"Navigating Biodiversity: The process of defining and utilizing corporate biodiversity efforts”

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Abstract:

Navigating biodiversity integration in corporate practice is a complex process that requires companies to define, value, and utilise biodiversity efforts. While biodiversity is a key component of corporate sustainability, little is known about how businesses conceptualise it and why they engage with it. This study applies a sense-making perspective to explore how businesses define, value, and utilize biodiversity, examining its alignment with the Global Biodiversity Framework. Based on semi-structured interviews with key informants from 15 Dutch companies, the findings reveal that biodiversity integration follows a structured three-phased sensemaking process aligned with Laszlo's sustainable growth framework. The results show that economic, ecological, and cultural values drive corporate biodiversity efforts, with financial incentives playing a key role in decision-making. Companies focus on species and ecosystem diversity, while genetic diversity remains largely unaddressed. Measurement approaches vary, with most firms conducting baseline biodiversity assessments (T0) and post-implementation evaluations (T1). While the Global Biodiversity Framework (GBF) provides a broad global vision, businesses do not directly integrate it into their strategies; instead, they prioritize national and sector-specific policies that offer clearer regulatory and implementation pathways. This approach reflects a pragmatic adaptation to biodiversity integration, creating opportunities to further bridge corporate action with global conservation efforts through more structured alignment.

Keywords: biodiversity integration, corporate sustainability, sensemaking, sustainability transitions, Global Biodiversity Framework, Sustainable Growth Framework, biodiversity measurement, corporate environmental strategy.

Introduction

In recent years, the concept of *biodiversity* has emerged as a critical element in global discussions on sustainability. It has become increasingly evident that human societies and businesses are intricately linked with and dependent on nature and biodiversity (Bentley & Brunner, 2022). During their operations businesses often have an impact on ecological systems (Mair et al., 2024). Looking closely at these biodiversity impacts can give both environmental advantages as well as competitive advantages to a company. Therefore, firms are recognizing the importance of integrating biodiversity into their business practices (Hawkins et al., 2024)

For European businesses, the integration of biodiversity into corporate practice has become a mandatory requirement for larger companies (Zhu et al., 2024). This regulation, established by European union, show the growing recognition of biodiversity's critical role in sustainable development (European Union, 2022). However, unlike other forms of sustainability reporting, such as carbon emissions which rely on absolute metrics like tons of CO2, the European biodiversity reporting currently lacks explicit targets that companies must achieve. The complexity of biodiversity poses significant challenges in setting standardized targets. This makes it difficult to establish uniform benchmarks that can be applied across different industries in Europe. As a result, current regulations primarily require companies to demonstrate an ongoing commitment to improving their biodiversity performance. Companies are thus tasked with implementing measures that contribute positively to biodiversity, without knowing exactly what to implement.

To properly integrate biodiversity as a company, you will first need to identify what the term entails. In practice and in less scientific context, when asked what the 'word' biodiversity means to a regular person, they will reflect on a wide range of different values, including notions of balance, human-nature interactions, and wilderness (Fischer & Young,

2007). Biodiversity is interpreted through a variance of three diversity elements: *genetic*, *species* and *ecosystem diversity*. The most recognizable and most understood element of biodiversity is the diversity of species (Mikkonen & Raatikainen, 2024). It sets biodiversity as "the richness of species in area." Though fundamental in ecology, species richness alone does not capture the full complexity of biodiversity, and it needs the inclusion of the other two elements for a full understanding that is not contradictory (Mace et al., 2012). Completely defining biodiversity is a careful balance between each of the three elements. Companies aiming to incorporate biodiversity face a challenge in defining and prioritizing each of these elements due to the varying goals and the broad nature of biodiversity itself (Zhu et al., 2024).

To standardize biodiversity efforts, a large group of conservationist scientists came together at a UN supported initiative called the *Convention on Biological Diversity (CBD, 2022)*. Here they created a framework that sets goals and targets for biodiversity in the future. This framework has a balanced approach of biodiversity and includes a definition that values each of the three diversity elements (CBD, 2022) This framework is called the Global Biodiversity Framework GBF). Recognizing that businesses are critical in achieving these objectives, the CBD calls for companies and financial institutions to measure and report their impact on biodiversity (Mair et al., 2024). In turn, the CBD definition and framework offers a hold on for companies to base their further actions on, offering advisory targets.

In practice, biodiversity is still frequently employed in varied, and at times conflicting, ways across different industries and organizational sizes (Mair et al., 2024). In the top one hundred of fortune 500 companies in 2016, out of 49 companies that mentioned biodiversity in their sustainability report, only six acknowledged the GBF, indicating a low level of engagement with the CBD framework (Addison et al., 2019). Later it is identified that there has been a significant increase in biodiversity reporting. 70 out of 100 companies are mentioning biodiversity, but there is still a lack of clarity regarding the specific scopes and

contexts in which they use the term in their reports (zu Ermgassen et al., 2022). Companies have found a way to integrate their biodiversity efforts, yet there is not much known about the origins of the complete process behind this integration. The present study explores the complex process of biodiversity integration within companies, like the approach taken in sustainability integration. According to Laszlo (2003), sustainable growth in a company is a structured process with several key steps: defining sustainability, aligning company values, assessing current practices, and developing strategies for implementation.

The existing literature is looking into the misalignment between the Global Biodiversity Framework (GBF) and businesses; yet it is unknown if companies consider using the framework in their biodiversity efforts. This gap in understanding highlights the need for further research into how corporations integrate biodiversity, as well as whether and how these align with the GBF. Creating more understanding on how companies define and implement biodiversity strategies is vital for aligning business operations with global biodiversity goals (Zhu et al., 2024). This alignment would not only support ecological preservation but also offers businesses opportunities for enhancing their sustainability and competitiveness (Zhu et al., 2024) .

Moreover, there is a significant gap in knowledge about the entire process of biodiversity integration by companies. This includes knowledge about each of the four steps outlined by Laszlo: defining biodiversity, aligning values, measuring biodiversity, and implementing strategies. An exploration of these steps, as done by the present study can reveal crucial insights into the knowledge gap of how companies are navigating the complexities of biodiversity integration. These insights are important because they can serve as a valuable example for future efforts in biodiversity (zu Ermgassen et al., 2022). By examining the current practices, businesses can identify both the strengths and weaknesses of their biodiversity strategies (Addison et al., 2020).

A sensemaking approach helps organizations interpret and give meaning to complex situations like the one biodiversity poses (Weick, 1995). Given the underlying complexity of biodiversity and the exploring nature of the present study. Sensemaking offers a suitable theoretical lens to gain a deeper understanding of the complete process through which businesses define, value, and utilize their biodiversity efforts. This process can be conceptualized through a framework that includes "why, what & how" sensemaking phases and the four steps for integrating biodiversity (figure 1). To address the aims of the research, the following research question and sub-questions were established.

How do businesses currently value, define, and utilise biodiversity, and how does this align with or diverge from the Global Biodiversity Framework (GBF)?

I. ***Why do companies engage in Biodiversity?***
II. ***What aspects of genetic, species, and ecosystem diversity from the Global Biodiversity Framework are reflected in companies' definitions and measurements to biodiversity?***
III. ***How do firms apply both their definition and measurements into practice?***

By collecting and analysing data from 15 established businesses (until saturation) engaging in biodiversity, this study will contribute to the existing literature by offering empirical evidence and insights into corporate biodiversity practises. It contributes to theory by adapting both the sustainable growth theory of Laszlo and sensemaking theory to the unique challenges of biodiversity integration. The study develops a new model that provides a structured approach, serving as a potential guide for companies to navigate the process of implementing biodiversity initiatives. The present study can provide insights for bridging the gap between businesses and biodiversity, giving examples of pathways for businesses to align more closely with global biodiversity goals and thereby contributing to broader environmental and societal benefits. Lastly, the research will explore whether companies consider alignment

with the GBF, during the process of biodiversity integration. Contributing to theory by addressing the “why “question from the perspective of businesses, a viewpoint that has been underrepresented in existing literature.

Literature Review

Several key steps form the basis of sustainability integration, and these are equally applicable to biodiversity, as the corporate implementation of biodiversity is similar to sustainability. Christopher Laszlo's (2003) book outlines sustainable growth as a structured process that can be adapted to guide companies in integrating sustainability. These steps are applicable to biodiversity, as well. Initially, companies need to assess their current practises by defining and measuring their biodiversity impacts. Next, they set goals and objectives that align with their core values. Finally, they develop and implement strategies to leverage these values, creating actionable plans that drive biodiversity efforts forward (Laszlo, 2003).

Through the lens of the three sensemaking steps—"Why" (Values), "What" (Defining and Measuring), and "How" (Measuring and Implementing)—the present study delves into understanding how businesses interpret and integrate biodiversity efforts. To effectively use this framework in the present study, the concepts of biodiversity definition, biodiversity values, and biodiversity utilization (measurements and strategies) need to be outlined through a comprehensive literature review. This sensemaking approach, combined with Laszlo's framework, offers a detailed pathway to make sense out of the results that are collected from the interviews as seen in figure 1.

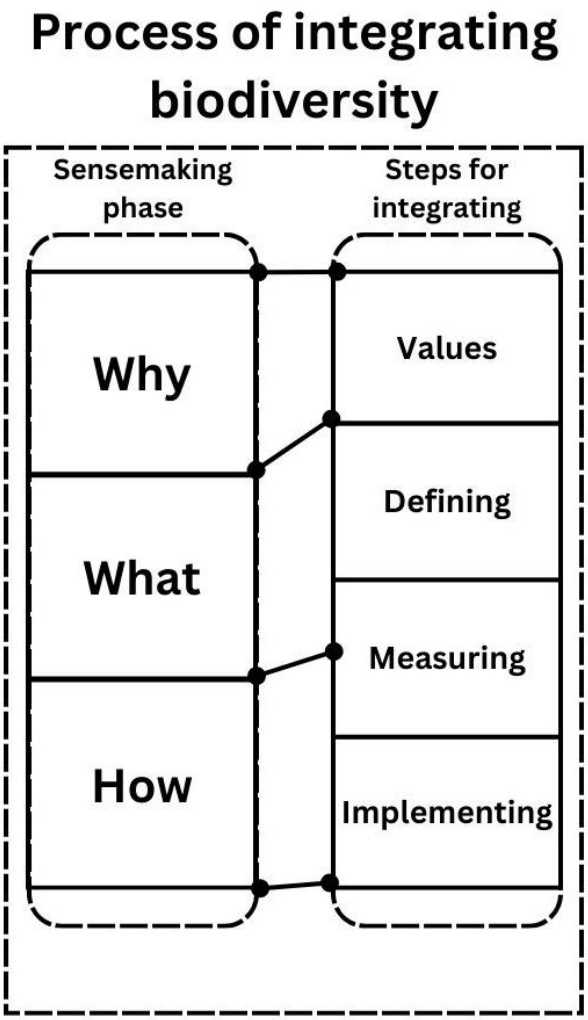

Figure 1: Through the lens of the three sensemaking steps—"Why" (Values), "What" (Defining and Measuring), and "How" (measuring and implementing)—the present study delves into understanding how businesses interpret and integrate biodiversity efforts.

Biodiversity and its types

In the process of integrating biodiversity, the first step for a business is to identify what they define when talking about biodiversity. Defining biodiversity can be a complex task but is still valuable for companies. How a company understands the concept is at the basis of every further step they take in their implementation. This understanding will significantly impact the efficacy of subsequent business strategies.

Integrating biodiversity can be of value for companies on both the global scale and on company level. Biodiversity is foundational to the global economy and society, with approximately half of the global GDP being dependent on living nature (World Economic Forum, 2020). Despite its importance biodiversity is under threat by human activities, leading to a loss that poses a severe risk for life on earth (Ceballos et al., 2015). This risk is not only an environmental issue but can also be a risk for businesses (Bentley & Brunner, 2022). Affected ecosystem services can consequent into a decrease in productive capacity for businesses. An example for this, is the reduced number of pollinators making it harder for agricultural businesses to farm crops (Bentley & Brunner, 2022).

The inherent complex nature of biodiversity makes it hard for non-conservationists to define and catch the complete scope of all that it entails (zu Ermgassen et al., 2022). Most individuals hold rich mental concepts of biodiversity, even if they are not familiar with scientific terminology. These concepts often include ideas of balance, wilderness, and human-nature interactions (Fischer & Young, 2007). Among laypeople, biodiversity is often appreciated for its intrinsic and aesthetic values. They tend to view biodiversity as a vital component of ecological health, contributing to the beauty and recreational opportunities provided by nature(Mikkonen & Raatikainen, 2024). In addition, laypeople's understanding of biodiversity can sometimes lack depth in scientific terms, focusing more on visible aspects of biodiversity loss, such as the decline of charismatic species or the degradation of local

habitats (Miller, 2005). The way laypeople perceive and define biodiversity is relevant, as these perceptions often influence standard business practices, particularly in companies lacking expertise or dedicated conservation departments (zu Ermgassen et al., 2022).

