

BIODIVERSITY AND THE BUILT ENVIRONMENT:

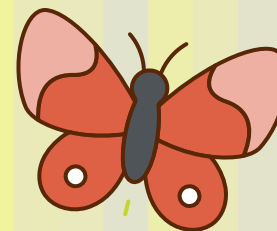
IRISH CASE STUDIES

Authors:

Marion Jammet & Irene Rondini

Irish Green Building Council

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Authors: Marion Jammet and Irene Rondini
Construct Innovate RPO: Irish Green Building Council

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- » **Tuath Housing**

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Case Study 10 -

- » [Embodied Ecological Impacts Knowledge Hub \(UK Green Building Council, 2024\)](#)
- » [The Embodied Biodiversity Impacts of Construction Materials](#) (Expedition Engineering, 2023)
- » [Exploring nature-positive buildings](#) (WBCSD, 2024)
- » [Biodiversity burdens in Spanish conventional and low-impact single-family homes](#) (Borja Izaola & Ortzi Akizu-Gardoki, 2024)
- » [Guidance on the identification and assessment of nature-related issues: the LEAP approach](#) (TFND, 2025)

Introduction



Construction and the built environment are deeply reliant on biodiversity and ecosystem services.

Nature provides our sector with the water and raw materials that we need to manufacture, construction materials and construct buildings. Trees and other plants contribute to improving air and water quality in our cities, preventing floods, and cooling our environment during heat waves. Many social and commercial benefits are also associated with the preservation of biodiversity in urban settings. For instance, vegetation cover and afternoon bird abundances are positively associated with a lower prevalence of depression, anxiety, and stress; and urban house value is boosted by proximity to public green spaceⁱ. Despite the reliance of our sector on biodiversity, **current spatial patterns of development and construction methods often negatively affect nature.**

The construction sector contributes to biodiversity loss through land-use changes, pollution, climate change, and the spread of invasive speciesⁱⁱ.

These adverse effects occur on-site, through **habitat** destruction and fragmentation, and off-site, from the extraction and processing of construction materials.

However, integrating biodiversity into planning and development offers transformative opportunities to create healthier and more resilient communities.

But to make this vision a reality, we must embrace innovative and sustainable approaches in construction, moving beyond business-as-usual practices to address ecological challenges while delivering social and environmental gainsⁱⁱⁱ.

About the Case Studies

These Case Studies showcase how **biodiversity** and **nature-based solutions** have been integrated into various building types and infrastructure projects. They aim to inspire building and construction professionals to protect biodiversity and incorporate nature-led features into their projects. They offer insights from the challenges and lessons learned by others from real-world projects.

The case studies are not designed to provide technical guidance for any specific category of building professional. They were **developed to create a common understanding across the industry of how biodiversity can be protected and enhanced in our built environment**, and of the benefits of doing so. The case studies **should not replace professional advice**. It is **best practice to have a suitably trained ecologist involved in all projects from an early**

i Cox, D.T.C., Shanahan, D.F., Hudson, H.L., Plummer, K.E., Siriwardena, G.M., Fuller, R.A., Anderson, K., Hancock, S. and Gaston, K.J. (2017). [Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature](#). BioScience, [online] 67(2), p.biw173

ii Opoku, A. (2019). [Biodiversity and the built environment: Implications for the Sustainable Development Goals \(SDGs\)](#). Resources, Conservation and Recycling, 141(0921-3449), pp.1–7

iii Although recent studies show that the majority of the impacts of the sector occur off-site – See “[Quantifying biodiversity footprints of Dutch economic sectors: A global supply-chain analysis](#)” and “[Exploring Nature Positive Buildings](#)”, the embodied ecological impact of construction has been largely ignored to date. This is addressed in the case study “Understanding the Ecological Impact of Your Supply Chain.”

stage. Additional case studies may be developed as required and will be published on the [Irish Green Building Council's website](#).

How to use this catalogue

Depending on your specific needs, you can use the **provided keywords** (Figure 1) to identify the case study most relevant to your project type or the information you require. It's important to note that some solutions — such as **green roofs** — may be more suitable in certain locations (e.g., densely populated urban areas) but might not be the most suitable approach in other places where more space is available.

Careful consideration of the local environment and project context, including cost, is crucial. It is best practice to use the Biodiversity Gain Hierarchy: **Avoid** – **Minimise** – **Protect & Enhance** – **Create** (Figure 2), when developing your project.

- » **Technical terms** are **highlighted in blue** throughout the catalogue and are defined in the glossary section.
- » Throughout the catalogue, **policies** are **highlighted in green** and, relevant **tools** are **highlighted in red**. Both are defined in the appendix
- » Hyperlinks are [underlined blue text](#) throughout the catalogue and link directly to digital sources

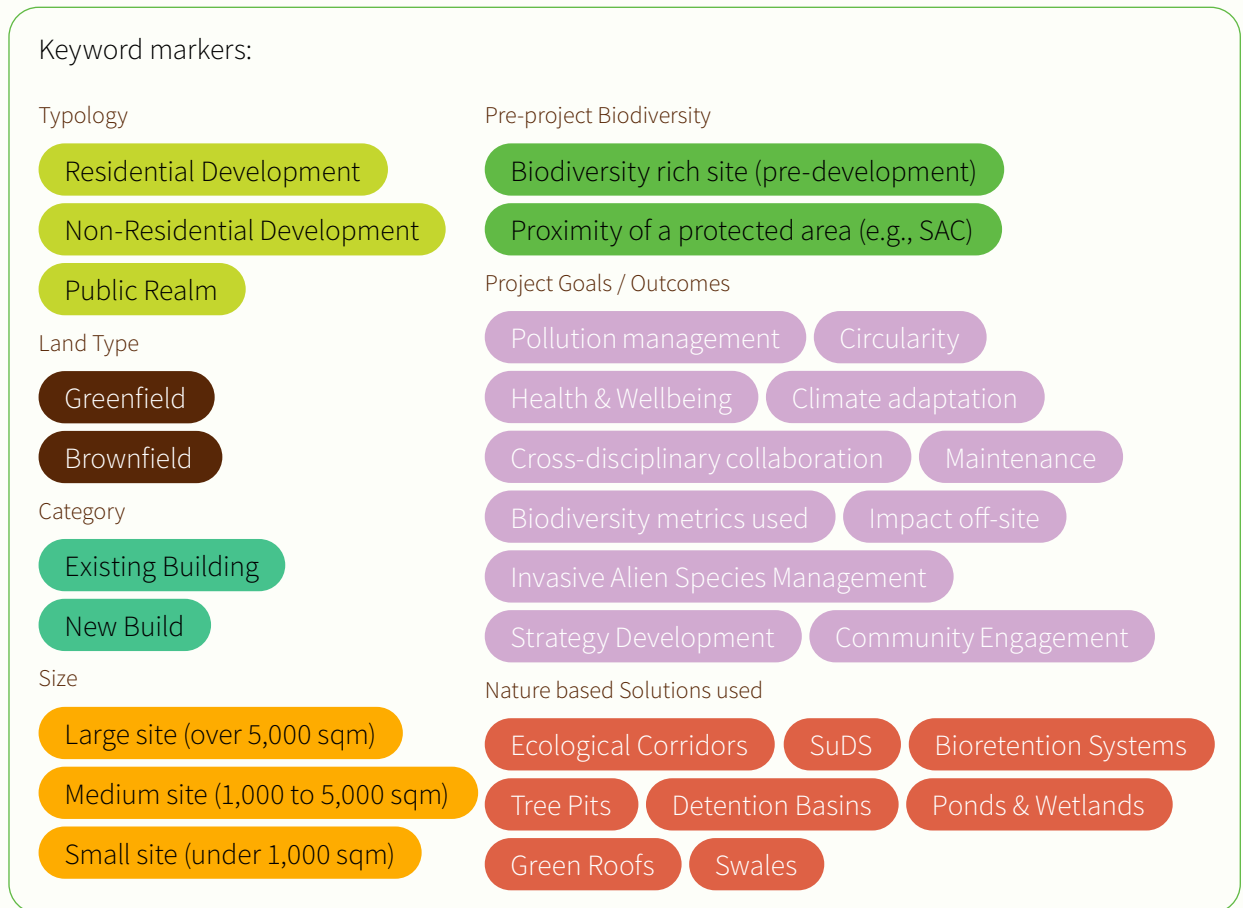


Figure 1: Keyword markers used to identify case studies

About the Biodiversity Gain Hierarchy

Similar to the well-known 'Waste Hierarchy', the **Biodiversity Gain Hierarchy** (Figure 2) sets out a sequence of steps to follow when planning and implementing projects, aiming to protect and enhance biodiversity. Steps:

» Step 1: Avoid

The first step in any strategy should be to avoid creating negative impacts from the outset. This involves careful site selection, thoughtful layout design, and, where necessary, timing construction activities to minimise disturbance. Avoidance is the most effective and reliable form of mitigation and must be given the highest priority. To enable this, biodiversity considerations need to be integrated from the earliest stages of project planning.

» Step 2: Minimise

When avoidance is not feasible, it is essential to minimise negative impacts on existing habitats. This can be achieved by adjusting the project design and strategy to reduce the duration, intensity, and extent of the impacts that cannot be completely avoided.

» Step 3: Protect & Enhance

Once impacts have been avoided and minimised, the next priority is to protect and enhance the quality of existing habitats.

» Step 4: Create

The final step is to explore opportunities for creating new habitats with greater ecological value, which can provide **ecosystem services**. This may involve more complex and costly approaches—such as the installation of green roofs.

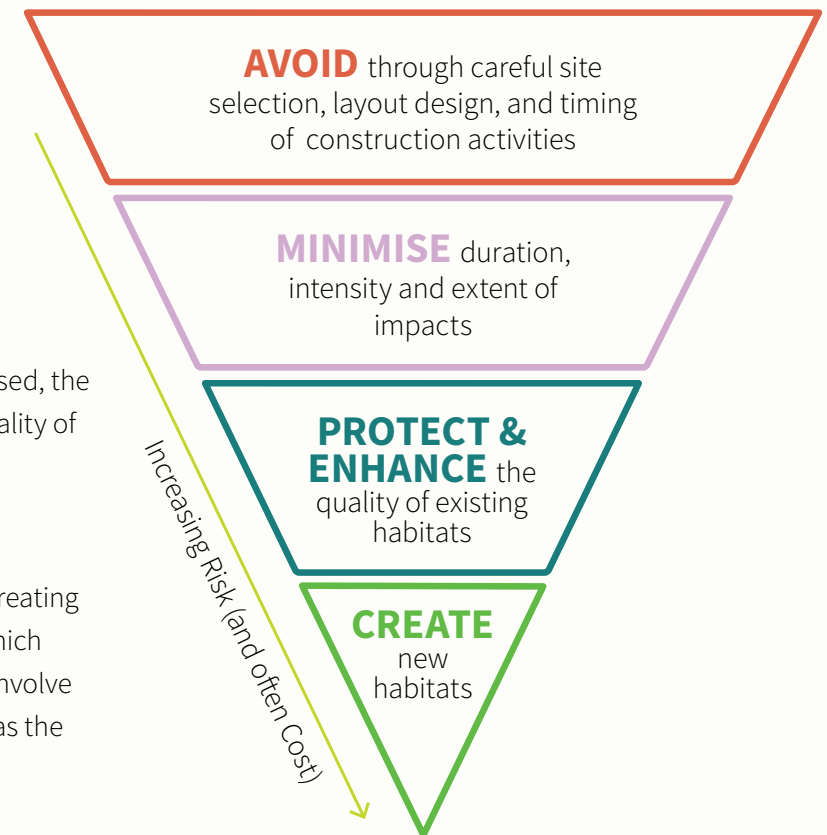


Figure 2: Biodiversity Gain Hierarchy

Case Studies



DEVELOPMENT NEAR PROTECTED AREAS: AVOIDING BIODIVERSITY LOSS



About the Project

This case study explores the development of a **mental health hospital** that aims to **improve patients' health and wellbeing** by enhancing biodiversity within the building spaces while **protecting the surrounding natural areas**. The project involved expanding and managing the existing woodlands, creating new habitats, and implementing a sustainable drainage system (SuDS) to manage surface water runoff and restore a nearby wetland. These activities were driven by the proximity of a number of protected areas and the mandatory Natura Impact Assessment but also by the commitment of the team involved and local community engagement.

Figure 1-1: Sensory garden in the National Forensic Mental Health Service. Source: STW, 2021 (left)



“Hospitals should aim to become green pillars in their communities. By using the healing effect of nature and adopting a more holistic approach to healthcare, hospitals could lead the way within their communities toward a more sustainable future. A future that will not only benefit the patients but also the hospital staff and the wider community.”

Ola Løkken Nordrum
Irish Doctors for the Environment

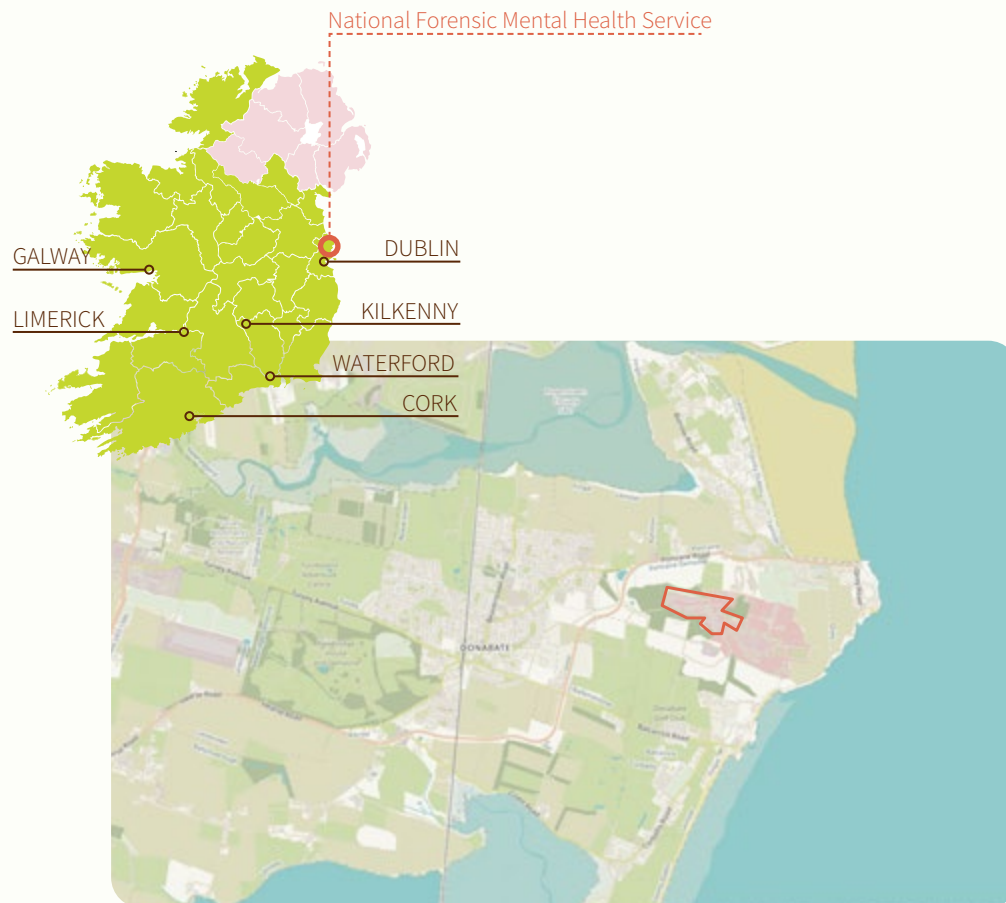


Figure 1-2: Location of the NFMHS in Portrane Demesne. Source: OpenStreetMap

Keywords:

Non-Residential Development

Greenfield

Brownfield

New Build

Large site (over 5,000 sqm)

Biodiversity rich site (pre-development)

Proximity of a protected area (e.g., SAC)

Pollution management

Health & Wellbeing

Climate adaptation

Cross-disciplinary collaboration

Invasive Alien Species Management

Ecological Corridors

SuDS

Ponds & Wetlands

Location: National Forensic Mental Health Service (NFMHS), Portrane Demesne, Portrane, Co. Dublin, K36 FD79

Client: Health Service Executive Ireland (HSE)

Budget: A breakdown of the costs associated with biodiversity and SuDSs action was not available

Funding: Publicly funded

Start Date: 2014-2015 (Planning Permission)

Completion Date: 2021

Green Building Certificate: ☒ BREEAM - designed to Excellent (71.2%)

Ecologist Involvement? ☒

Biodiversity Metric(s) used: ☒ However, the project ecologist, who was involved from day one, took a project-specific approach and produced a biodiversity management plan.

Key Stakeholders: The project involved local authority representatives (Fingal County Council's Biodiversity Officer and Parks Department). It also promoted group meetings with residents, sports clubs, and councillors to discuss the interventions, e.g. woodland footpaths

Project Team:

- » Ecologist: Faith Wilson Ecological Consultant
- » Architect: Scott Tallon Walker Architects (STW)
- » Landscape Consultant: Mitchell + Associates
- » Bat Specialist: Tina Augnhey
- » Arborist: Ciaran Keating
- » Conservation Consultant: Carrig Building
- » Structural & Civil Engineer: PUNCH Consulting Engineers
- » Medical Consultant: Medical Architecture
- » HSE Clerk of Works: Derek Redmond

Links to legislation and policies:

- » Habitats Directive (92/43/EEC)
- » Water Framework Directive (2000/60/EC)
- » Birds Directive (2009/147/EC)
- » Wildlife Act (1976) and Wildlife Amendment Act (2000)
- » National Biodiversity Action Plans 2017 - 2021 and 2021-2025

Biodiversity Status Pre-Project

The NFMHS Hospital construction includes **eight single-storey buildings** and **one 2-storey building**, as well as the provision of ancillary transformers and switchrooms, energy buildings, maintenance and engineering buildings and horticulture buildings, totalling approximately **25,324 square metres** of gross floorspace, and all associated site works, landscaping and lighting. The project also includes the demolition of five existing vacant structures.

In 2013, the project ecologist conducted a baseline ecological survey of the entire HSE landholding at Portrane Demesne (112 ha), the former site of St Ita's Hospital, a mental health facility that closed in 2011. The survey confirmed the use of the woodlands (mainly mixed broad leaf woodland, approximately 25.5 ha) and adjoining lands by a **variety of protected fauna**, including mammals such as **badgers and six bat species**, which were recorded foraging and commuting through the site.

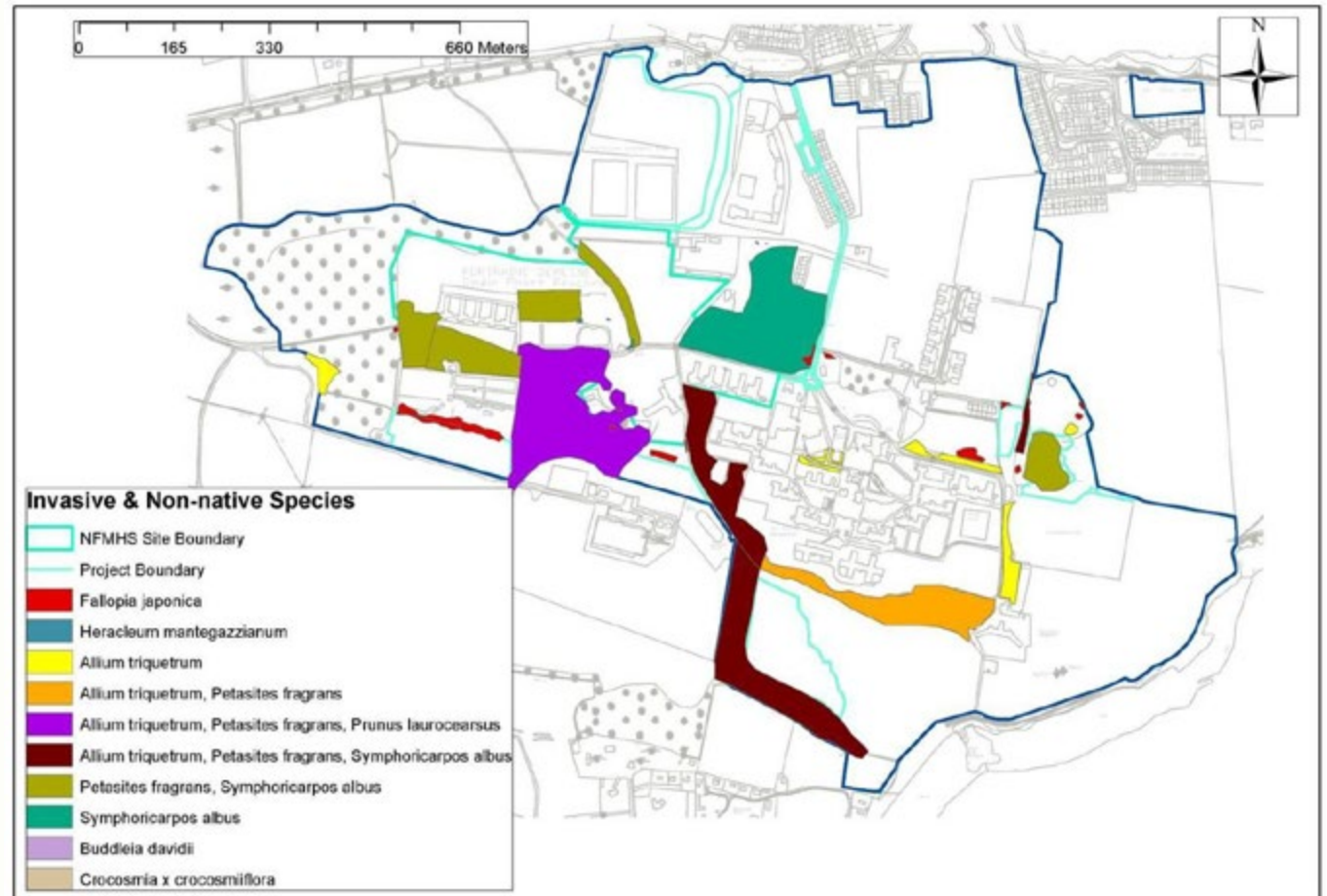
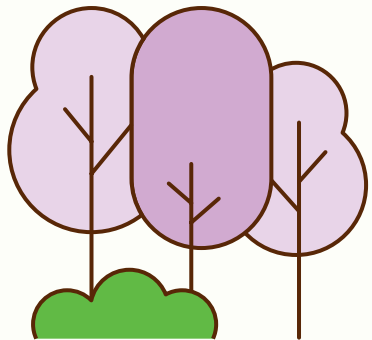
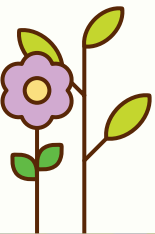


Figure 1-3: The main locations of invasive and non-native species at St Ita's Hospital.
Source: Wilson, 2014



The land where the facility was developed, including woodlands, was not designated for any nature **conservation** purposes, but some **Natura 2000 sites - Special Areas of Conservation (SAC)** and **Special Protection Areas (SPA)** and a **Proposed Natural Heritage Area (pNHA)**ⁱ - adjoin the Demesne. In addition, the **woodland habitats** are identified in **Fingal County Council Development Plan 2011-2017 as Nature Development Areas**, locations where nature conservation can be combined with existing activities such as farming, forestry, quarrying and recreation and therefore are also protected.

From an ecological perspective, the main driver for the project was to **create new habitats and enhance existing habitats** within the hospital grounds and wider demesne site, whilst protecting the designated sites and protected areas in close proximity. An **invasive and non-native plant species survey** was also conducted in 2013. It confirmed the presence of three **invasive species**ⁱⁱ (Figure 1-3): **Japanese knotweed, Giant hogweed, and Three-cornered leek** (see right, exploring why these plants present safety risk).

i Portrairie Shore pNHA (Site Code: 001215), Rogerstown Estuary SAC (Site Code: 000208), Rogerstown Estuary SPA (Site Code: 004015), Rogerstown Estuary pNHA (Site Code: 000208)

ii [First Schedule list of IAS of national Concern in the European Union \(Invasive Alien Species\) Regulations 2024](#) (S.I. No. 374 of 2024)

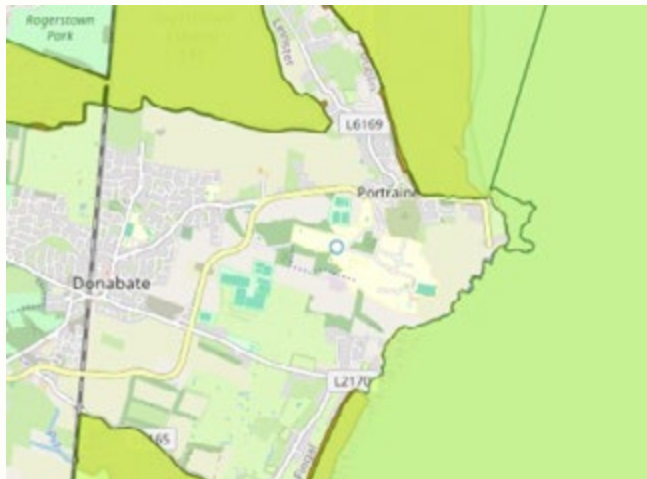


Figure 1-4: SAC and SPA (green) present in the proximity of the site
Source: EPA map, 2025



Figure 1-5: Aerial photograph of the site, after completion, showing neighbouring woodland and agricultural land. Source: STW, 2021

Japanese Knotweed (*Fallopia japonica*) spreads rapidly and forms dense thickets that outcompete native vegetation, reducing biodiversity. Its extensive root system can damage buildings, roads, and flood defences, making it a significant threat to infrastructure.



Japanese Knotweed, source: GBNNSS

Giant Hogweed (*Heracleum mantegazzianum*) is known for its toxic sap, which can cause severe burns and blisters upon contact with skin. Giant Hogweed also outcompetes native plants by forming large, dense stands. This reduces biodiversity and increases soil erosion along riverbanks.

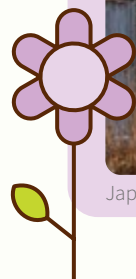


Giant Hogweed, source: GBNNSS

Three-Cornered Leek (*Allium triquetrum*) is an invasive plant that spreads quickly and dominates waste ground, roadsides, and field margins, outcompeting native flora. Its ability to rapidly colonise areas makes it a threat to local biodiversity.



Three-Cornered Leek, source: RPS Group PLC



Project Intervention

The HSE subsequently commissioned a **Biodiversity Management Plan** for the entire Demesne. The strategy was facilitated by the amount of land owned by the HSE in the area, giving them space to enhance biodiversity. As part of its strategy, the HSE has implemented a **range of biodiversity measures** inside the Hospital site and the surrounding demesne site (Figure 1-7).

During the construction phase, one key strategy was the **removal and control of invasive species**. The protocol prioritised preventing their further spread and included a **long-term monitoring and management plan** to ensure these species do not re-establish. Security requirements led to the loss of significant tree numbers within the site, potentially impacting protected fauna and overall biodiversity. The plan mandates annual biodiversity monitoring for the first five years, followed by assessments in years ten, fifteen and twenty by the project ecologist.



Figure 1-6: Mammal gate and nesting sites. Source: STW, 2013

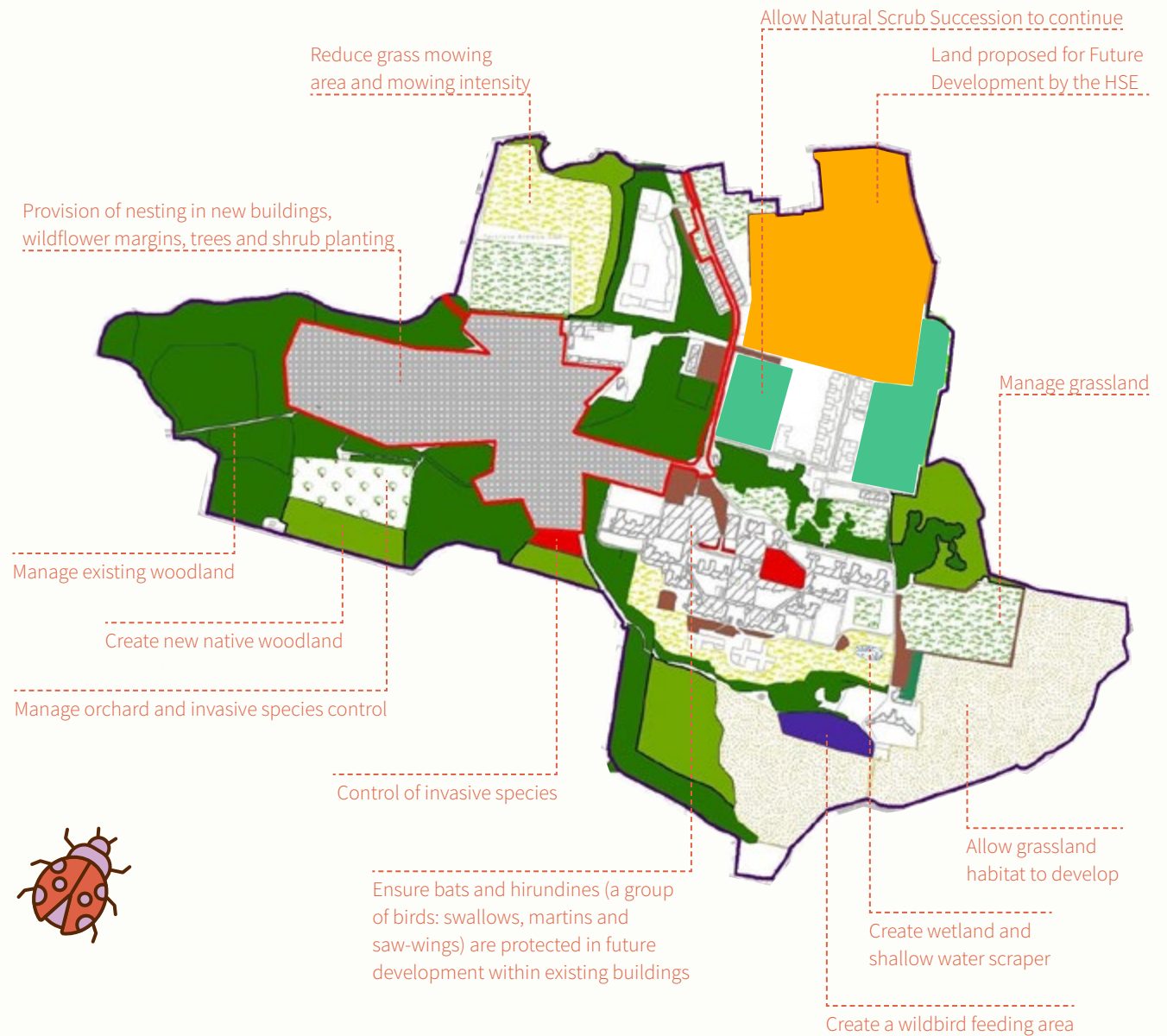
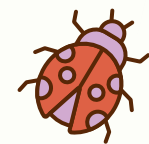


Figure 1-7: A visual representation of the Biodiversity Management Plan for Portrane Demesne. Source: Edited from Wilson, 2014

Inside the Hospital Site:

- » Implementation of **mammal gates** (Figure 1-6) in the secure perimeter fence to ensure connectivity between different areas and **integrated nesting sites in the buildings for bats, swifts, swallows, sparrows, and starlings**
- » The project included extensive shrub and perennial planting, a diverse selection of semi-mature trees, a **sensory garden** (Figure 1-1), and a **flower meadow** (Figure 1-8) around the security fences, creating a transition zone from woodland to the built environment and serving as a vital wildlife corridor. Native plants with varied flowering periods were incorporated to provide food and shelter for wildlife in line with the [All-Ireland Pollinator Plan](#)



Figure 1-8: Flower meadow in the NFMHS. Source: STW, 2021

Outside the Hospital Site:

- » The project involved the **enhancement, strategic expansion, and management of existing woodlands, with over 15,000 native trees planted**, bringing the woodland to 33.34ha (Figure 1-9). This afforestation effort serves as a **natural carbon sink**, supporting climate mitigation while enhancing connectivity between natural areas. Additionally, bat and **bird boxes** were installed to further support local biodiversity
- » **Bioretention SuDS habitats and additional habitats** were created:
 - » **A coastal grassland**, (approximately 13.2ha) which replaced an area of low ecological complexity
 - » **A wader scrape**, a shallow pond was created serving as new **habitat**, offering food and refuge for a diverse range of wetland wildlife, whilst providing a SuDS for surface water runoff (Figure 1-13)
 - » **A wetland**, restored by capturing stormwater and directing the runoff to an existing wetland area, improving flood control and enhancing water retention capacity, as well as providing a sustainable solution for surface water management (see right).



Wetland Area for Birds:

In the original proposal, the engineering company had planned to install an underground attenuation tank. However, **the Project Ecologist suggested an alternative approach**: diverting the water to a nearby wetland that had been drained over the years due to the development of pitches and housing, and now required additional water. The engineering company was open to this idea and conducted further research on the total volume of water to be discharged. After thorough analysis, it was agreed that the water would be redirected to the wetland. This solution demonstrated strong collaboration and teamwork between all members of the team. This also made financial sense since this measure saved around €100,000 as well as providing a sustainable solution for surface water management.



Wetland, source: IGBC

Biodiversity Status Post-Project

The project enhanced natural habitats by **preserving native woodlands** and with the creation of **habitats such as wetlands, coastal grassland etc. all of which are vital for wildlife**. In addition the landscaped areas within the hospital grounds provided new habitats for species.

These efforts supported existing species and attracted new ones, enriching ecological diversity. Five years of bird monitoring showed substantial positive impacts on biodiversity. The findings emphasise the importance of ongoing monitoring and adaptive management.

A Biodiversity Management Plan was developed to preserve the woodlands, support **native species**, manage non-native species, and control invasive ones.

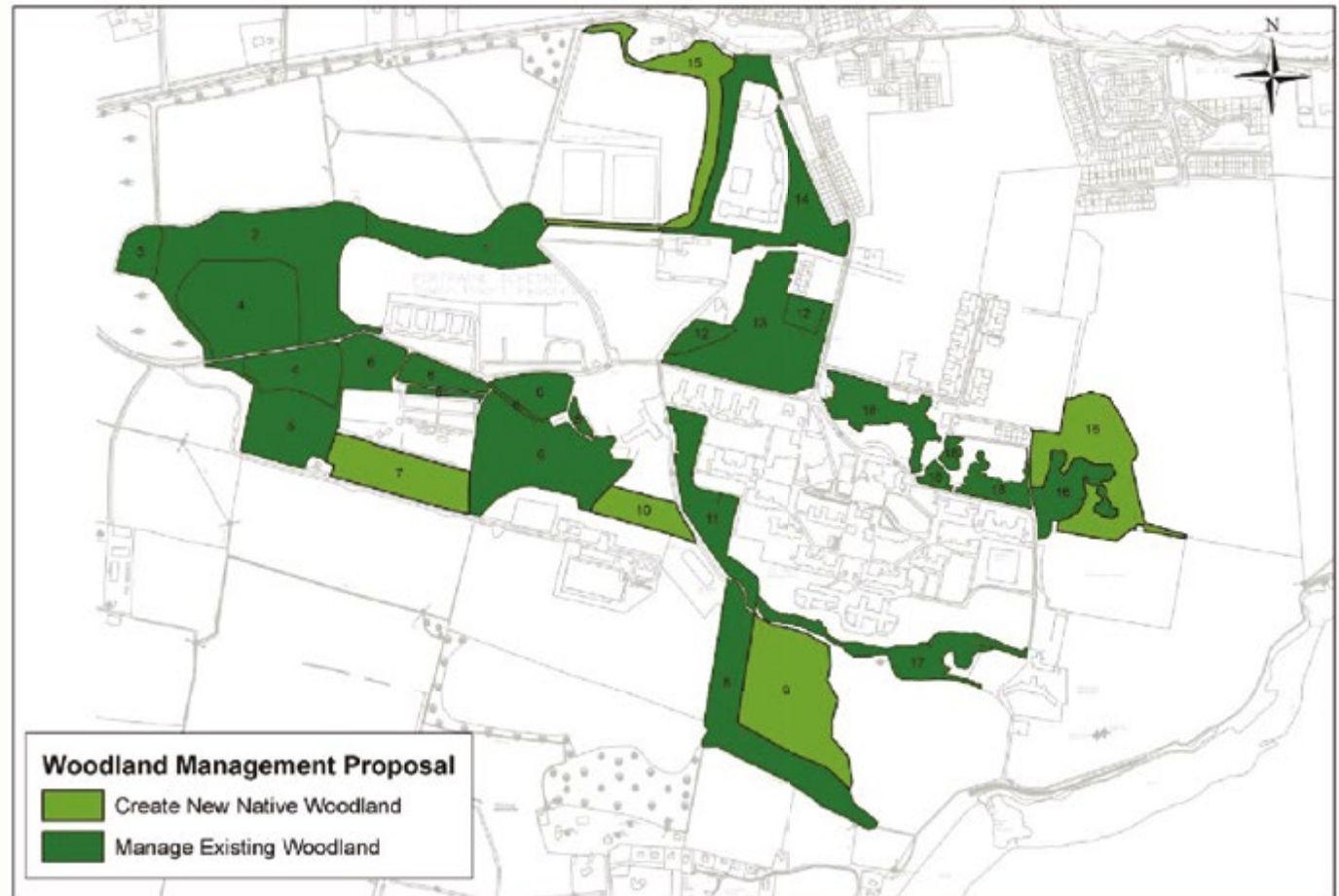
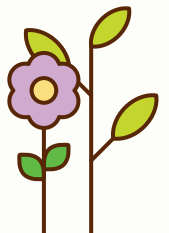
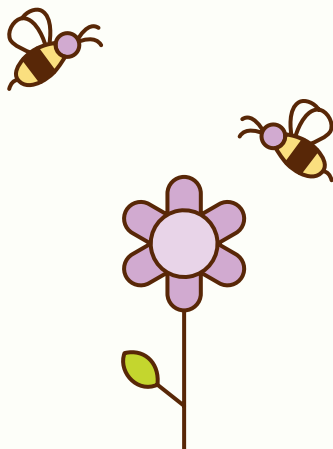


Figure 1-9: Woodland management plan for conservation of existing habitats and management post-delivery.
Source: Wilson, 2014



Co-Benefits

Health & Wellbeing of patients and community

The project's landscaping was carefully planned to include recreational and therapeutic spaces, such as a **sensory garden** (Figure 1-10) - a favourable environment for patient recovery. Research shows a strong positive correlation between exposure to green spaces and health promotion, especially improved mental well-being, making urban greening a valuable public health strategyⁱ.

Although patients cannot directly access these wider demesne site, the buildings were designed to take advantage of the natural areas, with **rooms oriented to the surrounding woodland** to provide a visual connection to nature.

Research shows that hospital patients have windows with a view of nature recovering fasterⁱⁱ. In addition, exposure to nature during an acute hospital admission has been shown to positively impact psychological outcomes such as anxiety, depression, pain perception, and overall patient satisfaction.

i Nordrum et al., 2022; Joschko et al., 2023; Yañez et al., 2023

ii Ulrich, 1984

iii Guidolin et al., 2024

These benefits are more pronounced with longer durations of exposure and deeper levels of immersion in natural environmentsⁱⁱⁱ. The public areas outside the hospital have been equipped with pedestrian signage (Figure 1-11) to explain interventions on the natural surrounding areas.



Figure 1-10: Sensory gardens. Source: STW, 2021

Project Highlights

Cross-sectoral cooperation

The project nurtured collaboration among building professionals, public health experts, environmental conservation professionals, and the local community. Key to this collaboration was the **early involvement of the project ecologist**, who collaborated closely with designers and construction teams, and the strong commitment of the client to biodiversity enhancement, supported by Fingal County Council's Biodiversity Officers and Parks Department.

The HSE also organised several **working group meetings with local residents, sports clubs, and councillors**. The woodland footpaths and information stands came out of those meetings.

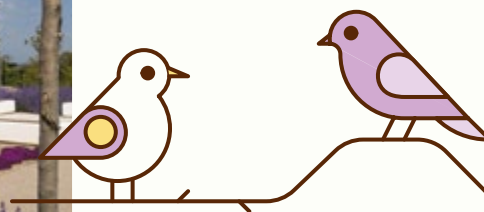


Figure 1-11: Recreational public area outside the hospital with pedestrian signage (left) and sensory garden inside the facility (right). Source: STW, 2021

Going the Extra Miles

Due to its proximity to **Nature 2000 sites**, the project has undergone a **Natura Impact Assessment**. This was carried out to **assess and mitigate potential impacts on the Natura 2000 sites**. Some of the biodiversity features were part of the mitigation required for building on the site. Some solutions, however, went beyond legal requirements, driven by the team's commitment to enhancing biodiversity.

- » **Restoring the wetlands** by diverting surface water was implemented as part of the design process, thanks to the involvement of ecologists (see Wetland Areas for Birds, page 1:6)
- » **Public access to woodlands** was not mandated but emerged from community engagement



- » **Use of pollinator-friendly plants** for internal landscaping was a decision made by the design team
- » **A wildlife rescue plan** implemented during construction, which ensured the safe relocation of wildlife.



“I took the initiative to implement a wildlife rescue plan during construction because I deeply care about all creatures and wanted to ensure the continued wellbeing of local fauna.”

Derek Redmond,
Clerk of Works, HSE



Figure 1-12: Tadpoles (left) and an eel (right) rescued by Derek during construction at the NFMHS site. Source: Derek Redmond and Jennie Quigley, photos taken 2017-2021

Project Challenges

- » **Preserving cultural and natural heritage**, requires careful attention during planning and construction.
- » **Supervising and upskilling contractors in biodiversity practices**. Contractors required training and close supervision to ensure they understood and followed strict protocols, including the proper management of reused soil.
- » **Coordinating site grading and soil movement**. Addressing differences in site levels demanded a strategic relocation and grading of soil across areas to ensure soil quality for planting.
- » **Addressing design restrictions in a high-security environment**. The mental health facility required unique design solutions to meet stringent security needs while maintaining functionality and aesthetics.



Figure 1-13: Grassland (left) and Wader Scrape (right). Source: HSE, 2024

Lessons Learnt

- » **Assessing and protecting existing ecosystems**. Prioritising the assessment, conservation, and connectivity of existing natural areas and **ecosystems** in new developments—such as local woodlands and **meadows**—provides a practical approach to enhancing the ecological value of an area. This strategy reduces the need for entirely new solutions.
- » **Early involvement of ecologists**. Engaging an ecologist from the kick-off of a project is essential to ensure that biodiversity considerations inform all stages of development. Ecologists can suggest solutions that might not otherwise be identified by other professionals in the team.
- » **Championing Biodiversity**. Similarly, involving individuals with a passion for nature and a commitment to wildlife conservation can be highly beneficial, particularly when mandatory biodiversity requirements are absent, as well as a client willing to listen and implement their solutions.



Figure 1-14: Sensory gardens and new tree planting. Source: STW, 2021



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- | | |
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LIVING ROOFS: BOOSTING URBAN BIODIVERSITY FROM ABOVE



About the Project

Green roofs are vegetative roofs designed to support plant growth. They are installed on flat or low-sloping roofs of buildings and can provide numerous benefits such as **thermal regulation, water management, and carbon sequestration** and can have a **positive impact on biodiversity**.

This case study focuses on the creation of a **new biodiverse green roof** on The Observatory building in Dublin City's docklands and also **models the potential upgrade of an existing sedum roof to an extensive green roof** (see page 2:5 for further on different types of green roof) on the adjacent 1 Windmill Lane (1WML) building.

Figure 2-1: Green Roof on the Observatory (2025).
Source: Hibernia Real Estate Group Limited



“Recent policy and regulatory changes, such as the Taskforce on Nature-related Financial Disclosures (TNFD) and the Corporate Sustainability Reporting Directive (CSRD), have led investors to focus more and more on enhancing biodiversity in the built environment, but the drivers are multiple. For instance, tenants are increasingly asking for access to green space in their buildings.”

Neil Menzies
Director of Sustainability at Hibernia Real Estate Group Limited

In 2016, when the original sedum roof was installed on 1 WML, reaching a **LEED certification**ⁱ was the main reason the building owner incorporated this green infrastructure. However, **stronger legislative drivers** have been introduced since then, such as the EU's **Corporate Sustainability Reporting Directive** (CSRD)ⁱⁱ, and **Nature Restoration Law**ⁱⁱⁱ. The disclosure recommendation and guidance from the **Taskforce on Nature-related Financial Disclosures** (TNFD)^{iv} are also strong drivers for businesses to integrate nature into their buildings.

At the local level, the **Dublin City Development Plan 2022-2028**^v states that the Council will require all new development projects over 100 sqm. to provide green roofs to support climate action and urban drainage^{vi} (see SI23).



