

How can architectural form follow ecological function?

Mixed methods research with practitioners of architecture and landscape architecture to study their professional insights into perceptions of informal urban wild spaces, and to explore how biodiversity in general is considered within the design and development process in Ireland.

Thesis submitted for Master in Science (Research)

20th August 2024

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Discipline of Botany

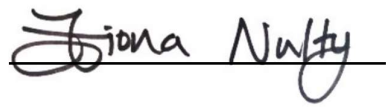
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Declaration

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Preface

Following my architectural education and transition into professional practice, I contributed to various development projects across Dublin city and suburbs. Over time I observed a disconnect between my personal appreciation for nature, and its consideration in my work. This was evident both in my individual design approach, and in the legislative frameworks which drove project requirements. Despite a direct impact on land use change, ecological considerations in development seemed limited and one-dimensional. This gradual yet steady observation prompted my transition into research. While acknowledging the potential for bias, my professional background has also provided valuable insight. This experience has undoubtedly guided aspects of the research however, the resolute objective was to remain neutral, open-minded, and to produce a comprehensive, solution focussed research study.

Abstract

A major factor in global biodiversity loss is land use change. Several processes influence this, including the expansion of the built environment through development. Consequently, there is a need for development projects to prioritise positive outcomes for biodiversity throughout the entire process. Furthermore, wild spaces are shown to be integral to the preservation of ecology in our urban areas; offering refuges for wildlife and diverse, resilient vegetation. This study explores the intersection of these topics, working with practitioners of architecture and landscape architecture to explore how biodiversity is considered within development and to understand the key factors influencing design and project outcomes. This study also seeks to provide practical recommendations to improve the integration of biodiversity measures into our development systems. Using mixed methods research to gain various insights from practitioners working within the system, themes of context, perceptions, values, connection, policy, knowledge, education, roles, responsibilities, and the project process are explored. The findings suggest that the current process of development does not prioritise biodiversity due to outdated policy systems, and an approach which values mitigation over optimisation. Furthermore, there is a need for targeted education and the collation of practical information to assist practitioners in integrating positive biodiversity measures early in the design process. Finally, the research indicates that increasing legibility, facilitating access, and promoting engagement with nature could positively influence societal perceptions of informal urban wild spaces.

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General Introduction

The 19th Century architect Louis H. Sullivan posited that “form ever follows function”. This standpoint was derived from his view that architecture should take inspiration from nature – not in an aesthetic sense – rather, he believed that the architectural design process should emulate nature’s method of expression. He was inspired by the clarity and rationality of the natural world where, in his words: “*the essence of things is taking shape in the matter of things*” ... “*life seeks and takes on its forms in an accord perfectly responsive to its needs*” (Sullivan, 1896).

Considering the needs to which modern-day architecture must respond, this thesis examines the design and development process in the context of the biodiversity crisis. It explores architectural form, not simply as shape or appearance, but as defined by (Bacon, 1974) in *The Design of Cities* as “the point of contact between mass and space” – the interaction between the built environment and the landscape. This interaction is shaped not only by the architect, but also by the wider development processes and influencing factors that drive the design strategy. The broad question, “How can architectural form follow ecological function?” aims to uncover how these processes and factors impact biodiversity outcomes, and whether there is potential to improve these outcomes.

Research Context

This study forms part of the NovelEco European Research Council (ERC) project led by Professor Marcus Collier in the School of Natural Sciences, Trinity College Dublin. The NovelEco project seeks to explore novel ecosystem theory as a concept for rewilding urban society, and to create a new awareness of the transformative potential of urban wild spaces (Collier, 2022).

Within this thesis, novel ecosystems and informal urban wild spaces represent a spontaneous, self-organised, nature-led incarnation of biodiversity in the built environment. It has been suggested that spontaneous vegetation is the “*de facto native vegetation of the city*” (Del Tredici, 2010) because it “*is authentic and is always appropriate to the site conditions*” (Kühn, 2006). Wild space is the typology of nature which is influenced most by ‘the agency of natural mechanisms’ (Kowarik, 2005), and embodies urban nature in its most natural form.

Increasing urbanisation and land use change is a major driver of global biodiversity loss and the extent of urban areas has doubled since 1992 (IPBES, 2019). To address the resultant ecological impacts, development must prioritise positive outcomes for biodiversity throughout the entire process (Li et al., 2022). Despite extensive academic research and recommendations on mitigating biodiversity loss within design and development systems, these suggestions are often not implemented at the project level, creating a significant barrier to effective action (Graça et al., 2022; Hürlimann et al., 2022). Moreover, there is a pressing need for greater collaboration between academia and practitioners to ensure that research translates into practical action (Nassauer & Opdam, 2008).

This research is grounded in these challenges and seeks to gain insights from practitioner experience to provide guidance on improving biodiversity outcomes within the design, planning, and development system.

Research Participants

The participants chosen for this study are practitioners of architecture and landscape architecture. Within the Irish system, the architect often occupies the role of ‘design team leader’ (SCSI, 2014). They synthesise information (Felson, 2013b), coordinate the work of the design team, and undertake a significant management function within a project (BSI, 1996; Hughes & Murdoch, 2001). They can therefore offer valuable insight into team dynamics, perceptions, roles, responsibilities, policy, and the key agendas which drive design outputs. Similarly, landscape architects mediate between the built and the natural environment, frequently advocating for the needs of nature (Moosavi et al., 2023). The importance of their role in protecting our ecological systems is well established (Ahern, 2005; Grose & Frisby, 2019; Teixeira et al., 2021). Furthermore, they too hold valuable insight into project dynamics, and how biodiversity is regarded, protected, and enhanced at the site level.

Aims and Objectives

The overarching hypothesis asks: how can outcomes for biodiversity be improved within the design, planning, and development processes in the Irish urban context? This is broken down into two aims:

Aim 1: Using informal wild space as a representation of ‘nature-led’ urban biodiversity; understand how it is perceived and regarded as a typology of urban space and land use.

Objectives:

- Gain insight from practitioners of architecture and landscape architecture into societal attitudes towards wild space and its ‘acceptability’ as a typology of space and land use.
- Examine how wild space is regarded by environmental policy and legislation, through analysis and a case study example.

Aim 2: Understand how biodiversity in general (not specifically wild spaces) is considered within the design, planning, and development process, and identify areas for improvement.

Objectives:

- Gain insight from practitioners of architecture and landscape architecture into the roles, responsibilities, and dynamics of the project team and understand how biodiversity outcomes are affected by these factors. Explore the role of knowledge.
- Document practitioner experience of the effectiveness of policy and development processes with regard to its impact on biodiversity outcomes at the project level.

Methodology and Fieldwork

The research methods consist of a comprehensive literature review, an analysis of environmental legislation and policy mechanisms, and a case study examining how development policies and processes respond to a case study of development on an urban wild space. The fieldwork, engaging with practitioners of architecture and landscape architecture is conducted through an online survey, and semi-structured interviews. Photo elicitation methods are used within the interviews to prompt the discussion on urban wild spaces.

The above establishes the parameters for this study. The objective is to gain insights, and understanding, ultimately leading to solutions and recommendations for improving biodiversity outcomes in urban land development systems.

Glossary of Key Terms

The list below provides definitions and literature sources for key terms used within the thesis. It is accompanied by clarifications as to how these definitions relate to the research.

Terms around Novel Ecosystems and Wild Spaces:

Novel Ecosystems: are defined as by Hobbs as a “system of abiotic, biotic and social components (and their interactions) that, by virtue of human influence, differ from those that prevailed historically, having a tendency to self-organise and manifest novel qualities without intensive human management” (Hobbs et al., 2013). The aspect of ‘reversibility’ - return to an historical ecological trajectory - is central to the classification and management of these systems (Hobbs et al., 2014).

Novel Urban Ecosystems (NUE): are classified as “Ecosystems that persist or arise in cities, resulting from – and structured by - intentional or indirect human management actions (including inaction/abandonment); with unique species composition and structure influenced by biotic introductions and invasions; and that provide a suite of ecosystem services/disservices resulting from interactions of the environment” (Ahern, 2016a). This definition includes remnant / restored patches, abandoned land, horticultural or formal areas, and aspects of green infrastructure.

Novel, Impacted, and Designed ecosystems: are identified as distinct from each other by Morse et al. They state the following: A **novel ecosystem** “can be identified by its origins rooted in human agency, the ecological thresholds it has crossed, a significantly altered species composition, and a capacity to sustain itself.” ... “In **impacted ecosystems**, human actions have unintentionally altered the structure and function from the natural state, but a threshold has not been crossed.” ... while the term **designed** is used to differentiate “an ecosystem created by intentional physical alteration aiming to enhance select ecosystem services, for example, a dammed river or cultivated land ... they are heavily managed systems” ... “Impacted and designed ecosystems have the potential to become novel ecosystems if a threshold is crossed.” (Morse et al., 2014).

Designed Ecosystems: “are assembled with specific goals in mind and are often heavily managed”, they “exist in the service of human interests, including specific services (e.g. filtration, cooling, nature appreciation), benefits to nature that are valued by people (e.g. biodiversity), aesthetics, and shifting value commitments toward green infrastructure”, and they are “intentionally created” (Higgs, 2017). Examples such as green roofs, green infrastructure and agroecological systems are included with this reference.

Urban Wilderness Areas: are “defined, from an ecological perspective, as places characterized by a high level of self-regulation in ecosystem processes, including population dynamics of native and nonnative species with open-ended community assembly, where direct human impacts are negligible. A high level of self-regulation is a shared feature of novel and ancient wilderness, but only the latter corresponds to historical benchmarks” (Kowarik, 2018). This reference mentions sites such as derelict land, railway areas and cemeteries.

Informal Urban Green Space (IGS): Is defined as “an explicitly socio-ecological entity, rather than a solely biological or cultural object. IGS consists of any urban space with a history of strong anthropogenic disturbance that is covered at least partly with non-remnant, spontaneous vegetation” (Rupprecht & Byrne, 2014a). These authors identify nine typologies of space: Street verges, vacant lots, gaps, railway sites, brownfields, watersides, overgrown structural elements (like walls), microsites found in cracks, and powerlines.

Urban Wild Space: is defined as “any space or component of an urban ecosystem (e.g. a patch within a park) where there is an absence of human intervention, where organisms are able to respond to their base instincts or self-assemble. This includes areas of remnant native vegetation, abandoned lots and wastelands, railway verges and other informal greenspaces, large old trees and habitat patches in gardens” (Threlfall & Kendal, 2018).

Urban Nature - Four Natures: This framework is helpful to show how novel ecosystems or wild spaces, and their characteristics fit within the urban landscape (Kowarik, 2018).

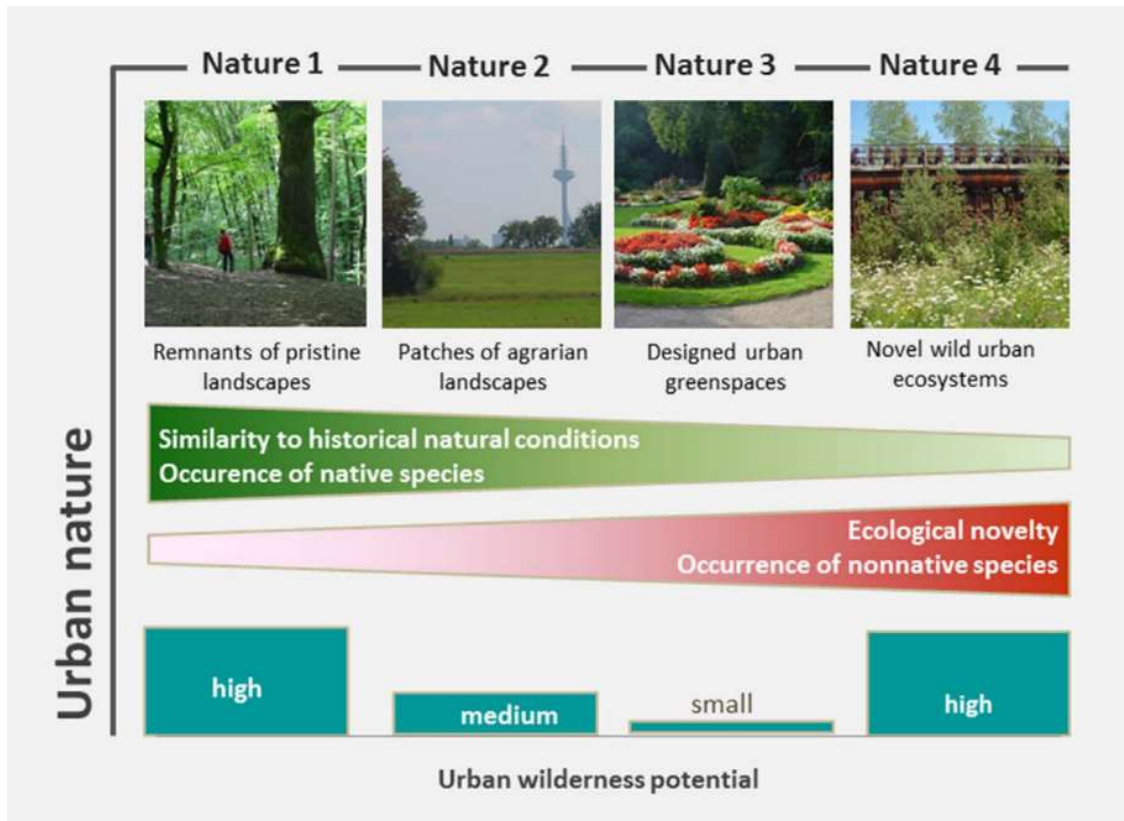


Figure 1: From (Kowarik, 2018). “The “Four Natures approach” differentiates the major types of urban nature that represent transformational stages from pristine to urban landscapes; these types differ in land-use legacies, current uses, and ecological characteristics, but all contribute to wilderness supply in cities, albeit to different extents as symbolized by the sizes of bars.”

Relevance to the thesis: the semantics between these definitions is not material to the thesis, as the work does not seek to add to the discussion on definitions or classifications of such spaces. These definitions are provided to give the reader a comprehensive context and understanding of the terms, and the site typologies they refer to. It is evident from the range of definitions that there is a degree of debate, discussion, and even confusion in the literature.

For simplicity, within this thesis the term “informal urban wild space”, is used to encompass the key site characteristics that are relevant to the work, namely: areas of spontaneous, self-organised vegetation that are self-sustaining, mostly undisturbed, and unmanaged. For the purposes of this study, they represent ‘ecological function’: i.e., ‘nature-led’ (rather than human-designed) biodiversity, in an urban context. Further detail on this approach is included in the main text of the thesis.

Terms used in planning and policy:

Urban Biodiversity: is “the variety or richness and abundance of living organisms (including genetic variation) and habitats found in and on the edge of human settlements. Species range from the rural fringe to the urban core” (Müller et al., 2013). The typologies of space mentioned in this reference are remnant vegetation, agricultural landscapes, urban industrial landscapes (wastelands, brown fields, railways), and ornamental gardens and landscapes.

Green Infrastructure: is “a strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings” (EC, 2014).

Ecosystem Services: the direct and indirect contributions of ecosystems to human well-being (TEEB; Kumar, 2012).

Nature-based Solutions: are “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions” (EC, 2024a).

Relevance to the thesis: the thesis also seeks to investigate how the process of design, planning, and development impacts biodiversity outcomes in the built environment. This aspect of the research sought to capture how biodiversity in a general sense is considered in the built environment process, including through planning and design strategies. Within this context, and within policy, the terms above occur frequently, and are occasionally referred to within the main text and fieldwork.

CHAPTER 1

LITERATURE REVIEW

1.1 Overview and Review Process

The approach to reviewing the literature was an iterative exercise. After each stage, the researcher reflected on the findings to determine the logical and correct next step. This was done to ensure suitable literature was being captured, and that a balanced understanding of the main themes was gained. Literature searches and explorations were carried out in the context of the research question and resulted in a three-stage process which informed the field work. The literature review was supported by initial early-stage interviews to identify practitioner insights which could then be incorporated into the detailed literature review. An overview of the process from scoping stage to design of fieldwork is shown below, followed by some detail on each of the three review process steps.

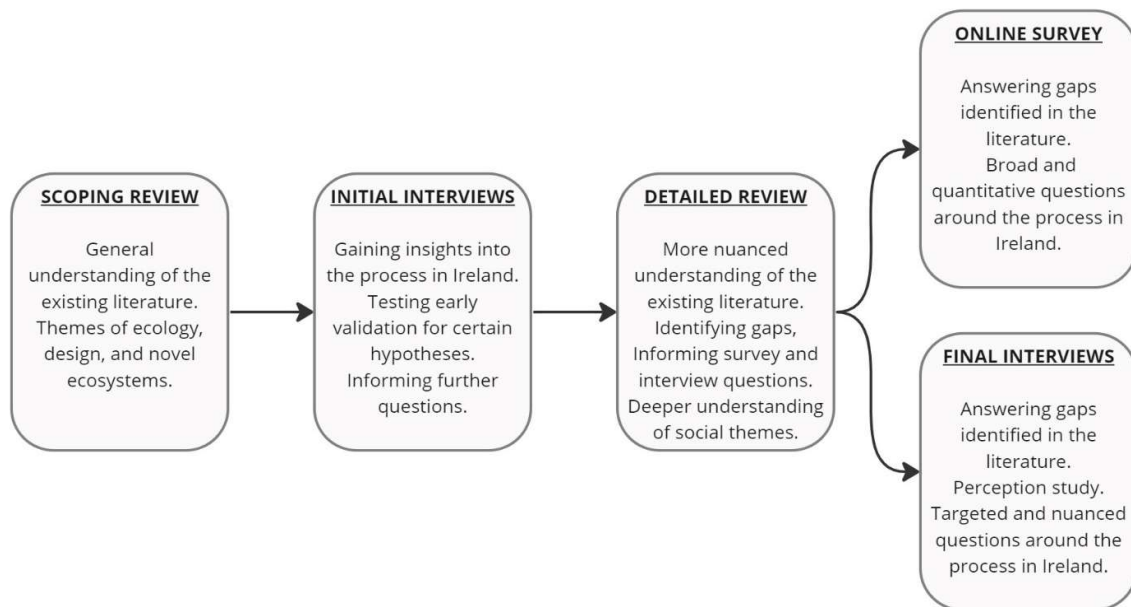


Figure 2: Roadmap showing the research process from scoping literature review to design of fieldwork.

1.1.1 Scoping Literature Review

Initially, a scoping literature review was conducted to identify patterns and themes that were of relevance to the research area, and to help in shaping the fieldwork. This scoping review investigated the intersection between Topic 1 (design + planning) and Topic 2 (urban biodiversity + novel ecosystems). Papers focussing on the urban and suburban context were

prioritised. The findings of this review, combined with insights from the researcher’s own experience working in the built environment sector in Ireland, formed the basis for the initial fieldwork scope. Rather than proceeding with a full, detailed literature review, some early-stage interviews were carried out. This was important and helpful for testing the questions, validating the themes, and identifying any new avenues for exploration.

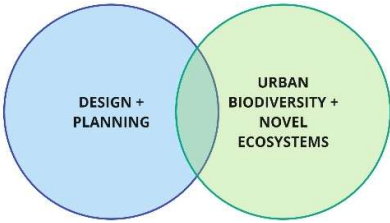


Figure 3: Diagram showing the scoping literature review topics.

At this stage, a systematic literature review approach was tested however, it quickly became apparent that the method was not suited to such a broad research question. By trialling combinations of relevant keywords and topics it was noted that there is a huge variation in the keywords used in design and ecology literature. Broadening the search to capture all keywords, generated a quantity of articles which were impossible for one researcher to review as shown below:

Search within
Article title, Abstract, Keywords

Search documents *
"novel eco*" OR "ecosystem service" OR "natur*" OR "eco*" OR "biodiv"

AND

Search within
Article title, Abstract, Keywords

Search documents
"design*" OR "architect*"

AND

Search within
Article title, Abstract, Keywords

Search documents
"urban" OR "cit*"

+ Add search field

Reset

Search

Documents Patents Secondary documents Research data

85,929 documents found

Figure 4: Example of high number of search results from using broad search terms to capture all keywords.

While narrowing the parameters to reduce the quantity of papers, caused key research and consequently key aspects of the discussion to be missed. This could be concluded because certain focal papers had already been identified in early-stage scoping. When key articles

were omitted by the search criteria it was apparent that the full picture was not being captured in the systematic process. Figure 5 shows keywords and results from the trial systematic reviews. The large variety of keywords used to describe urban nature and design is apparent.

SCOPUS - "Article title, Abstract & Keywords"					
Search Term	AND	Search Term	Number of papers	Search Term	Number of papers
"architect*"		"ecology"	5474	"ecomimicry"	6
"landscape architect*"		"ecology"	397	"biomimicry"	1888
"architect*"		"urban ecology"	126	"eco* design*"	8412
"landscape architect*"		"urban ecology"	37	"biodesign"	360
"architect*"		"biodiversity"	1749	"nature based design"	17
"landscape architect*"		"biodiversity"	103	"living architecture"	77
"architect*"		"urban greening"	51	"urban greening"	1062
"landscape architect*"		"urban greening"	13	"ecological design"	974
"architect*"		"green infrastructure"	244	"design* ecosystems"	112
"landscape architect*"		"green infrastructure"	95	"urban wild spaces"	2
"design*"		"ecology"	30,384	"novel ecosystem design"	2
"design*"		"urban ecology"	444	"urban biodiversity"	861
"urban design*"		"ecology"	424	"novel ecosystem*"	787
"design*"		"biodiversity"	15870	"biophilic design"	210
"design*"		"urban biodiversity"	195	novel ecosystem design	1733
"design*"		"novel ecosystem*"	90	novel ecosystem urban design	149
"design*"		"nature based"	1079	urban wild spaces	408
"design*"		"nature based solution*"	400	nature based design	56326
"ecosystem service*"		"novel ecosystem*"		living architecture	10181
				biodesign	360
				"design for nature"	6
				"design for biodiversity"	11
				"design* ecology"	53

Figure 5: Search terms and number of papers found while exploring a systematic approach to reviewing the literature.

Based on the above, it was concluded that proceeding with a systematic literature review would be impede the objective of gaining a comprehensive understanding of the research topic and would stifle what is a very nuanced discussion around urban nature in the literature. Prior to the detailed literature review however, the early-stage interviews were conducted.

1.1.2 Early-Stage Interviews

Three initial interviews were carried out: two with architects and one with a landscape architect. These explored the main themes of the research question and proved insightful – generating an interesting discussion and providing early validation for some of the research hypotheses. Overall, these interviews were successful however, the researcher concluded that a refinement of the questions and themes could add more depth; specifically, to gain greater insight into primary drivers of the current situation, to seek recommendations for pathways forward, and to address some gaps in existing academic literature. These interviews also revealed the need to contextualise the research within aspects of the built environment process, such as policy and legislation. Consequently, a desktop study was planned to examine the legislative framework and policy implementation mechanisms (see Chapter 2).

1.1.3 Detailed Literature Review

Following these interviews, detailed literature analysis was conducted to capture the research context and to further sharpen the fieldwork approach. This method of alternating inductive and deductive approaches in a reflexive process, integrating research findings with literature analysis has been established (Fereday & Muir-Cochrane, 2006; Gobster et al., 2023). It was an appropriate process for this research because applied practitioner experience was a key element of the research question, and so incorporating this input early on was important in validating the effectiveness of the study.

Refining the selection criteria to ensure the relevance of the literature review to the research area was also important. To rationalise the challenging variety of keywords and terminology, a decision was made to instead capture the conversation within the literature at a higher level. Terms such as ‘green infrastructure’, ecosystem services’, and ‘nature-based solutions’, are prolific within the design and urban nature literature, and each topic stems from different origins and academic discussion. Rather than charting the history and progression of each concept, the literature review was instead positioned to document the theoretical and practical factors which influence practitioners, the development process, and the built environment.

A semi-structured, narrative review method was used. This is designed for topics that have been explored across diverse disciplines and the method does not attempt to systematically capture every paper ever written. It is suited to understanding complex areas, and capturing the nuances within a discussion. Consequently, the process requires tailoring and the researcher must develop their own parameters to ensure that the appropriate literature is captured (Snyder, 2019).

The existing literature discussed a broad range of factors which influence and impact design and nature in the built environment. Themes such as aesthetics, perception, beliefs, values, and knowledge, as well as practical factors like roles, regulations, and policy all emerged and are discussed further within the thesis. Much thought was given to the literature review, and it was important to contextualise the research question within the nuances of the existing academic writing. An early brainstorming diagram can be seen below to give insight into the thought process behind the literature review.

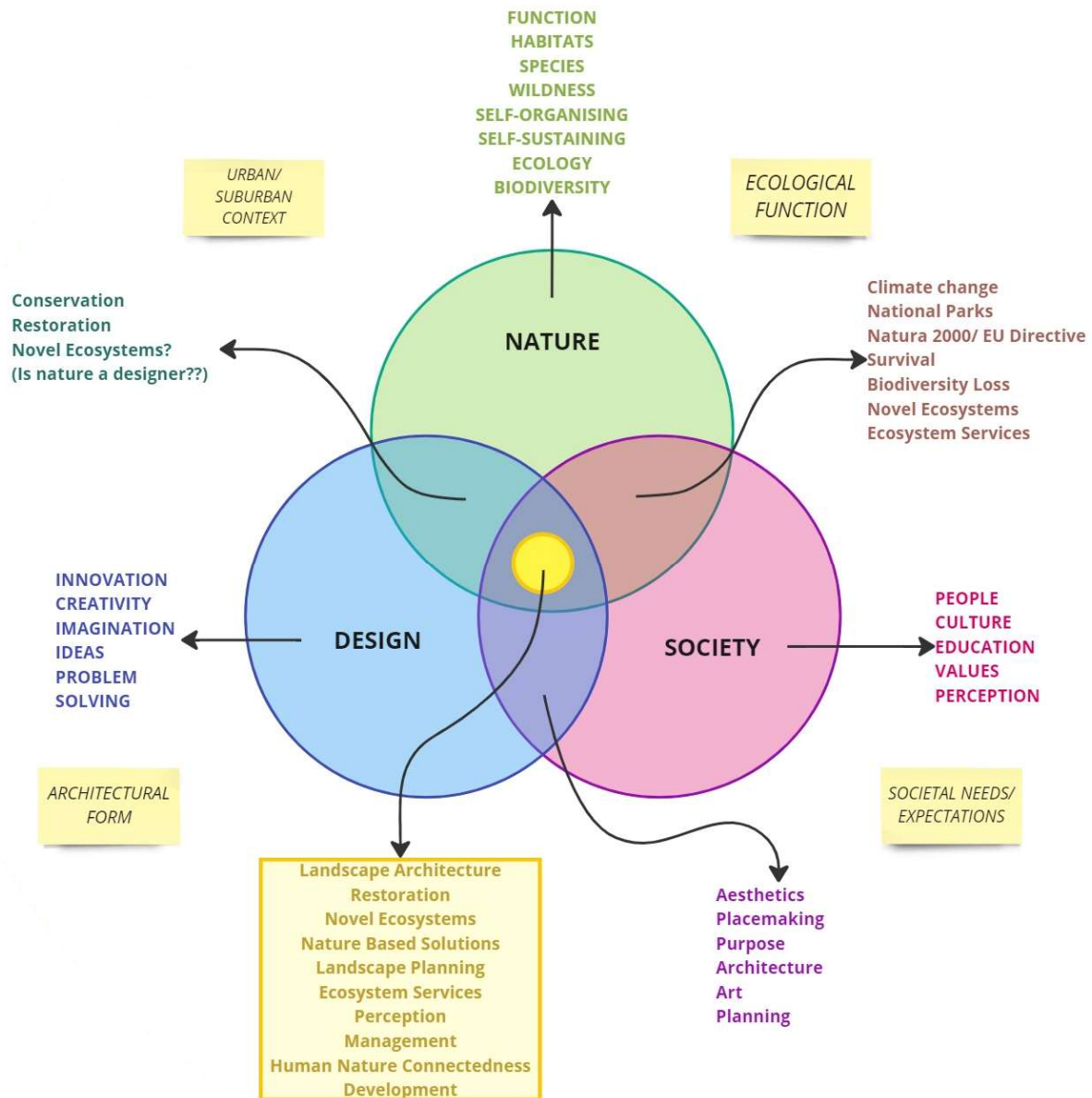


Figure 6: Early-stage diagram brainstorming the context of the research question.

The parameters developed by the researcher to ensure the existing literature was adequately covered, and could sufficiently fulfil the research question are set out below:

- Does this paper offer current* academic context for at least two of the main themes?
1) Wild spaces/ Novel ecosystems; 2) Design; or 3) The human-nature relationship
- OR, does this paper capture practitioner experience or research into the built environment process with regard to ‘green’ topics (ecology, sustainability, climate etc)?
- Does this paper offer a significant insight that hasn’t already been captured?*

** It was not practical or feasible to chart the theoretical history around the human-nature relationship, ecology, and design within this study, therefore, more influential papers were prioritised with historical theory included for context where relevant. A snowball method was also used to review the references within key papers.*

1.1.4 Presentation of Literature Findings

As the literature review covered quite a broad scope, numerous themes arose. They were analysed in the context of the research question and are organised in the following section under the headings: ‘ecological considerations’, ‘social considerations’, and ‘architectural practice’.

The objective of this research is to understand how wild spaces are perceived and regarded as a typology of urban green space and land use, and to examine how biodiversity in general is considered within the design, planning, and development process. Consequently, there are several factors at play and the reviewed literature covers many interesting avenues, tangents, and deeply engaging theoretical discussions. While it is beyond the scope of this thesis to intricately analyse each debate; rather than omit these topics, they are instead introduced, considered, and framed within the context of this research, either in passing or in more depth as appropriate.

It is critical to capture the broad as well as the narrow themes as they are foundational to the human-nature relationship. These factors affect our values and perceptions, and in turn influence our relationship with and actions towards nature. The following review seeks to provide a robust foundation for the research and fieldwork; one which demonstrates the complexity and depth of the research topic.

1.2 Ecological Considerations

To provide context for the research it is important to first understand the spectrum of green space found in the built environment, and how this has been interpreted, conceptualised, and studied in the literature.

1.2.1 Urban Green Space

Nature in the urban landscape is inherently a complex expression of ecological and human interaction (Gandy, 2006). Examples in the literature categorise nature in various ways to reflect the ecological, temporal, and cultural influences driving the different outcomes visible in our landscapes. Two such conceptual frameworks are noted by (Sack, 2013) in a table which is reproduced below:

Table 1 The cultures of nature

	Kowarik's four natures [†]	Hunt's three natures [‡]
Nature 1	Old wilderness	Wilderness
Nature 2	Traditional cultural landscape (including agriculture)	The agrarian landscape
Nature 3	Functional greenery (e.g., parks, street trees)	The garden
Nature 4	New wilderness (e.g., post-industrial sites, succession woodlands)	

[†]As adapted from Kowarik (2005); [‡]As adapted from Hunt (2000).

Figure 7: Table reproduced from (Sack, 2013)

The concepts of ‘nature of the third kind’, ‘nature of the fourth kind’ (Kowarik, 2005), and ‘the garden’ (Hunt, 2000), offer a good foundation from which to explore urban green space in the context of this research. Kowarik classifies these ‘natures’ in terms of the social history of their development and use, while also examining the extent to which they have been influenced by the agency of both natural and cultural mechanisms. ‘Nature of the third kind’ comprises green space resulting from horticultural planting and maintenance; essentially, gardens, parks, and street trees. This ‘nature’ is less influenced by natural mechanisms and strongly influenced by cultural mechanisms. Conversely, ‘nature of the fourth kind’ encompasses natural development in urban areas occurring without horticultural planning and design. This ranges from vegetation found in cracks in pavements to established urban-industrial woodlands. Consequently, it is highly impacted by the agency of natural mechanisms and much less so by that of cultural mechanisms (Kowarik, 2005). In another interpretation of the nature-culture dynamic, Hunt describes nature three or ‘the garden’ as having a “*layer of specific intention*”. This is beyond the necessities of nature two, which categorises agriculture or settlement. This layer of intention he describes as being “*of the*

creator, but sometimes of the perceiver, visitor, or consumer". He classifies 'the garden' as; *"a conjunction of metaphysical experience with physical forms, specifically some aesthetic endeavour – the wish or need to make a site beautiful"* (Hunt, 2000) p62; defining human-nature interaction as *"a sliding scale of cultural intervention in the natural world"* (Hunt, 2000) p63.

These conceptual frameworks assist in outlining how cultural and ecological dynamics influence typologies of urban nature. They also demonstrate the role of social and human factors, both of intent and of perception – action and observation. Architectural design and land development gives form to social needs and cultural ambitions. This inevitably shapes the landscape, therefore impacting on ecological systems and biodiversity. Moreover, interacting with nature in an urban environment is not only a natural experience but a social and cultural one. Consequently, examining either ecological or social dynamics in isolation would limit the depth of the research. Both topics are intricately connected, therefore both have been explored within the literature.

1.2.2 Formal Green Space

The realm of 'functional greenery' and 'the garden' comprises what is here referred to as 'formal green space'. In the built environment, formal green space includes parks, gardens, street trees, playing fields, and any manicured, intensely managed green space. Within the Irish context, this typology of green space as found in our urban and suburban landscapes, is vastly different to any of our traditional native habitats (Fossitt, 2000). It has been completely altered by human intervention which often favours colourful planting, non-native species, manicured lawns, and an aesthetic of neatness (Connop & Nash, 2021). The term 'ecological gentrification' was originally coined to reflect a social process, whereby the implementation of a planning strategy targeted at public green space, triggers the displacement of the local homeless population (Dooling, 2009). At a habitat or species level, this term can also be used to describe the homogenisation of our built environment through 'blandscaping' (Connop & Nash, 2018). Formal, managed landscapes may give the impression of a green city; however, they provide little support to most of our endemic species. They exemplify a simplification of habitats, which neglect the indigenous population, favouring the generalist 'urban adaptable' species, rather than the local specialist species (McKinney, 2006). The result is an overall reduction in biodiversity (Connop & Nash, 2018). This ecological simplification is often

brought about through maintenance regimes which entail pruning, mowing, and pesticide use (M. Aronson et al., 2017). Although planned, horticulturally cultivated green spaces have been shown to create a local enrichment in diversity of flora, a global homogenisation and overall decline in biodiversity endures, due to analogous introduced species becoming established across multiple cities (McKinney, 2006). Despite many plant studies showing this localised increase in species diversity associated with moderate urbanisation, research on invertebrate and non-avian vertebrate populations indicates that diversity decreases in an urban setting (McKinney, 2008). Invertebrate studies show that while pollinators may accept and adapt to certain introduced species, many herbivorous insects cannot. They have evolved alongside the native vegetation and rely on a symbiotic relationship with the chemical composition of the leaves for survival (Goulson, 2019). This issue of homogenisation persists due to standardised approaches to design and maintenance practices, coupled with a human-centric focus on ‘ecosystem services’ in urban green space development (Connop & Nash, 2018). We can expect that the continued expansion of cities through development, combined with the ongoing creation of standardised formal green spaces will further exacerbate ecological homogenisation and biodiversity loss in our urban areas.

1.2.3 Informal Green Space

The distinction between formal and informal green space follows a gradient of informality which is influenced by management (Rupprecht & Byrne, 2014b). At the far end of formality on the urban green space spectrum, novel ecosystems and urban wild spaces are found. If we refer back to Kowarik’s conceptual framework, this is considered ‘new wilderness’; a product of the agency of natural mechanisms and much less shaped by social or cultural factors (Kowarik, 2005). The concept of ‘novelty’ and ‘novel ecosystems’ within ecological restoration literature has been subject to much debate and divided opinion (Hobbs, 2017). When considered in a global context and applied to all landscapes and biomes, there are warranted reservations among ecologists that embracing this concept with open arms could result in ‘lowering the bar’ for restoration (Perring et al., 2014). This is the concern that by labelling certain ecosystems as ‘novel’ it could be construed that these systems do not fall under the traditional guidelines for ecological conservation and therefore exclude them from restoration efforts (Aronson et al., 2014). This apprehension is understandable as we still have much to learn about novel ecosystems and how they function (Murcia et al., 2014). They are defined as having ‘species compositions and relative abundances that have not

occurred previously within a given biome', with key characteristics of 'novelty' and 'human agency' (Hobbs et al., 2006). The aspect of 'reversibility' - return to an historical ecological trajectory - is central to the classification and management of these systems (Hobbs et al., 2014). However, there are questions surrounding how this ecological threshold is quantified – i.e., deeming a degraded ecosystem practically irreversible. Until we can clearly assess how and where this line is drawn, it is argued that the notion of 'irreversibility' remains unknown (Murcia et al., 2014). This debate challenges the suitability of the novel ecosystem concept within global ecosystem conservation and restoration practices. In the context of urban areas, however, the discussion is somewhat clearer. High levels of human disturbance, often in combination with periods of abandonment, as well as unique assemblages of native, naturalised, and introduced species – the latter generally a result of garden escapees - means that ecologically, cities are quite unique (Kowarik, 2005; Rupprecht et al., 2015). Urban wild space is therefore considered to be ecologically distinct (Ahern, 2016b; Hobbs et al., 2006), and of great importance for biodiversity (Bonthoux et al., 2014). Moreover, the lack of disturbance means that these sites offer habitat for fauna that otherwise would not be found in cities (Threlfall & Kendal, 2018). Consequently, it is generally accepted that the application of the novel ecosystem concept to urban areas is relevant and opportune (Teixeira & Fernandes, 2020). While a departure from historical baselines and 'pristine' ecosystems is not a universal solution, the conclusion regarding urban areas is helpful in directing the allocation of resources - avoiding their misuse on attempts to restore novel systems to historical conditions (Perring, Standish, et al., 2013). Furthermore, embracing this ecological typology may offer a pathway towards resilience and biodiversity enhancement in our urban areas (Collier, 2015; Kennedy, 2022; Kowarik, 2011).

In the built environment, 'novelty' presents in various ways. The 'self-sustaining' criterion often referred to in defining novel ecosystems, denotes that these ecosystems persist in the absence of or in spite of continuous human management (Morse et al., 2014). Consequently, novel ecosystems in cities are typically self-organised spaces, found on unused or unmanaged land. This classification of urban space is discussed in the literature under a multitude of different designations. Definitions include 'wild spaces' (Threlfall & Kendal, 2018), 'informal urban green spaces' (Rupprecht & Byrne, 2014a, 2014b), and 'ruderal ecologies' (Stoetzer, 2018). In terms of how these spaces manifest, Rupprecht and Byrne in (Rupprecht & Byrne, 2014a) present a selection of site typologies which they classify as 'informal wild space'. These include street, rail and waterway verges, vacant and abandoned lots, brownfield

sites, and spontaneous vegetation found in walls, gaps, or cracks. Furthermore, (Threlfall & Kendal, 2018) consider urban wild space to be “*any component of an urban ecosystem (e.g. a patch within a park) where there is an absence of human intervention, where organisms are able to respond to their base instincts*”. This definition is more expansive and includes remnant native vegetation, ancient trees, and habitat patches in gardens, which are additional to the (Rupprecht & Byrne, 2014a) classification.

Within the context of this research, the key understanding gained from these definitions of novel ecosystems and urban wild spaces is that they are self-organised, and unmanaged. They represent nature’s expression of its’ own needs. This study does not seek to debate or contribute to the discussion on urban green space classification, rather it aims to understand nature’s own expression in the city, its ecological function, and its biodiversity contribution, to establish a benchmark. Novel ecosystems, and urban wild spaces fulfil this brief and provide a typology of urban ecology which can be framed for research participants and investigated in the field work. In exploring how ‘form follows function’, these spaces are representative of the element of ‘ecological function’, a key component of which is a lack of management.

1.2.4 Benefits of Informal Wild Spaces in Cities

Research shows that wild spaces, vacant lots, and spontaneous vegetation have several benefits for the urban landscape. Wasteland sites are rich in biodiversity and are often more diverse than other urban habitats (Bonthoux et al., 2014). Wild spaces offer greater structural complexity than managed landscapes, thus supporting a greater diversity of species, and the plant communities within wild spaces tend to be more genetically diverse (Threlfall & Kendal, 2018). Urban novel ecosystems (spontaneous, self-sustaining, unmanaged areas) provide important habitats for native and endangered plant species, a factor which increases as these habitats become more mature (Kowarik & von der Lippe, 2018). Vacant lots in New York have been shown to have provide multiple ecosystem services including stormwater runoff mitigation, carbon storage and sequestration, air pollution removal, and provision of habitat (McPhearson et al., 2013). Other studies note the potential for urban novel ecosystems to provide further ecosystem services such as phytoremediation, climate mitigation, and recreation (Ahern, 2016b). Spontaneous vegetation in pavements has also been shown to contribute to species richness and biodiversity (Bonthoux et al., 2019). Informal wild spaces can impact diversity from a social perspective, allowing urban dwellers to experience natural-

cultural heritage (Rupprecht et al., 2015). They influence health, (Threlfall & Kendal, 2018), and childhood development – providing much needed ‘disordered space’ (Cloke & Jones, 2005). Overall, these spaces are shown to be important contributors to the urban landscape, however appropriate management practices play a role in sustaining this contribution to biodiversity (Rupprecht et al., 2015), and in balancing human needs with ecological processes (M. F. J. Aronson et al., 2017).

1.2.5 Design and Management

In parallel to nature’s self-expression, it is important to acknowledge and explore the influence of design and management in the context of urban green space and ecology, as these factors are at the interface of the human-nature dynamic. Initially here, the ecological considerations will be explored, while the social considerations are discussed later.

It is interesting to consider how design and management are embedded within ecological practice. Inherently, ecology is a human-led exercise and therefore, interventions to monitor, conserve, and restore even the most pristine ecosystems, are informed by our human values (Backstrom et al., 2018). Yellowstone National Park facilitated a ‘natural experiment’ through the historic presence, forced extinction, and subsequent reintroduction of wolves; offering an opportunity to study trophic interactions (Ripple & Beschta, 2012). The experiment involved decisions on when to reintroduce wolves, in which part of the park, how many individuals, and from where to source them (Bangs, 1996). While driven by ecological research, the essence of the park’s transformation relies on human evaluation, intervention, and management. Human ideals and actions influenced the ecosystem, demonstrating that *“restoration is essentially a design process”* (Higgs, 2003).

In terms of designed or engineered ecosystems and whether they should be considered ‘novel’ or ‘wild’; the discussion in the literature is varied. Eric Higgs creates a distinction between the two and defines novel ecosystems as ‘nature-led’, and designed ecosystems as ‘human-led’ (Higgs, 2017). Arguments to exclude human-engineered sites from ‘novel’ classification refer to situations of continuous management, which contradicts the requirement in some definitions for novel ecosystems to be ‘self-sustaining’ (Morse et al., 2014). Designed sites do however satisfy other criteria for novelty found in the literature – they are ‘human induced’, they have passed an ‘ecological threshold’ and they are made up of

‘unique species compositions’ (Teixeira & Fernandes, 2020). Furthermore, designed, and managed spaces can still show self-organisation through spontaneous dynamics, colonisations, and unexpected species interactions; therefore the literature also argues for their inclusion as ‘novel ecosystems’ (Ahern, 2016b; Backstrom et al., 2018).

Regardless of their classification, designed and managed spaces present opportunities for biodiversity conservation and enhancement (Higgs, 2017). However, their effectiveness depends on the strategies employed in their implementation. As discussed previously, design can negatively impact our urban biodiversity through ecological homogenisation (Connop & Nash, 2018). Furthermore, ill-informed maintenance strategies are the leading factor to negatively affect biodiversity on informal green spaces (Rupprecht et al., 2015). Research by (Filibeck et al., 2016) has shown how site management heavily influenced by public perception rather than a scientific approach can lead to a significant decrease in biodiversity. This case study shows a highly diverse urban wild space in Rome which was recognised as important for nature, protected from development, designated a ‘nature reserve’ and ‘greened’ by the municipality. The management interventions carried out under this regime resulted in a fifty percent reduction in biodiversity on the site (Filibeck et al., 2016). Studies also show that when targeted science-based management is applied, such as intermittent mowing regimes on urban domestic lawns, this can help to increase biodiversity and pollinator abundance (Lerman et al., 2018).

Recognising that design and management can both improve and deplete urban ecology has led to recommendations for collaboration within the literature. It is argued that long standing discourses in landscape architecture reflect similar ecological characteristics and spatial typologies to the novel ecosystems discussion. This leads to recommendations that ecological science needs engage beyond its own discipline in order to fully embrace and develop concepts around ecological novelty (Grose, 2014). Furthermore, there are calls for academia to pursue greater engagement with design practitioners (Graça et al., 2022; Nassauer & Opdam, 2008), and to ensure that scientific research is accessible and adaptable to the world of practice (Grose, 2010a; Weisser et al., 2022). The literature demonstrates that design, management, and practical application are critical factors to consider for the future of ecology and biodiversity, particularly in the urban context.

1.3 Social Considerations

There are many layers and complexities to the human-nature relationship and many factors which influence it. To gain a broader understanding of urban nature and how we perceive and relate to green spaces in our cities, it is important to consider the social and cultural context.