Scientifically biodiversity is commonly understood as "*The variety of life on* earth" through a variance of three diversity elements: *genetic, species* and *ecosystem diversity* (Franke, 1998). The present study draws on the foundational principles from Fryxell et al.'s (2003) book, "Wildlife Ecology, Conservation, and Management", a commonly used book on the fundamentals of ecology and conservation. Still, the interpretation and emphasis placed on either of these elements can vary across conservationists, reflecting different priorities and perspectives. Some have argued that the vagueness of biodiversity might conceal serious disagreement about conservation matters and might impair biodiversity conservation planning and policy making (Meinard et al., 2019). This vagueness comes from valuing one of the fundamental elements differently than another. These challenges can be illustrated by examining each element individually.

Species diversity is the variety of species within a particular area. It is often what people think of first when they hear the term biodiversity (Fryxell et al., 2014). Species diversity is a critical aspect of biodiversity because it reflects the amount of life forms within ecosystems, contributing to the general functionality (Fryxell et al., 2014). Species diversity is often measured and defined through species richness, which is the number of different species present in a given area (Fryxell et al., 2014). In agriculture, focusing on species diversity can lead to significant benefits for a company, particularly in terms of sustainability and productivity. An applicable example is the use of wildflower strips to attract pollinators and beneficial insects (Bentley & Brunner, 2022). By planting patches of wildflowers alongside crops, a farming company can support local bee populations and other pollinators, which are crucial for the pollination of most crops. This increased pollination can lead to higher crop

yields and improved quality, especially for fruits and vegetables that depend on pollinators. A downside is that species diversity is also one of the elements of biodiversity that is most limited by a human-centred bias. People often focus on more charismatic or familiar species, such as mammals and birds, while overlooking less conspicuous groups like certain plants and insects (Raphael & Molina, 2007).

Understanding *ecosystem diversity* involves looking beyond individual species to comprehend the complex interactions within ecosystems(Fryxell et al., 2014). Ecosystem diversity refers to the variety of ecosystems within a particular area. It includes the different habitats, communities, and ecological processes that occur within these ecosystems (Rawat US & Agarwal NK, 2015). Ecosystem diversity involves recognizing the importance of various ecosystems, each of which supports different species and ecological processes (Fryxell et al., 2014). This diversity is crucial for maintaining the resilience and functionality of the environment and highlights the interconnectedness of species and the web of life they form as a whole (Fryxell et al., 2014).

Genetic diversity refers to the variation in the inherited genomic basis of a species. It is the foundation from which all biological diversity originates (Mikkonen & Raatikainen, 2024). This diversity is shown through genetic differences, known as genotypes, which, in combination with the living environment, determine the appearance (phenotype) and ability to survive and reproduce (fitness) of an individual. These individual-level differences are crucial as they drive evolution through the need to adapt, eventually leading to the diversification of life into various species and ecosystems (Fryxell et al., 2014).

To take away the ambiguity of valuing different elements, a large group of conservationists came together at the Convention on Biological Diversity (CBD). This is a UN supported convention that developed the Global Biodiversity Framework (GBF) for three main biodiversity goals: “the conservation of biological diversity, the sustainable use of its

components, and the fair and equitable sharing of benefits arising from the utilization of genetic resources “ (CBD, 2022). The CBD is relevant due to their goals, which also require a more standardized definition of biodiversity that balances all three diversity elements. The CBD characterizes biodiversity as:” *The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.”* (CBD, 2022). The three diversity elements: *genetic*, *species,* and *ecosystem diversity* are all represented equally and balanced in this definition. According to the last convention, the CBD recognizes business as a main element in solving global biodiversity issues (CBD, 2022).

Despite its broad influence in conservation science and their new focus on businesses, the implementation of the balanced CBD approach varies significantly in the business sector. In the top 100 Fortune 500 companies in 2016, out of 49 that mentioned biodiversity in their sustainability reports, only six acknowledged the GBF, indicating a low level of engagement with the CBD framework (Addison et al., 2019). A follow-up study 4 years later identified that there has been a significant increase in biodiversity reporting. 70 out of 100 companies are mentioning biodiversity, but there is still a lack of clarity regarding the specific scopes and contexts in which they use the term in their reports (zu Ermgassen et al., 2022).

It is not completely clear why companies are not aligning their biodiversity efforts with the CBD. It is speculated that the CBD caters more to governmental legislation than to businesses (Mair et al., 2024). In addition, the goals of the CBD are not always completely measurable. Companies are increasingly implementing biodiversity into their practices. But they face a challenge due to the varying goals and the broad nature of biodiversity itself (Zhu et al., 2024). Recognizing that biodiversity holds a distinct risk benefit relation towards the business environment. Using the standardized science-backed CBD could be an option for

companies that are struggling with navigating the complex concept of biodiversity (Robinson, 2012).

To conclude, throughout this part about defining biodiversity, it becomes clear that a company's understanding of this complex concept is critical for effectively integrating biodiversity into business practices. The diverse interpretations of biodiversity—from lay people mostly appreciating its aesthetic value to scientific definitions emphasizing genetic, species, and ecosystem diversity—highlight the challenges companies face in establishing a clear and comprehensive approach. In addition, outlining the concept of defining sets the stage for making sense of the whole biodiversity integration process, underscoring the various perspectives and definitions that businesses might be using.

Biodiversity values of companies

Understanding how companies define biodiversity is foundational to integrating it into business practices, as this shapes all subsequent steps, including aligning definitions with company values (Laszlo, 2003). In addition, values form a foundation to the strategies. These strategies will not be effective if they are not aligned with the values. To effectively identify these values, it is important to outline what values are and how values relate specifically to biodiversity.

Values, fundamental beliefs guiding actions and decisions, influence the perspective on what is important and behaviour (Hirose & Olson, 2015). Companies are human organised and can have values as well. Companies are often seen as their own moral agents, and recent corporate social responsibility (CSR) developments are an example of this (French, 2015). In an organizational context, values are the core principles that guide the behaviour and decision-making of the organization and its members. These values are often explicitly stated in the organization's mission statement, code of conduct, or strategic plan (Ketola, n.d.).They influence the culture of the organization, the way it markets itself to the outside world and the

decisions it makes. It is also common for company values to be reflected in the values of its employees (Schein, 1991).

Values can be typically divided into intrinsic and instrumental values (Hirose & Olson, 2015). Intrinsic value refers to the inherent worth of something, independent of its utility or benefit to humans (Hirose & Olson, 2015). In the context of biodiversity, intrinsic value implies that all forms of life, whether they are plants, animals, or ecosystems, have value simply because they exist. Instrumental value is the value that something holds because of its utility or benefit to humans. This type of value is often associated with practical or functional roles (Hirose & Olson, 2015) In this view, the worth of biodiversity is measured by the benefits it provides to human societies, including economic, cultural, and health-related advantages (Biasetti & De Mori, 2016). This framework applies well known intrinsic and instrumental values to biodiversity. In their research it is acknowledged that biodiversity is a complex concept and that the values concerning it can be complicated as well. To make a structured framework they state that biodiversity efforts always have an origin in either 1 or more biodiversity values.

Intrinsic values, which can recognize the inherent worth of nature, can lead individuals and companies to adopt ethical practices that prioritize the protection of biodiversity for its own sake. This perspective encourages conservation efforts that are not solely based on human benefits but on the respect for all living organisms (Biasetti & De Mori, 2016).

Economic values play a crucial role in shaping corporate strategies. Companies often respond to the economic value of biodiversity by integrating sustainable practices into their operations. Recognizing the long-term profitability of conserving resources, businesses may invest in biodiversity strategies (Biasetti & De Mori, 2016). Intrinsic values are challenging to conceptualize (Hirose & Olson, 2015). When dealing with a complex concept like biodiversity, organizations can benefit from considering both intrinsic and instrumental

values. While intrinsic values underscore the inherent worth of biodiversity, instrumental values provide a more structured framework for justifying biodiversity efforts in terms of tangible benefits (Biasetti & De Mori, 2016).

Ecological values emphasize the importance of biodiversity for ecosystem services that support human life. This understanding can drive both individuals and companies to support policies and practices that protect these services. For example, companies might engage in habitat restoration projects or support conservation initiatives that ensure the stability of ecosystems they depend on (Biasetti & De Mori, 2016).

Cultural and aesthetic values influence behaviour by fostering a deeper appreciation for nature's beauty and diversity. Companies might leverage these values in marketing strategies, promoting products that are environmentally friendly or that support conservation efforts. This can also lead to increased consumer demand for sustainable products, encouraging companies to adopt greener practices (Biasetti & De Mori, 2016).

Understanding these values is crucial for companies because they form the basis of their biodiversity goals, definitions, and strategies. By identifying and aligning with these values, companies can set clear, measurable biodiversity goals that reflect their core principles and contribute to both their sustainability objectives and broader global efforts. This step is essential in translating the abstract concept of biodiversity into actionable business strategies that align with the company's mission and values. In addition, outlining the origin and description of these values is crucial for identifying them in the present study, to further make sense of the process throughout the “why” question.

Biodiversity Utilisation

The third and fourth step of biodiversity integration are the assessment of current practices and developing a strategy (Laszlo, 2003). Both steps can be conceptualized into biodiversity utilization. A company should begin by evaluating the existing business operations to identify areas where performance can be improved. For biodiversity implementation, measurements form an essential tool in gaining knowledge of the current state of affair in a company. With this knowledge in mind a company can then form and implement their strategies (Laszlo, 2003) . Outlining both measurements and strategies for biodiversity is crucial for the present study to help identify, as it helps to make sense of the "how" question.

Biodiversity measurements are tools used to measure the current state of biodiversity. The complexity of defining biodiversity is also reflected in the way it can be measured. The most encompassing measurements typically fall in the three elements: *Species, genetic and ecosystem diversity*. By dividing measurements into these three categories as well, companies can focus on the specific aspects of biodiversity that are relevant to them (Zhu et al., 2024). Still the problem remains that one measurement may provide insights into aspects of biodiversity, but on their own it will not capture the full complexity. A variety of biodiversity measurements will always be necessary to address the full scope of impact a company has on biodiversity (Mikkonen & Raatikainen, 2024). Helping to develop targeted strategies that are in line with the goals and values of the company.

There is a big amount of biodiversity measurements, but the most used methods for each of three elements are: Species richness for *species diversity*, gamma diversity for *ecosystem diversity* and gene analysing for *genetic diversity* (Mikkonen & Raatikainen, 2024). Each of these measurements require an extensive analysis of an area, preferably done by an expert conservationist that can identify distinct species (zu Ermgassen et al., 2022).

Species diversity is typically measured using several approaches that capture various aspects of diversity within a given ecosystem. The most straightforward measure is species richness, which counts the number of distinct species present in a specific area. This measure is often used as an indicator of an ecologically valuable or "healthy" environment, based on the premise that a higher number of species signifies greater biodiversity (Magurran, 2003).

Ecosystem diversity is often measured by examining gamma diversity, which refers to the overall biodiversity within a geographic area, considering the variation in species distributions and community structures across multiple ecosystems. Measuring ecosystem diversity involves assessing the different types of ecosystems present in a region and their unique characteristics, such as species composition, physical environment, and ecological processes (Magurran, 2003).

Genetic diversity measurements, including gene diversity indices and genetic distance measures, quantify the genetic variation within and between populations of a species. It is measured by the overall gene pool of a species' living population. As population numbers fluctuate, so does the variation in the gene pool (Magurran, 2003).

For organizations that are willing to start with integrating biodiversity, it is sometimes not possible to do full-scale measurement research. Budget costs or a lack of expertise, can be an obstacle to conduct complete measurements (Nic Lughadha et al., 2005). Still there are a few ways to quickly measure biodiversity. These do not necessarily hold value in the long term but can be a good starting point to base further strategies or measurements on. Without the necessity of conservation experts, companies might focus on keystone species—organisms that play a critical role in maintaining the structure of an ecosystem. The presence or absence of these species can provide valuable insights into the overall health and biodiversity of an ecosystem. Alternatively, companies might identify indicator species, which are sensitive to environmental changes and can signal shifts in ecosystem conditions(Magurran, 2003). This

follows a basic principle in ecology that the presence of certain ‘bigger’ species in the top of the pyramid can suggest that the foundation of the ecological pyramid is healthy as well (Magurran, 2003).

The importance of biodiversity measurements lies in their ability to inform strategic decision-making. Accurate measurements allow companies to identify areas where biodiversity is lacking and to implement strategies aimed at improvement (zu Ermgassen et al., 2022). For instance, if a company finds that its operations negatively impact species diversity, it might adopt practices that mitigate habitat destruction or promote the restoration of native species. On the other hand, if measurements indicate a healthy level of biodiversity, the company can develop strategies to maintain the status quo, ensuring that its activities do not negatively affect the ecosystem (Addison et al., 2019).