Figure 2-2: Example of semi-intensive green roof.
Source: Universal Floral, 2025



Figure 2-3: Example of an semi-intensive roof with rooflights. Source: Engineers Ireland, Dublin

i <https://www.usgbc.org/leed>

ii Refer to Figure 2-4 and <https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng>

iii https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

iv <https://tnfd.global>

v https://www.dublincity.ie/sites/default/files/2021-11/draft-dublin-city-development-plan-2022-2028-chapter-10-green-infrastructure-and-recreation_21-11-21.pdf

vi Refer to SI23 : <https://www.dublincity.ie/dublin-city-development-plan-2022-2028/written-statement/chapter-9-sustainable-environmental-and-flood-risk/95-policies-and-objectives>

Companies subject to the **Corporate Sustainability Reporting Directive** (CSRD) will have to report according to **European Sustainability Reporting Standards** (ESRS). ESRS framework, specifically the **ESRS E4** requires companies to **disclose and report on their biodiversity and ecosystem risks and impacts**, both positive and negative, and outline their actions to mitigate negative impacts, protect ecosystems, and integrate biodiversity considerations into their operations and value chains.

Navigating ESRS E4 Requirements

- » **ESRS E4-1 | Transition Plan:** Companies must disclose their transition plan aligning with biodiversity preservation and EU Biodiversity Strategy 2030 targets. This includes correlation with business strategy, approval from governing bodies, and feasibility considerations.
- » **ESRS E4-2 | Biodiversity Policies:** Disclosure of strategies addressing biodiversity effects, risks, and opportunities, considering dependencies and activities like production and procurement.
- » **ESRS E4-3 | Actions and Resources:** Details on biodiversity efforts and resource allocation, including measures for biodiversity compensation and whether they're integrated into ongoing practices.
- » **ESRS E4-4 | Biodiversity Targets:** Outline objectives, progress, and assessment of biodiversity targets, considering scientific evidence and ecological thresholds.
- » **ESRS E4-5 | Impact Metrics:** Disclosure of significant influences on biodiversity, including indicators for changes in species' status and proximity to protected areas.
- » **ESRS E4-6 | Financial Effects:** Disclosure of potential financial impacts from biodiversity risks and opportunities, quantifying effects on financial standing and performance, unless exempted under specific circumstances.

Figure 2-4: Focus Box on policy and statutory background for companies

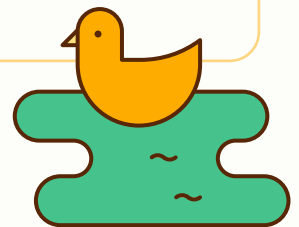




Figure 2-5: Location of the 1 Windmill Lane building (1WML) and The Observatory Buildings in Dublin City's South Docklands. Source: EPA Maps, 2024.

Keywords:

Non-Residential Development

Brownfield

Existing Building

Large site (over 5,000 sqm)

Climate adaptation

Maintenance

Biodiversity metrics used

SuDS

Green Roofs

Location: Windmill Quarter, D02 F206

Client: Hibernia Real Estate Groups Ltd

Budget: Estimated installation cost: approximately €130 per m² (The Observatory)
Estimated Maintenance cost: approx. € 4,000 per year (The Observatory)

Funding: Privately funded

Start Date: 2024 (original sedum green roof completed in 2016)

Completion Date: Expected in 2025 (ongoing)

Green Building Certificate: **1WML:** LEED for Building Design and Construction (LEED BD+C) and LEED for Operations and Maintenance (LEED O+M) Gold certified. **The Observatory:** Aiming for LEED for Operations and Maintenance (LEED O+M) Gold certification following refurbishment works.

Ecologist Involvement?

Biodiversity Metric(s) used: Biodiversity Net-Gain England Metric, DEFRA methodology and Ecosystem Serviced Provision, Environmental Benefits from the NATURE tool [[Statutory Biodiversity Metric](#)]

Key Stakeholders:

- » Dublin Climate Action Regional Office (CARO) and University College Dublin (UCD) as part of a research project on rainwater runoff and climate adaptation
- » No current engagement with tenants. However, this will be required later to ensure maintenance and will be achieved through the inclusion of a green clause within the leases for the relevant spaces of the Observatory

Project Team:

- » Ecologist: Greengage
- » Landscape Architects: Connect Construct
- » Lead Architect: MCA Architects
- » Green Roof Design: Landtech Soils and Universal Flora
- » Research Team: CARO Research Team and UCD

A water retention capacity study of various green roof mediums was carried out in 2023-2024. You can read more [HERE](#) and [HERE](#).

Links to legislation and policies:

- » [Corporate Sustainability Reporting Directive \(EU\) 2022/2464](#)
- » [EU Nature Restoration Law \(Regulation \(EU\) 2024/1991\)](#)
- » [National Biodiversity Action Plan 2023 – 2030](#)
- » [National Adaptation Framework 2024](#)
- » [Dublin Development Plan 2022-2028](#)
- » [Dublin City Biodiversity Action Plan 2021-2025](#)

Biodiversity Status Pre-Project

The baseline and post-development scenarios were calculated by the project ecologist using the **Statutory Biodiversity Metric England**ⁱ and the **Environmental Benefits from Nature** (EBN) toolⁱⁱ.

A **baseline biodiversity unit** (habitat units per hectare) and an **ecosystem services provision assessment** (across 18 criteria) were completed on both buildings – with the green roof already in place on 1 WML and none on the Observatory. These assessments were complemented by a **potential biodiversity uplift opportunities assessment**

i [The Statutory Biodiversity Metric, User Guide](#)

ii [The NATURE Tool](#)

iii A water retention capacity study of various green roof mediums was carried out in 2023-2024. You can read more [HERE](#) and [HERE](#).

aligned with the English Biodiversity Net Gain (BNG) requirements. This is important to anticipate regulatory changes and ensure future compliance.

Baseline at 1WML

The existing green roof (Figure 2-6) was classified under “Other Green Roof” category, alongside “Introduced Shrubs” and “Developed Land-Sealed Surface” habitats, as defined by the Statutory Biodiversity Metric guidance. Under this framework, these habitats are not subject to assessment of their ecological condition. An assessment of the water retention^a capacity of the

sedum roof was undertaken by the Dublin Climate Action Regional Office (CARO)ⁱⁱⁱ (Figure 2-8).

Baseline at The Observatory

Pre-redevelopment, the existing building was classified within the “Developed Land-Sealed Surface” habitat category, as outlined in the Statutory Biodiversity Metric guidance by the project ecologist. Under this framework, these habitats are not subject to condition assessments.

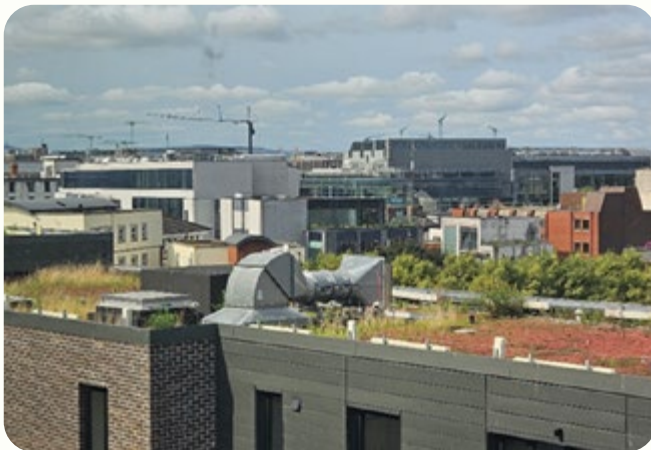
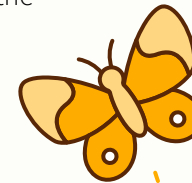


Figure 2-6: Existing Space in the 1 WML Roof.
Picture taken by Neil Menzies, 2024



Figure 2-7: Existing space in the Observatory roof.
Picture taken by Neil Menzies, 2024

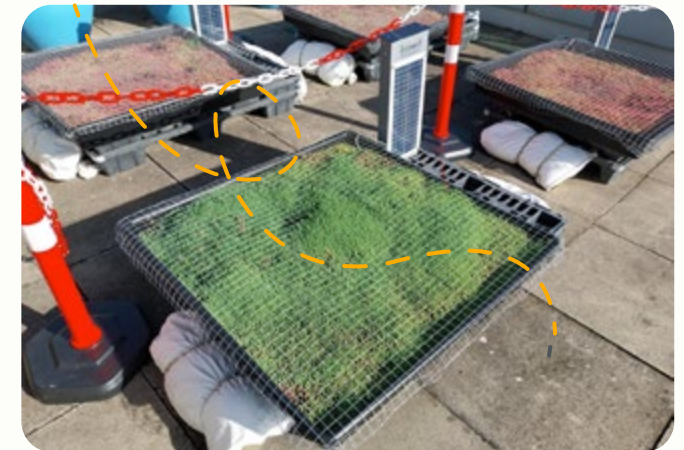


Figure 2-8: Trial conducted on the roof. Source: Research Project.
Picture taken by Hannah O’Keeffe, 2024

Green Roof Considerations

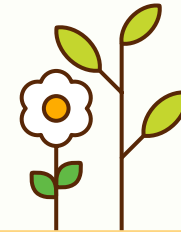
Green roofs can have a positive impact on biodiversity, especially when they are intensive (soil depth: 200-750mm+) or semi-intensive (150-250mm).

Intensive Green Roofs can accommodate taller plants such as shrubs and trees, creating natural habitats in the urban environment and attracting more insects and birds. These are also often called **Living Roofs**. Whereas Semi-Intensive Roofs can support, for example, a shallow rooting meadow. A semi-intensive green roof will be installed at The Observatory. Due to structural loading capacity, Extensive Green Roofs are often more suitable for retrofit of existing buildings as they use less growing media (100-200mm) (IGBC, 2023). Extensive green roofs do still provide a biodiverse **habitat**, in particular for insects and birds, but there is not the diversity of plant species and

variety in terms of plant heights that can be accommodated in an intensive or semi-intensive green roof.

This case study models the potential effect on biodiversity of replacing the sedum roof at 1WML with an extensive green roof. Another good approach is to leave at least a part of the green roof to self-vegetate from windblown and seed dispersal by birds. Known as Brown Roofs, these are the best way of replicating the wild urban spaces that are found at ground level (IGBC, 2023). Green roofs are particularly suited for small sites in densely populated urban areas where space is limited. However, this solution may not be ideal for enhancing biodiversity in all buildings. Retrofitting green roofs

to existing structures can pose challenges due to structural load limitations. In existing and new buildings, the embodied carbon emissionsⁱ from using construction materials to make the roof structurally able to accommodate an intensive green roof should always be evaluated.



In the English statutory Biodiversity Metric (versions 3.0 and 4.0) used for Biodiversity Net Gain (BNG) assessments, the three condition categories are defined as follows:

Good condition refers to habitats that:

- » Meet all or most of the positive criteria for that habitat type
- » Have appropriate physical structure and vegetation composition
- » Function well ecologically
- » Contain characteristic species assemblages
- » Show minimal signs of degradation or negative impacts

These habitats **typically score 3 out of 3 on the condition assessment scale**.

Moderate condition refers to habitats that:

- » Meet some but not all of the criteria for “good condition”
- » Have some of the desired physical structure and vegetation composition, but with notable deficiencies
- » May have some impairment of function
- » May be somewhat degraded but still functioning as that habitat type

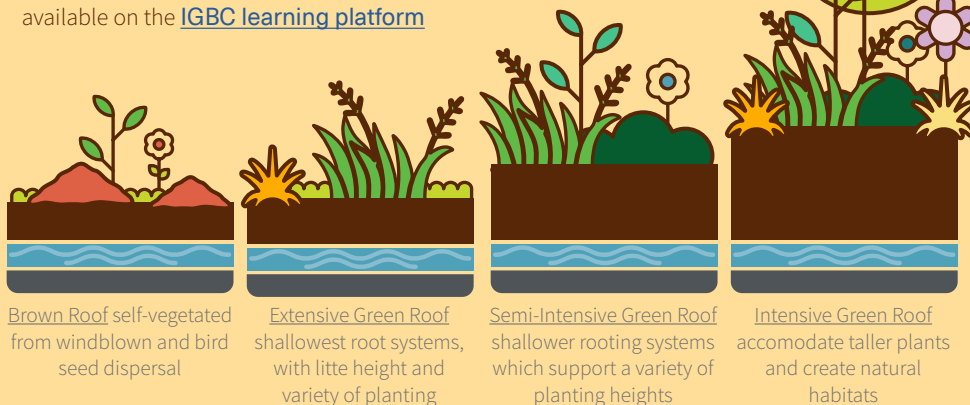
These habitats **typically score 2 out of 3 on the condition assessment scale**.

Poor condition refers to habitats that:

- » Fail to meet the criteria for moderate or good condition
- » Have significant deficiencies in their physical structure and vegetation composition
- » Have substantially impaired ecological function
- » Are heavily degraded or modified from their natural state
- » Typically have few characteristic species present

These habitats **typically score 1 out of 3 on the condition assessment scale**.

ⁱ In any building structure and substructure have the highest embodied carbon ([Indicate project, 2024](#)). To learn more about measuring Embodied Carbon can look at the on-demand training available on the [IGBC learning platform](#)



Brown Roof self-vegetated from windblown and bird seed dispersal

Extensive Green Roof shallowest root systems, with little height and variety of planting

Semi-Intensive Green Roof shallower rooting systems which support a variety of planting heights

Intensive Green Roof accommodate taller plants and create natural habitats

Figure 2-9: Focus Box on English statutory Biodiversity Metric used to assess the case study green roofs

Project Intervention

The following biodiversity enhancement measures were proposed by the project ecologist.

Enhancement at 1 WML:

Improvement of the existing sedum roof by:

- » **Installing an extensive, biodiverse green roof** in its place, covering an area of 0.0333 hectares. The newly proposed extensive biodiverse green roof would be expected to achieve a moderate condition
- » Installation of a series of **intensive green roof planters** on the southern terrace projected to achieve good condition, covering an area of 0.0036 hectares
- » Installation of **additional extensive biodiverse green roof areas** across other rooftop sections to achieve good condition

- » Installation of four sections of the “**other green roof**” category from the Statutory Biodiversity Metric guidance, most likely to be **sedum**, to cover an area of 0.0085 hectares. This would be expected to achieve a moderate condition
- » Creation of a **courtyard garden** consisting of both **shade-tolerant and moisture-tolerant species**. This would be expected to achieve a good condition.



Figure 2-10: 1WML Baseline and proposed intervention. Source: Greengage, 2024

The Observatory:

- » Installation of several areas of semi-intensive **biodiverse green roofs**, expected to achieve a good condition, covering an area of 0.0821 hectares. This action has been prioritised due to its potential impact to achieve a good condition status while balancing other project priorities.
- » The aim is for a semi-intensive green roof (150-250mm substrate) which includes a sedum blanket installed further seeded with taller flowers and plug plants with shrubs. The seed mix included: heliotrope (*Phacelia*), Buckwheat (*Fagopyrum esculentum*), White mustard (*Sinapis alba*), Coriander (*Coriandrum sativum*), Love-in-a-Mist (*Nigella damascene*), Marigold (*Calendula officinalis*), Cornflower (*Centaurea cyanus*), Oilseed Radish (*Raphanus sativus*), Mallow (*Malva sylvestris*), Borage (*Borago officinalis*), Dill (*Anethum graveolens*), Common Bird's

Foot (*Lotus corniculatus*), as well as Sunflowers (*Helianthus annuus*). Plug plants included Macedonian scabious (*Knautia macedonica*), Purple Coneflower (*Echinacea purpurea*), Common Foxglove (*Digitalis purpurea*) and Ragged Robin (*Silene flos-cuculi*)." The plan for this includes a **sowing plan** and a **maintenance plan with tasks and time estimated**

- » Installation of **bat boxes and bird boxes** on trees of suitable size and orientation throughout the site.

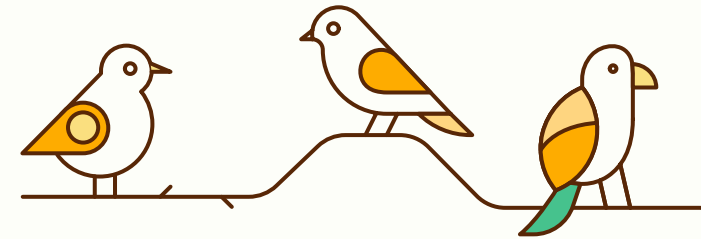


Figure 2-11: Observatory Baseline and proposed intervention. Source: Greengage, 2024

(Expected) Biodiversity Status Post-Project

The preliminary results suggest that **both buildings are likely to achieve a positive net change** in habitat units after the proposed interventions, in particular in relation to **pollination and pest control services**.

Uncertainty levels (level of confidence) for 11 of the 18 factors measured can be explained as many datasets are still lacking for urban settings, and even if they exist, they may not have appropriate value transfer methodologies for some urban green infrastructure typologies. Although the issue is largely similar in the UK, having access to Irish equivalents of national character areas and strategic significance would be helpful. More specifically, the development of a bespoke Irish equivalent to EBN that reflects nomenclature and data sets in use in the Irish system would be recommended.

In the absence of any national tool for Ireland, the approach taken for this project was to **undertake bespoke work to identify and incorporate the most relevant Irish equivalent datasets**. Of the 28 data inputs required for this site, six were marked as 'not known'. The "not knowns" in this project primarily relate to "local habitat distinctiveness" as this is a rating specifically linked to English policies. An example of the process for dataset substitution to assess EBN in the Irish context was for the "Soil Drainage" dataset, where

	Year 1	Year 10	Year 30	Confidence
Food production	→	→	→	2
Wood production	→	→	→	2
Fish production	→	→	→	2
Water supply	→	→	→	1
Flood regulation	↗	↗	↗	1
Erosion protection	→	→	→	1
Water quality regulation	→	→	→	1
Carbon storage	→	→	→	2
Air quality regulation	↗	↗	↗	2
Cooling & shading	↗	↗	↗	2
Noise reduction	→	→	→	2
Pollution	↗	↗	↗	1
Pest Control	↗	↗	↗	1
Recreation	↗	↗	↗	1
Aesthetic value	↗	↗	↗	1
Education	↗	↗	↗	1
Interaction with nature	↗	↗	↗	1
Sense of place	↗	↗	↗	1

Table 2-1a: 1WML EBN results. Source: Greengage, 2024

	Year 1	Year 10	Year 30	Confidence
Food production	→	→	→	2
Wood production	→	→	→	2
Fish production	→	→	→	2
Water supply	→	→	→	1
Flood regulation	→	→	→	1
Erosion protection	→	→	→	1
Water quality regulation	→	→	→	1
Carbon storage	→	→	→	2
Air quality regulation	→	→	→	2
Cooling & shading	↗	↗	↗	2
Noise reduction	→	→	→	2
Pollution	↗	↗	↗	1
Pest Control	↗	↗	↗	1
Recreation	→	→	→	1
Aesthetic value	↗	↗	↗	1
Education	→	→	→	1
Interaction with nature	↗	↗	↗	1
Sense of place	↗	↗	↗	1

Table 2-1b: The Observatory EBN results. Source: Greengage, 2024

Change in average score per hectare

Large decrease (> -2.5 out of 10)



Decrease (-0.25 to -2.5 out of 10)



Minor Change (-0.25 to 0.25 out of 10)



Increase (0.25 to 2.5 out of 10)



Large increase (> 2.5 out of 10)



Confidence rating for each service

1 The relationship between the provision of the ecosystem and the habitat is complex. Evidence for scoring is partial. Evidence gaps have been filled by consulting experts and with a degree of subjectivity.

2 Some suitable evidence to calibrate the range of scores across habitats

3 Strong evidence base for scores across the range of habitats and multipliers used.

The above compare the outcomes for the two buildings within this case study. The arrows indicate the magnitude and direction of change, looking at the score for each ecosystem service at three points in time compared to the pre-intervention baseline.

"Landis - Soilscales" is the default England and Wales dataset. For Ireland, the Irish Environmental Protection Agency's "National Soils Hydrology Map" was identified as a suitable substitute. This GIS data was downloaded into QGIS as a Web-Map-Service and used to discern the soil drainage type for the sites across Hibernia REG's portfolio.

A summary of the results of 1WML and the Observatory using the **Statutory Biodiversity Metric England** is provided in Tables 2-1 and 2-2. The results from the **Environmental Benefits from Nature** (EBN) tool for both roofs are explored in Table 2-3.

	Baseline	Proposed Uplift	Net Change	Percentage Change
Habitat Units	0.07	0.54	0.47	666.68%

Table 2-2: 1WML results summary. Source: Greengage, 2024

	Baseline	Proposed Uplift	Net Change	Percentage Change
Habitat Units	0.01	0.19	0.18	3245.25%

Table 2-3: The Observatory results summary. Source: Greengage, 2024

Co-Benefits

Rainwater Runoff Management

Green roofs can **help stormwater management** by capturing and retaining rainfall, which reduces runoff volume and slows its flow into urban drainage systems. The vegetation and substrate layers absorb and gradually release water, preventing system overload during heavy storms. This mitigates flooding risks, particularly in densely built-up areas with limited permeable surfaces, such as the one described in this case study.

Green roofs can also **enhance water quality** by filtering pollutants and sediments, reducing their entry into waterways. In addition, they assist in the insulation of roofs, as well as in reducing the **urban heat island** effect.

Occupant Benefits

Green roofs can enhance physical and mental well-being by providing a connection to nature within an urban setting. Where accessible, they can also offer recreational opportunities for building occupants (e.g., gardening).

Educational Opportunities

Green roofs can serve as valuable tools for environmental education, acting as **"living labs"** to demonstrate sustainability practices, foster community engagement, and raise environmental awareness among users. This opportunity may be limited, so it is recommended to prioritise accessibility when designing green roofs.

Financial Benefits

Additional accessible green space in an urban context can **reduce vacancy periods for buildings**, and contribute to attracting higher rents, as well as **increase interest from investors**.



Figure 2-12: Windmill Quarter site from across the river, showing The Observatory (left of image). Source: Windmill Quarter

Project Challenges

- » **Lack of financial mechanisms.** Financial mechanisms to support the creation, enhancement, and maintenance of green roofs on existing assets can be difficult to identify. Explaining the immediate costs against future benefits they offer to financial teams can also be challenging. Additionally, unless the green roof is accessible, building occupiers may be hesitant to invest in its implementation and maintenance. **Green clauses** may be used to ensure green roofs are properly maintained.
- » **Structural capacity of the existing building to support the additional load of the green roof.** Many roof spaces, particularly on existing buildings, are not designed to support the load of a green roof, including the soil-saturated weight. This must be investigated by a structural engineer, which may increase cost. Involving a structural engineer is essential to assess the feasibility of modifications to an existing roof. If the roof's load significantly increases, structural reinforcement may be necessary, adding to the cost. This is a key reason why green roofs are more commonly implemented in new builds,

where they can be integrated more easily and cost-effectively at the design stage. This is one of the main reasons why green roofs are primarily introduced in new built. It's easier and cheaper to introduce it at the design stage **Reinforcing the structure to retrofit an intensive biodiverse green roof can also be expensive.**

- » **Ensuring safe and secure access to green roofs.** Roof spaces can often be difficult to access, posing **safety risks for installation and ongoing maintenance.** Working at height introduces logistical challenges, including transporting materials to the roof level. Moreover, existing buildings may **lack accessible water points**, and without a rainwater harvesting system, irrigation may rely on potable water sources, which is less sustainable.
- » **Lack of a national Biodiversity Net Gain methodology and EBN Tool equivalent designed to be used in an Irish context.** Due to the lack of a national methodology for **Biodiversity Net Gain** and of an EBN Tool equivalent designed for the Irish context, Hibernia REG and the ecologist, Greengage, had

to use tools developed for an English context and take a bespoke approach. In the future, the development of a bespoke Irish equivalent to EBN that reflects nomenclature and data sets in use in the Irish system would be most helpful. A first step would be to aggregate all the appropriate tools for Ireland and appraise what alternative data sources exist for them.

- » **Ecosystem services valuation is a nascent field.** Tools such as EBN provide useful indicators of outcomes and help mainstream considerations around biodiversity protection and ecosystem services. Nonetheless, **quantitative outputs like this need to be considered alongside qualitative analysis**, as there are no models that are intelligent enough at this time to account for all situations. Ecosystem service valuation is a nascent field, and the current suite of ecosystem service assessment approaches should be assessed to determine what is best for an Irish setting.



Lessons Learnt

- » **Long-term benefits and investments.** Highlighting the long-term advantages of green roofs, such as **climate adaptation, reduced energy costs, improved stormwater management, and increased property value**, can foster broader adoption. Providing stakeholders such as financial teams, property occupiers, and decision-makers with case studies and measurable data on these environmental and economic benefits strengthens acceptance and facilitates investment in these solutions.
- » **Early integration into design.** Incorporating green roofs during the initial planning and design phases **ensures they align with structural requirements, cost considerations, and ecosystem benefits**. This approach (where possible) minimises retrofitting challenges and associated expenses.
- » **Prioritise maintenance planning.** The long-term success of green roofs depends on the establishment of a **clear maintenance plan**, including the appropriate budget for regular inspections and an ecological management plan feeding into an asset manager maintenance plan to sustain ecological and functional benefits. A detailed maintenance plan has been developed for the Observatory, outlining tasks, their frequency, and, crucially, the associated costs.
- » **Research and invest in the development of an Irish equivalent to EBN.** Ecosystem service valuation can help raise awareness about the co-benefits of biodiversity, and in doing so, contribute to protecting it. However, this is a nascent field, and the **current suite of ecosystem service assessment approaches should be assessed** to determine what is best for an Irish setting.



Figure 2-13: Green Roof on the Observatory in 2025.

Source: Hibernia Real Estate Group Limited, n.d.

References

- » Department for Environment, Food & Rural Affairs (2024). [The Statutory Biodiversity Metric: User guide](#)
- » Dublin City Council (2022). [Chapter 10: Green Infrastructure and Recreation. In: Dublin City Development Plan 2022-2028](#)
- » [Nature Tool 2.0](#) (2021 McCloy, Anthony and Barton, Kevin (2021). [Green Blue Roof Guide 2021](#). Dublin City Council.
- » Jammet, M. and Rondini, I. (n.d.). [Biodiversity and the Built Environment IGBC's Insights](#)
- » QGIS Tool. Available at: <https://qgis.org/>

[all hyperlinks checked:
February 2025]

Creating Neighbourhoods for People and Nature



“As residential developers, our ambition is to create sustainable, green communities that support both people and the planet. We recognise our role in shaping the future of housing and are committed to driving innovation that demonstrates how sustainable construction can become the industry standard. Biodiversity plays a central role in this ambition, and we are focused on progressing our efforts toward the shared goal of halting and reversing nature loss.”

Oisín Griffin
Head of Landscape & Urban Design at Cairn Homes

About the Project

Seven Mills is a **new town** being built beside the Grand Canal (a **proposed Natural Heritage Area** pNHA) between Clondalkin and Lucan in Clonburris, Dublin 22 (Figure 3-2).While the entire area is still under development,the first section, called Parkleigh (Tile 1) (Figure 3-3 and 3-4), has been completed, and residents are already living in the homes. Once it’s fully completed, Seven Mills will be around the size of Maynooth, with over 5,500 homes and a population of 15,000.

This case study focuses on **Parkleigh (Tile 1)**, where **Biodiversity Net Gain** (BNG) was measured, and the integration of **Nature-based Solutions** (NbS) was prioritised. Key features include **Sustainable Drainage Systems** (SuDS) throughout streets and open spaces, which contribute to the natural attenuation of water runoff and support wildlife.

The project also included the **planting of locally harvested native seeds**. The main drivers for incorporating these features at scale were to support the developer’s reputation and legacy, going beyond compliance with local and national biodiversity policies and aligning with Environmental, Social, and Governance (ESG) requirements. Creating greener neighbourhoods also meets the rising demand for sustainable living spaces, making the development more appealing to prospective homebuyers.

Figure 3-1: Swales at Parkleigh in Seven Mills Residential Development.
Source: Murray & Associates, 2025



Figure 3-2: Location of the Seven Mills Residential Development. Source: OpenStreetMap

Keywords:

Residential Development

Non-Residential Development

Greenfield

New Build

Large site (over 5,000 sqm)

Health & Wellbeing

Biodiversity metrics used

SuDS

Bioretention Systems

Tree Pits

Detention Basins

Green Roofs

Swales

Location: Seven Mills, Cappagh, Dublin, D22 E4P8 – part of the Clonburris Strategic Development Zone (SDZ).

Funding: Privately Funded

Start Date: 2019

Completion Date: Parkleigh (Tile 1) completed in 2023

Green Building Certificate:  [Home Performance Index \(HPI\), Well Community](#)

Ecologist Involvement? 

Biodiversity Metric(s) used:  [Biodiversity Net-Gain England Metric - DEFRA methodology](#)

Key Stakeholders: South Dublin County Council Parks Department, Waterways Ireland, and the new homeowners.

Project Team:

- » Ecologist: MKO
- » Architect: CWOB Architects
- » Landscape Architect and Arborist: Murray & Associates, Landscape Architecture
- » Engineer: DBFL Consulting Engineers

Links to legislation and policies:

- » [Corporate Sustainability Reporting Directive \(EU\) 2022/2464](#)
- » [European Nature Restoration Law - Regulation \(EU\) 2024/1991](#)

- » National Biodiversity Action Plan 2021-2025
- » [South Dublin County Development Plan 2016-2022](#)
- » South Dublin County Council's Biodiversity Action Plan 2020-2026
- » Clonburris Strategic Development Zone - Planning Scheme 2019
- » [Guidance for Urban Watercourses \(Inland Fisheries Ireland\)](#)



Figure 3-3: Development area in the existing context. In red, Parkleigh (Tile 1), in yellow, the Clonburris area. Existing Site Context (left) and Existing Site with SDZ Masterplan Context (right)

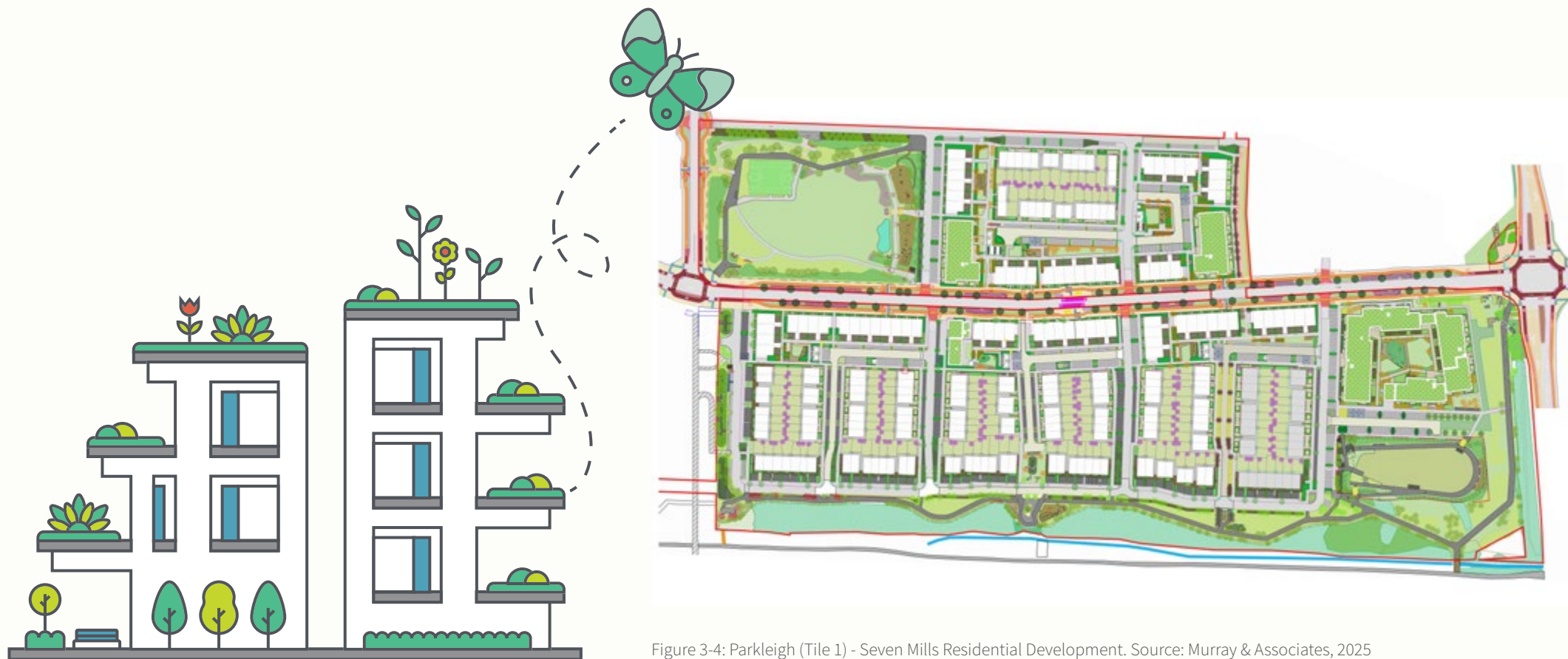


Figure 3-4: Parkleigh (Tile 1) - Seven Mills Residential Development. Source: Murray & Associates, 2025

Biodiversity Status Pre-Project

The site consists of a total of **17.07 hectares of historically agricultural lands** with associated hedgerows and drainage features. The Dublin-Kildare rail line running east/west is approximately 170 metres to the north of the development area. The Grand Canal, a **proposed Natural Heritage Area** (pNHA), is adjacent to the south of the site, also running east/west. To the east, the Fonthill Road (R113) runs north/south with the Clondalkin Fonthill Railway Station approximately 300 metres to the north-east. To the west, the agricultural lands are bounded by the elevated R136 roadway running north/south.

The site is part of the larger Clonburris Strategic Development Zone (SDZ) area (Figure 3-3) and is located in the southeast of the SDZ.

[A Biodiversity Management Plan](#) was developed for the SDZ.

The site (Figure 3-5 and 3-6) was a **greenfield**, with existing hedgerows crossing the former agricultural grasslands and more dense vegetation, such as immature woodland and scrub, adjacent to the Grand Canal.



Figure 3-5: Map of the habitats pre-project. Source: MKO, 2023



Figure 3-6: Seven Mills before development Source: Housing Ireland, 2023

Project Interventions

The development incorporates a range of measures aimed at achieving **Biodiversity Net Gain** (BNG) - quantified using the **Nature England Metric (v.4.0)** - and implementing climate resilience solutions. These include the preservation and planting of tree lines and hedgerows along roadside verges, permeable paving, the creation of SuDS such as **tree pits**, **swales**, and water detention basins, as well as the installation of **green roofs** (Figure 3-7).

Planting

The various open and public realm spaces were planted with different varieties of trees and different types of planting within areas of different functions and characters (Figure 8) Where **native species** were not used, planting was selected with reference to the **All-Ireland Pollinator Plan as follows:**

- » Ornamental shrubs, perennials, and hedging adjacent to seating areas and entrances to add interest in these intensively used spaces
- » Larger groups of tree planting create new ecological corridors and enhance existing green infrastructure
- » Native trees and shrub species are predominantly used throughout the different areas where possible and suited to the micro-climatic conditions.

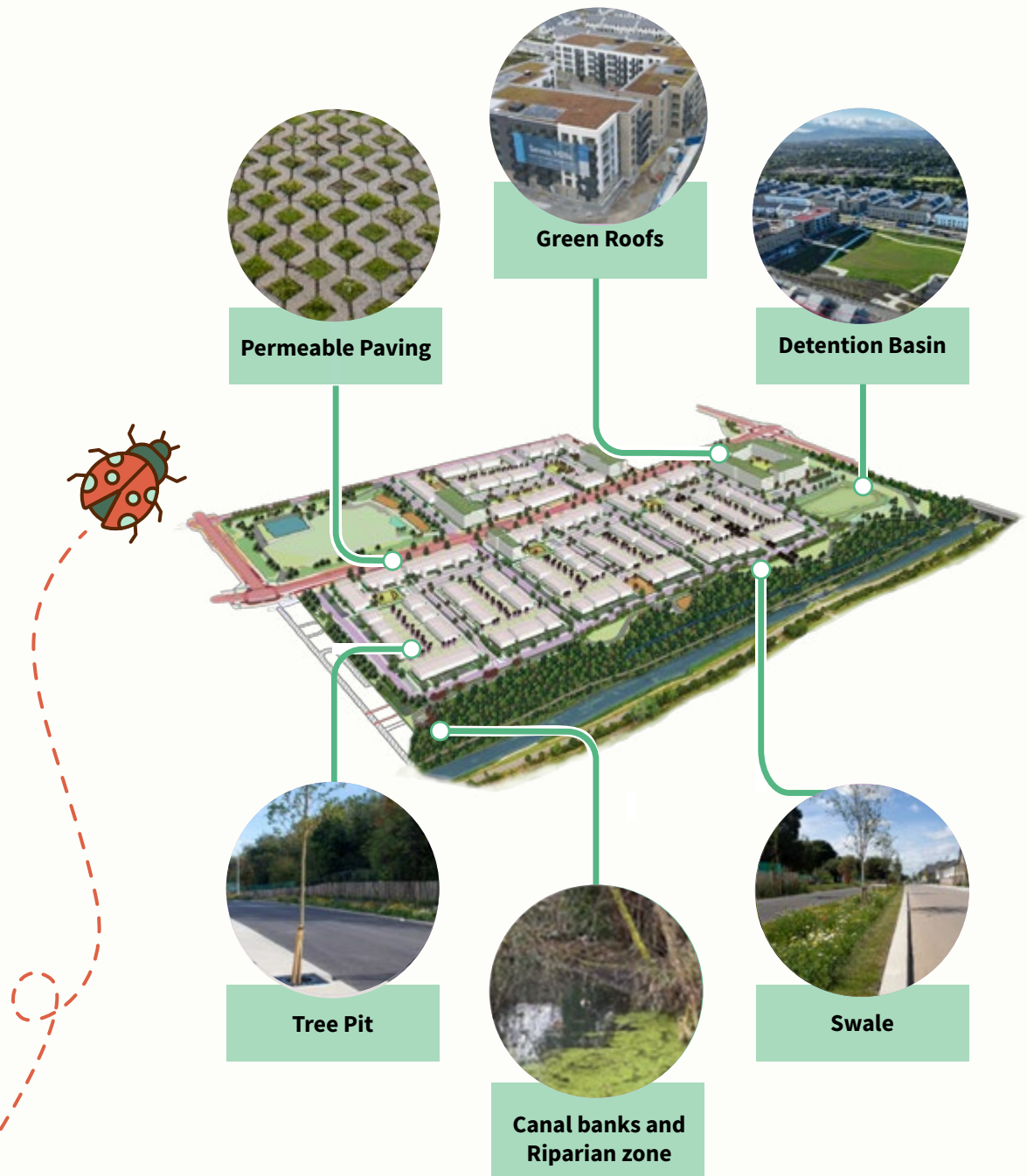
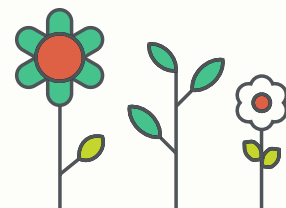


Figure 3-7: BNG and SuDS measures aiming at protecting biodiversity and improving climate resilience. Source: edited from Cairn Homes, 2025.

The importance of vegetation layers

All **vegetation layers** - ground cover, shrubs, and trees - are critical for biodiversity as they collectively support various species' needs. Each layer offers habitats and resources, contributing to a rich and balanced ecosystem. The ground layer, comprising mosses, ferns, and herbaceous plants, provides shelter and foraging grounds for numerous invertebrates and small mammals. Shrubs and understory vegetation offer nesting sites and food sources for birds and insects, while the canopy formed by mature trees supports arboreal species and influences the microclimate below.



Figure 3-8: Some examples of planting at Parkleigh - Seven Mills (Tile 1). Source: Murray & Associates, 2024

SuDS Implementation

The urban design layout incorporates various **SuDS** measures throughout the streetscape and open spaces before directing secondary runoff to the neighbourhood parks, which are designed as **basins with detention and bio-attenuation functions**, catering for a 1-in-100-year storm event. Although shaped as basins, the parks are designed with universal accessibility in mind and provide a wide range of durable playscapes, amenities, and features.



Figure 3-9: Example of planting at Parkleigh - Seven Mills (Tile 1). Source: Cairn Homes, 2025

The types of SuDS implemented in Parkleigh (Tile 1) of Seven Mills Development are the following:



01.
**Tree pit with
structural soil in
soft landscape**



05.
**Detention basin
with underground
tank**



02.
**Bio retention
garden**



06.
**Extensive green
roofs**



03.
Swale



07.
**Mowing schedule
and no-mow
grass**



04.
**Permeable
surface-
grasscrete**





01. Tree pit with structural soil in soft landscape

Constructed underground structures used to create voided space to contain a soil and/or storage volume and protect the root space of one or more trees when located within a paved area.



02. Bio retention garden

Planted, soft landscaped areas, positioned to collect, store, filter and reduce surface runoff from frequent rainfall.



03. Swale

Shallow vegetated channels designed principally to convey and treat runoff.



04. Permeable surface- grasscrete

A cast-in-place cellular reinforced concrete paving system made from concrete with voids formed by styrene moulds, designed for permeable surfacing in trafficked and water management areas.



05. Detention basin with underground tank

Landscaped depressions that are normally dry except during and following rainfall events, designed to attenuate runoff and, where vegetated, provide water treatment.



06. Extensive green roofs

Roofs with a vegetated surface that provide a degree of retention, attenuation and treatment of rainwater and promote evapotranspiration.

To learn more about all types of SUDs and how to implement them, please read: [“Implementation of Urban Nature-based Solutions - Guidance Document for Planners, Developers and Developer Agents”](#) (LAWPRO, 2024).



07. Mowing schedule & no-mow grass

The project follows recommendations from the **All-Ireland Pollinator Plan** and reduces the mowing frequency to allow wildflowers to bloom, providing essential food sources for bees and other pollinators. The goal is to create a balance between biodiversity conservation and maintaining functional green spaces for residents.

» Amenity lawns

1. Mow every 2–3 weeks, but raise the mower height to at least 4 cm.
2. Avoid mowing during peak flowering seasons (April-June) in certain designated areas.
3. Leave strips or patches uncut along margins to support pollinators.

» **Native meadow grass**

Cut only once or twice a year – ideally:

1. First cut in September or October.
2. Optional second cut in early spring (February/March) to remove excess growth.
3. The cuttings should be left for around a week to allow for the seeds to fall into the soil before removing them – this is to prevent soil enrichment (which favours aggressive grasses over wildflowers).

» **No-mow zones**

Some areas, such as biodiversity hotspots – very rich in species - like woodland edges and riverbanks - are left uncut to provide undisturbed habitats for insects, birds, and small mammals.

These areas can be revisited every 1–3 years for light management (e.g., selective strimming).

Some additional pollinator-friendly practices adopted consist of gradual mowing - progressive grass cutting - leaving flowering ‘weeds’, and avoiding pesticides and herbicides.



Figure 3-10: T1 Neighbourhood Park & SuDS Basin. Source: Cairn Homes, 2025



SuDS Implementation

The overall Seven Mills project aims to achieve Biodiversity Net Gain. To reach this objective, the landscape design follows the [Biodiversity Gain Hierarchy](#), prioritising the preservation and improvement of strategic ecological corridors: The Grand Canal, the railway corridor, and existing treelines and hedgerows. These corridors provide habitats for a diverse range of flora and fauna and ensure connectivity between the site and surrounding ecological networks, thereby playing a key role in promoting ongoing biodiversity enhancement.

Due to the Strategic Development Zone layout’s misalignment with existing hedges and the impossibility of its reconfiguration, many established hedgerows had to be removed. Despite efforts to preserve them, a considerable portion could not be saved. **Over 40,000 trees were subsequently planted, including 25,000 native Irish plants** such as Hawthorn (*Crataegus monogyna*), cultivated from seeds harvested directly on-site.



A dedicated budget has been allocated for the ongoing maintenance of the soft landscaping, ensuring the sustainability and long-term success of the biodiversity initiatives.

Efforts to restore the canal bank and riparian zone included targeted interventions to control **invasive species**, after which the area within fifty meters of the canal’s boundary was left undisturbed, enabling the [natural regeneration and recovery of its biodiversity](#) (Fisheries Ireland, Urban Watercourses).