1.3.1 Values, Beliefs, and Historic Connections

The human-nature relationship is a long and complex one. Nature is defined as: *“the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations”* (Oxford, 2006) yet, nature means different things to different people (Özgüner & Kendle, 2006). In examining how we design and interact with green spaces in our cities, it is important to consider this relationship. People assign value to nature for different reasons, and these associations can be nuanced, complex, and even subconscious. Using a conceptual framework, Kellert explores nine value typologies concerning the human connection with and reliance on nature. These categorisations explore the spectrum of relationships from control or exploitation, to an affiliation for nature through spiritual or symbolic connections, and aversion to nature through fear or alienation (Kellert, 1993). Other theories explore how worth can be attributed to nature through the appreciation of its aesthetic value (beauty), its information value (knowledge, notable details), its conservation value (rarity) and its associative value (memory) (Kühn, 2006). Furthermore, aspects of cultural landscapes, for example, historic field systems or settlement patterns, are often valued for their contribution to place attachment, heritage, and cultural identity (Gobster et al., 2007). Context also bears influence on relationship to nature - both the landscape context (typology, use, ownership, aesthetic) and our individual situational context (mood, memory, activity e.g. leisure) (Gobster et al., 2007).

Environmental ethics categorises human attitudes to nature according to which entities they deem morally important. Anthropocentrism, places human life as superior, biocentrism values all living things as individuals, and ecocentrism places worth on nature as a whole ecosystem (Samuelsson, 2013). Similarly, how humans consider themselves either as ‘part of’ or ‘apart from’ nature greatly impacts their relationship to the environment as well as their outlook on human action in the natural world (Schroeder, 2007). This concept has been organised into four basic categories of the human-nature relationship:

‘Master’ – Humans stand above nature and may do with it as they want.

‘Steward (or guardian)’ – People have the responsibility to care for nature on behalf of God and/ or future generations.

‘Partner’ – Humans and nature are of equal status, working together for mutual development.

‘Participant’ – Humans are part of nature both biologically and psychologically.

(de Groot, 2010; de Groot & van den Born, 2003; van den berg & Konijnendijk, 2012)

The question of whether nature exists for the benefit of humankind, if we are stewards, or if in fact nature has an intrinsic value, independent of its utility to humankind is a discussion deeply rooted in religion and philosophy with many contradictory exemplifications and interpretations (Bourdeau, 2004). Long prior to formalised philosophical or religious theory, acts of worship and constructed monuments focussed on environmental cycles or natural landscape features (Frazer, 1926; Jones, 2005). From Uluru to Uisneach, these ancient sites hold great significance across millennia and through generations, telling of a deep-rooted connection to the land and the cycles of nature; an historic connection which is still relevant today (Verschuuren B., 2021; Wild et al., 2008). Furthermore, evolutionary psychology proposes that the legacy of our development through the Pleistocene, is still etched on our modern-day psyches. That the echoes of thousands of generations existing pre-civilisation, living in the natural world as wildlife, still exist in us today, whether consciously or subconsciously. It suggests that while there may be a societal sense that we have left the natural world, nature has not necessarily left us (Tippett, 2018).

The literature encapsulates the complexity of the human-nature relationship. A broad awareness of these historic, religious, cultural, philosophical, and psychological influences helps in understanding the spectrum of the human nature connection, offering context to the attitudes and actions people may demonstrate towards nature today. Multiple combinations of these values co-exist within all of us, often competing and contradicting themselves. None are mutually exclusive and so the way in which we relate to nature, and to specific species or sites is constantly evolving, adding layers to our experiences and perceptions as we move through the world. The inherent complexity of the human-nature relationship also offers a plethora of opportunities and meanings through which people can reconnect with nature.

1.3.2 Culture and Knowledge

Culture and knowledge also play a huge part in our relationship with nature and in how that relationship evolves. Historic and generational understanding of the landscape and of local ecological systems is often a key part of cultural identity (Gobster et al., 2007). Moreover, the incorporation of this indigenous knowledge leads to better ecological outcomes (Grose, 2014). For example, historic farming practices in the Burren, Co. Clare are an integral part of the ecosystem. The seasonal patterns of cattle grazing assist in maintaining a flourishing and diverse landscape (O'Rourke, 2005). This culture-nature intertwining can develop into associative value, fostering human-nature connectedness by giving meaning or emotion to particular species or spaces (Kühn, 2006). Similarly, when it comes to changing perceptions and altering human behaviours, awareness can often act as a catalyst. Research on perceptions of urban biodiversity shows that preferences for natural meadows and support for the value of urban greenspace as a habitat asset is linked to familiarity with the term 'biodiversity' and feelings of responsibility towards biodiversity. The same study reports that two-thirds of participants were in favour of a 50% conversion of manicured lawn space to biodiverse tall-grass meadow after they were informed about the ecological benefits of such meadows (Fischer et al., 2020). Another study demonstrates an increased tolerance for the off-season appearance of meadows once participants were given information on other benefits of the meadow – i.e. aesthetics (flowering season appearance), biodiversity (insect abundance), and cost-savings (reduced mowing frequency) (Southon et al., 2017). While education can assist in the acceptance of nature in cities, conversely, misinformation can cause difficulty by generating unsubstantiated fear of certain types of habitats or species. A very recent example is the misguided persecution of bats due to the COVID-19 pandemic. The use of correctly framed, accurate information is emphasised as crucial in combatting this (MacFarlane & Rocha, 2020). Some concerns, however, are well founded, as is the case with certain health issues such as pollen allergies. Similarly, fire risk, untidiness, litter, and mosquitoes are some understandable complaints reported by residents living near wetland and meadow habitats (Özgüner & Kendle, 2006). In these situations, to increase comfort and positive experiences in nature, appropriate solutions are needed (Fischer et al., 2020).

The literature highlights how influential culture and education is, and these factors can also influence the built environment. Design professionals are often not well-informed on topics such as biodiversity and ecology (Grose, 2014). By providing education on these topics, our cities may become more nature-friendly as a result.

1.3.3 Context and Cues

As well as having different relationships to nature, people also define ‘nature’ or ‘natural spaces’ differently depending on the setting. Within a city-wide context, ‘nature’ is considered to be the ‘opposite of the built up environment’ while in a park or ‘green’ setting, it is deemed the ‘opposite of formal’. (Özgüner & Kendle, 2006). Furthermore, our understanding of certain conscious or subconscious cues within a landscape can influence our perception of that landscape. A key component in positively perceived green spaces and a strong predictor of ‘attractiveness’ is evidence of legible human intent, activity, or ‘care’ (Nassauer, 1995). In a one-dimensional sense, ‘cues to care’ represent evidence of human activity in green spaces. These are often qualities of neatness, such as trimming the edges of meadows to create ‘orderly frames’ (Nassauer, 1995). Such cues are important not only because they increase attractiveness, but they also reduce perceptions of danger (Rall & Haase, 2011; Unt & Bell, 2014). Furthermore, neatness is a universal language of care that is accessible and easy to interpret. It can be applied to any place and does not require any deeper understanding of place or local ecology (Nassauer, 1988).

‘Care’, however, when considered in a broader sense than ‘neatness’, holds a deeper meaning, and this is evident when care is redefined as intention. Literature on care as intention, aligns with a more theoretical and philosophical sense of the human-nature relationship. J.I. Nassauer discusses this topic, building upon Tuan’s explorations of care in his book ‘Dominance and Affection’. Nassauer considers human intention and its consequent action towards nature in three forms:

1. Domination – is often expressed as ‘neatness’ and frequently displays “*a disregard for the intrinsic character of the ‘cared-for’*”.
2. Involvement – a stewardship approach based on an understanding of natural systems, for example, the act of weeding to help favoured or less vigorous plants.
3. Accommodation – making space for nature without interference (Nassauer, 1988).

It is interesting to relate these forms of ‘intention’ back to philosophical and religious theory around humankind’s relationship to nature: i.e., nature as a resource to serve humankind’s needs, nature as a companion with humankind responsible for stewardship, or nature as a system in its own right, independent of humankind (Bourdeau, 2004; van den berg & Konijnendijk, 2012). A connection between historical beliefs, value systems, and actions towards nature becomes apparent. Similarly, Paul Gobster writes that “*context affects*

aesthetic experience of landscapes”. This is in reference to both ‘landscape context’ (land use, ownership, history) and ‘situational context’ (activity, mood, expectations, socio-cultural norms) (Gobster et al., 2007). We take cues not only from the landscape but from our own intentions and beliefs. It can be construed that in the absence of any legible context or intention behind novel landscape actions or unfamiliar aesthetic qualities, ‘cultural expectations of nature’, i.e., historic, generational, and socio-cultural value systems will inform perceptions (Gobster et al., 2007).

Research has shown however, that if the intention behind actions of care is legible, then the perceived ‘attractiveness’ of different landscape types responds in a corresponding way (Nassauer, 1995). Dominance (neatness), involvement (stewardship) or accommodation (naturalness) and their consequential aesthetic characteristics, all show an intention to care for the landscape in different ways. When the intention behind care is understood as ‘neatness’, qualities such as ‘weedy’ and ‘not landscaped’ are seen to be unattractive. In contrast when the intention behind care is ecological care or ‘naturalness’, a landscape that is ‘too formal’ is deemed unattractive (Nassauer, 1995). In short, ‘messy’ landscapes look attractive if people know the ecological function of what they are seeing, or if the landscape context indicates that the messy look is intentional (Nassauer, 1988). Nassauer suggests that the ‘distinction between ecological function and natural appearance’ offers an opportunity to address cultural expectations. Proposing that we can *“critically analyse the cultural language of naturalness and use it as a language to intentionally communicate ecological function”* (Nassauer, 1995).

The literature suggests that by ensuring our urban landscapes have embedded intent and meaning, in any or many forms, we broaden the possibility for human connection and in turn, value and acceptance of those landscapes. This can be further supported by incorporating education and knowledge sharing measures. Within the context of this research, essentially; design has the potential to act as a translator in the ecological evolution of our cities. However, if designers don’t understand or have awareness of the meaning behind nature, be that ecological, philosophical, cultural, etc, it is difficult to weave that meaning into design strategies. In particular, it is difficult to establish these intentions as outcomes in their own right, separate to aesthetic or economic development goals.

1.3.4 Aesthetics and Perception

In a more material sense, certain characteristics of urban nature also influence our perceptions and attitudes towards various typologies of green space. Previous studies on the perceptions of urban green spaces assist in gaining an understanding of societal attitudes towards these sites. Characteristics of care and neatness are associated with attractiveness; ‘weediness’ with unattractiveness (Nassauer, 1995). Furthermore, An aesthetic of ‘neglect’ is typically construed from an absence of neatness (Nassauer, 1988). Positive correlation is seen between a preference for ‘tidiness’ and short cut lawns (Fischer et al., 2020), and research has also shown preference for colour in meadows (Hoyle et al., 2018). Preference is also shown for irrigated lawns over dry natural meadows, which were deemed ‘neglected’ (Fischer et al., 2020). However, lawns are not the preferred landscape aesthetic in all greenspace settings; it has been shown that perennial meadows are preferred aesthetically over mown grass, and that meadows increase the perceived quality of urban green spaces. (Southon et al., 2017), demonstrated this by placing meadow plots in five areas of mown grassland and conducting surveys with 300 participants. Meanwhile, urban gardening features (flowerbeds, flower meadows, and vegetable plots) are deemed more aesthetically appealing than conventional lawns. This was shown by (Lindemann-Matthies & Brieger, 2016), who created photo visualisations, and recorded the preferences of over 300 participants. These are just some studies exploring attitudes towards urban nature, and it is difficult to determine a tangible pattern of positive or negative perception. It is evident that the threshold of acceptance between ‘managed’ nature and ‘natural’ nature is often subjective, unpredictable, and conditional. This is somewhat unsurprising considering the myriad of other influences at play, as discussed earlier.

When looking at wild spaces or novel ecosystems; in a social or planning context these spatial typologies have been labelled ‘interstitial spaces’ (Silva & Ma, 2021), ‘lost spaces’ (Trancik, 1986), ‘non-functional’ (Gaňko, 2020), ‘superfluous landscapes’ (Nielsen, 2002), ‘unintentional landscapes’ (Gandy, 2016), ‘ambivalent’ (Koole & Van den Berg, 2005), and ‘wastescapes’, which have “*lost their identities*” (Amenta & Van Timmeren, 2018). The frequent classification of these spaces as ‘non-functional’, implies that any current function, ecological or otherwise is not recognised or valued. In terms of their characteristics, these spaces are often deemed ‘abandoned’, and ‘derelict’ (Silva & Ma, 2021), or ‘overgrown’, and ‘weedy’ (Gobster, 2012). In studies on urban brownfield sites, negative perceptions tend to dominate (Mathey et al., 2018). In a similar vein, wild landscapes can

evoke feelings of fear and disgust, and this has been shown to correlate with a preference for manicured green spaces and the urban environment in general (Bixler & Floyd, 1997). However, familiarity with wild nature can increase tolerance and reduce negative perceptions; there is evidence that people who frequently visit the countryside respond more positively to meadows in urban settings (Southon et al., 2017). Another study on the perception of wilderness areas shows the importance of clear, safe, access as 67% of respondents desired a network of paths (Bauer, 2004; Hofmann et al., 2012). One study examining informal urban green spaces showed a strong desire among people to alter these wild spaces with 93 of the 100 participants wishing to make changes to the sites. The main themes of the improvements centred around ‘attractiveness’, ‘orderliness’ and ‘functionality’. Tidying, mowing, pruning, the addition of flowerbeds, paths, and benches were noted among participants as desired changes. (Włodarczyk-Marciniak et al., 2020). Spontaneous vegetation is often considered to be ‘weeds’ and accompanied by a perception that a site has been left to decay (Kühn, 2006). One study recorded 200 people’s perceptions of two urban spaces – a botanic garden, and a park. The botanic garden represented a formal landscape, while the park - an ancient wood encapsulated by urban development - represented a more naturalistic landscape. When asked if they would like the sites to be more ‘natural’ or ‘man-made’, ‘informal’ or ‘formal’ and ‘natural growing’ or ‘cultivated’, strong preferences were shown for ‘natural looking’, ‘informal’ and ‘natural growing’ qualities. Interestingly, when asked if they would like the sites to be more ‘wild’ or ‘managed’, a preference was shown for ‘managed’, although the results were quite close (Özgüner & Kendle, 2006). It must be noted that the participant preferences were based on their own interpretation of these words and how they would translate spatially. No additional descriptors or photo elicitation was used to clarify the meanings of these comparisons, so an allowance must be made for the connotations associated with the vocabulary used in the survey questions. Nonetheless, it is interesting to note the preference for a more natural appearance within designated green spaces (gardens and parks), compared to the desire for tidiness and formality in the perception studies of urban wild spaces. This desire for ‘managed’ space corresponds with discussions in the literature stating that a perceived lack of management is often understood as a lack of care (Rupprecht et al., 2015).

Furthermore, aesthetic preferences can lead people to change landscape in ways that do not regard the ecological function of that landscape. (Gobster et al., 2007) Consequently, management and communication play a key role in striking a balance between aesthetic

expectations and ecological function. While these two qualities may not be mutually exclusive, gaining public acceptance for conservation work with no perceived aesthetic qualities can be difficult. (Bruns, 1988). To combat this, the inclusion of ‘flagship’ species is suggested to improve the appearance of ‘natural’ meadows (Bretzel et al., 2016; Fischer et al., 2020). Similarly, it has also been suggested that spontaneous vegetation enhanced with some ornamental species could be used as an alternative to conventional planting in urban areas (Kühn, 2006). This ties in with research showing that the inclusion of flowering plants improves the public appreciation of a landscape (Bruns, 1988). Furthermore, communications around ‘focal species’ can improve the social perception of certain ecosystem types or conservation campaigns (Andersson & McPhearson, 2018). Another suggestion is to redefine our landscaping approach from ‘ornamental’ to ‘appropriate’ horticulture, targeting a holistic balance between ecologically functioning, aesthetically pleasing, and socially responsible planting in our urban and suburban areas (Beatty, 1981).

There are many more studies on perceptions of various typologies of green space in various cities which reinforce the findings above. While responses in these studies typically relate to specific sites or classifications of green space (i.e., wild spaces, or lawns vs meadows) there is a common thread of complexity and sometimes contradiction in perceptions and attitudes towards these spaces. While it is difficult to ascertain a definitive pattern, overall the studies suggest that to be accepted and perceived positively, urban green spaces (formal and informal) must strike a fine balance between themes of fear, safety, legibility, neatness, attractiveness, functionality, access, management, and many more factors. Furthermore, it is apparent from the extensive and thought-provoking literature that the human-nature relationship is far from one-dimensional. Below the surface, themes of spirituality, beauty, conservation, memory, mood, activity, use, ownership, knowledge, culture, and history are just some of the factors which also influence our perceptions.

1.4 Architectural Practice

To ground the prior discussions around ecological and social factors within the context of the research question, the realm of architectural practice and the development process must be explored.

1.4.1 Architectural vs Ecological Practice

“The fate of natural and semi-natural ecosystems is irrevocably bound up with the use of land. It should therefore be a matter of foremost concern for all those involved with land use change” (Owens & Cowell, 2011). While the disciplines of both architectural design, and ecological science are involved with land use change, there are fundamental differences in their approach. An understanding of this offers insight as well as opportunities for interdisciplinary working to improve ecological outcomes. Ecologists are accustomed to working with established landscapes and interpreting existing conditions. They are by nature, observers rather than creators; trained to document and report objectively in their scientific enquiry, and this can complicate their ability to influence decisions (Felson, 2013b). In this vein, ecologists typically review a proposal and assess the impact rather than informing the creative process; they rarely re-negotiate the site or re-define the problem by themselves (Grose, 2014). Conversely, designers are trained to be creative - laterally assessing problems and suggesting solutions. With a design mindset, everything is flexible until it is – sometimes literally – set in stone. Designers, therefore, are constantly reassessing problems, even engaging the client with the ecological possibilities of a site and re-negotiating the ambitions of the brief (Fry, 2009). The differences are inherent in the training of both professions – for example, if a class of architecture students are given the same brief and the same site, they will each design a different building, demonstrating their creativity and design skills. Conversely, if a class of ecology students are tasked with assessing and making recommendations for the conservation and restoration of a habitat, while the responses may vary somewhat, it is expected they would be quite comparable. This demonstrates good scientific observation, interpretation, and application. These fundamental differences in the two professions are positive when it comes to development and site design. Both disciplines can learn from each other and support one another to establish good interdisciplinary working techniques (Felson, 2013a).

1.4.2 Practitioner Roles, and the Project Process

Within the urban ecology literature, a lack of clarity around the roles of different practitioners in the design and development process, as well as the conflating of their responsibilities is apparent. There is ambiguity around the purpose of design, which suggests that the academic understanding of planning and design is detached from the reality of practice (Graça et al., 2022). This is illustrated by a somewhat vague approach to terminology within the literature. Academic papers refer to a wide range of ‘actors’ including ‘landscape ecologists’, ‘designers’ (Ahern, 2013), ‘landscape planners’ (Hofmann et al., 2012), and ‘champions for plans’ (Nilon et al., 2017); terms which are imprecise and ill-defined. The papers succeed in identifying built environment professionals as a collective and the astute and valid observations and recommendations by the authors can be understood in a general sense. However, this tendency to generalise creates an issue in translating these recommendations into practice due to a lack of operational, and practical detail. For example, the term ‘designers’ in a broad sense can be understood, however, in the context of a development project a greater definition is needed for what exactly constitutes a ‘designer? Who, specifically, is the ‘designer’ on a given project? What qualifications do they hold? Which legislation and codes of conduct govern their work? What is their position in the overall design team? At what project stages are they involved? Technically speaking, they could be an architect, landscape architect, urban designer, urban planner, or an interior designer. Furthermore, as discussed earlier in this chapter, ecologists could be considered designers too. Failing to drill down into the detail creates confusion around the academic findings and recommendations, expectations, ownership, and responsibility, which ultimately, forms a barrier to identifying appropriate next steps and motivating change. Furthermore, this lack of knowledge of the built environment process is attributed to impeding the integration of action in the sector (Hürlimann et al., 2022). The intention behind capturing the views of architects as part of this study is to provide the scientific community with insights into the dynamics of the built environment process on the ground.

(Hürlimann et al., 2022) in looking at climate change actions, introduce clarification on this issue through the creation of a process map. In terms of architects, this built environment map identifies them as being involved at several stages in the process – ‘project consideration’, ‘design’, ‘construction’, ‘use’, and ‘renewal’. These stages can all impact biodiversity in one

way or another however, ‘project consideration’ is particularly important as it involves ‘site scale analysis’ and ‘feasibility assessments’ which can often dictate the overall site layout.

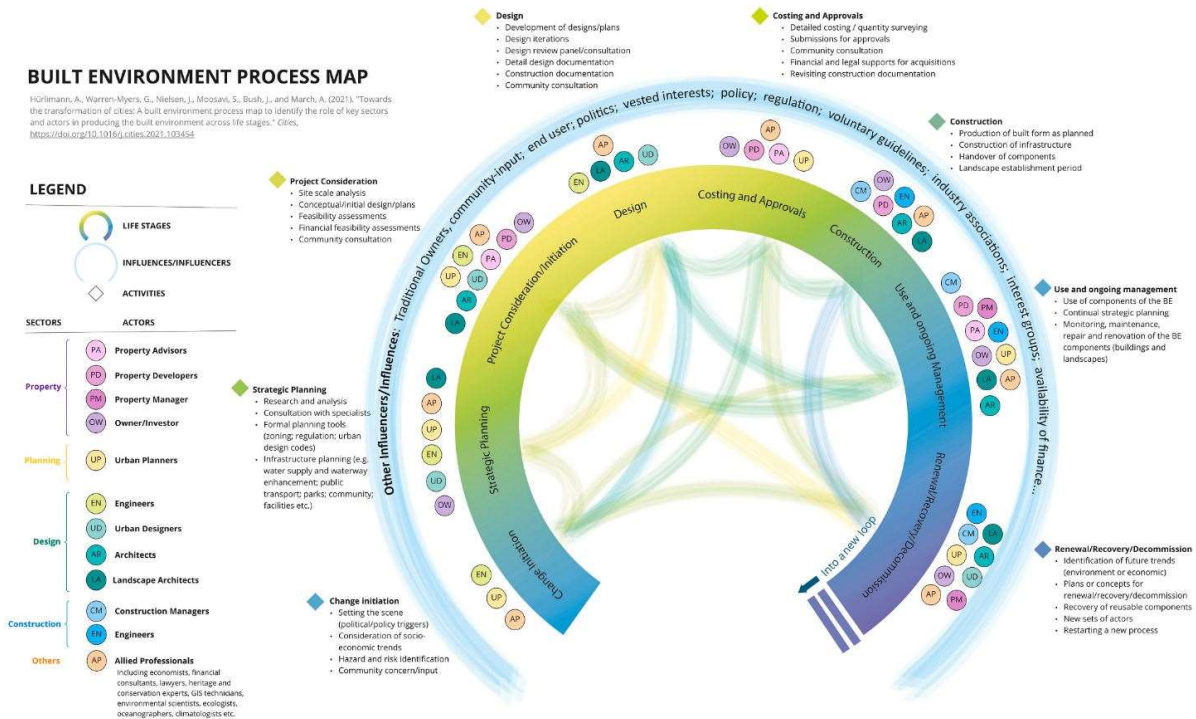


Figure 8: Built environment process map reproduced from (Hürlimann et al., 2022).

Typically, ecological input is not sought at this creative or conceptual design phase (Felson, 2013a). Moreover, the environmental evaluation for sites often involves a ‘rapid assessment’ process to inform design decisions and this process can be impeded by timing and budget restrictions (Felson et al., 2013). While Hurlimann et al note the involvement of landscape architects and allied professionals (including ecologists and environmental scientists) at this early stage, it is the researcher’s own professional experience that this is often not the case in Ireland. First-hand and anecdotal knowledge indicates that at feasibility stage in Ireland, the design team is much smaller, with the architect testing the feasibility of a scheme in consultation with the client and perhaps a planning consultant. Landscape architects and environment specialists such as ecologists are typically consulted later in the process, for example at the ‘design’ stage within the above diagram (Hürlimann et al., 2022), to enhance the design or mitigate risks. This inconsistency between the literature and the researcher’s experience is further motivation to explore practitioner roles and the project process in more depth. Hurlimann et al recommend that future exploration of the process should examine the power and influence each actor has across the project stages. It is also the researcher’s own experience that the hierarchical structure within the design team and the influence each actor

has on the project at each stage is an important dynamic to capture in identifying barriers to and opportunities for biodiversity enhancement in the project process.

1.4.3 Policy, and Academic Research

It is apparent from the literature that there is a gap between academic research and the needs of practitioners. Despite constructed ecologies becoming increasingly prevalent in scientific research, this has offered little by way of assistance to the theory and practice of the design disciplines (Grose, 2014). Studies have shown that scientific research targeted at green space enhancement offers guidance mostly at strategic urban planning level, and there is a lack of practical, detail driven recommendations suitable for application during the design process (Graça et al., 2022). Furthermore, academic literature has a tendency to conflate design and planning, and to misinterpret the different scales at which these practices operate (Graça et al., 2022). These are decidedly distinct disciplines and practices; planning is usually strategic and broad in its objectives, which is appropriate to the scale at which it operates: landscape scale. Design, conversely, operates typically at the site scale, development by development, and each iteration is a synthesis of stakeholders, constraints, and opportunities. Consequently, there is a need for researchers to engage more with practitioners to capture their professional knowledge from project experience and to gain their input on future research topics and critical knowledge needs (Graça et al., 2022; Nassauer & Opdam, 2008). It is also necessary to simplify and translate scientific knowledge so that it is usable to practitioners and can be practically applied in site-specific projects (Grose, 2010a; Weisser et al., 2022). In the architectural profession, while practitioners carry out a great deal of technical and project specific research in their work, engagement with academic research and institutions is uncommon (RIBA, 2014). Knowledge in the architectural world is often gained “through doing” and is disseminated casually via peer-to-peer learning; furthermore, there is a perception among practising architects that academic research is not relevant to their work (Collins, 2014). This is substantiated by an abundance of strategic-level recommendations and general frameworks in research which lack the finer scale detail and practical information to be applied in to project specific situations (Graça et al., 2022). Suggestions to address this issue propose a more direct relationship between research and practice with recommendations for embedding research experiments into real design projects (Ahern, 2016b; Felson & Steward, 2005). Another avenue is to develop communication methods such as science-practice feedback loops and the inclusion of research findings in open publications or

practitioner journals (Ahern, 2013; Calkins, 2005; Felson et al., 2013). Also critical is the question of how to teach ecology and develop guidelines for nescient professionals in the built environment sector (Grose, 2014; Harris et al., 2016) as well as the need to integrate biodiversity actions into the project process and policy (Filibeck et al., 2016).

These themes around practitioner engagement are highlighted in the literature time and time again, emphasising that research cannot effect change if it does not translate into real world application. Practitioners need to have an awareness and an understanding of research findings as well as, most critically, a mechanism to apply these recommendations to real projects. It is already established that there are barriers to achieving positive biodiversity actions in the built environment sector (Hürlimann et al., 2022), an important next step and aim of this study is to establish from the practitioner side, how these barriers could be overcome.

1.5 Literature discussion

We can see from the literature that even nature's 'self-expression' within our urban landscape is highly influenced by human agency. Whether as a byproduct, or through conscious intentional action, nature in the built environment is shaped by human intervention. These interventions, in turn are influenced by multiple, often conflicting factors such as our values, our history, our culture, our policies, and our preferences. However, human agency is not necessarily a bad thing for nature. The literature shows that design and management can both improve and deplete urban ecology. From a social perspective, evidence of management correlates with positive perceptions of urban wild spaces. We also know that perceptions of nature don't always follow a tangible pattern and are often conflicting. Human perception itself can be influenced, through education, knowledge, and cultural norms. It suggests that the key to increasing biodiversity in our urban spaces lies at the interface between 'natural and cultural mechanisms'. The implication is that neither will be successful in isolation. Given the far-reaching influence that design has on the urban landscape, exploring this interface with designers could offer insights for fast-tracking better ecological outcomes.

Analysing the literature in the context of the research question and the development process in Ireland was an important exercise for informing the fieldwork. This process involved both a theoretical lens, and a practical lens. From a theoretical perspective, the factors which

influence the design outcome were explored. This is shown below, and reflects theories from the literature, notably those proposing that in the absence of tangible cues or context, our ‘cultural expectations of nature’ inform our perceptions (Gobster et al., 2007). In the case of architects and landscape architects, it is posited that this also informs design action.

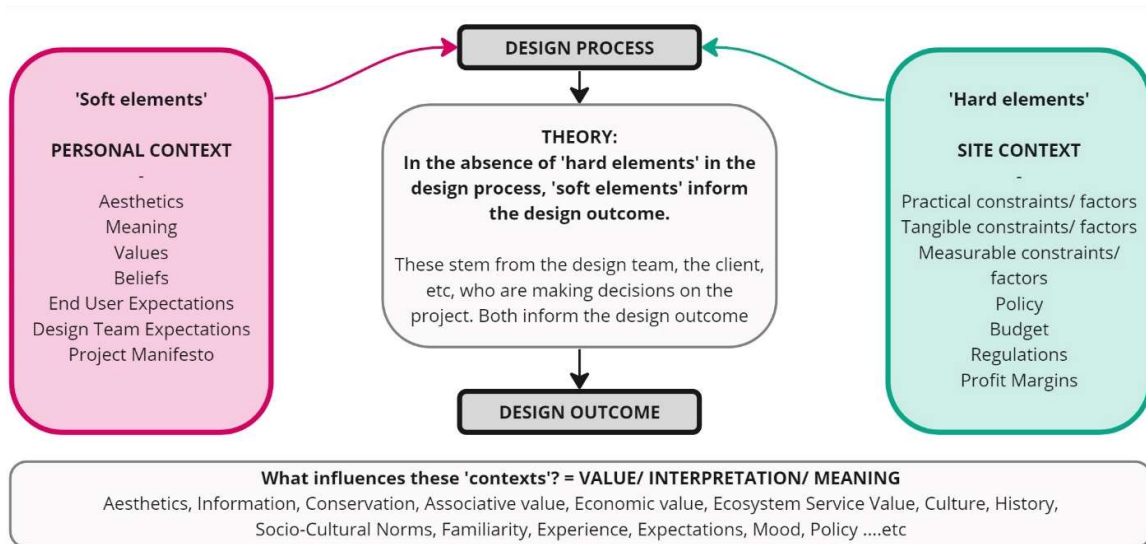


Figure 9: Researcher's own diagram exploring the design process in the context of the literature

Further theoretical analysis explored the symbiotic relationship between design and perception. Design is the physical manifestation of a series of influencing factors. Therefore, in theory, by adjusting one of these factors, the design outcome should also change. Furthermore, this design outcome has the potential to influence perceptions as design is also a manifestation of our cultural values. One

informs the other and the two evolve together. This concept is explored in the literature regarding landscape patterns. Actions in the landscape can bring invisible natural and societal processes into the perceptible realm, influencing the experience of landscapes which in turn prompt the actions humans take within landscapes. It is an iterative, evolutionary process.

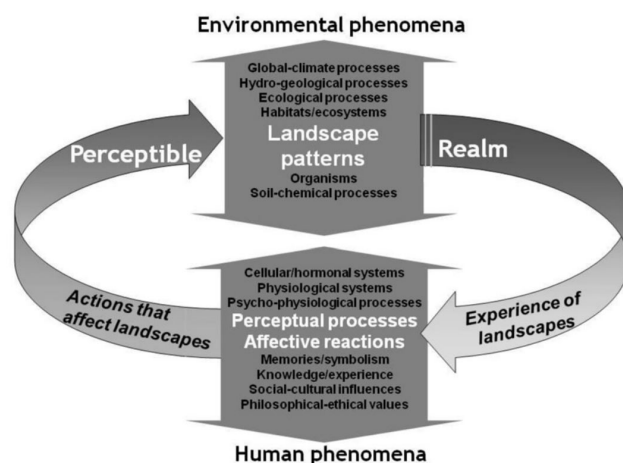


Figure 10: Diagram reproduced from (Nassauer, 2012), adapted from (Gobster et al., 2007)

Considering the development process in this context, the role of design becomes apparent, both as a manifestation of experience, but also as a communication tool to influence perceptions. Moreover, the literature analysis reveals potential intervention points which could drive change, both from the top down, and the bottom up.

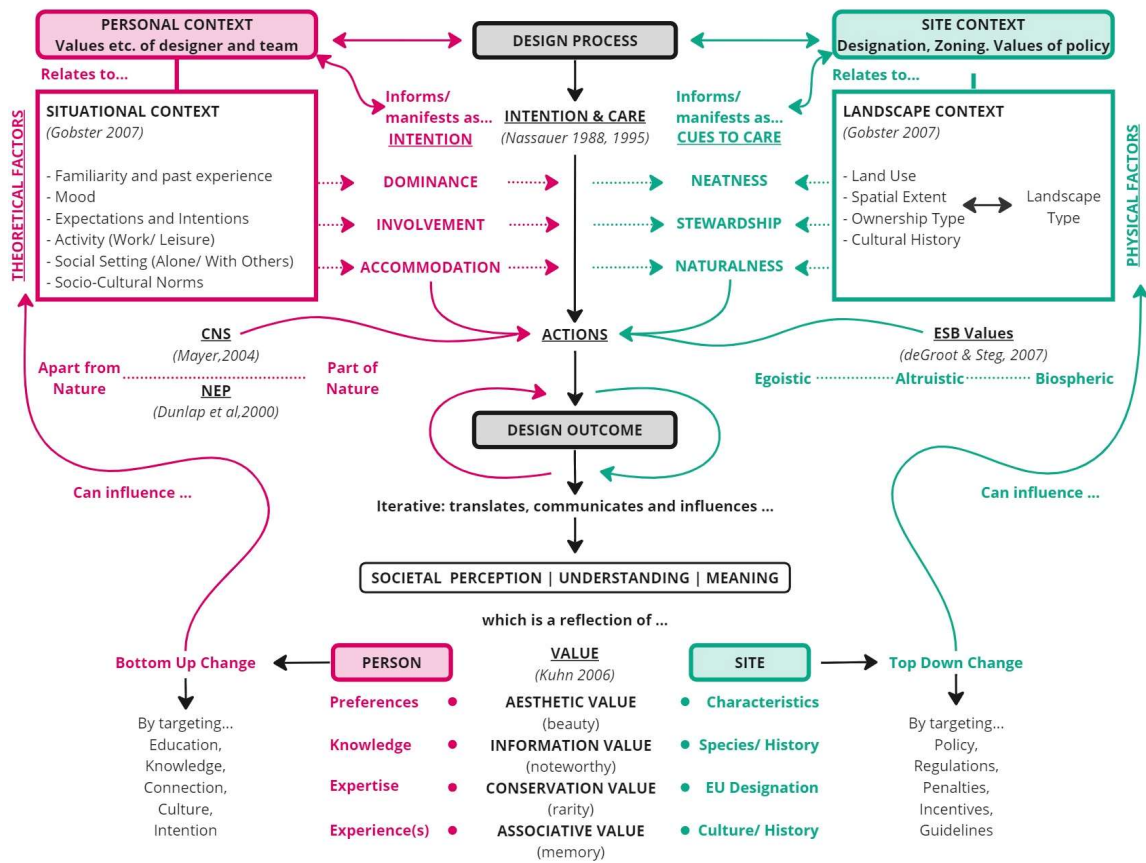


Figure 11: Researcher's own diagram exploring the literature and the chain of influence within the design process

Understanding the interactions within this network of influence was important both for the design and analysis of the fieldwork. Interestingly, undisturbed nature and its endeavour towards ecological function is perhaps the most predictable factor. It simply responds to the site conditions, free from the philosophical or social influences which humans endure.

Overall, the literature review provided a much deeper and nuanced understanding of the complexity of nature in the built environment. This existing research is rich and complex, providing a comprehensive and nuanced foundation upon which to build the fieldwork.

CHAPTER 2

POLICY AND THE DEVELOPMENT PROCESS IN IRELAND

2.1 Overview

To provide context for the research, understanding the framework within which practitioners operate was essential. Thus, a desktop study was conducted to examine the structure of the environmental legislation framework as well as the Irish planning and development system. This review captured environmental policy procedures such as environmental impact assessments (EIA) and screening for appropriate assessment (AA), as well as development processes like obtaining planning permission. Since the research explores the process and outcomes of development, the policy review was geared towards the mechanisms and policy instruments with which development interacts. A case study example is included to review how urban wild spaces are regarded by the current legislative framework.

2.1.1 Policy Review Methodology

The methodology used to analyse this literature was adapted from the 5W1H framework (Jia et al., 2016; Mosannenzadeh et al., 2017; Paliwal et al., 2020). This approach was chosen because the research focus was targeting the application, rather than the theory of the policy. It was a clear, practical methodology, suitable for large amounts of literature, and was ideal for clarifying when each legislative process is triggered, and under which circumstances it is applied. Questions were asked to analyse each policy mechanism (e.g., Appropriate Assessment Screening) and were as follows:

- What:** What does this policy mechanism entail? What information does it provide?
- Who:** Who requests the information, which discipline provides it, and who is assessing it?
- Where:** Where in the development process is it done? At what stage?
- When:** When is this policy mechanism triggered?
- Why:** Why is it done? What is it intended to determine/ protect?
- How:** How is this process carried out? What are the steps?

In addition to this, the policy driver was noted, i.e., under which legislation is the mechanism required, e.g., planning, or environmental legislation. Also noted was the output, i.e., is it a report? Is monitoring required? Etc.

2.2 Legislative Framework

Legislation is in place both nationally and at a European level to protect Ireland's vulnerable and threatened biodiversity from depletion and fragmentation. Similarly, legislation is in place to govern development, with a focus on minimising the impact of land use change and promoting sustainable development practices.

2.2.1 Environmental Legislation

The framework for protecting nature, wildlife, and biodiversity in Ireland is driven by European directives and National legislation. The EU Birds Directive (1979), and the EU Habitats Directive (1992) established a network of sites deemed highest in biodiversity importance for rare and threatened species and habitat types. Known as the Natura 2000 Network, these sites are classified as Special Protection Areas (SPAs) under the Birds Directive, and Special Areas of Conservation (SACs) under the Habitats Directive (EC, 1992). There are site-specific conservation objectives for each location and Ireland is mandated by the European Commission to report on the status of the protected habitats every six years, under article 17 for habitats and species (NPWS, 2024b), and Article 12 for birds (NPWS, 2024a). Ireland has been historically poor in fulfilling its compliance requirements under EU law (Connaughton, 2014), an issue which is still problematic today (O'Doherty, 2023; RTE, 2024). These European level directives are transposed into Irish law via the European Communities (Birds and Natural Habitats Regulations 2011, and various Statutory Instruments (NPWS, 2023).

At a national level, the primary legislation in place is the Wildlife Act, 1976, the scope of which was broadened by the Wildlife (Amendment) Act, 2000. These acts are supported by additional legislation such as Flora Protection Orders, the Planning and Development Act (2000), and Restrictions on Cutting Hedgerows (NPWS, 2024c). Protection is given to certain species, and damaging activities are restricted through licence requirements. The Wildlife (Amendment) Act, 2000 provided for the designation of Natural heritage Areas (NHAs) which are legally protected. A further 630 sites are identified as proposed Natural Heritage Areas (pNHAs). These sites are not legally protected, and their safeguard is instead administered through restrictions on agricultural and forestry schemes as well as the recognition of their ecological value by Planning and Licencing Authorities (NPWS, 2024d). In certain instances, an area may fall under multiple designations.

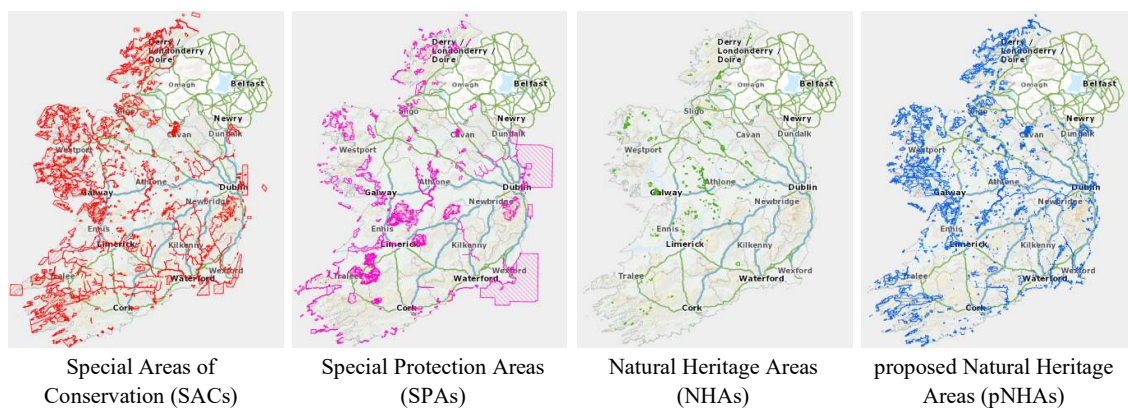


Figure 12: Maps showing the locations of the various typologies of protected sites in Ireland

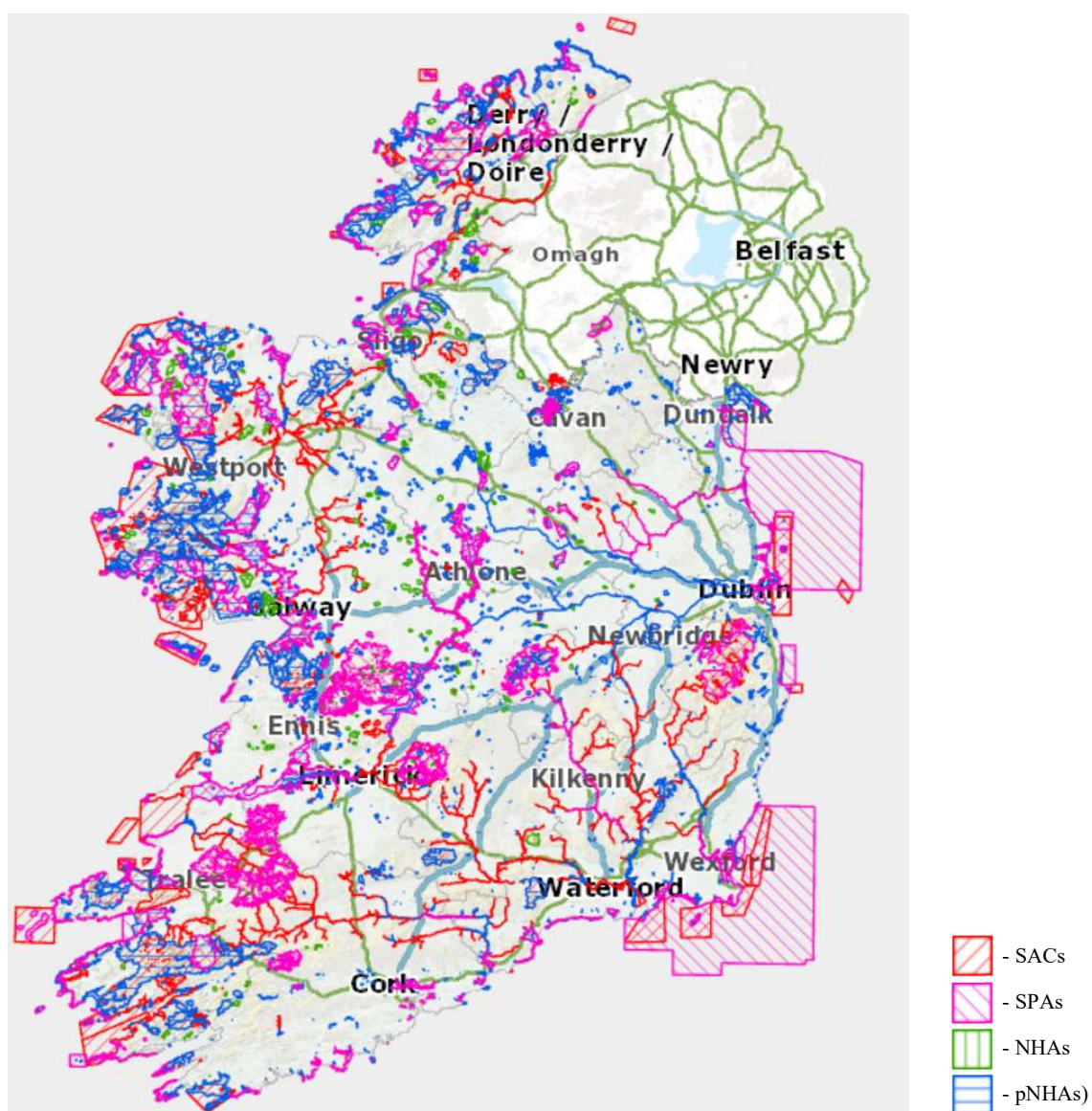


Figure 13: Combined map of all protected sites in Ireland.

Of the total area of terrestrial landmass in Ireland 13.9% is covered by protected areas. Of this protected area network, 94% is designated under the EU Natura 2000 network, 4.7% is designated under Irish law, and 1.3% falls under both designations (BISE, 2023). This leaves 86.1% of land in Ireland outside of formal designation.

