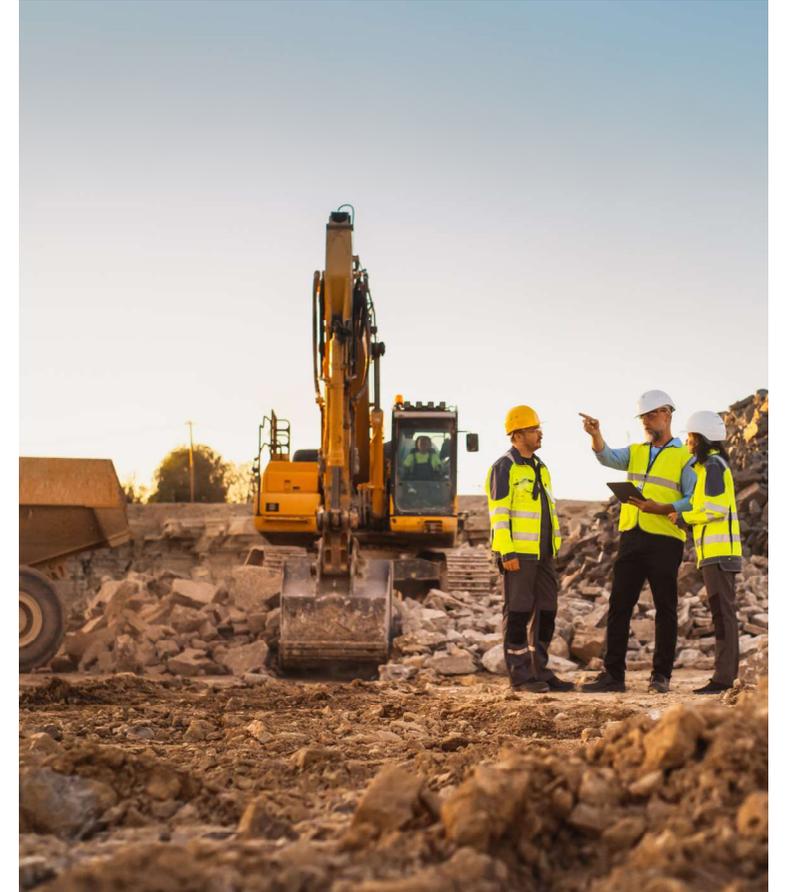
Embodied Ecological Impacts (EEI) are the pressures on nature and biodiversity that arise along construction-material supply chains. Life-cycle assessment (LCA) can be used to quantify these impacts; however, current methodologies face significant limitations. Persistent data gaps and modelling assumptions hamper their ability to reflect real-world biodiversity outcomes. Key constraints include the way species diversity is measured, the frequent omission of two of the five recognised drivers of biodiversity loss, mismatches between the spatial scale of impact models and available inventory data, and the inherent trade-off between ecological detail and LCA practicality [24, 18, 11]. To improve biodiversity assessment within LCA, the literature consistently recommends greater spatial resolution, coverage of all drivers of biodiversity loss and the inclusion of additional biodiversity indicators in LCIA models [11].

Our comparative review of ReCiPe 2016, LC-IMPACT, IMPACT World+, PBF, BIA+, EP&L, One Click LCA and the Doughnut Biotool confirms that no single method or tool outperforms the others across every criterion. Each involves compromises between scientific rigour, usability and data requirements, underscoring the need for further methodological development before a universally applicable approach to construction-sector biodiversity assessment can be realised. Given these limitations, companies should avoid relying on any one LCA method to set biodiversity priorities; instead, they should disclose their methodological choices transparently to support comparability and build confidence in results.

Although LCA tools on their own are not sufficient for comprehensive biodiversity decision-making, they remain valuable when their constraints are understood and when they are combined with qualitative ecological assessment. Action should not be deferred while awaiting perfect metrics.

Clients are encouraged to:

- Integrate biodiversity considerations into procurement and design processes, guided by frameworks such as TNFD and SBTN.
- Treat existing LCA outputs as directional indicators, supplementing them with site-specific ecological expertise.
- Make nature-positive choices even in the face of uncertainty, recognising that a robust biodiversity strategy comprises multiple complementary steps.



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