Habitat Classification	Component of the site	Component measure	Overall net gain (+10%) or net loss (0-10%)
Open Farmland (GA1 – Improved Agricultural Grassland)	Main site component, relatively low value for nature conservation	Green areas where the existing seed bank have been utilised to provide naturalised grassland that will be managed with differential mowing.	Although reduction in habitat area, the biodiversity potential is greater than the existing habitat, therefore net gain in biodiversity net gain
Hedgerows (WL1 – Hedgerows)	Partial retention of Hedgerows	Mature native or pollinator-friendly trees have been planted as part of the landscaping plan as well as hedgerows and woodland with native species.	Net gain due to larger number of high value species replacing the removed ones net gain

Table 3-1: Simplified description of compensation measures and net gain

Continued overleaf

Habitat Classification ⁱ	Compensation measure	Overall net gain (+10%) or net loss (0-10%)
Bioretention areas (ED3 – Recolonising Bare Ground)	Planted with native/pollinator-friendly species	net gain
Green roofs (BL- Built Land)	Planted with native <i>Sedum</i> spp (This wasn't transitioned to an intensive green roof due to roof load limitations)	no net loss
Vegetated swale (ED3 - Recolonising Bare Ground)	Planted with native/pollinator-friendly species	net gain
New hedgerows (WL1- Hedgerows)	Planted with native species and compensate for some of the hedgerows lost, combined with the woodland planting	net gain
Standard trees/ Woodland (WL2 - Treelines)	Native/pollinator-friendly species planted within the development and adjacent to it. They compensate for some of the trees lost in hedgerows, but the overall number is greater than those to be removed.	net gain
Ornamental and front garden planting (WS30 Ornamental/ non-native shrub)	Planted with pollinator-friendly species	

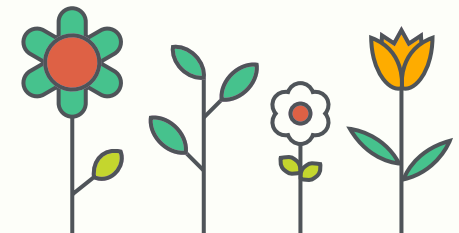
ⁱ In brackets, the habitats have been reclassified according to Fossit Habitat Classification, a hierarchical system that organises all Irish terrestrial, freshwater, and coastal habits into structures categories.



Figure 3-11: Residents participating to a community native tree planting day. Source: Cairn Homes, 2024

Co-Benefits

- » **Recreational and wellness spaces** The project features 225 acres of green spaces, including 12.5 km of cycleways and walkways and 3.5 km of canal frontage. The urban design ensures that every home is within a two-minute walk of a green space, adhering to the [3+30+300 rule](#) for urban greenery. This supports physical activity and mental health, contributing to the overall community's well-being.
- » **Climate adaptation and mitigation** The permeable parking spaces and other SuDS interventions adopted for this project are key to managing urban stormwater runoff and mitigating flood risks in the housing development. Preserving and enhancing woodlands and green spaces is also critical in sequestering carbon through plant growth while reducing the **urban heat island effect** by providing cooling through the vegetation's natural evapotranspiration process.



Project Highlights

- » **Locally harvested native seeds and wild landscape management** A cornerstone of this project is the use of **locally harvested native seeds sourced from native plants of the Clonburris SDZ** (Figure 3-12). Native flower seeds were sown in the meadow areas while trees were propagated in nurseries in Tipperary before being planted at Seven Mills.

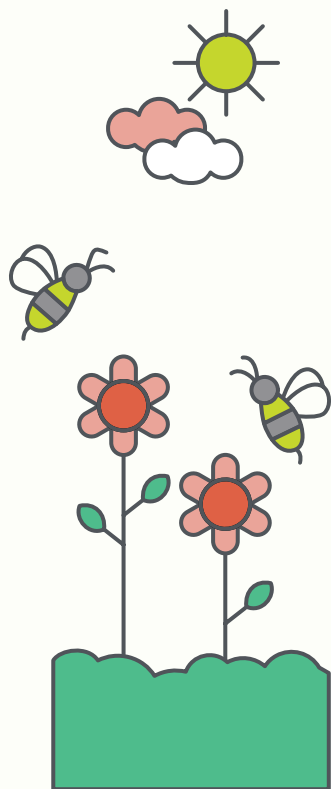


Figure 3-12: Seed harvesting.
Source: Cairn Homes, 2025



Figure 3-13: Native Irish Wildflower planting in a SuDS swale at Parkleigh – Seven Mills.
Source: Cairn Homes, 2024



Figure 3-14: Native hawthorn trees. Planted alongside a willow support fence, the installation also pays homage to the traditional craft of hedge laying, complete with a woven topknot - a gesture to Ireland's rich heritage. Source: Cairn Homes, 2024

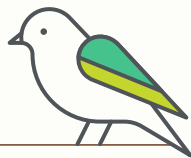
Native Hawthorn Planting

Native hawthorn trees were grown from seed collected on-site in 2021. The first batch of seed-grown hawthorns was successfully established in summer 2025 (Figure 3:8). This initiative plays a key role in preserving the **genetic integrity of Ireland's native tree species**.

There are several ecological reasons for choosing native, seed-grown hawthorn:

- » **Better ecological timing:** Imported hawthorns often flower outside the crucial period when native pollinators and insects depend on them for food, reducing their value in the **ecosystem**.
- » **Safeguarding biodiversity:** Using imported stock undermines efforts to conserve the unique genetic diversity of Ireland's native species, vital for the long-term resilience of our woodlands.
- » **Preventing disease:** Imported plants can introduce fireblight, a serious bacterial disease that poses a major threat to native hawthorn.

- » **Implementation of 3-30-300 rule** The project followed the 3-30-300 rule (Konijnendijk, 2021ⁱ), which highlights the vital role of urban tree planting in promoting healthier environments and communities. This guideline sets benchmarks for creating resilient urban areas with at least **three mature trees visible** from every home, a minimum of **30% tree canopy cover** in every neighbourhood, and ensuring **no residence is more than 300 meters from a high-quality green space**.



i Read more about the 3-30-300 Rule on the Nature Based Solutions Institute Website: <https://nbsi.eu/the-3-30-300-rule/>, or Watch: <https://tradkontoret.se/yggdrasil/>. Other useful information at: <https://bluesky-world.com/ntm/3-30-300-rule-analysis/>

Challenges

1. Lack of skills among contractors and subcontractors

There is a need to build understanding and skills among the construction industry to ensure the proper implementation of green infrastructure and prevent poor construction practices. For example, on this project, the construction of SuDS **required supervision and clear communication between designers, contractors, and subcontractors** to ensure that specifications were followed. The proper construction is essential to allow effective management and infiltration of water runoff into the ground and to prevent erosion and silt-induced clogging of SuDS components (Figure 3-15).



Figure 3-15: Examples highlighting situations where rain gardens were excessively filled due to a lack of understanding, hindering their ability to properly retain and filter water into the ground. Source: IGBC, 2025

2. Supply chain of native seeds for environmental restoration

A significant challenge in Ireland is the **limited number of native plant providers**. The growing demand for native species across the country has resulted in a gap in the sector, with insufficient nurseries capable of supplying native plants at scale. To overcome this issue, the developer collected seeds from the site, propagated them, and used them in the development.



Figure 3-16: An Example of signage installed in Parkleigh - Seven Mills' green areas to educate residents on biodiversity-friendly practices. Source: Cairn Homes, 2025

3. Educating residents on wild garden benefits

The naturalistic aesthetic of the “wild” landscapes received some criticism from residents for appearing “untidy”. The project addressed these concerns by **installing educational signage** (Figure 3-16) to inform residents about the ecological importance of biodiversity-focused management practices and the benefits of the implemented features, fostering community awareness and support for the initiative. The initiative also fostered community engagement by **organising a fruit tree planting day** (Figure 3-17), encouraging homeowners to **plant trees in their private gardens**.



Figure 3-17: Community native tree planting in Parkleigh - Seven Mills. Source: Cairn Homes, 2025

Lessons Learnt



Figure 3-18: Rain garden at Seven Mills. Source: Cairn Homes, 2025

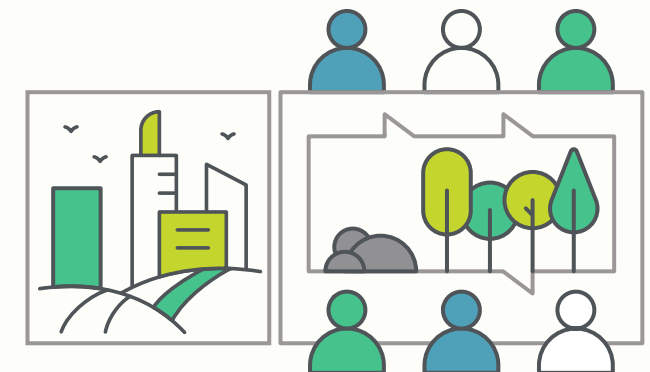
» Applying the biodiversity gain hierarchy

A key lesson from the project is the value of applying the [Biodiversity Gain Hierarchy](#) as a guiding framework. By prioritising the protection and enhancement of existing ecological assets, the project team avoided unnecessary habitat loss and ensured that some of the key natural features were retained and improved. **Early understanding provided by an ecologist** of the site and general area context baseline and biodiversity potential also fed into the design.

» **Consider structural requirements for green roofs** When the decision was made to pursue Biodiversity Net Gain, an extensive green roof had already been installed in the apartment block of Parkleigh (Tile 1). Due to **roof load limitations**, it could not be converted into an [intensive green roof](#). As a result, Tile 1 achieved no net loss rather than a biodiversity gain. This underscores the **importance of factoring in intensive green roof requirements early** in the design process and provides a valuable lesson for future phases of the Seven Mills development.

» Foster collaboration and knowledge sharing

Achieving best practices requires open communication, and a collaborative approach among all stakeholders is essential to ensure that site managers have a clear understanding of the project's goals while landscape architects and drainage engineers comprehend on-site implementation. Sharing insights and lessons learned during the process enhances understanding and ensures continuous improvement for future projects.



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[all hyperlinks checked: January & March 2025]

Improving Biodiversity Above and Below the Ground



About the Project

This case study aims to demonstrate how **biodiversity can be enhanced both above and below ground in urban environments**. Monaghan Town Centre's trial project **transformed low-value grass verges** (1-2 metres wide) along roadsides **into enriched soil ecosystems and vibrant [pictorial perennial meadows](#)**. The meadows were developed to **provide food and shelter** for biodiversity from early spring to autumn and work as **a buffer zone** between the traffic and pedestrians.

This approach was proposed by Monaghan County Council's horticulturist to **reduce the town's dependence on annual plants and hanging baskets**, with their high watering and maintenance costs.

Primarily led by the Municipal District, the initiative was supported by a strong collaboration with the local **Tidy Towns** group. As this trial proved successful, the approach is now being implemented in other parts of the town.



“Soil biodiversity in urban areas is poorly understood but it is clear that practices such as the removal or replacement of natural soil, surface-sealing, compaction, pollution, and above-ground vegetation changes negatively affect soil biodiversity with subsequent impacts on its functioning to support ecosystem services. Therefore, improving soil biodiversity in urban areas is crucial for supporting sustainable ecosystems and infrastructure, enhancing soil health, and increasing resilience to environmental challenges such as pollution and climate change.”

Michael Carrol
Horticulturist, Monaghan County Council

Figure 4-1: Pictorial meadows along the roadside in Monaghan Town Centre. Source: Eimear Fox, June 2024



Figure 4-2: Location of the roadside verges on Castle Road and Broad Road in Monaghan Town. Source: edited from Open Street Map, April 2026

Keywords:

Public Realm

Small site (under 1,000 sqm)

Pollution management

Circularity

Health & Wellbeing

Climate adaptation

Maintenance

Location: Castle Road, Monaghan Town

Client: Monaghan County Council

Budget: €12,000

Funding: Publicly funded (Municipal District funds)

Start Date: 2021 (Initial trial area)

Completion Date: 2021. However, soil quality species composition is monitored on an ongoing basis so that soil adjustments can be implemented when needed.

Green Building Certificate: ☒ None.

Ecologist Involvement? ☒ None. Led by the county Horticulturist, as no Biodiversity Officer had been appointed at that time.

Biodiversity Metric(s) used: ☒ None.

Key Stakeholders: Tidy Towns Group

Project Team: » **Project Lead:** Monaghan County Council - Roads Department

» **Horticulturist:** Michael Carroll, Monaghan County Council

» **General Operatives:** Monaghan County Council Staff

Links to legislation » [European Nature Restoration Law - Regulation \(EU\) 2024/1991](#)

and policies: » [The National Biodiversity Action Plan 2021-2025](#)

» [Monaghan County Council Biodiversity and Heritage Strategic Plan 2020-2025](#)

» Monaghan County Council - Climate Action Plan (2024-2029)

» All Ireland Pollinator Plan



Figure 4-3: Location of the roadside verges on Castle Road and Broad Road in Monaghan Town.
Source: edited from Google Maps, 2024



Urban Meadows or Pictorial Meadows

(Figure 4-1) are naturalistic, sustainable, and designed approaches to urban landscape areas. They enhance urban biodiversity while also improving the aesthetic appeal of public spaces and streets. Pictorial meadows **may contain non-native species** which **still provide for**

pollinators. What is crucial for pollinators is the structure of a flower and the availability of pollen and nectar. Nectar and pollen are greatly reduced in many of the bedding plants used in hanging baskets, such as petunias, that bees tend to avoid. Hence, the pictorial meadow provides plants that are more likely to attract pollinators.

It's important not to confuse these with Native Meadows, semi-natural **grasslands** among the most threatened habitats in Ireland. Restoring or creating native meadows was not the goal of this project. However, you can learn more about how to do that in the All-Ireland Pollinator Plan Guidelines.

It's important not to confuse these with **Native Meadows**, semi-natural grasslands among the most threatened habitats in Ireland. Restoring or creating native meadows was not the goal of this project. However, you can learn more about how to do that in [the All-Ireland Pollinator Plan Guidelines](#).

Biodiversity Status Pre-Project

In this project, soil biodiversity was recognised as a fundamental component of the **ecosystem**, equally important as the biodiversity of plants and animals above ground. **Soil supports 25% of the world's biodiversity (Bach and Wall, 2017) and plays a vital role in shaping and sustaining above-ground ecosystems.**



Figure 4-4: Non-native grass along the roadside pre-intervention. Picture taken by Michael Carroll, 2023

Biodiversity status of soil pre-project The soils in the verges were **compacted**, while the early and **frequent mowing regimes** have led to a depleted seed bank, resulting in **poor soil diversity**.

Early mowing, often carried out as part of the verge maintenance schedule, prevents plants from flowering and therefore early flowering plants are not able to set seed. Continued mowing on a short rotation prevents later flowering species from also setting seed, and thus the resultant seed bank becomes depleted, resulting in **poor vegetation growth**. This is a common challenge in urban verge areas.

Biodiversity status of vegetation pre-project The grass consisted of a **non-native mix maintained as a mowed margin** (Figure 4-4). It exhibited frequent browning of leaves due to drought stress and mowing.



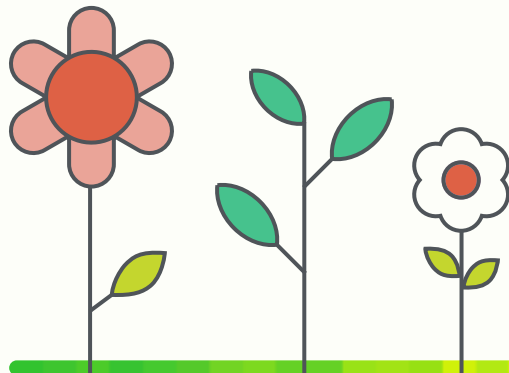
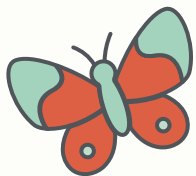
Project Intervention

The project adopted a dual-purpose strategy to **enhance biodiversity above and below ground**.

Maintaining soil nutrient balance is crucial for supporting plants that serve as habitats for wildlife, including pollinators. To improve soil health and structure, **the soil was enriched with wood pulp**, a natural material known to retain moisture and stimulate microbial activity (Räty et al, 2024)

Soil biodiversity is significantly **correlated with various ecosystem functions** and plays a critical role in delivering essential services such as **carbon sequestration**, organic matter decomposition, plant productivity, **nutrient cycling**, water regulation, and pathogen control (Fan et al. 2023).

Above ground, the **planting included species chosen for their adaptability to the local conditions**, including drought resiliency, and for their role in **providing critical resources such as nectar, pollen, and shelter for pollinators, birds, and other wildlife**.



Soil Management

Maintaining soil nutrient balance does not necessarily mean enriching its nutrient value, as meadow flowers tend to prefer low fertility, but **improving the soil's structure and ability to retain moisture**.

To achieve soil nutrient balance, the project **replaced the existing soil with a custom blend** (Figure 4-5) comprising specific proportions of sterilised soil and locally sourced wood pulp.

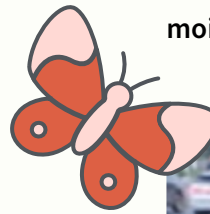
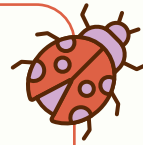


Figure 4-5: Soil management along the roadside during the project intervention.
Picture taken by Michael Carroll, 2023

Alternative Approach

Importing soil from an external source is not always the ideal solution, as it can act as a seed bank, carrying viable seeds that may germinate later and introduce plant species inconsistent with the site's ecological goals. The approach taken in this case study to improve the soil health and structure is one of several possible strategies and may not be the most suitable in every context. An alternative approach would have been to work with the existing soil, i.e., relieving compaction through loosening and turning it over to

encourage any dormant seeds already present to germinate and establish naturally. This could be further supported by overseeding with native wildflower and grass species, sourced locally, to reinforce **ecological connectivity** and ensure the planting reflects the native flora of the area.



Planting mix

The planting scheme incorporated a **selected mix of native and non-native species, including perennials** to serve as a food source for pollinators. This approach also helped prevent any single species from becoming dominant and minimised the need for frequent replanting.

To optimise resource efficiency, a **blend of seeds and bulbs** was sown at a low rate of 2–3 grams per square meter, reducing seed usage while maintaining effective coverage. The plants were also chosen for their ability to withstand extended periods of drought, ensuring the landscape's resilience in challenging environmental conditions.

The project incorporated All-Ireland Pollinator Plan signage (Figure 4-6), strategically placed around the sites to raise awareness among visitors about the presence of pollinators and increase acceptance of the naturalistic landscape aesthetics.

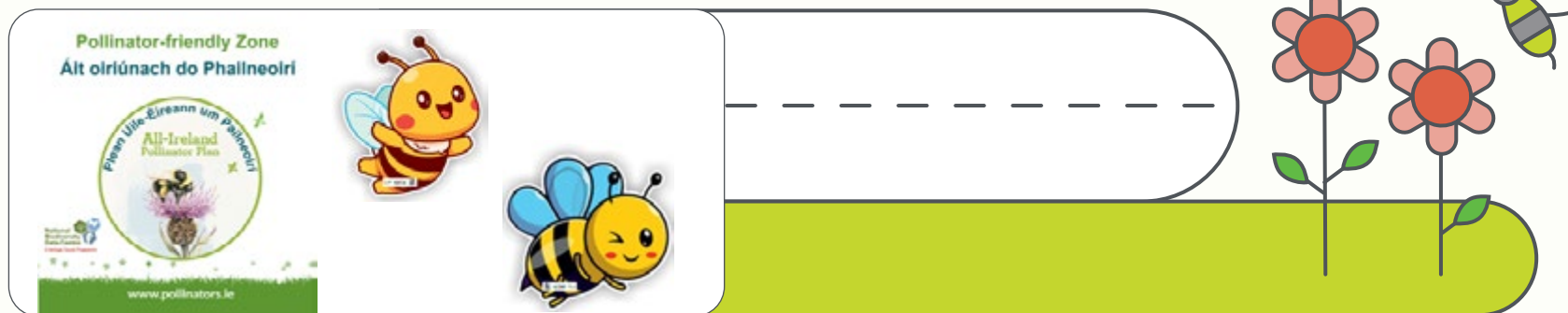
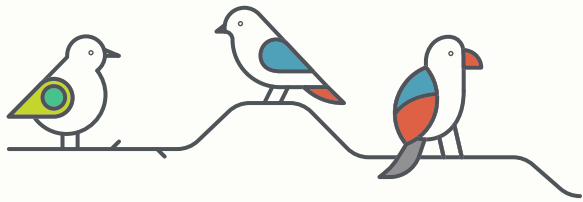


Figure 4-6: Signage integrated along the sowed pictorial meadow.
Source: Michael Carroll, n.d.



Biodiversity Status Post-Project

Early informal observations suggest encouraging signs for biodiversity, with apparent increases in plant and animal activity noted since implementation. These spaces, once of low ecological value, appear to be **developing into habitats with the potential to support pollinators and other wildlife**. However, it should be noted that these observations are anecdotal and have not yet been systematically measured or verified. A structured data collection process will be implemented to formally assess these changes and inform adaptive management going forward. Recent research by Zajdel et al. (2024) showed that sown meadows can compensate for the absence of large, natural meadows.

The local Tidy Towns groups are doing regular monitoring of the bee populations along the verges as part of the **All-Ireland Pollinator Plan Bumblebee Monitoring Scheme**. This will help properly quantify the presence of pollinators.

“The initiative has been transformative for Monaghan Town, not least because biodiversity in these typically barren roadside spaces has exponentially increased, but because it has brought a heightened awareness of biodiversity to road users and pedestrians in a novel way. No one could fail to be impressed by the spectacle of thousands of wildflowers such as ox-eye daisies, yarrow, and knapweed in full bloom and buzzing with insects at a busy intersection in an urban environment.”

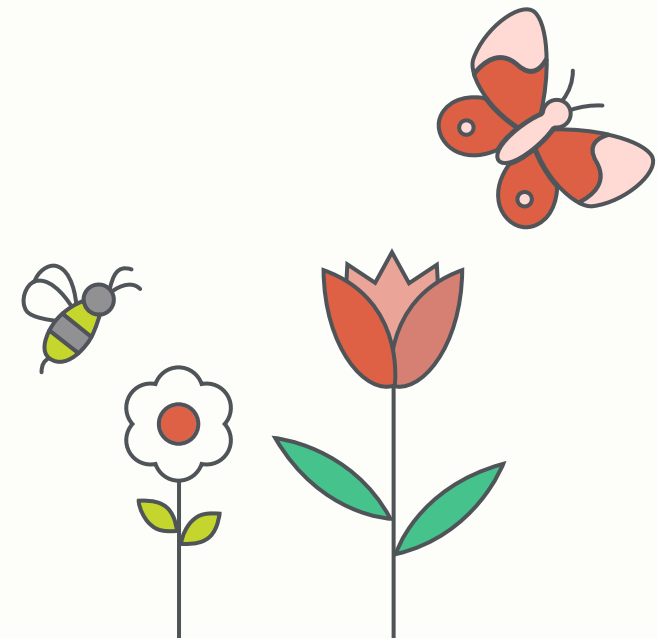
Dr. Patricia McCreesh,
Biodiversity Officer at Monaghan Co.Co.



Figure 4-7: Pictorial meadows along the roadside post-intervention. Picture taken by Michael Carroll, 2023



Figure 4-8: Pictorial meadows along the roadside post-intervention. Picture taken by Michael Carroll, 2023



Co-Benefits

Lower maintenance

Adopting a **naturalistic landscape design approach for urban green spaces can reduce management, resource needs, and costs**. Replacing hanging baskets and grass roadsides with perennial pictorial meadows cuts costs, including maintenance costs, because they do not require intensive grass-cutting, watering, or annual planting.

Circularity through organic waste use The wood pulp, sourced as a byproduct from Glaslough Peat, was chosen for its high moisture retention and organic content. **This initiative supported circular economy principles by integrating organic, locally sourced waste or byproducts** into soil improvement efforts while fostering partnerships with local businesses.



Enhanced community wellbeing

Incorporating diverse plantings along roadsides **enhances the quality of urban spaces**, creating a more inviting environment that encourages increased pedestrian use of walkways.

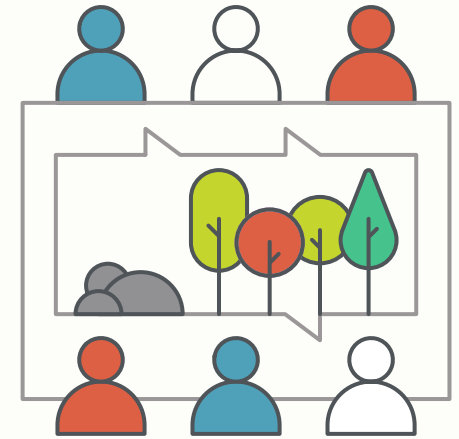


Figure 4-9: Pictorial meadows along the pedestrian walkway in Monaghan Town Centre.
Picture taken by Michael Carroll, 2023

Highlights and Challenges



Figure 4-10: Urban green spaces with naturalistic management in Monaghan Town Centre. Picture taken by Michael Carroll, 2023.



Highlights

Enhancing habitat connectivity

Adopting a naturalistic landscape design approach for urban green spaces can reduce management, resource needs, and costs. Replacing hanging baskets and grass roadsides with perennial pictorial meadows **cuts costs, including maintenance costs**, because they do not require intensive grass-cutting, watering, or annual planting.

Challenges

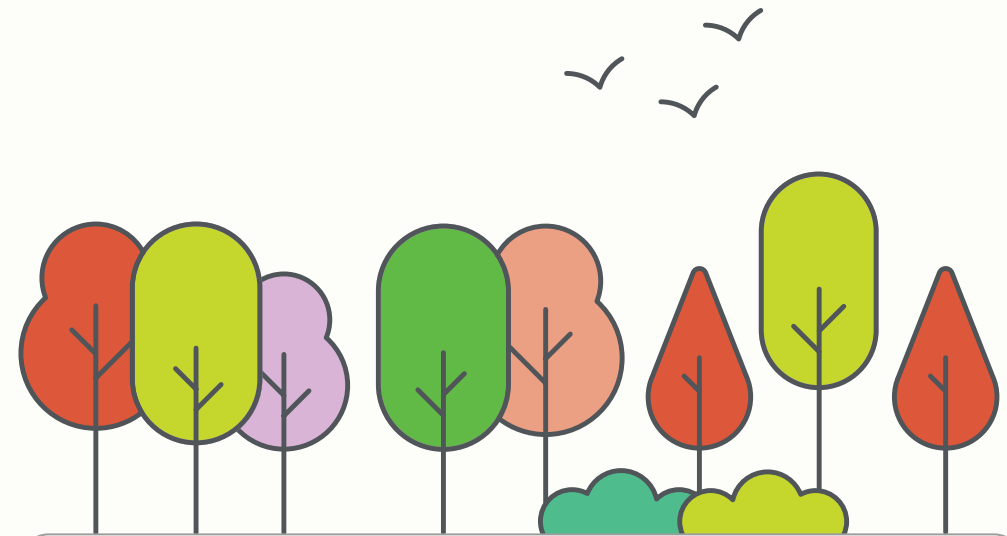
- » **Residents' acceptance** Adopting a naturalistic approach along the roadsides was initially met with **some resistance from residents**, who were used to maintained verges. A gradual shift in mindset emerged over time, and the winter downtime, when there are no meadow plants flowering, is now more accepted as part of the natural plant growth cycle.
- » **Lack of skilled professionals** There is a lack of skilled professionals who understand the importance of soil preparation and plant succession.
- » **Lack of native seed availability** There is a shortage of native seeds and plants to use on these projects.

Lessons Learned

- » **Engaging the community** The project actively engaged with the local community, collaborating closely with the Monaghan Tidy Town (MTT) group to promote awareness about the importance and benefits of biodiversity initiatives. The biggest win from the project has been mainstreaming the **idea of urban biodiversity as 'normal' within the town**. This was a massive change in people's perceptions as they were used to either sterile or heavily manicured verges, but now happily accept, and even request, the wilder appearance of the meadows.

This should make it easier to introduce other biodiversity measures, such as bird or **bat boxes**, as well as rainwater swales.

- » **Long-term landscape management** Effective landscape management requires a long-term commitment. **Regular monitoring** of soil health and plant growth by a skilled landscape manager, as well as soil scientists and ecologists, is crucial to address changes in soil nutrient status and to maintain the value and functionality of the site.



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[all hyperlinks checked:
January & February 2025]

Rain Gardens

A VERSATILE SOLUTION FOR CLIMATE RESILIENCE, NATURE, AND HEALTH & WELLBEING



About the Project

This project incorporates **rain gardens** as a **Nature-Based Solution** (NBS) for roads in Belgooly, County Cork. The rain gardens serve multiple purposes, from **enhancing local biodiversity** to **managing high volumes of rainwater runoff** and integrating footpaths for safe access to the local school. By retaining soil moisture, they also support vegetation growth that offers shade along the pathways. The rain gardens consist of a **long, linear strip with a shallow central depression that collects and temporarily holds stormwater, filters it, and allows it to infiltrate into the ground**. **Pollinator-friendly plants** enhance their ecological value. The project won the “President’s Award” at the Irish Landscape Institute Awards 2024.

Figure 5-1: Pedestrian pathway integrated with a linear rain garden in Belgooly, County Cork. Source: Áit Urbanism + Landscape, June 2024



“While serving an important functional feature, it has also added an aesthetic dimension to the school’s environs, which promotes both biodiversity as well as social and community engagement. As families assemble at the school each morning, the wildflowers and associated wildlife prompt an interest which serves to initiate interactions and conversations among the school community. Forming part of a popular local walking route, the wider community also enjoy availing of the Rain Garden’s wooden seating to rest and observe the seasonal changes therein.”

Diarmuid Hennessy
School Principal, Scoil Mhuire na nGráist Belgooly

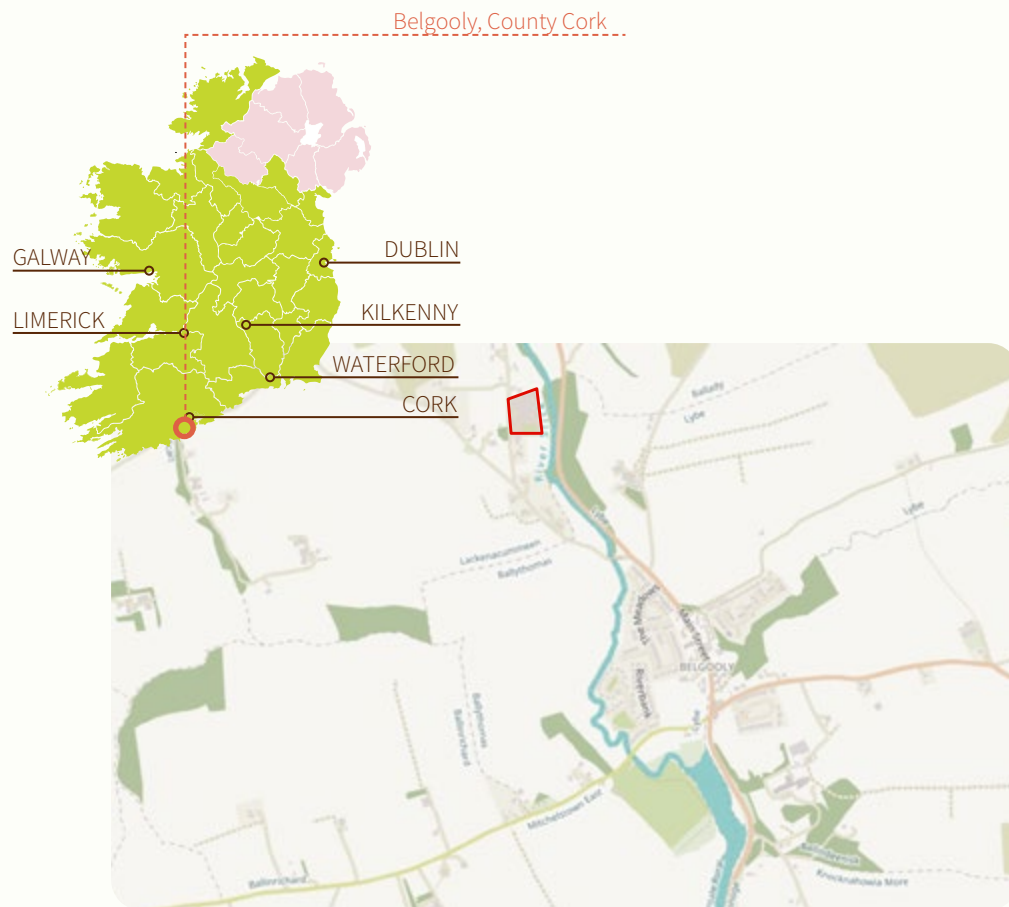


Figure 5-2: Location of Belgooly National School in County Cork. Source: edited from Open Street Map (April 2026)

Keywords:

Public Realm

Small site (under 1,000 sqm)

Pollution management

Health & Wellbeing

Climate adaptation

SuDS

Bioretention Systems

Location: Belgooly, County Cork.

Client: Cork County Council

Budget: 370,000 (for the whole “Safe Routes to School” project , including rain gardens)

Funding: Publicly funded

Start Date: 2022

Completion Date: 2023

Green Building Certificate:  None.

Ecologist Involvement?  None.

Biodiversity Metric(s) used:  None.

Key Stakeholders: Teachers and pupils of Belgooly National School, and residents.

Project Team: » **Local Authority:** Cork County Council

» **Landscape Architect:** Áit Urbanism + Landscape

» **Structural and Civil Engineer:** DBFL Consulting Engineers

Links with existing and upcoming legislation and policies:

» The National Biodiversity Action Plan 2021 – 2025

» [Cork County Development Plan 2022-2028](#)

» County Cork Biodiversity Action Plan 2009-2014

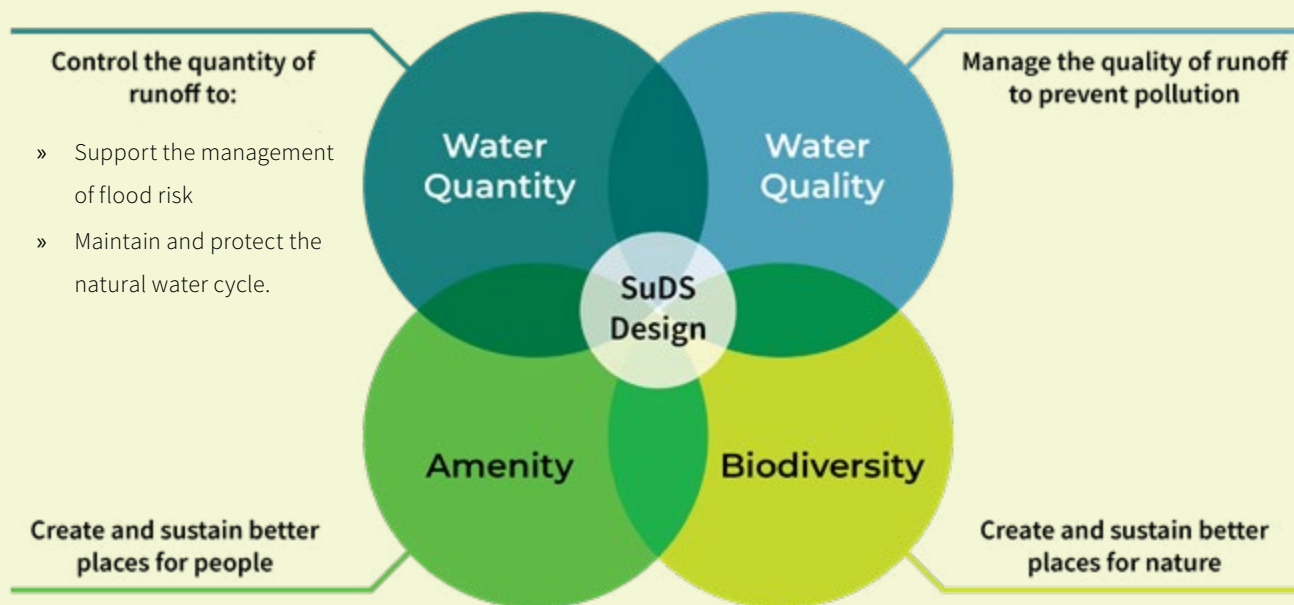


Figure 5-3: Adapted from CIRIA SuDS Manual, 2015

Rain gardens, a type of **Sustainable Drainage Solution** (SuDS), serve multiple purposes (Figure 5-3).

As **Bioretention Systems**, their primary function is to manage the quantity of water runoff, but they can also improve water quality, create attractive amenities for people, and support biodiversity.

The Belgooly Rain Garden and the [Cobh Raingarden demonstrator](#) presented in this case study illustrate how a single intervention can achieve multiple objectives and effectively create a better place for both people and nature.

Read more about implementing Nature-Based Solutions and SUDS in this [guide](#) (Local Authority Waters Programme, 2024)

Biodiversity Status Pre-Project

Prior to the intervention, the area was dominated by impermeable tarmac surfaces, while the roadside verges contained minimal wildflower diversity (Figure 5-4).

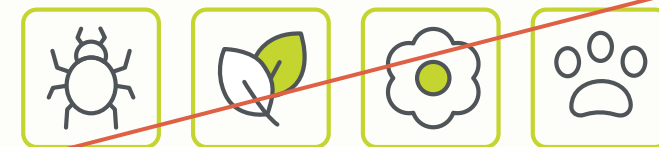


Figure 5-4: Before construction, the area consisted of impermeable surfaces in tarmac. Source: Google Maps, 2024

Project Intervention

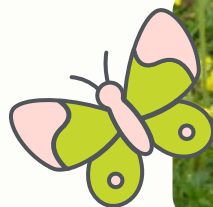
Pollinator-friendly planting

A mix of native and non-native plants was incorporated into the roadside verges to support biodiversity (Figure 5-5). The vegetation selected included **pollinator-friendly and slow-growing native perennials** and **shrubs** recommended to enhance biodiversity while avoiding pruning needs.

Moreover, the project team selected **plants tolerant of dry conditions** at the very edge of the gardens, while those along the slope of the depression needed to be able to tolerate wet soil for an extended period of time. Trees with deep roots, such as native Oaks (*Quercus robur* or *Quercus petraea*), Crab Apple (*Malus sylvestris*), and Wild Cherry (*Prunus avium*) were incorporated to aid stormwater filtration.

When preparing your planting list, be sure to include species that support wildlife. For accurate guidance on suitable plants and conditions, consult the [All-Ireland Pollinator Plan resources](#).

If you are designing a **rain garden planter**, check out the "[Make a Pollinator-Friendly Rainwater Planter](#)" Guide, which offers great recommendations for biodiversity-friendly plants.



a. **Cowslips** (*Primula veris*)
by Philip Halling. Sourced from geograph.org.uk (2026)



a. **Bird's-foot-Trefoil** (*Lotus corniculatus*)
by Paul Asman and Jill Lenoble, 2010
Sourced from Wikimedia (2026)



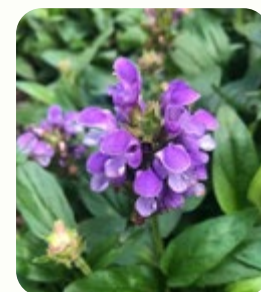
c. **Red Clover** (*Trifolium pratense*)
by Sergei Fomichev, 2022
Sourced from Pexels (2026)



d. **Yarrow** (*Achillea millefolium*)
by Vaughn Matthews. Sourced from lancswt.org.uk (2026)



e. **Oxeye Daisy** (*Leucanthemum vulgare*)
by Evely Simak, 2017.
Sourced from geograph.org.uk



f. **Selfhealer** (*Prunella vulgaris*) by Glority LLC Limited.
Sourced from picturethisai.com (2026)

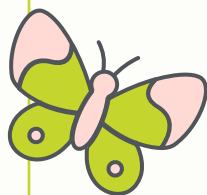


Figure 5-5: Examples of plants incorporated into the roadside verges

Linear Rain Garden

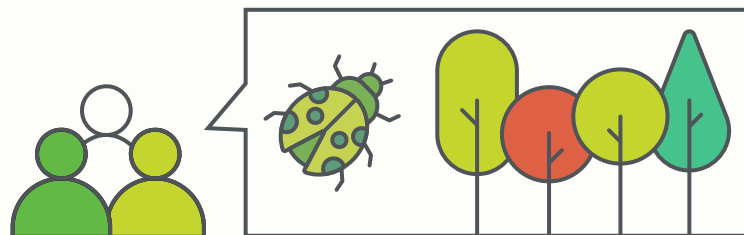
The rain gardens were designed as **permeable surfaces**. They feature an artificial depression that collects water runoff, allowing water to infiltrate into the ground gradually. They retain moisture and ensure better support for plant growth. The absorption rate is managed by estimating the runoff volume, which determines the depth of the depression and the size of the rain garden. Check dams were also strategically installed at regular intervals across the area to help slow water flow and improve soil infiltration during periods of high-water flow (Figure 5-7).

Educational Signage

Informative signs (Figure 5-6) were installed along the rain gardens detailing the purpose and benefits of native plants to **foster a deeper community understanding and appreciation for local ecology**. These signs help build awareness about the potential role of linear gardens in supporting biodiversity.



Figure 5-6: Detail of the educational signs.
Source: Áit Urbanism + Landscape, 2024



Biodiversity Status Post-Project

To date, no surveys have been conducted, and the results have not been measured. However, **teachers and pupils of Belgooly National School have been surveying biodiversity on site for educational purposes**.

Co-benefits:

Enhancing health and wellbeing

Seating areas were introduced along the linear gardens, providing spaces for rest and relaxation. These features encourage walking and social interaction, promoting healthier lifestyles and enhancing community well-being.

Providing Cooling

Planted rain gardens **reduce the urban heat island effect** by providing cooling via the return of moisture to the air through evapotranspiration from vegetation and the increased reflection rates from green areas compared with the darker surfaces usually found in an urban area, such as tarmacadam roads.

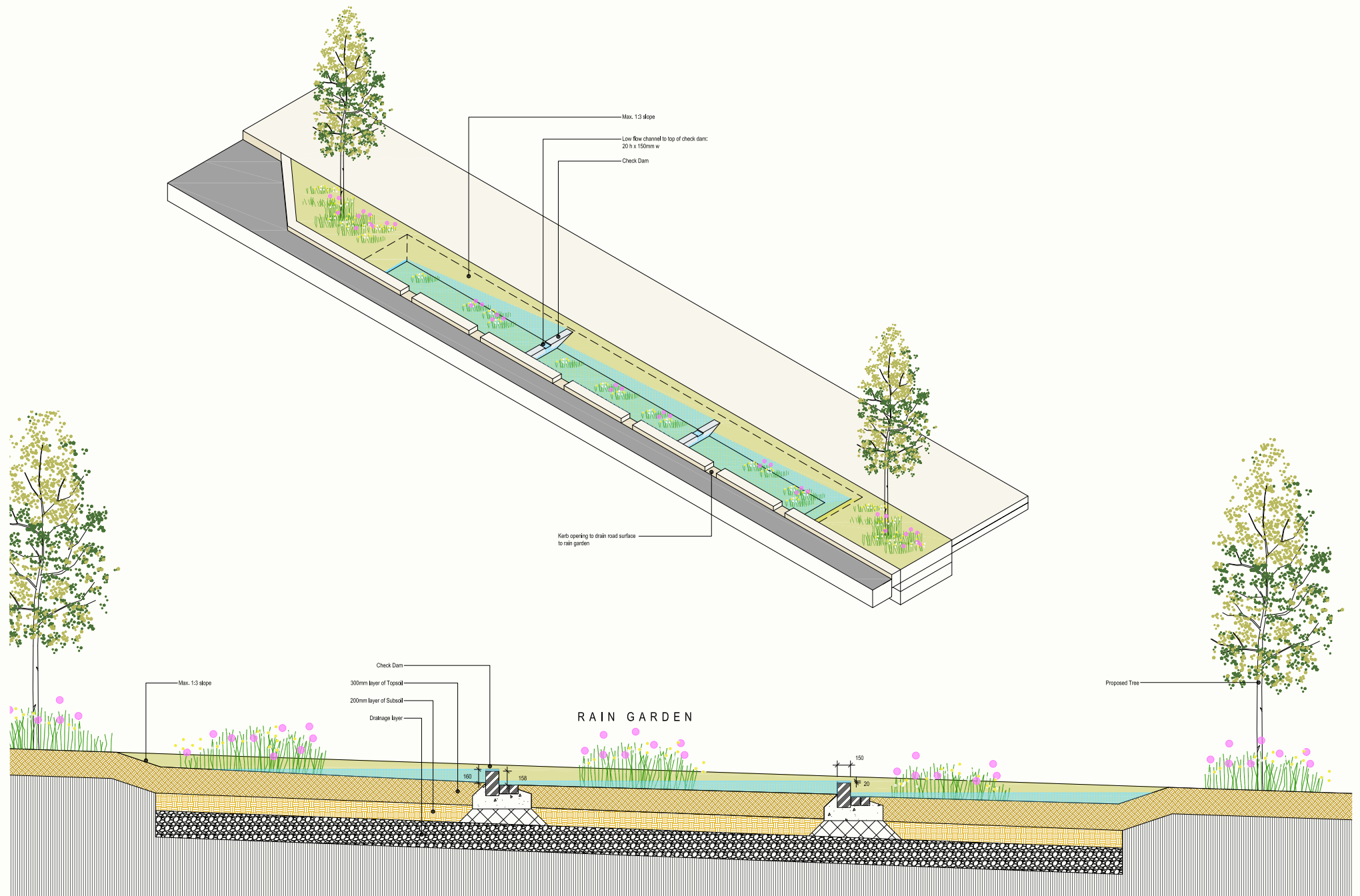


Figure 5-7: Rain Garden with Check Dam. Source: Áit Urbanism + Landscape n.d.