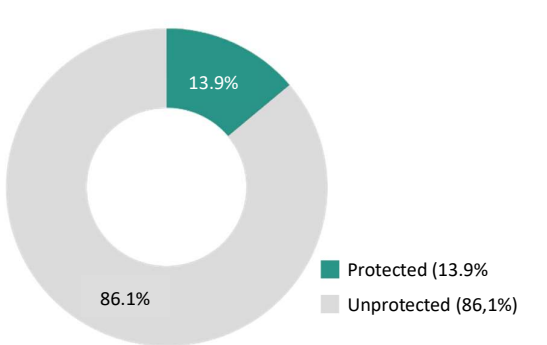


Figure 14: Protected Areas as % Landmass (BISE, 2023)

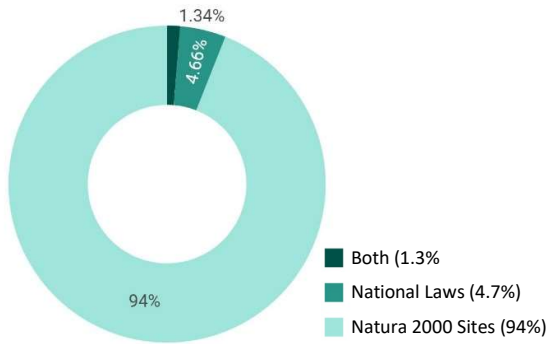


Figure 15: Designation of Protected Areas (BISE, 2023)

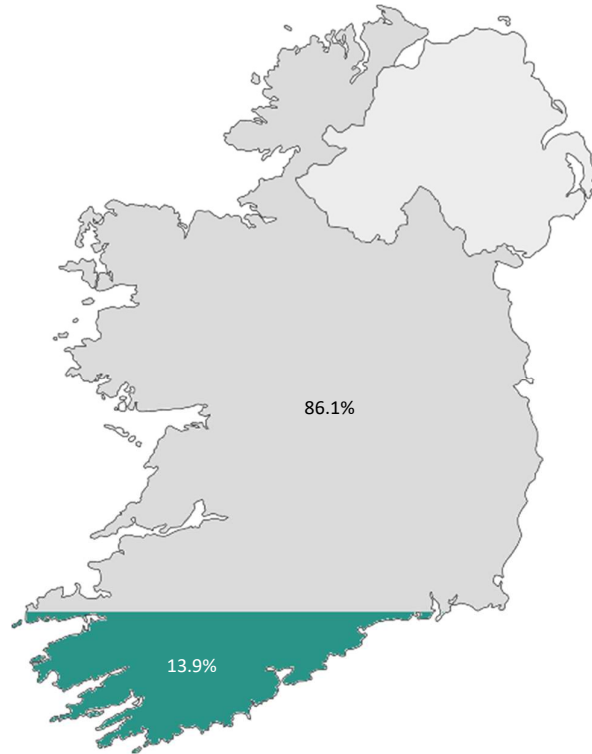


Figure 16: Map of Protected and Unprotected Landmass %

At just 13.9%, Ireland is below the average EU quantum of protected area of 26.4% (BISE, 2023). The EU biodiversity strategy 2030 targets legal protection of 30% of the EU’s land area, with one third - 10% of land area – to be strictly protected (EC, 2022). The European Parliament has recently passed the EU Nature Restoration Law, which sets a target for 20% of the EU’s land to be restored by 2030. Of that 20% of land area, 30% of the habitats must be restored from poor to good condition by 2030, increasing to 60% by 2040, and 90% by 2050 (EP, 2024). Further targets are set for items such as pollinating insects, forest ecosystems, river connectivity, and urban ecosystems (EC, 2024b).

2.2.2 Development Legislation

The legislative foundation for the planning and development system in Ireland is the Planning and Development Act 2000 (as amended), and the Planning and Development Regulations 2001 (OPR, 2022e). This system is currently being reformed, and at the time of writing, the Planning and Development Bill 2023, has completed Dáil Éireann, Second Stage (of 10), in the process of debates which moves a bill towards enactment into law (Oireachtais, 2023). Within the current planning and development system there are several frameworks and plans to shape and guide development proposals. The hierarchical structure of this is as follows (OPR, 2022e):

1. National Planning Framework - (*Department of Housing, Local Government and Heritage*)
2. Regional, Spatial, and Economic Strategy - (*Regional Authorities*)
3. Development Plans - (*Local Authority*)
4. Local Area Plans - (*Local Authority*)

At a site scale and a project level, individual development proposals interact with this hierarchy through the development plans, and the local area plans, via planning applications made to the local authority. Development plans work at the county or city level and comprise of written objectives and guidelines in a statement, accompanied by maps and appendices which set out how the catchment area will develop over the following six years. Within a development plan, at a local level, local area plans (LAPs) provide more detailed guidelines and policies for areas where significant development and change is expected. Both development and local area plans must reflect and be compatible with the objectives in the National and Regional strategies (OPR, 2022e). Development plans set guidelines for factors such as zoning, renewal, infrastructure, community services, heritage, environment, amenities, and conservation. Local councillors are responsible for making these plans, taking professional and technical advice from the various departments of the local authority such as, planning, engineering, and environmental. All planning applications are assessed against the objectives, standards, and policies set out in the development plan. The compatibility of the development proposal with these objectives forms the basis for a grant or refusal of planning permission, and the written compliance conditions attached to this decision (OPR, 2022d).

Planning decisions can be appealed by the applicant, or by any individual or group that submitted an observation on the planning application to the local authority. However, there are exceptions to this, one of which permits certain groups with objectives for environmental

protection to appeal in cases where an Environmental Impact Assessment Report (EIAR) was required for the planning permission. These appeals are directed to An Bord Pleanála, where the entire planning application is reviewed. The decision made by the Board is final and can only be contested through the High Court, by way of judicial review (OPR, 2022b). In the case of granted applications, local authorities are responsible for enforcement within the planning system, to ensure that decisions and compliance conditions imposed at planning stage are carried through and implemented in the finished development. If unauthorised development is taking place, the local authority will issue a warning letter to engage the developer in correspondence on the matter. In some cases, this may be escalated to an enforcement notice, or in rare cases, an injunction under the court system. Where unintentional unauthorised development has taken place, an application for retention permission can be made to the local authority. However, in cases where there have been impacts to the environment or where an Environmental Impact Assessment, or an Appropriate Assessment would have been required for the development, the local authority typically cannot accept retention applications (OPR, 2022c). At every stage of the process from the formulation of development plan guidelines to their enforcement, there exists an opportunity to integrate considerations for nature and advocate for the protection of biodiversity.

2.2.3 National Biodiversity Strategies

Alongside the European-driven legislation implemented in Ireland, at a national level plans and strategies designed to safeguard biodiversity have been introduced. Ireland's fourth National biodiversity Action Plan was launched in January 2024, and is the first such plan to include legal requirements for public bodies (DoHLGH, 2024). Under the Wildlife (Amendment) Act 2023, selected public organisations are required to consider and integrate the objectives and targets of the NBAP, into their own functions and operations. In addition, they must submit a report to the minister annually to document their progress (DoHLGH, 2023). Furthermore, almost every local authority has a biodiversity action plan; some of these include climate actions, and some local authorities also have invasive alien species plans (Clarke, 2020). Similarly, a strategy is underway to integrate biodiversity officers into all local authorities, currently there are twenty-five (out of thirty-one) in place with all posts expected to be filled by 2025 (THC, 2023).

2.3 Policy Mechanisms

When a strategic plan or an individual project proposal moves through the planning and development process, it will interact with different policy instruments designed to protect threatened habitats and species, to minimise the impact of land use change, and to promote sustainable development. These mechanisms and objectives can be embedded within national legislation, or within local level development plans and strategies and are designed to govern development and manage its effects on ecology and biodiversity.

2.3.1 National Policy Instruments

In the case of broad-scope strategic proposals such as Local Authority Development plans or National infrastructure plans, the potential environmental impacts of these proposals are assessed through the Strategic Environmental Assessment (SEA) process. At project stage, for specific large scale or high-risk development classifications, environmental impacts are assessed by the local planning authority or An Bord Pleanála through the Environmental Impact Assessment (EIA) process. This process is informed by an Environmental Impact Assessment Report (EIAR), prepared by the project proponent, and submitted with the planning application. These environmental assessments investigate the direct and indirect effects a proposal may have on numerous environmental factors, such as human health, biodiversity, soil, water, air, climate, material assets, cultural heritage, and the landscape. They are typically prepared for large projects (e.g., infrastructure, energy, or residential developments over 500 Units), however some sub-threshold projects also require an EIA, and this requirement is determined by the Local Authority through an EIA Screening process (OPR, 2022a).

The Appropriate Assessment (AA) process is in place to specifically review the impacts a plan or a project may have on any sites within the Natura 2000 network. In many cases both an Environmental Impact Assessment (EIA) and an Appropriate Assessment (AA) will be required for a plan or project. Stage 1 of the AA process involves screening to establish if the full Appropriate Assessment procedure is required, and this must not rely on any mitigation measures to achieve exemption from Appropriate Assessment. The screening stage examines the effects a plan or project, whether on its own, or in combination with other plans and projects may have upon designated European sites (OPR, 2022a). AA Screening is required for any proposal which constitutes a ‘plan or project’ within the meaning of the Habitats

Directive and Habitats Legislation (NTA, 2023), regardless of proximity to the protected site. The assessment reviews the zone of influence around the project which varies on a case-by-case basis, with a benchmark guideline of 15km. Long distance impacts, for example via downstream waterway catchments, are captured using the source-pathway-receptor model (OPR, 2021). The ‘precautionary principle’ is applied and if there is any doubt, the full AA process must be completed. This requires the proponent of the proposal to commission an specialist Natura Impact Statement for submission to the Local Authority (DEHLG, 2009).

2.3.2 Local Authority Policy Instruments

Objectives to promote sustainable development at a local level are set out within the local authority development plan. There are thirty-one local authorities in Ireland, twenty-six are county councils, three are city councils; Dublin, Cork, Galway, and two oversee both a city and a county; Limerick and Waterford (CIB, 2023a). Each local authority will produce a development plan, and while these plans must reflect the objectives of the National and Regional planning strategies, they are each tailored to the needs, opportunities, and constraints of their individual catchment areas. Consequently, these thirty-one development plans are all different. Environmental and ecological objectives are incorporated into these plans addressing various topics such as; green infrastructure, biodiversity, open space, parks, recreation, environmental infrastructure, flood risk, sustainable drainage, tree preservation orders, and ecological networks (DLRCoCo, 2022b). When a project proposal is submitted to the local authority for planning permission, it is considered within the context of the current development plan. The authority may seek alterations, further information, or impose conditions on the development permission to ensure the proposal meets the objectives of the development plan. The mechanism of assessing a development proposal in the context of the development plan can be both a qualitative and a quantitative process. In some cases, the proponent of the project, via their design team, interprets the development plan and describes in their planning statement the steps taken to integrate its objectives into the project proposal. The planning specialist within the local authority will then conduct an appraisal of the development against the development plan as part of the planning decision process, sometimes with the help of a checklist or a toolkit (DLRCoCo, 2022a). Other mechanisms seek a more quantitative approach, such as a Green Space Factor calculation. This is a calculation tool which derives a ratio for the new development based on the quantity and quality of the green space provided within the proposal and its impact on the existing green

cover within a site. The tool assesses urban green space elements such as lawns, trees, paving, sustainable drainage, and vegetation and each factor is weighted based on its positive impact on the urban green infrastructure and biodiversity. Development proposals must meet a minimum score requirement based on their location and must submit their calculation with the planning application (SDCC, 2022).

2.3.3 Independent Strategies and Campaigns

In addition to national legislation and policy, numerous organizations and campaigns actively promote the protection and enhancement of biodiversity in Ireland. Charitable and non-profit organizations like Birdwatch Ireland, the All-Ireland Pollinator Plan, and Bat Conservation Ireland are dedicated to advocating for the conservation of various species and their habitats. These entities not only conduct surveys but also engage with diverse stakeholders, offer best practice guidance, and collaborate with the public to advance nature protection efforts. The Tidy Towns competition, established in 1958, is a longstanding initiative to foster community stewardship of the local environment. Participating towns and villages, of which there are approximately seven hundred, undergo anonymous assessments between June and August each year, with awards presented across various categories. Wildlife and biodiversity have always been integral to the competition, now forming a core category for assessment (DoRCD, 2020). For new developments, the Home Performance Index (HPI) offers a voluntary certification pathway for residential developers. This comprehensive certification encompasses an array of indicators including considerations for biodiversity impacts. Developments exceeding 5,000 square meters seeking HPI certification must complete a mandatory biodiversity net gain assessment report (HPI, 2022). These are just some examples among numerous certifications, standards, and non-profit campaigns which also play essential roles in contributing to the protection and enhancement of biodiversity in Ireland.

2.4 Case Study

To assess how urban wild spaces interact with the legislative and policy frameworks, a case study was conducted. This was an important exercise to contextualise the research and examine the planning system in action.

2.4.1 Overview

This study reviewed a planning application on a novel ecosystem site, illustrating how biodiversity is considered within the planning framework. Local authority development plans, personnel, expertise, and opinions can vary, which may affect outcomes for similar sites. This case study serves as an illustration of system dynamics and policy mechanisms in action. Publicly available planning records were used, with details of the site or practitioners omitted for anonymity. The focus was on understanding the systemic process, rather than individual practitioner inputs.

The chosen site aligns with key characteristics defining a novel ecosystem, i.e., it has been altered by human agency, displays unique species compositions, it is self-sustaining and unmanaged, and it has crossed a biotic ecological threshold which would be difficult or impossible to reverse (Morse et al., 2014). This infill site is in a key suburban location in Dublin and planning applications for development were submitted in 2019 and 2022.

2.4.2 Case Study Site

To select a site, Google Earth imagery was reviewed against the planning application map. Novel ecosystem sites – overgrown, urban plots were sought out, and a small number were found to have recent planning applications. This site was selected as there were two planning applications, documentation for both was available online, the existing site ecology had been noted by the local authority in the pre-planning meeting for the most recent application (2022), and the application had been subject to a third-party appeal. This provided two planning iterations within the one site, as well as capturing the appeals process. While a single case study provides limited findings and is not conclusive, the following exercise represents a detailed working example of the planning process.

The examined site was previously in use as a horticultural nursery and had been abandoned and unmanaged for approximately twelve years. This resulted in ecological succession and an abundance of wild vegetation. The evolution of the site can be seen in the images below:



Figure 17: Site in 2008 (in use as a horticultural nursery)



Figure 18: Site in 2013 (showing abandonment / succession)



Figure 19: Site in 2018 (showing further succession)



Figure 20: Site in 2020 (after clearance works)

2.4.3 Planning Process

Publicly available documentation from the planning process was examined, and references or correspondence regarding ecology and biodiversity were extracted. The findings are set out below in chronological order and extracts can be seen in Appendix 1.

2.4.4 2019 Application

Pre-planning consultation: Three pre-application meetings were held to discuss the development proposal. Standardised forms and notes are prepared by the local authority to document the discussions. These forms include a checklist of standard planning procedures and note that Environmental Impact Screening (EIS), is not required, and Appropriate Assessment Screening (AA) is required for the proposed development.

AA Screening Report – Protected sites: The consultant report assesses the impact the proposed development may have on any protected sites within the Natura 2000 network. Potential negative effects are reviewed both individually and in combination with the effects of other developments in proximity. This report concludes a predicted negligible impact on protected sites, and that there is no requirement for a stage 2 assessment or a Natura Impact Statement (NIS).

AA Screening Report – Existing site ecology: Within the AA Screening report, there is an appraisal of the existing site ecology. A site visit was conducted on 18/12/2018 and the report notes that this is outside of the ideal flora survey window. Four habitat types are identified – scrub (WS1), hedgerows (WL2), treelines (WL1), and isolated areas of flower beds and borders (BC4). The report noted that many areas still enclosed by greenhouse structures were devoid of water and so vegetation growth was poor. Growth was greater where roof glass had been broken. It is stated that *“native biodiversity on the site was poor with opportunist species such as buddleia (Buddleja davidii) present throughout the site. No flora or fauna of conservation importance were noted on site.”* ... *“No records of threatened or legally protected plant species are known to occur within the site (NBDC and NPWS data, fine resolution)”*. The report earlier notes that some areas of the site were inaccessible due to dense vegetation, and this prevented a detailed faunal assessment from being carried out. No flora species are listed in the report. In terms of amphibians, the report outlines that *“Several records of common frog (Rana temporaria) were found in the vicinity of (but not within) the proposed site. There are no ponds on site but there are elevated water holding tanks. It is recommended that a pre-construction mammal and amphibian survey are carried out prior to the commencement of works on site.”* Photos from the site are included in the report:



Figure 21: 2018 AA Screening Report Extract *“Plate 1: Greenhouses”*



Figure 22: 2018 AA Screening Report Extract *“Plate 2: Greenhouses”*



Figure 23: 2018 AA Screening Report Extract “Plate 3: Scrub around the perimeter of the greenhouses”

Local Authority Decision: The local authority requested further information on the development proposal, none of which referred to ecology or biodiversity. The local authority accepted the AA Screening recommendation submitted by the applicant. Following review of the FI submission, the local authority granted permission for the development. No requirement for a pre-construction mammal and amphibian survey was included in the attached conditions.

Third party appeal: This decision was appealed to An Bord Pleanála by numerous third parties such as local residents in the vicinity of the development. The ABP inspector’s report summarises the appeal process and among numerous concerns within the third-party grounds for appeal, a “*negative impact on wildlife and bat population*” is noted. The applicant responds to the appeal by including a specialist “*ecology and bat survey*”. [Note: the researcher could not locate an online copy of this survey report]. The inspector’s report summarises the survey findings as follows: “*[The ecological] consultant notes result of walkover assessment of the site. No potential bat roosting opportunity within the structures on the site and native biodiversity of the site was poor with opportunist species such as buddleia present throughout the site. No flora or fauna of conservation importance were noted. Several records of the common frog were found in the vicinity but not within the site. A*

treated stand of Japanese knotweed was marked out and located on the southern boundary. No evidence of badgers or badger activity. Bat survey detected two bats on site with foraging activity for a short period. In terms of predicted and residual impacts it is outlined that as there is no evidence of a current or past bat roost no negative impact on bat roosting. Foraging activity may be reduced due to increase illumination of the site however will not necessarily be eliminated.” The planning inspector accepts this appraisal in their assessment of the development. They also accept the existing decisions regarding EIA and AA Screening.

The final decision is to refuse permission for the development proposal; however, this decision is not related to any ecological concerns.

The planning application summary clearly shows how the impacts of the proposed development, and the merit of the existing site ecology is assessed under the current legislative and policy framework. In 2022, another planning application was submitted, and this was also reviewed from the perspective of ecology and biodiversity.

2.4.5 2022 Application

Pre-planning consultation: Once again, ecological concerns appear in the minutes from a pre-planning consultation meeting held on 23/11/21. The minutes show that Environmental Impact Screening (EIS), is not required, and Appropriate Assessment Screening (AA) is required. In addition, there is a note regarding ecology which states: “**Ecology – need to identify if any protected species resident on site – surveys required*”.

AA Screening Report – Protected Sites: Once again, the consultant report concludes the development will have “*no impact on the designated European sites*”.

Ecological impact Assessment (EcIA): Likely due to the pre-planning meeting notes and previous third-party appeal, this application includes an EcIA report, which is a more detailed appraisal of the existing site than was included in the 2019 application. This is based on field assessments carried out on 18/12/2018 (2019 application), 03/09/2019 (bat survey for 3rd party appeal), and 07/03/2022 (this application). The EcIA report notes that site clearance had taken place since the 2018 and 2019 surveys, and the habitat assessment is thus based on the March 2022 site visit. Three habitat types are identified – buildings and artificial surfaces (BL3), scrub (WS1), and recolonising bare ground (ED3).



Figure 24: 2022 EcIA habitat map. Recolonising Bare Ground habitat (ED3) is shown in orange which reflects the site clearance works.



Figure 25: 2022 EcIA Report Extract “Plate 1: ED3 Recolonising Bare Ground”



Figure 26: 2022 EcIA Report Extract “Plate 2: WSI Scrub”

During the 2022 visit 30 flora species were found on site (common names are used for clarity); nettle, dandelion, red valerian, bramble, colt’s foot, creeping buttercup, clover, daisy, plantain, thistle, dock, greater plantain, butterfly-bush, moss, hoary willowherb, buddleia, ash, willow, birch, sycamore, scrambling rose, ivy, honeysuckle, hedge bindweed, cleavers, rosebay willowherb, ragwort, herb Robert, fuchsia, cat’s ear. Japanese knotweed is noted as an invasive species on the site. The report determines “*no rare or threatened plant species were recorded in the vicinity of the proposed site*”. Observed birds on site were wren, robin, blue tit, great tit, and blackbird. The report determines “*the habitats on site would not be deemed of importance to birds of international conservation importance*”. No mammals or amphibians were observed on site.

The impact assessment for construction stage identified “*direct negative impacts*” due to the removal of habitats, the displacement of flora and fauna, and the loss of bird nesting and foraging sites. It also states “*the removal of these habitats will result in a loss of species of low biodiversity importance. The area is not deemed to be an important area for terrestrial mammals or birds*”. Suggested mitigation measures include pre-construction surveys for mammals of “*conservation importance*”, birds, and amphibians. The impact assessment for

the operational stage anticipates that as the proposed landscaping matures, the biodiversity value, flora diversity, and mammalian habitats will increase. It will also “*assist in reinstating nesting and foraging loss*”. The overall appraisal concludes that the impact will be a “*long term, low, adverse, not significant, residual impact on the ecology of the site and locality overall.*” The habitats lost are of “*low biodiversity importance*”, and the landscaping strategy creates “*additional biodiversity features*”.

Bat Surveys: Bat surveys were conducted; one in September 2019 for the appeal process and two in July 2022 to accompany the current planning application. These identified no existing or potentially suitable roosting locations on the site. Activity and foraging of “*common bat species*” were observed for a short period during site walk surveys and activity on the static bat detector was noted as “*extremely low*”. Design stage mitigation measures were taken to ensure the proposed lighting strategy would not impact foraging activity, and the ecological report notes scented plants for bats are included in the proposed landscaping strategy. A total of twelve species are named, including, honeysuckle, lavender, mint, borage, and white jasmine, along with scented herbs, wildflowers, and scented bedding plants. Overall, the survey report determined that the development would have no long-term significant impacts to bats.

Proposed landscaping: The landscape design statement notes that “*the use of tree and shrub planting supports and promotes a positive net gain for biodiversity that will enhance the site’s ecological system, creating habitat and environmental diversity through nature positive interventions*”. Sixty-eight species are included on the landscape planting schedule: 9 trees, 9 shrubs, 26 groundcover and perennial plants, 2 manicured planting species, 8 bulb species, 3 grasses, 3 creepers, and 8 water-related plants. Of the twelve bat-friendly species listed in the ecological report, only two of these appear in the landscape planting schedule, suggesting a miscommunication between the two consultants. The proposed landscape layout follows the footprint of the proposed architectural site plan and consists mainly of perimeter planting and two courtyard gardens.

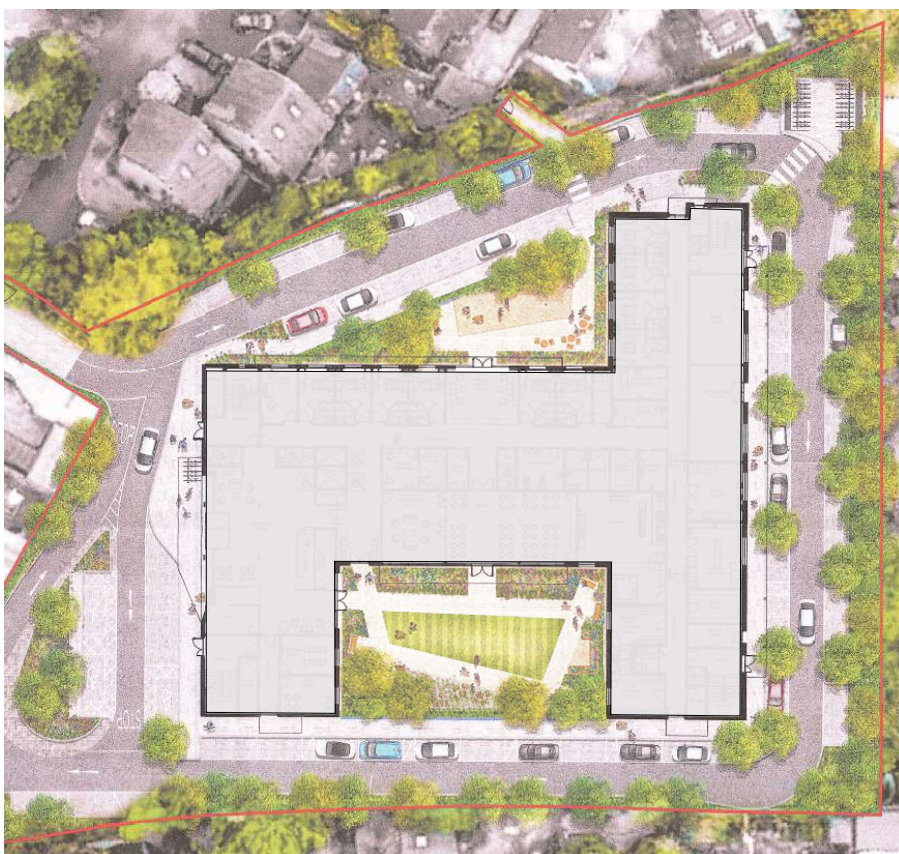


Figure 27: 2022 application, proposed landscape plan



Figure 28: Site in 2018

Third party observations: Several written observations were submitted to the local authority expressing concerns about the proposed development. Many issues were raised, with one observation stating that *“the site was cleared of vegetation during nesting season, which shows a scant regard for the local environment, flora, and fauna”*.

Local authority decision: The local authority requested further information on the development proposal, none of which referred to ecology or biodiversity. The local authority accepted the conclusions of the AA Screening and the EcIA report. Following review of the FI submission, the local authority granted permission for the development on 13/10/2022; no requirement for pre-construction ecological surveys was included in the attached conditions.

Current status: The local authority decision was appealed to An Bord Pleanála, and a decision on whether to grant or refuse permission is yet to be made as of the time of writing.

This case study provides one example of how existing site ecology is considered within the current legislative instruments and policy mechanisms. Future research could review multiple case studies across several local authorities to gain a broader understanding of how the policy behaves and to find commonalities of where it is working well or falling short in safeguarding biodiversity.

2.5 Discussion

The review of legislation and the planning system illustrates how nature is regarded within our policy framework. As is commonplace in environmental legislation, the objectives are rooted in conservation principles which focus on the protection and restoration of pristine ecosystems and historic species assemblages (Bridgewater & Yung, 2013). In the Irish context, European policy has the strongest influence, and this is evident in the national breakdown of protected sites which shows that 94% are designated via the Natura 2000 network. The EU Birds Directive and EU Habitats Directive date from 1975, and 1992; forty-nine and thirty-two years ago, respectively. While there have been subsequent amendments, the foundation of the legislation and its influence today reflects a historical emphasis on safeguarding rare, threatened species and vulnerable habitats. This strategy is of a different era when nature conservation and extinction prevention was of great importance. Arguably, it is not reflective of the awareness and urgency of the current global-scale biodiversity crisis.

As the policy analysis shows, the majority of Ireland's landmass (86%) is situated outside of the protected network. At a site scale, development proposals in unprotected areas may still be refused or altered due to ecological impacts. However, resulting from the parameters of current policy mechanisms (AA and EIA), such decisions are often driven by the impact on designated habitats and species, rather than the biodiversity present within the project site itself. This effect could be seen in the case study. Consultant ecological reports, driven by the legislation, underscore an emphasis on vulnerable or threatened ecology. Impacts to species or areas of 'high importance' are mitigated, while 'opportunistic' species are viewed unfavourably. The existing site biodiversity is negated as 'common' or of low value, and consequently, within this process its removal is permitted.

As stipulated within the AA screening process, the cumulative impacts of other nearby projects on protected sites must be factored into the assessment. However, when it comes to unprotected biodiversity, the policy does not provide for a review of any compounding impacts. The planning process assess applications on a site by site basis and ecological impacts to unprotected sites are instead presented in isolation as small, inconsequential losses of common habitats, as can be seen in the case study. This is a result of the considerable weighting within policy towards protected sites and species and is a shortcoming of policy apparent from the analysis. Failing to recognise the combined impact of repeated losses of common habitats results in a gradual yet sustained attrition of urban ecology, and the wider

unprotected natural landscape. The detrimental effect of land conversion and soil sealing on biodiversity is well recognised (IPBES, 2019), and at a national and local level, real time changes in the landscape and ecological networks can be seen through reviewing historical satellite imagery.

Analysing the effectiveness of current policy on urban wild spaces raises the question of whether we need to redefine and reframe our entire approach to nature legislation. In the context of a global crisis it can be argued that no site has ‘low biodiversity importance’. If we were to instead evaluate biodiversity on a spectrum that includes 100% of the landmass, rather than the 14% which is currently designated, the site of lowest biodiversity value would be a concrete box. Consequently, what we currently deem to be of ‘low importance’ holds significantly greater value when viewed in a broader context, especially in an already depleted urban setting. Moreover, the current development system assesses ecological diversity solely at a specific moment in time, disregarding historical value or potential future ecological significance. This approach inadvertently promotes site clearance, as is evident in the provided case study example, and as was found in the interviews (discussed in Chapter 5). The removal of vegetation prior to an ecological survey, causes it to be omitted from the record, and protects the developer from potentially onerous conditions arising from the discovery of protected species. Similarly, spontaneous or developing vegetation which occurs after the ecological survey is not observed or recorded. Given the extended duration of the planning process for many development projects, as shown in the case study which still awaits a decision from An Bord Pleanála, this system creates further loopholes for the removal and loss of biodiversity. While a pre-construction survey could potentially address some of these issues, it is only effective when included as a planning condition. As seen in the case study, despite this recommendation appearing several times in the ecological consultant report, it was not included in the local authority conditions. Furthermore, there are no recommendations to guide appropriate action in the event of discovering a protected species during a pre-construction survey. These factors all contribute to uncertainty, inconsistency, and oversight in biodiversity protection and management.

When applications for development are evaluated, the local authority decision is based on information submitted by the applicant. The local authority relies on the justification and mitigation measures outlined within expert reports as they do not have the specialist resources to independently review proposals. While some local authorities have additional ecological professionals within their staff, it is not the norm, partly due to a significant skills

shortage within the ecological sector (O'Reilly, 2022). For example, An Bord Pleanála has one ecologist among more than sixty inspectors on its staff (O'Doherty, 2022). Despite biodiversity officers being appointed to all local authorities by 2025, the assessment of planning applications is not in their remit (THC, 2024). There is an absence of independent expertise to query proposals or to suggest alternative mitigation measures. This can be seen in the case study as clear survey recommendations made by the consultant ecologist are omitted from the planning conditions. Expert consultants are employed by the site owner and/or developer and so there is a risk of conflicts of interest or pressure from the developer. This topic arose in the interviews, discussed in Chapter 5. Consultant ecologists can only work within the limits of the legislation and outside of designated sites and species there is little legislative protection for existing site biodiversity, as demonstrated in the case study.

Beyond the protected network, the objectives for biodiversity enhancement, nature positive actions, and nature-based solutions within new developments are captured in the local development plan. These aims however, are often generalised, and non-metric based, as was observed in the policy analysis. Development plans must cover far-reaching catchment areas and so they contain broad language such as '*where relevant*' or they call for '*appropriate measures*'. Moreover, as stated earlier, development plans must promote a range of objectives, some of which can be competing at the individual project level. Consequently, the local authority review of planning applications is often a qualitative, rather than a quantitative process (DLRCoCo, 2022a). The design team illustrates the measures taken to enhance biodiversity or green infrastructure as part of the proposed development, and there is room for nuance and competing interests. A lack of specificity in development plan requirements, as well as variation between local authorities creates further inconsistencies and loopholes around positive action for biodiversity. Given the broad scope that must be covered by development plans, this issue is difficult to address.

Overall, it is evident from the analysis that it is primarily designated or threatened nature which is protected within the current legislative and planning framework. The classification of nature, rather than its function is assessed and conserved. Consequently, in the urban context, wild spaces do not endure under the current system. The question as to whether this is correct, or wise, is a debate grounded in 'competing value frameworks'. It is a symptom of a focus on species composition associated with traditional conservation strategies, versus the novel ecosystem concept which places more emphasis on functionality (Lennon, 2015).

While it is beyond the scope of this research to conduct a broad scale analysis and comparison of multiple case study sites, this would be a valuable exercise for future research. The results would further confirm or challenge these findings and work towards highlighting repeated gaps and inconsistencies within our systems. A deeper study may also provide more conclusive evidence as to whether species composition, function, or a blend of both would improve the outcomes of new policy systems. In addition, a longitudinal study may assist in challenging the current approach of reviewing the site biodiversity at a 'moment in time'. It is short sighted and debatably opportunistic to assess site ecology as a snapshot in time and proceed to rely on that assessment indefinitely to inform decisions. There exists a legacy of robust ecological function in the landscape if we look far enough into the past. Similarly, if we reframe the approach for the future, there are vast opportunities for high ecological function, which could be fostered through policies promoting and nurturing such objectives. Positioning policy from a different perspective would allow sites to be considered not only as development opportunities, but also as potential ecological assets.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGIES

The process of developing the research approach was an iterative one and is discussed below. From the outset, it was established that semi-structured, qualitative interviews would be suitable to address the topic of the research and appropriate for its foundation in practitioner experience. As the overall research progressed, refinements and the need for additional fieldwork approaches emerged. The detail and rationale for this is set out below.

3.1 Research Design

Building upon the theoretical analysis, the literature was also reviewed to identify gaps and topics of relevance to the research question that were recommended for further research. These points were often stated in the literature or in some cases they emerged through observation. While reviewing the papers, relevant statements were extracted, and any additional patterns, questions, or observations made by the reviewer were noted. These were then thematically sorted and analysed. Some were omitted as they were outliers to the key themes or because they would require a larger study beyond the scope of this research.

3.2 Research Topics

Three main themes emerged from the literature to inform the fieldwork – (1) Aesthetics, Perception, and Knowledge, (2) Roles, Responsibilities, and Project Process, and (3) Policy and Regulations. The research topics within these themes and the sources in the literature are outlined below. Certain topics relevant to this research were not found in the review of the existing literature and this is also noted below.

3.2.1 Aesthetics, Perception, and Knowledge Intervention

- The role of aesthetics in achieving ecologically beneficial landscapes - (Gobster et al., 2007)
- Understanding which landscape patterns and compositions are valued by society - (Nassauer & Opdam, 2008)
- What characteristics of nature (biodiversity, accessibility, etc) are important for triggering a beneficial interaction - (Keniger et al., 2013)

- Understanding the nuances in acceptability of ‘messy’ aesthetics in urban areas - (Hoyle et al., 2017)
- How are landscape preferences expressed by individuals - (Gobster et al., 2021)
- Decisions about on the ground interventions are value-laden and driven by human needs - (Hobbs et al., 2014)
- Values-based perspectives need to be integrated into ‘objective’ science - (Perring et al., 2015)
- How do people perceive the impacts of their decisions on greater issues - (Grose, 2010b)
- Further research is needed on informal wild spaces - (Rupprecht et al., 2015)
- The role of wild spaces as temporary spaces - (Threlfall & Kendal, 2018)
- The role of context in landscape perception, particularly in terms of the aesthetics-ecology relationship and its influence on landscape change - (Gobster et al., 2007)
- The influence of landscape perception and knowledge on volition and action - (Nassauer & Opdam, 2008)
- The efficacy of knowledge interventions in different situational contexts - (Gobster et al., 2007)
- The effect of biodiversity literacy on the understanding of biodiversity benefits - (Southon et al., 2018)
- The role of education in enhancing the agency of design practitioners - (Moosavi et al., 2023)

3.2.2 Roles, Responsibilities, and Project Process

- Clarity around responsibility for biodiversity on development projects (Harris et al., 2016)
- Exploring the power and influence of different actors in the build environment process - (Hürlimann et al., 2022)
- Which factors influence the design outcome – (No existing reference found)
- Which disciplines are involved at various project stages – (No existing reference found)
- How do developers and clients regard biodiversity – (No existing reference found)
- What role do ecologists fulfil on a project – (No existing reference found)

3.2.3 Policy, Regulations, and Guidelines

- Understanding what knowledge practitioners feel is needed - (Graça et al., 2022)

- How to teach ecology to ‘noncognate’ professionals to benefit engagement - (Grose, 2014)
- Teaching climate-responsive design to professionals - (Klemm et al., 2017)
- Better techniques in providing guidance to practitioners are needed - (Harris et al., 2016)
- Scientific tools must incorporate and respond to stakeholder knowledge - (Nassauer & Opdam, 2008)
- Understanding how to integrate biodiversity into planning - (Filibeck et al., 2016)
- Ecological knowledge must be made available and usable to architects - (Weisser et al., 2022)
- How does the Irish policy impact biodiversity outcomes – (No existing reference found)
- What changes could improve biodiversity outcomes of Irish policy – (No existing reference found)

3.2.4 Formulation of Questions

The identified gaps, patterns, and recommendations for research served as the basis the fieldwork questions. Under each theme, questions were derived by examining the observations from the literature analysis within the framework of the research question, and the researchers own experience of the Irish case study. These observations were then reviewed through the lens of the research objectives, with reference to the target participants of architects and landscape architects. This process further refined the questions. Similar questions were grouped together, duplicates were eliminated or consolidated, and the questions were finalised. In framing the research for participants, the term ‘biodiversity’ was chosen not to be reductionist, but rather in the interests of translation and accessibility for the participants. While it is a “*cultural construction of nature*”, especially in an urban context (Gandy, 2013), it is a familiar and relatively accessible term, suited to research with non-ecology practitioners.

3.3 Research Methodologies

The final set of questions covered a broad range of topics. It was difficult to distil or eliminate questions due to the themes being so intertwined. While many of these questions were qualitative in nature and suited to interviews, several sought to gain more quantitative information, and could be asked in isolation. Consequently, to ensure interviews were kept to an appropriate length, an online survey was devised. This method also allowed for some of

the broad-stroke themes to be put to a larger sample of participants. Quantitative data was left to be captured in the online survey, which left the interviews for more nuanced discussion.

3.3.1 Online Survey

Online surveys are popular in research as they are simple to conduct and can be quickly created and circulated (Evans & Mathur, 2005). There are limitations however, in particular the challenge of selection bias (Andrade, 2020). Selection bias is suspected within this research and is further discussed in sections 4.1.1 and 5.1.1.

The online survey covered topics such as participants consideration of biodiversity in their work, the agency they have to influence biodiversity outcomes through their work, the level and sources of their knowledge on biodiversity, and how they react to additional knowledge shared on best practice interventions for biodiversity in design. The survey also touched on factors which influence project outcomes, as well as how responsibility for biodiversity is distributed within the project team. A copy of the online survey is included at Appendix 2.

The survey was designed using Survey Monkey, and various question typologies were included. The participants were first given an overview of the research and asked to give their informed consent to take part. If 'no' was selected, the survey automatically ended. Various question structures were used: for quantitative questions, Likert scales, 'yes/no', or multiple-choice questions were utilised to measure structured and closed-ended metrics. Qualitative data was captured as follow-up questions, using open-ended comment boxes, some of which were optional. This approach ensured that the qualitative themes came directly from the participants, rather than being pre-selected by the researcher, to avoid restricting the findings (Bryman, 2012).

Within the findings, the analysis of these quantitative results is represented in charts with overall responses shown alongside the comparison between the architects' and landscape architects' responses. Qualitative responses were examined through content analysis. The manifest content (as opposed to the latent content) of these responses was coded, and categorised, by identifying recurring themes such as budgets, policy, etc within the long-form answers. These categories were extracted, and the frequency of their occurrence was counted to give an overall analysis of the themes for each question (Vaismoradi et al., 2013). This data is represented in the findings using the frequency of occurrence information, word clouds, and a short description.

3.3.2 Semi-Structured Interviews

Interviews are a very common methodology for collecting qualitative data (Jamshed, 2014). The semi-structured interview approach is beneficial as it asks more open questions which gives the participant freedom in how they respond, thus allowing the points which they find most important to emerge (Bryman, 2012). Similarly, the researcher has the flexibility to change the order of the questions and to ask follow-up questions for clarification on what are considered significant replies (Bryman, 2012). Given that much of the research topic focussed on the design and development process in Ireland, it was important to conduct the fieldwork in such a way that would allow each practitioner to voice their individual experience and understanding. This needed to be done without any leading questions or a very rigid structure that would perhaps unintentionally shape the discussion or exclude important insights. Consequently, broad open questions were utilised.

A photo elicitation technique was employed for one part of the interview process. This method is a simple approach of using photographs in research interviews or surveys and it is beneficial as the image acts as a 'language bridge' (Collier Jr, 1957), and reduces the potential for misunderstanding in the discussion (Harper, 2002). It is an established approach for studying perceptions of nature, and has been used in several research studies that were examined in the literature review section of this thesis (Fischer et al., 2020; Hofmann et al., 2012; Lindemann-Matthies & Brieger, 2016; Mathey et al., 2018; Nassauer et al., 2009). This technique was suited to the discussion on wild spaces, given the likelihood that participants would not be familiar with the concept. As seen from the various definitions and classifications of wild spaces included at the beginning of this document, the term can cover many meanings and site typologies. Therefore, it was important that the researcher clearly illustrated the typology of space to be discussed, to ensure reliable results.

Prior to commencing any fieldwork, ethics clearance was sought and approved by the Ethics Committee at Trinity College Dublin. For the semi-structured interviews, once participants had agreed in principle to take part, a meeting date and time was agreed and they were sent an email with an online invitation (Zoom), and a copy of the interview consent form. This form contained information on the project and on the research, with sixteen points to which participants needed to tick to confirm they understood. This was signed by participants and returned by email to the researcher, who then counter-signed the document and returned a

copy to participants for their records. A sample of this consent form is included with the interview guide at Appendix 5.

The interviews were recorded and transcribed by the researcher in preparation for analysis. They were anonymised and coded with each participant being assigned a number. Architects were distinguished from landscape architects as part of the coding system with [A] included after the participant number for architects, and [L] for landscape architects. The analysis methodology for the interviews comprised of a thematic analysis approach. This method is used to identify, analyse, and report patterns within a data set. It is beneficial because its flexibility provides a rich, detailed, and complex account of the data (Braun & Clarke, 2006). Firstly, the answers to each question were reviewed numerous times both by listening to the interview audio and by reading the transcripts. Key information in relation to each question was extracted or summarised from the transcripts and collated in an excel document. The extracted answers for each question were then copied into a word document and reviewed collectively to identify the themes. Common themes were identified and words and phrases for various themes were coded through highlighting them in various colours as they occurred within the responses. A sample question showing the thematic analysis method is included in Appendix 7. All questions were analysed in this way with the exception of the informal wild space perception study. Some quantitative analysis was carried out to extract the 'overall perception' rating for each image and to facilitate the ranking of the images from most positively perceived to most negatively perceived. This was done by assigning a count each time an image was perceived positively or negatively by an interview participant. The counts were totalled, and this revealed the overall perception of each image and also gave a basis by which the images could be ranked.

3.4 Participant selection

The rationale for the inclusion of architects in the study arose from observed patterns in the literature review. Firstly, and most simply, despite calling for interdisciplinary approaches and engagement with built environment professionals (Grose, 2014; Klemm et al., 2017; Nassauer & Opdam, 2008; Perring et al., 2015), research in the urban ecology and biodiversity sphere engages primarily with disciplines such as landscape architecture and urban planning, with very few studies capturing the views of architects. This isn't to say that architects are omitted from research entirely, rather, the studies which consult the field of

architecture are typically (and understandably) more focussed on the built environment and construction (Scopus, 2023). Studies addressing ecology and architecture, tend to focus on buildings (Weisser et al., 2022), rather than the broader aspects of the architect's role. The role of the architectural profession in protecting and enhancing urban biodiversity is significant when we consider their position in the design team. The architect, in the Irish case study, typically occupies the role of 'design team leader' (SCSI, 2014). This is defined as "*a person responsible for overseeing and co-ordinating the work of the design team*". It is also noted that "*...the most significant management function undertaken within a construction project is that of the design team leader*" (BSI, 1996; Hughes & Murdoch, 2001). In performing these duties, the architect becomes a linchpin of sorts, "*a synthesiser of information*" (Felson, 2013b). Their role is "*...the primary link between project management and design management...*" (BSI, 1996; Hughes & Murdoch, 2001). Equipped with their experience from this position, they can offer a broad insight into team dynamics, roles, responsibilities, and the key factors and agendas which drive the design output. Similarly, landscape architects operate at the interface between the built and the natural environment, frequently advocating for the needs of nature (Moosavi et al., 2023). The importance of their role in protecting our ecological systems is well established (Ahern, 2005; Grose & Frisby, 2019; Teixeira et al., 2021). Furthermore, they too hold valuable insight into project dynamics, and how biodiversity is regarded, protected, and enhanced at the site level.

CHAPTER 4

ONLINE SURVEY

4.1 Overview

The online survey assisted in reaching a larger quantum of participants than was possible with semi-structured interviews. It was created using Survey Monkey, and the question design was informed by the literature review themes as discussed in Chapter 3. The full survey is included for reference in Appendix 2. The questions covered knowledge and opportunities for biodiversity, design actions for biodiversity, roles and responsibilities, and the design process. The survey captured both quantitative and qualitative data.