Once these biodiversity measurements are obtained, companies can begin formulating strategies to address identified issues. This approach ensures that the biodiversity integration is effective, leading to more sustainable business practices that benefit both the company and the environment. Identifying the different ways of measuring biodiversity by companies is also essential for the present study, as it will help with interpreting the results generated by the interviews. Biodiversity strategies are the next step in the integration of biodiversity, originating from the definitions, values, goals, and measurements that have been mentioned earlier (Laszlo, 2003).

For an organization integrating these strategies can seem just as complex as all the previously outlined concepts. Yet, small strategy efforts can lead to significant changes in biodiversity. For instance, adjusting mowing schedules to allow certain plant species to complete their life cycles can enhance habitat diversity and provide critical resources for pollinators. Such strategies, though seemingly minor, can contribute to maintaining and enhancing local biodiversity (Rawat US & Agarwal NK, 2015). For bigger efforts, companies

can seek guidance from existing conservation frameworks, like the one from the CBD. The CBD provides non-mandatory guidance on strategic approaches to biodiversity conservation. For instance, the CBD promotes companies to also consider the *ecosystem* diversity element. Encouraging companies to consider the entire ecosystem when making decisions, rather than focusing on individual species (CBD, 2022). Additionally, the CBD emphasizes the importance of integrating biodiversity considerations into sectoral and cross-sectoral plans, programs, and policies (CBD, 2022). This allows companies to tailor their strategies to align with their specific operational contexts and biodiversity goals, ensuring that their approaches suit the unique circumstances of their industry.

Biodiversity strategies within the corporate sector are frequently influenced by governmental policies and regulations. Governments play a crucial role in setting the agenda for biodiversity conservation, establishing legal frameworks, and offering incentives to promote sustainable practices (Zhu et al., 2024). These regulatory measures guide companies in developing their biodiversity strategies to ensure compliance and contribute to both national and global biodiversity objectives. However, it is important to note that most of these governmental regulations currently lack clear and specific targets for biodiversity conservation. This absence of defined targets can be advantageous for companies, allowing them greater flexibility in how they design and implement their biodiversity initiatives (zu Ermgassen et al., 2022). Without strict mandates, companies could innovate and tailor their strategies to fit their operational contexts while still aligning with broader policy goals (Sharma & Nguan, 1999).

Most corporations are increasingly investing in initiatives that incorporate biodiversity considerations into their business models (Addison et al., 2019). This shift reflects not only a trend towards recognizing biodiversity as a vital component of CSR but also the associated risk-benefit for companies. By integrating biodiversity into their strategic planning,

businesses can mitigate risks related to regulatory compliance, reputational damage, and operational disruptions caused by environmental degradation. Furthermore, these initiatives present opportunities for competitive advantage, as companies can enhance their brand value, foster innovation, and build resilience against future environmental challenges.

In addition to these strategic benefits, businesses are beginning to recognize the potential consequences of biodiversity loss on their operations, such as resource scarcity and increased costs (Bentley & Brunner, 2022). This understanding drives companies to proactively address biodiversity issues, enabling them to differentiate themselves in the marketplace and tap into new opportunities for growth. By leveraging biodiversity as a source of innovation, businesses not only protect themselves against ecological risks but also capitalize on emerging market trends and consumer preferences, thereby driving both growth and sustainability (Sharma & Nguan, 1999).

Biodiversity utilization represents the transition from planning to implementation. This phase follows the initial stages of defining biodiversity goals and setting corresponding values, serving as the practical application of the strategies developed during those earlier phases. Biodiversity utilization is where the definition and values from earlier phases come to life, making it a vital component of looking into the complete process of biodiversity integration by companies (Laszlo, 2003).

Sensemaking

Sensemaking is a process that involves the interpretation and understanding of complex or ambiguous situations, often within organizational contexts (Weick, 1995). It is characterized by several properties, including its retrospective nature, where individuals make sense of events by looking back at them, and its social aspect, as it often involves collective interpretation and shared understanding among group members(Weick, 1995). Sensemaking is driven by both belief and action, meaning that individuals' pre-existing beliefs influence how they interpret events, while their actions can also shape their understanding of those events. This dual process highlights the dynamic interplay between cognition and behaviour in sensemaking (Weick, 1995). There are three central questions in the sensemaking process: “Why” addresses the reasons behind events or changes, “what” involves identifying and defining what is happening and “how” focusses on the methods or processes involved in a situation(Weick, 1995). By addressing these questions, sensemaking allows for a structured approach to interpreting complex situations like the one of biodiversity integration by companies.

In exploring the nature of businesses engagement in biodiversity initiatives, it is essential to understand the link between the process of biodiversity integration and sensemaking. Having already conceptualised the concepts surrounding this process, this section focuses on how sensemaking processes can enable businesses to interpret and integrate these concepts into their biodiversity strategies. By integrating the “why,” “what” and “how” questions.

Sensemaking serves as a tool for exploring the earlier defined values that underpin businesses' engagement in biodiversity (Weick, 1995). It addresses the "why" by allowing organizations to delve into the core values driving their commitment to biodiversity. Through this reflective process, businesses can align their biodiversity efforts with their overarching

mission ensuring that their initiatives are guided by a coherent set of principles. This alignment not only strengthens their strategic approach but also fosters a deeper organizational commitment to sustainability.

In terms of defining biodiversity amidst its inherent complexity, sensemaking tackles the "what" by providing a framework for interpreting the complex nature of different biodiversity types (Weick, 1995). It enables businesses to construct a coherent meaning from all the complexity surrounding biodiversity. making it easier for them to communicate what biodiversity means for their operations and make informed decisions on further biodiversity integration.

When it comes to biodiversity utilization, sensemaking bridges the gap between understanding and action by addressing both the "what" and "how." It helps businesses comprehend biodiversity measurements by transforming scientific data into practical insights that are relevant to their specific contexts(Weick, 1995). This process involves interpreting biodiversity metrics to accurately assess impacts and identify areas for improvement, thus forming the foundation for informed decision-making. Furthermore, sensemaking supports the development of biodiversity strategies by guiding businesses in translating insights into strategic initiatives. It answers the "how" by enabling innovation, enabling companies to craft strategies that respond effectively to emerging biodiversity challenges and opportunities.

Thus, sensemaking provides a structured lens through which businesses define, value, and utilize biodiversity in their operations. By interpreting biodiversity through the interconnected phases of "why," "what," and "how," companies navigate the complexity of integrating biodiversity into corporate strategy. While the literature highlights the importance of defining biodiversity, aligning it with corporate values, and employing measurement tools to inform strategic action, there is still a limited understanding of how businesses apply these elements in practice. Existing research lacks empirical insights into whether companies follow

a structured process in their biodiversity efforts or if these efforts remain fragmented and ad hoc. This study seeks to address this gap by exploring how companies actively engage in sensemaking when integrating biodiversity—examining their values, definitions, measurement approaches, and strategic implementation. Through qualitative analysis of corporate biodiversity efforts, this research aims to reveal the extent to which companies follow a coherent integration process and whether their actions align with broader global frameworks such as the GBF.

Methodology

General

For the present study, a qualitative methodology was employed using an interview study strategy to explore and develop a descriptive theory of how companies integrate biodiversity into their operations through a sensemaking perspective. This approach allows for an in-depth inquiry into how companies define, value, and utilise biodiversity efforts within real-world business contexts. By focusing on interviews, this study analysed context-dependent experiences and generated practical knowledge that was both insightful and scientifically relevant, making a comparative analysis possible across industries and company sizes.

Sampling strategy

Participants were selected using a purposive sampling technique, focusing on a small set of companies and individuals who could provide insights into the complete processes of company biodiversity integration. The sampling strategy targeted firms operating in the Netherlands that actively engaged in biodiversity efforts and key informants directly involved in these initiatives. Informants included executives, ecologists, and managers engaged with biodiversity efforts in their company.

Participant recruitment was conducted primarily through LinkedIn, using targeted search terms such as “Biodiversity,” “Sustainability Manager/Advisor,” and “Ecologist” to identify professionals actively involved in corporate biodiversity efforts. Individuals holding these roles were contacted and invited to participate, with further communication taking place either directly on LinkedIn or through contact details provided. In total, around fifty professionals were approached across a range of companies in the Netherlands, focusing

mostly on those where biodiversity initiatives could be implemented rather than just discussed at a strategic or advisory level. The selection process prioritized larger companies, as these organizations tend to have more structured biodiversity policies and dedicated resources for implementation (Sharma & Nguan, 1999). While participation was based on willingness and availability, attention was given to ensuring a spread across industries, preventing an overrepresentation of any single sector. As a result, the final sample included companies from a wide array of industries as seen in Table 1. Beyond direct outreach, snowball sampling played a role in expanding the diversity of participants, as some interviewees referred to colleagues in relevant roles from different industries. Prior to each interview, a preliminary review of publicly available company materials and direct communication helped establish an understanding of the organization's biodiversity engagement and the participant's level of involvement. Interviewees either participated directly or designated a colleague with relevant expertise, ensuring that all responses reflected practical experience with biodiversity.

The recruitment process continued until saturation was reached for key themes and the data collection period concluded. Recruitment was planned to stop once a representative sample of companies had been interviewed, ensuring a balance between depth of analysis and data manageability. An initial target of 12 companies was set based on the expectation that this number would provide sufficient diversity in industry perspectives and biodiversity approaches to address the research questions comprehensively. As the interviews progressed, it became evident that key themes were recurring, indicating that additional data collection was unlikely to yield significantly new insights. However, when three additional companies expressed their willingness to participate, their inclusion was deemed valuable to enhance the study. This led to an adjustment of the sample size to 15, which represents the final pool of participants in the study. The full sample size can be seen in Table 1, along with the corresponding variables for each participant.

Table 1: Overview of Participating Companies and Their Biodiversity Engagement Across Categories

N	Category	Yes/No Presence of biodiversity in Annual Report of 2024	Company size	Interviewee role
1	Energy & infrastructure	Yes	Mid-sized (2,001 - 5,000 employees)	Ecologist
2	Construction	Yes	Large (5,001 - 10,000 employees)	Biodiversity advisor
3	Construction	Yes	Very Large (10,001+ employees)	Program Manager sustainability
4	Energy & infrastructure	Yes (2023)	Mid-sized (2,001 - 5,000 employees)	Ecologist
5	Other	No	Large (5,001 - 10,000 employees)	Head of ESG
6	Energy & infrastructure	Yes (2023)	Mid-sized (2,001 - 5,000 employees)	Environmental engineer
7	Construction	Yes (2023)	Large (5,001 - 10,000 employees)	Environmental engineer
8	Greenery Maintenance	Yes	Small (1 - 2,000 employees)	Project Advisor
9	Engineering advice	Yes	Small (1 - 2,000 employees)	Ecological advisor
10	Energy & infrastructure	Yes	Large (5,001 - 10,000 employees)	Sustainability advisor
11	Other	yes	Very Large (10,001+ employees)	Sustainability manager
12	Energy & infrastructure	No	Large (5,001 - 10,000 employees)	Environmental advisor
13	Energy & infrastructure	yes (2023)	Mid-sized (2,001 - 5,000 employees)	Environment & sustainability specialist
14	Construction advice	No	Small (1 - 2,000 employees)	Ecologist
15	Other	Yes	Very Large (10,001+ employees)	Sustainability manager

To further strengthen the research, the participating companies were categorized based on their industry sector, the presence of biodiversity considerations in their reports, their company size, and the role of the interviewee. This categorization, as shown in Table 1, provides context about the diversity of the sample. While these categories are not the primary focus of the research, they help illustrate the range of company types included in the study, offering a clearer understanding of the business landscape in which biodiversity integration is taking place.

Data collection

Data collection was conducted through semi-structured interviews with key informants, supplemented by secondary data from desk research for triangulation. The primary data source consisted of one-on-one interviews with company representatives responsible for biodiversity efforts. The semi-structured interview format ensured that all relevant themes were covered while allowing flexibility.

Before each interview, participants were informed about the research objectives, confidentiality, and their right to withdraw at any time. The interviews, each lasting approximately 45 minutes, focused on the process of biodiversity integration within the companies. Prior to the interviews, participants received an information document detailing the interview objectives, confidentiality terms and conditions for participation, as outlined in Appendix C. This document also included two example questions and an explanation of the five main themes covered in the interviews.