Project Highlight

Multifunctional solution

Providing **habitat** for wildlife and creating safe, attractive pathways for people, rain gardens also strengthen urban resilience to heavy rainfall. They slow and filter stormwater, reduce erosion and support the growth of trees and flowers, while helping protect groundwater and local waterways from contaminants.



Figure 5-9: After the intervention, the area included a pedestrian pathway integrated with linear gardens.

Source: Áit Urbanism + Landscape, 2024



Figure 5-8: After the intervention, the area included a pedestrian pathway integrated with linear gardens. Source: Áit Urbanism + Landscape, 2024



Figure 5-10: Detail of the pedestrian pathway and bespoke timber seating.

Source: Áit Urbanism + Landscape, 2024

In Cobh, Cork County Council piloted a rain garden project in East Beach to determine the **best-performing soil type for pollutant removal from urban road runoff**.

Contaminated runoff from road surfaces is directed in equal volumes to four rain gardens, where it percolates through soils containing various plant species. While the plant species are identical across the four rain gardens, each soil differs in composition, with varying percentages of gravel, sand, clay, and organic material, as well as different particle sizes (Figure 5-11).The demonstrator model was established in summer 2023, with design input from Civic Engineers, Cork County Council’s Architecture and Environment Departments, and the **invaluable support of Cobh Tidy Towns**.

Tidy Towns volunteers played a key role in the planting, which focused on pollinator-friendly

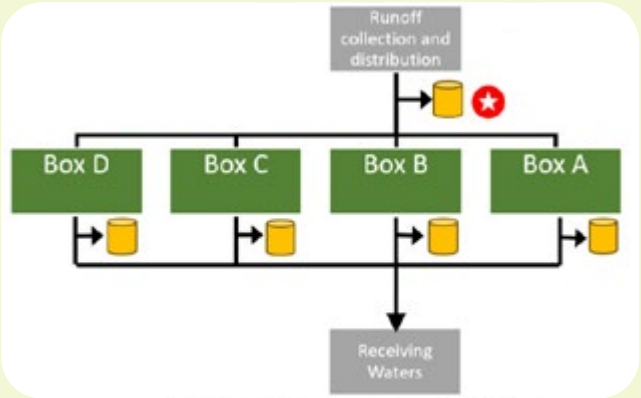


Figure 5-11: Configuration of the Rain Garden. Source: Cork County Council, 2024

species. The selection included California Lilac (*Ceanothus spp.*), Lavender (*Lavandula angustifolia*), Rudbeckia (*Rudbeckia spp.*), African Lily (*Agapanthus spp.*), Japanese Aralia (*Fatsia japonica*), Catmint (*Nepeta spp.*), and Skimmia 'Rubella' (*Skimmia japonica* 'Rubella'). While these are all **ornamental and non-native, they provide an important food source for bees and butterflies**.

This project aimed to demonstrate that rain gardens are a practical, low-cost solution for reducing urban runoff pollution. Final results from one year of monthly testing showed **impressive contaminant removal rates, ranging from 70% to 93%, depending on the soil and the contaminant**.

The project has been hugely successful. An overall best-performing soil was also identified, but each Raingarden produced significant reductions in everyday contaminants. The project demonstrates that **an alternative approach to contamination removal**

is possible with a little investment, requiring minimal maintenance. The entire year, there were no modifications or amendments to the structure, and it proved a worthwhile amenity in Cobh town. The success of this demonstrator site gives more impetus to the support of **Sustainable Urban Drainage Systems**, with exciting new opportunities and more expansive plans being developed in the locality and beyond.



Figure 5-12: Rain Garden when first established with channel cover in place (left) and after establishment with channel cover removed (right). Source: Cork County Council, 2023

	Raingarden Inlet Average	Outlets Average	%	Percentage Reduction
Suspended Solids (mg/l)	341	25	7.4	92.6
Ammonia (mg/l)	3.883	0.26	6.7	93.3
Chloride (mg/l)	4139.00	959	23.2	76.8
Total Organic Carbon (TOC) (mg/l)	60.30	8.9	14.8	85.2
Iron (µg/L)	6326	837	13.2	86.8
Lead (µg/L)	143.00	19.00	13.3	86.7
Zinc (µg/L)	325.00	38.00	11.7	88.3
Copper (µg/L)	70.00	14.00	20.0	80.0
Barium (µg/L)	336	111.00	33.0	67.0

Table 5-1: Some of the parameters analysed and results in the rain garden pilot. Source: Cork County Council, 2025

Challenges

New Approaches to Greening & Drainage

A key challenge was **communicating the design intent** for our new and innovative approaches to greening and drainage. This was addressed by preparing clear and easy-to-understand 3D details for presentation to the stakeholders and later the contractor.



Lessons Learned

- » **Work with site and context** The Belgooly raingarden details were designed to work with the continuous longitudinal fall of the road. The design and **specification of hard landscape surfaces** and details were tailored to be **easily sourced and implemented by local trades and local suppliers**.
- » **Balancing biodiversity with community use** Planting native and pollinator-friendly species along the pathway enhances local biodiversity while the pathway **encourages walking, jogging, and cycling**. Including comfortable seating along the path adds family-friendly and multigenerational spaces, providing resting spots for families, children, and older adults. This combination **strengthens community ties to nature and offers physical and mental health benefits**.
- » **Educational opportunity** Located just in front of the school gates, the **raingarden has become a valuable learning resource**. It has been used for various educational activities, including insect surveys with 1st class students and botany surveys to identify plants and raise awareness about the importance of biodiversity from an early age. The school also monitors air quality along the raingarden and tracks water depth, offering children a hands-on opportunity to engage with science and develop their understanding of the environment.



“On our return to school after the Summer 2024 break, pupils and staff noticed an increase in bee activity in a fire hydrant within the vicinity of the Rain garden. On further investigation, it emerged that we had a beehive which has since been relocated. The Rain Garden has increased an awareness and appreciation of biodiversity among the school and wider community.”

Diarmuid Hennessy
School Principal, Scoil Mhuire na nGrást Belgooly



Figure 5-13: Belgooly student surveying biodiversity around the rain garden.
Source: Belgooly National School, 2025

“When I arrive at school with my mum, we like to look at the flowers.”
- Katie

“It reminds me not to step on bugs as they are part of biodiversity.”
- Kayla



Figure 5-14: Cockchafer beetle (*Melolontha melolontha*).
Source: Belgooly National School

Figure 5-15: Bee foraging in the raingarden.
Source: Belgooly National School, 2025



“When the flowers are in bloom, it's like a big burst of colour.” - Lucia

“Seeing the insects in the flower bed makes me feel so happy” - Aniela



Figure 5-16: Cinnabar moth (*Tyria jacobaeae*).
Source: Belgooly National School, 2025

References

- » Local Authority Waters Programme (LAWPRO)(2024). Implementation of Urban Nature-based Solutions Guidance Document for Planners, Developers and Developer Agents available at: <https://lawaters.ie/publications/> [hyperlinks checked: February 2025]

Heritage and Nature:

RENOVATING TRADITIONALLY BUILT BUILDINGS WHILE PROTECTING BATS AND BIODIVERSITY



About the Project

The case study explores the **repair of an 18th-century traditional farm building** (Figure 6-1) **to conserve its cultural heritage and enhance biodiversity**. The project sought to stabilise the building and ensure it was sufficiently weatherproof for continued agricultural use while enhancing the existing biodiversity within the structure. The work was completed with a grant from the Heritage Council, whose assessment panel, comprising experts from both cultural and natural heritage sectors, identified the building as having significant habitat potential for bats and birds.

Figure 6-1: 18th-century traditional farm building before intervention.
Picture taken by Dr Niamh Roche and Anna Meenan, 2021



“Heritage and farm buildings are enormously important features for roosting bats in Ireland. We are delighted that the Traditional Farm Building Scheme continues to highlight newly discovered roosts, while also ensuring that bats remain safe from disturbance or injury during essential maintenance and restoration works. This

case study shows that it is clearly possible to carry out works to safeguard buildings for future generations, while also protecting bats and bat roost features. For the farmer, bats carry out important ecosystem services in the form of pest control, so retaining bat roosts is key to maintaining a healthy farming ecosystem.”

John Curtin
Co-Chair, Bat Conservation Ireland

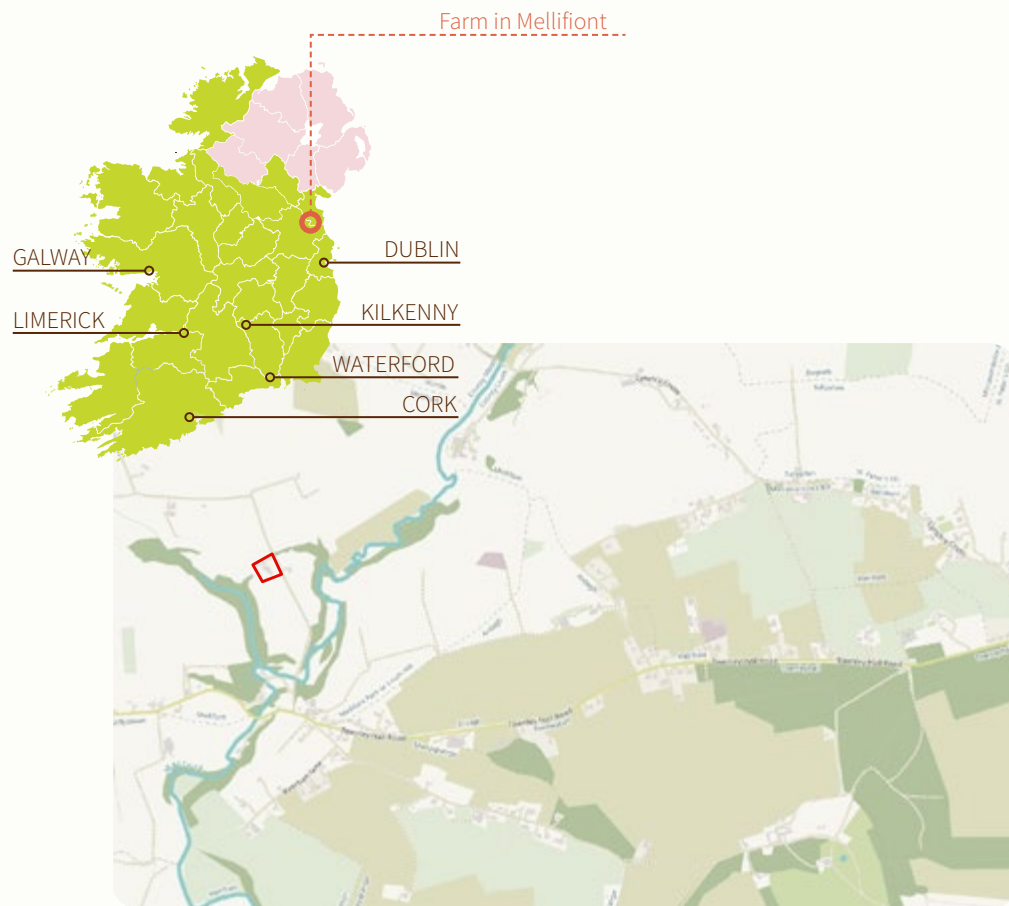


Figure 6-2: Location of Mellifont, Collon, Drogheda, Co.Meath.

Source: edited from Open Street Map (May 2026)

Keywords:

Non-Residential Development

Existing Building

Small site (under 1,000 sqm)

Cross-disciplinary collaboration

Biodiversity rich site (pre-development)

Location: Mellifont, Collon, Drogheda, Co. Meath

Client: Farmer

Budget: €21,041

Funding: Traditional Farm Building grant scheme (69%) and private funding (31%)

Start Date: September 2021

Completion Date: November 2021

Green Building Certificate: ☒ No green building certification, but the Heritage Council certified the project to the Department of Agriculture for having met all grant conditions, including those that pertain to wildlife.

Ecologist Involvement? ☒ Juanita Browne (as part of The Heritage Council grant assessment panel) and Dr Niamh Roche (Project Ecologist).

Biodiversity Metric(s) used: ☒ None.

Key Stakeholders: The Heritage Council (Coordinator), National Parks & Wildlife Service (submitting and acquiring a derogation license), Bat Conservation Ireland (database researched), National Biodiversity Data Centre (agreement and submission of biodiversity data to open database), Department of Agriculture Food and the Marine (funder of the scheme and communicated with throughout) and Owner.

Project Team:

- » **Ecologist:** Dr Niamh Roche MCIEEM
- » **Architect:** Turlough McKeivitt, FRIAI Architect
- » **Archaeologists:** Donald Murphy and Ian Russell of Archaeological Consultancy Services Unit.

Links with existing and upcoming legislation and policies:

- » European Wildlife and Natural Habitats (Bern Convention 1982)
- » Habitats Directive (92/43/EEC) – Annex IV and II
- » [Birds Directive](#) (2009/147/EC)
- » [Wildlife Act 1976](#) and Wildlife Amendment Act (2000).
- » [The National Biodiversity Action Plan 2017 - 2021](#)
- » [Meath Biodiversity Action Plan 2015 - 2020](#)

Biodiversity Status Pre-Project

A comprehensive **bat and bird survey**ⁱ was conducted to assess the habitat surrounding the building.

The farm owner (client) confirmed that **swallows** (*Hirundo rustica*) (Figure 6-3) were known to nest in the building. Swallows are an Amber-Listed species, meaning they are of ‘medium’ conservation concern (Lynas et. al., 2007).

The owner also shared details of their own environmental practices, including sowing one hectare of wild bird cover – mixed crops as habitat and food source for insects, birds, and small mammals – annually for the past four years and maintaining certified organic farming for six years. Given that the **building serves as a habitat for multiple species**, including one that is rare in County Meath, it was deemed to hold **Local or County-level Conservation Significance**.



Figure 6-3: Barn Swallow (*Hirundo rustica*) in Flight by Mildeep, 2024. Source:Wikimedia, 2026



Figure 6-4: Brown long-eared bat from National Park Service. Source: [Supercoloring.com](https://www.supercoloring.com), May 2026

ⁱ The Heritage Council publishes a list of professionals that can conduct bat/bird survey of buildings- Wildlife Panel



Figure 6-5: The exterior of the building with a stone structure.
Picture taken by Dr Niamh Roche and Anna Meenan, 2021.



Figure 6-6: The interior of the building with bat droppings accumulated on the first floor. Source: Anna Meenan, 2021

To ensure there were no negative impacts on existing habitats because of the building works, wildlife surveys were undertaken. The ecologist who conducted the bat and bird survey identified the surrounding habitatsⁱ as predominantly [organic arable land \(BC1\)](#) with areas of permanent pasture (GA1/GS2) and hedgerows (WL1) (Fossitt, 2000). Additionally, sizeable tracts of mixed broadleaved woodland (WD1) are located less than 500 meters to the west and east, lining the narrow valleys of the Mattock River and one of its tributary watercourses (FW1). The area experiences minimal artificial lighting and low traffic disturbance. The findings from the habitat survey revealed that the area provided **suitable conditions for all nine resident Irish bat species, except for the lesser horseshoe bat (*Rhinolophus hipposideros*)**, which is not found in the east of Ireland.

The ecologist conducted multiple surveys of the building, beginning with a daylight visit, followed by evening visits using a tuneable bat detector, which converts ultrasonic echolocation calls into audible

sounds. Quiet bat species, such as brown long-eared bats (*Plecotus auritus*) (Figure 6-4), which are rarely detected by bat detectors, were observed during the active bat surveys. While no active bird nests were observed, it was confirmed that the **building served as a roost for whiskered bats, brown long-eared bats, and common pipistrelle bats**. Notably, this survey marked the **first recorded whiskered bat roost for County Meath**.

The Heritage Council Panel assesses and scores biodiversity using five criteria, with Habitat Value or Potential being a key factor. To determine the building score, the panel reviewed submitted photographs, maps, and responses to specific questions. Based on their analysis of this information, combined with their professional expertise, the 18th-century traditional farm building was awarded a score of 16 out of 20 for Habitat Value or Potential, concluding that the structure has significant potential for bat habitation.

ⁱ This project referenced the Fossitt (2000) - Guide to Habitats in Ireland, published by the Heritage Council, to classify the identified habitats.

Project Intervention

The primary intervention in the building structure focused on **repairing the roof to ensure its continued use as a habitat for various bat species**. Without this repair, ongoing deterioration would have led to the bats abandoning the site. To minimise harm to the bats during the intervention, slates were carefully removed one by one, ensuring that any bats hidden in crevices between the slates or between the slates and cross battens were not disturbed. In line with the survey recommendations and the conditions of the derogation licence issued by the NPWS, an ecologist was present on-site throughout the process, observing and collaborating with workers to ensure the slate removal was conducted safely.

The original roof timbers were mostly in good condition, with only four collars requiring replacement. **No chemical timber treatments were applied**. New battens were installed, and these remained untreated. Pressure-treated softwood was used for the doors and shutters; however, there was uncertainty regarding whether a bat-safe treatment chemical had been applied to them. Repointing of the stonework was limited to areas where it was structurally necessary, preserving the building's historical character while reducing unnecessary wildlife disturbance.

The architect initially proposed the installation of a roof membrane, a waterproof layer commonly used in architectural projects to protect timber and other materials from damp conditions. However, **such membranes are known to pose serious risks to bats**. Typically made from long polypropylene or polyethylene fibres, these membranes can entrap bats by their feet or wings, often leading to injury or death. As a result, the Heritage Council rejected their use.

This decision highlights the **difference between architectural and natural heritage priorities and underscores a gap in awareness within the sector about the potential risks certain materials and methods pose to wildlife**. It also emphasises the need for clearer guidance on wildlife-friendly practices. In this context, the project achieved its primary objective of shifting attitudes toward building renovation by prioritising ecological sensitivity in restoration practices.



Bats and Building Retrofit

Bats frequently roost in roof spaces and other parts of buildings. They may be found under the slates, hanging from roofing felt, parging or timbers, and in joints and splits in roof timbers.

Bats do not pose any significant threat to the fabric of a building or to the health of its human occupants. They are usually only present in the roof space for part of the year but, as they tend to return to the same roosts every year, the roosts should be protected whether bats are present or not. **Bats and their roosts are protected by Irish and EU legislation.** The **Wildlife Acts**

make it an offence to wilfully damage or destroy the breeding or resting place of bats. Even where planning permission has been granted, or works to a roof are considered exempt development, the requirements of the Wildlife Acts still apply.

All bat species found in Ireland are also listed under Annex IV of the EC (**Birds** and **Natural Habitats**) Regulations and, as a result, **works that would capture or kill them, damage or destroy their roosts or disturb them at important parts of their life cycle cannot take place without first obtaining a derogation licence** from the National Parks & Wildlife Service- NPWS.

Further Reading

For more detailed information, please refer to the following resources:

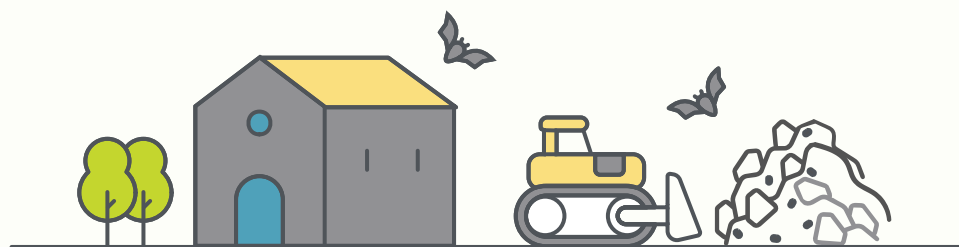
» **Bat Mitigation Guidelines for Ireland v2 (2022)** – published by the National Parks and Wildlife Service, available [here](#).

» **Guidance on Managing and Protecting Bats in Historic Buildings** – published by Eurobats, available [here](#).
 » **Bats in Heritage Structures** – published by Bat Conservation Ireland, available [here](#).

Biodiversity Status Post-Project

As of February 2025, the post-intervention biodiversity survey has not yet been undertaken. However, the ecologist's analysis determined that the **restoration work has enhanced the building's suitability as a habitat for roosting bats.**

The repaired roof now offers protection from environmental elements and ensures more stable internal temperatures. As a result, the intervention is not anticipated to have adverse effects on the local bat population. In contrast, had the roof not been repaired, **ongoing deterioration would have led to structural instability, temperature fluctuations, and damp conditions**, which are detrimental factors to sustaining or improving the existing bat population. Therefore, the **intervention supports the principle of no net loss of biodiversity in the long term.**



Co-Benefits

Cultural heritage impact

The restoration and repair of traditional buildings, along with associated elements such as gate-piers, surfaces, and walled gardens, significantly enhance cultural heritage. These efforts often lead to the **discovery of cultural artefacts and facilitate the transfer of traditional building skills from specialists to local communities** through direct participation, which is essential for the long-term preservation of these structures.

According to the [Evaluation of the Traditional Farm Buildings Grant Scheme 2022](#), the initiative generates employment opportunities for local craftspeople and conservation specialists and encourages the use of locally sourced materials. It also increases local awareness of the cultural heritage value of these buildings, promotes active custodianship, and delivers positive economic impacts at the community level.



Figure 6-7: The building before and during restoration. Source: Anna Meenan, 2021



Figure 6-8: Bats in the roof rafters. Source: Anna Meenan, 2021



Project Highlight

Collaborative knowledge-building and learning process

The project embraces a collaborative knowledge-building and learning approach, **encouraging the exchange of expertise and insights among a diverse group of stakeholders**, including conservation specialists, historians, architects, ecologists, and local community members. This inclusive and horizontal process combines local knowledge with professional expertise in traditional construction methods, sustainable practices, modern techniques, and appropriate materials. The goal was to restore the building's structural integrity in a manner that reflects its historical significance and cultural heritage while simultaneously promoting biodiversity both within the structure and in the surrounding environment.



Figure 6-9: Meeting between Heritage Council and farm owner discussing the guiding principles of the traditional farm building scheme. Picture taken by David Humphries, 2011



“Why not do it? Why not try? We are in a biodiversity crisis and anything we do to help wildlife will help us. This photo (Figure 6-9) was taken by David Humphries many years ago, but I love it because I was discussing the ethos of the scheme with the owner and builder and also it was taken unbeknownst to me. It’s a conversation, not an instruction. It was taken in the owner’s farmyard and we’re all standing on the same ground.”

Anna Meenan, Heritage Council

Challenges

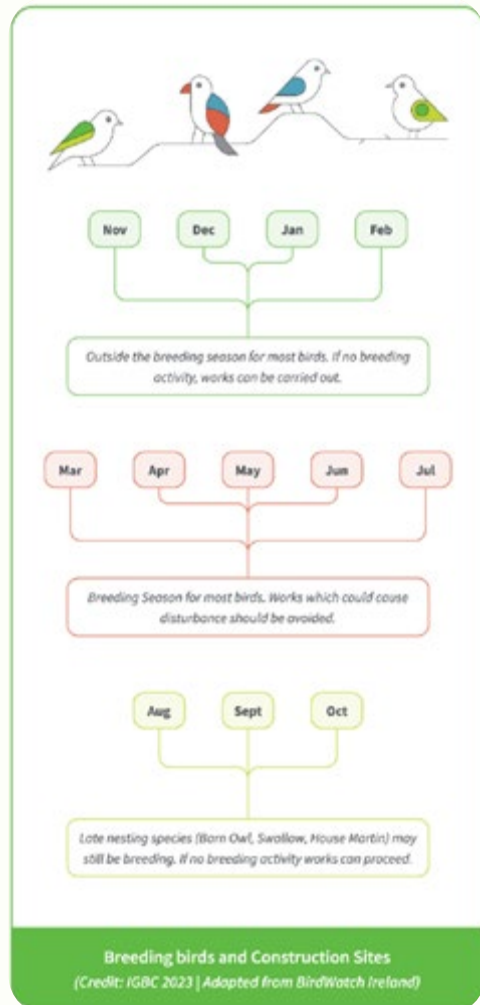


Figure 6-10: Breeding Birds and Construction site. Source: [IGBC, 2023](#), adapted from BirdWatch Ireland

» Aligning work planning with the breeding season and grant scheme timeline

Over 70% of projects under the Traditional Farm Buildings Scheme, including this one, have been identified as wildlife habitats. To minimise disturbance to roosting bats and nesting birds, **work must be scheduled outside the breeding season**, typically requiring repairs to begin between September and November at the latest (Figure 6-10). However, the **Grant Scheme operates on an annual calendar, creating a challenge for planning**. When the work specifications were drafted in May 2021, neither the client nor the architect was aware of the building's wildlife status and therefore could not account for it in the project design. The client only mentioned swallows nesting in the building, but the **presence of other protected species was**

only confirmed following the ecological surveyⁱ conducted in July 2021. This delay highlights the inherent difficulty in planning work on buildings that serve as wildlife habitats until the presence of protected species is confirmed.

» Transitioning to ecologically sensitive building practices

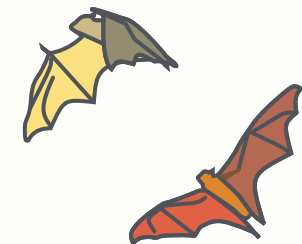
The project sought to stabilise the building and, simultaneously, enhance the existing biodiversity within the structure. However, achieving this balance presented challenges. For instance, **without proper guidance, a roof membrane might have been used, which is hazardous to bats**.

Similarly, commonly available **timber treatments are toxic to wildlife, and verifying whether the materials used were**

bat-safe was difficult. These issues highlight concerns that, if unaddressed, could undermine the project's biodiversity goals.

This stresses the need to **raise awareness and integrate best practices across the sector**.

For example, although timber treatment is often specified, it is not always necessary. Developing a deeper understanding and having careful consideration of such practices can help minimise risks to wildlife and foster more ecologically sensitive approaches.



ⁱ Surveys are typically conducted between May and September, although climate change is increasingly influencing the timing of biodiversity events, which in turn affects the optimal period for conducting surveys.

Timber Treatments

For detailed information about bat-friendly timber treatments, please consult the [Natural England webpage on timber treatment products](#).

Roofing Membranes

With regard to roofing, very few modern membranes are suitable for use in bat roosts. **Bitumen 1F** is one exception that has been demonstrated to be safe for bats in the long term. This material will not get caught in bats' claws or ball up in a way that could potentially entrap bats.

Two newer breathable roofing membranes, **TLX Batsafe** and **SIGA Majcoat 350**, have passed snagging propensity testing. However, due to limited long-term performance data, their use is recommended only in roosts with low bat activity and small

bat populations. They should not be used in known maternity roosts or roosts with high numbers of bats.

Siga Majcoat 200 or lower are not suitable for use in bat roosts.

Alternative Roofing Options

Another bat-safe option to consider is **roofing sarket boards**, such as the [Hunton Sarket product](#).

Roofing Materials and Bat Preferences

Many bat species show a **preference for buildings with natural slate roofing**. Whenever possible, re-roofing of buildings should:

- » Use **salvaged natural slate**
- » Use **new natural slate** that matches the original roof's thermal characteristics.

» Difficulty in sourcing an ecologist

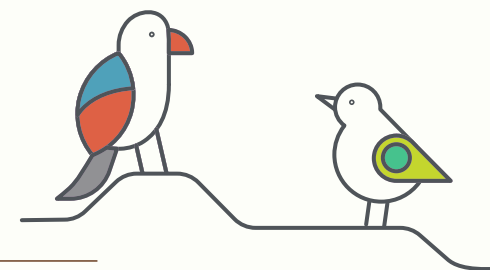
The project faced challenges in finding an ecologist, reflecting a **broader shortage of ecologists** highlighted by several organisationsⁱ.



Figure 6-11: No breathable felt used.
Source: Anna Meenan, n.d..

» Insufficient biodiversity records in the area

A search of the Bat Conservation Ireland database revealed only one bat record within 1 km of the building, a soprano pipistrelle (*Pipistrellus pygmaeus*) recorded in 2017. However, this does not necessarily indicate that bats are rare in the area; rather, it may reflect a lack of recorded observations or unsubmitted data to the National Bat Database or the National Biodiversity Data Centre. This highlights the **importance of conducting thorough investigations to accurately assess the local biodiversity and potential for net gain..**



ⁱ See Chartered Institute of Ecology and Environmental Management (CIEEM, 2022) and [Irish Green Building Council's National Upskilling Roadmap 2030 \(2024\)](#)

Lessons Learned

» Building an evidence base through data collection

Data recording and evidence-building are essential. Engaging a multidisciplinary team ensures that environmental, cultural, and structural aspects of a building are rigorously evaluated. **Involving an ecologist early in project development is critical to understanding local biodiversity**, and additional expertise may be required based on the project's complexity. For example, no cleaning of old walls should proceed without an assessment by a qualified botanist who understands local plant species and their ecological significance and vulnerability. The Heritage Council's assessment panel reviews the initial information provided to identify the expertise required before a project advances.



» Aligning grant timelines with wildlife patterns

The **annual grants calendar often conflicts with wildlife cycles, which are increasingly influenced by climate change**. For instance, birds and bats now remain in buildings beyond traditional dates, such as the end of August for birds and the end of October for bats (depending on the species and roost type). This misalignment can delay building repairs and disrupt project planning. To address this, the **Heritage Council provides additional flexibility within the constraints of the annual grants calendar**.



Figure 6-12: Restoration completed. Photo by Gerry Tobin, n.d..



Figure 6-13: Brown long eared bat. Photo by Gerry Tobin, n.d..

- » **Reevaluating timber treatments** Timber treatments are not always necessary; addressing the root cause of issues like dampness often resolves the problem more effectively. As highlighted by Ridout (2001) **building professionals should prioritise identifying the sources of the issues before deciding on the remedy**. If timber treatment is required, it must be non-toxic to wildlife. Ensuring the use of wildlife-safe pretreated timbers is critical, yet the inspection and certification of materials are not consistently practised across the construction sector. To promote best practices, the Heritage Council and Bat Conservation Ireland recommend consulting resources like [Natural England](#)'s guide, which **regularly updates research on bat-safe chemicals**.



More guidance for bats and birds in buildings

- » [Bats in Buildings Guidance Notes for: Planners, engineers, architects, and developers](#)
- » [Birds and the Traditional Farm Buildings Scheme](#)
- » [Protection of overground roosts for bats](#)

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Nature-based Solutions to Improve Water Quality Runoff



About the Project

“**Bog Field Nature-based Solutions**” project is located on the outskirts of Carrick-on-Suir in County Tipperary (Figure 7-3). This approximately 3,000 sqm area incorporates new thinking in the application of Nature-based Solutions and public amenity **placemaking**. It involved the construction of **Sustainable Drainage Systems** (SuDS), including grassed conveyance strips, swales, a settlement **forebay**, and a retention pond.

These **Nature-based Solutions** (NbS) were designed to deliver critical **ecosystem services**, including the purification of polluted surface water runoff before entering the River Suir. The Lower River Suir is a designated **Special Area of Conservation** (SAC) [Site Code: 002137], home to one of Ireland's most important spawning grounds for the Twaite shad (*Alosa fallax*) (Figure 7-2), a protected fish species classified as vulnerableⁱ in Ireland.

ⁱ ¹ As per vulnerable as per King et al, 2011.

King, J., Marnell, F., Kingston, N., Rosell, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Fish, Amphibians & Reptiles. National Parks and Wildlife

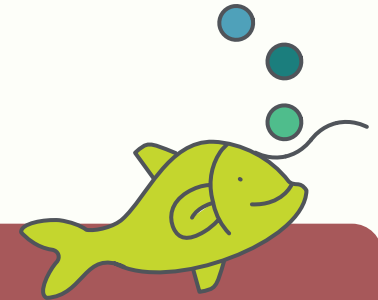
Figure 7-1: Swales and infiltration pond as nature-based solutions to improve water quality of road runoff. Source: Ben O'Keeffe, 2024



Figure 7-2: *Twaite shad, Alosa fallax*: protected rare fish species that spawns in the River Suir adjacent to the site in the months of May or June each year depending on temperature. Illustration of a *Twaite shad*, by Steven Hall. Source: <https://unlockingthesevern.co.uk>, 2026

The initiative features vegetated swales enhanced with extensive native planting, providing enriched habitats for both aquatic and terrestrial wildlife. Additionally, these NbS features, and associated vegetation, are designed to slow surface water runoff and gradually release it over time.

This process involves the interaction of physical, chemical, and biological mechanisms among vegetation, microorganisms, and soil substrate, which promote nutrient cycling and enhance water quality by effectively removing or significantly reducing both organic and inorganic pollutants, such as nutrients, heavy metals, hydrocarbons, pesticides, and microplastics (Ferreira et al., 2023). This approach also prevents soil erosion, maintains soil moisture, supports groundwater recharge, and enhances **ecosystem resilience**. (UN Environment-DHI, UN Environment and IUCN, 2018).



“Rainwater management using Nature-based Solutions mimics the natural drainage processes to reduce the effect on the quality and quantity of stormwater runoff from impermeable surfaces and provide amenity and biodiversity benefits.”

Dr. Fran Igoe
Regional Co-ordinator LAWPRO



Figure 7-3: Location of the project. Carrick-on-Suir, on the southeast edge of the town. The bog field was previously composed of rough ground with rubble and infestations of invasive plants, including Japanese knotweed.

Keywords:

Public Realm

Medium Site (1,000 to 5,000) sqm

Proximity of a protected area (e.g., SAC)

Community Engagement

Climate Adaptation

Pollution Management

SuDS

Detention Basins

Swales

Ponds & Wetlands

Location: Carrick-on-Suir, County Tipperary

Project Lead: Tipperary County Council

Budget: €31,150

Funding: Publicly funded by the Local Authority Waters Programme (LAWPRO) and the Department of Housing, Local Government and Heritage (DHLGH)

Start Date: September 2024

Completion Date: November 2024

Green Building Certificate: ☒ None.

Ecologist Involvement? ☒ Dr. Fran Igoe

Biodiversity Metric(s) used: ☒ None.

Key Stakeholders:

- » **Local Authority Waters Programme (LAWPRO):** Funder. Provided ecological and engineering advice to Tipperary County Council.
- » **Elected Officials:** Authorised the works on behalf of Carrick-on-Suir Municipal District.
- » **Carrick-on-Suir Lions and District Club:** Promoted the project and contributed to supplying the wetland reeds.
- » **Tirlán:** Site owner. Permitted Tipperary County Council to carry out the works.

Project Team:

- » **Architect and Landscape Consultant:** Cathal O'Meara - Cathal O'Meara Landscape Architects
- » **Ecologist:** CDr. Fran Igoe - Local Authority Waters Programme (LAWPRO)
- » **Civil Engineer:** Denis Power & Ben O'Keeffe - O'Keeffe Ltd
- » **Local Authority:** Tipperary County Council

Links with existing and upcoming legislation and policies:

- » **Habitats Directive (92/43/EEC)**
- » Water Framework Directive (2000/60/EC)
- » [Birds Directive](#) (2009/147/EC)
- » Environmental Impact Assessment (EIA) Directive (2014/52/EU)
- » [National Biodiversity Action Plan 2023 – 2030](#)
- » [Water Action Plan 2024](#)
- » County Tipperary Biodiversity Plan 2025-2030 (Draft)

Biodiversity Status Pre-Project

The site consisted of **rough ground and open, grassy areas of low biodiversity value, used by the public.**

The riverbank area had been heavily infested with **invasive species**, including [Japanese Knotweed](#) (*Reynoutria japonica*). Since 2018, the local community (Carrick-on-Suir & District Lions Club) has led ongoing efforts to remove these plants, continuing through to the present (2025).

Additionally, road drainage from the R680 and R676 routes previously discharged untreated water runoff into the Lower River Suir SAC through existing gullies (Figure 7-5).



Figure 7-4: Map illustrating the proximity of the site to the River Suir. AA screening was carried out to ensure that the project did not pose any risk to the site. Invasive Japanese knotweed has previously been treated and eradicated from the site by the local Lions Club and partners



Figure 7-5: Photos illustrating the pre-existing problem at Carrick bog field: A) Road water runoff carrying silt and blocking the drains at A. B) Silt and petrochemicals are being carried into the site C) Dirty road runoff is being conveyed into the River Suir. Source: Fran Iggoe, n.d..

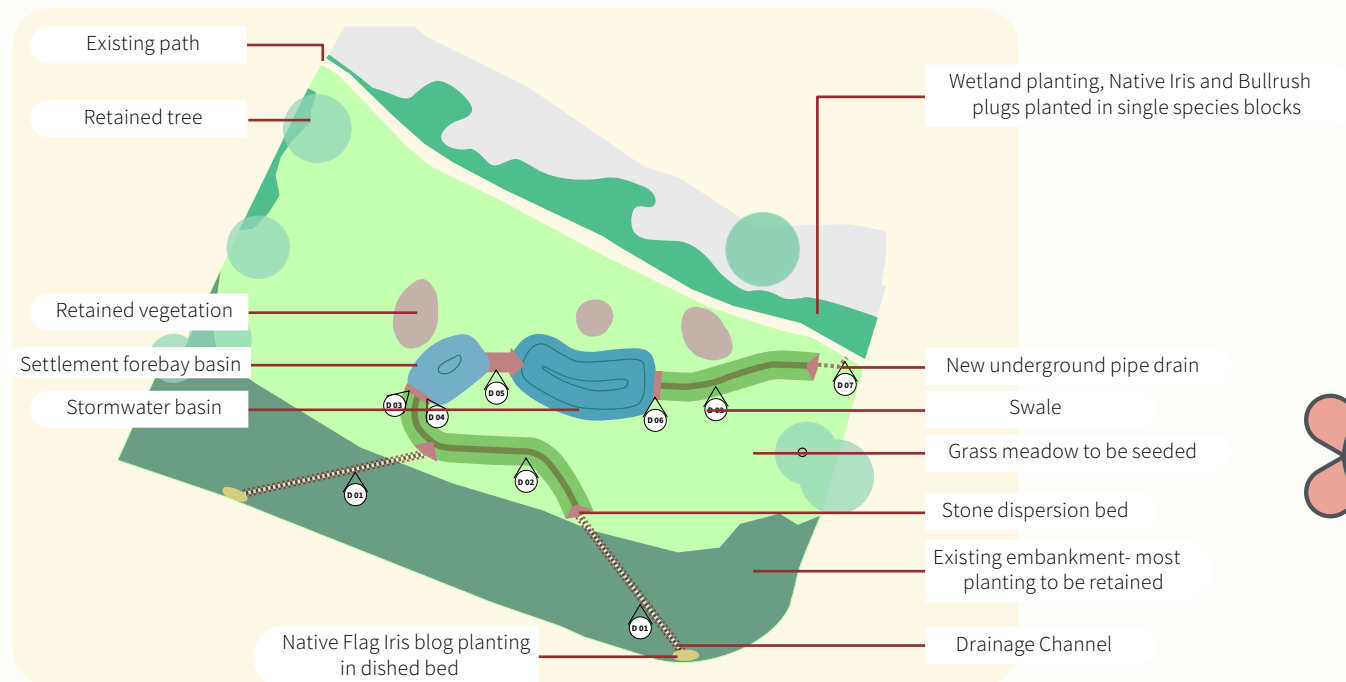
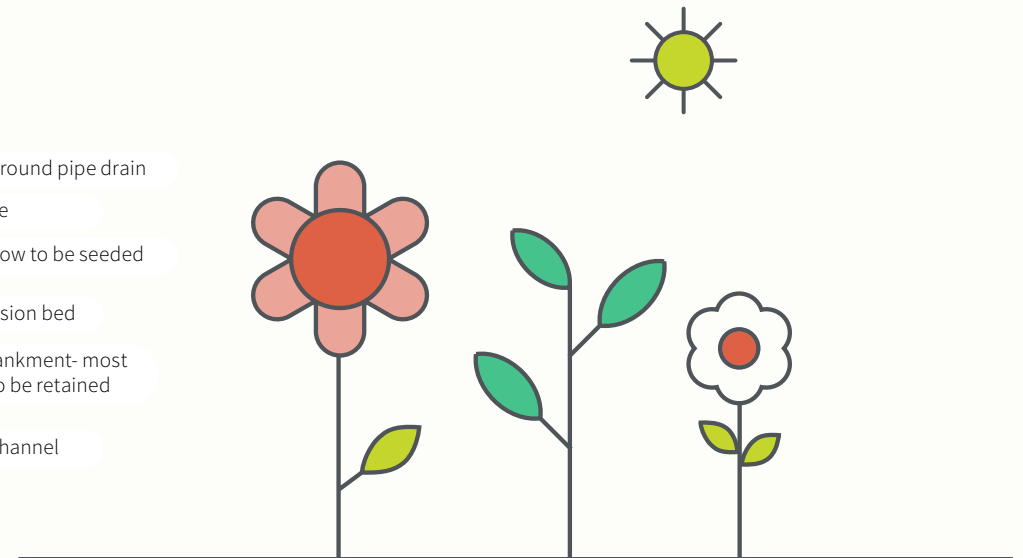


Figure 7-6: Project Design. Adapted from Cathal O'Meara Landscape Architects, 2024
Refer to page 7:13 for the full technical drawing and information

The project (Figure 7-6) **involved implementing swales and retention ponds** to slow water flow and filter pollutants from surface road drainage before they enter the Lower River Suir SAC. The landscape design was developed in partnership with the local community and the Carrick-on-Suir Lions and District Club. The design includes basic NbS features such as swales, ponds, and native tree and herb planting. A conveyance and attenuation swale is a shallow vegetated channel. It was used as it is well-suited to managing pavement runoff.

Retention ponds are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff. They have a strong capacity to remove urban pollutants and bring high ecological, aesthetic, and amenity benefits. (CIRIA, 2007).



Key objectives include:

- » **Biodiversity enhancement:** Promoting biodiversity within the project area.
- » **Flood mitigation:** Reducing and slowing the volume of water discharged into the River Suir.
- » **Pollution control:** Minimising pollutants in surface water runoff, including hydrocarbons, road abrasion particles, car window washer fluid, coolant, de-icer, and other chemicals.
- » **Improving green spaces:** Enhancing amenity areas and supporting **carbon sequestration** through greening, rewilding, and rewetting efforts.

Construction Phase and Completion



Upslope view from river:

Site preparation and swales under construction. Note the small foot bridges installed to facilitate and manage public use of the area as an amenity.



Downslope view from the road:

Swale running into ponds in the foreground. Note the River Suir in the background.



Completed project:

Toddler and dog-proof fencing was placed around the main pond to address concerns raised regarding safety. The aesthetics of the project were an important consideration due to its proximity to the River Suir Blueway.



Planting:

Native plants including **Yellow Flag Iris** (*Iris pseudacorus*) were planted by the local community to enhance biodiversity in the area.



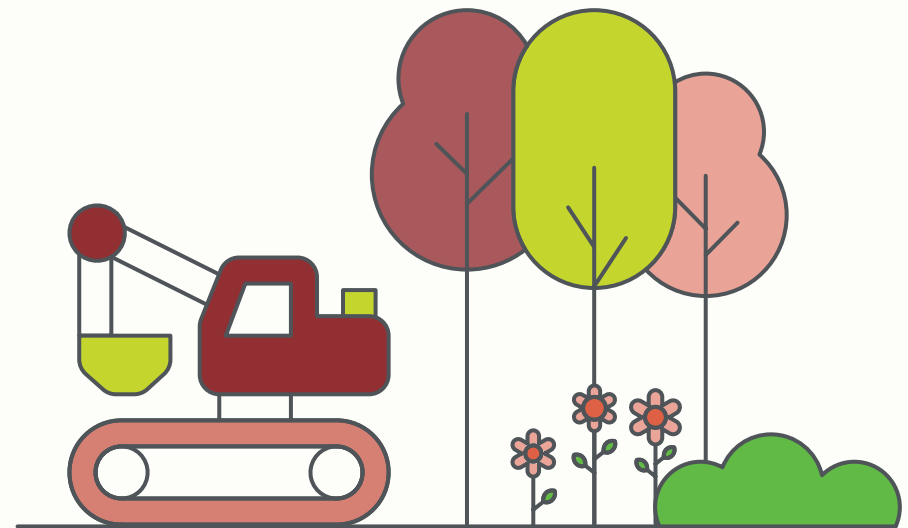
Established project:

Bog Field in August 2025

Implementation of Urban Nature-based Solutions

Based on feedback from local authorities and professionals working in the area, the **Local Authority Waters Programme** (LAWPRO) identified the need for guidance on the incorporation of nature-based solutions for the management of urban rainwater and surface water. An “Implementation of Urban Nature-based Solutions Guidance Document for Planners, Developers and Developer Agents”, which outlines interventions that can be easily incorporated, was subsequently published.