4.1.1 Survey distribution

The Survey Monkey link was circulated to both architecture and landscape architecture firms via email. These were selected from the databases of both the ILI (Irish Landscape Institute) and the RIAI (Royal Institute of Architects Ireland). Forty-five practices of each discipline were selected (90 firms in total) and an email was circulated to the ‘info’ addresses with a short cover note and the survey link. This method is classed as probability sampling, where each member of the target population has an equal probability of being selected to take part (Stratton, 2021). Despite the architectural firms (typically) being larger and so having a greater number of target participants, more responses were received from landscape architects; 23 no., compared to 13 no. responses from architects within three weeks of the survey being circulated. To address this imbalance, non-probability convenience sampling through the researchers contacts and their respective colleagues was used to increase the survey responses from architects. Convenience sampling can introduce bias to the study depending on the participants motivations to take part (Stratton, 2021). In this case, architects seemed not motivated to take part in the first instance (given the lack of responses to the probability method), therefore the potential for ‘pro-biodiversity’ bias is likely low among convenience sampled participants. However, the email subject and survey title used was “Biodiversity in Architecture and Landscape Architecture”, therefore (perhaps paradoxically) it is possible and likely that the initial probability sample contains some selection bias, as respondents were likely motivated to partake through prior personal or professional interest. This was anticipated and mitigated by phrasing the survey questions in an objective manner.

In total, 61 responses to the survey were received. Following initial review and elimination of incomplete responses (those answering up to 3 questions or less), the final total was 47 responses for analysis. As some questions were labelled ‘optional’, and as some participants did not complete the entire survey, the response numbers to the questions vary slightly and this is stated with each question and analysis piece in the findings.

4.1.2 Limitations

On reflection, it would have been useful in the online survey to capture where in Ireland the participants are practicing. This observation comes in hindsight from the interviews, as several candidates mentioned that the policy and processes around biodiversity are much improved within the Local Authorities based in Dublin, however outside of Dublin, policy was reported to be more lenient and not as strictly enforced. It would also have been useful to capture the typology of projects the participants typically work on – e.g., housing, commercial developments, public work, etc. This would have provided triangulation parameters to extract more extensive insights from the data: for example, if budget is more of a factor on private or public projects or if actions for biodiversity are more frequently implemented on large scale or small-scale projects. These are all learnings from the research process, and future studies could include these kinds of parameters to add further insight.

4.2 Results and Findings

The following section sets out the responses and findings of the online survey. Where quoted answers are included, [A] indicates the responses from architects and [L] indicates the responses from landscape architects.

4.2.1 Incomplete survey responses

In total, 61 participants responded to the survey and 14 of these responses were eliminated from the analysis as they were incomplete. Of these 14 incomplete responses, 4 answered only the consent question (‘agree’ or ‘disagree’ to participate), while a further 2 participants documented that they worked in industries other than architecture or landscape architecture. These 2 participants only completed the survey up to question no.3 before exiting.

Of the remaining 8 incomplete responses, 6 were from architects and 2 were from landscape architects. All 8 of these participants answered ‘*extremely important*’ when asked “*Q3. In your personal opinion, how important is it to protect and enhance biodiversity?*”. All 8 of these participants did not respond and exited the survey when asked “*Q4. In your work, how much consideration do you give to the biodiversity impacts of your designs and decisions?*”.

4.2.2 Completed survey responses

Q1. Consent: This question contained the consent form and the agreement to participate in the study. Participants read a short description of the research and were asked to click ‘agree’ or ‘disagree’. The survey immediately ended if participants clicked ‘disagree’ and no information was recorded for this.

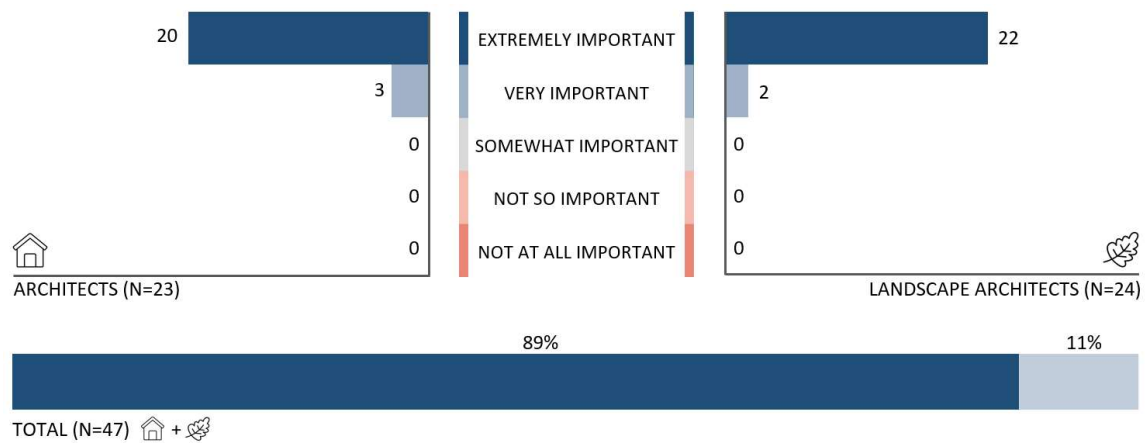
Q2. Please state your profession and the number of years you have been practicing.



Question 2: Shows the contextual information captured in the survey. The architects numbered 23 responses with an average of 16.5 years’ experience (min 8 years - max 40 years), while 24 landscape architects responded, noting an average of 21.5 years’ experience (min 1 year – max 50 years). This totalled 47 respondents (n = 47) with a combined average of 19 years’ practicing experience.

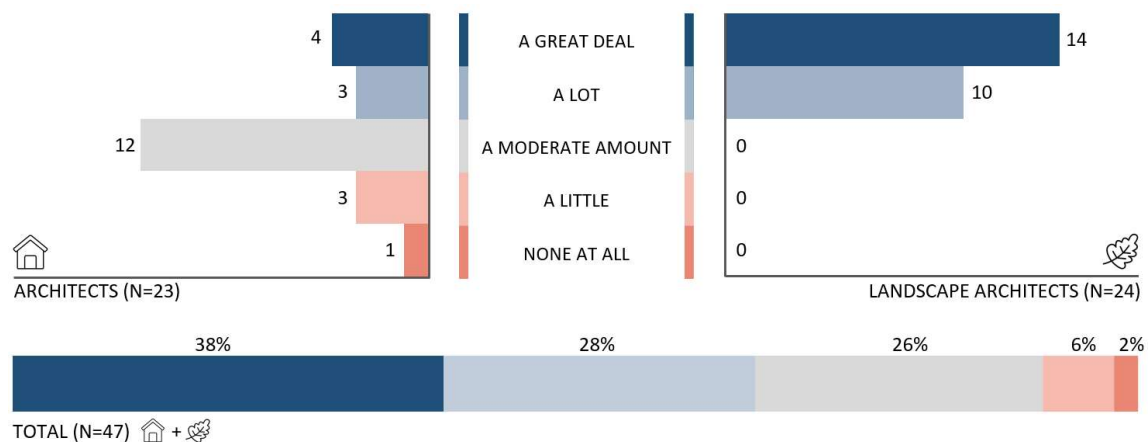
Note: The rationale for documenting the number of years the participants have been practicing was to understand the level of professional experience which informed the survey responses. A good level of practical experience among participants ensures the responses are reliable and reflective of extensive project experience. The averages were calculated to highlight the level of experience represented across the results, and to ensure there was not a significant difference between the level of experience of the architecture practitioners, compared to the landscape architecture practitioners.

Q3. In your personal opinion, how important is it to protect and enhance biodiversity?



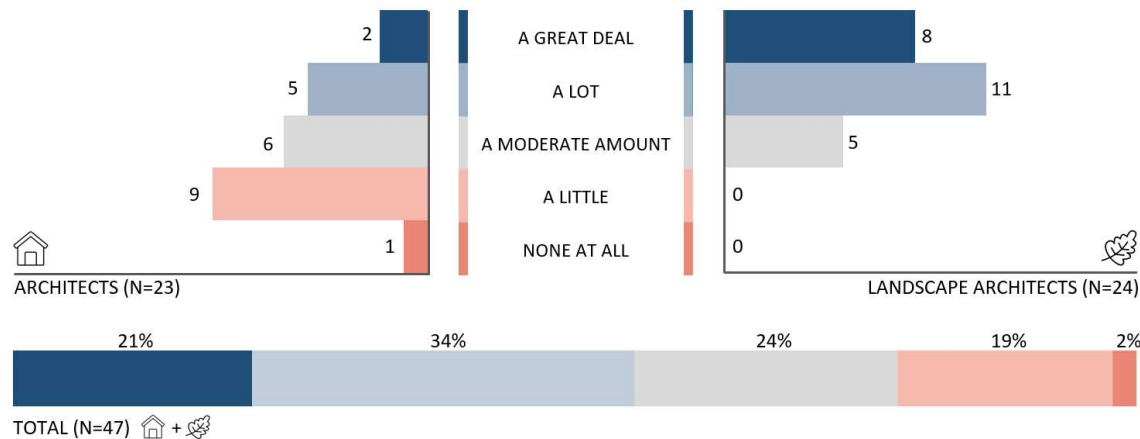
Question 3: Shows how participants, in their *personal opinion* rated the importance of protecting and enhancing biodiversity. Both groups demonstrated a high regard for biodiversity by choosing either ‘extremely’ (89%) or ‘very’ (11%) important.

Q4. In your work, how much consideration do you give to the biodiversity impacts of your designs and decisions?



Question 4: Shows how participants consider biodiversity in their work. Although both groups noted that in their *personal opinion* biodiversity is highly important, the results here indicate that in a professional context, they give less consideration to the impact their work may have on biodiversity. This trend is significantly more prevalent among architects, with ‘moderate’ to ‘no’ consideration amounting to 34% of all responses, the entirety of which can be attributed to architects.

Q5. In your work, how many opportunities do you have to protect and enhance biodiversity?

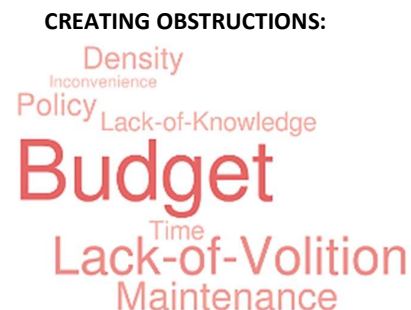


Question 5: Shows how participants perceive opportunities in their work for biodiversity. The responses shows lower levels again, with 45% of the overall results reporting moderate to no opportunities. The architects' responses reflect considerably less opportunities for biodiversity in their work than landscape architects.

Q6. Can you give an example of how these opportunities are created and realised and/or what factors obstruct these opportunities for biodiversity? (n=47)



OPPORTUNITIES	#
Enhancement (new measures)	25
Conservation (protect existing)	12
Policy	11
Volition (Client/ Team)	6
Early-Integration	4
Knowledge	4
Budget	3
Other	8

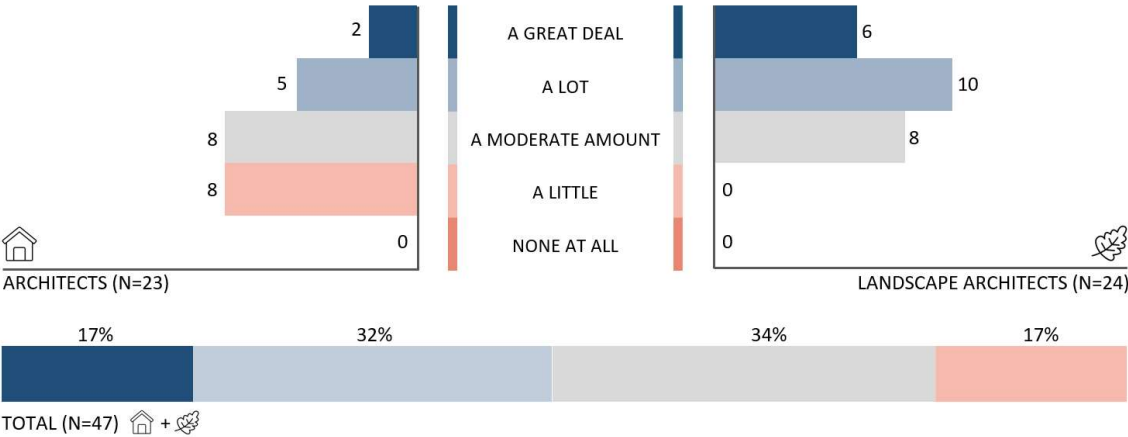


OBSTRUCTIONS	#
Budget	17
Lack of Volition	11
Maintenance	7
Development Density	5
Policy	5
Lack of Knowledge	4
Time	4
Inconvenience	2
Other	5

Question 6: Shows participant understanding of opportunities and obstructions to biodiversity in their work. In terms of opportunities, the responses fell into two strands. Some focussed on the practical ways in which opportunities are created for biodiversity, quoting enhancement measures (e.g., pollinator planting), as well as conservation measures to protect the existing site ecology. The remaining responses focussed on the drivers which create opportunities for biodiversity. ‘Other’ answers noted: design opportunities, specialist consultants, the project brief, collaboration, and maintenance changes. In terms of factors driving obstructions to biodiversity. ‘Other’ answers noted: governance, public perception, and the project brief.

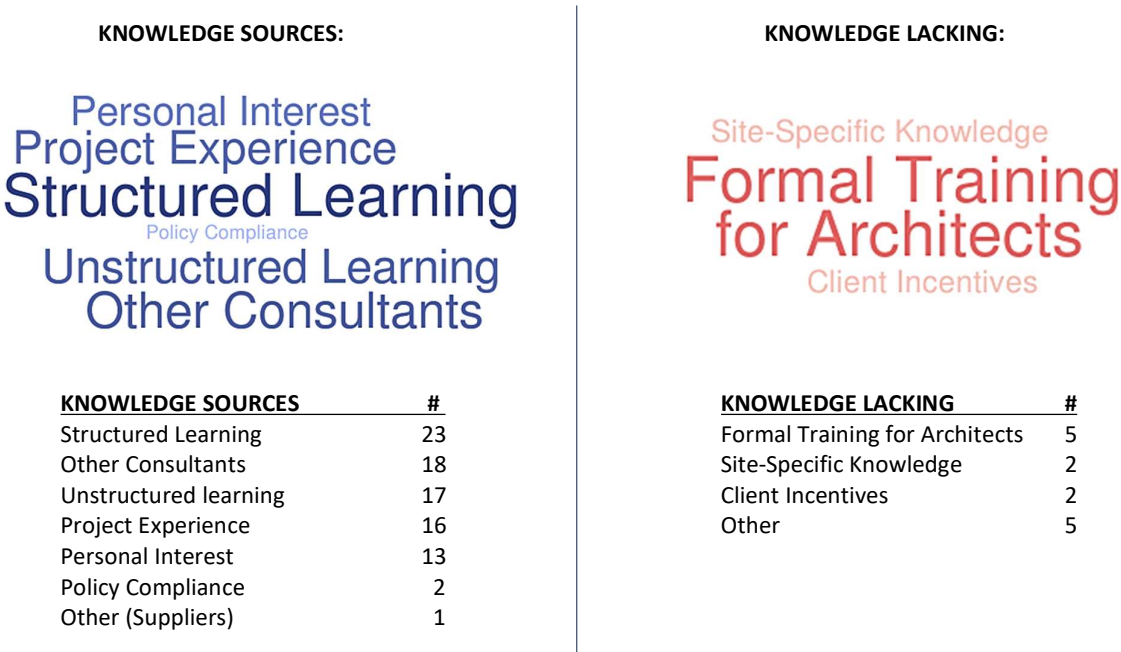
While policy was noted as typically creating opportunities, one response stated that: *“it is the preference of most planning authorities to have every m2 designed ... Apart from mature trees, scrub or developing habitats are generally levelled in favour of more introduced landscaping”*[L]. Volition (interest, drive, and willingness) was noted as influential in creating opportunities for biodiversity, and similarly a lack of volition or willingness was stated as the second biggest obstruction to biodiversity measures after the budget. Many participants mentioned this in relation to the client, and in conjunction with the influence of the budget. One response outlined: *[Opportunities are] “obstructed through lack of understanding, enthusiasm or cost related factors”*[A].

Q7. In your work, how much knowledge do you have about protecting and enhancing biodiversity?



Question 7: Shows how participants self-report their knowledge of biodiversity. The results show a mid-high range of knowledge with higher levels reported among landscape architects.

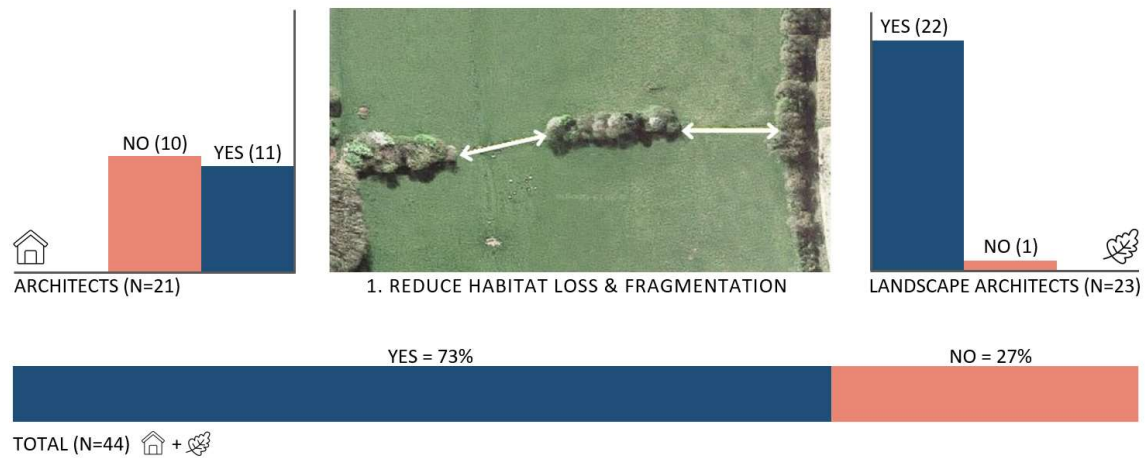
Q8. Can you please comment on how you gained this knowledge and/or what type of knowledge you feel is lacking? (n = 47)



Question 8: Shows how the respondents gained their knowledge and where they feel knowledge is lacking. ‘Other’ responses detailing where knowledge is lacking stated: the need for a scientific foundation in landscape architecture education, as well as gaps in training from professional bodies, and a lack of knowledge on topics such as plant sourcing, maintenance, public awareness, regulations, soil biodiversity and urban biodiversity.

Many participants stated that knowledge was gained through structured learning or from other consultants during the project process. A considerable level of responses reported that knowledge is gained through personal interest and unstructured learning. This amounted to 30/90 counts in the content analysis or 33% of the response. A lack of formal training for architects was also noted several times as a gap in the current knowledge base.

Q9. Have you implemented this biodiversity measure in your work?



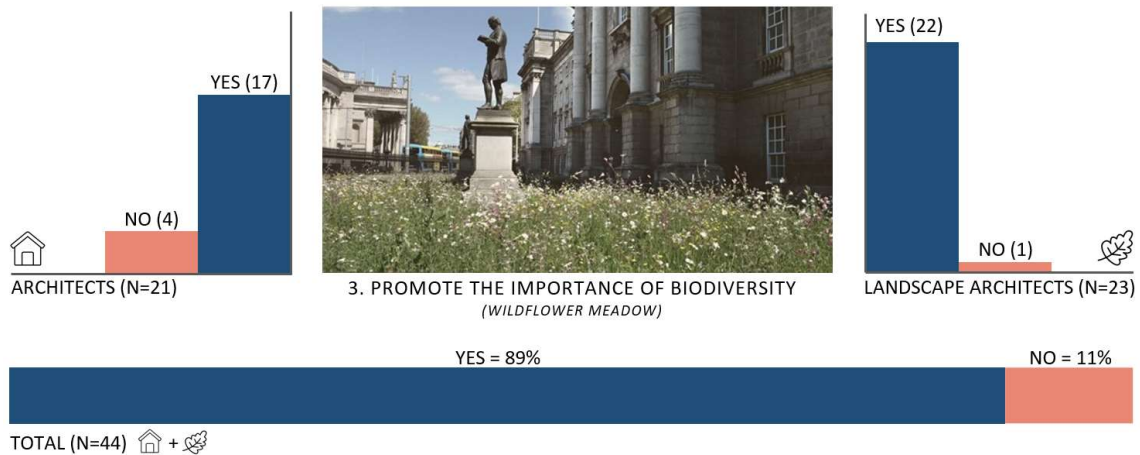
Question 9: Shows the implementation of biodiversity measures to reduce habitat loss and fragmentation. Participants were shown an image, as well as a brief description of the issues caused by fragmentation and some points on how to make a positive impact. Overall, this measure has been quite widely implemented by the survey sample, however over 50% of the architects had not used this measure in their work.

Q10. Have you implemented this biodiversity measure in your work?



Question 10: Shows the implementation of biodiversity measures to reduce soil sealing. Participants were shown an image, as well as a brief description of the issues caused by imperviousness and some points on how to make a positive impact. Again, this measure was widely implemented, more so by landscape architects than architects.

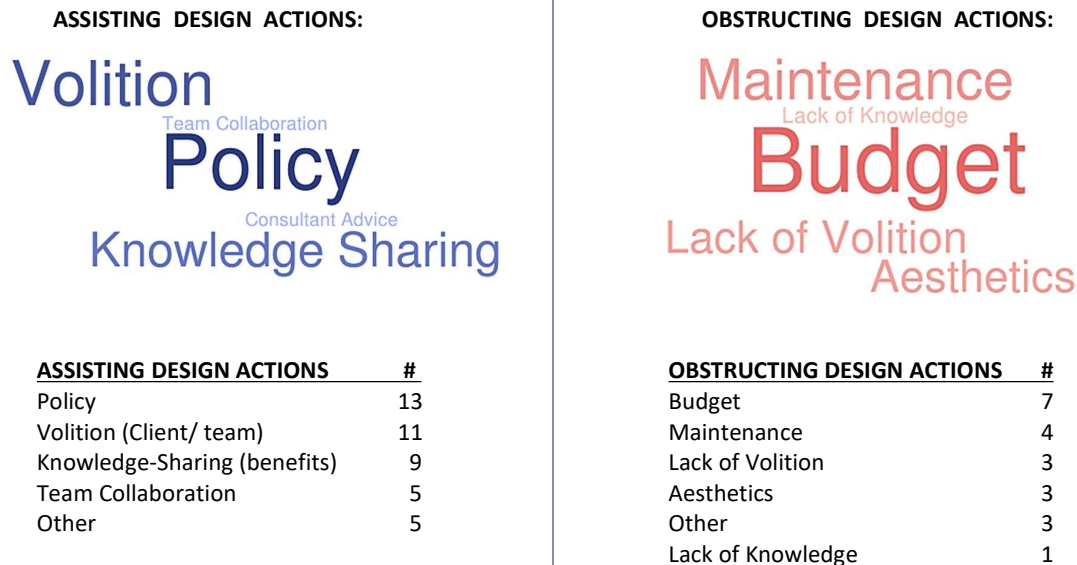
Q11. Have you implemented this biodiversity measure in your work?



Question 11: Shows the implementation of biodiversity measures as a promotional tool in urban projects to create a cultural impact and influence the aesthetic norm. Participants were shown an image, as well as a brief description on the importance of urban biodiversity as a communication and cultural tool. The image shown above notes ‘wildflower meadow’. This note was not displayed on the original survey, but it was apparent from the qualitative answers in Q12, that some participants understood the question to be around the use of wildflower meadows. On reflection, this was likely difficult to avoid, given the nature of the image.

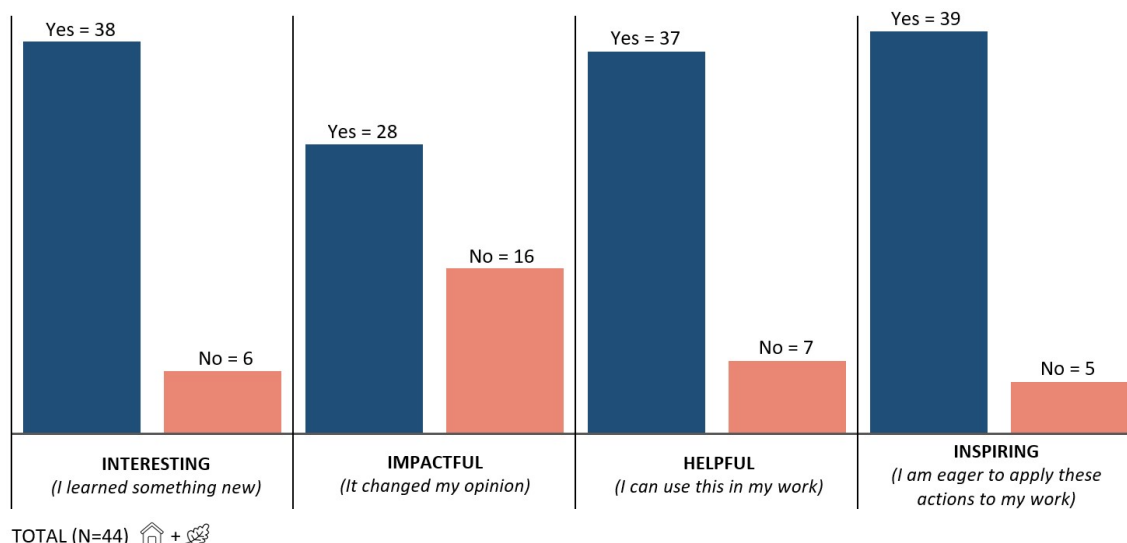
This measure was the most widely implemented of all three in this section, slightly more so by landscape architects than architects.

Q12. Please comment on what helped to achieve these actions (if yes) and/ or why these actions were not implemented (if no)? (n = 40)



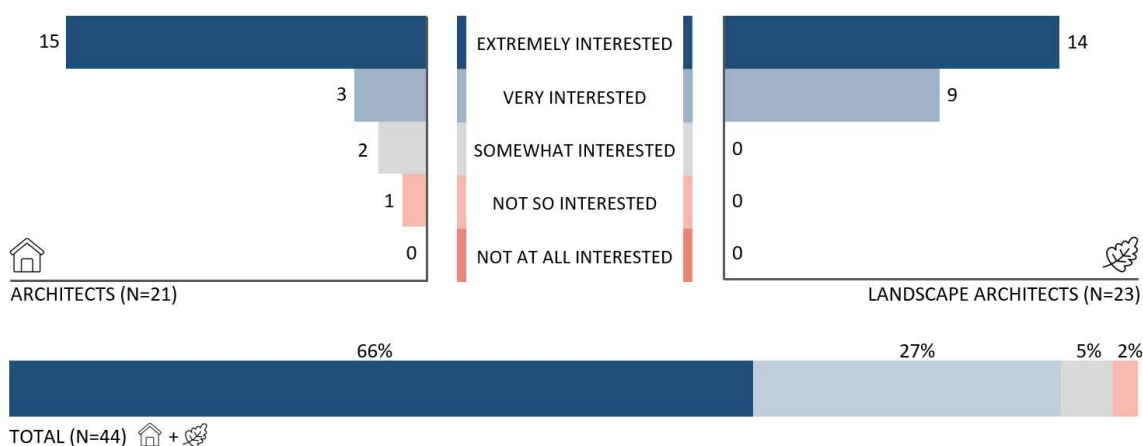
Question 12: Shows the factors which assist and/ or obstruct the implementation of biodiversity measures. As was also evident in question 6, the limitations of the project budget can disrupt positive measures for biodiversity. Similarly, volition scores highly again; one participant stated: *“I’m really pushy. I don’t always win - again budget restraints and clients not valuing the initiatives as I do”*[A]. Also noted in the responses is the importance of knowledge sharing, with the communication of benefits and the use of examples and case studies stated as having a positive impact on project outcomes for nature. ‘Other’ positive factors in the responses noted: the use of low-cost measures, a good aesthetic, and knowledge. ‘Other’ obstructing factors noted: policy, the requirement for native planting, and a lack of procedure embedded into the design and development process.

Q13. Overall, how did you find this information on design actions for biodiversity?



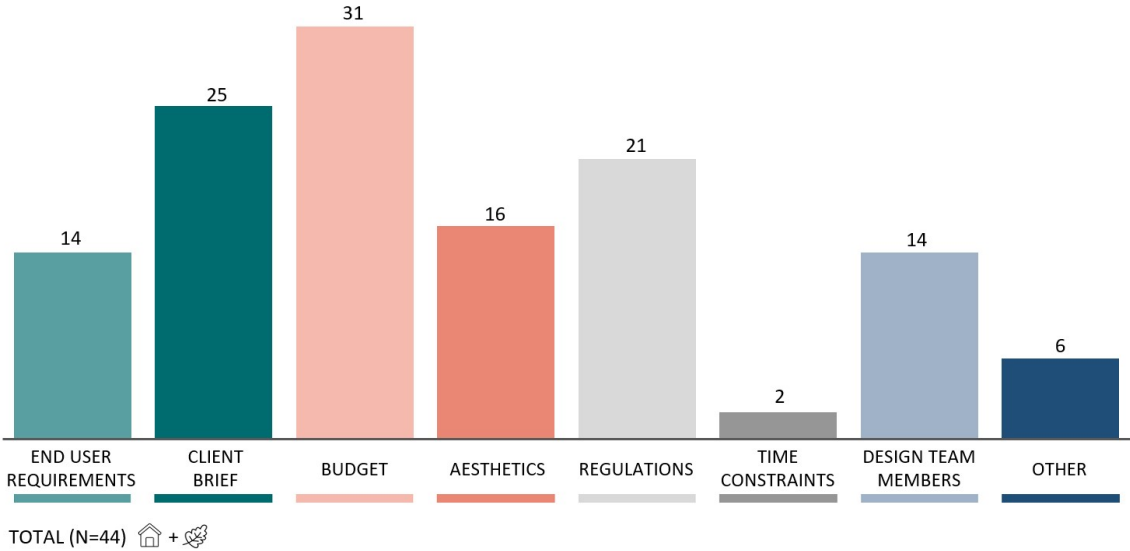
Question 13: Shows the participants reaction to the information given in questions 9-11. Respondents were asked to rate whether they found the information, ‘interesting’, ‘impactful’, ‘helpful’, or ‘inspiring’. Each heading included a short explanatory statement to assist in understanding the meaning of each word within the context of the survey. Less participants found the information ‘impactful’ (44%), however, the majority of participants found the information ‘interesting’, ‘helpful’, and ‘inspiring’ – 86%, 84%, and 89% respectively.

Q14. I would be interested to learn more about protecting and enhancing biodiversity in my work?



Question 14: Shows the participants interest in learning more about protecting and enhancing biodiversity in their work. These responses demonstrate high levels of interest from both professions and this is reflective of the responses to the previous question no.13.

Q15. In your experience which of the following factors most influence the design outcome? (Choose 3)



Question 15: Details the factors which participants noted to have the most significant influence on the design outcome. The budget, brief, and regulations (policy) are shown to have the biggest influence, followed by aesthetics, end-user requirements, and the design team members. Least significant is time constraints. ‘Other’ factors in the responses noted: maintenance, design, and passion. The budget, the client, and policy can again be seen as the key factors driving project outcomes.

Q16. How do these factors impact biodiversity outcomes? (Optional) (n=24)

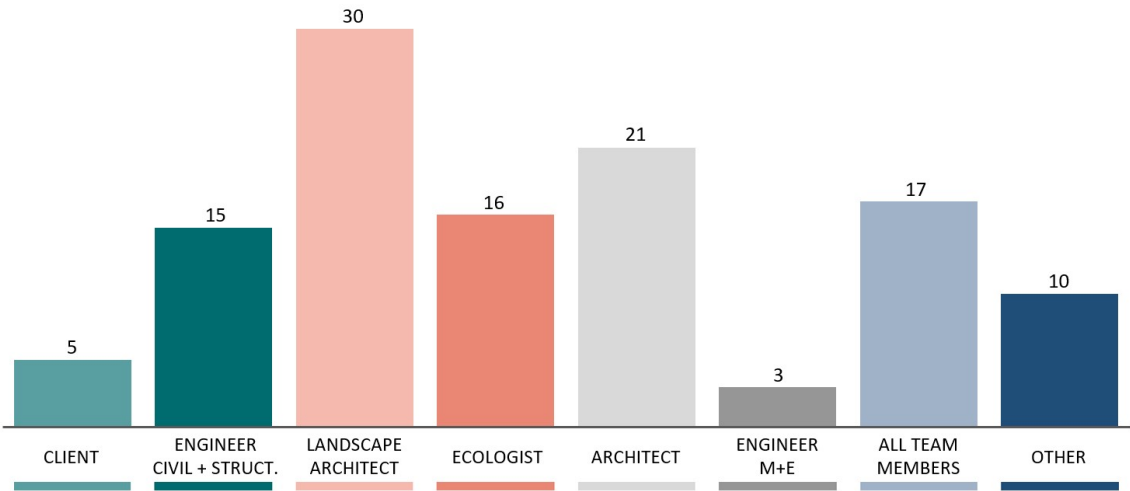
Question 16: This was an optional question and so had a reduced number of responses. Many answers elaborated on the impact of the budget and the influence of the client over the entire project process and outcomes. A selection of responses can be seen below which illustrate the findings around project dynamics and biodiversity measures in developments.

Answer 1: “For biodiversity even to make it to the table for discussion there usually needs to be at least one design team member with a strong interest. For biodiversity to be taken seriously as part of the process there has to be a policy or regulatory driver. Biodiversity measures cannot affect the budget negatively”[A].

Answer 2: “No regulation means no budget, so no action, or action only on low-cost or zero-cost measures”[A].

Answer 3: “Policy and Regulations drive everything, and they get incorporated into Development Plans which force a response. Budget affects every decision we make whether we like it or not. Clients commission projects so their brief is what we react to, question, and challenge but ultimately, we are working to the Client so we can’t dictate everything”[A].

Q17. In your opinion, which member(s) of the design team are responsible for biodiversity?



TOTAL (N=42) 🏠 + 🌿

Question 17: Details how participants viewed responsibility for biodiversity within the project team. Answers were generally quite evenly spread, with many responses mentioning multiple disciplines or stating that all members had responsibility. The landscape architect received the most counts in the responses, followed by the architect. ‘All Team Members’ scored third, with the ecologist ranked fourth in terms of level of responsibility for biodiversity within the design team.

Q18. How should that responsibility be shared? (Optional) (n=23)

Question 18: Again, an optional question and so the response numbers were reduced. Most answers stressed that the responsibility should be shared equally and among all design team members. In contrast, one participant recommended responsibility should be shared *“Not equally between people, but assigned to those who have the greatest opportunity to influence outcomes”*[A]. Further suggestions can be seen below:

Answer 1: *“Awareness of biodiversity and strategies for protecting and enhancing it should be incorporated throughout the process with obligations on the client and all design team members. Like the way health and safety is the responsibility of all and is a priority check at every meeting - but a health and safety check for the whole of the natural environment rather than just people”*[A].

Answer 2: *“Include ecology walkover findings at earliest stage, bring in relevant experts to work with design team, achieve biodiversity gains rather than just minimising impact”*[L].

Answer 3: *“Landscape architects and ecologists should be given much more priority in the design stage, perhaps by creating an outline biodiversity-centred design which sets the foundation that the rest of the design is based on and should work around”*[L].

Q19. If you have any additional thoughts or feedback, we would love to hear it. Thank you! (Optional) (n=14)

The final suggestions from participants again stressed the need for education, with several respondents expressing an interest in further training and CPD. The need for better policy was also reiterated; one response stated: *“More legislation is required to ensure the creation of new habitats and enhancement of existing. Plenty of legislation is in place to protect habitats. However, more legislation should be put in place to ensure creation of new habitats and biodiversity”*[L].

Another response proposed that policy should target the project budget to drive change: *“Policy driven requirements are the only thing that will create meaningful change. Some EU countries require 10% of budget to be spent on public art. A similar strategy could encourage biodiverse design”*[A].

4.3 Discussion and Recommendations

4.3.1 Discussion

Despite extensive research and recommendations on combatting biodiversity loss, a lack of implementation at the project level means the problem remains unaddressed. This survey aimed to understand the integration of biodiversity actions within development projects by capturing practitioner experience and perceptions. Recurring themes and patterns can be seen throughout the results. The data was collected from 47 practitioners, with an average of 19 years of project experience. The findings provide reliable insights and suggest pathways to improve outcomes for biodiversity.

The results show that some practitioners, particularly architects, do not perceive biodiversity as relevant to their work. This is evident through the low response rate from architects in the first instance, and through the 8 participants (6 architects and 2 landscape architects) who exited the survey when asked about consideration for biodiversity in their work. Within the completed survey results, architects also accounted for the entirety of 34% of the responses reporting ‘moderate’ to ‘no’ consideration for biodiversity. Perceived opportunities for biodiversity actions were also shown to be lacking, especially among architects. 45% of overall responses reported ‘moderate’ to ‘no’ opportunities with 34% of these from architects. This may be due to an actual lack of opportunity or may indicate a lack of knowledge among architects in terms of how to include actions for biodiversity in projects. Overall, the gap between a high personal regard for biodiversity and a lack of consideration or opportunities in a professional context suggests that current outcomes for biodiversity may be improved through targeting the role of practitioners as a pathway.

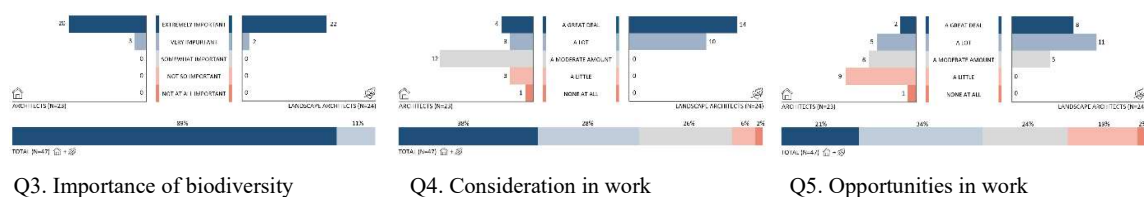


Fig 29: Comparison of Q3, 4, and 5 showing a high personal opinion of importance, yet low consideration, and even lower opportunities for biodiversity in design and development work.

In line with the perception that biodiversity is less relevant to their work, 70% of architects reported having ‘moderate’ to ‘little’ knowledge of the topic. In contrast, 67% of landscape

architects reported ‘a lot’ or ‘a great deal’ of knowledge on biodiversity, while 33% reported ‘a moderate amount’. These results may be slightly elevated due to potential bias among respondents who held a prior personal or professional interest in biodiversity. Nonetheless, landscape architects are undoubtedly more knowledgeable than architects on the topic.

The reported sources of knowledge were largely similar between both professions, although landscape architects reported more instances of ‘structured learning’ (15 counts) compared to architects (8 counts). Overall, ‘project experience’ and ‘other consultants’, accounted for 38% of knowledge sources, while ‘unstructured learning’ and ‘personal interest’ formed 33% of the results. Several responses providing optional comments stated explicitly that formal training for architects was lacking. These findings raise concerns about the accuracy and appropriateness of the expertise currently being used in projects. Knowledge gained from specific projects or through unstructured learning may not be universally applicable or scientifically reliable. These findings are also significant given that landscape architects reportedly hold the most responsibility for biodiversity within the design team, followed by architects. These figures are 14 and 5 counts higher respectively than the perceived level of responsibility held by ecologists.

The findings suggest that levels of knowledge of biodiversity, and levels of responsibility for biodiversity are misaligned within the project team, between architects, landscape architects, and ecologists. Across these disciplines, there are some overlaps between architecture and landscape architecture, and in a similar way, between landscape architecture and ecology. Notably, all three disciplines have a first-hand impact on the landscape and on one of the biggest drivers of biodiversity loss - land use change. However, knowledge and education regarding biodiversity across these disciplines is neither comparable nor interchangeable. Despite high self-reported biodiversity knowledge levels among landscape architects, this is not equivalent to that of an ecologist. Appendix 3 demonstrates this through a comparative analysis of the modules which students complete to earn a degree in each discipline. Ecology does not feature in the architecture course, while in the landscape architecture course, there is one core module on landscape ecology, with some additional optional modules. This is not to diminish the value of this knowledge, rather to question whether the primary responsibility for such a complex issue is appropriately allocated. Certainly, responsibility is often shared with ecologists, but findings from the semi-structured interviews suggest that on many projects, the ecologist often works in isolation, outside the main design team, and their role is commonly limited to ensuring legislative compliance under conservation law rather than

consulting on all aspects of biodiversity within a project. Further research is required with practitioners in ecology to understand the dynamics of this in more depth. This imbalance between levels of knowledge and levels of responsibility points to two solutions: the position of ecologists within the design team is not sufficient and needs to be enhanced, or architects and landscape architects need to be educated and appropriately equipped to deliver on this responsibility for biodiversity. Early-stage involvement is crucial to the former, while targeting the latter will require very clear definition of the subject matter and extent of knowledge required by each discipline to equip them in achieving better outcomes for biodiversity within their professional scope. This would also allow practitioners of architecture and landscape architecture to identify when a greater level of input is needed from an ecologist. This solution aligns with many responses stating that responsibility for biodiversity should be shared equally among the design team. This is a fair and arguably appropriate approach however when dealing with a topic as complex and nuanced as biodiversity, there must be clarity and structure regarding which aspects each discipline is responsible for and tangible detail around how to deliver on that responsibility in a practical sense. One participant suggested that responsibility should be shared “*Not equally between people, but assigned to those who have the greatest opportunity to influence outcomes*”[A]. Given the influence of the client as highlighted in the findings, it is interesting to consider if biodiversity should be assigned the responsibility of the landowner.

If knowledge is to be aligned with perceived responsibility, pathways and means of disseminating knowledge need to be developed across the various professions. This will ensure that information being used by each discipline is properly sourced, reliable, and suitable for application in site-specific development projects. The findings show that all landscape architects surveyed were ‘very’ or ‘extremely’ interested in learning more, while 86% of architects surveyed expressed a high level of enthusiasm in further education. This implies that design practitioners are not only interested, but consider themselves as suitably placed to apply positive measures for biodiversity if they had the appropriate knowledge. Coupled with the levels of perceived responsibility, there is both a demand, a suitability, and a strong need for biodiversity education among both professions, especially in the case of architects. It is also imperative that knowledge levels are aligned with responsibility and expectations across all design team disciplines in order to deliver the best-case positive outcomes for biodiversity on our development projects.

In terms of design actions for biodiversity, although the three sample measures in questions 9-11 were quite well implemented, the results suggest issues around knowledge and sequencing within design projects. Habitat loss and fragmentation are primary drivers of the biodiversity crisis and species extinctions (Damschen & Brodie, 2024). Imperviousness also has a considerable negative impact on biodiversity and surface water management (Horrox, 2024). These issues can both be combatted at a site and a landscape scale, but they must be considered from the project inception, before a site layout is finalised. As will be discussed further in the chapter on semi-structured interviews, it is typically the architect engaged as the sole design practitioner at project feasibility stage. The results from questions 9 and 10 show that less architects have implemented measures to combat fragmentation and soil sealing, which suggests issues of sequencing and knowledge. It also suggests that opportunities to improve ecological cohesion and to reduce imperviousness in the landscape are potentially being missed. Without the awareness of the benefits or of the practical application, these measures cannot be embedded within the original design intent, instead they are either sought by ecologists and landscape architects at a later stage through mitigation or omitted entirely. This again points to a need for appropriate and targeted education on biodiversity within the design professions. Furthermore, the results at question 13 suggest an appetite for such information high levels of participants found the information on biodiversity ‘impactful’, ‘interesting’, ‘helpful’, and ‘inspiring’ – 64%, 86%, 84%, and, 89% respectively which suggests the impact such information could have to the work of both architecture and landscape architecture practitioners.

The effect of interest, enthusiasm, willingness, and passion – grouped under the term ‘volition’ and in particular the impact when such willingness is lacking, is a notable finding in the results. It implies that there is a lack of other positive drivers for biodiversity outcomes, as well as suggesting a shortcoming within the existing policy and regulations. Within the findings, volition is repeatedly reported by individual practitioners who, without formal incentive, ensure that biodiversity is considered on their projects. Better supports and formal mechanisms are needed to assist these individuals and the wider professions in including and delivering positive outcomes for biodiversity. The stakeholder most frequently mentioned in respect of volition was the client - both in their enthusiasm to include biodiversity in their brief and more often in their lack of interest. Survey comments refer to the importance of clients being ‘*open to it*’ or biodiversity measures being obstructed due to a ‘*lack of understanding*’ or that ‘*clients often don’t recognise the value*’. The results suggest that

without any formal assignment of responsibility to the landowner or without a legislative requirement, it is somewhat of a foregone conclusion that biodiversity would be omitted and overlooked. Biodiversity measures are currently beyond the basic project scope and are “*far down the list*” according to one comment. They are also outside of the client’s remit. As one participant stated: “*Most of our clients are developers. Their goal is to make the best possible return on their investment.*” This aligns with other comments around the impact of the budget – “*clients generally don't want to spend money above the minimum requirement.*” This pattern around the budget, the client brief, and policy is recurrent within the findings. These factors are shown to have the greatest impact on project outcomes (question 15) and so it is critical that mechanisms aimed at improving outcomes for biodiversity target these factors to bring about meaningful change. The findings demonstrate that formalised, quantifiable targets as well as more rigorous policy are lacking in the development process, and this is causing biodiversity measures to be seen as a nice to have rather than a need to have.