The interview questions were structured around key themes that align with the study's research questions and theoretical framework, focusing on how companies value, define, and integrate biodiversity within their strategies. Interviews were done in Dutch, and the full list in Dutch and English can be found in Appendix D. The interviews began with broad questions on corporate sustainability to establish how biodiversity fits within broader environmental commitments. To explore this, interviewees were asked questions such as: "*Can you describe your company's general approach to sustainability and why biodiversity is an important part of that framework?"* This provided a starting point for deeper discussions on biodiversity integration. Next, the interviews examined how companies define biodiversity, investigating whether they follow a standard definition, develop their own, or allow the concept to evolve over time. This was essential to understanding biodiversity sensemaking within corporate contexts. Interviewees were asked, for example, *"Does your company have a formal*

definition of biodiversity? If so, why was this definition chosen?" and *"Has the meaning of biodiversity within your company evolved over time?"* These questions helped assess whether companies conceptualized biodiversity in broad ecological terms or adapted definitions based on industry expectations and business priorities. To further understand the integration of biodiversity, the study explored corporate values, aiming to determine whether companies engage with biodiversity primarily through ecological, economic, or cultural values. Participants were asked, for example, *"Are there existing corporate values that guide your company's biodiversity initiatives?"* and *"Why does your company prioritize certain biodiversity efforts, such as habitat restoration or species protection?"* The responses provided insight into the values that are at the foundation of their strategies. The present study also examined how companies measure it, focusing on the methods used to assess biodiversity impact and whether they rely on internal assessments or external expertise. To investigate this, participants were asked, for example *"Can you describe the methods your company uses to measure biodiversity?"* and *"How do you ensure that these assessments reflect biodiversity's complexity?"* These questions helped uncover how companies approach biodiversity measurement. Additionally, the study assessed corporate alignment with the Global Biodiversity Framework (GBF), exploring whether companies integrate its principles and how useful they find the framework. Interviewees were asked, for example, *"Has your company incorporated GBF guidelines into its biodiversity strategy? Why or why not?"* Some interviewees described clear alignment with the framework, while others found it too general to directly influence their biodiversity initiatives. An unexpected but recurring theme that emerged during the early interviews was biodiversity maintenance. Several respondents highlighted challenges in sustaining biodiversity efforts beyond initial implementation. As a result, later interviews included additional questions on how companies ensure the long-term success of biodiversity initiatives. Questions such as and *"Do you work with external*

contractors for biodiversity maintenance or measuring?" were introduced to explore how businesses approach ecological upkeep.

In addition to the interviews, desk research was conducted to supplement the interview data and provide contextual background on each company's biodiversity integration efforts. Publicly available company information was reviewed, once before each interview to gain preliminary insights and once afterward to contextualise the responses. This process was intended to enhance understanding and situate interview findings within the broader corporate context, rather than to verify responses. No inconsistencies between interview data and publicly available information were identified. Beyond these two stages of review, no further triangulation was conducted.

Data analysis

The research followed a deductive approach, using previously defined concepts from the literature as a framework for thematic analysis. This method enabled the systematic division and coding of data while ensuring alignment with theoretical foundations. The initial deductive coding structure is available in Appendix B, while the final coding structure, incorporating both inductive and deductive codes, is included in Appendix A.

Each interview was conducted online via Microsoft Teams and recorded with the consent of the participant. Transcription was performed using Microsoft Teams' built-in transcription feature. To ensure accuracy, all transcripts were manually reviewed by relistening to the recordings, with grammar and spelling errors corrected to enhance clarity while preserving the original meaning. To maintain confidentiality, all transcripts were anonymized by removing company names, employee identifiers, and any specific details that could lead to the identification of individuals or organizations. However, due to the specificity of the biodiversity measures discussed—some of which are unique to certain companies—complete anonymization was not feasible without compromising the integrity of the data. As a

result, the full transcripts were not included in the appendix to prevent traceability and to uphold the confidentiality agreements established with participants.

Template analysis was applied, starting with a coding template based on existing literature. Data was processed using Atlas.ti, where literature-derived codes were directly structured within the predefined framework, ensuring a continuous connection between theory and data. Inductive codes emerged iteratively from unexpected patterns across interviews and specific insights provided by participants. Coding consistency was maintained by referencing the literature-based coding table in Appendix B. After analysing the first five interviews, new inductive codes were integrated, and this process was repeated. Each interview was reviewed three times to ensure that codes were consistently applied and refined.

Throughout the coding process, the sensemaking framework (Weick, 1995) and the steps for integrating biodiversity (Laszlo, 2003) were actively applied, as illustrated in figure 1. Rather than coding data separately and later mapping it onto these frameworks, interview data was categorised within this structure from the outset. The *why* phase captured corporate values for biodiversity integration, aligning with Laszlo's *values* step. The *what* phase examined how biodiversity was conceptualised, corresponding with the *defining* step. The *how* phase focused on biodiversity measurement and strategies, linking to the *measuring* and *implementing* steps. This approach ensured that interview responses were systematically analysed within a cohesive, theory-driven framework.

This categorisation is explicitly reflected in both the initial and final coding structures. The first coding structure, Appendix, organised data according to the three sensemaking phases (why, what, how), corresponding to Laszlo's integration steps (values, defining, measuring, implementing). While the five overarching themes remained unchanged, the number of sub-themes increased from 23 to 27, and the total number of individual codes expanded significantly from 40 to 81. This growth reflects a strong deductive approach, as

many additional codes were developed within the predefined structure, ensuring alignment with the theoretical framework. At the same time, some inductive adjustments were made to capture emerging insights, allowing for greater nuance in the empirical findings. The final coding table in Appendix A demonstrates how all emerging themes remain systematically categorized under these overarching phases, ensuring coherence between theory and data.

The findings of this study were structured in two ways to provide both a broad overview and a sensemaking view of biodiversity integration across the participating companies. First, an overview of independent questions was used to create a heatmap of biodiversity integration across all fifteen companies, shown in figure 2. This part of the analysis involved collecting straightforward yes-or-no responses from the interview data and capturing key aspects. This heatmap provided a foundational understanding of the extent to which companies are integrating biodiversity, highlighting common practises and general trends. Second, deeper insights were gained through the co-occurrence of multiple sub-themes and codes, offering a more nuanced understanding of how biodiversity is implemented across different companies. This in-depth exploration analysed patterns and relationships between themes, such as how companies define biodiversity, the values behind their biodiversity efforts, and the specific actions taken to integrate biodiversity into their operations. This analysis was guided by the sensemaking framework, focusing on the "Why", "What"), and "How" of biodiversity integration.

Results

General overview of company data:

The heatmap in Figure 2 provides a visualisation of how biodiversity is integrated into corporate sustainability efforts across different companies. It highlights the first key finding: biodiversity is widely acknowledged as an important component of corporate strategy, with nearly all companies demonstrating a widespread level of engagement. However, while the heatmap offers a broad overview of corporate biodiversity efforts, it does not capture the underlying differences in why companies engage with biodiversity, what it means to them, and how they implement it in practice. These distinctions become evident through a deeper analysis using the sensemaking framework. The heatmap provides a crucial starting point for this exploration, offering an initial overview of biodiversity integration while also identifying key areas where further analysis is needed to uncover the values, definitions, and strategies that shape corporate biodiversity decision-making.

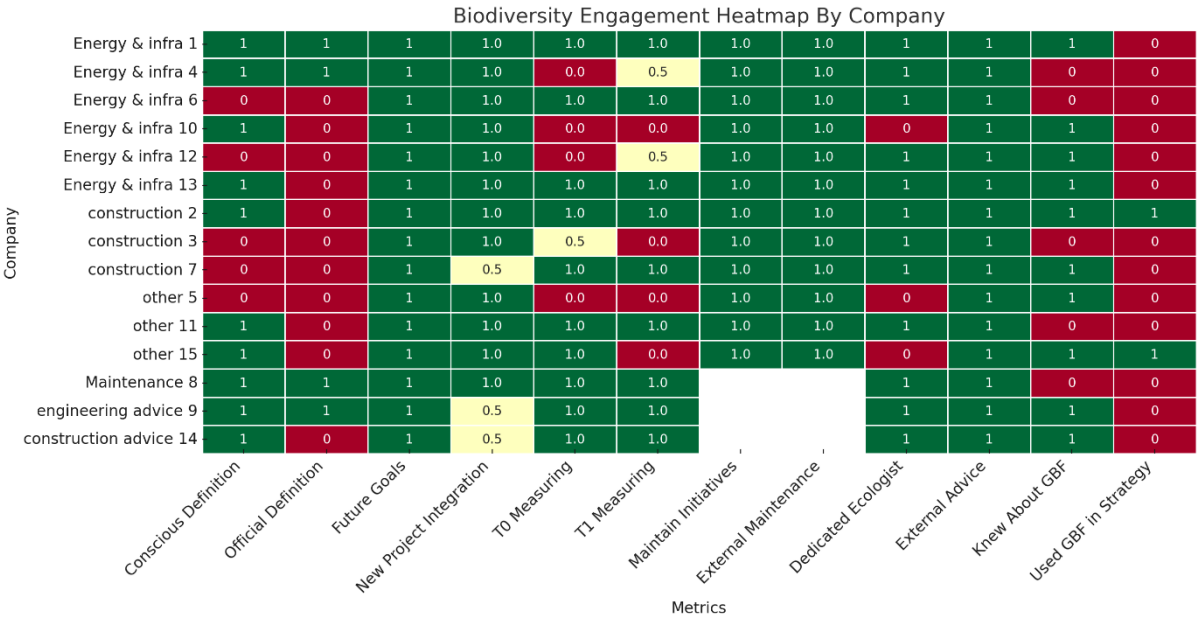

Figure 2: Corporate Biodiversity Engagement Heatmap: Defining, Measuring, and Utilizing Strategies Across Companies

One of the most notable observations is that most companies consciously incorporate biodiversity considerations into their sustainability strategies; far fewer have an official definition of biodiversity that they were able to express during interviews or that is explicitly outlined in their official sustainability reports. This suggests that while biodiversity is valued, its definition remains flexible and varies between industries, leading to different approaches to how they go through the framework of Figure 1.

Despite these differences, biodiversity is generally considered in all new projects across the companies, and all companies have a future goal surrounding the topic, indicating a broader commitment to integrating biodiversity into business practice. Measurement practises also show a practical engagement with biodiversity, as most companies conduct a T0 baseline assessment on either their projects or their owned properties, ensuring that there is an understanding of initial biodiversity conditions before taking action. Similarly, T1 post-implementation measuring is also commonly performed, indicating a long-term view on the subject in which companies want to track their progress.

The results in the heatmap include a preview to two main new findings that were previously overlooked during the literature review. Firstly, the importance of maintaining biodiversity initiatives appeared to be an essential element in biodiversity utilisation. Each company indicated that greenery maintenance was an important part of their biodiversity strategies and plays a significant role in the decision-making process. Maintenance is usually done through external sources, with some of these greenery maintenance companies also providing their own advice or having a self-made biodiversity framework to integrate biodiversity even better at their customers. Maintenance was a theme that came back in the values, measuring, and implementation of biodiversity.

Secondly, the role of internal and external ecologists, and external advice companies was overlooked but plays a key role in biodiversity utilisation as well. Most interviewed

companies have at least one dedicated ecologist that focuses on biodiversity-related topics. In addition, each company that did or did not have the internal knowledge of an ecologist actively engaged in cooperation with external sources like NGO's, consultancies, or industry partners.

While the heatmap provides a useful overview of biodiversity engagement, it does not capture the full complexity of how companies define and implement biodiversity. To further explore these variations, figure 3 structures the key codes that emerged from the data analysis using the sensemaking framework (Weick, 1995), categorising them into the *Why*, the *What*, and the *How* of biodiversity integration. By structuring the most important codes within this analytical framework, figure 3 provides a foundation and overview for the deeper examination that follows. The next sections will go through how companies navigate biodiversity integration: analysing the values behind their decisions (why), the conceptual and measurement approaches they adopt (what), and the strategic choices shaping their biodiversity practices (how).