Link: https://lawaters.ie/publications/#filter=*



Biodiversity Status Post-Project



Figure 7-7: Retention Pond with Yellow Flag Iris (*Iris pseudacorus*)

The project is now several months from completion. A small retention pond has been established, and the swales are in the process of being vegetated. Achieving full functionality will require time and ongoing monitoring. The **project offers potential benefits for amphibians through the pond feature and for dragonflies through the creation of suitable habitats.** Over time, the swales, if allowed to develop sufficient vegetation cover, could also provide shelter for otters.

Birdlife

The retention pond has been visited by both **Grey Wagtail** (*Motacilla cinerea*) and **Pied Wagtail** (*Motacilla alba*), indicating the early establishment of a functioning ecosystem.

Aquatic Vegetation

Constructed underground structures used to create voided space to contain a soil and/or storage volume and protect the root space of one or more trees when located within a paved area.

Future Monitoring

The site will be continually monitored twice weekly, with a particular eye out for the **arrival of dragonflies and damselflies.**

Aquatic and Terrestrial Invertebrates

The appearance of invertebrates is proceeding in a typical seasonal sequence. The following species have been observed so far:

- » **Whirligig Beetle** (*Gyrinus substriatus*)
- » **Common Pond Skater** (*Gerris lacustris*)
- » **Great Diving Beetle** (*Dytiscus marginalis*)

Additionally, **Red Mason Bee** (*Osmia bicornis*) has been seen collecting excavated mud from the retention pond edge, presumably for nest construction elsewhere. It is worth noting that they are not nesting on-site, but their activity is concentrated close to the water's edge. **Banded Demoiselle** (*Calopteryx splendens*) was observed in the adjacent field, which is a positive sign. However, additional submerged vegetation will likely be required to support a broader range of aquatic life.

Co-Benefits

Amenity enhancement

The project includes **controlled public access** through the **addition of pathways, significantly improving the area's usability**. Community feedback has been overwhelmingly positive.

Educational opportunities

The site offers potential benefits for local biodiversity and could **serve as an outdoor classroom for children**, fostering environmental engagement. For example, for UN World Wetlands Day in February 2025, the Carrick-on-Suir & Districts Lions Club gave a presentation to local 5th & 6th-class students, sharing some of the highlights of the project.

Climate change adaptation

The vegetated swales help in **managing stormwater by slowing runoff, storing it in ponds, and releasing it gradually** (Figure 7-8). This natural approach helps **reduce flood risks** and strengthens the catchment's resilience. In general, **swales** reduce the **urban heat island effect** by providing cooling via the return of moisture to the air through evapotranspiration from vegetation.



Figure 7-8: Road runoff is discharged directly into a grassed conveyance strip that flows into a newly planted swale below. Source: Ben O'Keeffe, 2024

Project Highlight

This project introduced NbS to treat contaminated road runoff and safeguard a riverine SAC. It attracted attention within the local council chamber, where a previously sceptical councillor, after observing its progress and development, recognised the project's significance and offered full support for the initiative.



Figure 7-9: Bog Field in August 2025. Source: Fran Igoe, 2025



“The Bog Field in Carrickbeg had previously been unused and was derelict. It had become a location for anti-social behaviour with individuals lighting bonfires at the site. The completion of the Nature-based Solutions at the Bog Field has created an amenity and biodiversity area that can potentially be utilised by the community in Carrick now and long into the future.”

Councillor David Dunne
Carrick-on-Suir

Challenges

Securing funding & managing budget

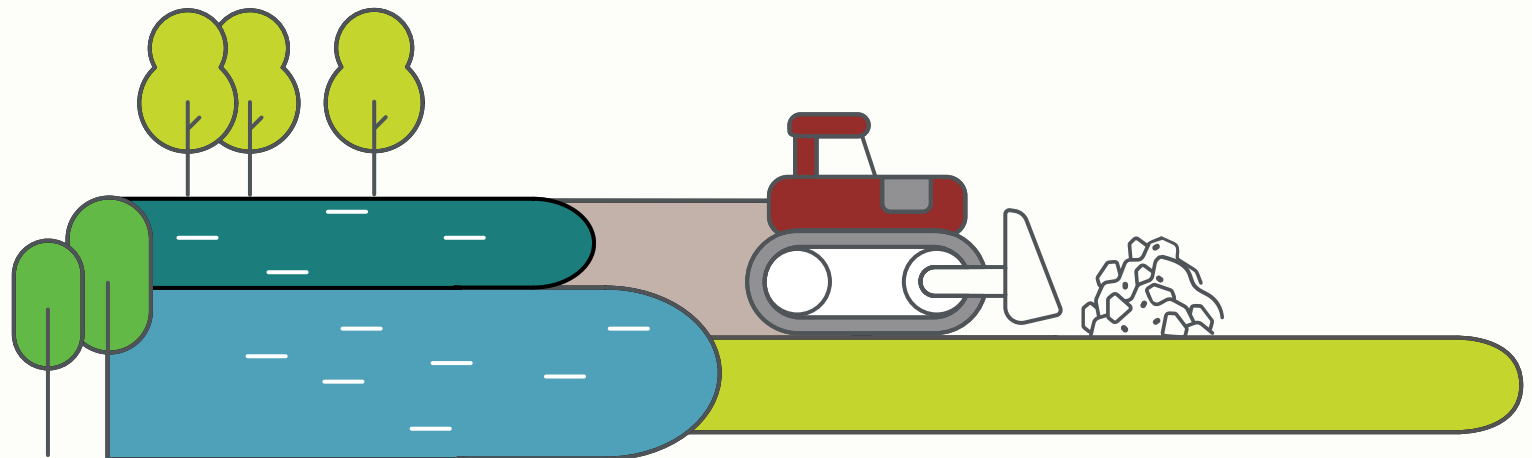
Ensuring adequate financial resources for the project presented significant challenges. The grant funding Tipperary County Council received from LAWPRO was a fixed amount, and thus, the **project budget had to be managed extremely carefully**. A great emphasis was placed on **minimising and avoiding variations during the construction stage**. This was achieved by completing a thorough design process, culminating in the production of detailed drawings and specifications by the designer. This allowed the contractor to accurately price and effectively deliver the works with minimal changes.

Collaborative engagement

Coordinating with a diverse range of stakeholders, including the National Parks and Wildlife Service (owing to the proximity of the site to the adjoining SAC), Tipperary County Council, LAWPRO, the local community, elected officials, and the site owner, devoted considerable time and effort to align priorities and secure collective buy-in. This **effective and early engagement was a key factor in the successful delivery of the project**.

Construction difficulties

The site posed construction challenges due to the **difficult ground conditions** encountered, which made excavation and adherence to the design somewhat difficult in certain locations. The presence of large boulders resulted in the need to alter the pond layout to ensure design volumes were achieved. The site is also prone to flooding, and the **contractor's task scheduling needed to be flexible** to ensure excavation work was carried out during dry weather periods. **Working with an experienced contractor was key** in the successful delivery of the project.



Lessons Learned

- » **Thorough design helps with budget control** With fixed funding from LAWPRO, **careful budget management** is essential. A thorough design process, including detailed drawings and specifications, is needed for accurate pricing and to minimise costly changes during construction.
- » **Community engagement** One of the key benefits of the project lies in the process itself as it allowed the team to **raise awareness about biodiversity**, and the nature-based approach as critical in addressing water quality issues (e.g., contamination from road water runoff) within the local community and relevant state agencies. Carrick-on-Suir and District Lions Club continue to **promote the benefits delivered by the project within the local community**.
- » **Health and safety concerns** To address safety concerns raised during construction, it was agreed that a **perimeter fence around the pond should be incorporated into the final design**. A wicker fence was erected around the pond, which prevents unauthorised entry by people to the water feature, whilst still facilitating the movement of wildlife.

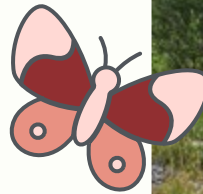
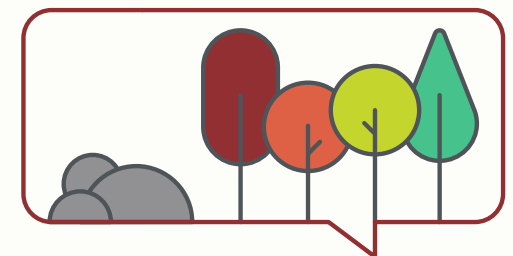
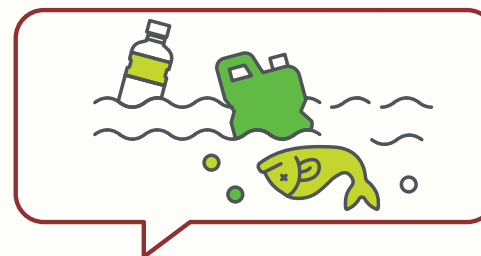
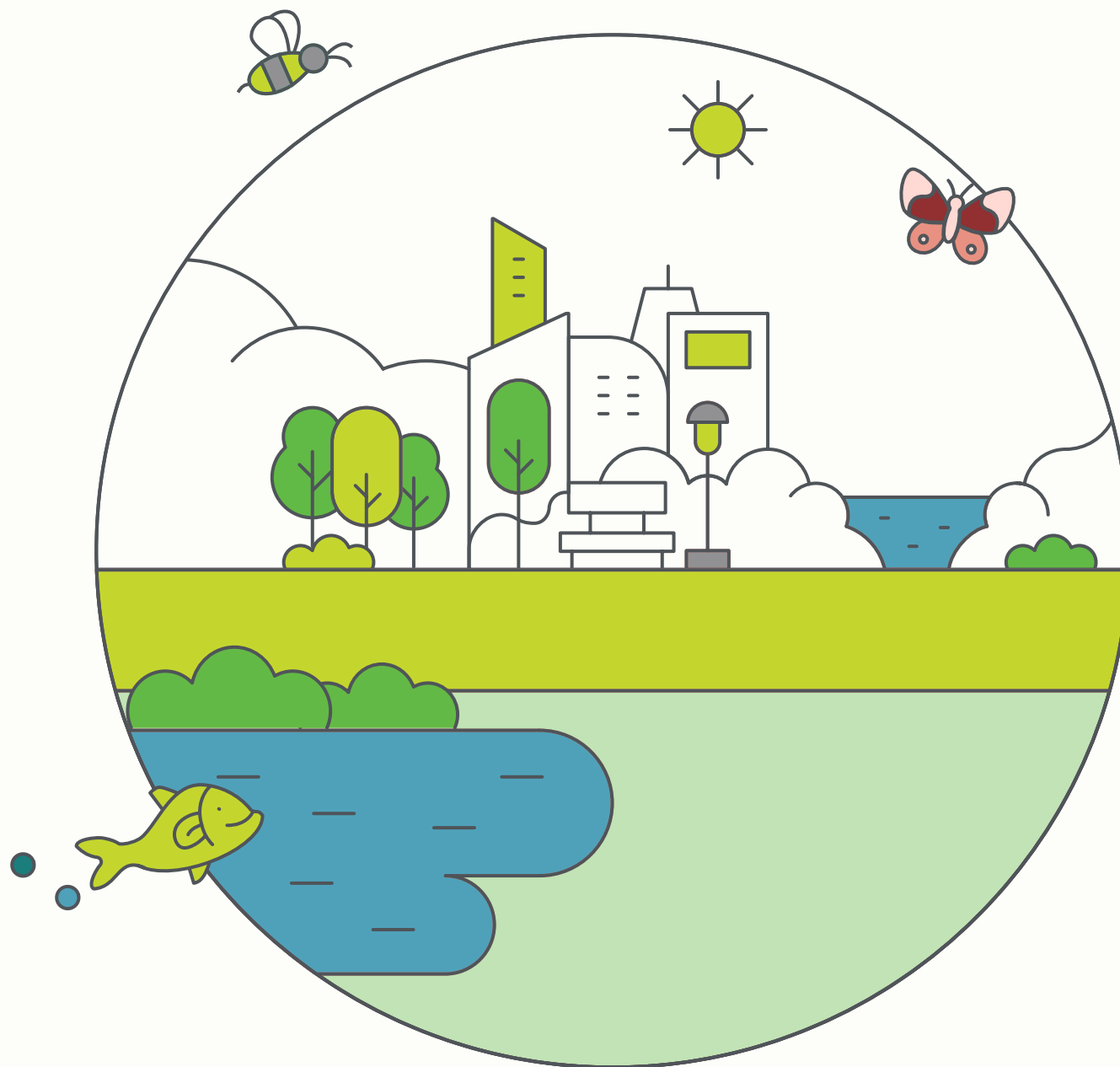


Figure 7-10: Bog Field in August 2025. Source: Fran Igoe, 2025

Fences are not always needed. An alternative approach to ponds and basins may also be used. These include the use of shallow gradients, which may require a low post and rail fence to be erected to prevent small children from gaining access until vegetation establishes more fully.



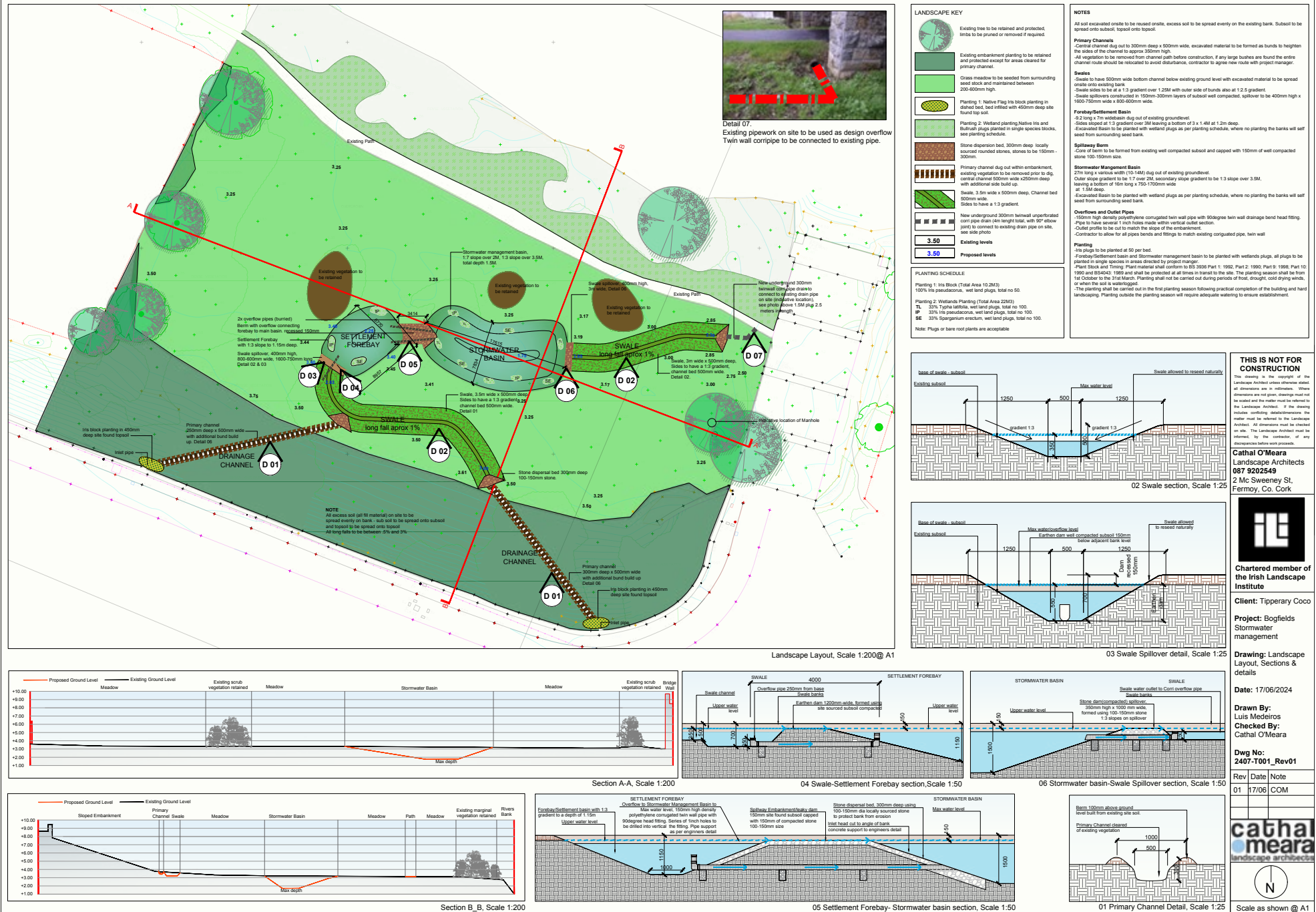


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[All hyperlinks accessed January 2025]

Case Study 7 - Improving Water Quality Runoff



Technical Drawing of Bogfield SuDS, Cathal O'Meara Landscape Architects, 2024

Developing a Biodiversity Strategy



Figure 8-1: Hedgehog (*Erinaceus europaeus*)



“Developing a biodiversity strategy showed a clear gap in guidance for Ireland’s built environment sector. By creating a comprehensive, freely available strategy and guidelines, we aimed to not only support biodiversity within our organisation but also influence the wider sector. A strong biodiversity plan is now essential for meeting ESG and green finance expectations - helping to manage environmental risks, attract investment, and drive sustainable growth aligned with both environmental and financial goals”

Susan Vickers
Head of Environmental Sustainability, Clúid Housing

Keywords:

Strategy Development

About the Project

Ireland ranks 227th out of 240 countries in the [Biodiversity Intactness Index \(BII\)](#): a tool developed by the Natural History Museum of London in 2018 to measure the impact of human activity on ecological communities. Given the impact of the construction industry on biodiversity loss, organisations from this sector have both a responsibility and an opportunity to help reverse this decline by **mitigating the impact on the environment through design innovation and work practice.**

There are many **challenges** to implementing biodiversity measures and nature-based solutions in new residential developments – and, more broadly, across the built environment. These range from **a lack of industry knowledge** (for example, how to prepare and treat soil correctly) to **limited awareness of the benefits, poor collaboration between disciplines**, and the **absence of ecologists** at the **early stages of planning**ⁱ. As a result, opportunities for impactful, integrated nature-based solutions are missed.

Developing a **Biodiversity Strategy** can help overcome these barriers and ensure nature is not an afterthought, but a core design driver. This case study examines Clúid Housing’s approach to developing its [Greening Strategy](#). Including a [Landscaping and Biodiversity Guide for New Developments](#), their experience provides a practical model that **can be adapted to the wider built environment sector.**

ⁱ From findings for “[Main Challenges To Incorporating and Maintaining New Nature-Led Residential Developments at Scale](#)”- IGBC, 2025

Drivers

There are **several reasons** for organisations involved in the built environment sector **to develop a clear biodiversity strategy**, including:

- » **Regulatory Compliance:** Compliance with **EU directives** such as the **Birds Directive** ([Directive 79/409/EEC](#)) and the **Habitats Directive** ([Council Directive 92/43/EEC](#)), the **Wildlife Act 1976** (as amended) as well as national and local planning regulations and policies reduce the risk of delays, fines, or planning refusals.
- » **Future Regulations:** Developing a robust strategy can also help **to prepare for anticipated regulatory requirements**, such as **Biodiversity Net Gain** (BNG), hence building capacity within an organisation.
- » **CSR, Corporate Reputation & ESG Goals:** A strong biodiversity strategy supports **Corporate Social Responsibility** (CSR) objectives by providing a flexible framework with low or no-cost actions. At the same time, it strengthens an organisation's **Environmental, Social, and Governance** (ESG) performance, enhancing credibility and stakeholder trust.
- » **Financial and Market Advantage:** Investors and clients increasingly prioritise sustainability, and demonstrating leadership in the preservation and enhancement of biodiversity can provide a competitive edge. For instance, the **EU Taxonomy of Sustainable Finance Activities** - [EU Taxonomy Regulation \(EU 2020/852\)](#) - include requirements on biodiversity.
- » **Environmental Management:** A biodiversity strategy can be effortlessly integrated into Environmental Management Systems like ISO 14001:2015, supporting certifications and improving overall environmental performance.
- » **Climate Resilience: Nature-based Solutions** and biodiverse landscapes support **climate adaptation**, improved water and air quality and aquifer recharge while reducing risks of extreme weather events such as flooding and overheating. (European Environmental Agency, 2023).
- » **Social and Community Benefits:** Social and Community Benefits: Biodiversity-rich spaces improve health, well-being, and quality of life for communities.
- » **Operational Efficiency & Resource Management: Green infrastructure** and biodiversity-friendly design can reduce maintenance costs and enhance the site functionality in the long run. (BISE, 2020).

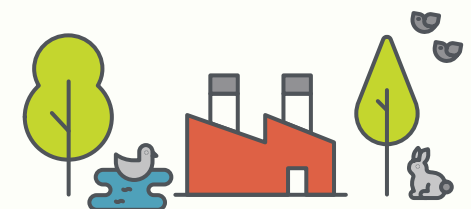




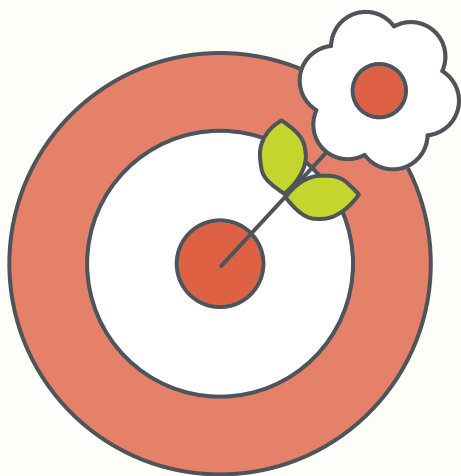
Figure 8-2: A Clúid Housing development's resident enjoying a community green space.
Source: Clúid Housing, n.d.



“Green infrastructure that is designed for the community creates pride of place and generates local buy-in and respect for these spaces. This helps to reduce the long-term maintenance cost of the built and landscaped environment. Attentive maintenance during the two-year establishment period is critical - weeds are hugely reduced, plants establish healthier specimens, and the community develops trust in our commitment to their environment and facilities.”

Ingrid Swan
Landscape Designer at Clúid Housing

Key Steps to Developing a Biodiversity Strategy



Regardless of an organisation's core drivers or activities, the following are the key steps in developing an effective biodiversity strategy.

1. Identify Areas of Influence:

Determine **where your organisation's activities impact biodiversity**. Prioritise areas where action can have the most significant effect, such as construction and landscape design, **placemaking**, resident-

led community projects, or daily operations. Consider procurement opportunities too to mitigate the upstream ecological impact of materials, i.e., the **embodied ecological impact** of projects.

It is also important to identify any **higher-level themes** when developing a biodiversity strategy. This is important from both an intentional and a reporting viewpoint. Examples of themes used by Clúid Housing are Climate Action, Infrastructure & Design Influence, Management & Maintenance, Community Engagement & Placemaking.

2. Map Stakeholders and Processes: Identify all **relevant internal and external stakeholders** directly and indirectly impacting biodiversity efforts and decision-making. Understand their roles, influence, constraints and how they interact within key organisational

processes. It is vital to engage with such stakeholders at the outset to foster a collaborative approach and ensure that they are aware of the influence they may have, the importance of their input, and to secure full buy-in.

3. Set Clear Goals and Objectives:

Goals should be aligned with the organisation's mission and set using the **SMART approach** - Specific, Measurable, Achievable, Relevant, and Time-bound

4. Develop and Implement an Action Plan:

Once developed, the best way to ensure the implementation of a biodiversity strategy is to **establish clear guidelines** that define the roles and responsibilities of everyone involved in the company and of key stakeholders for the specific areas identified. Outline key actions, assign responsibilities, set timelines, and track progress

using measurable indicators. Regularly review and adjust the plan to improve its effectiveness and ensure it remains relevant.

5. Endorsement and Communication: To maximise impact and align with best practices, **collaboration with NGOs and environmental organisations** such as the **All-Ireland Pollinator Plan** can support the development of biodiversity guidelines. Endorsement from these organisations can help boost the guidelines' national relevance. Once approved, a range of outreach strategies, including media, webinars, partnerships, and public engagement, can ensure the guidelines reach both internal audiences and the wider built environment sector.

Clúid Housing developed the **“Landscaping and Biodiversity Guide for New Developments”** (Figure 8-3). Although these guidelines are specific to new residential development, the development process used to create Clúid Housing’s Biodiversity Strategy **can be applied broadly across the construction and built environment sectors.**

The purpose of Clúid’s guide – endorsed by All-Ireland Pollinator Plan – is to provide developers, contractors, landscape architects and designers, horticulturalists, grounds maintenance personnel, and other relevant stakeholders with the information required to design and maintain public and communal open spaces to protect and enhance biodiversity.

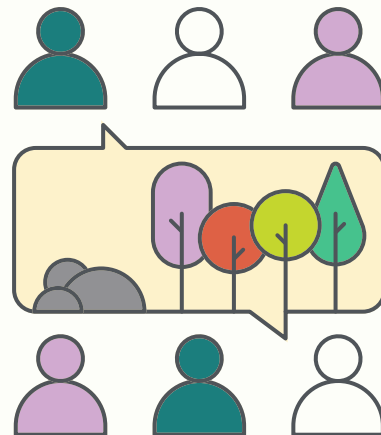
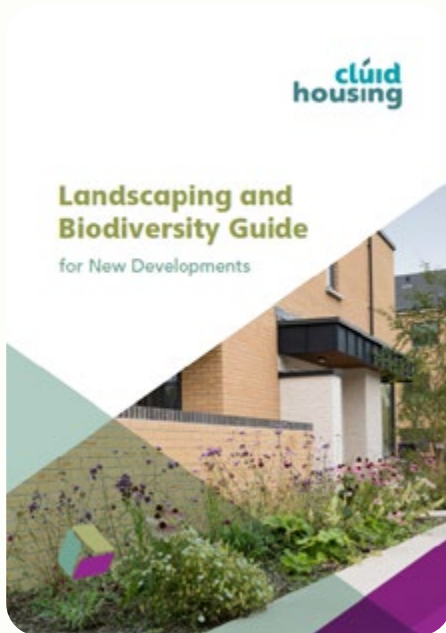


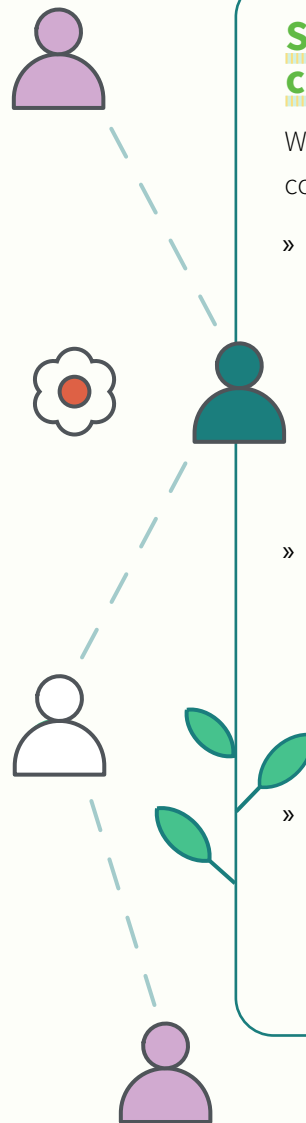
Figure 8-3: Clúid's Landscaping and Biodiversity Guide for New Developments. Source: Clúid Housing, 2023



Figure 8-4: Strategic meeting. Source: Clúid Housing, 2023

Lessons Learned

- » **Involve an Ecologist** While drafting the strategy, it's very important to involve an Ecologist to collaborate with all vested professions to contribute, review and provide feedback and advice
- » **Engage Stakeholders Effectively** As the strategy must provide all stakeholders with the information they need to protect and enhance biodiversity, it must be made **accessible, understandable, and relevant to all stakeholders**, being technical or non-technical. This requires a strong level of stakeholder engagement, which is also key in securing buy-in. Successful strategies require the involvement of various stakeholders with different expertise, from designers and planners to ecologists and community representatives. Ensuring that all relevant parties are included and their perspectives considered is **crucial to creating holistic solutions that will be achievable and applicable**.
- » **Budget and Skills Personal Allocation** An appropriate budget must be allocated to the implementation of a biodiversity strategy, including the maintenance elements, which can often be overlooked. There must be a clear understanding of the work and skills that are needed throughout, so that clear resourcing, in terms of staff and budget can be allocated. Senior leadership and board support are vital in ensuring the strategy is adequately resourced.



Stakeholder Engagement Process conducted by Clúid

When planning the stages in designing the guide, the following consultations were conducted:

- » **Various internal departments and stakeholders** for collective and individual discussions to determine what works and what does not work from their experience.
- » **Architect and planning teams** to gain understanding of their needs and to discuss challenges, inclusions and omissions of concepts.
- » Key stakeholders, such as the **National Biodiversity Data Centre's All Ireland Pollinator Plan** to ensure alignment with wider biodiversity strategies,
- plans, and policies.
- » **Landscape designer** who understands the constraints and opportunities within the planning system and construction industry. They should be capable of balancing the impact of these with design solutions that meet the public's expectations of public and communal space, i.e., balancing aesthetics with environmental benefits.
- » Final discussion to gather all feedback and comments and refine the guide.

» Budget and Skilled Personnel Allocation

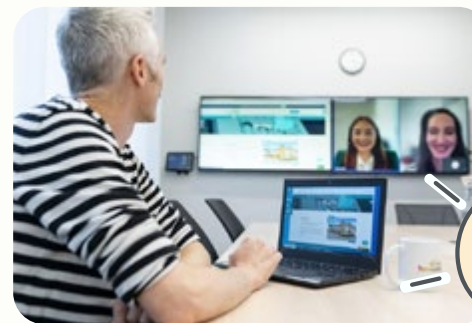
An appropriate budget must be allocated to the implementation of a biodiversity strategy, including the maintenance elements, which can often be overlooked. There must **be a clear understanding of the work and skills that are needed** throughout, so that **clear resourcing**, in terms of staff and budget can be allocated. Senior leadership and board support are vital in ensuring the strategy is adequately resourced.

» Promoting Training and Knowledge Sharing

The varying levels of understanding of biodiversity among stakeholders can hinder the effective design and implementation of the strategy. This can be overcome through **targeted training, accessible resources, and clear communication from an early stage**. Training tailored to teams involved in biodiversity initiatives can be shared across the organisation to raise awareness and ensure collective support for the initiative.

» Seeking Relevant Endorsement

Early and ongoing **engagement with a reputable body such as the All-Ireland Pollinator Plan** ensured the organisation aligned with nationally recognised biodiversity goals and best practice, significantly **enhancing the project's credibility** and facilitating access to essential resources.



[Top] Figure 8-5: Stakeholders Engagement at Clúid. Source: Clúid Housing, 2023



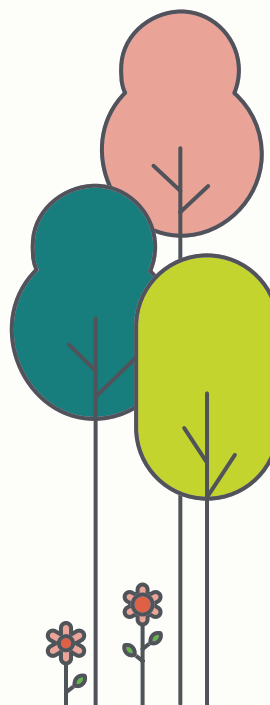
[Bottom] Figure 8-6: Young residents of Clúid's developments benefitting from the outcomes of the biodiversity strategy. Source: Clúid Housing, 2023

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- Scaling Nature-Based Solutions for Climate Resilience and Nature Restoration. <https://www.eea.europa.eu/publications/scaling-nature-based-solutions>
- » Irish Green Building Council; Trinity College Dublin (2025). Main Challenges To Incorporating and Maintaining New Nature-Led Residential Developments at Scale. <https://www.igbc.ie/resources/bio-neighbour-report-1/>

[All hyperlinks access April-August 2025]



Cultivating Wellbeing by Reconnecting Communities with Nature



“The impact has been huge, especially for people battling addiction, mental health and their own fears. They have seen what's going on, they come out, they ask questions, and they get involved. For me, it has been a huge part of engaging with other residents whom I had never spoken and seen before.”

Linda
Ballygraique Court Resident

Residential Development

Greenfield

Existing Building

Keywords:

Small site (under 1,000 sqm)

Health & Wellbeing

Community Engagement

About the Projects

Encouraging communities to participate in greening their outdoor public spaces can help to **deepen** their **understanding and appreciation of biodiversity**. This case study explores how this approach was applied in **social housing estates**, where **residents actively participated in creating their green spaces**. This not only improved biodiversity but also strengthened residents' relationships with nature while promoting social inclusion and tackling loneliness. **Two projects of a different scale** are presented:

Project 1

At **Ballygraique Court Estate** (Clúid Housing), a scheme of **81 units** located on the outskirts of Nenagh Town, **residents reshaped their communal outdoor space into a community-friendly biodiverse hub**. This project is a great example of a community coming together to provide usable spaces while enhancing biodiversity.

Project 2

Residents of Tuath Housing's **13 A-rated apartments** at **Kickham Street, Carrick-on-Suir, Co. Tipperary**, transformed a **small communal space into a welcoming garden**, while providing habitats for bees, butterflies, insects, and birds.

Figure 9-1: (left) On-site planting day with residents and Tuath staff. Source: Tuath, 2023



Figure 9-2: Location of the Ballygraigue Court, Source: OpenStreetMap, accessed May 2026



Location 1: Ballygraigue Court Estate, Ballygraigue, Nenagh, Co. Tipperary

A **scheme of 81 houses** made up of 2- and 3-bedroom family homes. Developing community integration, and participation and enhancing living spaces in Ballygraigue Court (Figure 1), was a response to a community coming out of the COVID-19 pandemic, which had a devastating impact on many residents.

Project Lead: Clúid Housing

Budget: €15,000

Funding: Privately funded by Clúid Housing and complemented by donations from Tipperary County Council, local councillors, and residents

Start Date: 2021

Completion Date: 2024

Green Building Certificate ☒ None.

Ecologist Involvement? ☒ None.

Biodiversity Metric(s) used: ☒ None.

Key Stakeholders: » **Tipperary County Council**

- » Residents
- » Local Resource Centre "Silverarch"
- » Trees on the Land (a cross-border initiative working to establish young native trees across the 32 counties of the Republic of Ireland and Northern Ireland)

Project Team: » **Residents**

- » **Ballygraigue Residents Group**, established with the assistance of the Clúid Housing Officer.
- » **Landscape Architect** (external - design stage consultation only).
- » **Civil Engineer:** Denis Power & Ben O'Keeffe - O'Keeffe Ltd
- » **Clúid Head of Environmental Sustainability and Horticulturist/Landscape Designer**

Links with existing and upcoming legislation and policies:

- » [Recommendations from the All-Ireland Pollinator Plan were followed.](#)

Biodiversity Status Pre-Project

The scheme has a horseshoe design arranged around a large green area. This layout ensures that every household has direct views onto the green. However, before the implementation of the project, the site held **little ecological value and was classified as “amenity grassland (GA2 – in Fossitt Classification)”ⁱ** (Figure 9-3).



Figure 9-3: Ballygraigue Court. Source: Google Maps, 2018

ⁱ As per “[A Guide to Habitats in Ireland – Fossitt, 2000](#)”



Figure 9-4: Ballygraigue Court Biodiversity Plan. Source: Clúid Housing, n.d.

Project Intervention

This project aligns with Clúid’s Landscape and Biodiversity Guidelines, which you can read more about in [Case Study 8 - Developing A Biodiversity Strategy](#). Following a consultation process, facilitated by the Clúid Housing Officer and the local Family Resource Centre, which funded a workshop with an external Landscape Designer, a **group of eight residents formed a working group** which collaborated with internal and external stakeholders to gather ideas and agree on a theme for the project.

Clúid’s Head of Environmental Sustainability and Horticulturist/Landscape Designer provided expertise and guidance, and the Housing officer **organised a trip to another Clúid scheme** in Carlow, **which had successfully created a biodiversity communal garden**.

Clúid, along with the residents, **co-designed a plan for the communal green areas in the estate**, to enhance biodiversity and provide recreational spaces for children and adults, which were lacking in the area.

Residents of all ages helped with cleaning, clearing, planting and maintenance. The main interventions (Figure 9-5) included:

- » **Pictorial meadow** planted at the entrance to the estate by children living in the area (6000 bulbs).
- » **Signage & birdfeeders** (Figure 9-5, middle left) created by talented residents
- » **Planting of an orchard with trees** with guidance from Trees on the Land. Residents and Clúid staff all helped in planting – Birch, Hazel, Apple trees, Blackcurrants.
- » **An edible boundary** of blackcurrant hedges was planted around the orchard (Figure 9-5, bottom left)
- » **Raised herb beds** were installed and this area was planted with a rosemary hedge to create a border (Figure 9-5, top left)
- » **A polytunnel** was set up in another small communal area, to grow a variety of vegetables and fruit.
- » The establishment of a Junior Committee to progress environmental actions on their estate, such as litter picking, managing the polytunnel, making jams and preserves, etc. (Figure 9-5, middle right)
- » Workshops on healthy eating were funded by the local Resource Centre as a direct response to the children's interest in growing their own food and increased awareness around nutrition.



Figure 9-5: Ballygraique Court Biodiversity features. Source: Clúid Housing, n.d.

“I have created a junior committee so I can make kids see the importance of taking care of our estate and our environment”

Clara,
Founder of the Ballygraique Junior Committee

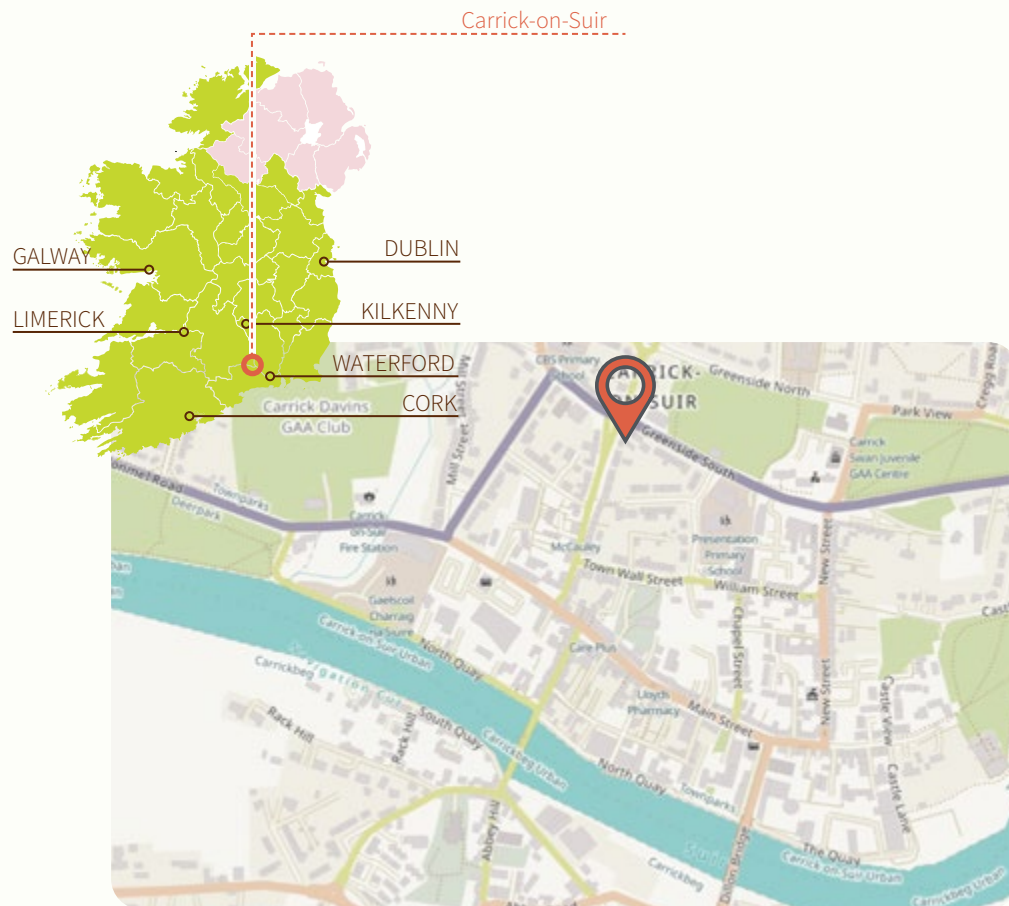
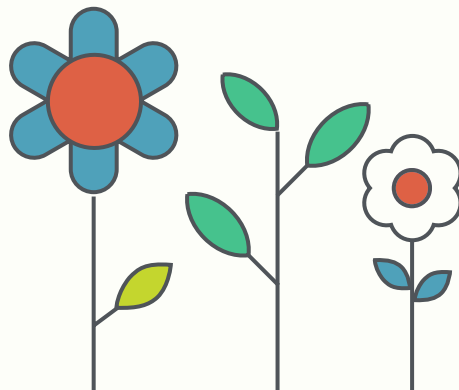


Figure 9-6: Kickam Street Community Garden, Source: Openstreet Map, June 2026



Location 2: Carrick-on-Suir, County Tipperary

Project Lead: Tuath Housing

Budget: €4,000

Funding: Privately funded by Tuah Housing

Date: 2023

Green Building Certificate?  None.

Ecologist Involvement?  None.

Biodiversity Metric(s) used:  None.

Key Stakeholders: » Residents
» Clonmel Garden Centre

Project Team:

- » Horticulturist from Clonmel Garden Centre
- » Tuath Housing Tenant Engagement & Housing Services Coordinators
- » Tuath Housing Green Team



Figure 9-7: Detail of communal garden in Kickam Street. Source: Tuath, 2025

In November 2022, Tuath residents moved into 13 A-rated apartments in Carrick-on-Suir, Co. Tipperary. Tuath's tenant engagement staff noted that the **communal garden** – initially just concrete and grass - **would make an ideal space for a resident-led project (Figure 9-8).**

The first **design consultation** event was held in March 2023, where staff, residents, and a horticulturist from Clonmel Garden Centre met to co-design the garden (Figure 9-9). They discussed their goals for the communal area and the best approach to maximise the garden's potential.

In April 2023, the design came to life when Tuath hosted an **on-site planting day** with residents and Tuath's green team staff members.

A variety of plants, trees, fruits, and vegetables were planted, chosen by the horticulturist in consultation with the residents. The selection considered the small plot size and the tenants' preferences and needs, incorporating a mix of native and non-native plants. Herbs, elderflower, heathers, apple trees, pear trees, strawberry plants, sweet pea, vegetables, and tomatoes were planted. **The trees were selected to provide food for the residents, birds, and insects, offer shelter for wildlife, and attract pollinators.**

The communal space was transformed into a welcoming and vibrant garden that supports biodiversity and creates a natural ecosystem for bees, butterflies, insects, and other wildlife. **It was important to strike a balance between a green space that looked good, supported biodiversity and was accessible and easy to maintain for the residents.** For instance, the raised beds were designed to be wheelchair accessible. The collaborative process from the outset fostered a sense of community and inclusivity.



Figure 9-8: On-site planting day with residents and Tuath staff. Source: Tuath, 2023



Figure 9-9: Planning day with residents. Source: Tuath, 2025

Before



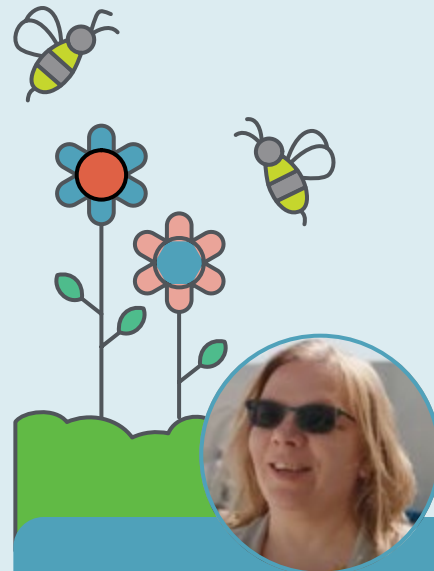
After



Later



Figure 9-10: The communal garden before (top), after the redesign in 2023 (middle), and later in 2025. Source: Tuath, 2023/2025



**“I love gardening,
and I always wanted to
have my own but never
had the chance, but
now I can enjoy it here,
relax and get to know
my neighbours better; it
means a lot.”**

Gosha

Kickham Street Resident


[Watch the video](#)

Peat Free Compost

Peatlands are home to a high proportion of Ireland’s biodiversity. While only 10% of Ireland’s biodiversity has been assessed, we do know that 15% of the original flora of Ireland is peatland plants. 14% (59 species) of bird species have been recorded on peatland. Peat extraction is causing significant damage to Ireland’s raised bogs, with 90% already lost due to commercial activities. Despite this, peat continues to be widely used in gardening, with 66% of harvested peat going to amateur gardeners. However, peat is not a fertile or sustainable option for soil conditioning. Alternatives like bark and composted waste material are now available in garden centres, allowing gardeners to make a positive environmental impact. By switching to peat-free options, gardeners can help protect peatlands and preserve the biodiversity dependent on these ecosystems.