The online survey research addresses certain gaps noted in the existing literature. It provides insights into practitioner perceptions around knowledge needs (Graça et al., 2022), engagement (Grose, 2014), and responsibility for biodiversity within the project process (Harris et al., 2016). The study also offers small insights into knowledge interventions (Gobster et al., 2007) and their role in effecting volition and agency (Moosavi et al., 2023), although more in-depth studies are needed to further develop this research area. It also serves to give additional detail on practitioner experience into the scientific knowledge chain (Calkins, 2005; Nassauer & Opdam, 2008).

4.3.2 Recommendations

A key aim of this research was to identify practical measures for improving biodiversity outcomes within the design, planning, and development process. Within the survey findings, both qualitative and quantitative data highlight budget as the primary factor influencing project outcomes. Additionally, the project brief, client and design team volition, and policy measures are critical for ensuring that biodiversity goals are achieved. Knowledge sharing is also a key factor, particularly communicating the benefits, and by using case study examples.

Key recommendations:

Responsibility: Biodiversity responsibilities should be clearly assigned to all team members across all project stages. The design team should demonstrate how biodiversity factors like conservation, enhancement, landscape cohesion, sustainable drainage, etc have been considered and how best outcomes for biodiversity have been achieved. Ideally, this should be quantifiable or independently reviewed to ensure best practice.

Knowledge: Discipline-specific training should be developed, detailing tangible actions for biodiversity and their practical application. In the short-term, a central database of reputable biodiversity information for architects, engineers, and landscape architects should be compiled, as existing resources are not always easily located by non-specialists.

Policy: There is an immediate need for robust policy measures which impact the site scale as well as the landscape scale. Vague language in policies should be clarified to set clear, tangible expectations for biodiversity outcomes. However, it is also important that measures which work towards a quantitative target, or a metric do not create outcomes which oversimplify the intrinsic complexity of biodiversity.

Knowledge-Sharing: To overcome barriers like budget, maintenance, and lack of volition, it is important to share case studies that detail the costs, installation, maintenance, and benefits of biodiversity measures. Aesthetics of biodiversity measures. Familiarity and clear examples can increase client willingness to adopt these practices.

The researcher used a wildflower meadow at Trinity College as a case study to explore this approach (see Appendix 4). Unlike traditional lawns, which people are familiar with in terms of cost, maintenance, and aesthetics, alternative grassland management, such as meadows and wildflowers, is less common. This unfamiliarity can lead to hesitancy in adopting these measures. This aligns with survey results, where a participant noted that *"case studies and best practice guidelines (details and specifications) are very useful to help clients and contractors understand the value, implementation, and management required for nature-based solutions."* Tangible case studies that include details on costs, maintenance, and aesthetics can help build familiarity and confidence in biodiversity measures. Communicating the benefits for both biodiversity and humans can also increase client willingness to implement these actions.

The online survey provides valuable baseline findings and insights into the development process in Ireland from a practitioner's perspective.

CHAPTER 5

SEMI-STRUCTURED INTERVIEWS

5.1 Overview

5.1.1 Interview process

The semi-structured interviews gathered qualitative insights from fifteen practitioners, comprising eight architects and seven landscape architects. As noted in the survey chapter, the probability sampling process resulted in more landscape architects engaging with the request for interviews than architects. To balance the number of practitioners, six additional architecture participants were selected via convenience sampling through the researcher's contacts in the architectural profession and their colleagues.

The interviews were conducted over Zoom, each lasting approximately one hour, and the discussions were recorded. The interviewees gave generously of their time and experience, and their enthusiastic, open participation was essential in gathering meaningful data. The following discussion aims to reflect the conversations, draw conclusions, and make recommendations to improve outcomes for biodiversity in the built environment. Note: The interview guide is included at Appendix 5.

5.1.2 Limitations

As previously noted, convenience sampling can introduce bias to a study (Stratton, 2021). However, in this case it is likely that the convenience-sampled participants held less bias than probability sampled participants. This is because they did not self-select to take part, and when contacted they tended to question if their input would be relevant. Other participants did self-select to take part and this likely introduced selection bias (Andrade, 2020). These participants were potentially motivated to take part as they have a prior interest in the topic (Stratton, 2021). This possibility was anticipated and by way of mitigation the questions were phrased openly, in a neutral manner and sought to capture experience rather than opinion as much as possible. Overall, given the potential for selection bias among participants, the results of this study may point towards a more 'pro' stance on biodiversity measures than would be gained from an entirely neutral sample, however, with such a small sample size this cannot be stated conclusively. While it is important to note this potential for bias, it does not take away from the findings, as the research objective is not to establish if biodiversity

outcomes are important, rather it seeks to examine the development process, to identify gaps and make recommendations for how biodiversity outcomes can be improved. Practitioners with a predisposed sensitivity to biodiversity matters are highly attuned to the issues which occur around such measures in development projects and their professional experience offered valuable insight into challenges within the development process, and the attitudes of clients or design teams. They also offer valuable ideas on how to overcome such challenges.

The small sample size of interview participants is also a limitation of the study. This arose from the limited pool of responses to the call for interview. Despite the small sample size, the participants represented practitioners working in both the public and private sector and on both large and small scale projects. Recurring themes and discussion topics arose repeatedly in the interviews, indicating that the findings are robust, and that a degree of data saturation was reached. This is an accepted principle in qualitative research and described as *“when the researcher begins to hear the same comments again and again, data saturation is being reached”* (Grady, 1998). Given the small sample size this does not mean that further interviews would not provide new information, however towards the latter stage interviews, the researcher did observe a large degree of repetition.

5.2 Interview Section 1: Aesthetics and Perception

5.2.1 Overview

This research sought to gather insights from practitioners of architecture and landscape architecture regarding urban wild spaces, focusing on both their design perspectives and their understanding of public attitudes toward such spaces. Participants, drawing from their experiences with clients, local authorities, and other stakeholders, shared their views on societal expectations and the acceptability of urban wild spaces. Designers serve as intermediaries - translating public standards into design outcomes. In their projects, they must balance diverse and often conflicting public needs, stakeholder demands, and policy requirements. Thus, their interpretation of what is 'acceptable' reflects a blend of professional judgment and perceived public opinion. The findings capture practitioners' design perspectives, insights into public perception, and societal acceptance of urban wild spaces, as well as the perspectives of specific stakeholders, such as local authorities or developers. These practitioners are uniquely positioned to provide insight into attitudes towards urban

wild spaces, the boundaries of 'acceptability' for urban wild spaces and to propose strategies for better integrating these spaces into the urban fabric.

The position of context is referred to in the findings and discussion, and it must be noted that perception and societal attitudes can be shaped by several external factors or 'contexts'.

These can be societal factors, or personal factors which introduce levels of complexity to perception. In the case of wild spaces, a typology of which is vacant or brownfield sites, perceptions may be influenced by the national or local context. Issues like lack of housing, public services, vacancy, dereliction, as well as the socio-economic background of a neighbourhood can all influence how a particular site or wild space is viewed. Furthermore, personal or family circumstances, age, nationality, gender, or impairment can all impact on participants reactions to sites, and the characteristics they are drawn to comment on. Finally, sites of different sizes, shapes, and locations may be perceived differently, and this point is noted in the findings and results. Overall, given the scope of this thesis and the size of the study sample, these factors cannot all be explored conclusively. It is a point for further research however, the influence of context was evident in this study and is detailed in the findings and discussion.

5.2.2 Findings

As a broad start to the interview, the participants were first asked: *Think of a green space in an urban or suburban area that you are familiar with, and state what you like, or find attractive about that space?* The responses to this question fell into four main themes:

1) Human connection and experience of nature: Participants noted that they enjoy fresh air, long vistas, observing wildlife, and how green spaces provide “*relief*” and an “*escape from the city*”. They appreciate how spaces help them to feel “*close to nature*” and give them “*perspective*” and “*peace*”, with one remarking “*there is a permanence in that the trees will outlive me*”.

2) Ecology, biodiversity, and vegetation characteristics: Attributes such as the variety of planting, naturalised areas, diversity, birds, bats, bees, pollinator plants, trees, water, pretty flowers, colours, and textures in vegetation were noted as positive. Participants also appreciated seeing “*seasonality changes*” and the “*passage of time*”, through deciduous and fruiting trees as well as observing things like chestnuts or sycamore “*helicopter*” seeds.

3) Human activity and use: Several responses noted how they liked to see people actively using and enjoying a green space, and that a successful green space should facilitate activities like football, having lunch, walking loops, playgrounds, sandpits, art installations, and playful design elements. One participant highlighted the wider implications of active use – “*I think if we use a space, then we cherish it, and it becomes valued*”.

4) Management, and maintenance: Participants appreciated elements like, universal access, safety, overlooking, passive surveillance, and good infrastructure such as paths that are not muddy and are usable all year round. Maintenance was also mentioned several times with participants appreciating when a green space was clean, free from litter, and well cared for.

Participants were then asked: *Is there anything you dislike, find unattractive, or you think doesn't work well about that space or about urban green space in general?*

The responses again fell into four main themes:

1) Aesthetics and design: The aesthetics of unmanaged grassland and completely unmanaged rewilded areas were noted as having the potential to be seen as unattractive from a public perspective. Poorly designed infrastructure such as over-engineered culverts, railings, and bridges were identified as lacking imagination and jarring with the natural landscape.

2) Ecology and planting: Participants identified several aspects of vegetation they disliked. These included monoculture grassland and green spaces which lack biodiversity and variation within the vegetation. Also noted was “wasteful” planting using annual species, and a recent push for native planting driven by planning and policy demands. While the good intention was acknowledged, participants deemed these species as not always suitable for a “hostile urban environment”.

3) Human factors: Issues with antisocial behaviour, and damage through human pressure caused by the volume and manner in which people and their pets use green spaces were identified as difficult aspects of urban green spaces. Multiple participants noted the importance of embracing “the philosophy that humans are part of nature”, as key to solving this issue.

4) Management and usability: both extremes of management from overly tidy Victorian lawns to “feral” unmanaged rewilded areas were disliked by participants. Usability factors such as muddy paths or steep terrain were also noted as challenging in urban green spaces.

Overall, from both a positive and negative perspective, the complexities of urban green space were evident: “It’s about balancing ecology, people, and placemaking. People need to feel safe, and aesthetics are important. There are a lot of competing things.”[13L]

Informal Urban Wild Spaces - Perception Study Using Sample Images

Moving on from green spaces generally, the conversation next explored informal urban wild spaces. Six photographic examples were used to generate discussion. To aid the image selection, the typologies from (Rupprecht & Byrne, 2014a) were referenced, and the images captured several examples including roadside verges, gaps, structural, vacant lots, microsites, and brownfield sites. The images showed a variety of characteristics including recolonising bare ground, scrub, trees, human elements, and flowering plants. The participants were given a brief outline of what constitutes an informal urban wild space, highlighting the key points that they are spontaneous, self-organised, unmanaged, and often undisturbed. The participants were shown each image individually, and a summary sheet comprising all six images was then displayed to aid the discussion.

After viewing all images, the participants were firstly asked two questions:

- 1) Choose a favourite or most attractive image and state what you like about it.*
- 2) Choose a least favourite or most unattractive image and state what you dislike about it.*

The six images of informal wild spaces which were shown to the interview participants:



Image 1



Image 2



Image 3



Image 4



Image 5



Image 6

Figure 30: Collage of urban wild space imagery shown to participants during interviews

General comments and overall observations

Within the responses, participants commented in a general sense about all images, about informal urban wild space as a typology, and how it is viewed by society. These observations are helpful to set the scene. They capture the competing aspects of such sites both from a socio-economic standpoint and from a nature and biodiversity perspective, illustrating the range and depth of attitudes. On one hand they are “*no man’s lands*” - unattractive spaces, typically associated with bonfires, antisocial behaviour, and “*Joe Duffy*”. Another recurring theme was that of access, as many participants took issue with fences and hard boundaries - “*There’s a difference in perception around something that can be accessed, and something that can’t.*” Other comments note an excitement and sense of potential from seeing nature push back against the man-made environment – “*I think, fair play to you little plant*”. It was also pointed out that nature as one stakeholder vs the public as another creates differing needs – “*[informal wild spaces are] attractive from a nature point of view because nature has won over, but from a public space point of view, they’re not the most attractive because for public space it needs to be really usable and safe. Safe is a very important word with public space*”. Conflicting observations were often made within the same response and there were few if any conclusive views as all participants pondered and debated the complexity of the topic.

Analysis and interpretation of the quantitative and qualitative findings

The analysis was conducted both from a quantitative and a qualitative perspective to unravel the discussion and find patterns or themes beyond the surface level observations. The process looked at 1) positive observations, 2) negative observations, and 3) proposed design changes for each image. It then examined all positive observations, negative observations, and proposed changes collectively to find the common themes. The objective was to gain a depth of understanding of the logic and context behind the practitioner insights.

To aid this, perceptions and observations were considered as distinct from each other. For example, a participant could remark that an image looks “*really well*” – this was noted as a positive perception of that image. The participant could add a negative comment such as “*the plants might damage the wall*”, and this would be noted as a negative observation. Negative observations didn’t necessarily add up to a negative perception, and vice versa for positive ones. This approach sought to capture the overall perception of each image while allowing flexibility to analyse the characteristics and themes behind the perception.



Image Number 1:

Quantitative Findings

Positive Perceptions = 4

Negative Perceptions = 6

Overall Perception = Negative

Image Number 1 – Qualitative Findings

The participants had mixed reactions to the above image. Characteristics such as variation, the diversity of planting, the individual species (poppy, willow, buddleia), the natural aesthetic, and nature “*bursting through the cracks*” were all observed positively on this “*interesting brownfield site*”. Conversely, elements such as visible rubbish, the unfinished building, and the hard surface contributed to negative connotations, a perceived lack of care, and nature “*fighting the concrete*”, with the space deemed “*weak*” and “*in-between*”.

Proposed interventions to improve the acceptability of the space suggested leaving it untouched and holding guided tours, removing the rubbish, and creating seating using informal materials such as wooden pallets, designed to gel with the existing aesthetic. The latter was intended to give a cue to people on how to use the space by designating an area to sit and enjoy it without disturbing the wildlife. The provision of signage about wildlife on the site was also suggested.



Image Number 2:

Quantitative Findings

Positive Perceptions = 11

Negative Perceptions = 0

Overall Perception = Positive

Image Number 2 – Qualitative Findings

The participants had an overwhelmingly positive reaction to the above image. The way the planting contrasts and softens the hard background of the wall, alongside a love for the species (Red Valerian/ *Centranthus Ruber*), were the most common observations. The image was deemed “happy”, “pretty”, “positive”, and “organised”. Participants also appreciated the biodiversity value, the colour of the flowers, and enjoyed seeing nature “coming back against the hard landscape”. The structural implications of the planting on the stone wall were noted several times as a negative observation, although sometimes reluctantly by participants as the image was positively perceived in all instances. One comment noted that their reaction may be less positive later in the season if the planting had turned brown, or if the vegetation started to trap rubbish.

No changes were proposed aside from one suggestion to include some communication around the benefit of the site for pollinators.

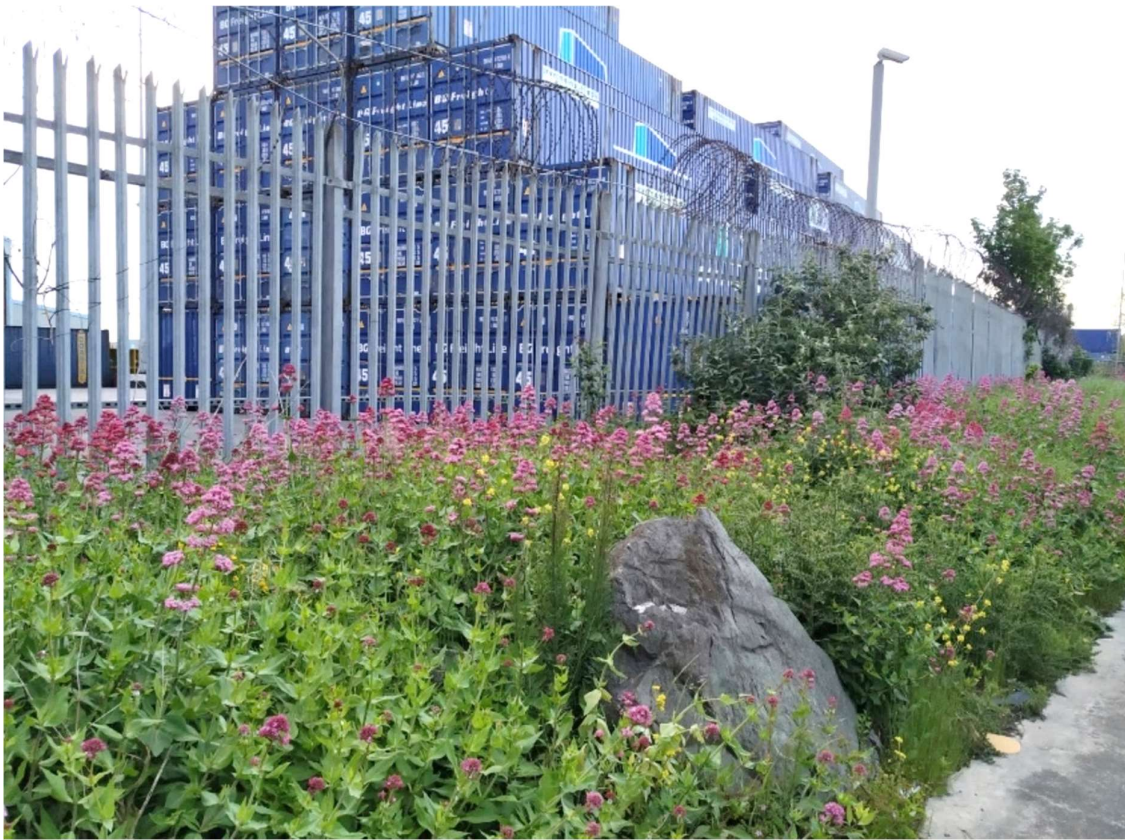


Positive Perceptions = 0
 Negative Perceptions = 10
Overall Perception = Negative

Image Number 3 – Qualitative Findings

This image – “*a combination of natural regeneration and ill-conceived boundaries*” - gained both the most negative perceptions and negative observations from the participants. By far the biggest factor was the boundary treatment with nine negative observations referencing the fence. The site was described as “*uninviting*”, “*harsh*”, “*derelict*”, “*under cared for*”, and as giving “*a sense of negative foreboding*”. The lack of access, metal cladding, graffiti, and proximity to a busy road were all noted as negative factors. Some participants remarked positively on elements of the urban character such as the graffiti and texture of the brick, while some also noted how the fence was beneficial to nature by “*enabling it to return*”.

The participants proposed that the site could be used informally, with all suggested changes recommending that the fence be removed. Other proposed alterations included adding trees, widening the footpath, providing a path to “*cut the corner*”, adding seating, a pop-up café, a mural on the gable wall, and the inclusion of signage to explain how wildlife might use the space. The most common change proposed to the vegetation was the addition of trees to add diversity and variation in height.



Positive Perceptions = 7

Negative Perceptions = 3

Image Number 4 – Qualitative Findings

Overall Perception = **Positive**

Mixed, but mostly positive observations were made about this image. As with image number two, participants appreciated the softening effect that the vegetation has on the harsh context. The species (Red Valerian) was again noted as a “*pretty weed*”, and the “*lush*” vegetation was described as “*bright*”, “*colourful*”, and “*beautiful with the boulder*”. One comment described the vegetation as “*homogenous*”. The planting was also deemed, nice in comparison to “*thistle or ragwort*” and it was remarked that “*a lawn wouldn’t soften that context as much*”. Adverse observations highlighted the “*horrendous*” and “*negative*” boundary treatment of palisade fencing and barbed wire, with the lack of access for people also remarked upon.

Only a few changes were suggested, one to remove the fence, another to “*possibly add some trees*”, and a third to add information to communicate that “*this is deliberate*”.



Positive Perceptions = 1

Negative Perceptions = 8

Overall Perception = Negative

Image Number 5 – Qualitative Findings

This image was perceived negatively with participants describing it as “ugly”, “derelict”, “a wasteland”, “abandoned”, “an eyesore”, “not maintained”, and “a dumping ground”. The car, container, building waste, and scrap metal were all identified as factors contributing to the negative feeling of the image. “*Docks and thistles*” were pointed out as negative species in the vegetation and the site was described as “*somewhere you don’t want to go, and you shouldn’t go*”. Some participants made positive observations, identifying the variety and texture within the vegetation, the range of habitats, and the piles of brick forming possible nesting sites for invertebrates as favourable aspects to the site.

Recommendations for changes were varied. Most advised removing the car, container, and rubble, with some suggesting reusing the container as a café, and the bricks to form paths. An ecological survey was suggested as a guide for any interventions. A “*transitional*” aesthetic was proposed to compliment the ecology, alongside ecological tours, and “*low-key*” features like bunting. Other suggestions included creating a community garden with allotments, a stage, pallet furniture, and making the car a feature, by turning it upside down and planting in it. Another participant proposed removing the “*dumped stuff*” and grassing the site.



Positive Perceptions = 4

Negative Perceptions = 4

Overall Perception = Neutral

Image Number 6 – Qualitative Findings

This final image evoked mixed responses from participants. Those in favour appreciated the trees, the density of the background vegetation, the biodiversity, the visible ecological succession, the size, the vista, and the accessibility of the space as well as its perceived distance from cars and traffic.

Less favourable observations deemed the site “*weak*”, “*forlorn*”, “*unkempt*”, “*derelict*”, “*unfinished, unused, underutilised*”, and “*a wasteland*”. Several participants noted that they expected the site would be developed.

In terms of suggested interventions, these varied in intensity from “*it needs to be greened up and landscaped*” to “*close the gates and walk away*”. Most proposed leaving the vegetation alone but adding pathways to allow access and human engagement with the space. Making the fencing more transparent was suggested to help with safety, and multiple participants recommended using signage features to communicate the ecological value of the space, as well as the long-term strategy for the site such as “*this is deliberate*” or “*this is awaiting*”.

Summary of findings:

Positive Observations

- Nice contrast with the hard background.
- Vegetation is pretty and colourful.
- Happy, positive, organised, biodiverse.

- Nice contrast with the harsh context
- Vegetation is pretty, and lush.

- Nice trees, biodiversity, and dense vegetation.
- Site is removed from cars and traffic.

- Vegetation is varied and diverse with nice species, Poppy etc.
- Nature is “bursting through the cracks”.

- Variety and texture in the vegetation.
- A wide range of habitats – eg bricks for invertebrates.

- Fence enables nature to return.
- Urban context is nice with texture, graffiti.

Most Positive Perception



Most Negative Perception

Negative Observations

- Plants may damage the structure of the wall.
- May not be as nice if planting was brown or if rubbish trapped in vegetation.

- Fencing and barbed wire is negative.
- Lack of access.

- “Unkempt”.
- Development waiting to happen, “derelict”, “unfinished”.

- Visible rubbish, lack of care.
- Development waiting to happen, “unfinished”.

- Visible dumping, waste, scrap metal.
- “abandoned”, “ugly”.

- Lack of access, fence is negative.
- “uninviting”, “harsh”.

Positive Perceptions

Negative Perceptions

Figure 31: Graphical summary of perception study findings

Thematic analysis of perception study

Participant observations on images were analysed collectively, revealing repeating patterns.

Positive Observations: Two themes emerged in these responses. Firstly, positive observations about the vegetation; participants noted *“texture”*, *“density”*, and *“colour”* as specific characteristics they enjoyed. Responses also appreciated variation and the perceived biodiversity value of this and they identified specific species visible in the photographs. The second theme was the relationship of the greenery to its context: participants enjoyed nature as a relief, and a soft contrast to the harsh urban environment. They repeatedly referenced nature *“coming back”*, *“returning”*, and *“bursting through”* the hard landscape.

Negative Observations: Patterns also emerged among the overall negative observations. Firstly, issues with the context were remarked upon – either the built context or the social context as understood from each image. Participants noted *“harsh”*, *“negative”* and *“uninviting”*, elements like fences, concrete, and barbed wire. Similarly, the social context of perceived abandonment (*“unfinished”*, *“underutilised”*, *“derelict”*), was negatively observed. Another theme which arose was that of maintenance: visible rubbish, scrap, and an *“unkempt”* appearance, were also perceived negatively.

Proposed Changes: Several themes emerged from the changes participants proposed for the sites. Lack of access was addressed as many participants proposed the removal of fences and the creation of paths to facilitate human access and engagement with the sites. The idea of restricting access to allow nature to continue undisturbed was only lightly mentioned and typically in a shared way, rarely giving the entire site to nature. Further patterns were evident around themes of management and design such as rubbish removal and seating. Several answers addressed education and communication by suggesting signage or ecological tours.

Discussion questions

To further explore the practitioner insights into the societal acceptance of informal urban wild space, some follow up questions were asked. Before this, the participants were given some short information on the biodiversity value of informal wild space. It was noted that, the self-organisation, lack of management, and the undisturbed nature of these sites means that they provide habitat for flora and fauna that may otherwise not be found in urban areas.

Participants were first asked: *Is this typology of space (Informal Wild Space), acceptable in an urban setting? In either a temporary or a permanent capacity?*

None of the participants unequivocally stated that this typology of space was entirely acceptable. It is fair to assume that their responses were based on the six images they had just discussed, and these images provide a reasonable representative sample of the variety of informal wild space typologies visible in Irish cities. Rather than a simple ‘yes’ or ‘no’ response, the question instead prompted further nuanced discussion on these types of spaces and on nature in our cities generally. Upon thematic analysis, the responses revisited topics that had previously been touched on, primarily; use and intent, education and communication, and practical themes such as usability and maintenance.

Use and intent: This is the social, developmental, or planning context within which a site is perceived. Participants repeatedly noted the importance of clear and legible intention with such spaces. A feeling like a place is “just left”, “intentionally abandoned”, or “someone is choosing not to do anything”, makes for a negative perception. Many reiterated that the “closing off” of these spaces is a huge factor in their negative perception, as the feeling is that they are lying unused when they could be meeting a need – either a housing need, an ecological need, or a public green space need. Interestingly, the ecological purpose alone (i.e., the sites in their current, sometimes inaccessible condition) did not seem sufficient for many participants. The importance of public green space in a city environment was emphasised and it was noted that the biodiversity need, and the public space need are not mutually exclusive. Rather, it is possible and optimal to achieve both within one site. Several responses noted that biodiversity is also a human need, and it is imperative to change the narrative that humans are separate to nature.

Another aspect of how use and intent influence the attractiveness and acceptability of these spaces was the effect that visible evidence of latent or stalled human activity has on

perception. One participant described it as follows: *“Undisturbed nature within a stalled development with concrete and hardcore, is different to an unspoiled landscape in the countryside which would obviously look more attractive. It’s different when its nature reclaiming an area that was initially spoiled by human intervention”*[14A]. Another participant framed it as follows: *“Once you put in elements of permanence, construction for example, you need to rewind that ... it’s like we are an invasive species, and we need to take out some elements we put in to allow the ecosystem to flourish”*[6A]. The fact that nature benefits from a lack of human disturbance tended to further divide rather than unites the two causes in the responses. Participants discussed a co-existence, but tended to use human-led terms like a ‘biodiverse park’, or they proposed a solution which separates undisturbed nature areas from amenity areas.

Education and communication: As arose in some of the image observations, when asked if this typology of space was acceptable, participants noted that it *“depends on how you frame it”*. Which ties in with the findings on use and intent. Participants cited the role of their own education in assisting their understanding of these spaces, and how understanding the nature benefit makes them *“more tolerant of not accessing it [the site]”*. In terms of public perception, communicating that the site appearance is *“deliberate”* as well as sharing information on *“what’s the plan? The strategy for the site”*, are all important factors in whether these spaces are acceptable, according to the interviewees.

Practical themes: Pathways, seating, and making the spaces a little *“tidier”*, also featured in the discussion on acceptability. Participants were not generally in favour of a total lack of management, (if communication measures and signage are classified as a form of management). One participant noted that the *“unkempt appearance”* in image number three suggests a lack of care, in contrast to the *“Trinity wildflowers”* (at college green), which *“feels more positive”*. These notes on maintenance reinforce the existing literature and the importance of ‘cues to care’.

As a final question and to further tease out which attributes, characteristics, and contextual circumstances are important in determining the threshold of acceptability for informal urban wild spaces, the participants were asked: ***When changing our cities to become more biodiverse, what are the most important human needs that must be met? For example, with these types of spaces (Informal Wild Spaces), is there a basic threshold or set of criteria they must meet to become more acceptable?***

The responses here again touched on some of the themes from the previous questions. Sanitation, safety, and accessibility were the most common factors mentioned. *“There is a line where something is unsafe or unsanitary and then people don’t want it. Anything above that is negotiable and more down to preference”*[4A]. Access was deemed important with many interviewees noting that if sites were accessible, they could meet a public need for green space. Usability and safety were again conditioned into this: *“If spaces are opened it is an unspoken declaration that they are safe. So, management is needed to ensure that they are in fact safe”*[9L]. This recurring theme covers two aspects of safety: that spaces are safe to use, in a practical sense, and safe to be in, in a social sense. Interviewees spoke of a fear of even the potential of a space not being safe, and how this impacts development projects. Existing scrub was identified as a challenge in this regard and participants described how design efforts to retain such features are often met with resistance – *“it’s fear ... drug dealing, drinking, the fear of untidiness. The councils as well, often they just want grass and trees, no shrub planting because ‘there’d be lads in there’. Even when you try to retain something, if someone complained, it just got destroyed”*[12L]. Intervisibility was noted as an important factor to consider when improving the safety of informal wild spaces. A further challenge of retaining existing vegetation is its appearance within a design – *“there’s no acceptance of something being a bit tatty”, “it’s difficult to integrate in. It can look shoddy, like it was left out”*[12L].

Communication and signage were again identified as vehicles to promote a positive perception of informal wild spaces and to reduce fear around such spaces: *“I suppose you’re dealing with a fear of antisocial spaces. I think a lot of people wouldn’t understand the need to leave it alone, there’d be a lot of complaints. So even you know those little signs, ‘there’s an ark’, that people put up, I think signage ‘this is a wild space’. I think information, on what it is and why it’s wild and that its wild for a purpose, so that there’s some level of understanding because otherwise, you know a massive cohort would just not be ok with it”*[12L].

The idea of ‘meanwhile use’ was noted as a solution which involves making these spaces accessible on a temporary basis while a site is in limbo for development. Participants discussed how this simple concept is obstructed because landowners and development companies are concerned with insurance and risk: *“the idea of meanwhile use is a no brainer, but our insurance system creates like little vultures themselves, so people aren’t allowed in because of the risk factor. Until we reform the insurance system and have a normal, European style system, no one will be allowed to go into these spaces”*[15A].

One unique suggestion was to calculate the monetary value of the ecosystem services a site provides for humans. Where appropriate in terms of zoning and strategic context, the land could be purchased by the state or a local authority and retained to continue providing those services or even improve upon them. This was suggested as a strategy which would make people think differently. The site would be *“not for us to go into, but for us in terms of pollination, clean air, etc”*[11L].

The pattern in the results becomes visible: to increase acceptability, make the spaces safe, clean, accessible, and valued. These suggestions were not associated with many, if any radical changes to the vegetation. Participants instead proposed interventions which would match the ecology but facilitate a certain level of access and use: *“cue to people that this is kind of informal ... but there’s a place for you”*[5A]. Where a site is totally inaccessible or if certain features or areas are especially ‘untidy’, the results suggest that negative perception can be mitigated by ensuring there is clear communication and signage available to explain that this action or lack of action is intentional, and the strategy is for biodiversity enhancement. As one participant summed it up, these spaces can be: *“transformed into amenities but keeping the rough around the edges look. Simple things like pathways, seating, and signage explaining what’s going on and why ... most people get it and they become quite successful. It’s all contextual – the people, the landscape, the ecology”*[13L].

5.2.3 Discussion

The findings within the perception study revealed some common themes that influence perception such as context, land use, intent, accessibility, usability, education, communication, and aesthetics. Highlighting the influence of factors like safety, may seem basic or obvious, however, it is important to reiterate as a finding within this study. Participants stated that most of the images shown did not feel safe or sanitary and before exploring more nuanced or in-depth findings, it needs to be clearly stated that safety, sanitation, accessibility, and usability (safe paths to walk, etc) are core influences on the positive perception and acceptance of informal urban wild space as a typology. Participant observations, both positive and negative, as well as proposed interventions focussed on these topics time and time again. These factors should be central to any discussion regarding informal urban wild space, and they have been noted in the existing literature (Fischer et al., 2020; Hofmann et al., 2012; Włodarczyk-Marciniak et al., 2020).

Within this study, the overarching theme which emerges from the findings is the importance of legibility within the urban environment. It is apparent from the results that public interpretation of the intention and meaning of a space, is a key factor in the acceptability of informal wild spaces and is more important than aesthetic design qualities or vegetation characteristics. While practical on the surface, the root of the interview discussions on access, maintenance, use, and communication, stemmed from the participant's interpretation of the intent, purpose, or context of the site, as they understood it from what was visible in the image. Intention, meaning, or context is: the planning and development status of a site, the socio-economic signals that stem from fences, locks, and barbed wire, and the understanding garnered from litter, deteriorating concrete, or a stalled development. It is not about rubbish or fences; at the core of these discussions was either participant dissatisfaction with the intent of the site as they understood it from the image, or an uncertainty stemming from not understanding the intention or purpose of the site, due to perceived ambiguity within the image - for example, visible concrete, hardcore, or a stalled development co-existing with pioneer vegetation, scrub, and trees. There is a subtext among the responses which suggests that in an urban context, people feel more comfortable or better able to understand 'wild nature' (i.e., spontaneous, self-organised nature) when it is 'wild' in a legible, designated, or assigned way. During the discussions, participants sought to resolve and assign reason to informal wild spaces and question the lack of clarity that they embody. In fact, several

interviewees struggled with this ambiguity when asked to suggest changes to improve the sites, with some requesting a brief or more detailed information to give direction to their proposals.

If we examine the changes participants suggested for the site and again explore the root of the comments, it appears that the interventions seek to assign intent, meaning, and purpose to the sites. Access, paths, seating, and signage – ambiguity is being erased by proposed changes which assign purpose and intention. These interventions make sites more legible, helping the public understand what the spaces are, and where relevant, how to use them. No fence means *'you can come in'*, a path means *'you can walk here'*; a bench means *'you can sit here'*, signage means *'learn what is happening on this site'*, etc. The core objective underlying these interventions is to make the intention and purpose of the site clear, even when the intention is to do nothing. That is a key element to note within the findings – when a participant wanted to do nothing to a site, they still felt a need to communicate the reason behind doing nothing. This was through education, guided tours, information, and signage. It is a key marker from this study which tells us to look beyond aesthetics and instead at the message aesthetics convey. Aesthetically, there seemed to be a general indifference to the vegetation - colourful species were simply praised more rather than other vegetation being disliked, and most of the participants recognised the benefit of these spaces for green infrastructure. Perhaps if some of the other themes were rectified or neutralised, then vegetation would become an issue. However, the feeling from the interviews was that the vegetation was 'up for grabs' if elements like accessibility and safety were addressed. The findings show that messaging or cues that are understood from the context play a bigger role in defining perceptions.

This need for legibility is quite unsurprising, particularly in an urban setting. Humans like to know where they stand, and rules or cues are essential when navigating the busy urban realm to assist people in where to walk, where to cross the road, etc. 'Use' is also a key factor in the built environment. Cities are planned spaces, so people expect them to be legible, they expect to be able to interpret the layout. There is a certain comfort, clarity, and familiarity in the fact that everything in an urban setting is assigned. So, if we look at informal wild spaces through this lens, it is not that they do not fit in, rather, the findings suggest we need to get better at communicating how, where, and why they do fit in. The research findings indicate that if urban wild spaces are to be truly accepted as wild, unmanaged, and self-organising within our cities, then paradoxically, we need to designate them as such and convey that to the city users. The interviewees sought a clear understanding of what is occupying the site, humans,

or nature, as if it didn't subconsciously make sense for intermittent human activity and spontaneous colonising nature to be mingling on one site. It may seem incongruous to the essence of wild space, but from a human perspective, in an urban context, it is understandable. Cities have high levels of human induced dangers such as rubbish, broken glass, needles, rodents, and anti-social behaviour. It is reasonable that people do not necessarily want to walk off the path or explore 'abandoned sites' when they don't understand the safety risks or if they could be trespassing. It is also reasonable that without some communication aids, most people would not understand or appreciate the benefits these sites offer for nature. Reflecting on the findings in the context of the existing literature, perhaps it is not necessarily a cue to care that people need (Nassauer, 1995), rather, any cue may be sufficient to increase acceptability and understanding of urban informal wild space, through targeting legibility rather than aesthetics. To apply this theory, we can broaden our own understanding of how these cues manifest. For example, if a site is pending development and is fenced off, while simultaneously left growing 'wild' to benefit urban biodiversity, this is a strategy, and this intent can be conveyed. Despite the interview findings showing that access is an extremely important factor in the acceptance of these spaces, the discussions suggest that it isn't essential. Intervisibility, informative signage, or limited partial site access would be step down solutions to allowing undisturbed nature while fostering a positive public perception.

The topic of access is interesting to explore in more depth. Many of the suggested interventions focussed on allowing people to use and engage with the subject sites. Despite the interviewer mentioning clearly that much of the benefit for biodiversity came from the fact that informal wild spaces are often undisturbed, participant observations and changes focussed almost entirely on human access, engagement, and interaction with these sites. Even when the benefits of a lack of disturbance were reiterated, participants still pushed for a shared use. The findings suggest that perhaps biodiversity as a sole use for a site is not fully accepted or not sufficient. Rather, the social needs are viewed as outweighing the ecological benefit. It is likely the urban context is a driver of this. However, this finding could also be reflective of a heightened understanding of the social needs, and a lesser familiarity with the ecological needs and benefits of informal wild spaces. Communication measures may increase public understanding beyond just 'empty sites'. The need for access could also be because space is at a premium in an urban context, and there is often a lack of green space for people. Perhaps participants were simply stressing the need and opportunity for co-benefits from these sites. As one interviewee said: *"If you leave them alone for biodiversity... I kind*

of think it's a missed opportunity for the humans" ... "because we do tend to forget about the humans in the biodiversity as well and we're part of that story too ... we can't just be observing and sitting outside looking in either"[9L]. Future research could investigate these hypotheses further, and drill into the public sentiment around segregated sites for nature within an urban context. While this study may not have pinpointed the exact driver behind the need for access, it is apparent that access to and human engagement with informal wild spaces is important for their acceptance and social integration into the built environment.

Interestingly, the images which provoked the least number of changes were two and four – both linear, edge spaces. It is possible the participants didn't feel the need to intervene because the purpose of these sites is clear. They present as fringe spaces, not large enough for a building or a park, not a symptom of a greater social issue like lack of housing, they are legible and somewhat familiar within the grain of a city. Alternatively, there are several other possibilities for this result. For example, both images show colourful vegetation (Valerian) in flower, neither site has visible rubbish, nor broken, deteriorating surface material, and both sites are accessible. Further study would be needed into factors such as access, litter, colour, vegetation, species and weather or blue skies in the images which may have influenced participant responses. Future research should investigate participant perceptions when these factors are neutralised. I.e., research imagery which has no visible rubbish or other unsanitary elements, and sites which are accessible and clearly legible in terms of their urban and social context. By analysing the findings of this study, and interrogating the source influences for participant perceptions, a huge amount of the discussion was focussed on the context – both physical and socio-economic. Therefore, to gain a deeper understanding of participant sentiments towards informal wild space from an aesthetic or ecological perspective, the social, planning, development, and physical context must be neutralised.

One final point to consider is how our perception of place is based on societal meanings, narratives, and norms that have developed over generations (Scannell & Gifford, 2010). Throughout the course of this research and field work, no mainstream, public-oriented, ecological narrative about the benefits of informal wild space was found by the researcher. This suggests either one does not exist, or it is not readily available. Developing something like this may add another perspective to the narrative on urban wild space and its role in the built environment. However, it is also important to reflect on the broader narratives which are tied to these sites - their social context, as discussed earlier. Is there a value in also clarifying and communicating the social and policy-driven narrative of these spaces? Previous research

has shown that ‘abandoned’ or ‘derelict’ sites are often perceived negatively (Mathey et al., 2018), but is it fair that the site itself bears the burden of this disapproval, when there are other factors at play? The interviewees repeatedly proposed communication tools and signage as a solution to help the public understand what is going on with these spaces. If we take the negative observations stated in the interviews and instead communicate the source, and social context of these issues, the signage may read as follows: *‘this site is not accessible for public use or recreation due to insurance risk’*, or *‘neither the landowner nor local authority ensure the safety and sanitation of this site is maintained’*. The effect would be that negative public perception is correctly directed at the core problem, rather than the site itself. This would allow the ecological character of informal wild space to be decoupled from the social shortcomings, and instead seen as distinct and perhaps even as a positive side effect. The practicalities of this approach are questionable, but the concept helps to illustrate the in-depth findings, and the broader societal themes which are truly at the core of the discussion.

Overall, these findings show that there is a need to build a more positive perception of urban wild spaces, especially for larger areas or sites. Currently the ambiguity around their use and purpose, combined with a negative social context is contributing to a negative overall perception. Increasing legibility by conveying the plans and strategies for these sites could improve perception. A similar effect is possible through communicating the benefits these sites offer for biodiversity and as green infrastructure. Furthermore, allowing the public to engage and form a connection with nature by facilitating access, while ensuring a basic level of safety and sanitation within the site, could have an extremely positive effect on perception.

5.2.4 Recommendations

From many perspectives, these sites are an asset to a city. They hold potential for housing, development, public urban green space, green infrastructure, as sanctuaries for biodiversity, or as sustainable drainage solutions, yet they often evoke a negative reaction while in their ‘limbo’, or ‘meanwhile’ state. Some possible reasons for this were discussed earlier, and some proposals for improving this are outlined below. These sites are victims of time and due process. Land sales, development plans, zoning, design proposals, planning, procurement; the list of delays in urban development is notable. During this time, these sites are typically fenced, hoarded and inaccessible to the public, generally because access would create and an

insurance risk for the landowner. In addition, the sites are often subject to intermittent vegetation management through clearing or spraying of herbicide.

Note: This process was evident in the case study in Chapter 2. The point also arose in the later interview questions when participants discussed the development process and policy, however it is included here as it refers to informal wild spaces.

The reason for this intermittent site clearance activity is unclear, it may be a routine procedure to keep the vegetation at a manageable level. Interview participants suggested one objective is to remove any existing vegetation prior to an ecological survey, or to ensure nothing of ecological significance or value has an opportunity to establish. This allows development on the site to be maximised and ‘de-risks’ the planning process as there can be no conditions instructing the developer to retain existing small trees or vegetation within the new development. This site management process can be seen by reviewing vacant sites using the timeline feature on Google Earth, and examples are included below. For whichever reason, it is a common occurrence on urban sites, and it is not ideal for biodiversity particularly when achieved using herbicide. Note, all three sample sites shown below are on the current vacant sites register in Dublin City Council (DCC, 2023).

Fig 32: Site at Montpelier Hill and Infirmary Road (Google Earth)



Fig 33: Site at 113 Phibsborough Road (Google Earth)



Fig 34: Site at 2A, Faussaugh Avenue, Cabra (Google Earth)



One possible solution to this management issue on informal wild spaces could be to encourage and incentivise the use of zoned land, vacant land, or land awaiting planning permission as temporary wild space, which contributes to the green infrastructure and biodiversity of the city. Informal wild spaces provide this function already, the solution here is simply to formalise that function as an assigned temporary land use and to establish best-practice management guidelines to preserve vegetation and maximise ecological function. This approach would also respond to the findings in the interview discussion that show the importance of legibility and clear intention in the built environment. Currently there seems to be a concern around allowing vegetation to establish for fear of delays to development through planning revisions and conditions or the triggering of ecological policy and legislation. It may also be a cost issue associated with clearing larger vegetation. To challenge this norm, landowners could be incentivised to engage with local authorities about using sites temporarily for biodiversity, under an agreement that this will not delay or alter a proposed development. It would be important to establish which approach would do more ecological damage. To manage and clear the sites intermittently (using sustainable, non-herbicidal techniques, outside of the growing or nesting season), or to allow them to establish indefinitely – potentially over a decade or more, in the understanding that at some stage there is an allowance for them to be completely cleared to facilitate development. It is not a perfect solution; however, it may result in an overall net gain for nature across the city – there are currently forty-one registered vacant sites within the Dublin City Council catchment area.

This approach would also assist in giving purpose and meaning to these sites, by assigning them an interim use for nature. They are no longer devoid of function from a planning, zoning, or social point of view: they are temporary green infrastructure. A simple communication campaign could convey this strategy and the benefits for urban nature to encourage public understanding and support.