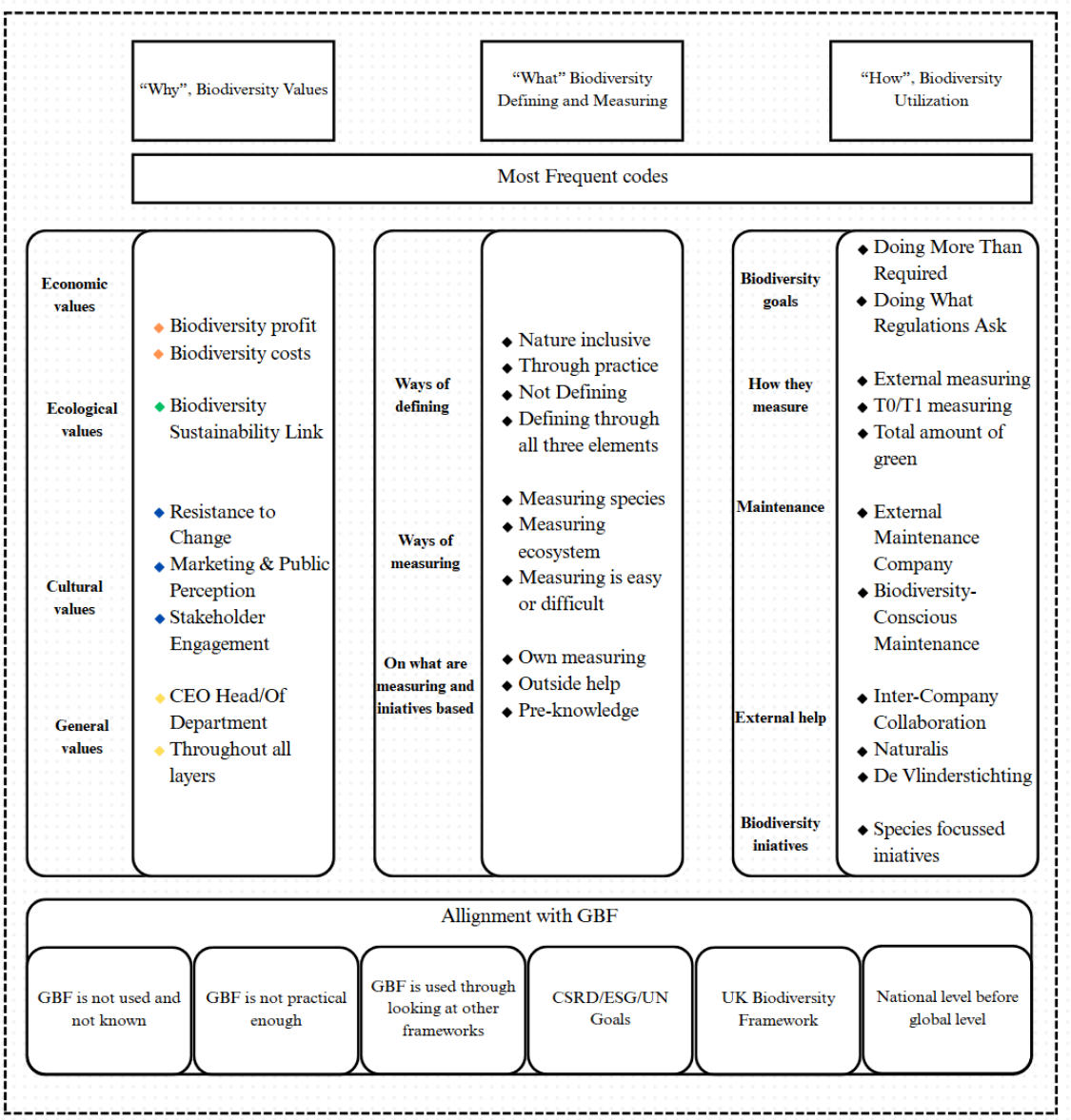

Figure 3: Sensemaking Framework for Corporate Biodiversity Integration: Mapping Values, Definitions, Measurements, and Utilisation Through Key Codes

The codes presented in figure 3 were selected based on their frequency and co-occurrence in the data. Frequently mentioned codes indicate central themes in biodiversity integration, while co-occurring codes reveal connections between values, definitions, and usage. The figure also includes alignment with the Global Biodiversity Framework (GBF) throughout the entire process. By organizing key codes this way, figure 3 provides a foundation and overview for the following sections, where each of these codes will be explained further.

The why of sensemaking

The *why* phase in the sensemaking process is crucial for understanding the underlying values driving biodiversity integration. It reveals the reasoning behind companies' engagement with biodiversity, shedding light on the values and justifications that shape their strategies. By analysing these values, it becomes possible to trace how companies make sense of biodiversity in their broader sustainability agendas. This section provides an illustration of the values that serve as the foundation for biodiversity integration. The quotes included throughout this part reflect the general tendencies observed across interviews, offering direct insight into the perspectives and priorities that guide corporate decision-making. Rather than isolated statements, these quotes represent recurring themes in how companies conceptualize the importance of biodiversity, helping to contextualize the broader findings.

Economic Values

Biodiversity Delivers Profit

Businesses recognize that biodiversity initiatives can offer financial advantages, enhancing land value, reducing maintenance costs, and differentiating them in the marketplace. For instance, companies highlight how investing in ecosystem services can generate long-term returns. One company explained that securing additional funding for greenery can create societal value, effectively paying for itself over time. Another pointed out that *"mowing less can deliver profit because there are less maintenance costs"* (Company 5). These findings align with research emphasizing how biodiversity can provide economic benefits, particularly in reducing long-term operational expenses (Jones, 2024). For companies in the green sector, biodiversity is directly tied to their business model, ensuring long-term operational success. A greenery maintenance company noted that their projects integrate biodiversity not just for environmental reasons but because they *"contribute to the*

continuity of our business operations" (Company 8). Additionally, businesses competing for contracts under public procurement rules benefit from incorporating sustainability into their proposals, as demonstrated by the EMVI criteria in the Netherlands, which reward environmental considerations.

Biodiversity costs profit

However, biodiversity initiatives also bring costs. Businesses face expenses related to biodiversity assessments, hiring experts, and implementing conservation measures. One company explained that *"monitoring initiatives can be quite costly, which means that sometimes we only monitor the mandatory requirements and do not look beyond those"* (Company 4). These financial barriers align with research on compliance costs in biodiversity management (zu Ermgassen et al., 2022) Additionally, integrating biodiversity into managed environments can create operational challenges. Companies have reported that new plant growth can obstruct maintenance work, affecting safety and efficiency. This highlights a practical challenge often overlooked in previous literature, which tends to focus on direct financial costs rather than logistical constraints. Regulatory compliance is another financial consideration, with businesses acknowledging that failing to meet biodiversity regulations can result in fines, penalties, or project delays. One company stressed the importance of building a business case for biodiversity, stating that "*if we don't take action, we'll face significant problems, including major legal risks"* (Company 2).

Ecological Values

Biodiversity Sustainability Link

Biodiversity is increasingly positioned as a core element of corporate sustainability strategies, though its prioritization varies across organizations. Some companies place biodiversity on equal footing with climate change and circular economic efforts. "*For biodiversity, it's essentially the same—it is one of the four pillars of our sustainability strategy, alongside CO2 reduction, inclusivity, and circularity"* (Company 1). This supports previous findings on biodiversity's role in sustainability strategies, while adding nuance by showing how companies balance competing priorities such as circularity and emissions reduction (Maas et al., 2024). Another company takes an even stronger stance, viewing biodiversity loss as an existential threat*: "If we don't change this, we will have no earth to do our business"* (Company 15). However, some companies struggle to prioritize biodiversity over other environmental commitments that align more closely with their business model. One firm explained that while biodiversity is part of their broad sustainability agenda, *"circularity and CO2 reduction are higher on our priority list because they are more directly connected to the core of our business"* (Company 12). This practical prioritization reflects a real-world challenge that is often absent in more theoretical discussions of corporate biodiversity strategies (Maas et al., 2024).

Cultural & Aesthetic Values

Resistance to Change

Despite the benefits of biodiversity integration, resistance to change remains a significant barrier. Many businesses operate within traditional models that emphasize short-term economic gains, making it difficult to adopt biodiversity-conscious strategies. Cost concerns play a key role in decision-making, as one company highlighted: "*Everything must*

fit within a business case—if biodiversity initiatives end up costing millions, the business case collapses" (Company 1). This supports existing research on economic constraints as a barrier to sustainability adoption (zu Ermgassen et al., 2022). Industries accustomed to conventional land-use practices may also hesitate to embrace biodiversity measures that require significant investments or operational adjustments. One company noted that its employees come from highly technical backgrounds, making it challenging to integrate biodiversity into existing workflows.

Marketing & Public Perception

Companies recognize that biodiversity initiatives can enhance their market positioning and public reputation. Sustainability branding appeals to environmentally conscious consumers and investors, reinforcing biodiversity as a valuable corporate asset. *"Nature is an integral part of our product, which gives us even more reason to invest in it"* (Company 5). This aligns with literature on sustainability-driven branding strategies (Jones, 2024). However, effectively communicating biodiversity efforts remains a challenge. Some firms struggle to frame their initiatives in ways that resonate with stakeholders, requiring active engagement to bridge this gap. *"We take stakeholder concerns very seriously, but at the same time, we need to find ways to enhance biodiversity without compromising technology or safety"* (Company 12).

Stakeholder Engagement

Engaging stakeholders—including local communities, NGOs, government agencies, and industry partners—is a crucial factor in successful biodiversity integration. Companies that actively involve external partners often achieve more meaningful and effective biodiversity outcomes, benefiting from shared knowledge, expertise, and resources. Collaborative projects also help companies align with biodiversity frameworks, enhance credibility, and demonstrate a commitment to sustainable practises. Several companies have

highlighted the importance of working with well-established organizations to validate their biodiversity methodologies and strengthen their approaches. One company described how they actively sought external feedback to ensure their methodology aligned with expert perspectives:

"We thought, yes, if we want to be credible and truly assess whether this methodology holds up, we shouldn't limit it. So, about two years ago, we organized a large meeting with various NGOs from the Netherlands and beyond to present our plans and gather their feedback."

(Company 1)

In addition to formal collaborations with large NGO's, companies also engage in partnerships with individual ecologists and consulting firms. These collaborations are not only aimed at obtaining expert advice but also fostering continuous knowledge exchange between businesses and ecological professionals. Despite the benefits of stakeholder collaboration, companies also experience challenges in maintaining long-term partnerships. Managing diverse interests, aligning priorities, and ensuring continuity in engagement require significant effort. Some businesses noted that while external partnerships improve biodiversity outcomes, they also require continuous coordination to ensure that biodiversity goals remain integrated into long-term corporate strategies.

Strengthening biodiversity values

The first stage of the framework involves recognizing biodiversity's economic, ecological, and cultural values. Leadership commitment and company-wide engagement reinforce these values by embedding them into corporate strategies and daily operations. When biodiversity is prioritized at all levels, it shifts from an abstract principle to a core part of corporate identity, strengthening both business outcomes and environmental responsibility.

Leadership commitment

Companies with strong leadership backing tend to have more ambitious and consistent biodiversity initiatives. One company highlighted that their CEO frequently discusses biodiversity in speeches, stating that *"when the CEO talks about biodiversity, it grabs the attention of all levels within the organization—because then, action needs to be taken"* (Company 1). This demonstrates how leadership communication can function as a driver for internal engagement, ensuring that biodiversity remains a priority across various levels of the organization.

Another company emphasized the role of leadership in securing financial resources for biodiversity initiatives: *"I have higher-up approved budgets now, and substantial ones at that"* (Company 6). Leadership support was seen as a key factor in determining whether biodiversity initiatives receive the necessary funding and strategic commitment. Through multiple organisations, leadership involvement influenced not only the prioritisation of biodiversity but also the extent to which it was embedded in strategies.

Throughout All Layers

To integrate biodiversity into corporate culture, companies must engage employees at all levels. Some organizations integrate biodiversity considerations across multiple departments, ensuring sustainability teams, project managers, and operational staff contribute to biodiversity goals. Others focus on establishing a common language around biodiversity within the organization, making it easier to integrate these principles into daily operations. *"We deliberately structured it this way to ensure it's understandable for everyone. We are pushing the entire company toward using this common language"* (Company 2). This adds to research by zu Ermgassen et al. (2022) on biodiversity interpretation by providing empirical evidence of how companies create shared biodiversity frameworks to drive internal engagement.

The what of sensemaking

In the process of biodiversity integration, businesses engage in sensemaking to interpret and define biodiversity within their organizational context. This involves both forming a definition and determining what is assessed and measured. Following the Why phase, where companies establish their values, the What phase translates these into concrete definitions and measurement approaches(Laszlo, 2003). It consists of two key elements: the formation of definitions and measurements, referring to the process through which companies construct their understanding, and the content of these definitions and measurements, reflecting what they include. This phase forms the foundation for further biodiversity strategies and actions.

Forming biodiversity definitions

Defining Biodiversity Through Practice

For most companies, biodiversity is not defined through formal ecological frameworks but rather through practical actions and initiatives. These organizations focus on habitat creation, species protection, and sustainability projects without necessarily adopting a standardized biodiversity definition. This approach allows them to remain flexible and adapt their biodiversity efforts based on project-specific needs, stakeholder demands, and industry expectations. By emphasizing what they are already doing to support biodiversity, rather than adhering to a theoretical definition, these companies integrate biodiversity through their actions. Aligning with the findings of zu Ermgassen et al. (2022), who note that many businesses adopt a more practice-based rather than theoretical approach, shaping their biodiversity efforts based on visible and immediate impacts rather than structured definitions.

Not Defining Biodiversity Explicitly

Two companies deliberately choose not to define biodiversity. This flexibility allows them to adapt their biodiversity strategies over time without being constrained by rigid definitions. This approach helps them in responding to changing environmental conditions and regulatory requirements.