Irish Peatland Conservation Council, n.d.

Biodiversity Status Post-Projects

Measuring the biodiversity impact of initiatives like the two presented in this case study can be challenging and relies largely on the expertise of the Housing Services Team. **The impact extends beyond biodiversity on the sites - it positively affects residents by improving health and well-being while also raising awareness about the importance of protecting Nature.**

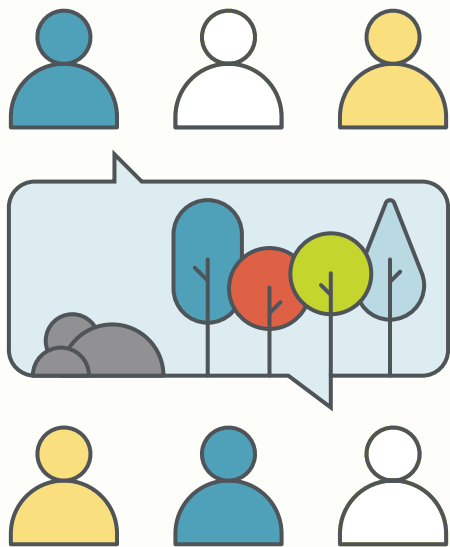


Figure 9:11: Ballygraigue Court recreational and sensory garden. Source: Clúid Housing, n.d.



Co-Benefits

Community wellbeing

In terms of social impact, these **projects inspired residents to become more engaged with nature and their community.** They also fostered a stronger connection to the shared outdoor spaces.

Residents are now taking more pride in their homes and green spaces, and the social housing providers have seen a reduction in estate and tenancy management challenges, such as fly-tipping, damage to property, and anti-social behaviour. **Residents appear more engaged, using their green spaces in a positive way** to meet up for a chat and do some weeding, or collect herbs for a cup of tea.

Children are enjoying their new play areas. For example, **the sensory garden at Ballygraigue Court is helping children with sensory issues to decompress**, creating a sense of calm for them and their parents. Biodiversity information boards are placed around the site, and

children are learning about plants, insects, the seasons and how they can contribute to creating a more sustainable future. The overall project outcomes include enhancing the Estate's aesthetic, bringing together the community, and combating residents' loneliness and isolation.

As shown by a recent study by Astell-Burt et al. (2021), **urban greening may reduce loneliness by offering opportunities for solace, social reconnection and supporting processes such as stress relief.** The study observed a lower cumulative incidence of loneliness among people with more green space within 1600 m of home, especially for people living alone.

Additionally, **vegetation cover and afternoon bird abundances are positively associated with a lower prevalence of depression, anxiety, and stress** (Daniel T. Cox et al., 2017).

Projects Highlight

Community Engagement

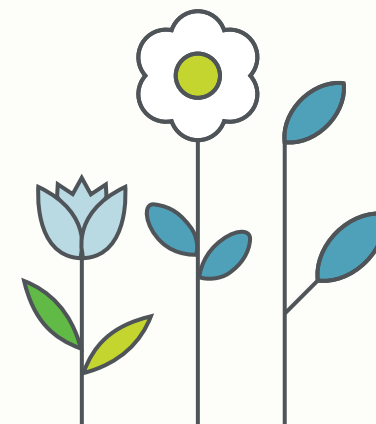
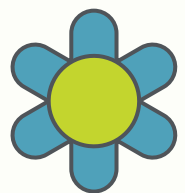
Both projects recognise public spaces as valuable social resources and emphasise the importance of resident involvement in shaping their use. **Community participation is fundamental to their success, demonstrating how residents can adapt their surroundings to meet evolving needs.** In both cases, the housing provider facilitated workshops and consultations with specialists, empowering residents to design their own spaces and fostering a strong sense of ownership.



Figure 9-12 On-site planting day with residents and Tuath staff.
Source: Tuath, 2023



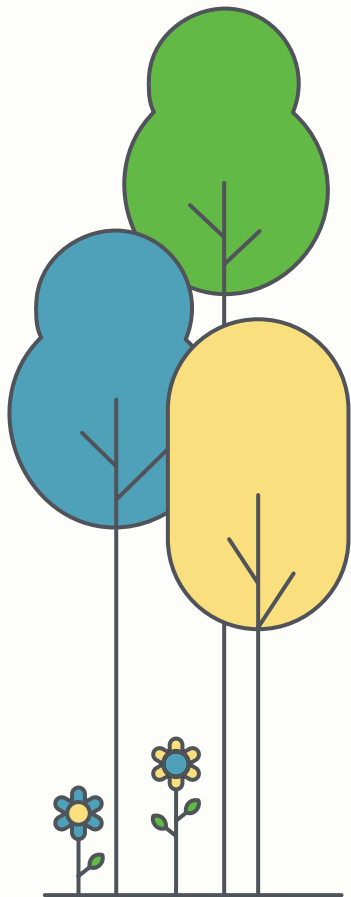
Figure 9-13: Ballygraigue community tree planting day. Source: Clúid Housing n.d..



Challenges

» **Fostering the project mediation & connection**

Assisting residents to engage with both their neighbours and other stakeholders, and maintaining project momentum.



Lessons Learned

» **Resident's inspiration through site visits**

The Housing Officer for Ballygraigue Court facilitated a **trip to another scheme** in Carlow. This was a great opportunity for residents to see the impact this type of work can have and help inspire and form their ideas. It was also an opportunity for residents to hear first-hand the testimonies from another community and take back transferable information and skills for their projects.

- » **Early engagement** At Kickham Street, a key lesson was to **engage with the developer at the beginning, and to allow residents to take ownership of the garden** and make use of the allocated funding. This approach enabled residents to make their own decisions and feel confident that the garden was the result of a collaborative effort.



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[All hyperlinks accessed March-April 2025]

Understanding the Ecological Impact of your Supply Chain



About the Project

Recent studies reveal that **75 to 95% of the impacts on biodiversity occur off the construction site**ⁱ. But, to date, the focus in the construction industry has been on taking actions to protect and enhance biodiversity on-site. As large organisations are now increasingly required to report on their impacts through their supply chain (for example through [CSRD](#) and [TFND](#)), this case study focuses on how Glenveagh, one of Ireland's largest homebuilders, conducted a **Double Materiality Assessment (DMA)** to understand how ecological issues impact their business (outside-in) and how their activities affect the biodiversity (inside-out).

ⁱ See for instance, Exploring nature-positive buildings – Arup/WBCSD - Quantifying biodiversity footprints of Dutch economic sectors: A global supply-chain analysis”

Figure 10-1: A bee on a lavender flower.

Source: Glenveagh Biodiversity Strategy, 2025

“Being part of the Double Materiality process was incredibly rewarding. It challenged us to think holistically about biodiversity impacts, risks and opportunities right across our value chain. By evaluating biodiversity through the dual lens of impact and financial materiality, Glenveagh now has a clearer understanding of both its ecological footprint and the business risks tied to biodiversity loss, but there is more work to be done. The process fostered collaboration across business departments, leading to a cross-pollination of ideas and insights. For me, it was a powerful reminder that sustainability isn't just about compliance, it is about foresight, accountability and action.”

Ruth Saurin
Former Sustainability Manager at Glenveagh

About Embodied Ecological Impacts (EEI)

The environmental impacts of the construction industry extend far beyond the physical footprints of our urban environment, and even beyond national borders. **The materials used in construction often originate from numerous locations across the globe**, transferring ecological burdens such as deforestation, water scarcity and pollution to remote and less visible locations. These **impacts can be difficult to trace** in fragmented, opaque, global supply chains.

Embodied Ecological Impacts (EEI) refer to the off-site environmental consequences associated with upstream and downstream activities, such as **habitat** destruction or pollution resulting from raw material extraction, processing, and transportation.

While the industry has made progress in adopting the whole life cycle approach, recognising the importance of **embodied carbon**, **ecological assessments still overwhelmingly focus on on-site impacts**. This narrow focus overlooks the majority of ecological damage associated with buildings, which occurs off-site.

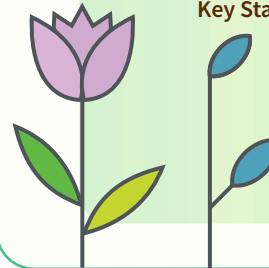
Key tips to reduce your EEI

- 1. Minimise Material Use** Every material has an ecological footprint. Reducing the quantity of materials used is one of the most effective ways to lower overall impact, including reducing carbon emissions, waste and costs. This can be done, for example,

Project Lead: Glenveagh

Internal Key Stakeholders: » Executive Committee,
» Senior Leadership Team - Procurement, Commercial, Finance,
» Environmental health and safety (EHS)

External Key Stakeholders: » NGO's
» Academics
» Investors
» Suppliers
» Industry Bodies
» Sectoral Enablers
» Technical Experts



through design standardisation.

- 2. Prioritise Reused Materials** The extraction phase is often the most damaging to biodiversity. Reusing existing materials can significantly reduce the need for new extraction, thereby protecting ecosystemsⁱ.
- 3. Use responsible sourcing and certification schemes** Many materials now come with certifications that consider biodiversity impacts. Leveraging these schemes helps ensure that suppliers are taking ecological responsibility seriously
- 4. Trace Material Provenance (where possible)** Liaise with your supply chain and use existing tools, such as the [UKGBC Embodied Ecological Impact Materials Map](#) to trace where your materials come from, specifying and sourcing materials with traceable origins can be highly challenging as supply chains are often long and complex. It is essential to engage with supply chain partners early to understand what options are available.

Keywords:

Strategy Development

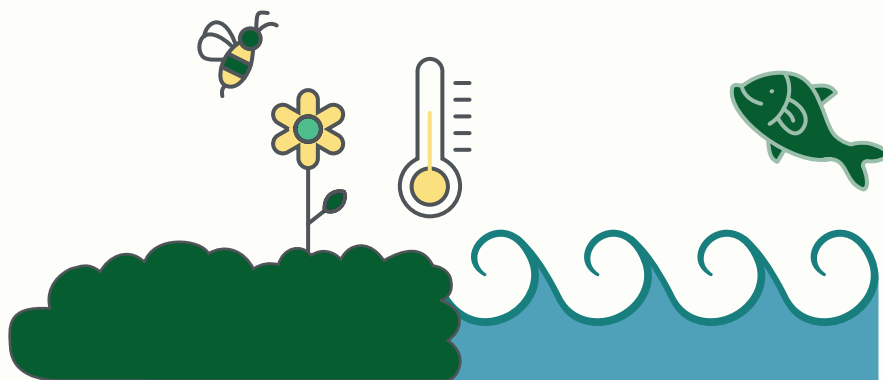
Impact off-site

ⁱ You can read more about reusing construction materials in “Building A Circular Ireland” (IGBC, 2025).

Drivers

To move towards a nature-led future, companies must **understand their impacts and dependencies on biodiversity across the full value chain**, from sourcing and design to construction, use, and end of life. In line with the **EU Nature Restoration Law**, which aims to restore at least 20% of the EU's land and sea areas by 2030 and all ecosystems in need of restoration by 2050, businesses also have a role to playing supporting broader **global biodiversity goals**.

Glenveagh recognises that its activities can affect biodiversity and the ecosystems that support long-term wellbeing. These ecosystem services, such as climate regulation, flood protection, clean water, pollination, and recreation, are vital for environmental stability and may become important **business dependencies** in the future. Damage to these systems could lead to acute and chronic **physical risks** (like increased flooding or water scarcity) and **transition risks** arising from new regulations and evolving market dynamics, which could impact the company's operations and long-term resilience.



Several regulations, policies and regulatory frameworks, such as CSRD, EU Biodiversity Strategy for 2030, and the Global Biodiversity Framework are reshaping how companies assess their impacts, risks and opportunities, encouraging a dual materiality lens that considers financial as well as environmental and social aspects of their business.

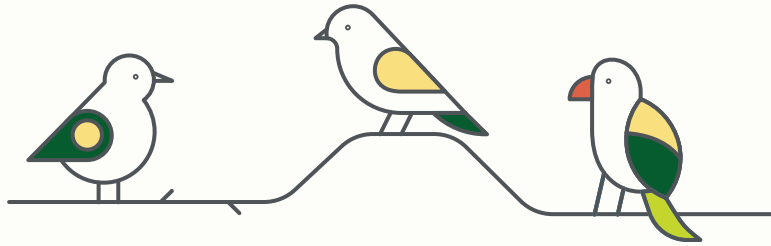
The **EU Deforestation Regulation** (EUDR) also strengthens the case for supply chain transparency, requiring companies to prove that products sold in the EU are not linked to deforestation or forest degradation.

Beyond regulations, other drivers - like investor expectations, emerging standards such as the **Taskforce on Nature-related Financial Disclosures** (TNFD) and growing public demand for transparency - are contributing to the increasing importance of DMAs. Carrying out DMAs means evaluating



not only how environmental and social issues affect the business (**financial materiality**), but also how the business affects people and the environment (**impact materiality**). This two-way view ensures sustainability reporting captures the full risk and responsibility landscape, supporting informed decisions by investors, regulators, and stakeholders.

This is key in reducing uncertainties such as disruption in the supply chain and also in strengthening trust with stakeholders while supporting long-term value creation.



Glenveagh has conducted a **Double Materiality Assessment** to better understand its dependencies, impacts, risks, and opportunities across the value chain.

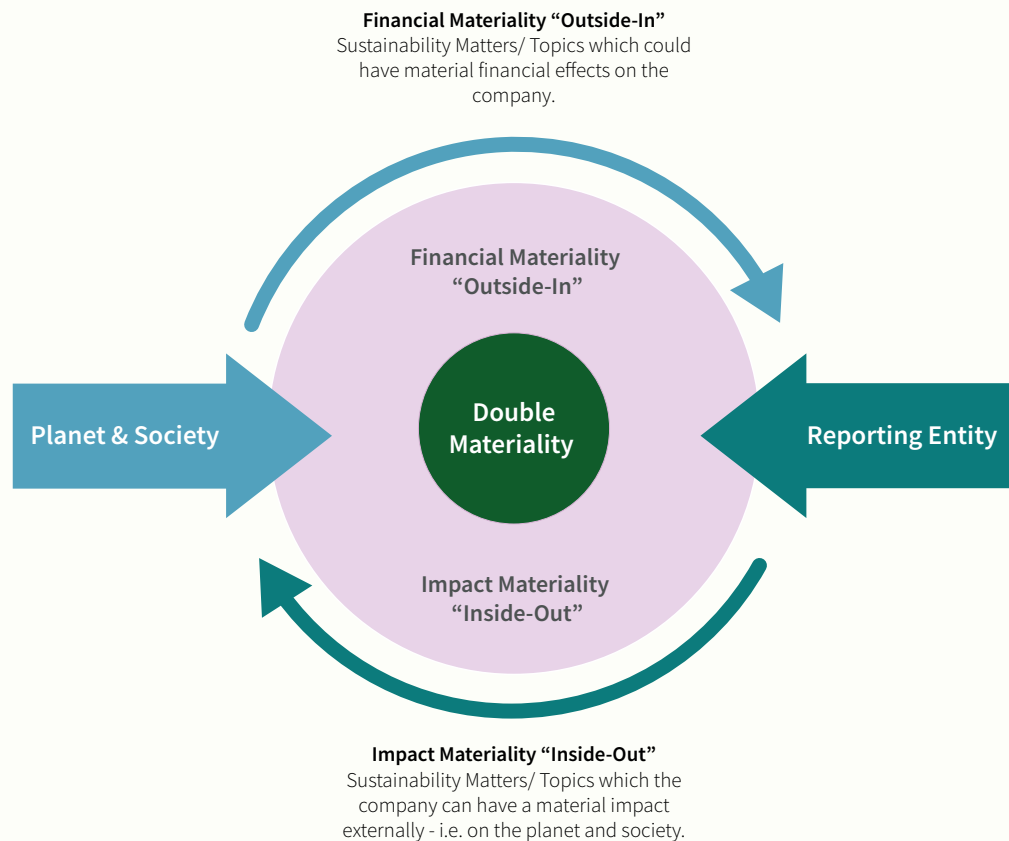


Figure 10-2: Double Materiality Assessment. Adapted from: IBEC, 2024

Developing a Double Materiality Assessment (DMA)

A DMA requires companies to consider the relationship **between a company and the broader environment and society from two perspectives.**

- 1. Impact materiality:** the 'inside out' view examines the company's actual or potential impacts on people or the environment through its operations and value chain.
- 2. Financial materiality:** this 'outside in' view assesses how sustainability matters could trigger financial effects (risks or opportunities) on the company.

The DMA consists of 4 stages:

1. Understanding
2. Identifying
3. Assessing
4. Reporting.

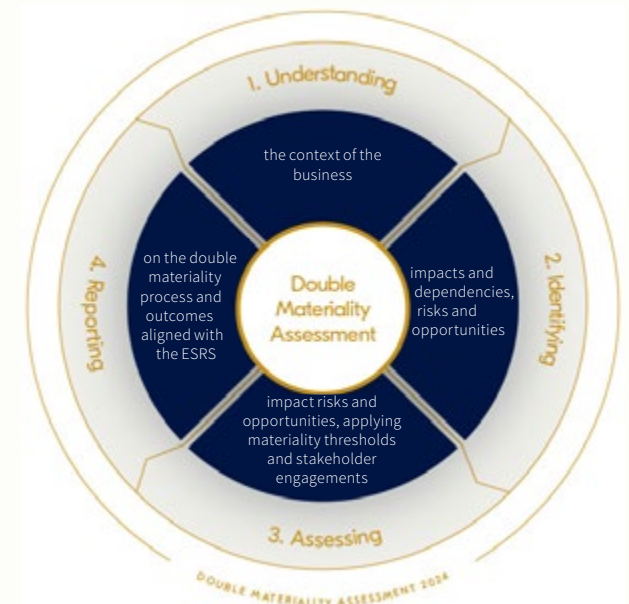


Figure 10-3: Double Materiality Assessment. Adapted from: Glenveagh Biodiversity Strategy, 2025

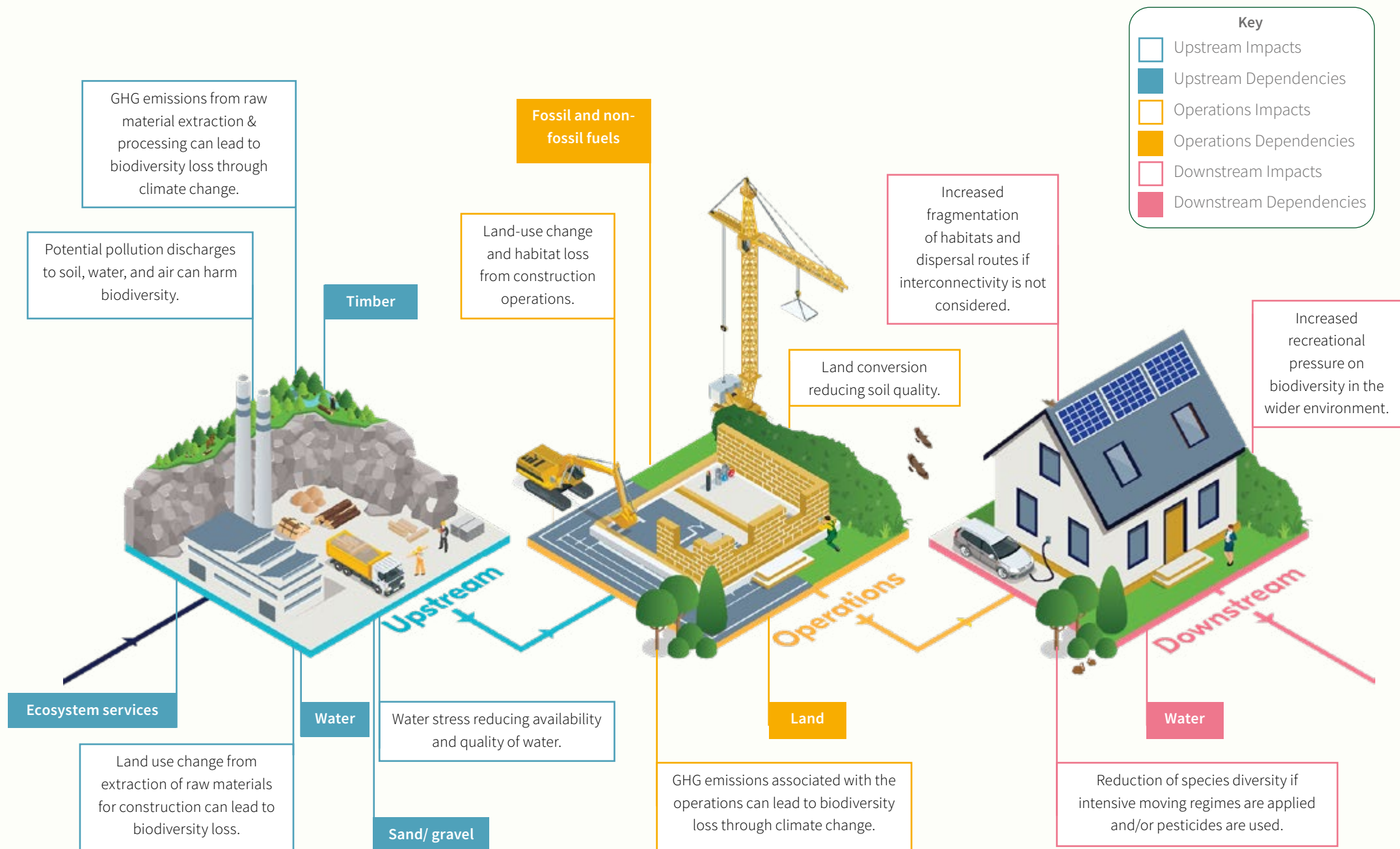
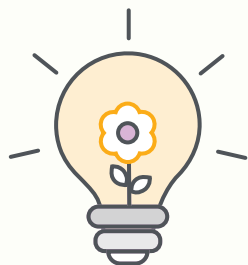


Figure 10-4: Glenveagh value chain. Source: Glenveagh Biodiversity Strategy, 2025

Step 1: Understanding



Companies begin the process by **understanding the business context** through determining their boundaries and analysing all their activities, business model, business relationships, and value chain through a biodiversity lens.

Glenveagh considered the **locations of their operations** and recognised that their activities and business relationships across the value chain can be **associated with potential impacts on nature, biodiversity, and ecosystems**, such as **land use change as a direct impact driver of biodiversity loss**.

Furthermore, they considered **financial risks** and opportunities in this context. Their process considered these aspects across **three time horizons: short** (one year), **medium** (one to five years), and **long-term** (more than five years).



Step 2: Identifying

Building on the work completed in step 1, companies should use a range of sources to develop a **‘long-list’ of potential biodiversity impacts, risks and opportunities (IROs) and to assist in determining their materiality**. For Glenveagh, this included:

- » **extensive desktop research** on biodiversity and ecosystem issues relevant to the construction industry,
- » **applicable current and expected legislation, and**
- » **engagement with industry partners, peer analysis, external experts’ reports, CSRD** (topics and subtopics), and intrinsic knowledge within the company including via the corporate risk register, Environmental Health & Safety impacts register and Environmental and Ecological Impact Assessment reports.

More specifically, it utilised biodiversity related tools, methodologies, reports and data, including but not limited to the following:

- » [SBTN Materiality Screening Tool \(Construction\)](#)
- » [ENCORE](#)
- » [SBTN High Impact Commodity List](#)
- » [WRI’s Aqueduct’s Water Risk Atlas](#)
- » [Global Forest Watch](#)
- » [One Planet Natural Resources Report](#)

- » Glenveagh Environmental Impact Assessments
- » Glenveagh Ecological Impact Assessments

In identifying biodiversity IROs, it also considered:

- » the **impacts** Glenveagh is involved in through its **operations** or as a result of its business relationships; and,
- » where in Glenveagh’s operations and its **upstream and downstream value chain, the interface with nature takes place**.

Some impacts could be framed positively or negatively. Based on their review of guiding principles and legislation, they were first identified through a negative/adverse lens. The review also considered the company’s dependencies on natural resources and assessed their financial materiality based on:

- » Impact on resource availability, quality, and cost; and
- » Effect on maintaining necessary business relationships on acceptable terms.

Over the coming years, Glenveagh will refine its knowledge of these biodiversity-related impacts to get a better-informed understanding of how they relate specifically to the process and activities of the main suppliers.

Step 3: Assessing

A company should then assess and score their long list of impacts, risks and opportunities. At Glenveagh this involved **engaging internal subject matter experts** from across its business. This cross-functional approach ensures a robust and credible output, while also fostering greater awareness of biodiversity IROs across the business.

Glenveagh's biodiversity impacts were reviewed to assess whether they:

- » were **positive** or **negative** in nature; and,
- » were **actual** or **potential**.

Biodiversity impacts were assessed pre-mitigation and controls and scored to determine both their impact and financial materiality. These assessments considered the short-, medium- and long-term horizons. The IROs were scored in accordance with the **European Sustainability Reporting Standards** (ESRS), a set of mandatory reporting standards that provide the framework for disclosures under the **CSRD**.

From this assessment, Glenveagh found that its material biodiversity IROs occur mainly in the upstream phase (related to raw material and resource extraction) and in the operational phase of its value [chain](#). [To](#) understand the types of impacts and whether

they were actual or potential, Glenveagh availed of insights from third-party ecologists, its internal expert on the supply chain and publicly available external information relating to biodiversity and ecosystems services in the construction industry value chain.

Stakeholder Consultation

Stakeholder engagement plays a vital role in the double materiality process, acting as a validation step for the IROs. At Glenveagh, consultation with both internal and external experts took place after the IROs were scored to check the IROs for completeness and accuracy, both in terms of the IROs covered and the determination of materiality.

The validation process at Glenveagh comprised the following five key initiatives:

1. Financial materiality check by the Chief Strategy Officer and the Head of Finance;
2. Employee workshop;
3. Environmental workshop;
4. Social and Governance workshop;
5. Interviews with investors, banks and suppliers.

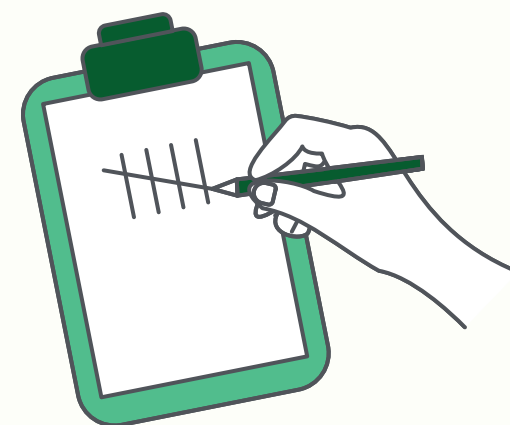
Participants were selected based on their knowledge, their relationship with Glenveagh and/or experience they had related to the topics.

Based on the feedback from this validation exercise, **recommendations were made regarding challenges to the materiality** of some of the IROs and reviewed by the Glenveagh Sustainability team and ultimately reviewed and approved by the Executive Committee.

Approval of the DMA

Final review and approval of the DMA:

- » The Executive Committee and the Environmental and Social Responsibility Committee reviewed the material IROs;
- » The Audit and Risk Committee recommended the DMA to the Board for approval, and the Board of Directors approved the DMA.



Step 4: Reporting

The outputs from the DMA have been used to underpin the first iteration of Glenveagh's sustainability reporting under the Corporate Sustainability Reporting Directive.



Biodiversity-related impacts, risks, opportunities and dependencies

Following the double materiality assessment, the matters related to biodiversity and ecosystem services deemed to be material are:

1. Land use change is a direct impact driver of biodiversity loss.
2. Impact on the state of species:
3. Impact on the extent and condition of ecosystems;
4. Inability to develop land due to the sensitive ecology of the land; and
5. Dependency on water supply.



Management of IROs

These biodiversity IROs form the basis of Glenveagh's first Biodiversity Strategy as well as its Supply Chain Engagement Strategy to drive implementation in this area.



Policies

While Glenveagh does not have a biodiversity policy, its environmental policy covers its commitment to protecting the natural environment in the operational part of its value chain. The company's Sustainable Procurement policy sets out its approach to biodiversity and ecosystem IROs in the upstream and addresses its commitment to **responsible sourcing**, including a consideration for biodiversity and nature.



Actions

Glenveagh has started to address biodiversity IROs across the value chain. In relation to its upstream biodiversity and ecosystem services IROs, Glenveagh has developed a **biodiversity strategy for implementation**.

It has three key pillars (Figure 10-5), with an additional overarching commitment to embed biodiversity throughout its organisation. This is underpinned by robust governance and transparent reporting, ensuring that biodiversity considerations are integrated into decision-making at every level.

Implementation of the Biodiversity Strategy commenced in 2024. Glenveagh, in collaboration with third-party ecologists, designed **a suite of biodiversity assessment templates to evaluate biodiversity at every stage of the development lifecycle:**



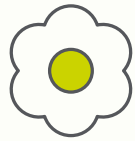
By the end of 2024, the company had used the first stage biodiversity assessment templates on 55% of land acquisition deals closed in the reporting year. In addition to that, it also conducted two biodiversity baseline assessments at its offsite construction manufactory locations (NUA Manufactory in Arklow and Carlow) to better understand the biodiversity value and opportunities present at those sites. Furthermore, it developed a strategic framework for supply chain engagement.

As Glenveagh implements actions to deliver the commitments within its biodiversity strategy and engages with its supply chain partners, the knowledge and understanding of biodiversity impacts and dependencies will improve as more granular-level data is gathered, and the double materiality assessment will be updated accordingly.



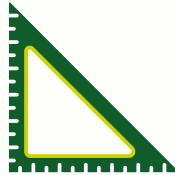
Figure 10-5: Key pillars to embed biodiversity in Glenveagh.
Source: Glenveagh Biodiversity Strategy, 2025

Challenges



Complexity of biodiversity

Biodiversity is a wide range of species, ecosystems and genetic variations that interact in many different ways. Changes in one part of an ecosystem can affect another part, making it difficult to fully understand and manage IROs. **Unlike carbon emissions, which are globally uniform in effect, biodiversity impacts are highly location-specific and depend on local ecosystems and land use.**



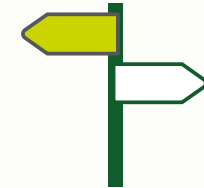
Lack of standardised metrics in Ireland

The uncertainty on how to quantify biodiversity at a national level is leading to difficulties in measuring biodiversity impacts and risks, particularly related to IROs in operations and local supply chains. Establishing a biodiversity metric to report on has been challenging, particularly as there is no joined-up guidance for the construction industry. **Interconnections with other key topics such as climate, pollution and water add a layer of complexity to the double materiality assessment.** Understanding how these issues impact each other is challenging to incorporate into the double materiality framework, in that IROs have to be examined under each topic individually.



Data collection and quality

Gathering accurate and comprehensive data on biodiversity impacts and dependencies is complicated. **Due to this complexity gaps in data and understanding can arise.** Available tools are generic, and while helpful, can sometimes highlight an impact that may not be relevant to the company's value chain. Knowing this, Glenveagh **developed a supply chain engagement strategy** to help close some of these gaps, particularly in supply chain activities. Desktop research, while valuable, has its limitations – it can often provide a broad overview rather than in-depth insights. Also, desktop data can sometimes be outdated, especially in a rapidly changing area like biodiversity, where conditions and knowledge evolve rapidly.



Uncertainty arising from the changing regulatory landscape in the EU

The EU Omnibusⁱ introduces significant uncertainty into the sustainability landscape. It could impact progress and diminish corporate buy-in, making it **harder to maintain strategic focus and long-term commitment** to sustainability goals.

ⁱ The EU Omnibus Simplification Package is a proposal to streamline and simplify various EU sustainability regulations, including the Corporate Sustainability Reporting Directive (CSRD), EU Taxonomy, and Corporate Sustainability Due Diligence Directive (CSDD). The primary goal is to reduce administrative burdens for companies, making it easier for them to comply with sustainability requirements and enhance their competitiveness.

Lessons Learned

» Power of Communities of Practice

Communities of practice, such as the **IGBC Biodiversity & Built Environment group** and **Business for Biodiversity**, are essential for meaningful stakeholder engagement and knowledge sharing. They are sectoral enablers that create spaces for peer learning, shared problem-solving, and coordinated action.

» Early Stakeholder Engagement is Key

Engaging stakeholders early **brings diverse perspectives**, enriching the process and leading to more thorough and effective assessments.

» Map your Supply Chain

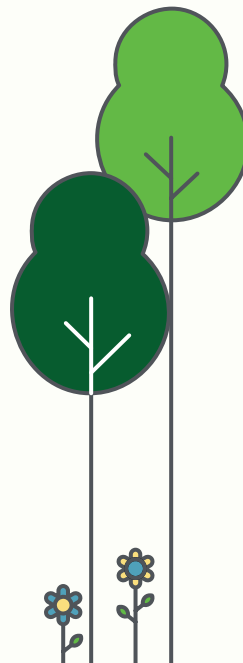
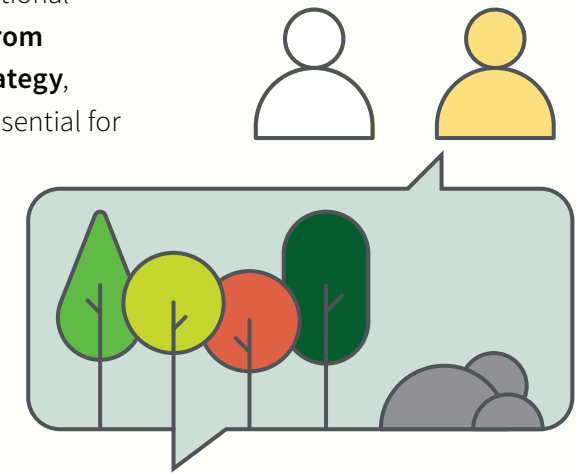
Mapping the supply chain and **using a heat map** to assess IROs helps identify environmental and social hotspots across the value chain. It enables **targeted supplier engagement** and prioritisation of sustainability actions where they matter most. **Supply chain maps** also help to define scope and geographical context, which is fundamental for an accurate double materiality assessment.

» Embrace Continuous Improvement

Biodiversity impacts and ecosystems evolve, so adopting a continuous improvement mindset helps companies **adapt, innovate, and refine their strategies over time**.

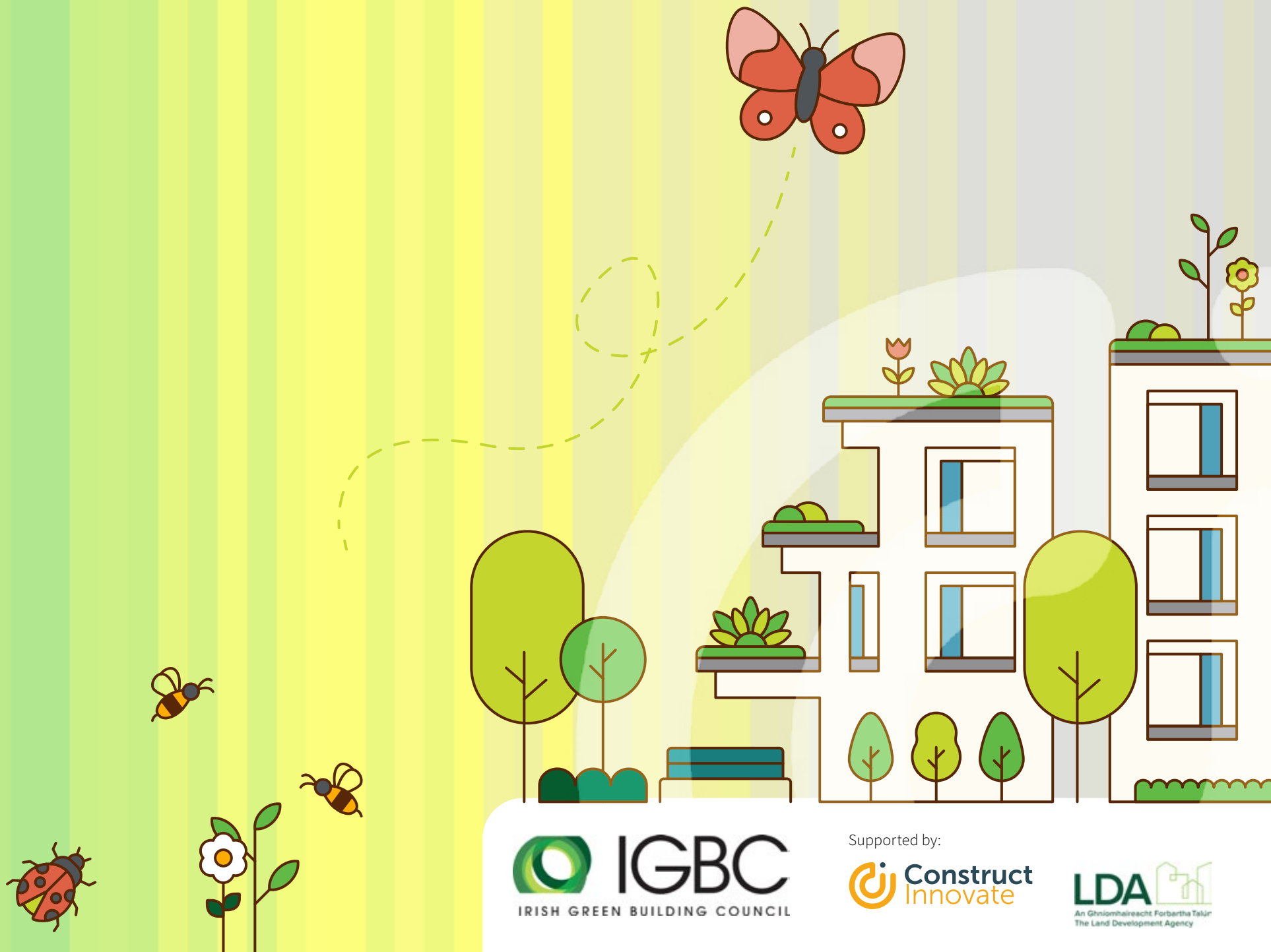
» Beyond Legislation: A New Business Case

Beyond legislation, a new business case for biodiversity is emerging, one built on resilience, reputation, and long-term value. Even if EU reporting requirements are rolled back, biodiversity remains a critical operational and strategic concern. **Companies must shift from compliance-driven action to purpose-led strategy**, recognising that nature-positive practices are essential for future-proofing their business.



Key Resources

- » [Embodied Ecological Impacts Knowledge Hub \(UK Green Building Council, 2024\)](#)
- » [The Embodied Biodiversity Impacts of Construction Materials \(Expedition Engineering, 2023\)](#)
- » [Exploring nature-positive buildings \(WBCSD, 2024\)](#)
- » [Biodiversity burdens in Spanish conventional and low-impact single-family homes \(Borja Izaola & Ortzi Akizu-Gardoki, 2024\)](#)
- » [Guidance on the identification and assessment of nature-related issues: the LEAP approach \(TFND, 2025\)](#)



Appendices



Glossary

All-Ireland Pollinator Plan Bumblebee Monitoring Scheme:

Part of the All-Ireland Pollinator Plan, a framework coordinated by the National Biodiversity Data Centre to make Ireland a place where pollinators can thrive (more in “[Policy](#)”). This long-term citizen science initiative monitors bumblebee abundance and diversity, with volunteers recording sightings along fixed routes monthly from March to Octoberⁱ.

Bat Box: Artificial roosts for bats, supplementing natural sites to help rest, shelter, and maternity roost needs. Best placed in foraging areas or where natural roosting sites are rare, sheltered from strong winds but exposed to

adequate sunlight, typically 3-5 m high on tree trunks or posts [2]ⁱⁱ.

Bird Box (or nestbox): Artificial nesting sites that provide shelter for birds where natural cavities are scarce. They should be placed 2-5 m above ground in sheltered locations, ideally facing between south-east and north to avoid direct sunlight and heavy rain. Different entrance sizes suit different speciesⁱⁱⁱ.

Biodiversity: Variety of life on earth in general, or the variety of living things in a given ecosystem or region. It covers all living things, ranging from bacteria, plants and animals, including humans^{iv}.

Biodiversity Gain Hierarchy:

A required step-by-step process in England’s Biodiversity Net Gain system that prioritises avoiding harm to important habitats, followed by enhancing or creating onsite habitats, then using registered offsite gains, and, as a last resort, buying biodiversity credits^v. It complements the Mitigation Hierarchy, a framework designed to manage and reduce the negative biodiversity impacts of development projects by avoiding, minimising, restoring and compensating for biodiversity losses^{vi}.

Biodiversity Management Plan:

A plan outlining the details of a site’s biodiversity features of value

to be retained, restored, created, and enhanced as part of a project or maintenance regime. It includes design objectives, management and monitoring prescriptions, work schedule, roles, and responsibilities of those delivering the plan^{vii}.

Biodiversity Net Gain (BNG): An approach to development that is mandatory in England. It ensures that habitats for wildlife are left in a measurably better state than before the development took place. Developers must achieve a BNG of 10%, meaning the project must result in more or better quality natural habitat than existed prior to development^{viii}.

i National Biodiversity Data Centre, ‘Bumblebee Monitoring Scheme - All-Ireland Pollinator Plan’, All-Ireland Pollinator Plan. Accessed: Aug. 13, 2025. [Online]. Available: <https://pollinators.ie/record-pollinators/bumblebee-monitoring-scheme-2/>

ii Bat Conservation Ireland, ‘Creating Roosts - Bat Boxes’. Accessed: Aug. 25, 2025. [Online]. Available: <https://www.batconservationireland.org/irish-bats/bat-roosts/775-2>

iii BirdWatch Ireland, ‘Nestbox Designs for Birds and Wildlife’. Accessed: Aug. 25, 2025. [Online]. Available: <https://birdwatchireland.ie/irelands-birds-birdwatch-ireland/nestbox-designs-for-birds-and-wildlife/>

iv European Union (EU), ‘Biodiversity’, EUR-Lex. Accessed: Aug. 13, 2025. [Online]. Available: <https://eur-lex.europa.eu/EN/legal-content/glossary/biodiversity.html>

v UK Government, ‘Biodiversity net gain’, [GOV.UK](#). Accessed: Aug. 14, 2025. [Online]. Available: <https://www.gov.uk/guidance/biodiversity-net-gain>

vi CIEEM Ireland Policy Group, ‘Briefing Paper: Biodiversity Net Gain in Ireland’, 2024. Accessed: Aug. 14, 2025. [Online]. Available: <http://https://cieem.net/resource/cieem-briefing-paper-biodiversity-enhancement-for-new-developments-in-ireland>

vii ESB, ‘Networks for Nature - Biodiversity Strategy’, 2024. [Online]. Available: https://www.esbnetworks.ie/docs/default-source/publications/esb-networks_biodiversity_strategy_2024_29_final.pdf

viii UK Government, ‘Understanding biodiversity net gain’, [GOV.UK](#). Accessed: Aug. 15, 2025. [Online]. Available: <https://www.gov.uk/guidance/understanding-biodiversity-net-gain>

Biodiversity Strategy: Long-term plan, typically government or organisation-led, that sets measurable actions, commitments, and policies to protect, conserve, and restore nature^{ix}. For organisations, it guides efforts to understand, manage, and reduce their impact on nature while identifying opportunities to support restoration by assessing biodiversity risks and dependencies across operations and supply chains^x.

Bio-retention Systems: Planted, soft landscaped areas, positioned to collect, store, filter and reduce surface runoff from frequent rainfall, including but not limited to, raingardens, raised planters, bioretention tree pits, swales and/or trenches^{xi}.

Blue roof: Roof system explicitly designed to store water and attenuate runoff before a controlled release, and in its true form refers solely to this attenuation capacity. It may or may not include co-benefits for water quality improvement and biodiversity^{xii}.

Brownfield: Any land which has been subjected to building, engineering, or other operations, generally comprising redundant industrial lands, docks, former barracks, hospitals, or obsolete housing areas^{xiii}.

Butterfly garden: Managed area or garden designed to attract, support, and conserve butterflies. Such gardens typically feature native nectar and larval food plants, provide shelter, and encourage natural pollinator diversity as part of biodiversity conservation and

pollinator restoration efforts^{xiii}.

Carbon sequestration: The long-term storage of carbon in plants, soils, geologic formations, and the ocean. Carbon sequestration occurs both naturally and as a result of anthropogenic activities^{xiv}.

Climate Change: Long-term shifts in Earth's climate, especially rapid global warming and weather pattern changes driven by human activities. The main cause is the rise in greenhouse gases (such as carbon dioxide, methane, and nitrous oxide) from fossil fuel burning, deforestation, industrial processes, and agriculture. These gases trap heat in the atmosphere, leading to warmer temperatures, melting ice caps, sea-level rise, more frequent extreme weather events (like droughts and

floods), and disruptions to ecosystems and biodiversity^{xv}.