A further and more robust solution would see landowners being incentivised to facilitate access on vacant sites. The findings of this study show that lack of access contributes to a negative perception. Temporary access and meanwhile use would help to bring these sites into a more favourable status in terms of public opinion. This could be done in a low-cost way, and one which ensures safety. Surface mounted, modular walkway systems are one such solution to allowing access. See image examples below:



Fig 35: Imagery showing modular boardwalk systems (Archatrak)

Taking image three (from the interview discussion images) as a sample site, see below:



A very simple solution could involve removing the fence and installing a modular pathway through the site to ‘cut the corner’, these types of paths would be reusable, and low impact in terms of their footprint on the ground and the existing ecology. Seating could be included, and the walkway could be maintained as per a standard footpath in terms of rubbish. This would allow public engagement with the site while ensuring safety by clearly designating a zone for access. A suitable insurance framework could be drawn up based on similar models in other countries. Using lightweight modular solutions would preserve the existing ecology and signage could be incorporated to explain why the vegetation was left untouched. If desired, some ornamental planting could be included in containers, and all elements, walkways, seating, signage, and planting containers could be modular and reusable.

On certain sites, if access via pathways is not possible, the boundary hoarding could be set back by 1.5m to facilitate green edge planting and public seating along the existing footpath. If vegetation is present on a site, clear Perspex sections could be included in the hoarding to allow visibility into the site and signage could be installed to explain the benefits of informal wild spaces as nature-based solutions.

If assigning temporary use as green infrastructure, or facilitating public access is not possible, a minimum solution would be to establish management guidelines for vacant sites. These could prohibit sealed surfaces on long-standing vacant sites, obligating landowners to remove finishes and allow free drainage through the soil. Similarly, if a landowner is carrying out vegetation management, this should be via a non-herbicidal regime, and completed outside of the growing season.

Financing for these solutions could be sourced through offering the landowner a reduction or an exemption in the vacant sites levy if they complete certain management actions. This could be a tiered system based on increasing levels of management, public access, and use. The vacant sites levy is an annual tax on vacant land that currently stands at 7% of the market value of the land (CIB, 2022). At the time of writing, there are forty-one vacant sites in the Dublin City Council catchment area, with an average market value of 4.2 million (DCC, 2023). Of the forty-one sites, thirteen are in the ownership of Dublin City Council (DCC, 2023). At a rate of 7%, the average levy on these sites is almost €300,000, annually, per site. This scheme is due to be replaced with the Residential Zoned Land Tax, which will tax infrastructure-ready land that is zoned for residential use. This levy will be 3% of the market value of the land, annually (CIB, 2023b). If we take the average market value of a vacant site in Dublin City (4.2m), this is a levy of €126,000, annually. The RZLT has been deferred until 2025, with the vacant and derelict sites levies remaining in effect in the meantime (CIB, 2023b). If even some of this tax was to be reinvested in the sites themselves to facilitate maintenance for safety and sanitation, temporary use as green infrastructure, sanctuaries for wildlife, sustainable drainage, or temporary access as public greenspace it could create a more positive use and a more positive perception for these sites within the city.

These recommendations are ideas and suggestions which attempt to address two of the main findings from this perception study on informal urban wild spaces – that of assigning meaning, purpose, and use to these sites in a legible way, and that of facilitating access for people.

5.3 Interview Section 2: Roles, Responsibilities, and Project Process

5.3.1 Overview

During the second part of the interview, the dynamics of the project team were explored: their respective roles, responsibilities, and the approach and overall process of a development project. Various questions were posed to investigate how biodiversity is considered in the project team and development process. The objective of this was to identify gaps, weaknesses, and areas for improvement.

It is important to point out that the interview participants work in both the architecture and landscape architecture disciplines. Within each cohort, participants engage with a range of project typologies and scales. Effort is made in the findings to collate the responses to reflect systemic issues rather than singular project specific insights. Certain topics discussed may not be applicable to all project scales and typologies (e.g., EIA), however all results are relevant to the overall system and processes of development.

5.3.2 Findings

Initially, participants were asked about the design team structure, roles, and communication channels. The discussion took a broad approach, focussing on a typical project scenario, and using a diagram as a prompt. This diagram, seen on the next page, was adapted from the existing literature (Engineers, 2012; Hürlimann et al., 2022), and had been sent in advance. Participants were given a brief description as follows: The structure of this diagram looks at communication channels and organisational structure within a typical project:

- ***‘Design Team Management’*** comprises of the client, project manager, and architect, with the architect acting in a design team lead and coordination role.
- ***‘Nominal Lead Disciplines’*** are the core design team, who would typically be present at all project meetings.
- ***‘Contributing Disciplines’*** would attend meetings relevant to their expertise.
- ***‘Allied professionals’***, are consultants often appointed directly by the client, or project manager for specialised work packages who are not necessarily part of the design team.

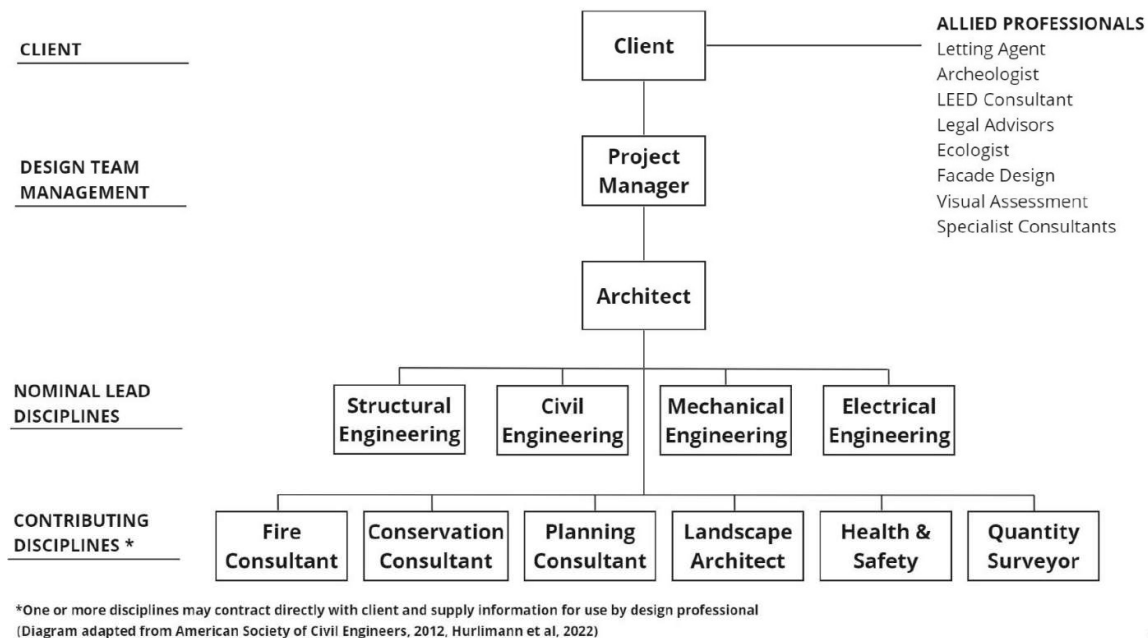


Fig 36: Diagram of design team structure sent to participants in advance of the interview

The participants were first asked: ***On a typical project, does this diagram accurately reflect your experience of how a design team works in terms of the team structure, roles, and communication channels? Are there any changes you would make?***

Many participants first stated that the team structure would depend on the typology, scale, and stage of the project, the main differences are presented below:

Typology: Participants agreed that the diagram accurately depicted the architect's role in building projects, with one suggesting it should say 'building architect'. However, for other project types like roads, infrastructure, or parks, they suggested that engineering or landscape professionals might lead, and those teams may not include an architect at all.

Scale: Referencing smaller building projects, participants felt the diagram accurately depicted the architect's role as leading and coordinating the design team. It was noted that architects also take on roles and responsibilities like project manager and client liaison, or planning consultant if the relevant disciplines are not appointed to a project, or the architect may need to coordinate the appointment of these consultants. On larger projects, it was noted that the project manager typically oversees the client's interests, project timeline and "pushing all the buttons"[P12L], while architects were noted as more in line with other

consultants, with additional responsibility for coordinating the overall drawings. The client position was deemed correct at the top of the diagram, and they may take a more, or a less active position, depending on how they work, with some developer clients tending to be quite active, and others deferring more to the project manager.

Stage: Participants generally considered the diagram in the context of a project at planning stage, focusing on preparing for a planning application. Feedback highlighted that the roles of the planning consultant and project manager are notably different before and after planning. Some participants noted that a strong planning consultant can act similarly to a project manager in guiding the project toward planning approval. One participant suggested that the diagram's hierarchy should adapt as the project progresses through various stages.

Participant Feedback on Roles

When revising the diagram (fig38), a building project at planning stage is assumed, which aligns with most participants' approach. Revisions reflect feedback on consultant positions. Footnotes mark specific comments or exceptions. The key points are summarised below:

Architect's Role: While participants generally agreed on the architect's leadership role in building projects, the revised diagram reflects a flatter hierarchy at the 'Nominal Lead Disciplines' level. This change acknowledges feedback suggesting that architects should be on a level with other consultants, yet still central due to their responsibility for coordinating drawing information and resolving conflicts.

Quantity Surveyor (QS): Although QS's do not typically submit documents as part of a planning application, participants recommended elevating their position to the 'Nominal Lead Discipline' level. This reflects the finding in the online survey that budget greatly influences project outcomes. One participant noted *"he [the QS] is always there, with his pen"* [12L]

Planning Consultant: It was recommended to include the planning consultant at 'Nominal Lead Discipline' level. This reflects participant feedback that planning consultants often take on project management roles, at planning stage, steering the project towards approval.

Mechanical and Electrical Engineering: It was suggested to move M+E engineering to the 'Contributing Disciplines' level, due to their typically lesser involvement at planning stage.

Arborist: The interviewees recommended the inclusion of arborists as ‘allied professionals’. They were noted as often working closely with landscape architects advising on tree management, however it was noted that they don’t attend many design team meetings.

Ecologist: The ecologist’s role was stated as typically preparing Appropriate Assessment Screenings at planning stage. Participants noted this role as important but that ecologists are typically less involved in design team meetings. Consequently, their position remained unchanged in the diagram, at ‘allied professional’ level.

Revised Diagram

Within the revised diagram, certain team positions remain unchanged while other have been moved to positions of greater or lesser involvement. The results illustrate the various levels of influence and presence different disciplines hold within the design team and adds further information and depth to existing research on design team organisation and dynamics (Hürlimann et al., 2022; Moosavi et al., 2023).

Additional Participant Comments

While providing feedback to input into the revised diagram, some interviewees proceeded to comment on the effectiveness of this structure in achieving good outcomes both for the project and for biodiversity. The findings of these additional comments show that all participants felt the current organisational structure is suboptimal, and they emphasised the significance of interdisciplinary teams and collaboration for improving project outcomes. Those with experience of broader, more horizontally structured, interdisciplinary (rather than multidisciplinary) teams, commented on how positive they found this method of working, and the impact it had on project success. Additionally, some participants noted the role of a strong project manager, and a strong architect in positively influencing both the team and the overall project.

ORIGINAL DIAGRAM

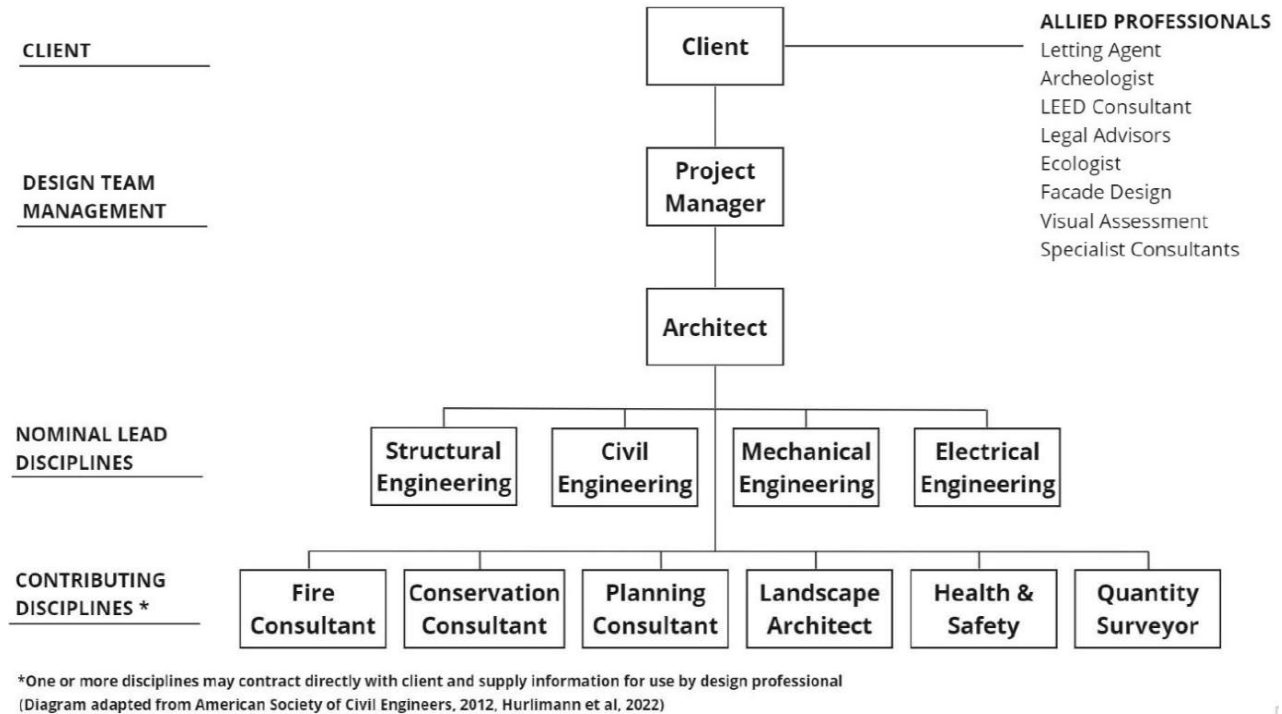


Figure 37: Original diagram shown to participants

REVISED DIAGRAM

DIAGRAM REFLECTS THE PLANNING STAGE, OF A BUILDING PROJECT

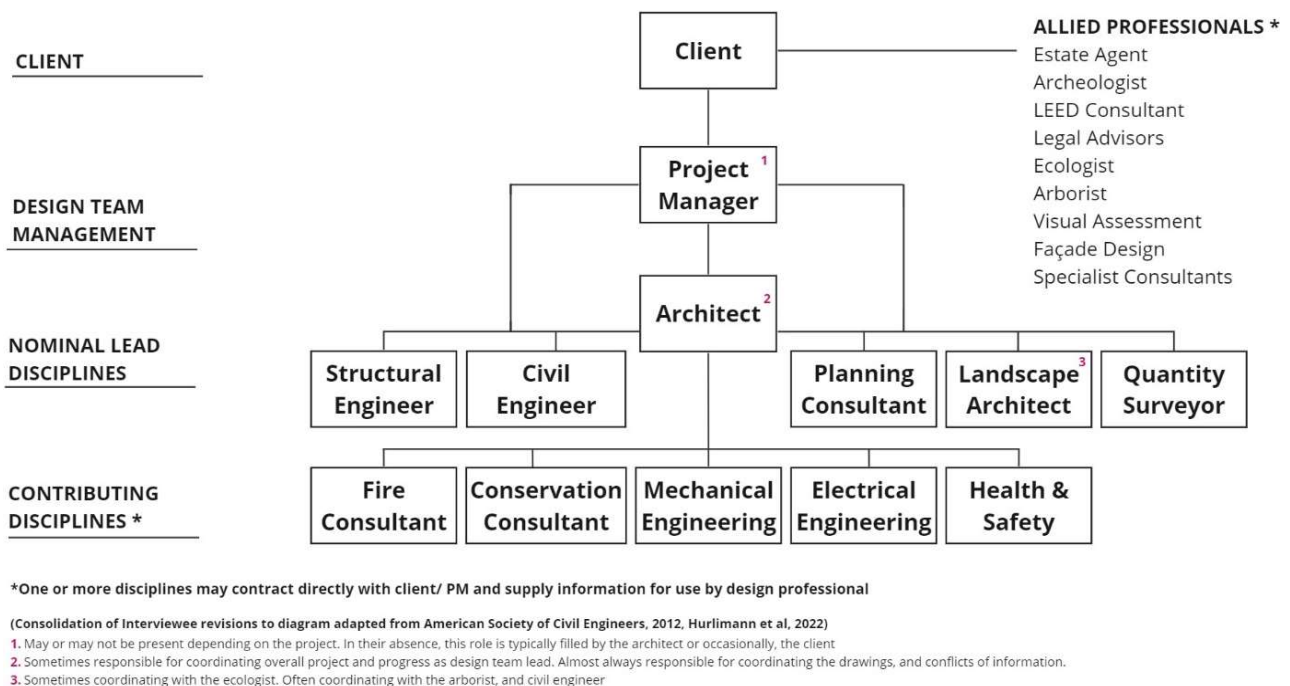


Figure 38: Revised Diagram as per participant feedback in interviews

As a follow up, continuing to look at the design team structure and project stages, the participants were asked: *At early-stage feasibility stage or viability stage of a project, which disciplines are typically involved?*

These findings are summarised below with a list of the professional disciplines, and the percentage of participant responses in which they were mentioned:

Architect	100%
Civil Engineer	44%
Structural Engineer	30%
Planning Consultant	30%
Landscape Architect	22%

Some interviewees noted that certain consultants would be contacted at feasibility stage, to “check something” [P6A], in a broad sense, by way of “are you generally ok with this?” [P8A]. The disciplines mentioned in this regard were: the landscape architect, the quantity surveyor, engineering, and the fire consultant. Participants also elaborated on how the feasibility study process works; clarifying that smaller projects typically have smaller teams. Similarly, large projects (e.g., LRD), use larger teams, and sometimes a master planning layout is included as part of the feasibility study. Interviewees commented that feasibility or viability stage designs are usually about unit numbers: “Can the site accommodate ‘X’? Because we need that to make it viable. And can that viability be squared away in the development plan?” [P12L]. Another called it the “back of the envelope building” [P11L] that then gets put on the site. A third echoed: [The strategy is] “can a car get in and can you plonk enough houses on the site? And they’ll just be working off the square meterage rates, you know? Like the concept is always the same. Sardines. Tin. How many sardines can we get in a tin? That’s it.” [P15A].

The results show that architects are heavily involved at the early stage. One architect described the process as follows: “Those early-stage feasibilities; it’s a director [in an architecture firm] asking you to look at it for two days. It’s speculative - they [the clients] often haven’t even bought the site yet. So, at that stage you’re just ringing someone [another discipline] to check something. But you’re kind of doing it on your own. If we’re talking about viability in a commercial sense, usually it’s just the architect. You can see all the problems that sets up [for ecology] because you’re saying, ‘400 apartments on this site if we build right to the edges’” [P6A].

One landscape architect cited themselves as being involved at feasibility stage of a development, based on projects they had worked on previously. Another landscape architect stated that for approximately 75% of projects, they would receive a site layout drawing on which to price their fee for professional services, as opposed to a brief: *“the architects and the planners have decided what works best and you [the landscape architect] have to work around it. Which isn't the best way, because for changes you kind of have to go back up and start again” ... “If there's mature trees or drainage issues you might move things around ... and with some effort you can get back up and revise it.”* [P7L]

Participants also noted the complexity of the feasibility study process: *“You're given a brief. A week later you're expected to have a presentation with a rough outline of where the building is going to sit on the site. There is no way you can possibly understand that site in that length of time, it's impossible, unless all of the research is done in advance, and that is to hand, and even at that, you will, I would say 100% of the time, be expected by your client to give something that is the most economical and profitable approach to the site.”* [P2A]

Many stated the importance of an interdisciplinary team approach and a holistic site analysis site as the correct first step, based on their own experience. They stated that the best approach is to understand the existing site and its surrounding context from all aspects including, landscape, ecology, biodiversity, topography, transport, strategic planning, public realm, etc.

Next responsibility for biodiversity was discussed, asking: ***In terms of biodiversity, how would that be accommodated within the structure and the responsibilities of the various roles as described?***

Participants here stated that often biodiversity seems like nobody's responsibility, which reflects the online survey findings. They stated that aspects of responsibility fall to various disciplines, and sometimes in between disciplines. Many participants stated that biodiversity should be the responsibility of everybody on the team, which also reflects the findings of the online survey. The discipline most frequently mentioned was the landscape architect, however some noted they felt this was perhaps not the best allocation. Several architects noted they had worked with landscape architects who did not advocate for biodiversity measures beyond minimum requirements, and that because of the timing of the involvement of landscape architecture within the project process – towards the latter stages of design and development – the scope of biodiversity measures often gets reduced. While biodiversity

protection and enhancement does align closely with the landscape architecture discipline, it is not an in-depth part of their training, as seen from Appendix 3. It must also be noted that many landscape architects who took part in the interview and the survey self-reported as advocating strongly for good biodiversity measures on projects. Practitioners stated they found the responsibility for biodiversity difficult at times, due to a lack of support from the wider design team, and due to the number of other responsibilities they carry within their profession. Many participants, both architects and landscape architects, spoke of biodiversity in terms of a 'fight', and a 'battle'. One participant stated: *"you're fighting for a stakeholder that has no voice, so, you know, it's a fight"*[P8A].

The interview progressed to discussing the position of the ecologist, asking: ***How often would an ecologist be part of the design team? And what role do they fulfil?***

While almost all participants stated they would encounter ecologists in the course of their work, the majority noted that ecologists were typically not integrated into the design team. Several interviewees mentioned that in their experience, the ecologist involvement extended only to planning compliance and producing the associated reports such as AA screening. Multiple participants referred to the scope of ecologist involvement as *"a tick box exercise"*. Architects seemed particularly disconnected from ecologists within the team, and several noted that they often never met the ecologist appointed on a project and that they had *"never received any guidance, tuition, or principles, from an ecologist on design"*[P1A]. One stated: *"I learned recently there was an appropriate assessment screening done for a project I was the lead architect on, but I had no knowledge of it. I never worked with the ecologist, and they are not engaged after planning ... it had no impact on the design of the building ... it's a prime example of a box ticking exercise"*[P4A]. Participants distinguished between smaller projects which require AA screening, and larger projects which require an EIA process. On smaller developments, as per the previous quote the design team may not be aware of the report, or it was noted that the *"[AA report] often comes in too late for you to learn anything from it"*[P10L]. Another interviewee corroborated this perspective stating: *"the ecologist isn't brought to every meeting at the start, so the rest of the design team aren't getting their feedback or input at a time when decisions are being made. Probably, without massively changing the development, more could be done just from a process point of view."*[P1A] Larger developments, according to the interview feedback, are more successful when it comes to ecological input, with the EIA process triggering a greater involvement from the

ecologist. Participants noted that in the case of an EIA, ecologists partake in the design development. Firstly, by informing the design: *“the first step is looking at that habitat map and seeing what we need to do. Seeing where we can actually put a building”*[P14A]. Secondly, they assist in refining the design by assessing the impacts: *“their reports and impact assessments had very significant impacts on the design development”*[P10L].

In cases when an EIA process is not triggered, participants highlighted the communication issues caused by engaging ecologists to complete a report somewhat separately to the design team and without adequate briefing on the project or engagement in the overall process. One interviewee noted: *“With the ecologist’s report, it can happen that it says certain things, and it’s almost anti-development, but the site is zoned for development, and the report is full of clangers. And the ecologist thinks their work is done, but we’d all be done if that report went into the planners. We’d be in trouble if somebody reads that line. It’s just that the teams don’t work as teams anymore.”* [P12L]. This situation reflects the ‘tick box’ approach noted by other interviewees. These issues can also result in a poor perception of ecology within development. One participant noted that ecology is *“often seen as the bearer of bad news, because it is getting in the way of time and money”* [P15A]. A landscape architect noted that when talking about existing vegetation or biodiversity on a project, they feel a lack of team support when proposing a good ecological strategy: *“People [other design team members] putting drainage through existing trees and it’s a battle ... It feels like we’re seen as ‘oh here they come again’”*[P12L]. It was noted that at times the ecologist can come under pressure on a project to *“manipulate information sometimes to achieve the desired outcome for the client”*[P6A]. Similarly, one participant noted they are sometimes tasked with *“chatting to the ecologist to get them onside”* [P12L]. The results show that the ecologist is often omitted from the full picture, completing their work in isolation. The design team can then become frustrated at the need to implement mitigation measures after the project is designed.

Participants again noted the importance of interdisciplinary working. Where participants had worked closely with ecologists, they reflected on how they *“learned a lot”* and how the ecologist is *“making the design better”*. Participants, particularly architects who reported having little to no collaboration with ecologists on projects, expressed a desire to know more and to learn more on the topic, which seen in the online survey findings.

In terms of consistency, one landscape architect noted that they found ecologists approaches can *“vary wildly. You have some that are afraid to touch anything, and then another who is not afraid to rework the bed of a stream or create new habitats. It’s mad”* [P12L]. Two of the

landscape architects interviewed have ecologists who work in house, and this was described by both as a very positive situation. They noted the value of having the ecologist “*embedded*” within the team. One stated: “*There’s a constant stream of conversations. It’s an informal way of mentoring our graduates and embedding that, so they [ecologists] share their experience, and things to do, things not to do, and what is the best way to enhance biodiversity*”[P13L].

Overall, participants expressed a strong desire for architects, landscape architects, and ecologists to work more together, and to work better together. They stated that ecologists should be involved earlier, and engaged throughout the project, rather than just for planning. One participant’s suggested approach was to “*keep the science front, clear, and centre. And stop thinking that we can design our way around everything and minimise impact. We’re beyond minimising impact. In order to make informed decisions, you need the science of the site*” [P11L]. Another interviewee echoed this sentiment in the context of the current project process, stating: “*we establish new systems that we feel are appropriate, responding to the environment and the issues we have with the environment, but actually, it’s about stepping back a little bit and seeing what you have and protecting that before you start ripping it all out and putting in a new ecosystem*” [P2A]. In summary, the findings reveal significant opportunities to enhance ecologist involvement in development projects, particularly by improving the scope and sequencing of their input.

In your experience, how do developers and clients regard biodiversity - either as existing on the site prior to development or as part of the proposed project?

The responses to this were quite lengthy and involved. Participants were very engaged in communicating their observations from projects, and shared various interesting anecdotes from their experience. See Appendix 6, to read some of these (optional). The results here focuss on collating and illustrating the key information; the attitudes towards ecology and biodiversity in development projects, and the factors driving the clients or developers, which in turn impact the project.

Many interviewees were not positive when asked how developers and clients regard biodiversity: “*No, not great, now.*” / “*I don’t think it matters to them massively*” / “*they regard it as a risk, something that has to be dealt with*” / “*a necessary evil*” / “*a problem*” / “*a nuisance factor*”.

The discussion points raised varied depending on whether the participant typically worked with large scale developers, or on smaller projects (e.g, domestic)

Large Scale Developers

Some were very direct in communicating their experience, particularly with commercial developers. *“In my experience, developers don’t give a shit, so they will do the absolute bare minimum that they have to do to ... this is why regulation and planning is so important. All they want to do is make money. They don’t care what shite they throw up. So, the only form of protection that we have against them is planning and regulation. And we’ve seen the failure of that over the last couple years, which is why everything is so bad. I think, in my experience, which is quite a negative thing to say: smaller scale clients care more, you know, but the bigger developers don’t...”* [P6A] Another participant echoed this sentiment:

“developers just see it as a problem, because the approach is sardines in a tin, and it gets in the way of their sardines.” [P15A]. The findings noted that it is predominately commercial interests driving the developers and in turn, the projects, as it is part of a commercial developer’s job to *“maximise”*, to *“exhaust the site”*, and to *“make money”*. Almost every interviewee noted that regulations influence biodiversity outcomes: *“It’s forced upon them, because there’s cost associated with it, you’re getting less density on the site, it’s essentially local authority legislation that’s driving it. Anything that we’re not building, isn’t creating a revenue return, or adding to the business model – the viability of the project. If it’s not going to add commercial value, they generally won’t do it. Where it is done, the driver is the local authority requirements.”* [P14A]. Another participant noted *“the reality is that they [developers] will go right up to the edge of legal parameters, and even push beyond it a bit, so you need someone to push back. So that’s where guidance comes in, legal protection, development plan policies.”*[P11L]. While the interviewees stated that many clients and developers do consider the existing ecology and biodiversity on their sites, they noted the motivation is often to *“de-risk”* the project for regulatory compliance.

Participants noted the influence of end user demands on clients’ regard for biodiversity. One interviewee clarified that increasingly, pension funds are seeking to invest only in sustainable projects. Similarly, it was stated that certifications such as LEED, BREEAM, or the HPI are more and more in demand from end users, and this drives the market standard for certain building typologies. The participant noted that where purchasers or tenants expect to see sustainable, biodiversity friendly developments, the developers will embed this into the project, and promote it as part of their lifestyle marketing and PR. *“If it’s required for them*

to have a more sellable product, or to enhance their profit levels, they have no problem doing it”[P2A]. One interviewee noted that this marketing is often centred around landscape features such as “meadows and beehives, or herb planted walls”[P1A]. (Researcher’s note for context: such features are typically not helpful for biodiversity). The overall sentiment of the findings is that developers typically prioritise returns, and provide only the minimum requirement for biodiversity, usually driven by policy requirements. One participant reflected on the situation: “They are still getting the quantum they want in the locations that they want and then it is looking at the landscaping afterwards, and then, that landscaping, it may have a biodiversity strategy, but the reality is what was there before, and how was that impacted, and is that seriously considered or is it just ticking boxes... We still are going to go with the most efficient layout of the site that works, and maximise the site for our client and then we ...ooohhh... is this what you call greenwashing? I don’t know...God...”[P2A].

Participants noted that there are directly competing agendas driven by investors who want to invest in sustainable projects but also want maximum returns. Interviewees stated that in terms of biodiversity, *“it costs money to deal with it, or retain existing features, or with planning and the issues it causes, and the fact that the site isn’t 100% developable, because it’s down to numbers of units.” [P12L] ... “Even if the biodiversity measures are cost neutral, they still wouldn’t be inclined to do it because it comes with a risk. Most developers are conservative because they are protecting an investment point” [P4A]* Another participant noted: *“the market hasn’t rewarded biodiversity” [P15A].*

Smaller Scale Projects

Some interviewees carry out smaller scale work, dealing with many domestic clients and projects. They too reflected on how their clients regard biodiversity noting that the idea can be more appealing for clients than the reality. Once it comes down to *“brass tacks”* and the *“detail”* of what is needed for true benefits to biodiversity, *“you’re into the field of compromise” [P3L]. “The clients are generally open to it in theory, but when it starts to affect the timing of their build, them moving in, their budget; then they become less keen. So, I think so long as it’s not an implication to them, they’re fine with it ... We have projects with swallows, owls, bats, but at the same time the people who own the properties need to be able to upgrade them. It’s a really delicate thing, so it’s all about timing.” [P8A].* One participant used the comparison of other sustainable actions to explain why domestic clients don’t always opt for biodiversity friendly measures, in their gardens: *“It’s kind of like why are people in their cars, rather than on their bikes? ... Or buying milk in the plastic container*

rather than organic in a glass bottle? ... People couldn't be arsed! It's too hard ... the attitude is 'I just want it done. I just want colour' and there's artificial grass, and it just has to look fabulous for visiting friends." [P9L].

Factors that Positively Impact Client and Developer Regard for Biodiversity

Participants championed factors like engaging with nature, education, awareness, and knowledge as drivers of positive outcomes and attitudes towards biodiversity. *"Plastic grass can be a gateway to getting someone out and engaging and before you know it, they're growing raspberries!"* [P9L]. The interviewees noted that clients and developers are becoming more educated and aware, and that this has a positive impact as well: *"When you explain things to people, most people... they may not love it, but they'll get it, if you know what I mean? And then, they're in and it raises awareness around this, as to how important these little spaces and incidentals are and, you know, you have almost like demonstration landscapes and you're trying to mainstream it as such."* [P13L] Participants also noted the importance of understanding how commercial developments work. *"Developers want clarity, so access to a GIS dataset from the outset, so they know 'there's no way I can do anything over here, so I'll have to make this side of the site work'. In terms of developers at pre-planning, its crucial having ecological spatial data"* [P11L]. The value of case studies was also noted, and the Trinity College meadow used as an example: *"It's really important that Trinity have done that, and lots of people won't even notice it on their way there, but that's alright. For someone maybe thinking of doing up their lawn or going the next step it maybe gives them a little bit of braveness to do it."* [P3L].

Variation in Client Regard for Biodiversity

Participants also stated that how clients regard biodiversity often depends on the client or the project. The responses indicated that less commercial clients are more likely to see the value in ecology and biodiversity: *"a university client or something, might see the value"* [P12L]. Similarly, community groups and volunteer groups tend to be more engaged with the landscape: *"When a client is more engaged, like communities, they see something like the corncrake as an amazing asset, that we should be leveraging and working with."* [P15A].

5.3.3 Discussion

The responses highlight shortcomings within the current development process, particularly concerning the design team structure and the engagement of various disciplines. A key issue identified is the timing and sequencing of practitioner engagements, as well as the scope of appointments, notably for ecologists, which leads to inadequacies in addressing biodiversity concerns. Interestingly, participants note the variability in ecologists' opinions, which can perhaps be attributed to the subjective nature of ecology, and perhaps exacerbated by the need to assess existing (real) ecology against proposed drawings and planting lists. The findings also note that ecologists often work in silos, separate to the wider design team. This suggests a need to rethink how ecology is integrated into the development process. It is particularly important to address how ecology is dealt with in the early stages of a project. The speculative nature of viability and feasibility studies, often before a site is even purchased does not allow for the detailed analysis and consideration required to maximise outcomes for landscape and ecology. The results show that the timeframe for these studies, and the scope of professional services and expertise involved at this early stage does not allow for the sort of interdisciplinary, collaborative approach that participants call for. Instead of informing the design strategy, it creates a future exercise in mitigation. The approach seems to compensate for loss, rather than being afforded the time and support to co-design a holistic solution which targets best practice for biodiversity. This is compounded by challenges in how ecology is perceived on development projects. It is repeatedly referred to as a 'risk', or a 'problem', and advocating for biodiversity is described by participants as a 'battle'. This is an issue which runs much deeper than policy or practitioners, it reflects our societal value systems. Despite being "*essential for human existence and good quality of life*" (IPBES, 2019), nature is seen simply as an inconvenience, "*getting in the way of time and money*" [P15A].

The findings suggest that the root of this situation does not lie with the architects, or landscape architects, or ecologists. The interviewees in this study, and the participants in the online survey expressed a resounding interest and desire to improve biodiversity outcomes within their work, and to learn more on the subject. It seems the current system is failing biodiversity. Findings presented in other sections of this research point to a lack of strong policy and a lack of clear and appropriately assigned responsibility for biodiversity within the project team. Overall the findings suggest that the cumulative effects of an unclear and fragmented system create a sub-optimal and fragmented result.

5.3.4 Recommendations

As highlighted in the recommendations from the online survey, the formal assignment of responsibility for biodiversity across project disciplines would offer significant benefits. This approach would designate specific duties around existing ecology and enhancement measures to practitioners such as architects, landscape architects, civil engineers, and ecologists, based on their roles and expertise. It would be supported by tailored education and information on best practice, that is relevant to each discipline and practical for application at a project level. This strategy aims to address the current situation where biodiversity falls through the cracks, often overlooked, and is treated solely as a mitigation exercise. It would create opportunities for good interventions to be integrated early in the process, especially where they do not impact the project outcome or the development budget. Currently, design team members are often unaware of their potential to have a positive influence and similarly, they lack the necessary knowledge and tools for effective action.

Project teams need to evolve to be more horizontal in structure to facilitate collaborative, interdisciplinary working. Furthermore, ecological decision making could be strategized at a higher level, particularly in areas zoned for development, to ensure a consistent standpoint, and to combat isolated work patterns experienced by ecologists. This would establish a cohesive strategic framework and best-practice approach for biodiversity, providing a reference point for ecologists. It would also assist design disciplines in understanding the impacts of their actions and facilitate them in identifying early-stage mitigation measures.

Finally, addressing the negative perception of ecology by clients and developers is a significant challenge. These attitudes undoubtedly filter down through project teams and practitioners, causing far-reaching negative impacts on project outcomes for biodiversity. It reflects a broader societal issue of a growing disconnect between humans and nature. To confront this, two potential solutions emerge. Firstly, through targeting the existing value system in development, which primarily revolves around budget and regulatory compliance. This approach would involve implementing financial penalties or incentives for good biodiversity actions within development. Complementing this would be robust policy and regulation, structured around specific, measurable action steps, with penalties for non-compliance, and incentives for surpassing minimum standards.

The second approach proposes a fundamental shift in our value systems. Instead of assessing development success based on return on investment or maximisation of density, a different

index could be adopted. Considering that nature is essential for human existence, we could measure our project success against the returns for nature and quality of life. This would involve detaching ourselves from our addiction to growth and moving beyond GDP, towards alternative frameworks like the Happy Planet Index (Attenborough, 2020). In terms of our ecological footprint, Ireland currently ranks 121st out of 152 countries on the Happy Planet Index. This is calculated based on the average amount of land needed per person to sustain their country's typical consumption patterns (HCI, 2019), and our score indicates that there is significant room for improvement. While such an overhaul of our value system may seem radical, it is not unattainable. In 2019, New Zealand adopted a new index of success based on its national concerns. The Wellbeing Budget comprised of measures and targets structured around the NZ Treasury's 'Living Standards Framework. This took a four capitals approach – Natural Capital, Human Capital, Social Capital, and Financial Capital to place value on the “assets that generate wellbeing now and into the future” (NZ, 2019). Given our current reliance on financial indexes and the influence of budgets on project outcomes, the integration of natural capital accounting systems into the development process, as suggested by one participant, could be a suitable first step. By translating the benefits of ecosystem services into financial terms compatible with our GDP framework, we can encourage profit-driven actors to recognise the value of nature, rather than the ‘inconvenience’. Ultimately however, to achieve real change we must disrupt economic returns and profit systems to prioritise the quality of our ecosystems over financial gains. As one participant remarked:

“I think we need to treat Mother Nature as sacred, in legislation, and that's very difficult when we see everything as a thing. We see the world as a thing that we can use, not as a living being, and biodiversity forces us to actually challenge that, and to see something as a living being... and that doesn't currently factor into how we do development” [P15A].

5.4 Interview Section 3: Policy and Regulations

5.4.1 Overview

The final part of the interview explored the practitioners' insights into the effectiveness of policy and regulations in influencing outcomes for biodiversity on individual projects. This investigated both the current situation and sought out ideas for future improvements.

5.4.2 Findings

The first question asked participants: ***Q1: What are your thoughts on the current process of design, planning, and development?***

Common topics arose within the responses, and these are set out below:

Importance of Legislation and Development Plans

Participants underscored the vital role of legislation in shaping project outcomes. While European and National policies concerning protected sites were acknowledged as beneficial, development plans were highlighted as particularly influential at the project level.

Interviewees noted that the plans facilitate the advocacy and enforcement of biodiversity measures, giving practitioners leverage when working with clients who might otherwise overlook such measures. One respondent stated: *“There is a preference [with developers] to gloss over a lot of the biological stuff, in terms of like, ‘yeah, there’s policy there but we just need somebody that’s willing to say it’s not that important’ ... and unfortunately those people are there, but the stronger the policy is, the less you can get away with”* [P4A]. It was also noted that while policy (EIAR) for large sites drives early-stage ecological analysis, and the retention of vegetation such as hedgerows, on smaller, more urban sites, existing biodiversity is often overlooked. One participant commented that something like AA screening has *“no impact”* on an overgrown site, and new developments are *“nowhere near as biodiverse”* [P4A]. This reflects the findings of the case study exercise in Chapter 2. One participant stated that some local authorities recognise and designate Locally Important Biodiversity Sites (LIBS), in the development plan, but that this is the exception, rather than the rule.

Planning Compliance

Practitioners emphasised that 'sign-off' requirements and compliance certificates are crucial for implementing biodiversity measures. Responses highlighted that local authorities can request 'as built' drawings, or conduct inspections to ensure landscaping aligns with plans. Multiple responses also noted that although landscape architects are often not involved at the construction stage, recent planning conditions (typically issued by local authorities in the Dublin area) increasingly stipulate that they are appointed for the duration of the project. Without a landscape architect, participants stated that the responsibility for sign off falls to the architect, and this task falls outside their expertise. It was also pointed out that planning conditions work two ways, in that a requirement to agree landscaping with the local authority can also offer the developer an opportunity to revise and value-engineer the scheme (e.g., mature trees revised back to saplings), if they can persuade the council to agree to it. In the absence of a condition, the drawings submitted for planning become the default requirement for the completed development, and participants noted the advantages of this as well.

Local Authorities

The majority of participants remarked that policy varies significantly between urban and rural local authorities, and several noted that in general, local authorities are understaffed and underfunded. Urban based councils in Cork and Dublin were noted as having more robust policies, with participants attributing this to their better resourcing, higher population density, and competitive development environment. In contrast, rural areas were noted as being much 'looser'. This was attributed in part to less experienced staff and the tendency to allocate landscaping and biodiversity measures under the remit of less qualified departments, such as engineering, in the absence of a dedicated parks department. Interviewees also noted that rural , development is less competitive, and the authorities encourage it to bring in levies and to promote growth. Consequently, participants noted that in this situation, it is more difficult to 'argue' with the developer as they know they will likely get planning anyway.

Enforcement Challenges

Enforcement was noted by many participants as seriously lacking across all local authority catchments, and this was attributed to a lack of staff and a lack of knowledge to protect against value engineering measures and the omission of landscape elements. Interviewees

emphasised that planning is outside the remit of the newly appointed biodiversity officers in local authorities. The discussion noted that problems arise “when planning hits the ground”. One participant observed that, particularly outside of Dublin, when they revisit projects several years after completion, elements like playgrounds, trees, and benches will be entirely missing from the development, and that there are no consequences. They stated that the legislation is in place, it is just not enforced: *“It’s all there ... like we don’t need another law from Darragh O’Brien or whatever, we actually just need enforcement”* [P7L]. Policies which underpin enforcement were also praised, and one participant noted that tree protection bonds are often included for large projects, and they have a positive impact on outcomes.

Issues of Competing Interests

The findings suggest that legislation is the most important factor in driving positive outcomes for biodiversity and in its absence, biodiversity is outcompeted by other project factors. Costs again seems to be the greatest is the greatest barrier, and participants stated that outside of legislation, cost neutral measures are easier to integrate. Practitioners expressed interest in achieving better outcomes but suggested that the system doesn’t always facilitate it: *“I would definitely try to advocate for biodiversity, but I would probably run out of steam very quickly.” It ends up in the pile of stuff we can’t afford, like landscaping, and just gets knocked out.”* [P5A].

Future Policy

Some participants warned that there needs to be a balance, when land is zoned for development to ensure that projects are viable. One stated about a project: *“I don’t see how we could have built what was needed and retained biodiversity”* [P4A]. Another noted that there is a breaking point, and going too far beyond the current legislation, could result in a tipping point where projects no longer become feasible, suggesting that the zoning strategy and the biodiversity strategy need to go hand in hand. In terms of the implementation of new policy measures, participants cited policies like BCAR (Building Control Amendment Regulations) or SUDs, remarking that often these are received like *“the sky is falling”*, yet people and projects quickly adapt, and such measures quickly become the norm.

Q2: How could the current process of design, planning, and development be improved?

Overall, the responses to this query can be summarised by one participant's remark stating that *"Like a lot of things, you either need a carrot or a stick, and... I think it's too late for the carrot. I think the stick is more effective"* [P4A].

Compliance and Enforcement Measures

In line with the findings of the first question in this section, when asked how to improve the process, participants emphasised the need for robust, tangible metric-based policy measures to drive impactful change. However, they warned that specific requirements, such as stipulations for native planting need to be appropriate for the development setting. Several interviewees recommended financial incentives, such as fines for non-compliance, and restrictions on sign-off which can impact client's loans, when certificates are needed to release funds. Payment incentives for developers were suggested as a means of encouraging land allocation for biodiversity, which it was noted is a common approach in agricultural schemes. In addition, the introduction of green capital accounting frameworks was noted as a possibility for ensuring biodiversity measures can be calculated, and are taken seriously, either as a financial allocation or a space allocation within a development. The importance of enforcement was again noted, with pre-development site clearance being cited as an issue.

Education and Early-Stage Integration

Many participants recommended that biodiversity should be considered from the beginning of a project. They also noted, as in previous questions the importance of creating interdisciplinary environments, with early involvement from ecologists. Additionally, participants recommended educating architects about ecological considerations. One participant described how the current process works regarding this: *"For things like feasibility studies, they [ecologists] are just not going to get asked. And once the client sees the bottom line, that's what they want. You know what I mean? Once they see they can get four hundred apartments on the site, they're not going to drop to three hundred, because there's, you know, a really important to habitat all along the left boundary. Like, they're just not. Whereas if you knew, if the architect knew about the importance of the boundary to the left, then they would only say you could get three hundred."* [P6A]

Policy, and Development Process Improvements

Suggestions for process improvements included introducing targets and checklists for protection and enhancement measures. Improving site assessments by using local authority information and GIS datasets was recommended to help designers and developers understand the site context and ecology. Similarly, participants stressed the importance of joined up thinking with regards zoning and ecological connectivity. They noted that sites at various stages and in various ownerships are all needed to work together for landscape connectivity to be achieved, and this needs to be embedded early in the process as well as in policy. It was recommended that local authority catchments should map and monitor existing ecology to prevent further loss. Enhancing public realm policies, such as widening greenway cycle paths and requiring developers to allocate green space, was also proposed by participants.