Biodiversity definition content

Nature-Inclusive Approach

A couple of companies define biodiversity as part of a broader "nature-inclusive" strategy, where the focus is on integrating green spaces, wildlife-friendly infrastructure, and ecological design into their operations. This approach is particularly common in industries such as urban planning, construction, and infrastructure, where biodiversity can be embedded into projects through elements like green roofs and pollinator-friendly landscapes. By incorporating biodiversity into built environments, these companies create spaces that support both human and ecological well-being. The emphasis on biodiversity as part of a broader nature-inclusive approach is also reflected in research by Mikkonen & Raatikainen (2024) , who highlight that companies often integrate biodiversity into existing sustainability goals rather than treating it as a standalone concept.

Defining Through All Three Elements

Four companies adopt a comprehensive approach to biodiversity by incorporating all three fundamental elements: species diversity, ecosystem diversity, and genetic diversity. These organizations recognize that biodiversity is more than just species counts and consider the interconnected nature of habitats, ecological processes, and genetic variation. By defining biodiversity through all three elements, they ensure a more holistic and scientifically grounded approach, which can improve their ability to implement effective biodiversity strategies. However, genetic diversity remains the least commonly addressed element in

corporate biodiversity efforts. This mirrors findings from literature, which show that species and ecosystem diversity are more frequently measured than genetic diversity, due to the latter's complexity and lack of direct visibility (Zhu et al., 2024).

Forming biodiversity measurements

Internal Measurement Approaches

Some companies develop and conduct their own biodiversity assessments using internal teams, sustainability departments, or in-house ecologists. This allows them to have greater control over how biodiversity is measured and integrated into business strategies. Internal assessments can be beneficial for long-term monitoring and customized measurement methods that align with company-specific biodiversity goals. However, companies that rely solely on internal measurements may face challenges in ensuring objectivity, which is often something that is stated by companies that use external measurements. "The butcher who approves his own meat." This practice is consistent with previous literature highlighting the benefits of third-party validation, particularly in enhancing transparency and credibility in corporate sustainability initiatives (zu Ermgassen et al., 2022).

External Support for Measuring Biodiversity

All companies seek external expertise from conservation organizations, environmental consultants, and research institutions to conduct biodiversity assessments. Outsourcing biodiversity measurements can provide access to specialised knowledge, standardised methodologies, and third-party verification, ensuring credibility in reporting and compliance with regulatory requirements. However, dependence on external experts can also lead to higher costs and reduced internal biodiversity capacity.

Pre-Knowledge and Internal Expertise

The level of pre-existing biodiversity knowledge within a company significantly influences how biodiversity is measured and integrated into initiatives. Companies with internal ecologists or sustainability specialists tend to have more structured and scientifically informed biodiversity programmes. On the other hand, organizations with limited in-house biodiversity expertise often rely on external training, partnerships, and consultant support to develop their strategies.

Biodiversity measurement content

Measuring Species Diversity

Species diversity is the most measured aspect of biodiversity among businesses. Companies often conduct baseline biodiversity assessments that focus on counting and monitoring species present in their operational areas. These assessments help track biodiversity changes over time and evaluate the impact of corporate activities on local wildlife.

Measuring Ecosystem Diversity

A few companies go beyond species-level assessments and evaluate ecosystem diversity, examining the broader environmental conditions that support biodiversity. This includes habitat connectivity, ecosystem health, and land-use impacts. Measuring ecosystem diversity provides a more complete picture of biodiversity integration but often requires more resources, expertise, and collaboration with external ecological specialists.

One company measuring through genetic biodiversity

Company 9 measures biodiversity, including genetic aspects, through eDNA analysis, which detects DNA from organisms in water, soil, and air samples. This cost-effective method identifies species and estimates populations without traditional sampling. To handle

the large data output, the company is developing software for faster processing and sees eDNA as a potential future standard for biodiversity monitoring.

Measuring Biodiversity: Easy or Difficult?

The difficulty of biodiversity measurement varies depending on the company's expertise, resources, and industry sector. Some organizations find it relatively easy to measure biodiversity using established frameworks, while others struggle with a lack of standard methodologies, data limitations, or technical expertise. Companies in highly regulated industries often have more structured biodiversity measurement practises, whereas others must develop their own approaches.

The how of sensemaking

After establishing why biodiversity is valued and what it entails within corporate contexts, the next step is understanding how these values are translated into action. The "how" of sensemaking focuses on the structures and processes that ensure biodiversity integration is not just acknowledged but actively implemented. This section is structured into four interconnected steps. Structuring biodiversity commitment examines how companies position themselves in relation to existing regulations, whether by exceeding compliance, meeting minimum standards, or collaborating with others. Measuring and assessing biodiversity focuses on tracking progress through various assessment methods to ensure accountability and adaptability. Implementing and maintaining biodiversity efforts addresses the strategies used to sustain biodiversity gains over time. Finally, targeted biodiversity initiatives explore focused approaches that direct efforts toward specific conservation priorities.

Structuring Biodiversity Commitment

Doing More Than Required

A couple of companies go beyond regulatory requirements, actively striving to exceed biodiversity mandates and contribute positively to ecological sustainability. These businesses view biodiversity integration as an opportunity to lead by example, differentiate themselves in the market, and build a reputation as sustainability pioneers. Often, these companies engage in voluntary biodiversity projects, invest in habitat restoration beyond what is mandated, and develop ambitious biodiversity policies that align with broader conservation goals.

Doing What Regulations Ask

For other companies, biodiversity efforts are primarily driven by compliance with existing laws and industry regulations. These organizations focus on meeting the minimum biodiversity standards set by governmental and environmental authorities and ensuring that they align with mandatory biodiversity reporting and sustainability criteria. While their efforts contribute to conservation, they tend to be reactive rather than proactive, implementing only what is required to maintain regulatory approval.

Inter-Company Collaboration

Collaboration between companies is becoming an increasingly effective way to integrate biodiversity at scale. Businesses across industries are forming biodiversity alliances, sharing expertise, and co-developing sustainability strategies to maximize their collective impact. Companies that collaborate often gain access to shared resources, scientific insights, and policy alignment, making biodiversity integration more efficient and impactful. However, effective collaboration requires strong communication, aligned goals, and clear accountability frameworks. This aligns with findings from previous studies showing that partnerships between businesses and conservation organizations improve biodiversity outcomes while also providing companies with the necessary scientific and regulatory expertise (Robinson, 2012).

Measuring and assessing biodiversity

External Measuring

All companies rely on external experts and third-party organizations to conduct biodiversity assessments in some form. External measuring provides objective, science-backed data and ensures that biodiversity efforts are aligned with industry best practises. Using external assessors allows companies to validate their biodiversity performance while also accessing specialised expertise.

T0/T1 measuring

Baseline biodiversity assessments (T0) and post-implementation measurements (T1) are common methodologies for tracking biodiversity progress over time. T0 assessments establish the initial biodiversity state before a company implements biodiversity strategies, while T1 measurements help evaluate the effectiveness of those strategies. All companies apply a T0 assessment but not all follow this up with a T1 or further assessment. This approach ensures that biodiversity initiatives are measurable and adaptable based on ecological outcomes. However, some companies struggle with conducting long-term biodiversity tracking, as it requires continuous funding and commitment.

Total Amount of green

A few companies measure biodiversity success by tracking the total amount of green space they create or maintain. Expanding green space is often a tangible, visible indicator of biodiversity efforts, making it an attractive metric for corporate sustainability reporting.

Implementing and maintaining biodiversity initiatives

External maintenance company

After implementing biodiversity initiatives, most companies work with external maintenance companies to ensure the long-term sustainability of their efforts. These

companies specialize in ecological landscaping, habitat restoration, and biodiversity-conscious site management. Outsourcing maintenance allows businesses to focus on their core operations while ensuring biodiversity efforts remain effective. However, reliance on external maintenance companies can also lead to variability in biodiversity outcomes, depending on the expertise and priorities of the contractors. This aligns with sustainable landscape management practices enhancing long-term biodiversity outcomes and reduce the unintended negative impacts of conventional maintenance(Rawat US & Agarwal NK, 2015)

Biodiversity-Conscious Maintenance

Some businesses specifically seek out biodiversity-conscious maintenance providers who prioritize ecological health over conventional landscaping practices. These companies use techniques such as seasonal mowing, pollinator-friendly planting, and non-invasive species management to ensure that biodiversity gains are preserved over time. By integrating biodiversity-conscious maintenance strategies, businesses can avoid biodiversity losses caused by traditional maintenance approaches, such as over mowing or habitat destruction.

Targeted biodiversity initiatives

Frequently named advice organisations:

Naturalis, a leading biodiversity research institution, plays a key role in corporate biodiversity assessments and conservation strategies. Most businesses partner with Naturalis to conduct biodiversity studies, develop species protection programmes, and gain access to scientific expertise. Their research-driven approach helps companies align their biodiversity efforts with innovative conservation science, ensuring ecological integrity in corporate sustainability initiatives. De Vlinderstichting's (Dutch Butterfly Conservation) is a frequently consulted organization in biodiversity monitoring, particularly in species conservation efforts. Companies engage De Vlinderstichting to assess pollinator health, butterfly populations, and

the overall ecological impact of corporate biodiversity projects. Their work is crucial in measuring species richness and the success of pollinator-friendly initiatives, helping businesses refine their biodiversity strategies.

Species-Focused Initiatives

Some companies prioritize species-specific conservation efforts by targeting key species that are threatened, ecologically significant, or culturally important. These initiatives may focus on protecting native species, restoring habitats for endangered wildlife, or supporting pollinator populations. Species-focused projects often provide clear conservation benefits, but they require targeted expertise and ongoing monitoring to be successful.

The alignment with GBF

The extent to which companies engage with the Global Biodiversity Framework (GBF) varies, reflecting different approaches to biodiversity integration. This alignment is not just part of how biodiversity is implemented; it is also present in why companies value biodiversity and what definitions and measurements they adopt. This section examines how much the GBF is used and why companies do or do not engage with it, showing how global frameworks intersect with corporate biodiversity commitments at every stage of the sensemaking process.

How much the GBF is used:

GBF is not used and not known

Several companies indicated that they were unaware of the GBF or had not actively engaged with it in shaping their biodiversity strategies. In these cases, biodiversity efforts were primarily guided by internal sustainability goals, regulatory compliance, or broader corporate frameworks. Company policies, reports, and interviews did not reference the GBF, indicating that not all businesses have widely adopted it as a guideline.

GBF is used indirectly through other frameworks.

A few companies reported engaging with the principles of the GBF indirectly through other sustainability frameworks rather than referencing it explicitly. Biodiversity strategies were often aligned with reporting standards such as the Corporate Sustainability Reporting Directive (CSRD), Environmental, Social, and Governance (ESG) frameworks, and the United Nations Sustainable Development Goals (UN SDGs). These frameworks were commonly integrated into corporate policies and reporting structures, serving as the primary reference points for biodiversity-related commitments. For most companies, biodiversity was positioned within a broader corporate sustainability agenda rather than treated as a standalone initiative linked specifically to the GBF. CSRD, ESG, and UN SDG frameworks were frequently mentioned in sustainability reports and interviews as guiding biodiversity efforts, emphasising measurable targets and compliance-driven approaches. These frameworks provided structured reporting mechanisms, making them more practical for companies compared to the broad, high-level objectives of the GBF. Additionally, some companies referenced the UK Biodiversity Framework despite operating in the Netherlands. This was primarily due to its structured approach and applicability in specific industry sectors. The UK framework was seen as providing clearer guidelines for biodiversity integration compared to the GBF, leading some companies to consider its principles alongside national and European regulatory frameworks. While it was not formally adopted, it served as an additional reference point for companies seeking practical biodiversity strategies beyond global commitments.

Why companies do or do not engage with the GBF

GBF is not practical enough.

Among companies familiar with the GBF, some stated that they did not use it because they found it impractical for direct application. The framework was described as too high-level or lacking specific sectoral guidance, making it difficult to translate into measurable

corporate biodiversity strategies. These companies indicated a preference for frameworks that provide clear, operationalized guidelines and define reporting requirements.

National level before global level

A subset of companies stated that their biodiversity efforts were primarily aligned with national biodiversity policies and regulations before considering global frameworks. These companies emphasized that national policies provided the necessary regulatory structure and enforcement mechanisms, which influenced how biodiversity was integrated into corporate decision-making.