Climate adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects, human intervention may facilitate adjustment to expected climate and its effects^{xvi}.

Climate Mitigation: A human intervention to reduce emissions or enhance the sinks of greenhouse gases^{xvi}.

Circular Economy: A system that maintains the value of products, materials, and resources in the economy for as long as possible, and

ix Fauna & Flora International, 'National Biodiversity Strategy and Action Planning'. [Online]. Available: <https://www.cbd.int/nbsap/doc/guidelines/ffi-nbsap-guidelines-en.pdf>

x Biodiversify, 'Biodiversity Strategies'. Accessed: Aug. 26, 2025. [Online]. Available: <https://biodiversify.com/services/corporate-biodiversity-strategy/>

xi LAWPRO, 'Implementation of Urban Nature-based Solutions. Guidance Document for Planner, Developers and Developer Agents', 2025. [Online]. Available: <https://lawaters.ie/publications/>

xii OPR, 'Planning Glossary'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.opr.ie/planning-glossary-list/>

xiii National Biodiversity Data Centre, 'Gardening for butterflies - helping butterflies with native plants', 2023. Accessed: Aug. 18, 2025. [Online]. Available: <https://biodiversityireland.ie/gardening-for-butterflies-helping-butterflies-with-native-plants/>

xiv IPBES, 'Annex I: Glossary of the Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services', Zenodo, 2019. [Online]. Available: <https://doi.org/10.5281/zenodo.5657079>

xv LAWPRO, 'Implementation of Urban Nature-based Solutions. Guidance Document for Planner, Developers and Developer Agents', 2025. [Online]. Available: <https://lawaters.ie/publications/>

xvi IPCC, 'Annex II: Glossary [Möller, V., R. van Diemen, J.B.R. Matthews, C. Méndez, S. Semenov, J.S. Fuglestedt, A. Reisinger (eds.)]', in In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK and New York, NY, USA.; Cambridge University Press, 2022, pp. 2897–2930. doi:10.1017/9781009325844.029

minimises the generation of waste. This means a system where products are reused, repaired, remanufactured, or recycled^{xvii}.

Conservation: The protection, care, management and maintenance of ecosystems, habitats, wildlife species and populations, within or outside of their natural environments, to safeguard the natural conditions for their long-term permanence^{xviii}.

Degradation [of an ecosystem]: A level of deleterious human impact to ecosystems that results in the loss of biodiversity and simplification or disruption in their structure, composition, and functionality, and generally leads to a reduction in the flow of ecosystem goods and services^{xix}.

Designated Sites: Legally protected areas in Ireland and the EU, including Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Natura 2000 sites, designated under EU Directives for the protection of habitats and species of conservation concern^{xx}.

Detention Basins: Landscaped depressions that are normally dry except during and following rainfall events, designed to attenuate runoff and, where vegetated, provide treatment^{xi}.

Ecological Connectivity: The unimpeded movement of species and the flow of natural processes that sustain life on Earth^{xxi}. The ecological connectivity for species is the movement of populations, individuals, genes, gametes and propagules between populations, communities and ecosystems, as well as that of

non-living material from one location to another^{xviii}.

Ecological Corridors: Natural or restored areas, from narrow vegetation strips to larger greenways and riparian zones, that connect fragmented habitats. They allow wildlife movement, dispersal, and access to resources, and support genetic diversity, helping mitigate the impacts of habitat fragmentation on biodiversity^{xviii}.

Ecosystem: A system in which living things (plants, animals, bacteria, etc.) and their non-living surroundings interact as a functional unit^{xxii}. Ecosystems may be small and simple, like an isolated pond, or large and complex, like a specific tropical rainforest^{xxiii}.

Ecosystem health: A state or condition of an ecosystem that expresses attributes of biodiversity within normal ranges, relative to its ecological stage of development^{xxiv}.

Ecosystem Resilience: The capacity of a system to absorb disturbance and reorganise while still retaining similar function, structure, and feedback. In plant and animal communities, this property is highly dependent on adaptations by individual species to disturbances or stresses experienced during the species' evolution^{xxiii}.

Ecosystem Services: Services that an ecosystem provides and on which humans depend. These are commonly categorised as: provisioning services (food, water, wood); regulating services (climate regulation, flood control, disease regulation, and water quality); cultural services (recreation and

xvii European Union, 'Circular economy', EUR-Lex. Accessed: Aug. 18, 2025. [Online]. Available: <https://eur-lex.europa.eu/EN/legal-content/glossary/circular-economy.html>

xviii J. Hilty et al., 'Guidelines for conserving connectivity through ecological networks and corridors', IUCN, 2020. doi: <https://doi.org/10.2305/IUCN.CH.2020.PAG.30.en>

xix Society for Ecological Restoration, 'International Standards for the Practice of Ecological Restoration - including Principles and Key Concepts', 2016. [Online]. Available: https://seraustralasia.com/wheel/image/SER_International_Standards.pdf

xx National Parks & Wildlife Service, 'Designated site data'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/maps-and-data/designated-site-data>

xxi CMS, 'Ecological Connectivity in the Post-2020 Global Biodiversity Framework', 2020. [Online]. Available: <https://www.cbd.int/api/v2013/documents/7459664A-979E-BD14-419F-FBC30555FB09/attachments/212112/CMS.pdf>

xxii European Union (EU), 'Ecosystem', EUR-Lex. Accessed: Aug. 13, 2025. [Online]. Available: <https://eur-lex.europa.eu/EN/legal-content/glossary/ecosystem.html>

xxiii IUCN, 'Guidance for using the IUCN Global Standard for Nature-based Solutions', 2020. [Online]. Available: <https://doi.org/10.2305/IUCN.CH.2020.09.en>

xxiv IPBES, 'Ecosystem health'. Accessed: Aug. 13, 2025. [Online]. Available: <https://www.ipbes.net/glossary-tag/ecosystem-health>

ecotourism); and supporting services (soil formation, pollination and nutrient cycling)^{xxv}.

Embodied Carbon: The GWP associated with all construction materials and products over a building's whole life cycle; cradle to grave (modules A1-A5, B1-B5 and C1-C4)^{xxvi}.

Embodied Ecological Impact

(EEI): The ecological impacts that happen off-site through upstream or downstream activities, such as habitat loss or environmental damage from material extraction, manufacturing, transportation, and disposal of unused materials. These impacts are primarily associated with the extraction, production, and supply chain of materials^{xxvii}. Environmental, Social, and Governance (ESG): A set of reporting standards, defined by mandatory laws and voluntary guidelines, that

helps relevant stakeholders (investors, shareholders, regulators, employees, and consumers) understand how companies, investment firms, financial advisors, and other actors manage risks and opportunities related to environmental, social and governance factors^{xxviii}.

Forebay: A small basin or pond upstream of the main drainage component with the function of trapping sediment^{xxix}.

Grassland: Herbaceous-dominated ecosystems with minimal woody cover, characterised by a mix of grasses and wildflowers, which can be semi-natural or managed^{xxx}. Semi-natural grasslands are habitats managed through low-intensity farming, grazing or mowing. They support healthy soils, clean water, and a variety of wildlife, including wildflowers, insects, invertebrates,

birds, and mammals^{xxxi}. Both types are vital for biodiversity conservation.

Greenfield: Potential open development land on the periphery of urban settlements, having no previous building on it. Development on such lands will generally require the provision of new infrastructure, including roads, sewers and ancillary social and commercial facilities^{xii}.

Green Infrastructure: Refers to all natural, semi-natural and artificial networks of multifunctional ecological systems within, around and between urban areas, at all spatial scales. The green infrastructure concept emphasises the quality as well as quantity of urban and peri-urban green spaces, their multifunctional role, and the importance of interconnections between habitats^{xxiii}.

Green Roof: Roofs with a vegetated surface that provide a degree of retention, attenuation and treatment of rainwater and promote evapotranspiration. As a nature-based solution, they provide benefits including water quality treatment, amenity and biodiversity^{xi}. Subtypes of green roofs include:

Extensive roof: a roof that has a lower substrate (100-200mm) and lower maintenance requirements, and tends not to be accessible. They are often more suitable for existing buildings as they use less growing media^{xi, xxxii}.

Intensive roof: a roof that has a deeper substrate (soil depth: 200-750mm+) and higher loads but requires more intensive accessible maintenance. They can accommodate taller plants such as shrubs and trees, creating natural habitats in the urban

xxv European Union (EU), 'Ecosystem services', EUR-Lex. Accessed: Aug. 13, 2025. [Online]. Available: <https://eur-lex.europa.eu/EN/legal-content/glossary/ecosystem-services.html>

xxvi IGBC, 'Building a Zero Carbon Ireland', 2022. [Online]. Available: <https://www.igbc.ie/building-a-zero-carbon-ireland>

xxvii UKGBC, 'Embodied Ecological Impacts', UKGBC. Accessed: Aug. 18, 2025. [Online]. Available: <https://ukgbc.org/our-work/topics/embodied-ecological-impacts/>

xxviii C. Sweeney, 'Environmental, Social and Governance (ESG), and Sustainable Development The Legal and Regulatory Framework in Ireland', Tithe an Oireachtais Houses of the Oireachtas, 2023. [Online]. Available: https://data.oireachtas.ie/ie/oireachtas/libraryResearch/2023/2023-10-03_spotlight-environmental-social-and-governance-esg-and-sustainable-development-the-legal-and-regulatory-framework-in-ireland_en.pdf

xxix susdrain CIRIA, 'Glossary'. Accessed: Aug. 27, 2025. [Online]. Available: <https://www.susdrain.org/resources/glossary.html>

xxx National Parks & Wildlife Service, 'Grasslands'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/research-projects/grasslands>

xxxi National Biodiversity Data Centre, 'Glossary', All-Ireland Pollinator Plan. Accessed: Aug. 18, 2025. [Online]. Available: <https://pollinators.ie/wildflower-seed/glossary/>

xxxii IGBC, 'Biodiversity and the Built Environment', 2023. [Online]. Available: https://www.igbc.ie/wp-content/uploads/2023/05/Biodiversity-and-the-Built-Environment_IGBC-1.pdf

environment and attracting more insects and birds^{xi, xxxii}.

- » Semi-intensive roof: (150-250mm)^{xxxii}.
- » Brown roof: a green roof that is left to self-vegetate from windblown and bird seed dispersal^{xxxii}.

Habitat: The place or type of site where an organism or population naturally occurs^{xviii}.

Heritage (Cultural and Natural):

Cultural heritage includes monuments, groups of buildings, and sites of outstanding universal value; natural heritage refers to natural features, geological and physiographical formations, and areas with value for science, conservation or natural beauty^{xxxiii}.

Invasive Species: A species that is not native to a specific location or nearby, lacking natural controls, and that tends to rapidly increase in abundance, displacing native species^{xvi}.

Mammal gates: A type of gate designed to allow animals, such as hedgehogs, to pass freely through fences without causing damage^{xxxiv}. They should be strategically placed along established wildlife corridors, allowing animals to travel between foraging and nesting areas^{xxxv}.

Meadows: Semi-natural grasslands and among the most threatened habitats in Ireland^{xxxvi}.

Native Species: Indigenous species of animals or plants that naturally occur in a given region or ecosystem^{xvi}.

Natura 2000: An EU network of areas of high biodiversity value. It comprises special protection areas (SPAs) established under the Birds Directive (1979) and special areas of conservation (SACs) established under the Habitats Directive (1992)^{xxxvii}.

Nature-based Solutions (NbS):

Solutions inspired and supported by nature that are cost-effective, provide environmental, social and economic benefits, and help build resilience. They bring diverse natural features and processes into cities and landscapes through locally adapted, resource-efficient and systemic interventions^{xxxviii}. In urban drainage design, NbS use nature to replicate natural drainage processes, offering sustainable alternatives to hard engineering^{xi}.

Natura Impact Assessment [or Natura Impact Statement]: Scientific and technical report prepared to support the Appropriate Assessment process under the EU Habitats Directive. It specifically evaluates the implications of a plan or project on one or more Natura 2000 sites (SACs and SPAs), considering their conservation objectives and integrity^{xxxix}.

Natural Carbon Sink: Any [natural] process, activity or mechanism that removes carbon dioxide from the atmosphere^{xiv}.

Natural Heritage Area (NHA): Natural Heritage Areas (NHAs) for Ireland have been created by the Natural Parks and Wildlife Service (NPWS). They are areas considered important for the habitats present or areas which hold species whose habitats require protection. They are the basic designation for

xxxiii UNESCO, 'Convention Concerning the Protection of the World Cultural and Natural Heritage', UNESCO World Heritage Centre. Accessed: Aug. 18, 2025. [Online]. Available: <https://whc.unesco.org/en/conventiontext/>

xxxiv Conservation Evidence, 'Action: Provide badger gates'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.conservationevidence.com/actions/84?utm>

xxxv E. Mason, 'The NHBS Guide to Badger Gates', The NHBS Conservation Hub. Accessed: Aug. 18, 2025. [Online]. Available: <https://blog.nhbs.com/how-to-guides/nhbs-guide-to-badger-gates/?utm>

xxxvi National Biodiversity Data Centre, 'What a meadow should look like', All-Ireland Pollinator Plan. Accessed: Aug. 18, 2025. [Online]. Available: <https://pollinators.ie/wildflower-seed/what-a-meadow-should-look-like/>

xxxvii European Union, 'Natura 2000', EUR-Lex. Accessed: Aug. 18, 2025. [Online]. Available: <https://eur-lex.europa.eu/EN/legal-content/glossary/natura-2000.html>

xxxviii European Commission, 'Nature-based solutions'. Accessed: Aug. 15, 2025. [Online]. Available: https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en

xxxix National Parks & Wildlife Service, 'Guidance on Appropriate Assessment for Planning Authorities'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/protected-sites/guidance-appropriate-assessment-planning-authorities>

wildlife protection in the Irish state. The NHA dataset comprises a range of sites designated under Irish legislation. The process of designation is ongoing, and the data is constantly undergoing minor changes as a result of an appeals procedure^{xl}.

Nature Development Areas:

Locations where nature conservation can be combined with existing activities such as farming, forestry, quarrying and recreation (e.g. golf courses). These areas are reservoirs of biodiversity and, together with the corridors and stepping stones, allow species to move through the landscape^{xli}.

Nutrient Cycling: An ecological process that maintains the stocks of nutrients (such as nitrogen and

phosphorus) and regulates their flows through soil, water, plants, and animals^{xlii}.

No net loss: Means negative impacts are offset, resulting in a neutral effect^{xi}.

Ornamental Plants: Plants that are cultivated for aesthetic and decorative purposes^{xliii}, such as pot plants, bulbs, and nursery stock^{xliv}.

Peat-free Compost: Compost made without peat, composed instead of alternative materials (bark, wood-waste and other organic matter)^{xlv}.

Perennial Plants: Plants that recur year after year^{xxxi}.

Permeable paving/surface: A paving system that allows water to infiltrate into underlying layers or soils, reducing surface runoff and supporting stormwater management^{xlvi}. However, in their most common hard format, they do not meet the criteria for NbS and should not be considered the primary option for sustainable urban drainage design^{xi}.

Peatland: Wetland ecosystems where soils are dominated by peat. In peatlands, net primary production exceeds organic matter decomposition as a result of waterlogged conditions, which leads to the accumulation of peat^{xvi}.

Pictorial Meadow: Deliberately created, colourful planting of

wildflowers and other decorative plants, designed mainly for visual appeal, with ecological benefits as a secondary aspect^{xlvii}.

Placemaking: A multi-faceted approach to the planning, design and management of public spaces. It capitalises on a local community's assets, inspiration and potential, with the intention of creating public spaces that promote people's health, happiness, and wellbeing^{xlviii}.

Pollinator-friendly plants: Plants that attract and sustain pollinators by providing reliable food sources (nectar and pollen) and suitable habitat throughout pollinators' active seasons^{xlix}.

xl National Parks & Wildlife Service, 'Natural Heritage Areas (NHA)'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/protected-sites/nha>

xli Fingal County Council, 'Chapter 9: Green Infrastructure and Natural Heritage', Fingal County Council Online Consultation Portal. Accessed: Aug. 18, 2025. [Online]. Available: <https://consult.fingal.ie/en/consultation/draft-fingal-county-development-plan-2023-2029/chapter/chapter-9-green-infrastructure-and-natural-heritage>

xlii Millennium Ecosystem Assessment, 'Ecosystems and Human Well-being - Synthesis', 2005. [Online]. Available: <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>

xliii C. Oluwaseun Adetunji, D. Ingo Hefft, D. Onyango Mbugue, and T. Seyoum Workneh, 'The effect of evaporative coolant structure on ornamental plants', in *Evaporative Coolers for the Postharvest Management of Fruits and Vegetables*, 2023. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/ornamental-plant>

xliv Teagasc, 'Production of Nursery Stock and Ornamental Plants'. Accessed: Aug. 18, 2025. [Online]. Available: <https://teagasc.ie/rural-economy/rural-development/diversification/production-of-nursery-stock-and-ornamental-plants/>

xlv Irish Peatland Conservation Council, 'Be a Peat Free Gardener'. Accessed: Aug. 26, 2025. [Online]. Available: <https://www.ipcc.ie/help-ipcc/be-a-peat-free-gardener/>

xlvi Natural Water Retention Measures, 'Permeable surfaces'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.nwrm.eu/measure/permeable-surfaces>

xlvii Pictorial Meadows, 'Pictorial Meadows'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.pictorialmeadows.co.uk/>

xlviii Dublin City Council, 'Placemaking and Clusters'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.dublincity.ie/business-and-events/find-supports-local-businesses/placemaking-and-clusters>

xlix National Biodiversity Data Centre, 'Who are our pollinators?', All-Ireland Pollinator Plan. Accessed: Aug. 18, 2025. [Online]. Available: <https://pollinators.ie/record-pollinators/>

Ponds: Depressions designed to temporarily store surface water above permanently wet pools that permit the settlement of suspended solids and the biological removal of pollutants^{xi}.

Positive net gain: Means a measurable improvement in biodiversity after development, compared to the biodiversity that existed before the development took place^l.

Protected areas: A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values^{xviii}.

Proposed Natural Heritage Area (pNHA): In addition to the NHA, there are proposed NHAs (pNHAs), sites identified as being of conservation interest, but which have not yet

received full legal protection. Planning authorities must consider pNHAs in decision-making processes, though the level of legal protection is weaker than for NHAs^{xi}.

Rain garden: A shallow planted depression in the ground that mimics natural temporary pools and stores rainwater^{li}.

Resilience: The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure^{xvi}.

Restoration: Any intentional activities that initiate or accelerate the recovery of an ecosystem from a degraded state [14].

Sealed Surface: An area covered by an impermeable material (concrete, asphalt, etc.) that prevents infiltration of water, impacting runoff and urban drainage^{lii}.

Sensory Garden: Spaces that offer opportunities to connect with nature through the five senses: sight, sound, touch, smell, and taste. This connection to nature is recognised as beneficial for human health and wellbeing^{liiii}.

Species: A group of similar organisms that are typically distinct from other groups. They can be classified based on physical traits or genetics and assigned a unique scientific name^{xiv}.

Special Areas of Conservation (SAC): These are prime wildlife conservation areas, considered to be important on a European as well as Irish level. Most SACs are in the countryside, although a few sites reach into town or

city landscapes, such as Dublin Bay and Cork Harbour. Detailed conservation objectives are available for some SACs and, as additional ones are approved, they are posted on the NPWS website (www.npws.ie). The legal basis on which SACs are selected and designated is the EU Habitats Directive. The Directive lists certain habitats and species that must be protected within SACs^{liv}.

Special Protection Areas (SPA): The EU Birds Directive (79/409/EEC) requires designation of SPAs for: listed rare and vulnerable species; regularly occurring migratory species, such as ducks, geese and waders; wetlands, especially those of international importance, which attract large numbers of migratory birds each year. Internationally important means that 1% of the population of a species uses the site, or more than 20,000 birds regularly use the site^{lv}.

^l UK Government, 'Biodiversity net gain', GOV.UK. Accessed: Aug. 15, 2025. [Online]. Available: <https://www.gov.uk/government/collections/biodiversity-net-gain>

^{li} McCloy Consulting and Robert Bray Associates, 'A householder's Guide to Sustainable Drainage (SuDS) - Managing rainfall more naturally in South Dublin', 2022. [Online]. Available: <https://www.sdcc.ie/en/services/environment/environmental-health/water-services/sustainable-drainage-systems/>

^{lii} European Commission, 'Guidelines on best practices to limit, mitigate or compensate soil sealing', 2012. [Online]. Available: <https://circabc.europa.eu/ui/group/54d2e010-4fc4-4962-9113-1e7d574f4a46/library/c201a601-293f-48b9-abe3-3fea3fdc1a82/details>

^{liiii} National Biodiversity Data Centre, 'New flyer: Pollinator-friendly Sensory Gardens', All-Ireland Pollinator Plan. Accessed: Aug. 27, 2025. [Online]. Available: <https://pollinators.ie/sensorygardens/>

^{liv} 'Special Areas of Conservation (SAC)'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/protected-sites/sac>

^{lv} National Parks & Wildlife Service, 'Special Protection Areas (SPA)'. Accessed: Aug. 18, 2025. [Online]. Available: <https://www.npws.ie/protected-sites/spa>

Sustainable Urban Drainage System

(SuDS): SuDS are methods that use nature to replicate natural processes of drainage, providing a solution that is more sustainable and not based on hard engineering. SuDS design is guided by the management of surface water runoff such that it achieves maximal benefits, including improvements to water quantity and quality, amenity, and biodiversity. A feature does not need to achieve all four pillars to be classified as SuDS^{xi}.

Swale: Shallow vegetated channel designed principally to convey and treat runoff. A Dry Swale is a Conveyance Swale that has the addition of a filter medium and underdrain system. A Wet Swale is a Conveyance Swale, designed to deliver wet and/or marshy conditions at the base^{xi}.

Tree Pits: Constructed underground structures used to create voided space

to contain a soil and/or storage volume and protect the root space of one or more trees when located within a paved area^{xi}.

Tidy Towns: An initiative organised by the Department of Rural and Community Development and the Gaeltacht, with support from sponsors, that encourages communities to improve their local environment and sustainability^{lvi}.

Urban Biodiversity: The variety and abundance of life in a city. It is most often measured by the types and extents of ecosystems (lakes, grasslands, wetlands, and forests) and by the types and abundances of plant and animal species within them^{lvii}.

Urban Heat Island: The phenomenon where urban areas experience higher air, surface, and soil temperatures compared to their rural surroundings.

This temperature difference arises due to human activities and the built environment, such as buildings, roads, and other infrastructure, which absorb and retain heat more than natural landscapes like forests and water bodies^{lviii}.

Wetlands: An area of land that is saturated with water either permanently or seasonally, and where the water table is near or at the surface^{lix}. In the context of SuDS, they are depressions designed to temporarily store surface water above permanently wet pools that permit settlement of suspended solids and biological removal of pollutants^{xi}.

Wader Scrape: A shallow pond that provides nesting and feeding opportunities for waders (young curlew, snipe, lapwing) and is also beneficial for other species such as frogs. It should be located away from hedgerows, scrub, woodland, and forestry. A large wet

grassland field is ideal, though a cutover bog can also be suitable^{lx}.

Woodlands: Areas dominated by native species of trees and other native plants. Different woodland types have distinct ecological attributes and sensitivities, reflecting their species composition, structure, and history. Together, they represent some of the most complex and biodiverse habitats in the country, supporting species-rich environments that contribute to biodiversity, habitat stability, and wider ecosystem services such as water and soil protection, carbon sequestration, and cultural value^{lxi}.

lvi Government of Ireland, 'Tidy Towns', [gov.ie](https://gov.ie/en/departments/rural-and-community-development-and-the-gaeltacht/policy-information/tidytowns/). Accessed: Aug. 18, 2025. [Online]. Available: <https://gov.ie/en/departments/rural-and-community-development-and-the-gaeltacht/policy-information/tidytowns/>

lvii The World Bank, 'Urban Nature and Biodiversity for Cities'. [Online]. Available: https://www.thegps.org/sites/default/files/final_urban_nature_and_biodiversity_for_cities.pdf

lviii G. Mills, 'Explainer: why are cities warmer than the countryside?', 2016. Accessed: Aug. 27, 2025. [Online]. Available: <https://www.ucd.ie/newsandopinion/news/2016/25explainerwhyarecitieswarmerthanthecountryside/>

lix Irish Ramsar Wetlands Committee, 'Irish Wetland Types - An Identification Guide and Field Survey Manual', 2018. [Online]. Available: <https://www.npws.ie/sites/default/files/general/irish-wetlands-guide.pdf>

lx ACRES, 'NPI Wader Scrapes'. Accessed: Aug. 27, 2025. [Online]. Available: <https://acresireland.ie/action-projects/npi-wader-scrapes/>

lxi J. R. Cross and K. D. Collins, 'Management Guidelines for Ireland's Native Woodlands', National Parks & Wildlife Service, Department of Arts, Heritage, Regional, Rural & Gaeltacht Affairs, 2017. [Online]. Available: <https://www.npws.ie/sites/default/files/publications/pdf/Management%20Guidelines%20for%20Ireland's%20Native%20Woodlands%202017.pdf>

Regulations & Policy

Level	Name	Type	Year
Global	Kunming-Montreal Global Biodiversity Framework (GBF)	Policy Framework/ International Agreement	December 2022
	UN Sustainable Development Goals (SDGs) UN Resolution A/RES/70/1 (2015)	Policy Framework	September 2015
EU	European Green Deal COM/2019/640 final	Policy Framework	December 2019
	EU Biodiversity Strategy for 2030 COM/2020/380 final	Strategy	May 2020
	A New Deal for Pollinators COM/2023/35 final	Initiative	January 2023
	Action Plan: Financing Sustainable Growth COM/2018/097 final	Policy / Framework	March 2018
	EU Taxonomy Regulation Regulation (EU) 2020/852	Regulation	June 2020
	European Sustainability Reporting Standards Delegated Regulation (EU) 2023/2772	Delegated Regulation	July 2023
	8th Environment Action Programme Decision (EU) 2022/591	Strategy / Policy	April 2022
	New European Bauhaus COM/2021/573 final	Initiative	September 2021
	EU Green Infrastructure Strategy COM/2013/249 final	Strategy	May 2013

Level	Name	Type	Year
	Birds Directive Directive 2009/147/EC	Directive	November 2009
	Habitats Directive Council Directive 92/43/EEC	Directive	May 1992
	EU Nature Restoration Regulation Regulation (EU) 2024/1991	Regulation	June 2024
	EU Deforestation Regulation (EUDR) Regulation (EU) 2023/1115	Regulation	May 2023
	Strategic Environmental Assessment (SEA) Directive 2001/42/EC	Directive	June 2001
	Environmental Impact Assessment (EIA) Directive 2014/52/EU	Directive	April 2014
	Appropriate Assessment (AA) Directive 1992/43/ EEC- Art. 6(3)/6(4)	Directive	May 1992
	Strategic Risk Assessment (SFRA) Directive 2007/60/EC	Directive	October 2007
	Water Framework Directive Directive 2000/60/EC	Directive	October 2000
	Urban Wastewater Treatment Directive 2024/3019	Directive	November 2024
	Taskforce on Nature-related Financial Disclosures (TNFD)	Initiative	June 2021

Level	Name	Type	Year
National	Ireland's 4th National Biodiversity Action Plan 2023–2030	Policy Framework/ International Agreement	January 2024
	National Planning Framework: First Revision	Policy Framework	April 2025
	All-Ireland Pollinator Plan 2021–2025	Initiative	March 2021
	The Wildlife Act 1976 - The Wildlife (Amendment) Act 2000 and 2023	Legislation	1976, 2000, 2023
	Water Action Plan 2024: A River Basin Management Plan for Ireland	Plan	September 2024
	Nature Based Management of Urban Rainwater and Urban Surface Water Discharges – A National Strategy	Strategy	May 2024
	National Adaptation Framework (NAF) 2024	Policy/Framework	June 2024
Local	Local Authority Climate Action Plans	Plan	
	Local Authority Biodiversity Action Plans	Plan	
	Local Authority Biodiversity and Heritage Strategic Plan	Plan	

Global Kunming- Montreal Global Biodiversity Networkⁱ

Part The Kunming-Montreal Global Biodiversity Framework (GBF) was adopted in 2022, building on the UN Convention on Biological Diversity (CBD), an international treaty established at the 1992 Rio Earth Summit, with 196 parties including Ireland. The GBF is a landmark agreement to halt and reverse nature loss, establishing four goals for 2050 and 23 targets for 2030, with several directly relevant to the built environment.

These include restoring at least 30% of degraded ecosystems, conserving at least 30% of natural areas, and integrating biodiversity into spatial planning through participatory, integrated, and biodiversity-inclusive approaches. The framework calls for improving urban green and blue spaces,

using nature-based solutions, and integrating biodiversity into all planning and policy decisions.

The GBF supports the achievement of the UN Sustainable Development Goals (SDGs). By adopting it, all parties, including Ireland, committed to setting national targets for its implementation and submitting National Biodiversity Strategies and Action Plans (NBSAPs).

[More information](#)

UN Sustainable Development Goalsⁱⁱ

[UN Resolution A/RES/70/1 \(2015\)](#)

The UN Sustainable Development Goals (SDGs) were established in 2015 as part of the UN 2030 Agenda for Sustainable Development, a global collective pledge to find sustainable and inclusive development solutions by 2030. The EU committed to implementing the SDGs in all its policies and encourages members

ⁱ Source: Convention on Biological Diversity (n.d.). 'Kunming-Montreal Global Biodiversity Framework'. Available at: <https://www.cbd.int/gbf>

ⁱⁱ Sources: EU (n.d.). 'Sustainable Development Goals'. Available at: https://international-partnerships.ec.europa.eu/policies/sustainable-development-goals_en UN (n.d.). Sustainable Development Goals. Available at: <https://sdgs.un.org/>

to do the same. Of 17 goals, those particularly relevant to biodiversity and the built environment include:

- » Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable (e.g., enhancing sustainable urbanisation, reducing environmental impact of cities, and providing access to green public spaces).
- » Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss (e.g., reducing natural habitat degradation, managing invasive species, and integrating biodiversity into planning)ⁱⁱⁱ.

More information: <https://sdgs.un.org/>

European Union European Green Deal^{iv}

COM/2019/640 final

The European Green Deal (EGD) is a growth strategy and policy framework covering multiple priorities, including the preservation, protection and enhancement of the EU's ecosystems and biodiversity, as well as safeguarding the health and well-being of citizens from environment-related risks and impacts. The EGD recognises land-use change and the direct exploitation of natural resources as primary causes of biodiversity loss. It states that all EU policies should contribute to preserving and restoring Europe's natural capital.

To deliver this vision, several biodiversity-related action plans, such as the 8th Environment Action Programme and the EU Biodiversity Strategy, and initiatives like the New Deal for Pollinators have been developed.

Note: The Omnibus package^v, adopted in February 2025, is a legislative simplification initiative aimed at reducing administrative burdens for businesses and streamlining sustainable finance rules, including reporting under the CSRD and criteria under the EU Taxonomy. As of August 2025, the Omnibus package is still under development. Stakeholders should monitor ongoing developments as future decisions may significantly influence the strength and reach of the EU's sustainability reporting framework.

[More information](#)

EU Biodiversity Strategy^{vi}

COM/2020/380 final

The EU Biodiversity Strategy sets out commitments and actions for Europe's biodiversity recovery by 2030. It addresses the five main drivers of biodiversity loss, such as changes in land and sea use, over-exploitation, climate change, pollution, and invasive alien species, and aims to establish an enhanced governance framework.

It also promotes the systematic integration of healthy ecosystems, green infrastructure and nature-based solutions into all forms of urban planning, requiring cities with populations over 20,000 to implement ambitious Urban Greening Plans by 2021.

[More information](#)

ⁱⁱⁱ SDGs global progress by 2024: Goal 11: There is insufficient data to evaluate most of its targets, including those related to sustainable urbanisation, urban green and public spaces, and urban planning. However, cities sprawled up to 3.7 times faster than they densified from 2000 to 2020 (data from 1,217 cities in 185 countries). This unregulated growth has negative impacts on the natural environment and hinders progress toward achieving balanced urban growth. Goal 15: Progress on reducing biodiversity loss has regressed, although measures to prevent the introduction of invasive species are on track. There has been only marginal progress in integrating biodiversity into national and local planning, as well as in increasing financial resources for biodiversity and ecosystems. Significant acceleration is needed in both areas (<https://unstats.un.org/sdgs/report/2024/The-Sustainable-Development-Goals-Report-2024.pdf>).

^{iv} Source: EC (n.d.). 'The European Green Deal'. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019_2024/european-green-deal

^v Source: EC (2023). 'Omnibus I package'. Available at: https://finance.ec.europa.eu/publications/omnibus-i-package-commission-simplifies-rules-sustainability-and-eu-investments-delivering-over-eu6_en

^{vi} Source: EC (2021). 'Bringing nature back into our lives'. Publications Office of the European Union. Available at: <https://data.europa.eu/doi/10.2779/677548>

A New Deal for Pollinators (Initiative)^{vii}

COM/2023/35 final

This initiative, a key part of the Biodiversity Strategy 2030, aims to reverse the decline of pollinator populations by 2030. It outlines actions to address the causes of pollinator loss, including urbanisation, and strengthen conservation efforts. This initiative also supports the Nature Restoration Regulation and the upcoming National Restoration Plans.

[More information](#)

Action Plan: Financing Sustainable Growth^{viii}

COM/2018/079 final

The EU Action Plan for Financing Sustainable Growth aims to reorient capital flows towards sustainable investment, mainstream sustainability in risk management and foster transparent financial and economic activity. Key strategic elements of the plan included establishing a classification system for environmentally sustainable activities (EU Taxonomy), improving sustainability disclosure and transparency requirements, and promoting sustainable finance integration across markets.

[More information: https://finance.ec.europa.eu/publications/renewed-sustainable-finance-strategy-and-implementation-action-plan-financing-sustainable-growth](https://finance.ec.europa.eu/publications/renewed-sustainable-finance-strategy-and-implementation-action-plan-financing-sustainable-growth)

The EU Taxonomy Regulation^{ix}

Regulation (EU) 2020/852

The EU taxonomy establishes a classification system to determine which economic activities can be considered environmentally sustainable, supporting investments for the European Green Deal. It sets six climate and environmental objectives, including protection and restoration of biodiversity and ecosystems.

For construction-related activities (e.g., manufacturing of materials, construction and renovation of buildings), a technical screening criteria (EU 2021/2139, Annex I) was set to ensure projects avoid significant harm to biodiversity. Requirements include avoiding construction in greenfield land of high biodiversity value and

integrating nature-based solutions and blue/green infrastructure^x.

[More information](#)

Corporate Sustainability Reporting Directive^{xi}

Directive (EU) 2022/2464

The Corporate Sustainability Reporting Directive (CSRD) sets mandatory requirements and obligations for large companies to report on their impacts, risks, and dependencies linked to biodiversity throughout their operations and supply chains.

[More information](#)

vii Source: EC (2023). 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Revision of the EU Pollinators Initiative - A new deal for pollinators'. COM(2023) 35 final. Available at: <https://eur-lex.europa.eu/legal-content/cdd/TXT/?uri=COM%3A2023%3A35%3AFIN&qid=1674555285177>

viii Source: EC (2018). 'Action Plan: Financing Sustainable Growth'. COM/2018/097 final. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097>

ix Source: EU (2020). 'Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088'. Official Journal L 198, 22 June 2020, pp. 13–43. Available at: <https://eur-lex.europa.eu/eli/reg/2020/852/oj/eng>

x Source: EU (2021). 'Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 (OJ L 442, 9.12.2021, p. 1). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R2139>

xi Source: EU (2022). Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 on corporate sustainability reporting (CSRD). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464>

European Sustainability Reporting Standards^{xii}

Delegated Regulation (EU) 2023/2772

The European Sustainability Reporting Standards (ESRS), adopted in 2023, are the detailed reporting standards and frameworks to implement the CSRD. ESRS E4, focused on biodiversity and ecosystems, requires disclosure of material impacts, risks, dependencies, and opportunities related to biodiversity across operations and value chains, including construction activities. Key ESRS E4 include disclosure of: transition plans aligned with biodiversity preservation and the EU Biodiversity Strategy 2030 targets; biodiversity-related policies; actions and resources for biodiversity protection; biodiversity targets; biodiversity impacts; and financial effects of biodiversity-related risks and opportunities.

[More information](#)

The 8th Environment Action Programme^{xiii}

Decision (EU) 2022/591

The 8th Environment Action Programme (EAP) builds on the European Green Deal and it is a legally binding framework, outlining the EU's environmental policy agenda through 2030. It establishes key priorities and the enabling conditions required to achieve them.

[More information](#)

New European Bauhaus (Initiative)^{xiv}

COM2021/573 final

The New European Bauhaus (NEB) is an initiative that aims to reimagine sustainable living with biodiversity as an inseparable value, providing tools to support projects, such as the NEB Compass (2023) and NBS Investment Guidelines (2024). The Compass is a

guiding framework offering criteria to evaluate projects environmentally, ensuring they enhance biodiversity, and promote restoration and expansion of nature.

The Investment Guidelines provides advice on how to align built environment investments with NEB principles, and offers recommendations for buildings, open space and neighbourhood projects to enhance biodiversity, such as connecting to nature through green streets and restored natural elements, implementing green and blue infrastructure (e.g., NbS and SuDS), and fostering biodiversity by preserving and creating diverse green spaces and protecting urban water bodies.

[More information](#)

EU Green Infrastructure Strategy^{xv}

COM/2013/249 final

The strategy promotes the protection, restoration, creation and enhancement of green infrastructure (GI). One of its objectives is to develop a Trans-European Network for GI and green corridors, aimed at halting biodiversity loss and supporting ecosystem services. It also calls for mainstreaming and integrating GI into policies and urban planning.

[More information](#)

Birds Directive^{xvi}

Directive 2009/147/EC

The directive focuses on the protection of all wild bird species in the EU, the restoration of their habitats, and the halting of their decline or disappearance, enabling their long-term thrive in their natural habitats.

^{xii} Source: EU (2023). 'COMMISSION DELEGATED REGULATION (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU as regards sustainability reporting standards'. Available at: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32023R2772>

^{xiii} Source: EU (n.d.). 'Environment action programme to 2030'. Available at: https://environment.ec.europa.eu/strategy/environment-action-programme-2030_en

^{xiv} Sources: EU (n.d.). 'New European Bauhaus Compass'. Available at: https://new-european-bauhaus.europa.eu/tools-and-resources_en

EC (2024). 'New European Bauhaus Investment Guidelines'. Available at: https://new-european-bauhaus.europa.eu/tools-and-resources_en

^{xv} Sources: EEA. EC (n.d.). 'EU Green Infrastructure Strategy'. Available at: <https://climate-adapt.eea.europa.eu/en/metadata/publications/eu-green-infrastructure-strateg>

^{xvi} Source: EC (n.d.). 'The Birds Directive'. Available at: <https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive>

It mandates the creation of Special Protection Areas (SPAs)^{xvii} for threatened and migratory bird species, which form part of the Natura 2000 network.

[More information](#)

Habitats Directive Strategy^{xviii}

Council Directive 92/43/EEC

The directive aims to conserve over 1,000 species of wild animals and plants, as well as around 230 habitat types of European importance. It established the Natura 2000 network, the largest ecological network in the world, which includes Special Areas of Conservation (SACs)^{xix} designated under this directive, alongside the SPAs from the Birds Directive.

EU Member States are required to designate and manage these protected areas to maintain or restore

habitats and species to a favourable conservation status.

Under articles 6(3) and 6(4) of the directive, an Appropriate Assessment is required for plans and projects (e.g., urban development) likely to have significant effects on Natura 2000 sites. This assessment evaluates potential impacts on the integrity of protected sites and may only allow such projects to proceed if no adverse effects are identified, or if overriding public interest justifies it with compensatory measures.

[More information](#)

EU Nature Restoration Regulation^{xx}

Regulation (EU) 2024/1991

The EU Nature Restoration Regulation, also known as the EU Nature Restoration Law (NRL), sets legally binding targets to restore degraded ecosystems. By 2030, at least 20% of the EU's degraded land and sea areas must be restored, and by 2050, all ecosystems will need to be restored.

For the first time, urban ecosystems are included as a specific focus in EU restoration targets. The specific target for urban ecosystems is to achieve no net loss of green urban space and tree cover by 2030, and to increase the total area covered by green urban space, through integration into buildings and infrastructure, by 2040 and again by 2050 (Art. 8).

The law requires all Member States to

produce a national restoration plan by 2026. Ireland will submit its Nature Restoration Plan in September 2026. This work will be led by the National Parks & Wildlife Service (NPWS) and will include a public participation process informed by robust ecological and socio-economic impact assessments.

[More information](#)

^{xvii} SPA : Sites for the conservation of all species of wild state birds, their eggs, nests and habitats naturally occurring in geographical sea and land biotopes (Birds Directive ^{79/409/EEC})

^{xviii} Source: EC (n.d.). 'The Habitats Directive'. Available at: <https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive>

^{xix} SAC : Site of community importance designated by the Member States (...) where the necessary conservation measures are applied for the maintenance or restoration, at a favourable conservation status, of the natural habitats and/or the populations of the species for which the site is designated (Habitats Directive ^{1992/43/EEC})

^{xx} Source : EU (2024). 'Regulation (EU) ^{2024/1991} of the European Parliament and of the Council of ²⁴ June ²⁰²⁴ on nature restoration and amending Regulation (EU) ^{2022/869}'. Official Journal of the European Union, L ^{2024/1991}, pp. 1–93. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1991&qid=1722240349976> NPWS (2024). 'Ministers announce membership of Advisory Committee for Ireland's Nature Restoration Plan'. Available at: <https://www.npws.ie/news/ministers-announce-membership-advisory-committee-ireland%E2%80%99s-nature-restoration-plan>

EU Deforestation Regulation^{xxi}

Regulation (EU) 2023/1115

The EU Deforestation Regulation (EUDR) aims to minimise the EU's contribution to global deforestation and forest degradation to support biodiversity and sustainability goals. Under the regulation, products such as timber, rubber, and derived products (e.g., furniture) may only be placed on the EU market or exported from the EU if they are deforestation-free^{xxii} and comply with all relevant legislation of the country of production, including environmental, forest and land-use laws.

The regulation affects the construction sector by setting requirements for the raw materials commonly used in construction. Operators and traders must perform strict due diligence, which includes providing geographic coordinates of the land of origin

and ensuring legal compliance in the production area. Construction companies using materials such as timber or rubber must ensure that these materials meet EUDR requirements.

[More information](#)

Environmental Impact Assessments

Another key component of the regulatory framework to protect biodiversity is the requirement for Environmental Impact Assessments (EIAs). EIAs are processes that identify the potential effects of proposed developments and recommend appropriate mitigation measures. They are a legal requirement in Ireland, and are intended to promote sustainable development and protect the total environment, including biodiversity. Key legal requirements include:

[More information](#)

^{xxi} Source: EU (2023). 'Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on deforestation-free products' Official Journal L 150, 09.06.2023, p. 206–256. Available at: <https://eur-lex.europa.eu/eli/reg/2023/1115/oj/eng>

^{xxii} 'Deforestation-free' means that raw materials such as timber must not have been produced on land that was deforested or degraded after 31 December 2020.

Details	Strategic Environmental Assessment (SEA)	Environmental Impact Assessment (EIA)	Appropriate Assessment (AA)	Strategic Risk Assessment (SFRA)
Legislation	Directive 2001/42/EC Statutory Instrument (SI) No. 435-436/2004; SI No. 200-201/2011	Directive 2014/52/EU SI No. 296/2018	Directive 1992/43/EEC – Art. 6(3)/6(4) SI No. 477/2011	Directive 2007/60/EC Mandatory under ministerial guidelines "The Planning System and Flood Risk Management"
Application	Certain plans/programmes (e.g. land-use planning such as development plans)	Certain projects (e.g. large-scale developments such as roads, railways, and airports)	Plans and projects *Its findings are integrated into the SEA/EIA	Plans and projects
Issues covered	Biodiversity, flora and fauna, including AA Population and human health, including SFRA Soil Water Air and climatic factors Material asset Cultural heritage Landscape	Biodiversity, flora and fauna, including AA Population and human health, including SFRA Soil Water Air and climatic factors Material asset Cultural heritage Landscape	European/Natura 2000 sites (SACs, SPAs)	Flood risk, including protection of human health and assets
Objective	High level of environmental protection Integration of environmental considerations into planning and decision-making Promotion of sustainable development	Ensure environmental protection and transparency in the decision-making process	Protect SACs and SPAs Ensure the integrity of Natura 2000 sites	Ensure flood risk is assessed and integrated into spatial planning to avoid inappropriate development

Water Framework Directive^{xxiii}

Directive 2000/60/EC

The Water Framework Directive (WFD) requires Member States to use their River Basin Management Plans (RBMPs) and Programmes of Measures (PoMs) to protect and, where necessary, restore water bodies to reach good chemical and ecological status, and to prevent deterioration. Ireland is currently drafting its third cycle RBMP. The draft RBMP goes on to acknowledge the need to move towards a more nature-based approach.