Regarding the policy process, all participants deemed the planning and development plan stage as most suitable for incorporating biodiversity measures. Additional suggestions included introducing a building regulation; 'Part N, for Nature', and noted that regulations are much stricter, tangible, and metric-based than planning policy, and they are also more tangible, and metric based. Another participant stated that the certificate of compliance with planning was an appropriate mechanism if correctly implemented and enforced.

Cultural Change

Finally, it was noted that a change in culture is needed to view biodiversity measures as opportunities rather than constraints. Engaging the public with small-scale, tactile interventions and fostering long-term environmental stewardship through co-creation processes were also highlighted as essential to improving overall outcomes.

Q3: What measures would you suggest for educating architects or landscape architects and assisting them in advocating for biodiversity in their work?

The responses to this question overlapped somewhat with the last answer, however many suggestions were made as to the information needed to assist architects and landscape architects in accommodating more biodiversity measures into their work.

Improved Education and Information

Participants emphasised the need for better education and information on biodiversity, particularly for architects and engineers. It was suggested that biodiversity should be taught in colleges and one participant felt that that knowledge enhancement would boost professionals' advocacy for biodiversity actions in their work. Another participant argued that biodiversity measures are outside the remit and 'bandwidth' of architects who already have extensive responsibilities on projects. It was suggested that biodiversity agendas are better placed with landscape architects.

Format of Educational Information

Limited 'bandwidth' is reflected in the preferred format of information that participants suggested. Almost all responses noted that educational material should be clear, specific, focussed, concise, practical, tangible, appropriate to their field of work, applicable to projects, and metric based where possible. There was a strong preference for simple messaging, the use of images, diagrams, measurements, case study examples, and site visits to communicate interesting, engaging, and helpful information in an effective way. Clear specification and instructions were much preferred. A participant shared an example of their experience: *"one ecologist from about 5 years ago, was like 'only do one type of a bird box, it's a Schwegler, I'll tell you which ones to pick from' ... and I was like, 'Thanks! That is exactly what I need to know!' ... And they're like 'hang it this direction, facing this way, on this particular kind of tree, and put these ones on the building elevation... and goodbye!'"* [P10L]. A toolkit approach was preferred over a rule book. Several times elements like 'toolkits', 'checklists', 'brochures', or 'shopping lists' were mentioned, reinforcing the need for clear information. Discussions with landscape architects found that the 'toolkit' approach is also helpful for standardising actions that are repeatable. Participants noted that the same interventions are taken again and again such as site analysis, tree protection, habitat protection, tree pits, etc.

They emphasised there is an opportunity to create standard best practice approaches, using existing knowledge and resources to assist in rolling out high-standard solutions at scale. Digital information was also preferred. Interviewees remarked on the importance of existing datasets, maps, GIS, and satellite imagery in providing site information and influencing outcomes for biodiversity. Reports, for example for planning, that are produced as static PDFs were criticised and a preference for dynamic, digital data was strongly expressed.

Existing Guidance, Knowledge Sharing, and CPD

Participants repeatedly noted the vast amounts of good information already available, but that it needs to be collated, synthesised, and made ‘digestible’ for people to apply in their work. It was also noted that due to the urgency and the scale at which measures for biodiversity need to be implemented, we should collaborate and share knowledge where possible, rather than different organisations each doing “*their own little thing*” [P15A]. One participant noted that publications can sometimes be too static for topics like biodiversity, because best practice is constantly evolving and the advice changing. Sources such as webinars, lunchtime talks, and CPD events were all cited multiple times as being helpful for upskilling, and that CPD content for architects around biodiversity is currently lacking. Interviewees also noted the value in inviting ecologists, arborists, and entomologists to speak to architects or landscape architects as they share valuable information and heighten awareness. It was noted that landscape architects play a role in educating the wider design team, but they are often involved too late in the project process to have a significant influence on outcomes. One participant noted that there is also great benefit in having a landscape architect working within an architectural practice, to embed shared knowledge between the disciplines.

Information Subject Matter

In terms of topics of information, many participants desired to have greater knowledge of the existing site, to inform their design approach. It was suggested that to communicate the value of existing sites and to inform the site layout, architects should receive a base drawing from the outset, which shows information on the site-specific ecology and trees. It was noted that this could be derived from existing datasets and satellite imagery, and that ground truthing and more detailed surveys could be carried out as the project progresses, which is currently the norm anyway. One interviewee suggested this could take the format of a heat map, which

shows zones of lowest to highest biodiversity on a site, and which could be used to guide the site layout. This would prevent misinformed assumptions being made. They likened the process to how an architectural conservation inventory and statement of significance would guide interventions in a protected structure. Again, GIS information was noted as paramount in disseminating good information and the influence that could have in guiding development plan zoning and site selection by developers. It was suggested that this would evolve to also identify areas for restoration, wildlife corridors and green infrastructure. The need for an overall comprehensive strategy was stressed, beyond existing building and road layouts.

Other Suggestions

Other suggestions put forward included education around the impact of development on biodiversity, and communicating to architects the various incentive schemes for private landowners such as tree planting and meadow creation. The importance of incentivising nature restoration was noted. It was suggested that to create large scale change, we need to look beyond the local authorities. One participant noted how existing networks like the GAA encourage community-led action. They also stated that a vegetation map of Ireland, as if humans didn't exist, which shows the standard native vegetation, would be very useful to inform how our landscape could or should naturally look. Another suggestion was a points scheme, which quantified biodiversity loss on a site and offered opportunities to choose interventions to regain lost points. The participant used an example that if lost vegetation caused a two-hundred-point deficit, then there would be a 'shopping list' of measures with allotted points to assist an architect in offsetting the original impact. Finally, to assist with the sectoral shortage of ecologists, it was suggested that a qualification system for architects and landscape architects be developed to formally recognise different grades of ecological knowledge in each profession. This was compared to existing system in place for architectural conservation, which sets out different grades; I, II, and III of conservation architect. Architectural heritage projects, protected structures, and national monuments require that practitioners working on them must have the appropriate conservation qualification. It was suggested that this system could be replicated for ecological knowledge and projects which impact biodiversity.

5.4.3 Discussion

The findings show that policy and development plan requirements have the strongest influence over project outcomes and are most effective when objectives are specific and measurable. However, it is essential that these are supported by targeted planning conditions and enforcement measures to ensure positive biodiversity actions follow through to project completion. This is somewhat lacking currently, due to a shortage of resources in local authorities. Furthermore, there is a significant disparity between targets and outcomes for biodiversity in rural catchments when compared to urban areas. Penalties targeting project finances or completion certificates have been shown to encourage compliance, which relates to earlier findings around the influence of budget on a project.

The fieldwork found great passion and interest in biodiversity measures among architects and landscape architects, and this drives enthusiasm for further education, which was also seen in the online survey. Given the broad range of responsibilities that both disciplines undertake within a development project, educational content must be concise and practical, using tangible examples and metrics where possible. There is a need to share, synthesise, and collate existing information, in a 'toolkit' type approach, to assist with rolling out best practice interventions at scale. Similarly, the use of existing digital resources is encouraged to generate a baseline ecological site map which can inform further site assessments and guide design decisions from an early stage. As is apparent in earlier findings, an interdisciplinary, collaborative approach generates better outcomes for biodiversity and the involvement of ecologists is essential for integrating biodiversity considerations. Overall, the findings show that there is room for improvement in our policy frameworks and implementation.

5.4.4 Recommendations

While difficult to achieve in the short-term, biodiversity outcomes could be improved through better resourcing for local authorities to expand their teams of skilled and experienced ecologists, environmental managers, and data analysts. This would facilitate a review of the current status of biodiversity within every county catchment across the country, which in turn would generate coherent, strategic solutions, identifying areas for conservation, restoration, and for the creation of diverse habitats and corridors. It would also provide the resources to enable applications for development to be objectively and independently reviewed by specialist practitioners, who can assess the impacts in the context of a strategic

plan which they themselves created. Currently, individual ecologists are working on individual proposals, typically targeting mitigation rather than optimisation for biodiversity outcomes. They are limited by the conservation driven approach of European legislation (as was apparent in the case study in chapter 2) and restricted by the competing interests of the developer and the wider team members. Furthermore, due to project sequencing as discussed in section 5.3, their involvement is often too late in the project process to have any meaningful impact on the outcome. Similarly, ecologists may not be aware of strategies like wildlife corridors within the development plan, as their remit is for legislative compliance in the context of AA screening or EIA.

A radical, yet arguably appropriate solution would be to novate the services of these isolated ecologists working on individual projects, over to the local authority. Rather than reviewing the development on behalf of the developer, they would review on behalf of the local authority, liaising with the in-house ecology team. This could be funded by development contributions, or fees on applications, so rather than commissioning an ecologist to do a compliance report, developers support a centralised team of ecologists who assess, give feedback, and collaborate with design teams to work towards county-scale coherent objectives for biodiversity. Essentially, if a developer wants to develop a site, they pay the local authority to do a site-specific ecological assessment, in the context of the county-wide strategy and objectives. This could be carried out at pre-planning or feasibility stage to inform the site approach, rather than mitigate it. Furthermore, this would facilitate a more coherent approach to data collection. The local authority could define which surveys need to be carried out and using which method. The findings could be collected, stored, and digitised in a standardised manner, which adds to the local authority database. In a time of capacity crisis within the ecology sector we need smart solutions, ones which extend the reach of our experienced ecologists, and avoid static, reductionist information which is only relevant in the context of the project it relates to.

Another approach to strengthen the impact of policy is to target specific, measurable, best practice objectives for biodiversity within the development plan guidelines. These are already in place for elements like bicycle parking and car parking. It would create non-negotiable, clear objectives, which are ultimately easier for design teams to implement because they are specific. Although this may be challenging to design at a local authority level, as the landscape often varies significantly through the county catchment, it has been done. South

Dublin County Council have introduced the green space factor calculation, and the feedback on this was positive when it came up in the interviews.

There is a need for better education on biodiversity, especially among architects and engineers. As was recommended in the online survey chapter, a very simple exercise to assist with this would be to collate all of the best practice documentation that has been produced to date, regardless of which local authority or organisation produced it, and host it in one location. This would cover topics such as site analysis, habitat protection, standard details, biodiversity enhancement measures, and so on. Including a corresponding checklist to guide practitioners on which actions to incorporate at which stage of the project, would also assist them in incorporating biodiversity best practice into their projects.

Finally, the lack of enforcement measures was identified as having considerable negative impact on biodiversity outcomes at project level. In the absence of resources at local authority level, the capacity to combat this issue must be afforded to design team members, in particular the architect, engineer, or surveyor who is signing off on the opinion of compliance with planning permission. This can be facilitated through an increase in the inclusion of robust planning and compliance conditions within the local authority grant of permission. While hosting this responsibility within the developer's design team creates a potential issue of conflict of interest, it offers an interim solution to a lack of resources. To further assist with limited resources, an ecological grade qualification framework could be designed for architects, landscape architects, and engineers. This would mean on certain sensitive or locally important sites; the design team would be required to have additional qualifications in best practice for ecology. This would be similar to the current system that is in place for conservation grade architects (RIAI, 2019).

Overall, the feedback on policy offers good insight into its effectiveness at the individual project level, and in turn reveals some areas for targeted improvements.

CHAPTER 6

CONCLUSIONS

6.1 Summary Findings, Recommendations, and Conclusions

Below sets out the research aims and objectives, and the corresponding research studies that were conducted as part of this thesis to execute the objectives.

Aim 1: Using informal wild space as a representation of ‘nature-led’ urban biodiversity; understand how it is perceived and regarded as a typology of urban space and land use.

Objective 1: Gain insight from practitioners of architecture and landscape architecture into societal attitudes towards wild space and its ‘acceptability’ as a typology of space/ land use.

Research: Chapter 5 - Interview Part 1: Societal perceptions of urban wild spaces, design perspectives, and thresholds of acceptance of informal wild space.

Objective 2: Examine how wild space is regarded by environmental policy and legislation, through analysis and a case study example.

Research: Chapter 2 - Policy Review: Analysis of policy framework. Case study to test how urban wild spaces navigate this system.

Aim 2: Understand how biodiversity in general (not specifically wild spaces) is considered within the design, planning, and development process, and identify areas for improvement.

Objective 1: Gain insight from practitioners of architecture and landscape architecture into the roles, responsibilities, and dynamics of the project team and understand how biodiversity outcomes are affected by these factors. Explore the role of knowledge.

Research 1.1: Chapter 4 - Survey: Responsibilities for biodiversity. Knowledge and knowledge sources. Measures used. Team dynamics. Impact on biodiversity outcomes.

Research 1.2: Chapter 5 - Interview part 2: assessing the design team structure, roles, and responsibilities, knowledge, and the impact this has on ecology within the development project process.

Objective 2: Document practitioner experience of the effectiveness of policy and development processes with regard to its impact on biodiversity outcomes at the project level.

Research 2.1: Chapter 4 - Survey: Factors influencing project outcomes.

Objective 2.2: Chapter 5 - Interview part 3: understanding how policy and regulations influence the project process and outcomes for biodiversity. Exploring recommendations for improvements.

Summary Findings and Recommendations

There was a degree of overlap and repetition within certain aspects of the findings and recommendations. The results are summarised as succinctly as possible, using relevant headings, and with reference to the questions and gaps in the literature that were set out in section 3.2. Findings have been discussed in detail in the previous sections and so the objective here is simply to provide an overall summary, and relate back to the literature.

6.1.1 Perceptions - Findings

The interview and perception study exercise showed that there are many factors which influence societal attitudes towards informal wild spaces including context, land use, intent, accessibility, usability, education, communication, and aesthetics. Safety and sanitation emerged as core topics which influence positive perception and play a key role in defining the threshold of acceptability for urban wild spaces. Access has a considerable effect on the social integration of informal wild spaces into the built environment and was also identified as having a strong influence on acceptance. These findings assist in closing a knowledge gap around nuances in acceptability identified by (Hoyle et al., 2017). Despite the ecological benefits of minimal disturbance, participants expressed a desire for shared use and engagement with these sites, demonstrating a preference for co-benefits, rather than a sole use for biodiversity. Furthermore, participants repeatedly noted the importance of communication tools for increasing acceptability and understanding around these spaces, which is interesting in the context of (Southon et al., 2017, 2018) who found that information on the benefits of meadows, increases tolerance for winter aesthetic. Finally, a key finding was apparent around the significance of legibility within the built environment, revealing that a clear understanding of the intention, purpose, and meaning of a space plays a pivotal role in the acceptance of that space. Interview participants discussed and sought clarity on the purpose of sites, often proposing interventions to make spaces more legible and understandable to the public. Many of their concerns lay with social and built context rather than the ecology, suggesting that clear communication of the social context could potentially decouple negative perceptions from ecological character. Overall, the findings suggest that increasing legibility, facilitating access, and promoting engagement with nature could significantly improve perceptions of urban wild spaces. This adds to the research and discussion of (Gobster et al., 2007) on the role of context in landscape perception and the aesthetics-ecology relationship. It also relates to (Nassauer & Opdam, 2008) who suggest that design research should investigate the landscape patterns that are valued by society.

6.1.2 Perceptions - Recommendations

The findings show that urban vacant sites can evoke negative reactions and calls for development to utilise these spaces. A lack of public communication and understanding around the intention or purpose of such sites exacerbates this issue. Furthermore, delays in development trigger developers to install fencing, hoarding and to conduct intermittent

vegetation management, often using herbicides which negatively affect biodiversity. One suggested solution to this is to formalise the assignment of urban wild spaces as temporary green infrastructure from a land use perspective, incentivising developers to manage the sites for biodiversity while they await development. Moreover, guidelines could be issued for the management of such sites prohibiting sealed surface treatments and supporting organic methods of vegetation maintenance. Public engagement with spontaneous nature could be improved by facilitating access to urban wild spaces using modular walkway systems and seating. The provision of communication tools detailing the purpose and intention for these sites would also influence positive perceptions. Developers could be incentivised to implement these solutions through reductions or exemptions in the vacant sites levies. These recommendations relate to the need for assigning purpose and legibility to urban wild spaces.

6.1.3 Policy - Findings

The findings both in the policy analysis study, and the interviews show that in the Irish context, our National legislative frameworks, informed primarily by the European Habitats and Birds directives, have a conservation-driven approach which focusses on the protection and restoration of pristine historic ecosystems, prioritising rare and threatened species and habitats. This approach does not value ecological function which causes many biodiverse sites, including urban wild spaces to be overlooked. This finding validates the recommendation of (Lennon, 2015), that if Novel Ecosystems are to be represented in policy, a move away from traditional objectives is necessary. Within the development process, the impact of a project proposal is typically evaluated based on its effect on designated habitats and species, neglecting site-specific biodiversity and unprotected species. This undesignated nature often falls victim to site clearance measures, carried out by developers and landowners to simplify the planning process and minimise the need for ecological surveys. Furthermore, the current system overlooks the cumulative depletion of this unprotected biodiversity across multiple site and developments, resulting in a creeping loss as wild spaces are gradually yet steadily removed from our urban landscapes. Within local policy, the development plan requirements can strongly influence project outcomes, however they sometimes lack specific and measurable targets within the objectives leading to inconsistencies across projects and loopholes in positive action. Participants welcome the tangible objectives that are in place in some development plans, noting the positive impact they have on outcomes for biodiversity. Interviewees repeatedly mentioned the disparity between urban and rural catchments when it

comes to development plan objectives and planning enforcement. Rural areas were noted as much more lenient, however the lack of enforcement seems to be an issue across all local authorities. A shortage of suitably skilled resources is a significant factor in the issues with local level policy. This has an impact on enforcement and also on the independent evaluation of planning proposals, leading to a reliance on applicant-submitted reports. An increase in skilled resources could have a significant impact on biodiversity outcomes as targeted planning conditions, enforcement measures, financial penalties, and restrictions on planning certificates were all shown to increase compliance among developers. Overall, there is room for improvement within our policy systems and the research findings show that theoretical concepts do not always translate effectively into practice.

6.1.4 Policy - Recommendations

Implementing robust policy measures at both a site and landscape scale is essential for translating intentions into on the ground actions. Participant feedback on the current policy system reveals areas for targeted improvements. The impact of policy could be enhanced through the inclusion of specific, measurable biodiversity objectives within development plans. Furthermore, practitioners could be afforded greater influence on the development outcomes through the increased inclusion of robust planning and compliance conditions within the local authority grant of permission, which would target the certificate of opinion on compliance. Ecologists in the current situation are often working in isolation, and their influence on design outcomes is limited by legislation and project sequencing. To combat this and to assist with the lack of skilled resources at local authority level, ecological assessments for development could be hosted within the local authority, yet still financed by developers. This would facilitate a greater alignment of individual site proposals with county wide biodiversity objectives and allow a coherent approach to data collection. Finally, to assist with the skills shortage within the ecological sector, an ecological grade qualification framework could be introduced for architects, landscape architects, and engineers. This would reflect the system used in architectural conservation and would require practitioners to hold a certain skill level qualification if they are working on ecologically sensitive sites.

Adding to knowledge on how to integrate biodiversity measure into planning is critical (Filibeck et al., 2016), these findings and recommendations provide valuable information for the Irish context.

6.1.5 Knowledge and Education - Findings

On the subject of biodiversity, architects were reported as less knowledgeable than landscape architects, which is to be expected, however both disciplines demonstrated great interest and enthusiasm for further education. Current sources of knowledge on biodiversity included other consultants, structured learning, and project experience. In addition, participants also obtained knowledge through personal interest and unstructured learning. This creates a potential issue around incorrect information being applied to projects. Participants cited ‘formal training for architects’ as the most pressing knowledge need to be addressed. This finding addresses a gap in the knowledge pool identified by (Graça et al., 2022). Knowledge sharing around positive design interventions for biodiversity in the online survey (Q9, 10, 11) was considered ‘interesting’, ‘impactful’, ‘helpful’, and ‘inspiring’, by the vast majority of participants, suggesting it may impact both agency and action. This addresses a gap identified by (Gobster et al., 2007; Moosavi et al., 2023; Nassauer & Opdam, 2008) around the efficacy of knowledge interventions, their impact on agency and action. The findings of this study, although from a small sample (n=44) suggest further research on this topic may be worthwhile. Regarding education, the findings show that there is a lack of awareness, education, and practical information to ensure positive biodiversity measures are embedded early in the design process. This suggests a need for targeted education within the design professions. Participants expressed a strong desire for information that is concise, practical, and relevant to the various disciplines and responsibilities within development projects. The use of case studies, examples, and tangible metrics were strongly recommended to ensure engagement and application of the measures by practitioners within their projects. These findings relate to the literature by way of addressing gaps around teaching ecology to noncognate professionals (Grose, 2014), understanding what knowledge practitioners feel is needed (Graça et al., 2022), teaching climate-responsive design to professionals (Klemm et al., 2017), suggesting better techniques to provide guidance to practitioners (Harris et al., 2016), and making ecological knowledge available and usable to architects (Weisser et al., 2022). The interviewees noted that there is a wealth of good information already available, however it needs to be collated and synthesised, with several participants suggesting a ‘toolkit’ type approach. Finally, interviewees stressed the importance of using digital resources, existing datasets, GIS, and satellite imagery to facilitate ecological site mapping and inform design approaches, while warning against the production of static information.

6.1.6 Knowledge and Education - Recommendations

The findings show that comprehensive best practice documentation, toolboxes, and checklists for architects, engineers, and landscape architects are required to ensure biodiversity measures are incorporated into projects effectively. This could be further supported by communicating the benefits for biodiversity and humans, and by utilising case studies, and tangible examples to increase familiarity and certainty around nature-based solutions, as per Appendix 4. Furthermore, discipline-specific formal training on biodiversity actions for practitioners is needed. A step back solution to this is to compile a central database of reputable biodiversity information sources, accessible by practitioners to inform their designs.

6.1.7 Roles and Responsibility - Findings

The results show that there is a lack of clear responsibility for biodiversity on projects. This finding aligns with the study by (Harris et al., 2016), and adds greater detail in terms of where responsibility is allocated, and the design team dynamics. Landscape architects were the top practitioner identified in the online survey as having responsibility for biodiversity. Interestingly, ecologists finished third, after architects. Given the parameters of their training (Appendix 3) and their numerous other project obligations as reported in the interviews, it must be questioned if it is either fair or appropriate to place this duty with landscape architects. It may be more practical to instead assign responsibility across all disciplines based on their knowledge and role within the project team. This unassigned and misaligned responsibility for biodiversity causes it to fall through the cracks on development projects. The scope and timing of ecologist involvement also contributes to shortcomings for biodiversity, with compliance around ecological impacts often seen as a ‘tick box exercise’. Consequently, ecologists often work in isolation and are rarely involved at the early stage of design proposal to assist with decision making. Similarly, landscape architects are often brought into the design team after the project strategy has been agreed.

6.1.8 Roles and Responsibility - Recommendations

The assignment of clear, formal responsibility for biodiversity across all project disciplines and development stages is needed to ensure its integration into the project process. This would involve allocating designated duties for architects, landscape architects, civil engineer,

and ecologists, supported by tailored education and best practice information. This approach should use measurable targets where possible and could integrate independent reviews to ensure best practice. The aim of this is to address the current situation where biodiversity measures are often overlooked and treated as a mitigation exercise.

6.1.9 Project Process - Findings

As mentioned above, the timing and sequencing of practitioner engagements, coupled with the scope of their appointments, particularly for ecologists, are identified as key issues which lead to inadequacies in addressing biodiversity concerns within the project process. For early-stage feasibility studies, particularly with smaller projects, there is little to no specialist input on the impacts to ecology. When reviewing the design team structure, participants maintained the role of the architect as design team lead and elevated the landscape architect and quantity surveyor from ‘contributing disciplines’ to ‘nominal lead disciplines’. The ecologist remained in the position of ‘allied professional’, which is in line with the comments of the participants that ecologists often work independently and are sometimes siloed from the core design team. These findings are relevant for the existing literature as they address a knowledge gap identified by (Hürlimann et al., 2022), around providing research on the power and influence of different actors in the built environment process. Despite the willingness of practitioners to advocate for biodiversity, it was often described as a ‘battle’. The use of case study examples as well as communicating the benefits of biodiversity were cited as having a positive influence on the integration of biodiversity measures into projects. However, ecology is often perceived by developers as a ‘risk’ or a ‘problem’. Furthermore, client priorities and budget constraints emerged as significant barriers to integrating biodiversity measures into projects. This reflects deeper aspects of our societal value systems which prioritise factors such as time and money over outcomes for nature and quality of life. Understanding this can inform how we promote the inclusion of biodiversity measures into projects, either through targeting factors like the budget, or introducing new frameworks to measure development success which value nature and quality of life. Ultimately, there is a need to rethink how ecology is integrated into the development process, especially in the early stages of a project, as current practices often lead to a future exercise in mitigation rather than a proactive approach to biodiversity friendly design. The positive influence of interdisciplinary working and collaboration on outcomes for biodiversity was noted by many of the interview participants. Facilitating this approach may be an appropriate first step in improving the project process.

6.1.10 Project Process – Recommendations

The project process could be improved by collaborative, interdisciplinary working. This could be supported by novating the appointment of ecologists who assess development projects impact over to the local authority, rather than the current process of direct employment by developers. The developers would simply pay the fee to the local authority, rather than the ecologist. This adjustment would allow ecological strategies, decision making, development impacts and data management to be centralised in the local authorities. It would also reduce the potential for conflicts of interest that sometimes arise when ecologists are employed directly by developers. The negative perception of ecology by clients and developers reveals the priorities driving projects – mainly the budget. Two possible solutions to this are suggested: targeting the current value system through the integration of natural capital accounting to place economic value on ecosystem services or reinventing the value system entirely using a new framework like the Happy Planet Index.

6.2 Conclusion

The research findings offer important insights into dynamics and factors that influence the development process and suggest potential solutions for enhancing biodiversity outcomes. Repeating patterns are presented which address gaps in the existing literature and build upon current findings, either providing validation or expanding the knowledge base. Additionally, key findings and recommendations regarding societal perceptions of urban informal wild spaces may have broader relevance, beyond the Irish context.

Notably, there has been limited research involving architects, with only two studies identified in the literature review (Grose, 2010a; Hürlimann et al., 2022), neither of which focused on biodiversity. Additionally, many of the research topics explored in this study have not been previously examined in the Irish context. These factors highlight the relevance and necessity of this research, as well as its implications for design, planning, and policy.

Design plays a critical role in shaping the built environment, not only reflecting cultural norms but also influencing them. Prioritising biodiversity outcomes in the design process can promote sustainability, ecological stewardship, and a culture of environmental responsibility, helping to regain balance between land development systems and nature conservation.

All things in nature have a shape, that is to say, a form, an outward semblance, that tells us what they are, that distinguishes them from ourselves and from each other.

Unfailingly in nature these shapes express the inner life, the native quality, of the animal, tree, bird, fish, that they present to us; they are so characteristic, so recognizable, that we say, simply, it is "natural" it should be so. Yet the moment we peer beneath this surface of things, the moment we look through the tranquil reflection of ourselves and the clouds above us, down into the clear, fluent, unfathomable depths of nature, how startling is the silence of it, how amazing the flow of life, how absorbing the mystery! Unceasingly the essence of things is taking shape in the matter of things, and this unspeakable process we call birth and growth. Awhile the spirit and the matter fade away together, and it is this that we call decadence, death. These two happenings seem joined and interdependent, blended into one like a bubble and its iridescence, and they seem borne along upon a slowly moving air. This air is wonderful past all understanding.

Yet to the steadfast eye of one standing upon the shore of things, looking chiefly and most lovingly upon that side on which the sun shines and that we feel joyously to be life, the heart is ever gladdened by the beauty, the exquisite spontaneity, with which life seeks and takes on its forms in an accord perfectly responsive to its needs. It seems ever as though the life and the form were absolutely one and inseparable, so adequate is the sense of fulfilment.

Whether it be the sweeping eagle in his flight, or the open apple-blossom, the toiling work-horse, the blithe swan, the branching oak, the winding stream at its base, the drifting clouds, over all the coursing sun, *form ever follows function*, and this is the law. Where function does not change, form does not change. The granite rocks, the ever-brooding hills, remain for ages; the lightning lives, comes into shape, and dies, in a twinkling.

It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form ever follows function. *This is the law.*

Louis H. Sullivan.

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APPENDIX 1:

Case Study – Planning Application Extracts

2019 Application

SUMMARY OF PLANNING PROCEDURES & PLANNING ISSUES DISCUSSED	
Planning Application Procedures/Regulations, Public Notices:	
Protected Structure: YES: ☐ NO: ☒	E.I. S. Required: YES: ☐ NO: ☒
Within an A.C.A.: YES: ☐ NO: ☒	Within an S.D.Z.: YES: ☐ NO: ☒
Within LAP Area: YES: ☐ NO: ☒	Appropriate Assessment/Screening: YES: ☒ NO: ☐
Floor Risk impact Assessment D.o.E. 2009: YES: ☐ NO: ☐	

Extract from pre-application consultation – 25/08/2016

Level of assessment completed	Stage 1 Screening
Overall conclusions	
There is no possibility of significant impacts on Natura 2000 sites, features of interest or site specific conservation objectives. A Natura Impact Statement is not required.	

Extract from consultant AA Screening report showing not NIS required

The use of natural resources, in particular land, soil, water and biodiversity.	This is a brownfield site with cover of greenhouses many of which had broken glass and concrete paths. <u>Native biodiversity on site has been assessed by the project ecologist as being poor with opportunist species such as buddleia (<i>Buddleja davidii</i>) present throughout the site. No flora or fauna of conservation importance were noted on site.</u> The proposed development will improve the current situation in terms of surface water and run off. No substantial excavation to facilitate the proposed development is proposed.
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Extract from developers planning application report

SITE VISIT AND ECOLOGICAL ASSESSMENT

A site visit was carried out on the 18/12/2018. The proposed development site (Figures 1 & 2) comprises primarily of the built structures (greenhouses) and hard standing areas (Plates 1-3) with a perimeter of scrub (WS1), hedgerows (WL2) and treelines (WL1) with isolated areas of Flower beds and borders (BC4). The majority of the greenhouses were inspected but extensive vegetative growth within some greenhouses and in scrub areas prevented a detailed faunal assessment.



Plate 1: Green houses



Plate 2: Greenhouses



Plate 3: Scrub around the perimeter of the greenhouses.

This is a brownfield site with cover of greenhouses many of which had broken glass, concrete paths and in many areas were devoid of water so vegetative growth was poor. In areas of broken roof glass vegetative growth was greater. Native biodiversity on site was poor with opportunist species such as buddleia (*Buddleia davidii*) present throughout the site. No flora or fauna of conservation importance were noted on site. However, the survey was outside of the ideal flora survey window. No records of threatened or legally protected plant species are known to occur within the site (NBDC and NPWS data (fine resolution)). Several records of Common frog (*Rana temporaria*) were found in the vicinity of (but not within) the proposed site. There are no ponds on site but there are elevated water holding tanks. It is recommended that a pre-construction mammal and amphibian survey are carried out prior to the commencement of works on site.

No potential risks that may cause a threat to Natura 2000 during construction or operation of the proposed project were noted on site.

DEMOLITION AND CONSTRUCTION IMPACTS

All waste from the demolition and construction phase will be disposed of in a registered facility and will not pose a threat to a NATURA 2000 site. The proposed works are not in close proximity to, or have a direct connection to watercourses which could act as a vector for downstream impacts to Natura 2000 sites.

OPERATIONAL IMPACTS

There are no direct pathways or stepping stones⁴ to Natura 2000 sites and no species or habitats of biodiversity importance were recorded on site. An indirect pathway exists to marine Natura 2000 sites, for onsite surface and foul water via the existing Ringsend WWTP. The capacity of

⁴ Stepping stones and ecological corridors including nature conservation sites (other than Natura 2000 sites) encapsulated by Article 10 of the Habitats Directive. Such features are those which, by virtue of their linear and continuous structure such as rivers with their banks or the traditional systems for marking field boundaries or their function as stepping stones (such as ponds or small woods) are essential for the migration, dispersal and genetic exchange of wild species.

- Bat fauna and ecological assessment by
Consultant notes results of walkover assessment of the site. No potential bat roosting opportunity within the structures on the site and native biodiversity of the site was poor with opportunist species such as buddleia present throughout the site. No flora or fauna of conservation importance were noted. Several records of the common frog were found in the vicinity but not within the site. A treated stand of Japanese knotweed was marked out and located on the southern boundary. No evidence of badgers or badger activity. Bat survey detected two bats on site with foraging activity for a short period. In terms of predicted and residual impacts it is outlined that as there is no evidence of a current or past bat roost no negative impact

on bat roosting. Foraging activity may be reduced due to increase illumination of the site however will not necessarily be eliminated.

7.6 Ecology

- 7.6.1 On the issue of impact on local wildlife and biodiversity, I note the reports by including survey results which indicate that no flora or fauna of conservation interest on the site. A treated stand of Japanese knotweed was marked out and located on the southern boundary of the site. In terms of impact on bats it was noted that there is no evidence of a current or past bat roost on the site.

2022 Application

SUMMARY OF PLANNING PROCEDURES & PLANNING ISSUES DISCUSSED			
Planning Application Procedures/Regulations, Public Notices:			
Protected Structure: YES: ☐	NO: ☒	E.I. S. Required: YES: ☐	NO: ☒
Within an A.C.A.: YES: ☐	NO: ☒	Within an S.D.Z.: YES: ☐	NO: ☒
Within LAP Area: YES: ☐	NO: ☒	Appropriate Assessment/Screening: YES: ☒	NO: ☐
Floor Risk impact Assessment D.o.E. 2009: YES: ☐		NO: ☐	

ng Officer: * *Ecology - need to identify if any*
like the performance of the planning authority of any of its other
Act 2000 (as amended), or any regulations made under this Act and
cess or in legal proceedings (Section 247(3) of the Planning and
protected species resident on site - surveys
required.

Extracts from pre-application consultation – 23/11/2021

The assessment of significant effects	
Describe how the project is likely to affect the European site	No significant effects predicted
Response to consultation	N/A
Data collected to carry out the assessment	Site Visit (7 th March 2022) and Supporting NPWS data.

Given that there are few developments of significance proximate to the proposed development site, it can be concluded that the proposed development at _____ in combination with surrounding granted developments, outlined above, will have no impact on the designated European sites.

Extracts from consultant AA Screening report showing no significant effects predicted

ED3- Recolonising Bare Ground

A substantial portion of the site consists of recolonising bare ground. Species observed in this area included nettle (*Urtica dioica*), dandelion (*Taraxacum spp.*), red valerian (*Centranthus ruber*), bramble (*Rubus fruticosus agg.*), colt's foot (*Tussilago farfara*), creeping buttercup (*Ranunculus repens*), clover (*Trifolium spp.*), daisy (*Bellis perennis*), plantains (*Plantago spp.*), thistles (*Cirsium arvense* & *C. vulgare*), docks (*Rumex spp.*), greater plantain (*Plantago major*), butterfly-bush (*Buddleja spp.*), moss (*Sphagnum sp.*), hoary willowherb (*Epilobium parviflorum*)



Plate 1. ED3 Recolonising Bare Ground.

WS1-Scrub

Scrub was noted in several areas of the site. This habitat was concentrated in areas around the perimeter that have not undergone vegetation clearance and in the vicinity of an area of Japanese Knotweed (*Reynoutria japonica*) that is currently undergoing treatment (Appendix I). Native biodiversity in the scrub area is poor with opportunist species such as buddleia (*Buddleja davidii*) present throughout the habitat. Other species included ash (*Fraxinus excelsior*), willow (*Salix sp.*), birch (*Betula sp.*), sycamore (*Acer pseudoplatanus*), scrambling roses (*Rosa spp.*), ivy (*Hedera helix*), honeysuckle (*Lonicera periclymenum*), hedge bindweed (*Calystegia sepium*), cleavers (*Gallium aparine*), rosebay willowherb (*Epilobium angustifolium*), colt's foot (*Tussilago farfara*), nettle (*Urtica dioica*), dandelion (*Taraxacum spp.*) and Fuchsia (*Fuchsia magellanica*).



Plate 2. WS1-Scrub.

Extract from consultant EclA report showing site habitats and vegetation

Evaluation of Site

No flora or fauna of conservation importance were noted on site. No records of threatened or legally protected plant species are known to occur within the site (NBDC and NPWS data (fine resolution). Several records of Common frog (*Rana temporaria*) were found in the vicinity of (but not within) the proposed site. There are no ponds on site but there are elevated water holding tanks.

Plant Species

The plant species encountered at the various locations on site are detailed above. No protected species were noted on site or in the records of rare and threatened species from NPWS. No rare or threatened plant species were recorded in the vicinity of the proposed site. Japanese knotweed (invasive species) is located on site.

Mammals

No signs of mammals of conservation importance were noted on site.

Amphibians

The common frog (*Rana temporaria*) or newts (*Triturus vulgaris*) were not observed on site. There are no water features on site.

Bats

There are no trees or buildings on site that could form potential bat roosts. A bat assessment and detector survey was carried out and is seen in Appendix I. Two bats were observed on site. A common pipistrelle and a Leisler's bat were on noted. The common pipistrelle was noted entering the site from the north and foraged for a short period on the northern boundary. The Leisler's bat was noted passing briefly overhead.

Birds

The following bird species were noted on site (Table 4):

Table 4: Bird Species noted in the vicinity of the proposed development.

Common Name	Scientific Name
Wren	<i>Troglodytes troglodytes</i>
Robin	<i>Erithacus rubecula</i>
Blue tit	<i>Parus caeruleus</i>
Great tit	<i>Parus major</i>
Blackbird	<i>Turdus merula</i>

This site is 4.2 km from South Dublin Bay and River Tolka SPA. The qualifying interests of SPA's were not recorded on site during the survey or by National Biodiversity Data Centre or NPWS Rare and protected species data. The proposed development site consists primarily of built land and would not be used as an ex-situ foraging site for SPA's. The habitats on site would not be deemed of importance to birds of international conservation importance.

Potential Impacts

This report has been prepared to outline the construction and operational phase measures in addition to detailing the potential impacts on sensitive receptors within the Zone of Influence (ZOI).

Construction Impacts

The overall development of the site is likely to have direct negative impacts upon the existing habitats, fauna and flora. Direct negative effects will be manifested in terms of the removal of the site's internal habitats. The removal of these habitats will result in a loss of species of low biodiversity importance. The area is not deemed to be an important foraging area for terrestrial mammals or birds. The site is primarily an area of built land, recolonising bare ground and scrub.

Biodiversity

The impact of the development during construction phase will be a loss of existing habitats and species on site. It would be expected that the flora and fauna associated with these habitats would also be displaced.

Terrestrial mammalian species

No protected terrestrial mammals were noted on site. Loss of habitat and habitat fragmentation may affect some common mammalian species.

Impacts: Low adverse / site / Negative Impact / Not significant / short term. Mitigation is required in the form of a pre-construction survey for terrestrial mammals of conservation importance.

Flora

No protected flora was noted on site. Site clearance will remove the flora species on site. Japanese knotweed was noted and is being treated on site.

Impacts: Low adverse / site / Negative Impact / Not Significant / Short term. Mitigation is required to remove Japanese knotweed and associated soil off site under licence.

Bat Fauna

Bat foraging was noted briefly on site. There are no buildings or trees that could form potential bat roosts. Lighting during construction could impact on foraging activity.

Impacts: Low adverse / site / Negative Impact / Not significant / short term. Mitigation is needed in the form of control of light spill during construction.

Aquatic Biodiversity

Due to the lack of any water features or direct pathway to watercourses, there is little potential for downstream impacts on aquatic biodiversity from silt or petrochemicals. Frogs were not observed on site, and given that there is no waterbody or pond within the site boundaries, it is unlikely that there are any present. However, NRW have recorded common frog 130m from the western boundary of the proposed development site. A project ecologist is required to carry out a pre construction survey for amphibians.

Impacts: Neutral/ short term.

Extract from consultant EclA report showing construction stage impact assessment

Bird Fauna

The site is primarily a brownfield site. However, scrub and recolonising bare ground are present on site. Site clearance will result in the loss of bird nesting and foraging habitat.

Impacts: Low adverse / Local / Negative Impact / Not significant / long term. Mitigation is required to protect nesting birds.

Operational impacts

Designated Conservation sites within 15km

The proposed development includes a sustainable drainage strategy. All surface and foul water will discharge to a combined sewer and will be treated at Ringsend WwTP.

Impacts: Negligible / International / Neutral Impact / Not significant / Long-term

Biodiversity

Biodiversity value of the site will improve as landscaping matures.

Terrestrial mammalian species

No protected terrestrial mammals were noted on site. Additional habitat will be created on site.

Impacts: Low adverse / site / Negative Impact / Not significant / short term.

Flora

No protected flora was noted on site. Landscaping will increase flora diversity on site.

Impacts: Low adverse / site / Negative Impact / Not significant / long-term

Bat Fauna

No bat roosts will be lost due to this development and the species expected to occur onsite should persist. The proposed development will change the local environment as new structures are to be erected and some of the existing vegetation will be removed. The buildings are comprised of solid materials consisting of a solid material on the exterior which includes sections of concrete and glass. These buildings would be clearly visible to bats and would not pose a significant collision risk.

Impacts: Low adverse / International / Negative Impact / Not significant / long term.

Aquatic Biodiversity

Due to the lack of any watercourse within the site boundary, the lack of a direct hydrological pathway to a watercourse, and the fact that all drainage will discharge to a combined sewer, there is little potential for downstream impacts on biodiversity from silt or petrochemicals. Standard controls will be in place.

Impacts: Neutral/ permanent.

Bird Fauna

The proposed development will change the local environment as new structures are to be erected. The buildings are comprised of solid materials consisting of a solid material on the exterior which includes sections of concrete and glass. These buildings would be clearly visible to bird species and would not pose a significant collision risk. Landscaping on site will introduce new landscape elements that will assist in reinstating nesting and foraging loss during site clearance.

Impacts: Low adverse / site / Negative Impact / Not significant / long term.

Mitigation Measures & Monitoring

Direct negative impacts upon the existing build ground and vegetation within the site are not regarded as being significant due to the absence of species of conservation importance and, as a result do not, require mitigation. However, mitigation measures should be put in place to ensure there is no downstream impacts during construction and operation of the proposed works, and that bats or birds are not impacted during construction and operation. The following mitigation measures will be implemented.

Potential Impacts of Proposed Redevelopment on Bats

Greenhouses have very poor potential for bat roosts. They are bright during the day and the thermal range varies significantly where they would be hot during the day and cold at night. No roosts or bats emerging from the onsite structures or trees was observed. There are no trees on site that would act as potential roosting areas. The site is brightly lit from the west. In 2022, foraging was noted at height by Leisler bats and at a low level along the western wall by a single Soprano pipistrelle. In the absence of mitigation in relation to lighting there is potential for a loss of foraging on site.

Mitigation measures

As outlined in Marnell et al. (2022) "Mitigation should be proportionate. The level of mitigation required depends on the size and type of impact, and the importance of the population affected." In addition as outlined in Marnell et. al (2022) 'Mitigation for bats normally comprises the following elements:

- Avoidance of deliberate, killing, injury or disturbance – taking all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats. The seasonal occupation of most roosts provides good opportunities for this
- Roost creation, restoration or enhancement – to provide appropriate replacements for roosts to be lost or damaged
- Long-term habitat management and maintenance – to ensure the population will persist
- Post-development population monitoring – to assess the success of the scheme and to inform management or remedial operations.'

However, no bats were noted roosting on site. No trees of bat roosting potential are noted on site. The level of activity on site is low with common bat species foraging on site. As no evidence of a bat roost was noted in any of the onsite structures and there are no potential bat roosting areas on site, no mitigation measures in regard to potential roosting bats are needed during the proposed works. There is also no requirement for a *National Parks and Wildlife Service* derogation licence application to allow the planned works. Discussions took place between the lighting contractor and the proposed lighting strategy. This resulted in lighting being set at a warm lighting of 2700°K and columns being no greater than 6m high. A post construction light spill assessment will be carried out. During construction lighting on site, if required, will be directed inwards and no to site boundaries.

Landscaping elements will include scented plants for bats

Climbers

European honeysuckle	<i>Lonicera caprifolium</i>
Italian honeysuckle	<i>L. etrusca superba</i>
Japanese honeysuckle	<i>L. japonica halliana</i>
Native honeysuckle	<i>L. periclymenum</i>
White jasmine	<i>Jasminum officinale</i>

Scented bedding plants

Lavender	<i>Lavandula</i>
Heather	<i>Calluna</i>

Scented herbs and wildflowers

Chives	<i>Allium spp</i>
Borage	<i>Borago officinalis</i>
Lemon balm	<i>Melissa officinalis</i>
Marjoram	<i>Origanum vulgare</i>
Mint	<i>Mentha spp</i>

Predicted and residual impact of the proposal

There is no evidence of a current or past bat roost or activity within the structures or trees on site. Therefore, no negative impacts on bat roosting are expected to result from the proposed redevelopment. Foraging activity may be reduced due to increased illumination of the site. However, the site is brightly lit from The Bat Conservation Ireland "Bats & Lighting" Guidance Notes for: Planners, engineers, architects and developers has been applied and provides a practical approach to limiting the impact of the development on foraging activity. Landscaping will include scented plants to encourage bat foraging on site. Following the construction of the proposed development and the implementation of a sensitive lighting and landscaping strategy foraging is expected to continue on site. No long term significant negative impacts would be foreseen following the implementation of mitigation on site.