Summary of key findings

The present study demonstrates that while biodiversity is widely integrated into corporate sustainability strategies, the depth and approach of this engagement vary. The heatmap analysis provided a broad overview, showing that most companies acknowledge biodiversity's importance, yet differences remain in how they define, measure, and implement it. To better understand these variations, the findings were structured using the sensemaking framework, distinguishing three key phases: why, what, and how. The Why phase revealed that companies engage with biodiversity for economic, cultural, and ecological values, balancing financial considerations with sustainability commitments. The What phase showed that biodiversity definitions and measurement approaches differ, with some companies relying on internal frameworks while others seek external expertise. The How phase examined implementation strategies, highlighting a spectrum from regulatory compliance to proactive biodiversity commitments, with external consultants and maintenance practices playing a crucial role.

These findings indicate that biodiversity integration is not merely a technical task, but a structured and evolving process shaped by companies' values, interpretations, and strategic choices. While the heatmap outlined general engagement, applying the sensemaking framework reveals how companies navigate biodiversity through values, defining, measurement, and strategic action. The structured yet flexible ways in which companies integrate biodiversity provide the foundation for a general discussion, where the broader implications of these findings will be analysed in relation to theory and practice.

General discussion

Through the framework of Figure 1, the present study explores how businesses define, value, and utilize biodiversity within their operations and how these efforts align with the Global Biodiversity Framework (GBF). With increasing regulatory and societal pressure, companies are recognizing the strategic importance of biodiversity and actively incorporating it into their sustainability strategies. However, biodiversity efforts remain highly diverse, with companies adapting their approaches based on industry needs, regulatory frameworks, and available expertise. While the GBF serves as an overarching guideline, most companies engage with biodiversity through national frameworks, reflecting the practical challenges of translating global biodiversity goals into corporate action. This research sought to answer:

"How do businesses currently value, define, and utilize biodiversity, and how does this align with or diverge from the Global Biodiversity Framework?"

The findings show that companies engage with biodiversity for multiple reasons, primarily regulatory obligations, economic advantages, and broader sustainability commitments. Definitions of biodiversity vary significantly, with most companies adopting a practical, flexible approach that prioritizes species diversity, whereas ecosystems and genetic diversity receive less structured attention. Biodiversity is typically measured through baseline (T0) and post-implementation (T1) assessments, often supported by external experts such as consultancies, NGOs, and universities, both of which are reflected in the overview heatmap in Figure 2. Implementation strategies focus on habitat restoration, nature-inclusive design, and long-term maintenance efforts, ensuring that biodiversity actions extend beyond initial commitments. While direct alignment with the GBF is limited, companies are increasingly integrating biodiversity in ways that contribute to global conservation efforts. Many firms engage with GBF principles indirectly, primarily through CSRD, ESG, and national

biodiversity policies, reflecting a pragmatic approach to biodiversity integration. These insights highlight both progress and areas for improvement. Businesses are moving beyond acknowledgement toward measurable biodiversity action, and as global biodiversity frameworks become more structured, companies have the potential to further align their biodiversity strategies with international conservation goals.

Theoretical implications

The present study finds that companies define biodiversity through practical application rather than fixed theoretical frameworks. Instead of using a predefined definition, businesses construct their understanding through industry-specific needs, stakeholder expectations, and operational priorities. This suggests that biodiversity sensemaking is driven by action rather than abstract conceptualization, reinforcing the idea that companies prioritize measurable and achievable biodiversity outcomes over theoretical constructs. Prior research acknowledges that biodiversity is a multi-layered concept with varying interpretations (Addison et al., 2019). However, the present study extends that view by demonstrating that businesses rarely engage with biodiversity as a theoretical construct. Instead, biodiversity is embedded into business operations through regulatory demands, corporate sustainability goals, and measurable impact assessments, making official theoretical definitions secondary. This finding refines sensemaking theory by demonstrating that corporate biodiversity engagement is shaped by external pressures and operational priorities, rather than by abstract theoretical frameworks, reinforcing that biodiversity is primarily understood through practice rather than conceptualization.

Another key finding is that when measuring biodiversity, companies predominantly focus on species diversity, while ecosystem and genetic diversity remain significantly underrepresented in corporate biodiversity strategies. Businesses measure primarily through species counts and baseline (T0) versus post-implementation (T1) assessments, a trend that

mirrors prior studies emphasizing species diversity as the most tangible metric (Magurran, 2003). However, the present study reveals that this emphasis is driven more by familiarity and ease of measurement rather than explicit regulatory requirements. Interviewed companies indicated that while ecosystem and genetic diversity are recognized as important, they are rarely measured due to resource constraints, a lack of standardized methodologies, and the practical challenges of data collection and analysis. This finding contributes to biodiversity measurement research by demonstrating that corporate biodiversity assessments prioritize species diversity because it is the most tangible and measurable aspect of biodiversity, rather than due to explicit regulatory requirements. As a result, ecosystem and genetic diversity measuring remain underexplored in corporate settings, reflecting the challenge of integrating broader biodiversity dimensions into structured sustainability reporting.

Economic and regulatory drivers emerge as primary values behind biodiversity integration, with ecological and cultural values playing a supporting but meaningful role. The present study confirms that businesses engage with biodiversity as a risk-management strategy rather than as an opportunity for competitive differentiation, directly challenging prior research that frames biodiversity as a potential strategic advantage (Sharma & Nguan, 1999). In addition, Biasetti & De Mori (2016)suggest that biodiversity strategies always originate from underlying values, and the present study builds upon this by demonstrating while financial incentives and regulatory mandates are primary influences, ecological considerations still inform corporate decision-making. This finding demonstrates that although economic and compliance-driven values often dictate initial engagement, companies also recognize biodiversity's broader ecological significance, particularly in the context of long-term resilience and sustainability commitments

A key insight from this study is that long-term biodiversity success depends not just on initial commitments, but on continuous ecological upkeep. While prior research highlights

that maintenance practices like mowing intensity impact biodiversity resilience (Hu & Lima, 2024), the present study finds that companies integrating biodiversity-conscious maintenance strategies achieve more stable biodiversity outcomes. Businesses that outsource maintenance to specialized providers with ecological expertise report better long-term biodiversity results than those using conventional landscaping services. Additionally, the present study highlights that while companies do engage in maintenance, they do not always fully integrate biodiversity considerations into their maintenance practices, treating it primarily as an operational task rather than a biodiversity strategy. The findings demonstrate that without structured, low-intensity maintenance strategies, companies risk biodiversity losses despite initial investments. This aligns with broader concerns in biodiversity research that long-term ecological oversight is essential for sustaining biodiversity outcomes (Addison et al., 2020). By providing real-world corporate cases, the present study extends prior research by showing that the choice of maintenance approach is a key determinant of biodiversity performance and long-term ecological stability.

Corporate collaboration is another emerging driver of biodiversity integration, with businesses increasingly partnering with NGOs, researchers, and industry peers. This aligns with (Hassan et al., 2020) who identifies biodiversity partnerships as a growing trend, but the present study refines this perspective by highlighting that collaboration, while not strictly necessary, is a highly beneficial approach for businesses. Rather than engaging in partnerships purely for sustainability reasons, many companies strategically seek collaboration to enhance credibility and access external expertise in biodiversity assessment and reporting. Collaboration also helps businesses navigate regulatory complexities, making it a strategically valuable tool rather than just an optional commitment. Instead of being a necessity, collaboration is often a deliberate choice that strengthens biodiversity initiatives and reinforces corporate sustainability efforts. This demonstrates that partnerships are not just

voluntary sustainability efforts but essential mechanisms for navigating regulatory landscapes and establishing credibility, reinforcing that collaboration is a structural necessity rather than a voluntary initiative. In addition, biodiversity measurement remains a balance between internal and external assessment strategies. While some businesses prefer internal biodiversity tracking for cost efficiency and flexibility, others prioritize third-party validation for credibility and methodological rigor. Prior research by McKenzie et al. (2025) highlights the trade-offs between cost, accuracy, and strategic priority in corporate sustainability assessments, but the present study extends that discussion by suggesting that businesses opting for external measuring demonstrate a higher long-term commitment to biodiversity transparency. This suggests that companies view biodiversity measuring not merely as a reporting requirement, but as a strategic investment in corporate accountability.

One of the most critical findings of the present study is that businesses do not directly align their biodiversity strategies with the Global Biodiversity Framework (GBF) but instead favour structured regulatory frameworks such as CSRD, ESG, and national biodiversity policies, which provide clearer compliance mechanisms. This supports Zhu et al. (2024) who argue that the GBF remains too abstract for direct corporate use. While further prior research suggests that global biodiversity frameworks provide guiding structures (Smith et al., 2020), the present study refines this perspective by demonstrating that businesses engage with GBF principles through national adaptations rather than treating the GBF as a primary biodiversity framework. A clear example is the role of two codes in the present research CSRD and the UK Biodiversity Framework, both of which translate broad biodiversity goals into structured reporting standards and actionable corporate requirements (Maas et al., 2024).Unlike the GBF, which remains a high-level policy framework, CSRD and the UK Biodiversity Framework provide concrete sector-specific guidance and compliance-driven integration pathways. The present study finds that companies respond more positively to biodiversity

frameworks that offer clear implementation steps rather than abstract global targets. The recent study of Maas et al. (2024) confirms that Dutch companies are increasingly aligning their biodiversity strategies with CSRD's reporting requirements, reinforcing the role of structured regulatory policies in shaping corporate biodiversity engagement. These findings contribute to theory by demonstrating that corporate biodiversity engagement is shaped by overlapping regulatory layers rather than a single global framework. While the GBF provides an overarching biodiversity vision, companies primarily rely on national regulations and corporate reporting standards for implementation. This study refines previous research by showing that global biodiversity goals influence corporate action only when operationalized through structured, compliance-driven national policies.

Practical implications

The findings of this study highlight three key practical implications for businesses, NGOs, and policymakers, offering opportunities to further strengthen biodiversity integration within corporate sustainability efforts. While businesses have made notable progress in incorporating biodiversity into their operations, the results indicate that, for many companies, biodiversity is often treated as a standalone initiative rather than being fully embedded into broader business strategy. However, some firms go beyond regulatory compliance and take a more holistic approach, actively integrating biodiversity into their long-term sustainability efforts. Greater alignment between biodiversity and financial decision-making presents an opportunity for companies to enhance resilience, improve regulatory positioning, and contribute more effectively to sustainability targets. The results of the present study suggest that incorporating biodiversity into purchasing policies, land management, and broader sustainability strategies could help businesses adopt a more integrated, long-term approach to ecosystem management rather than viewing ecological diversity primarily as a short-term compliance obligation.

For policymakers, the findings suggest that structured, actionable biodiversity regulations play a crucial role in shaping corporate biodiversity engagement. The study finds that businesses are more likely to align with CSRD, ESG, and national biodiversity policies rather than the Global Biodiversity Framework (GBF), as the latter lacks direct implementation guidance. The UK Biodiversity Framework provides a strong example of how sector-specific biodiversity reporting structures and standardized corporate engagement pathways can enhance corporate biodiversity alignment. It might be helpful for governments and regulatory bodies to turn global biodiversity goals into clear, sector-specific rules and incentives. This would help businesses go beyond passive commitments and take more integrated action for biodiversity. National biodiversity frameworks that provide structured compliance pathways could help businesses implement biodiversity initiatives at greater scale while maintaining regulatory clarity and economic feasibility.

Lastly, the results of the present study indicate that businesses tend to prioritize biodiversity metrics that are easiest to measure and report, even if these do not necessarily provide a complete picture of biodiversity's health. Expanding biodiversity measurement beyond species diversity to include ecosystem and genetic assessments presents a promising opportunity. The study finds that genetic biodiversity assessments through eDNA, while not widely adopted, can be cost-effective, and provide highly valuable data. Despite these advantages, companies continue to rely on familiar but limited biodiversity assessment tools, highlighting the potential for broader adoption of more ecologically comprehensive monitoring practises. Businesses, NGOs, policymakers, and industry leaders could work together to make genetic and ecosystem biodiversity assessments more widely used. This would help with making decisions based on science, measuring the effects of sustainability better, and making conservation contributions that are more effective.

Limitations and future research

This study has several limitations that could be considered when interpreting its findings. First, the research focuses on Dutch businesses, meaning that the results are shaped by the Dutch regulatory landscape, including policies such as the Corporate Sustainability Reporting Directive (CSRD) and other national biodiversity initiatives. While these findings provide insights into how companies engage with biodiversity within this context, they may not fully capture how biodiversity strategies develop in countries with different regulatory approaches. For example, the UK Biodiversity Framework integrates the Global Biodiversity Framework (GBF) more directly into national policies, providing structured implementation pathways, whereas Dutch companies tend to engage with biodiversity primarily through corporate-driven reporting standards. Therefore, it might be helpful for future research to compare how businesses in different countries handle integrating biodiversity and to find out if mandatory biodiversity policies generate more corporate involvement than voluntary ones.