[More information](#)

Urban Wastewater Treatment Directive^{xxiv}

Directive 2024/3019

The Urban Wastewater Treatment Directive (UWWTD) aims to protect human health and the environment from the effects of untreated urban wastewater. It requires EU Member States to ensure that towns, cities, and settlements properly collect and treat wastewater. The 2024 recast highlights the need to prioritise green and blue infrastructure, such as vegetated ditches, treatment wetlands and storage ponds designed to support biodiversity, when creating new infrastructure to reduce pollution from stormwater overflows (Annex X).

[More information](#)

Taskforce on Nature-related Financial Disclosures (Initiative)^{xxv}

The Taskforce on Nature-related Financial Disclosures (TNFD) is a global, voluntary initiative that provides a standardised framework for companies and financial institutions to report and manage their nature-related risks, impacts, dependencies, and opportunities. It aims to encourage disclosure that aligns financial flows with nature-positive outcomes, supporting the protection, restoration, and sustainable use of biodiversity and ecosystems.

The TNFD has developed specific sector guidance for construction materials, engineering, construction, and real estate. For construction, TNFD guidance focuses on assessing how activities such as land use, resource extraction,

and infrastructure development affect biodiversity and ecosystems. It emphasises the identification of areas with high biodiversity value, management of habitat disruption, and the adoption of nature-based solutions to mitigate negative impacts.

[More information](#)

^{xxiii} Source: EU (2000). 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy'. Official Journal L 327, 22.12.2000, pp. 1–73. Available at: <https://eur-lex.europa.eu/eli/dir/2000/60/oj/eng>

^{xxiv} Source: EC (2024). 'Directive (EU) 2024/3019 of the European Parliament and of the Council of 27 November 2024 concerning urban wastewater treatment (recast)'. Official Journal of the European Union. L3019, 12 December 2024, pp. 1–59. Available at: <https://eur-lex.europa.eu/eli/dir/2024/3019/oj/eng>

^{xxv} Source: TNFD (n.d.). 'Our work'. Available at: <https://tnfd.global/>

National Ireland's 4th National Biodiversity Action Plan 2023-2030^{xxvi}

Ireland's 4th National Biodiversity Action Plan (NBAP) 2023-2030 sets out a national agenda for protecting and restoring biodiversity for the period 2023-2030. Key objectives in the plan include:

- » Adopt a whole-of-government, whole-of-society approach to biodiversity.
- » Meet urgent conservation and restoration needs.
- » Secure nature's contribution to people.
- » Enhance the evidence base for action on biodiversity
- » Strengthen Ireland's contribution to international biodiversity initiatives.

[More information](#)

National Planning Framework: First Revision^{xxvii}

The National Planning Framework First Revision updated several of its national policy objectives to include the application of nature-based solutions to reduce flood risk, manage stormwater, rainwater and surface water risk, and, in retrofitting existing environments, cater for surface water run-off. New national policy objectives also support an increase in green and blue spaces and tree canopy cover in settlements and addressing no net loss to biodiversity within the plan-making functions of local authorities.

[More information](#)

All-Ireland Pollinator Plan for 2021-2025 (Initiative)^{xxviii}

This plan sets out actions for all sectors, including local authorities and urban planners, to protect pollinators and biodiversity. It encourages the integration of pollinator-friendly measures into urban development, such as creating wildflower meadows, reducing pesticide use, and enhancing green spaces to support pollinators within towns and cities.

More information

The Wildlife Act 1976 - Amendment Act 2000 and 2023^{xxix}

The Wildlife Act 1976, as amended in 2000 and 2023, is the principal national legislation for the protection and conservation of wildlife, including fauna, flora and important ecosystems. It provides mechanisms for the statutory protection of Natural Heritage Areas (NHAs)^{xxx} and strengthens the protective regime for SACs.

The Act aligns with Ireland's obligations under the UN Convention on Biological Diversity. The Wildlife (Amendment) Act 2023 reinforces this by putting the National Biodiversity Action Plan on a statutory footing and placing a biodiversity duty on public bodies. As such, public bodies, including local authorities, are legally required to consider biodiversity conservation in

^{xxvi} Source: Government of Ireland (2024). 'Ireland's 4th National Biodiversity Action Plan 2024-2030'. Available at: <https://www.gov.ie/en/department-of-housing-local-government-and-heritage/publications/irelands-4th-national-biodiversity-action-plan-20232030/>

^{xxvii} Source: Government of Ireland (2025). National Planning Framework First Revision. Available at: <https://www.npf.ie/first-revision-to-the-national-planning-framework/national-planning-framework-first-revision-april-2025/>

^{xxviii} Source: National Biodiversity Data Centre (2021). 'All-Ireland Pollinator Plan for 2021-2025'. Available at: <https://pollinators.ie/aipp-2021-2025/>

^{xxix} Source: NPWS (n.d.). 'Wildlife (Amendment) Act 2000'. Available at: <https://www.npws.ie/legislation/irish-law/wildlife-amendment-act-2000>

^{xxx} Natural Heritage Area (NHA): areas designated and protected by law to protect habitats, species, or geology of national importance. In addition, there are proposed NHAs (pNHAs), sites identified as being of conservation interest but which have not yet received full legal protection. Planning authorities must consider pNHAs in decision-making processes, though the level of legal protection is weaker than for NHAs (<https://www.npws.ie/protected-sites/nha>).

their policies and operations, which influences how development is planned and executed in urban areas.

[More information](#)

Water Action Plan 2024: A River Basin Management Plan for Ireland^{xxxii}

The Water Action Plan 2024 outlines Ireland's strategies for improving water quality and highlights the importance of integrating biodiversity into urban development. It promotes the use of Integrated Catchment Management, encouraging measures that deliver co-benefits for biodiversity and enhance ecosystems while managing water resources. The plan also requires assessing and addressing the impacts on water bodies, such as water quality, biodiversity, and the condition of the local habitats.

[More information](#)

Nature Based Management of Urban Rainwater and urban Surface Water Discharges- A National Strategy

The policy framework for the use of nature-based solutions in flood and water quality management in urban areas was strengthened by the publication of the Design Manual for Urban Roads and Streets (DMURS) in 2023, and the National Strategy for the Nature Based Management of Urban Rainwater and Urban Surface Water Discharges in 2024.

The DMURS provides guidance for designers on how to incorporate nature-based solutions into road and street drainage design. Applying DMURS guidance is now mandatory when providing new or modifying existing urban roads and streets^{xxxiii} planted areas into urban areas to store and treat rainwater run-off prior to discharging

it back into the urban drainage system. This approach promotes better management of urban water resources^{xxxiii}.

The implementation of the DMURS guidance and the national strategy by local authorities has the potential to scale up the use of nature-based solutions for urban drainage in new developments, as well as in the retrofitting of urban neighbourhoods and streetscapes.

[More information -DMURS](#)

[More information- Strategy](#)

^{xxxii} Source: Government of Ireland (2024). 'Water Action Plan 2024 – A River Basin Management Plan for Ireland'. Available: <https://www.gov.ie/en/department-of-housing-local-government-and-heritage/policy-information/river-basin-management-plan-2022-2027/>

^{xxxiii} Source: Government of Ireland (2023). 'Design manual for Urban Roads and Streets'. Available at: <https://www.gov.ie/en/department-of-transport/publications/design-manual-for-urban-roads-and-streets/>

^{xxxiii} Source: DHLGH (2024). 'Nature Based Management of Urban Rainwater and Urban Surface Water Discharges - A National Strategy'. Available at: <https://www.gov.ie/en/department-of-housing-local-government-and-heritage/publications/nature-based-management-of-urban-rainwater-and-urban-surface-water-discharges-a-national-strategy/>

Local

Ireland is influenced by European Union policies and the UK's approach to BNG, which may lead to future legislative developments in the country. Ireland's environmental policies are evolving, and there is a growing momentum for integrating biodiversity protection and enhancement into the planning process. Currently, there is no formal national guidance on BNG; however, several local development plans are beginning to commit to BNG for new developments. For example, the Sligo County Development Plan and the Dublin City Development Plan promote measures that contribute to biodiversity enhancement^{xxxiv}.

Local Authority Biodiversity Action Plan^{xxxv}

As per the NBAP, all local authorities are required to develop Local Biodiversity Action Plans by 2026. These plans are to be integrated within the city and county development plans. To support this process, the Heritage Council has developed guidelines to assist in the preparation and effective implementation of these plans. The Local Biodiversity Action Plans are strategic documents designed to record, conserve, restore, and promote biodiversity at the local level. They guide the planning and management of local ecosystems, ensuring that urban development is sustainable and that biodiversity considerations are integrated into policy and practice. These plans are intended to inform decision-makers, with a focus on balancing development and biodiversity conservation.

Local Authority Biodiversity and Heritage Strategic Plan^{xxxvi}

Some local authorities prepare broader strategic plans that cover not only biodiversity but also heritage (e.g., Monaghan Biodiversity & Heritage Strategic Plan 2020 – 2025). These strategic plans set out the vision and objectives for conserving natural and cultural heritage, including biodiversity, within a local authority area. They emphasise integrating biodiversity into spatial and urban planning, ensuring that development projects consider impacts on habitats and species, and promoting sustainable land use.

Local Authority Biodiversity Officers

Biodiversity Officers manage the biodiversity function within a city/county in a coordinated way. They are employed by Local Authorities in partnership with the Heritage Council under the Biodiversity Officer Programme, and their responsibilities may include collecting data on biodiversity, carrying out conservation projects, developing policies, providing advice and information, and raising awareness. While the role varies based on each local authority's priorities, it consistently focuses on strategic planning and collaboration to support biodiversity and nature. This programme is being delivered by the Heritage Council and the County and City Management Association, with support from the Department of Housing, Local Government and Heritage (DHLGH) and the National Parks and Wildlife Service (NPWS). A full list of Biodiversity Officers is available on the Heritage Council's website.

[More information](#)

xxxiv Source: CIEEM (2024). 'Biodiversity Net Gain in Ireland'. Available at: <https://cieem.net/wp-content/uploads/2024/08/BE-Briefing-Paper-Aug-2024.pdf>

xxxv Source: The Heritage Council (2024). 'Local Authority Biodiversity Action Plan Guidelines'. Available at: <https://www.heritagecouncil.ie/content/files/Local-Authority-Biodiversity-Action-Plan-Guidelines>

xxxvi Source: The Heritage Council (2024). 'Local Authority Biodiversity Action Plan Guidelines'. Available at: <https://www.heritagecouncil.ie/content/files/Local-Authority-Biodiversity-Action-Plan-Guidelines>

Local Authority Climate Action Plans^{xxxvii}

While primarily focused on **climate mitigation** and **adaptation**, local authority climate action plans increasingly recognise the role of biodiversity in climate resilience. These plans often include measures to protect and enhance biodiversity within urban development, such as implementing nature-based solutions for flood management, integrating green infrastructure, and restoring habitat to support both climate and biodiversity goals.

As part of the development of these climate action plans, at least one decarbonisation zone must be established, a spatial area for piloting climate mitigation, adaptation, and biodiversity actions^{xxxviii}.

Local authority climate action plans published in 2024 particularly emphasise the use of nature-based solutions in surface and rainwater management, urban greening, river restoration and integration of nature-based solutions into housing developments^{xxxix}.

[More information](#)

^{xxxvii} Source: Government of Ireland (2023). 'Guidelines for Local Authority Climate Action Plans'. Available at: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/guidelines-for-local-authority-climate-action-plans/>

^{xxxviii} Source: Government of Ireland (2023). 'Technical Annex D Decarbonising Zones – Local Authority Climate Action Plan Guidelines'. Available at: <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/guidelines-for-local-authority-climate-action-plans/>

^{xxxix} Source: CARO (2024). 'Local Authority Climate Action Plans – Biodiversity Sectoral Report'. Available at: [https://www.caro.ie/local-authority-climate-action/local-authority-climate-action-plans-2024-2029-\(1\)/sector-analysis-of-la-caps-\(1\)](https://www.caro.ie/local-authority-climate-action/local-authority-climate-action-plans-2024-2029-(1)/sector-analysis-of-la-caps-(1))

Tools

General sustainability certifications

This section provides a brief overview of the green building certifications referenced in the case studies, including Home Performance Index, BREEAM, and LEED, and highlights the key biodiversity-related indicators/credits within each.

Home Performance Index

[Home Performance Index](#) is an Irish national certification system for residential developments, developed by the Irish Green Building Council. It assesses the full environmental footprint of housing projects, considering factors such as land use, biodiversity loss, water consumption, energy use, and material impacts. As of August 2025, 111 projects are registered and undergoing certification, with a further 21 projects already certified.

In version 3, biodiversity is assessed under the ecology indicator (EN 5.0), including the evaluation of the development's impact on natural habitats and ecosystems. This version introduces a requirement for a Biodiversity Net Gain report, prepared by a qualified ecologist, for projects exceeding 5,000 sqm. For projects under 5,000sqm, a minimum number of ecology indicators should be introduced into the project. The key biodiversity-related credits in HPI v3.0ⁱ are:

[Read more](#)

ⁱ Source: IGBC (2022). 'Home Performance Index (HPI) – Technical Manual v3.0'. Available: <https://homeperformanceindex.ie/technical-manual-download/>

- » **EN 1.0: Land Use** - Encourages the use of brownfield/infill sites, protecting greenfield areas and sites with high ecological value and sensitive habitats (e.g., wetlands, protected habitats).
- » **EN 3.0: Surface Water Runoff** - Encourages the quantitative assessment of Sustainable Drainage Systems (SuDS) implemented within the development to evaluate their effectiveness in reducing water run-off and minimising the risk of flooding and pollution of existing water courses.
- » **EN 5.0: Ecology** - Encourages stakeholders to demonstrate improvements in the ecological value and biodiversity of the site. This can be done through one of the following options:
 - » **Option A: Biodiversity Net Gain** (BNG). Required for projects over 5,000 sqm. This option involves:
 - » Preparation of a BNG report by a qualified ecologist, detailing baseline ecological conditions (habitats and fauna) and proposed enhancement measures to achieve a slight, moderate, or significant biodiversity net gain.
 - » The report should include a medium-long term ecological management and maintenance plan, ensuring that key biodiversity and ecological enhancement measures are maintained for at least 5 years post-completion.
 - » Follow-up site visits by the ecologist after construction to assess whether biodiversity net gain is likely to have been achieved.
 - » **Option B: Ecology Green Points**. Applicable only to projects of 5,000 sqm or less. With this option, points are awarded for implementing ecological features listed in the Ecology Calculator, such as bird/bats boxes, ponds and wildlife corridors.

BREEAM

BREEAM (Building Research Establishment Environmental Assessment Methodology) is a sustainability certification scheme for buildings and infrastructure, developed by the Building Research Establishment (BRE) in the UK. It comprises a suite of schemes applicable to the entire built environment life cycle, including in-use, refurbishment and fit-out, communities, new construction, and infrastructure. In Ireland, BREEAM certification is primarily used in non-residential buildings, including public buildings.

BREEAM developed the Strategic Ecology Framework (SEF) as a consistent approach to guide the future direction of ecological assessment criteria across its certification schemes. The SEF is based on the high-level principles, including:

- » Assess the existing ecological value and condition of the site and its surrounding areas to

inform appropriate objectives.

- » Protect and enhance key existing ecological features.
- » Remove or minimise features that negatively impact the site's ecological value.
- » Mitigate unavoidable ecological impacts and compensate for any residual effects.
- » Enhance the site's overall ecological value and connectivity.
- » Ensure long-term management and maintenance to sustain ecological outcomes.

The upcoming BREEAM version 7 for new construction is expected to update benchmarks to align with the English Biodiversity Net Gain legislation. It will also introduce methodologies for developments on sites with low or zero biodiversity baselines, encouraging developers to exceed minimum ecological requirementsⁱⁱ. Biodiversity-related assessment categories in BREEAM includeⁱⁱⁱ:

ii Source: BRE Global (2024). 'Summary of changes – BREEAM New Construction Version 7'. Available at: <https://bregroup.com/news/breeam-new-construction-version-7-technical-manual-now-available-for-feedback>

iii Source: BRE Global (2024). 'BREEAM UK New Construction – Version 6.1 – Technical Manual – SD5079'. Available at: <https://breeam.com/standards>

Source: BRE Global (2012). 'BREEAM Communities – Technical Manual – SD202 – 1.2'. Available at: <https://breeam.com/standards>

New construction scheme

» **MAT 03: Responsible sourcing of construction products** -

Encourages the selection of construction products with lower negative environmental (including biodiversity), economic and social impacts across their supply chain, including extraction, processing and manufacture.

- » *Note: This credit highlights the importance of recognising the ecological environmental impacts (EEI) of developments. EEI refers to ecological impacts that happen off-site, via upstream or downstream activities, such as habitat loss or environmental damage caused by material extraction/manufacturing.*

» **LE 01: Site Selection**

- Promotes brownfield redevelopment and discourages development on greenfield land, thereby reducing the overall environmental impact.

- » **LE 02: Ecological risks and opportunities** - Encourages

the identification and enhancement of ecological value on and around the site by:

- » Aligning with biodiversity policies and public opinion
- » Engaging appropriate expertise to assess risks and opportunities
- » Avoiding negative environmental impacts
- » Minimising harm to natural assets during construction
- » Promoting ecosystem benefits (e.g., wellbeing and community value) through effective ecological design and management

- » **LE 03: Managing impacts on ecology** - Encourages to avoid or minimise negative ecological impacts from the project both on-site and surrounding areas, supporting conservation of environmental assets, ensuring compliance with environmental laws and policies, and reducing the risk of legal issues or public opposition.

New construction scheme (cont'd)» **LE 04: Ecological change and enhancement**

- Encourages enhancement of the site's ecological value in line with local, regional, and national priorities by:

- » Improving biodiversity through better quality, connectivity, density and coverage of natural spaces
- » Raising environmental awareness
- » Recognising biodiversity net gain and efforts to halt the loss of habitats and biodiversity
- » Addressing public concern over biodiversity loss

» **LE 05: Long term ecological management and**

maintenance - Promotes long-term monitoring, management and maintenance of the site's habitats and ecological features to ensure intended outcomes are achieved. Encourages well-planned practices, providing support to stakeholders in maintaining and enhancing site ecology, and initiatives to improve social cohesion and environmental stewardship and awareness.

- » **Pol 03: Flood and surface water management** - Encourages appropriate site selection and design solutions that enhance resilience and minimise flood risk, watercourse pollution and other environmental damage.

Communities scheme (for masterplans of new communities and regeneration projects)

- » **LE 01 – Ecology strategy** - Encourages to establish a strategy to protect existing natural habitats wherever possible, and minimise and mitigate negative impacts, while ensuring biodiversity

enhancement on site and in the locality.

- » **LE 02: Land use** - Promotes brownfield redevelopment and discourages development on greenfield land.

- » **SE 11: Green infrastructure** - Encourages access to high quality space in the natural environment or urban green infrastructure, and the development of a management strategy, considering long-term maintenance.

- » **SE 13: Flood risk management** - Encourages the implementation of solutions (e.g., infiltration or SuDS) that minimise flood risk, watercourse pollution and other environmental damage.

- » **LE 03: Water pollution** - Promoting the adoption of measures that protect the local watercourse from pollution and other environmental damage.

- » **LE 04: Enhancement of ecological value** - Encourages enhancement of the development's ecological value in line with guidance from ecologists and relevant governmental bodies. This can be achieved through the protection, enhancement and/or creation of wildlife corridors that link existing and/or new habitats on or adjacent to the site. Integration of ecological and green infrastructure plans is particularly encouraged.

- » **LE 05: Landscape** - Encourages consultation with ecologist to ensure that 60%-80% of tree, scrub and herbaceous planting consists of appropriate native species. It also promotes the consideration of water efficiency and the implementation of a landscape management and maintenance plan to support long-term ecological objectives and ensure upkeep during occupation.

[Read more](#)

LEED

LEED (Leadership in Energy and Environmental Design) is a green building certification programme developed by the U.S. Green Building Council. It offers a framework promoting sustainable, healthy, and resource-effective building practices for various types of buildings. LEED applies to new constructions, interiors, operations and maintenance, and core and shell. In Ireland, it's primarily used for commercial buildings.

Its approach to biodiversity and ecology has evolved across versions. For instance.:

- » LEED v4 and v4.1: Encourage voluntary ecological conservation through credits (e.g., for habitat restoration and native vegetation), but do not require biodiversity net gain (BNG).
- » LEED v5: Elevates ecological conservation and restoration as a main impact area, introducing requirements for ecosystem

restoration and encouraging design that delivers measurable biodiversity outcomes. Biodiversity-related categories in LEED (v5) include^{iv}:

[Read more.](#)

Building design and construction

Integrative Process, Planning, and Assessments Credit: IPC1 - Integrative Design Process
Encourages setting a measurable goal for synergy across building systems to support ecosystem conservation and restoration. Highlights strategies such as minimising soil erosion, planting native vegetation, and integrating green infrastructure to reduce environmental impact and restore ecological functions.

- » **Location and Transportation Credit: LTc1 - Sensitive Land Protection** - Incentivises locating projects on sites that minimise disruption and protect sensitive areas, prioritising previously developed sites or areas away from high-value ecosystems. For greenfield developments, it requires avoiding sensitive habitats and protecting at least 40% of the land from development and construction activity.

- » **Location and Transportation Credit: LTc2 - Equitable Development** - Encourages locating projects on sites that enhance the ecology of the surrounding areas, such as through brownfield remediation that reduces environmental pollution and improves environmental health.
- » **Sustainable Sites Prerequisite: SSp1 - Minimise Site Disturbance** - Requires limiting site disturbance from construction activities and preserving existing native vegetation, healthy soils, and wildlife habitats by requiring an erosion and sedimentation control plan to prevent sediment runoff, as well as a site assessment of ecological conditions, including special-status vegetation, healthy habitat, and invasive vegetation, to inform site planning and design.

^{iv} Source: USGBC (2025). LEED v5 Reference Guide Building Design and Construction. Available at: <https://www.usgbc.org/resources/leed-v5-reference-guide-building-design-and-construction-april-2025-launch-edition>

» **Sustainable Sites Credit:****SSc1 - Biodiverse Habitat -**

Encourages conserving natural habitats and restoring damaged areas to support biodiversity and ecosystem health.

Strategies include protecting greenfield areas, restoring previously disturbed sites, restoring soil and vegetation, designating pollinator habitats, and using bird-friendly glass to reduce wildlife collisions.

» **Sustainable Sites Credit:****SSc2 - Accessible Outdoor**

Space - Promotes the creation of accessible open spaces (e.g., urban gardens) that meet the vegetation restoration requirements in SSc1.

» **Sustainable Sites Credit: SSc3****- Rainwater Management -**

Encourages the management of stormwater to mimic natural hydrology, reduce polluted runoff, and protect water quality. Incentivises retention using green infrastructure (e.g., vegetated swales and rain gardens).

» **Sustainable Sites Credit:****SSc5 - Heat Island Reduction**

- Promotes minimising heat island effects that can negatively impact microclimates and wildlife habitats, by encouraging strategies that incorporate native vegetation.

» **Water Efficiency Prerequisite:****WEp2 - Minimum Water**

Efficiency - Recognises that reducing potable water consumption and using optimisation strategies can help ease the strain of projects on ecosystems and preserve vital resources.

» **Material and Resources****Credit: MRc4 - Building Product Selection and**

Procurement - Recognises ecosystem health as one of the criteria for which a product can demonstrate compliance through documentation.

Biodiversity / Ecology-specific Tools

This section provides a brief overview of biodiversity-related tools referenced in the case studies and used to assess biodiversity impacts. These include the Green Space Factor (used in Ireland), Biodiversity Net Gain (BNG) metrics (used in England), and other biodiversity-related assessment tools.

BNG is a mandatory policy in England requiring most developments to deliver a net increase in biodiversity, demonstrated through an approved biodiversity metric. While BNG is not mandatory in Ireland yet, several of these metrics were applied in the case studies to assess and mitigate biodiversity impacts in projects.

Green Space Factor (GSF)^v

Developed by South Dublin County Council (SDCC), the GSF is a planning tool used to quantify and improve the quality and quantity of landscaping and green infrastructure in new

developments. It aims to ensure that new projects contribute meaningfully to biodiversity, water management, and climate resilience. How it works:

- » **Ratio-Based Assessment:** The Green Space Factor (GSF) is calculated as a ratio: green space (landscaping, green infrastructure, vegetated surfaces) to impermeable 'grey' space. The higher the ratio, the greater the proportion of green cover relative to built surfaces.
- » **Minimum Standards:** Each land use zoning (e.g., residential, commercial, industrial, regeneration) has a minimum required GSF score.
- » **Weighted Features:** Developers can boost their GSF by retaining or adding specific types of landscape and green infrastructure features (e.g., trees, green roofs). Each feature is assigned a weighting based on its ecosystem service value (e.g., pollution filtering, habitat provision).

^v Source: South Dublin County Council (SDCC) (2022). 'Green Space Factor Guidance Note'. Available at: <https://www.sdcc.ie/en/devplan2022/adopted-plan/related-documents/green-space-factor-guidance-note.pdf>.

- » Developer Inputs: The tool requires measurement of total site area and the area covered by each type of green feature. Developers then input this data into a provided worksheet corresponding to their site's zoning, allowing calculation of the GSF score.
- » Design Flexibility and Incentives: Higher-weighted features (e.g., large biodiverse planting beds) make a greater contribution.
- » Decision-Making: The GSF is referenced during planning application review to ensure that the minimum score is met. If not, additional greening measures must be incorporated for approval.

[Read more.](#)

Biodiversity Net Gain (BNG) Metrics

The tools described below are directly tied to the implementation of BNG in England, including:

- » Statutory Biodiversity Metric (DEFRA): This metric is the primary and statutory tool for delivering and evidencing BNG in planning applications in England.
- » Small Sites Metric (SSM): The SSM supports the implementation of BNG on small sites, offering a simplified process while still ensuring compliance requirements.
- » Natural England Biodiversity Metric: Earlier Natural England metrics informed the development of the statutory approach, but they are no longer valid for meeting BNG requirements.

[Read more.](#)

Statutory Biodiversity Metric (DEFRA)^{vi}

A standardised calculation tool developed by the United Kingdom (UK) Department for Environment, Food & Rural Affairs (DEFRA), supporting the mandatory Biodiversity Net Gain (BNG) policy in England. Since 2024, all major developments and small sites (with exemptions), as well as nationally significant infrastructure projects (from May 2026), must deliver a minimum 10% net gain in biodiversity using this metric. It is the only approved tool for English planning applications.

The tool enables users (e.g., ecologists, planners, developers) to quantify the impact of a project on biodiversity by calculating 'biodiversity units' that can be used to plan, predict, and demonstrate compliance with the required net gain.

The calculation process is structured around the mitigation hierarchy, guiding decisions on avoidance, minimisation,

remediation, and compensation of biodiversity impacts. In summary, this metric provides:

- » Calculation of the baseline biodiversity unit value of a piece of land before a planning application
- » A second calculation of the post-intervention biodiversity unit value
- » The difference between the two calculations is the biodiversity gain or loss

Small Sites Metric (SSM)^{vii}

For eligible small development sites, a simplified version called the Small Sites Metric (SSM) can be used. The SSM is mandatory for small sites from April 2024, but where higher distinctiveness habitats, protected sites, or off-site compensation are involved, the main statutory metric is required.

vi Source: UK Government (2025). 'Guidance Understanding biodiversity net gain'. Available at: <https://www.gov.uk/guidance/understanding-biodiversity-net-gain>

vii Source: UK Government-DEFRA (2025). 'The Small Sites Metric (Statutory Biodiversity Metric) User Guide'. Available at: https://assets.publishing.service.gov.uk/media/686677acdd1a7e01559e6d45/The_Small_Sites_Metric__Statutory_Biodiversity_Metric_-_User_Guide_July_2025.pdf

Natural England Biodiversity Metric^{viii}

Natural England, an executive non-departmental public body sponsored by DEFRA, previously developed biodiversity metrics (versions 2.0, 3.0, 3.1, 4.0), which are now superseded for statutory BNG by DEFRA's metric. The statutory metric is based on version 4.0 but is the only metric permitted in England for planning applications from February 2024.

[Read more](#)

Environmental Benefits from Nature (EBN) tool^{ix}

The Environmental Benefits from Nature (EBN) tool is a voluntary, habitat-based decision-support tool developed by Natural England (in collaboration with the University of Oxford, DEFRA, and others) to work alongside BNG assessments. It is a practical, spreadsheet-based instrument for assessing how proposed land use changes affect the ecosystem

services provided by nature within a development or project area. It supports evidence-based decision-making for planners, developers, and environmental practitioners, emphasising the wider value delivered by biodiversity enhancements and green infrastructure. How it works:

- » Assessment Basis: The tool uses a habitat-based approach. Users enter data on habitat types and areas before and after the proposed intervention, often sourced from biodiversity net gain or statutory biodiversity metric assessments.
- » Ecosystem Services: It evaluates the impact of changes on 18 ecosystem services (e.g., flood management, air and water quality). These are scored to reflect both benefits and potential trade-offs.
- » Additional Inputs: Users may provide up to 40 contextual indicators (e.g., tree size, canopy cover, proximity to public access, designated sites).
- » Scoring and Outputs: Using a simple zero to ten scoring system, the EBN Tool summarises the effects of each intervention on ecosystem services for at least 30 years.
- » Decision Support: Outputs include a benefits statement and balance sheet, highlighting:
 - » Gains and losses in ecosystem services and associated trade-offs
 - » Variation between alternative project design options
 - » Advice on how to increase multifunctionality and address local priorities
- » Integration and Flexibility: The tool is designed to work alongside Statutory Biodiversity Metrics and aligns with Natural England's Green Infrastructure Standards. It can be used for projects at any scale, drawing on local or project-specific data sources, and

generates infographic summaries for stakeholder communication and reporting.

The EBN Tool is intended to make the wider benefits of nature-based interventions visible and measurable, supporting compliance with environmental policy and strengthening the business case for investment in biodiversity and natural capital.

[Read more](#).

NATURE-tool

The Nature Assessment Tool for Urban and Rural Environments (NATURE Tool) is a free and user-friendly Excel-based application designed for industry and planning professionals to help assess the impact of land-use and management changes on natural capital performance in development projects. Its primary aim is to provide built environment professionals, planners, and related stakeholders with objective, evidence-based insights to guide sustainable decision-making and

viii Source: Planning Advisory Service & Natural England (2024). 'An introduction to the Statutory Biodiversity Metric'. Available at: https://www.local.gov.uk/sites/default/files/documents/Introduction%20to%20the%20Biodiversity%20Net%20Gain%20Statutory%20Metric%20Jan%202024_PAS%20slides.pdf

ix Source: UK Government - Natural England. 'What is the Environmental Benefits from Nature Tool?'. Available at: <https://designatedsites.naturalengland.org.uk/GreenInfrastructure/EBNT.aspx>
UK Government - Natural England. 'The Environmental Benefits from Nature Tool - Beta Test Version (JP038)'. Available at: <https://publications.naturalengland.org.uk/publication/6414097026646016>

demonstrate the benefits of positive environmental interventions during development. How it works:

- » Assessment Focus: The tool evaluates up to 17 ecosystem services (such as climate regulation, air quality, water management, and recreation), as well as physical and mental health benefits.
- » Scoring System: Impacts are scored based on both their direction (loss or gain) and magnitude (extent of change), resulting in two main indicators: biodiversity (impacts on wildlife and species resilience) and people (ecosystem services and health benefits).
- » Inputs Required: Users need only basic information: site boundary, habitat data before and after project intervention, and greenspace accessibility.
- » Indicators Provided: The tool outputs six key project indicators:

- » Change Score: Measures net change in natural capital performance vs. baseline.
- » Potential Score: Assesses whether the project has maximised the site's natural capital potential.
- » Completeness Score: Reflects how comprehensive the assessment is.
- » Policy Priority: Aggregates results based on national or local policy settings.
- » Objectives Met: Reports whether set natural capital objectives are achieved.
- » Achievements: Indicates if the project delivers Net Gain and/or reaches bronze, silver, or gold 'excellence standards'.
- » Adaptability: The NATURE Tool can be tailored by 'objective setters' (e.g., planning authorities or businesses). This means it

can be customised for a specific location, organisation, or project type, with local policy priorities and minimum target improvements easily integrated into the tool's assessment logic.

The tool is designed to be easily accessible for non-specialists, reducing the expertise and data burden typically associated with thorough natural capital assessments, and can be used at any project stage or scale. Outputs are suitable for reporting, engaging stakeholders, and informing decisions to deliver measurable improvements for both people and nature.

[Read more.](#)

Science Based Targets Network (SBTN) Target-Setting Process

The Science Based Targets Network (SBTN) was funded in 2019 by a group of NGOs to help define what is necessary for companies and cities to stay within

Earth's limits and meet society's needs. The target-setting process involves five steps: assess, prioritise, set targets, act and track. SBTN provides for each step methods, tools and additional resources to guide companies through the process. The case studies referred to tools that are used in the process, for the 'assess' step-the SBTN Materiality Screening Tool^x, the SBTN High Impact Commodity^{xi} List, and for the 'prioritise' step-ENCORE (Exploring Natural Capital Opportunities, Risks, and Exposure).

SBTN Materiality Screening Tool^{xii}

The SBTN Materiality Screening Tool is used to perform a high-level screening to determine whether a company's economic activities across its value chain are likely to cause significant impacts or pressures on nature. These pressures are assessed across categories such as land and water use change, resource exploitation, pollution, invasive alien species, etc. If an activity

x Materiality: referred to 'environmental materiality' for SBTN, a measure of the impact of a company's operations and value chain on nature, including biodiversity and ecosystem services loss, and resource availability. Source: SBTN (2024). Technical Guidance – Step 1 Assess. Available at: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2024/06/Technical-Guidance-2024-Step1-Assess-v1.1.pdf>

xi High impact commodities: raw and value-added materials used in economic activities that are known to have material links to the key drivers of biodiversity loss, resource depletion, and ecosystem degradation. Source: SBTN (2024). Technical Guidance – Step 1 Assess. Available at: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2024/06/Technical-Guidance-2024-Step1-Assess-v1.1.pdf>

xii Source: EcoLynx (2023). Materiality Screening Tool. Available at: <https://sbtn.ecolynx.io/>

is identified as ‘material’, it must be further assessed and included in the target-setting step within the SBTN process to set measurable and science-based targets to reduce or manage its impacts on nature. How it works:

- » Sectoral Focus: Activities within the construction sector are categorised using economic activity codes (e.g., construction of buildings).
- » Pressure Screening: The tool evaluates each activity against environmental ‘pressure’ categories (e.g., land use, pollution).
- » Threshold-Based Assessment: The ‘materiality’ of the activities are marked if their pressure score meets or exceeds SBTN thresholds, requiring further analysis in the SBTN materiality screening process.
- » Decision Process: Only material activities continue through to more detailed evaluation steps for science-based targets.

SBTN High Impact Commodity List^{xiii}

The SBTN High Impact Commodity List complements the materiality screening by identifying a defined list of commodities, such as cement and steel and others that are known to be major global drivers of biodiversity loss and other environmental pressures. Companies are required to check if any commodities from the list are present in their operations or supply chain. If so, these commodities are automatically prioritised for further assessment and may require target setting, regardless of activity-level materiality scores.

[Read more.](#)

ENCORE^{xiv}

ENCORE is a free, online tool maintained and continuously improved by Global Canopy, UNEP FI and UNEP-WCMC. It enables users to understand how their business potentially impacts and depends on nature, as well as potential risks to business continuity. The tool

was developed to support nature-related assessment initiatives, such as the SBTN target-setting process and the risk management and disclosure framework developed by the Taskforce on Nature-related Financial Disclosures (TNFD). How it works:

- » Sector or Process Input: Users can select a sector or specific economic activity.
- » Dependency and Impact Analysis: The tool outlines ecosystem services the activity depends on and impacts it may cause.
- » Interactive Interface: The platform offers sector-specific risk assessments, data visualizations, and access to environmental datasets.
- » Decision Support: It helps users to better analyse investment, loans and insurance.

The SBTN Materiality Screening Tool was built using ENCORE’s data and aligns its pressure categories and methodologies with ENCORE’s

framework, helping harmonise how impacts and dependencies are screened across both tools. As part of the prioritise step of the SBTN target-setting process, ENCORE is suggested to be used to evaluate a company’s dependencies on nature^{xv}

[Read more.](#)

Tools to Assess and Mitigate Embodied Ecological impacts^{xvi}

Aqueduct Water Risk Atlas
The Aqueduct Water Risk Atlas, developed by the World Resources Institute, is a global, online tool for mapping and assessing water-related risks, such as floods, droughts, and stress at different scales and locations. How it works:

- » Data: The tool uses open-source, peer reviewed data. The code, data and methodology behind Aqueduct are documented and available for download.
- » Catchment-Level Data: It

xiii Source: SBTN (n.d.). Step 1a - Materiality screening. Available at: <https://sciencebasedtargetsnetwork.org/companies/take-action/assess/materiality-screening/>

xiv Source: UNEP (2025). Exploring Natural Capital Opportunities, Risks and Exposure. Available at: <https://www.encorenature.org/en>

xv Source: SBTN (2024). Technical Guidance Step 2 Interpret & Prioritise. Available at: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2024/07/Technical-Guidance-2024-Step2-Prioritize-v1-1.pdf>

xvi Source: World Resources Institute (2025). Aqueduct. Available at: <https://www.wri.org/aqueduct/tools>

provides high-resolution, globally consistent maps of water risks using available data.

- » Multi-risk Assessment: It provides detailed water risk data for any location worldwide (users can click on map, type the address or coordinates, or import file with address/coordinates), allowing users to explore indicators such as water stress, depletion, and flood risk, including future projections. Provides water risks projections and scenarios to support water management and adaptation decisions.
- » Users: Companies, governments, researchers, and the public interested in understanding water risks.

The Atlas is part of a complementary set of tools developed to identify and evaluate water risk around the world, including Aqueduct Country Rankings, Aqueduct Food, and Aqueduct Floods. This tool is useful for assessing and mitigating embodied ecological impacts (EEI).

[Read more.](#)

Global Forest Watch^{xvii}

Global Forest Watch (GFW), developed by the World Resources Institute in partnership with other organisations, is an online platform that provides data and tools for forest monitoring, allowing users worldwide to access near-real-time information about forest change and trends. How it works:

- » Application: The platform includes an interactive online watch map and dashboards, presenting information on forest change, land cover, land use, climate and biodiversity. GFW also features Forest Watcher, a mobile app for offline forest monitoring and field management. It also

provides relevant curated data sets for visualisation, analysis, and download. Finally, GFW Pro, a supply chain edition that helps companies to track, manage, and report on deforestation risks to meet regulatory requirements and deforestation-free commitments.

- » User: Companies, governments, NGOs, researchers, and citizens can use the platform to support forest conservation and sustainable supply chain management.
- » This tool is useful for assessing and mitigating embodied ecological impacts (EEI).

[Read more.](#)

UKGBC Materials Map

This map, developed by the UK Green Building Council as part of their work on embodied ecological impacts, illustrates key locations for material extraction, where relevant, overlaid with biodiversity hotspots. The data reflects global material extraction, regardless of where the UK sources its imports.

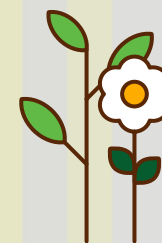
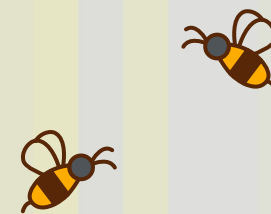
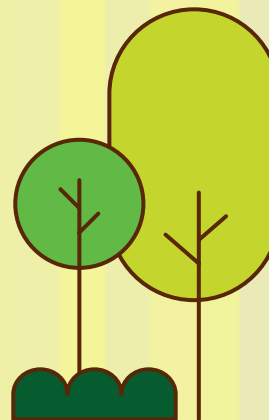
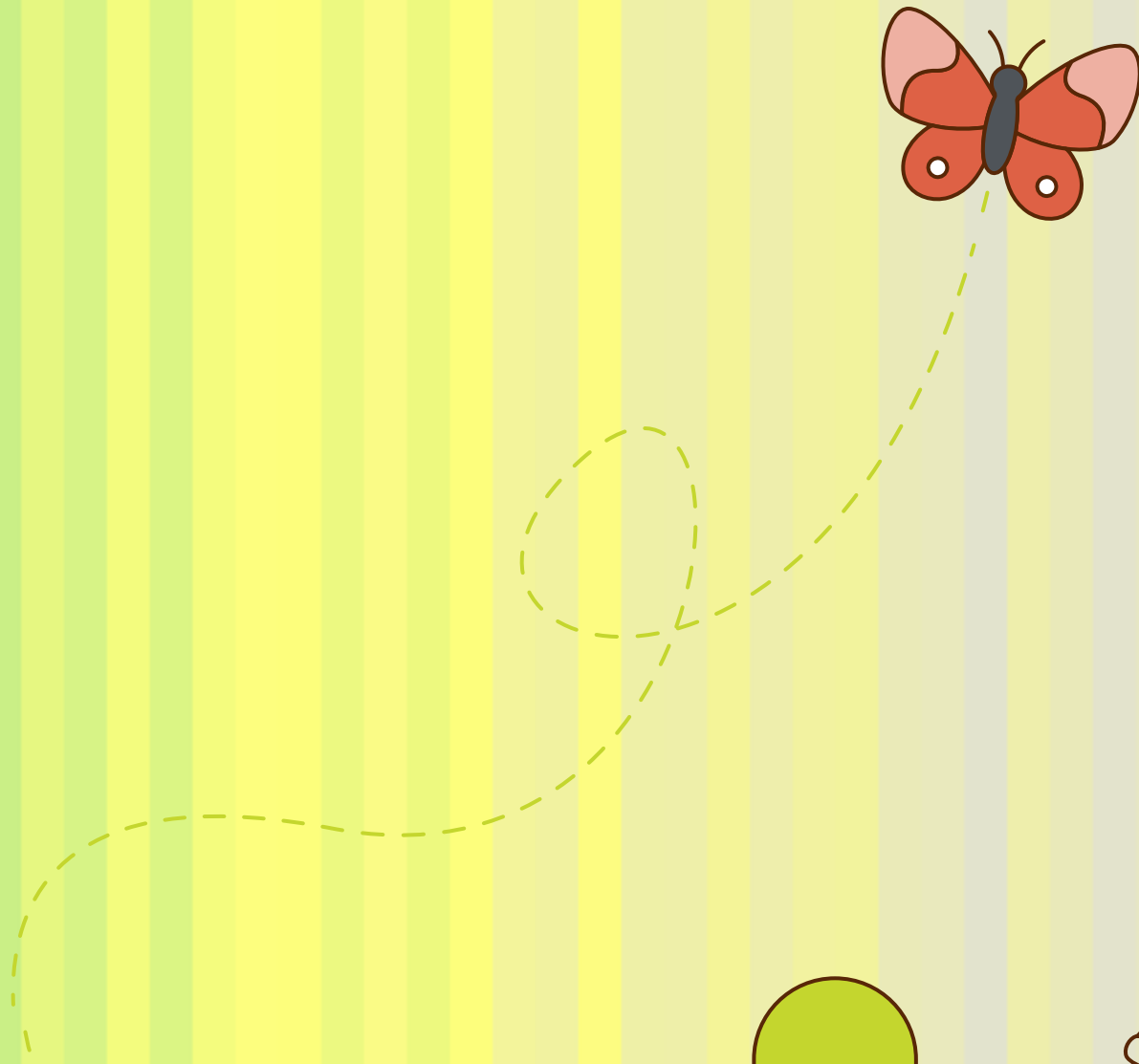
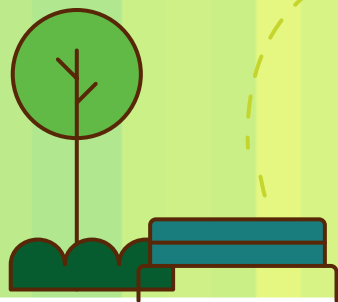
Countries highlighted represent at least 50% of the global supply for that particular resource^{xviii}.

Using the filters available, you can get specific details for each material, including extraction methods, major ecological impacts, practical recommendations, and links to further resources.

[Read more.](#)

xvii Source: Global Forest Watch (n.d.). About Global Forest Watch. Available at: <https://www.globalforestwatch.org/about/>

xviii Source: UKGBC (n.d.) Embodied Ecological Impacts – Material Map. Available at: <https://ukgbc.org/our-work/topics/embodied-ecological-impacts/>



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