Extract from consultant bat survey report showing impact assessment

The landscape expression must be welcoming, memorable and understated as a point of arrival with the courtyards inviting residents and guests to enjoy its hospitality. To compliment but not compete with, the design should respond to the needs of the residents as well as to the architecture in a legible and elegant manner, beautifully detailed with high quality materials. The use of tree and shrub planting supports and promotes a positive net gain for bio-diversity that will enhance the site's ecological system, creating habitat and environmental diversity through nature positive interventions.

MANICURED PLANTING			
Species Name	Common Name	Stock	Colour
Buxus sempervirens	Common Boxwood	Clipped Hedge / -Balls	Green
Fagus sylvatica	Beech	Clipped Hedge	Green
BULBS			
Species Name	Common Name	Stock	Colour
Allium 'Purple Sensation'	Allium 'Purple Sensation'	Bulb	Purple
Allium 'Mount Everest'	Allium 'Mount Everest'	Bulb	White
Anemone sylvestris	Snowdrop Anemone	Bulb	White
Camassia leichtlinii	Leichtlin's Camass	Bulb	Purple-Silver
Crocus spp.	Corocus	Bulb	Blue
Narcissus 'Petrel'	Daffodil Petrel	Bulb	White
Galanthus plicatus	Snowdrops	Bulb	White
Tulipa 'Spring Green'	Tulip 'Spring Green'	Bulb	Light Green
GRASSES			
Species Name	Common Name	Stock	Colour
Luzula nivea	Snow-white Wood-rush	3L	White
Miscanthus 'Silver Feather'	Eulalia Grass	3L	Green
Stipa tenuissima	Mexican feathergrass	3L	Green
CREEPERS			
Species Name	Common Name	Stock	Colour
Clematis 'Blue Eclipse'	Clematis 'Blue Eclipse'	3L	Blue
Hedera helix	English Ivy	3L	Green
Trachelospermum jasmenoides	Star Jasmine	3L	White
WATER RELATED PLANTING			
Species Name	Common Name	Stock	Colour
Amsonia spp.	Bluestars	3L	Blue
Eupatorium spp.	Bonesets	3L	Pink
Carex acutiformis	Carex	3L	
Chelone	Chelone	3L	Pink
Cyperus longus	Snow-white Wood-rush	3L	
Juncus effusus	Soft Rush	3L	
Lythrum salicaria	Purple Loosestrife	3L	Pink
Spartina pectinata	Eulalia Grass	3L	

Extract from landscape planting proposal

TREES			
Species Name	Common Name	Stock	Colour
Betula pendula (Multi-stem)	European White Birch	6m height	
Betula utilis var. jacquemontii (Multi-stem)	Himalayan Birch	6m height	
Crataegus laevigata 'Paul's Scarlet'	Paul's Scarlet Hawthorn	20-25mm Stem Girth	Pink
Liquidambar styraciflua	Sweet Gum	25-35mm Stem Girth	
Magnolia grandiflora	Southern Magnolia	25-35mm Stem Girth	White
Prunus serrula (Multi-stem)	Paperbark Cherry	4-6m Height	Pink
Prunus yedoensis	Yoshino Cherry	4-6m Height	White
Quercus palustris	Swamp Spanish Oak	6m height	
Taxodium distichum	Bald Cypress	25-35mm Stem Girth	
SHRUBS			
Species Name	Common Name	Stock	Colour
Camellia japonica	Japanese Camellia	3L	White
Cyathea australis	Rough Tree Fern	10L	Green
Daphne odora	Winter Daphne	5L	Pink
Dicksonia antarctica	Soft Tree Fern	10L	Green
Dryopteris filix-mas	Male Fern	2L	Green
Hydrangea spp.	Hydrangea	5L	White / Blue
Polystichum aculeatum	Hard Shield Fern	2L	Green
Rosa spp.	Roses	5L	White
Viburnum davidii	David Viburnum	5L	Pink
GROUNDCOVERS & PERENNIALS			
Species Name	Common Name	Stock	Colour
Ajuga reptans 'Burgundy Glow'	Buldgeherb	3L	Purple
Artemisia 'Powis Castle'	Wormwood	3L	Silver-Blue
Echinacea purpurea	Purple Coneflower	3L	Purple
Echinops ritro	Southern globe thistle	3L	Blue-Purple
Helleborus x hybridus	Hellebore	3L	Purple / Pink
Heuchera 'Fireworks'	Coral Bells	3L	Burgundy
Heuchera 'Autumn Bride'	Coral Bells	3L	White
Hosta spp.	Plantain Lily	3L	White
Lavandula angustifolia	English Lavender	3L	Purple
Lavandula intermedia 'Provence'	Lavandin 'Provence'	3L	Purple
Liriope muscari	Big Blue Lilyturf	3L	Purple
Lupinus spp.	Lupin	3L	Purple / Pink
Myosotis sylvatica	Wood Forget-me-not	3L	Blue
Orchis mascula	Early Purple Orchis	3L	Purple
Pachysandra terminalis	Carpet Box	3L	White
Petasites fragrans	Winter Heliotrope	3L	Pink
Philadelphus spp.	Sweet Mock-orange	3L	White
Primula vulgaris	Primrose	3L	Purple
Pulmonaria 'Diana Clare'	Lungwort	3L	Blue
Sedum spp.	Sedum	3L	Multi-colour
Stachys byzantina	Lamb's Ear	3L	Purple-Silver
Teucrium scorodonia	Wood Sage	3L	Pink
Verbena bonariensis	Brazilian Vervain	3L	Purple
Vinca minor	Common periwinkle	3L	Purple
Viola odorata	Sweet Violet	3L	Blue
Viola riviniana	Common Dog-violet	3L	Blue

Extract from landscape planting proposal

Appropriate Assessment:

The applicants have submitted an Appropriate Assessment Screening for the proposed development of a site at [redacted]. No Natura 2000 sites are within the zone of influence of this development. It notes that having taken into consideration the effluent discharge from the proposed development works, the distance between the proposed development site to designated conservation sites, lack of direct hydrological pathway or biodiversity corridor link to conservation sites and the treatment of all surface and foul discharges in Ringsend WwTP, it is concluded that this development will not give rise to any significant effects to designated site. The report presents a Stage 1 Appropriate Assessment Screening for the proposed Development, outlining the information required for the competent authority to screen for appropriate assessment and to determine whether or not the Proposed Development, either alone or in combination with other plans and projects, in view of best scientific knowledge, it is likely to have significant effect on any European or Natura site.

Having regard to the nature and scale of the proposed development, and the distance to the nearest European site, it is considered that significant effects are not likely to arise, either alone or in combination with other plans and projects that will result in significant effects to any Natura 2000 area. A Stage 2 Appropriate Assessment of this project is therefore not required.

Ecological Impact Assessment

A report has been submitted states that field assessments were carried out on 09/09/19, 18/12/18 and the 07/03/22. Site clearance have taken place on site since the 2018 and 2019 surveys the habitat assessment is based on the March 2022 survey. Habitats within the proposed site were classified and as seen from figure 21 the vast majority of the proposed development consists of an area of recolonising bare ground. It states no species of conservation importance were previously noted on site and vegetation clearance since 2019 has resulted in much of the area consisting of recolonising bare ground. It notes that an area of scrub remain at the edges of the proposed development site.

The report notes the various species and an area of the site has Japanese Knotweed is undergoing treatment.

The report states that the overall development of the site is likely to have direct negative impacts upon the existing habitats, fauna and flora. The removal of these habitats will result in the loss of species of low biodiversity importance. The area is not deemed to be important foraging area for terrestrial mammals or birds. It notes that given the distance to the nearest designated conservation site, no noise or lighting impacts beyond the immediate site outline are predicted. In the absence of mitigation, it is considered that significant effects on designated conservation sites would be unlikely due to distance and local of direct hydrological pathways. It concludes that the due to the absence of species of conservation importance and as a result do not require mitigation. But mitigation measures should be put in place to ensure that there is no downstream impacts during construction and operation of the proposed works and that bats or birds are not impacted during construction and operation.

Environmental Impact Assessment (EIA)

Having regard to the nature, scale and location of the development and to the criteria set out at Schedule 7 of the Planning and Development Regulations, 2001, as amended, it is not considered the development would give rise to significant environmental impacts, by itself or cumulatively with other projects, and therefore it would not require to be subject to Environmental Impact Assessment.

APPENDIX 2:

Online Survey Questions

Biodiversity in Architecture and Landscape Architecture

Research as part of the NovelEco project, Trinity College Dublin

Biodiversity refers to the variety of life on earth - animals, plants, insects, birds, etc. It is well known that many of these creatures and the overall ecological richness of our planet is under threat. With this short survey we would like to understand more about how the disciplines of architecture and landscape architecture engage with biodiversity in their work. Thank you in advance for participating!

This survey will take about 8 minutes to complete. We would love to capture your experience and insights so please try to complete all questions if you have time. It is anonymous and all the information you provide is protected. Before you start, please read, and agree to our consent form.

Consent Form

This research project abides by the principles of confidentiality, anonymity, and storage of data according to the Trinity College Dublin data management policy. All data collected through this survey will be held securely and confidentially in accordance with the General Data Protection Regulation 2018 and the Data Protection Act 2018. Any identifiable information about you (personal data), including the transfer of this personal information about you outside of the EU, will be protected in accordance with the General Data Protection Regulation (GDPR). Your data will be gathered on computer files not stored in the 'cloud', and accessed only by our researchers through a password-protected double authentication process.

We assure you that this is a strictly confidential survey, and responses are anonymous. Under no circumstances will your individual responses be made available to anyone outside the research team. Any identifiable information will be coded using an assigned ID for purposes of confidentiality. By taking part in this survey, you will be asked to provide the following information only if you consent to participate in a follow-up interview and/or workshop: your full name and email address.

Anonymised direct quotes of your words from the survey might be used in publicly available study reports, academic publications, and other research outputs. At no point will the information you provide be shared in a way that would allow you to be personally identified. Any published material will be anonymised. Participants can withdraw their data up to one month after the survey completion by requesting it via email from the researcher.

This project has been reviewed by and received ethics clearance through the Research Ethics Committee at Trinity College Dublin (TCD). If you have any comments or concerns resulting from your participation in this study, you may contact the TCD Research Ethics Officer. More information, including a full data protection and confidentiality statement, can be found at www.noveleco.eu.

* 1. If you do not wish to participate in the research study, please decline by clicking on the "disagree" button.

☐ Agree

☐ Disagree

Biodiversity in Architecture and Landscape Architecture

To capture some background information, please respond to the following questions:

* 2. Please state your profession and the number of years you have been practicing?

Profession

Experience (years)

* 3. In your **personal** opinion, how important is it to protect and enhance biodiversity

Extremely important

☐

Very important

☐

Somewhat important

☐

Not so important

☐

Not at all important

☐

Biodiversity in Architecture and Landscape Architecture

Regarding your work, please respond to the following questions:

- * 4. In your work, how much **consideration** do you give to the biodiversity impacts of your designs and decisions?

A great deal	A lot	A moderate amount	A little	None at all
☐	☐	☐	☐	☐

- * 5. In your work, how many **opportunities** do you have to protect and enhance biodiversity?

A great deal	A lot	A moderate amount	A little	None at all
☐	☐	☐	☐	☐

- * 6. Can you give an example of how these opportunities are created and realised and/or what factors obstruct these opportunities for biodiversity?

- * 7. In your work, how much **knowledge** do you have about protecting and enhancing biodiversity?

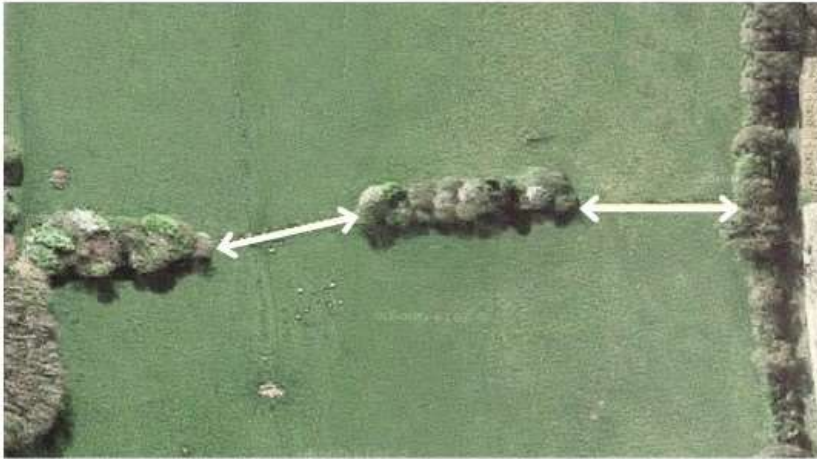
A great deal	A lot	A moderate amount	A little	None at all
☐	☐	☐	☐	☐

- * 8. Can you please comment on how you gained this knowledge and/or what type of knowledge you feel is lacking

Biodiversity in Architecture and Landscape Architecture

Please review the following design actions for biodiversity:

* 9. Have you implemented this biodiversity measure in any of your designs?



1. Reduce Habitat Loss & Fragmentation

Habitat loss and fragmentation threatens biodiversity by limiting sources of food and shelter, and restricting species' movement.

Make an impact by...

- Repairing existing corridors and connecting to the surrounding landscape
- Protecting existing habitat areas and providing new habitat areas

☐ Yes

☐ No

* 10. Have you implemented this biodiversity measure in any of your designs?



2. Minimise Soil Sealing

Sealed surfaces are bad for water management, but even permeable paving restricts the ability of the soil to breathe. This negatively affects insects, earthworms, and prevents vegetation from growing

Make an impact by...

- Reducing areas of hard standing to a minimum
- Using paving that allows the soil to breathe (e.g. Reinforced grass structures)

☐ Yes

☐ No

* 11. Have you implemented this biodiversity measure in any of your designs?



3. Promote the importance of Biodiversity

Urban projects are high impact due to their visibility. In this way, design can have a cultural influence by promoting biodiversity and changing the norm.

Make an impact by...

- Using design to communicate that biodiversity is important
- Providing a wildflower patch, or green wall in a visible area
- Showcasing nature and biodiversity at every project stage (e.g. Renders/visualisations)

☐ Yes

☐ No

* 12. Please comment on what helped to achieve these actions (if yes) and/ or why these actions were not implemented (if no)

* 13. Overall, how did you find this information on design actions for biodiversity?

	Yes/ Agree	No/ Disagree
I found it <u>interesting</u> (I learned something)	☐	☐
I found it <u>impactful</u> (it changed my opinion)	☐	☐
I found it <u>helpful</u> (I can use this in my work)	☐	☐
I found it <u>inspiring</u> (I am eager to apply these actions to my work)	☐	☐

* 14. I would be **interested** to learn more about protecting and enhancing biodiversity in my work

- ☐ Extremely interested
- ☐ Very interested
- ☐ Somewhat interested
- ☐ Not so interested
- ☐ Not at all interested

Biodiversity in Architecture and Landscape Architecture

Almost there - last page!

Regarding the design process, please answer the following:

* 15. In your experience which of the following factors most influence the design outcome?

(Choose 3)

- ☐ Budget
- ☐ Client Brief
- ☐ Aesthetics
- ☐ Policy and Regulations
- ☐ Time Constraints
- ☐ End User Requirements
- ☐ Design Team Members
- ☐ Other (please specify)

16. How do these factors impact biodiversity outcomes? (Optional)

* 17. In your opinion, which member(s) of the design team are responsible for biodiversity?

18. How should that responsibility be shared? (Optional)

19. If you have any additional thoughts or feedback we would love to hear it. Thank you!
(Optional)

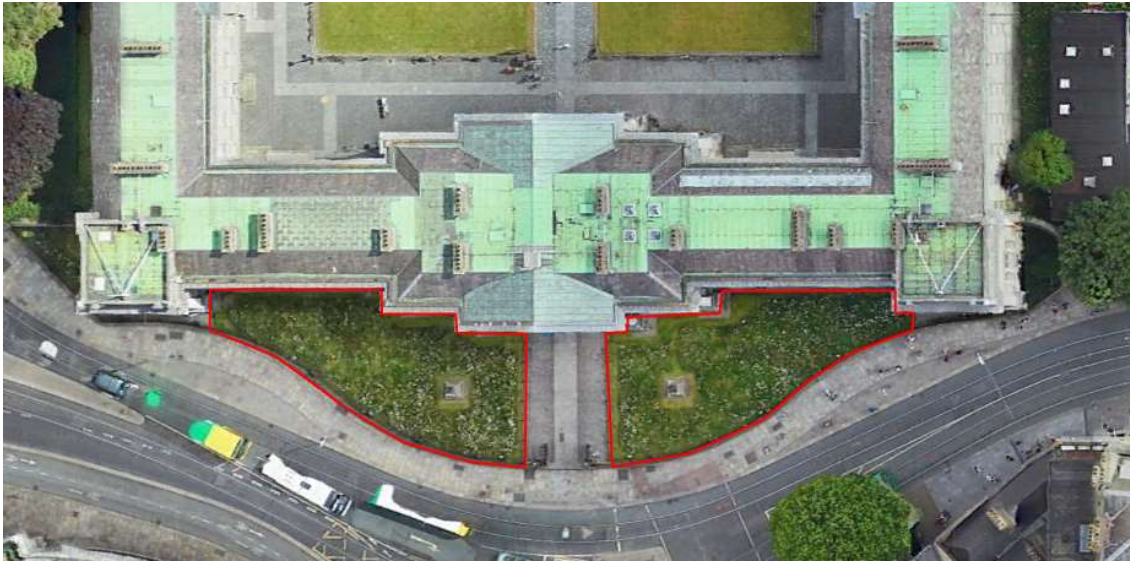
20. If you would like to discuss this topic further and would be interested in participating in a **research interview** please leave your contact details below and we will be in touch:

APPENDIX 3: Education Comparison

Architecture, landscape architecture and ecology modules (2023 course programmes)

ARCHITECTURE - UCD (2023)	LANDSCAPE ARCHITECTURE - UCD (2023)	ECOLOGY & ENVIRONMENTAL BIOLOGY - UCC (2023)
Stage 1 Core Modules	Stage 1 Core Modules	Stage 1 Core Modules
Architectural Design I	Land Use and the Environment	Cells, Biomolecules, Genetics and Evolution
Architecture & its Environment	Landscape Studio 1A	Physiology and Structure of Plants and Animals
Survey I: History and Theory of the Built Environment I	Understanding Landscape I	Habitats and Ecosystems
Architectural Technologies I – Introduction to Building Envelope	Plants&Landscape Architecture	Grand Challenges in Biological, Earth and Environmental Sciences
Architectural Design II	Landscape studio 1B	Introductory Chemistry for Environmental Scientists
Into Practice	Understanding Landscape II	Introduction to Environmental Science
Perspectives: History and Theory of the Built Environment II		Introduction to Geology
The Engineering and Architecture of Structures 1	Stage 1 Option - Choose 1	Geological Evolution of Ireland
	Intro archaeology of Ireland	Introduction to Physical Geography
	Cell and Plant Biology	Calculus for Science Part 1
	Environment Change & Policy	Physics for the Environmental Sciences I
	Plants and People	
Stage 2 Core Modules	Stage 2 Core Modules	Stage 2 Core Modules
The Indoor Environment	Landscape Ecology	Fundamentals of Ecology
History & Theory of the Designed Environment III - Survey Course 2	Landscape Plants	Ecological Fieldwork and Analysis
Architectural Design III	Landscape Studio 2A	Plant and Animal Genetics
Imagining Architecture	Soil Resources	Understanding and Reviewing Scientific Literature
Architectural Design IV	Landscape Studio 2B	Ecological Plant Physiology
Architectural Technologies II – Building Frames and Skins	Landscape Theory and History	Plant Identification
The Engineering & Architecture of Structures 2		Introduction to Biostatistics
		Vertebrate Diversity
Stage 2 Optional (Equated with Electives)	Stage 2 Optional (Equated with Electives)	Invertebrate Diversity
Intro to Computational Design	Introduction to City Planning	Practical Invertebrate Skills
Enhancing Digital Drawing Skills	Forests, Climate and Carbon	Stage 2 Option - Choose 1
		The Environment and Human Health (5)
		Introduction to Geoinformatics (5)
		Vertebrate Diversity 2 (5)
Stage 3 Core Modules	Stage 3 Core Modules	Stage 3 Core Modules
History & Theory of the Designed Environment IV - Architecture, Urban and Landscape	History & Theory of the Designed Environment IV - Architecture, Urban and Landscape	Practical Field Ecology
Architectural Design V	Landscape Studio 3 A	Zoology and Ecology Literature Review
Building Renovation and Energy Retrofit / Architectural Technologies III		Evolution & Diversity
Framework for Practice	Stage 3 Option - Choose 1	Conservation Biology
Architectural Design VI	GIS for Environmental Assessment	Key Research Skills in Biology
Architectural Technologies IV – Integrated Building Process	Site Specific Design 1	Freshwater Science
The Engineering and Architecture of Structures 3	Placemaking: Urban and Rural Design	Biostatistics I
	Stage 3 Placement	Advanced Invertebrate Zoology
Stage 3 Optional (Equated with Electives)	Landscape Architecture Internship - Long	Stage 3 Option - Choose 2
Intro to Computational Design	OR	Market Forces and the Environment (5)
Enhancing Digital Drawing Skills	Landscape Architecture Internship – Short + Study Abroad	Plants and Hostile Environments (5)
	OR	Advanced Vertebrate Biology (5)
	Diversity of Plant Form & Function	Adaptations to Extreme Environments (5)
	Forests, Climate and Carbon	Animal Behaviour (5)
	Landscape Studio 3B	
	Site Specific Design 2	
Stage 4 Core Modules	Stage 4 Core Modules	Stage 4 Core Modules
Design Technologies I	Environmental Assessment	Landscape Conservation and Management
Research & Innovation in the Designed Environment	Landscape Studio 4A	Temperate Marine Biology
Architectural Design VII - Comprehensive Design Studio	Landscape Research 1	Advanced Ecology and Biogeography
Architectural Design VIII	Landscape Studio 4 B	Research Project
Research and Innovation in the Designed Environment II	Planning Law	Environmental Impact Assessments
	Rural & Landscape Planning	Stage 4 Option - Choose 5
Stage 4 Optional (Equated with Electives)	Stage 4 Option - Choose 1	Field Ornithology (5)
Agency: Design / Build	Site Specific Design 1	Freshwater Macroinvertebrate Biomonitoring (5)
Concrete Research	Climate Policy and Politics	Biological Work Placement (5)
Realising Built Projects	Planning, Society and Diversity	Sustainable Food Production (5)
Conservation History, Theory and Policy		Valuing the Environment (5)
Street Life: Urban Design, an Introduction		Sustainable Plant Pest and Disease Management (5)
Architecture in a Climate Emergency		Crop Physiology and Climate Change (5)
Planning, Society and Diversity	Stage 4 Optional (Equated with Electives)	Biostatistics II (5)
Urban Design Theory (UDT)	Site Specific Design 2	Evolutionary Ecology (5)
Urban Resilience and Ethics	Building Biodiversity: nature as Builder	Pathogen biology, ecology and control (5)

APPENDIX 4: Sample Case Study



Meadows at Trinity College

Area: **642 Sqm.** Site Context: **Urban**

Note: Costs are not accurate and are shown for demonstration purposes

Stage	Action	Duration	Time of Year	€
Preparation	Strip and dispose of existing lawn. Prepare substrate by rotavating topsoil and adding 0.5 tonne of sand to improve drainage and reduce nutrient content.	1 Week	Feb-Mar	2,000
Supply	Sand (0.75kg/ M2)	-	-	75
Supply *	Native wildflower seed (1 kg) *	-	-	350*
Installation *	Sow wildflower seed 1.5g/m2 *	1/2 Day	Mar-Apr	200*
Establishment	Watering and additional seed	1 Month	Apr	250
Maintenance	Mowing of 1m strip around both meadows (every 2 weeks)	Ongoing	Mar-Nov	500
Management	Cut and lift once per year	1 Day	Sep	500
Monitoring	Ecological survey to monitor plant species (optional)	2 Days	May / Aug	500
Monitoring	Ecological survey to monitor pollinator species (optional)	2 Days	May / Aug	500

Total Installation Fee: €2,875

Total Management Fee: €1,000

Total Monitoring Fee: €1,000

***Note:** Wildflower turf strips can be used. This assists with weed suppression, speeds up establishment, and provides instant 'green' for highly visible areas. Cost approx. €25/

SAMPLE CASE STUDY

Benefits of Urban Meadows

Water Retention: More layered and complex vegetation helps to slow the progression of rainfall to the soil, which can assist with water retention and flood mitigation. (Parker, 2016)

Pollinators: Meadow planting increases the number and variety of flowering plants which provides food for pollinators, this is a particularly important measure in urban areas.

Species Diversity: Meadow planting contains significantly more species than short cut monoculture ryegrass lawns, and therefore assists in increasing plant diversity cities.

Invertebrates: Introducing more complex and indigenous plant species has a positive effect on both the population and diversity of urban insects. Studies on modified green space have shown plant-insect interactions to be 14.6 times higher after 3 years. (Mata et al., 2023)

Human Benefits: Urban ecosystems provide psychological, recreational, educational and health and wellbeing benefits to humans. (Perring, Manning, et al., 2013)

Aesthetics



Spring (Photo: Zahra Lockett, Trinity News)



Summer (Photo: Evergreen Trinity)



Autumn (Photo: Facebook, Rewilding Dublin)



Winter (Photo: Fiona Nulty)

APPENDIX 5:

Semi-Structured Interview Consent Form and Interview Guide



Research Title: Societal perceptions of informal wild spaces in cities

MSc Research Project: *How can architectural form follow ecological function?*

Research Team: Principal Researcher: Dr. Marcus Collier, Trinity College Dublin

MSc Researcher: *Fiona Nulty, Trinity College Dublin*

Research Funding: This research is fully funded by the European Research Council grant agreement No 101002440)

What is NovelEco?

Cities contain many informal wild spaces or ‘urban novel ecosystems’ of different shapes and sizes’ spaces that, in urban areas, are not normally found in ecosystems outside cities. An informal wild space can be anywhere. They can be unused land, or a unmanaged corner of a street; they can be a collection of wild plants growing along the top or bottom of a wall, or an overgrown derelict site; they can be a sudden flush of wildflowers at the side of the road, or a steep slope or rock area that is too difficult to manage. In other words, informal wild spaces can be almost anywhere, almost any size, and almost any shape. It is only when we *notice* them that we start to give them values. But, what are these values? Little is known about them because many people ignore or avoid wild spaces in cities. NovelEco wants to involve citizens in collecting ecological data on informal wild spaces. This is what we are looking to find and it is why we need citizens to be our eyes ‘on the ground’, so to speak. This interview is aimed on gathering information that will help us to design our research approach and answer the questions you would like to know the answer to.

Why should I participate?

This interview is designed to capture information about your personal perceptions and values of informal wild spaces in cities. We are seeking to hear your experiences and perceptions of these spaces, and the findings will build a picture of our relationship with wild spaces and help scientists and communities to rewild our cities. We would welcome your participation in this short, anonymous interview.

Who will see my answers?

We assure you that this is a strictly confidential interview, and responses are anonymous. All data collected through this interview will be held securely and confidentially in accordance with the General Data Protection Regulation 2018 and the Data Protection Act 2018. Under no circumstances will your individual responses be made available to anyone outside the research team. Individual results will be aggregated anonymously, and research reported on aggregate or combined results. At no point will the information you provide be shared in a way that would allow you to be personally identified. Any published material will be anonymised. More information, including a full data protection and confidentiality statement, can be found here.

Will I be asked to provide personal details?

By taking part in this interview, you may be asked to provide the following information:

- Your full name, professional experience and country of residence. This is for statistical purposes only.

Your personal data will be collected and processed by our research team. The data you provide by compiling and signing this Informed Consent will be gathered on computer files not stored in the 'cloud', and accessed only by our researchers. Unauthorised access is prevented by the adoption of the following security measures: we will employ a password to get access to computer files storing your personal data (using a double authentication process). Your data on this computer is encrypted through available encryption software. These data will not be shared in any case with, or disclosed to, anyone outside our research team.

How long will it take?

The interview will take about 45 minutes to complete.

Who should I contact?

If you have any queries regarding this survey, please contact nultyf@tcd.ie or info@noveleco.eu
Thank you.

Fiona Nulty, School of Natural Sciences, Trinity College, Dublin.

Professor Marcus Collier, School of Natural Sciences, Trinity College, Dublin.



PARTICIPANT CONSENT FORM

I, the undersigned, confirm that (please tick the box):

1	I am 18 years or older and I voluntarily consent to participate in this study.	
2	I confirm I have read, or had read to me, and have understood the information on this survey.	
3	The information has been fully explained to me and I have been able to ask questions, all of which have been answered to my satisfaction.	
4	I voluntarily agree to participate in the project. I am fully aware that I am not obliged to answer any questions, but that I do so at my own free will.	
5	I understand that if I decide at any time during the interview that I no longer wish to participate in this project, I can notify the researcher involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up to one month after the interview.	
6	I consent to the use of anonymised direct quotes of my words from the interview in publicly available study reports.	
7	I consent to the digital audio-recording / online video recording of my interview.	
8	I understand the principles of confidentiality, anonymity, and storage of data according to the Trinity College Dublin data management policy.	
9	I understand that any identifiable information about me (personal data), including the transfer of this personal information about me outside of the EU, will be protected in accordance with the General Data Protection Regulation (GDPR).	
10	I agree that information of the participant's identity to be coded using an assigned ID for purposes of confidentiality	
11	The use of the data in research, academic publications, sharing and archiving has been explained to me.	
12	I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms I have specified in this form.	
13	I am also aware that this project has been reviewed by, and received ethics clearance through, the Research Ethics Committee at Trinity College Dublin. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the TCD Research Ethics Officer.	
14	I, along with the Researcher, agree to sign and date this informed consent form.	
15	I will be given a copy of this consent form.	
16	I consent to be photographed and will be asked for additional consent if my image will be used in public activities	

I have confirmed all 16 of the statements above.

Signature of participant

date

I certify that I have presented the above information to the participant.

Signature of Researcher

date

Introduction and participant background (5 mins)

(Following on from the survey) the interview is discussing nature in the city generally and there's a bit about the project process and how biodiversity fits in to that.

This project is studying the relationship between design and biodiversity, through interviews with individuals who work in either architecture or landscape architecture.

When speaking about biodiversity, this refers to all of the different kinds of life you will find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. When these species co-exist in a particular habitat, that is an ecosystem – does that make sense?

Q1: What is your current job title and professional qualification(s) or background?

Q2: How long have you been practicing?

Part 1 – Aesthetics and Perception (20 mins)

Q1: To get started, I would like you to think of a green space you are familiar with. It can be a park, or another type of space where you experience nature in the city.

What do you like or find attractive about that space? ... Why? (Ref 17)

Is there anything you dislike or find unattractive? ... Why? (Ref 17)

Q2: Informal wild spaces often occur in cities – here are some examples. Please choose your favourite and least favourite image.



Favourite: What do you like or find attractive about that image? Why? (Ref 11)

Least Favourite: What do you dislike or find unattractive about that image? Why? (Ref 11)

Q3: In your least favourite image, are there design or aesthetic interventions you would suggest to make this space more attractive? Why do you think these particular changes are important to make? (Ref 12)

Knowledge Sharing: *In each of these images, the vegetation is spontaneous (has appeared by itself) and self-organising (is not managed by humans). This means each one of these spaces offers something unique and valuable for biodiversity and all of these spaces increase and improve biodiversity in the city (Kattwinkel et al., 2011) (Bonthaux). Because these spaces are not disturbed, they offer habitat for flora and fauna that otherwise would not be found in cities (Threlfall and Kendal, 2018).*

Q4: Do you think this typology of space is acceptable in an urban or suburban setting? And as a permanent space? Why?/Discuss (Ref 21)

Q5: If we are changing our cities and green spaces to enhance biodiversity - what do you think are the most important human needs to consider and integrate? Is there a threshold? (Ref 23)

Any other comments?

Part 2: Roles, Responsibilities, and Project Process (15 Mins)

Q1: Comment on the accuracy of the following diagram and any adjustments you would make to bring it in line with your experience of the project organisational structure. (Ref 58) *(Diagram will have been sent in advance)*

Q2: In your experience, at early-stage feasibility / viability stage of a project which disciplines are typically involved?

Q3: In terms of biodiversity, how would that be accommodated within the structure and the responsibilities of the various roles as described? (Ref 5)

Q4: How often would an ecologist be part of the design team? What role do they fulfil?

Q5: In your experience, how do developers and clients regard biodiversity - either as existing on the site prior to development or as part of the proposed project?

Any other comments?

Part 3 - Project Process - Regulations, Policy, etc (15 mins)

Q1: In terms of policy and regulations around biodiversity – what are your thoughts on the current process of design, planning, and development?

Q2: How could the current process of design, planning, and development be improved?

Q3: What measures would you suggest for educating architects or landscape architects and assisting them in advocating for biodiversity in their work?

****Specific questions to add to discussion****

* How could CPD on biodiversity be presented to make it interesting to architects and informative for their work? (Ref: 1B/3)

* In terms of the existing site, do you think it would be useful to have information on the site biodiversity to inform your design work or decisions? How do you think the complexity of this should be simplified and presented for designers to use? (Ref: 25A/26)

Final Question: Have you any final comments or anything to add?

APPENDIX 6:

Interview Anecdotes

Where does responsibility for biodiversity fall within the project team?

“Now we've come on in leaps and bounds from comments in the early 2000s, that we used to get about ‘Ah just a few growies over there’, or, you know, ‘sure, just green that up?’. It's come on a long way from there. But the responsibility has been... we just seem to go to meetings and just spend our days giving out... that like... ‘there's trees on the site’ ... ‘Oh, yeah’ ... ‘But you've got your drainage going through them?’ ... ‘Oh, yeah. Do you think that will affect them?’ ... ‘Awh it might...’. You know, it's this constant Jesus Christ battle! But with a good team you don't have that. But I think I think too much of it comes to us, and we do end up then feeling... ‘Oh here they come again!’ Like there are days that we do feel that... like... ‘Oh Christ, here they are!’.” [P12L] *(FN clarification: Comment means that the design team reacts this way to the Landscape architects)*

How do developers and clients regard biodiversity?

“Because of the backlash that we've had with SHDs and kind of coming from nowhere, and the backlash that we've had with the local authorities, it's gone back to just being a nuisance factor. The one in Rathcoole, where the judge said that they were going to quash the planning because of the removal of how many linear meters was it? 637 or something? 637 linear meters of hedgerow and that the mitigation couldn't negate the removal. What will happen now is you'll just get clients who'll go in and go: ‘right remove everything. So, we start with a site, with nothing on it’. And that will start to happen, and it will come up, and they [the Local Authority] will say: ‘What happened here?’...”

[Client] ‘Oh, no, when we bought the site, the farmer cleared it. Ah Jaysus, sure he thought he was doing the right thing!’ ... So, you're left now with a scorched earth policy. That's not right either.” [P12L]

How do developers and clients regard biodiversity?

We've had experience of designing a landscape plan around high number of really good existing trees on the site. And planning was achieved, we went to site, and they chopped the trees down. So that can be quite a shock and can make you quite cynical about a particular developer. They would have been contravening their planning by doing that. But the proposal

was aimed at achieving planning. And the trees came down soon after the site opened. The local authority contacted the landscape architect - they hadn't been retained past planning. The L.A. confirmed they had not instructed the trees to be felled. It was then blamed on the groundworks contractor. [P10L]

How do developers and clients regard biodiversity?

One such example, there was a site with an LAP, for a 7-acre green area, we ended up doing a lovely long linear park with ponds, SUDs, biodiverse areas, everything, it was 9-10 acres probably. If it wasn't legislated for in the LAP, it wouldn't be done, because they're [the developer] not just going to offer up 7 acres. [P14A]

How do developers and clients regard biodiversity?

For example with green roofs on one project. We were pushing for them on all the lower buildings that are overlooked by taller ones. And the client is pushing back because it would be more than the minimum requirement. Because the cost would be the driver for them. The ecology wasn't driving me [architect], to be honest, it was aesthetics, so people weren't looking out a bitumen roof. And a bit of eco stuff in terms of SUDs. You can use that as an argument for green roofs as well. Like it was really helpful that the local authority had a requirement for a certain amount of green roof, because we got it in. With one project we had a park in the development because they needed it to satisfy the development plan, so that's fine. But then there was need for an intensity of use elsewhere. We did manage to get a further park, but we had to fight quite a bit for it. And us as architects drove that, because we felt it would be very depressing without a park in that location of the site. [P6A]

Policy and planning

We have a client that shall remain nameless but we're now 5/6 years later where they didn't put in a playground and luckily, it's with a local authority that gives a damn so they can't... but they didn't build a playground. They've dumped a lot of soil in a park, because it was cheaper for them to dump the soil in the park. So, you've got the park in front of a lot of houses that's got 3 metres of soil, so you're going up ramps and it's a huge park, but they've saved half a million dumping all the soil there and now we're handing the park, we're going have to redesign it to hand it back over to the local authority. Its cost them a bit to do that but

still like they've saved like, 3-400 grand. And the local authority, could have, should have, been well within their rights to say get rid of all that soil, do you know? And I think that's a wider Irish problem, like you've got that case in Meath where a couple built like a 500 square metre mansion, just without planning and it's been there for 20 years and there's been demolish orders and all that kind of stuff and nothing happens. Erm but it's all there like... it doesn't require... like we don't need another law from Dara O'Brian or whatever, we actually just need enforcement, do you know? [P7L]

Policy and planning

I've two iconic trees that are, kind of lost, since last year. I've been involved in this site since 1998, and we've been monitoring. We have a tree management system that has a GIS system that has all the trees logged and we have a full system of their inventory of what they are, their attributes, so on... the ecological stuff, their management intervention, so on, so forth, but about 15 years ago, a building... and it's a beautiful building, came right up beside one of these big iconic trees within the site. Amazing tree. Everybody in the place, they all love it, they love the tree, right, so the tree is there. But it's now showing after last year's drought, in the summer, the tree is now really dropping all its leaves, and now there's a fungus that's coming out, a honey fungus attacking it. And what happened was the construction impacts from eight years ago, nine years ago. They got too close to the trees, we were telling them to back off, but they kept going and because the tree, the root zone around that tree... and this is where I come back to the soils. The root zone the tree is growing in is so important. There's air, water, and the fungi, the micro bacteria and stuff that's going on underground, that's what trees need. And if you screw that up, or if you change the drainage or whatever else, the tree is fine for a while and then it just slowly... it's like slowly, kind of killing it off, you put it under pressure, and then the stress of the climate puts it under pressure, and then fungi, the bad fungi come in and attack. So that's what's happening, this poor auld tree is going to have to come down, and it's an awful thing. It's been there since 1847. This magnificent tree. It's there since the start of the day. So, you know the implications of construction, that's where I'm kind of getting at, understanding the context and understanding construction processes, there's not enough people, fully aware, unfortunately. And it comes back to the context thing. So, the actual tree in there. Previously, when you look back when it was planted, we have to go back to the original maps, and there were walls built. So, this tiny little tree was planted, and there were walls built in there and the tree roots didn't go beyond those walls. So, the

wall actually acted as a barrier. And the tree roots were going out into the grassed areas. So, when they then put footpaths, they built over the green areas where the tree roots were, the bit where the wall was, there's no tree roots in there. So, it was safe to build over there. And then what they did was they put more pressure as the building came on, they came in on the on the wrong side of the tree, as it were and put pressure on it. So, it really is it's very site-specific thing, and that's where you kind of have to do that analysis, if you know what I mean, you kind of look at each site individually. Look at its context, and how are you going to respond to that? [P13L]

Policy and planning

Some new conditions require that an as built plan for the landscaping is submitted to the planning authority post completion but pre-sign off, opinion on compliance, and the local authority parks will inspect and say whether its ok. So that has given the landscape architect a stick to use. Because in one example, the client wanted to take another 70k out of the landscaping budget, and the landscape architect was able to push back and say, you won't get that past the parks department. Otherwise, they would be strong armed into signing off on value-engineered landscaping. [PT04]

Education

Tree protection to me is one of the simplest, easiest things that you can do, right? Dead straightforward, and people just don't get it. I'm 28 years at it, and I'm doing it every day. Tree protection, fencing, you know, those simple measures of what need to be done. When utility companies are putting down servicing and ducting, they just slice through tree roots, and then cover it up. And then the tree dies five years later. Like *redacted* Park a few weeks ago, all the trees came down. That was because utilities were cut into the service roots about eight years ago, nine years ago, so you lose... this is the impact of human intervention. So, if I could change things, I would definitely change the engineering profession. I would make them far more, as professionals, far more aware of the value of biodiversity, value of nature in our urban areas, and then how to protect it when you are doing these evolving changes in a city scape. Like, trees are such amazing things, they put up with awful abuse from us for from humans. [P13L]

APPENDIX 7:

Thematic Analysis for Semi-Structured Interview

Q1: Think of a green space in an urban or suburban area that you are familiar with, and state what you like, or find attractive about that space?

Merrion Square: Overlooked, but yet open. It's highly accessible. It's safe because all of it is overlooked, from a public area. It creates relief, in a built up area - 4/5 storey buildings all the way around it. It's used - probably because it is accessible and safe. It's more than a park - it has events on it. Large open green spaces accommodate lots of different uses - slacklining, football, having lunch, the food market. It's well kept. Very clean. High level of maintenance. It's locked at night. Good usability - a playground but not pitches etc because the context wouldn't require it. Paved loop around it, which allows for people to walk laps. Lot of art installations which draws tourists. Plenty of seating. A surface that doesn't get muddy - usable all year round. Aesthetically, you see maintenance and care. New plants, constantly, which is great visually - it's very interactive. Visually stimulating, people watching. There's something to look at every time you go. I like trees that fruit and produce. And deciduous trees that you can actually get an idea of the cycle of time. A bare tree doesn't really upset me too much. Seeing chestnuts or sycamores with the helicopters fall... that whole idea of the passage of time, is something you can engage with it more than homogenous conifers. Merrion square works because of the juxtaposition to the urban grain outside it. It is your open space.

Dun Laoghaire: The seafront and the harbour nice because fresh air and you could see into the distance. Nice when you're in an apartment that you can go somewhere where you can see further. Somewhere to do a walk. Around DL town: Somewhere with space and that slows you down, you're not walking in a straight line. Something to look at whether its shops or plants. Where you don't feel like you're on the side of the road, where you have space. Nice plants, seating, somewhere to pause and appreciate the landscape where you don't feel isolated but also don't feel like you're in the way. It's nice to see different colours and textures in planting, rather than one hedge. Doesn't have to be super bright, just variety, interesting things, and visual interest.

St Anne's Park: The trees muffle the unpleasant sound of the traffic. Watching squirrels, birds, etc. It's also nice to see lots of human activity like kids playing in the playground, teams playing on the fields, people walking dogs, etc. It's also very well maintained in terms of litter, its clean, and it's pretty with flowers, etc.

Bushy Park: Diversity both aesthetic and ecological biodiversity (river, playing fields, parkland trees, new tree areas). I think that's what the public are looking for - diversity and ecological experience: birds, bats, bees, and you can kind of walk through it (FN: access/immersion). Diversity is key.

Phoenix Park: I like that it has really long vistas, because its so big, you get to see some version of nature for a very long distance. And I think that's really lovely thing to get in Dublin.

Church grounds project, Beechwood, Ranelagh: It makes people feel like they're in nature, that they're in the countryside, rather than a city context. They are back where they feel they belong. They feel close to nature. There's lots of green, and nature around you in that space, and you're encouraged to walk on the grass. the space welcomes you into nature.

St Audoens Park: by Dermot Foley. Really well resolved in terms of universal access/ design. Used recycled and local materials. Lots of perennial planting that doesn't need lots of management and works with a non-herbicidal regime. Lots of playful design elements - adds to a sense of discovery. Retained a lot of existing trees. Has lots of pollinator plants. I think if we use a space, then we cherish it and it becomes valued.

Killiny Hill: It's a park, it's a woodland and its coastal. It has cliff edges and its very popular.

Min Ryan Park: Accessible, looks good, there's a playground, a lot of planting, it's actively used. They used lots of elements that parks can be afraid to use like water and sandpits - that's well centered, in a focussed area. There's a skate park. It's linked by pathways through existing land and that land hasn't been touched which is great for the carbon profile and sequestration. There's lots of SUDs features and naturalised areas. They haven't done wildflowers, they just let it go. Flowers that pop up like meadowsweet or foxglove, they just happen, and because of that, they look right in the space. Things that attract me in nature are trees, water, and people. People using the open space and elements of biodiversity.

Merrion Square: It's a great amenity in the city centre for people to enjoy. Great to see people using it. It used to be quite closed from the street with dense vegetation, you felt like you're escaping from the city environment. They thinned it out, and I was concerned that it might be too permeable, but it still works really well. And now you can see in so it can be enjoyed just by walking past, it has also made it safer through passive surveillance.

Forest in Rostrevor: Diversity, quiet, and peace. The seasonality changes throughout the year, so it isn't fixed but there is a permanence in that the trees will outlive me. There is a tree that is older than the United States! So when you get your head around that, you put yourself in perspective. If you're stressed out, you get that bit of perspective.

- = Elements of human connection and experience of nature.
- = Elements of ecology, biodiversity and vegetation.
- = Elements of human activity and use.
- = Elements of safety, management, usability, and practicality.