Additionally, this study does not differentiate between companies at various stages of biodiversity integration, nor does it explicitly explore how the maturity of biodiversity integration influences corporate sensemaking processes. Companies at early stages might focus primarily on basic sensemaking—defining biodiversity concepts and aligning preliminary values—whereas firms with advanced integration likely implement structured strategies, sophisticated measurement practises, and stronger collaborations with external experts. The current study may have missed some interesting details about how biodiversity strategies change over time and the things that affect the path from first ideas to full integration because it grouped companies together regardless of how far they were in the integration process. Future research could thus adopt a longitudinal or comparative approach, explicitly differentiating between stages of biodiversity integration, to better understand how sensemaking and implementation processes develop over time. Such an approach could

significantly enrich theoretical models of corporate biodiversity integration, providing clearer pathways and benchmarks for companies seeking to deepen their engagement and align more effectively with global biodiversity frameworks.

A final methodological limitation of this study is its reliance primarily on interviewees who occupy sustainability-focused roles (e.g., ecologists, sustainability managers), which may have shaped the perspectives shared during interviews. While this approach provided rich insights into how biodiversity initiatives are conceptualized and operationalized, it may have limited the study's ability to fully capture internal organizational dynamics, such as competing departmental priorities, economic constraints, or differing perspectives on biodiversity integration. Because the study did not explicitly explore these internal dynamics by incorporating perspectives from other organizational areas (such as finance, operations, or executive management), some potentially influential internal tensions or challenges may have remained unexplored. In the future, researchers could expand their research methods by looking at different organizational perspectives. This would help them get a better understanding of how the structures and dynamics within an organization affect how well it integrates biodiversity.

Conclusion

This research has provided a comprehensive overview of how businesses currently define, value, and integrate biodiversity into their operations. The findings indicate that, while biodiversity is increasingly recognized as an essential part of corporate sustainability strategies, its practical application varies widely between industries. Most companies engage with biodiversity primarily through species diversity assessments, often supported by external experts. However, a more structured approach to ecosystems and genetic diversity remains underdeveloped. Despite the challenges posed by regulatory ambiguity and measurement complexities, businesses are making steady progress in embedding biodiversity into their sustainability commitments. Alignment with frameworks such as the Global Biodiversity Framework (GBF) is often indirect, with companies favouring national policies and structured regulatory mechanisms like CSRD and ESG reporting to guide their biodiversity efforts. The study highlights a growing awareness and commitment to biodiversity as an integral part of business strategy. As regulatory expectations become clearer and methodologies for biodiversity measurement evolve, companies have the potential and willingness to strengthen their biodiversity integration further. To improve the fluency, replace with: The current trajectory is promising, indicating that businesses are already moving beyond acknowledgement toward concrete action—with potential and promises for even greater alignment and impact in the years ahead.

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Appendix

Appendix A complete Coding structure

Theme	Sub-theme	Code	Description
Biodiversity definition	Defining is conscious/unconscious choice	Defining is conscious	They are aware of biodiversity and define it.
		Defining is not something they pay attention to	Biodiversity is not actively defined in their work.
	Defining through different terms	Nature inclusive	Biodiversity is seen as part of nature-inclusive work.
		Through practical measures	Biodiversity is framed through actions/measures.
		Not defining	Not defining is a choice
	Defining through 3 elements	Defining through species	Focuses on species diversity.
		Defining through ecosystems	Focuses on ecosystem diversity.
		Defining through genetics	Focuses on genetic diversity.
		Defining through all three	A holistic definition covering all three elements.
	Official definition	Official definition	They have an official definition that can be recited in the interview or found in reports
		No official definition	They do not have an official definition that can be recited in the interview or found in reports

Biodiversity values	Economic values	Market advantage	Investing in biodiversity can be a market advantage.
		Company customer relation	Relation between company and customer
		Biodiversity delivers profit	Biodiversity is seen as financially beneficial.
		Biodiversity costs money	Biodiversity is viewed as an expense.

		Regulatory costs	Investing in biodiversity prevents expensive legal and permitting issues
		Challenge to secure funding	Securing consistent funding for biodiversity remains a hurdle.
	Ecological values	Biodiversity-business link	Biodiversity impacts businesses, and businesses impact biodiversity.
		Biodiversity-sustainability link	Biodiversity is linked to other sustainability issues
		No earth without biodiversity	If we don't fix biodiversity there will be no earth left
	Cultural & aesthetic values	Personal vs professional divide	It's hard to put on "green" glasses when thinking from a practical business perspective
		Aesthetic and recreational benefits	Seen as valuable for enjoyment and wellbeing.
		Resistance to change	Most professionals resist biodiversity integration due to unfamiliarity.
		Stakeholder engagement	Collaboration with local communities and experts improves biodiversity outcomes.
		Marketing & public perception	Sustainability initiatives enhance brand reputation.
		Idealist ecologist	Potential view differences between ecologists and company goals
	Biodiversity is valued company-wide	CEO/head of department	Leadership actively supports biodiversity.
		Throughout all layers	Biodiversity is prioritized at all levels.
	Biodiversity in new projects	Always gets a spot	Always included in project planning.
		Often gets a spot	Frequently considered, but not always.
		Sometimes gets a spot	Included inconsistently.
	Biodiversity goals	Doing more than required	Exceeds regulatory requirements.
		Doing what regulations ask	Meets but does not exceed regulations.
		Not defined completely	Goals are vague or undefined.
		Defined goals	Goals are properly defined
		Comes out in a year	Biodiversity goals are currently in development.

Biodiversity measuring	Internal/external measuring	Internal measuring	Self-conducted biodiversity assessments by company
		External measuring	Using third-party organizations for assessments.
		Both	Doing both
	Type of measuring	T0 measuring	Baseline measurements
		T1 measuring	Measuring beyond baseline
	Measuring focus	Species	Focussing on Species
		Ecosystem	Focussing on ecosystem
		Genetic	Focussing on genetics
		Combi	All three
	Specific measuring companies	Open for names	Involves specialized biodiversity measurement firms.
	Measuring framework	Open for different framework	Different types of measuring frameworks used by companies to measure biodiversity
	Measuring difficulty	Measuring is easy or difficult	Measuring is easy or difficult

Biodiversity strategies	Internal biodiversity communication	Internal awareness campaigns	Employees are informed about biodiversity.
	In house ecologist	They have an in-house ecologist	They have an in-house ecologist
		They have a whole ecology department	They have a whole ecology department
		no ecologist	They do not have an ecologist and rely on externals
	External biodiversity communication	Public reporting	Biodiversity efforts are shared externally.
	Help of external companies	Partnering with biodiversity consultants	External expertise is used.
		De Vlinderstichting	Dutch NGO to preserve butterflies and insects in general
		Naturalis	Dutch museum and knowledge centre for nature
		Universities	Knowledge centres doing research
		Partnering with NGO	Using different NGOs to gather knowledge or make strategies

	Maintenance company	Biodiversity-conscious maintenance	Maintenance considers biodiversity impacts.
		Maintains their initiatives?	Do they have a strategy for maintaining their initiatives?
	Focus of Initiatives	Species	Initiatives aimed at protecting species.
		Habitat	Habitat restoration and protection.
		Bottom-up focus	Focussing on soil water etc
		Total amount of green	Focussing on area
		Connecting nature areas	Connecting nature areas
	Interesting initiatives	Innovative biodiversity actions	Unique or experimental approaches to conservation.
	Coworking initiatives	Collaborations with other companies	Joint biodiversity projects with partners.
	Basis of initiatives	Own measuring	Initiatives based on their own research
		Outside help	Initiatives based on outside advice
		Pre knowledge	Initiatives based on pre knowledge

Biodiversity Frameworks	Different types of frameworks	UK Framework	UK-specific biodiversity guidelines.
		CSR/CSRD	Corporate sustainability frameworks.
		ESG	Environmental, Social, and Governance principles.
		European frameworks	EU-level biodiversity regulations and policies.
		National frameworks	Country-specific biodiversity frameworks.
	Comments about GBF	GBF is noted but not used	Aware of GBF but does not integrate it.
		GBF is used for definition	Uses GBF to define biodiversity.
		GBF is used for measuring	Uses GBF for biodiversity tracking.
		GBF is used for Strategy	GBF informs biodiversity-related strategies
		Current frameworks are vague	Current frameworks, be it the GBF, European or Dutch. Are vague and not usable in the current state.

Appendix B starting coding structure

Theme	Sub-theme	Code	Description
Biodiversity definition	Defining is conscious/unconscious choice	Defining is conscious	They are aware of biodiversity and define it.
		Defining is not something they pay attention to	Biodiversity is not actively defined in their work.
	Defining through different terms	To be developed from results	
	Defining through 3 elements	Defining through species	Focuses on species diversity.
		Defining through ecosystems	Focuses on ecosystem diversity.
		Defining through genetics	Focuses on genetic diversity.
		Defining through all three	A holistic definition covering all three elements.
	Official definition	Official definition	They have an official definition that can be recited in the interview or found in reports
		No official definition	They do not have an official definition that can be recited in the interview or found in reports
Biodiversity values	Economic values	To be developed from results	
	Ecological values	To be developed from results	
	Cultural & aesthetic values	To be developed from results	
	Biodiversity is valued company-wide	To be developed from results	
	Biodiversity in new projects	To be developed from results	
	Biodiversity goals	To be developed from results	
Biodiversity measuring	Internal/external measuring	Internal measuring	Self-conducted biodiversity assessments by company
		External measuring	Using third-party organizations for assessments.
		Both	Doing both
	Type of measuring	To be developed from results	
	Measuring focus	Species	Focussing on Species
		Ecosystem	Focussing on ecosystem

		Genetic	Focussing on genetics
		Combi	All three
	Specific measuring companies	To be developed from results	
	Measuring framework	To be developed from results	
Biodiversity strategies	In house ecologist	They have an in-house ecologist	They have an in-house ecologist
		They have a whole ecology department	They have a whole ecology department
		They do not have an ecologist and rely on externals	They do not have an ecologist and rely on externals
	Help of external companies	To be developed from results	
	Maintenance company	To be developed from results	
	Focus of Initiatives	To be developed from results	
	Interesting initiatives	To be developed from results	
	Basis of initiatives	Own measuring	Initiatives based on their own research
		Outside help	Initiatives based on outside advice
		Pre knowledge	Initiatives based on pre knowledge
Biodiversity Frameworks	Different types of frameworks	To be developed from results	
	Comments about GBF	GBF is noted but not used	Aware of GBF but does not integrate it.
		GBF is used for definition	Uses GBF to define biodiversity.
		GBF is used for measuring	Uses GBF for biodiversity tracking.
		GBF is used for Strategy	GBF informs biodiversity-related strategies

Appendix C interview form in Dutch

MSc-scriptie "Navigating Biodiversity: The process of defining and utilizing corporate biodiversity efforts."

Onderzoeker: Kjelt Leeflang, master student Sustainable Business & Innovation

Begeleider: Dr. Ilona E. de Hooge.

Onderzoekbeschrijving:

Dit onderzoeksproject onderzoekt hoe bedrijven biodiversiteit begrijpen en integreren in hun activiteiten en hoe deze inspanningen mogelijk in lijn zijn met wereldwijde biodiversiteitsdoelen. Het doel is inzicht te krijgen in het volledige proces van biodiversiteitsintegratie, met de nadruk op de achterliggende processen in plaats van op de effectiviteit ervan. Om deze reden is de uitleg van de thema's vooraf opzettelijk klein gehouden; ik wil echt verkennen wat er op dit moment bekend is.

Structuur:

Het interview volgt een semi-gestructureerd format, duurt maximaal één uur en behandelt thema's met betrekking tot het integratieproces van biodiversiteit in bedrijfspraktijken. De interviews worden online of offline afgenomen, waarbij flexibiliteit en vertrouwelijkheid worden gewaarborgd.

Thema's:

- Definiëren van biodiversiteit
- Waardering (Values) van biodiversiteit
- Gebruik (Meten en strategieën) van biodiversiteit
- Wereldwijde biodiversiteitsdoelen
- Sensemaking (het proces van het begrijpen en interpreteren van complexe situaties om er betekenis en richting aan te geven).

Enkele voorbeeldvragen:

- *Kunt u beschrijven hoe het begrip van biodiversiteit binnen uw bedrijf zich in de loop der tijd heeft ontwikkeld? Welke factoren hebben deze verandering beïnvloed?*
- *Kunt u de algemene aanpak van uw bedrijf ten aanzien van duurzaamheid beschrijven en uitleggen waarom biodiversiteit een cruciaal onderdeel is?*

Gegevensverzameling en gebruik:

- Interviews worden online of offline afgenomen, opgenomen en getranscribeerd met behulp van automatische software.
- Alleen onderzoekers die bij het project betrokken zijn, hebben toegang tot de opnames en transcripties.
- De opnames worden veilig opgeslagen en na het afronden van het onderzoek verwijderd.
- De gegevens en identiteit van deelnemers blijven vertrouwelijk en anoniem.
- Het onderzoek is bedoeld om inzicht te bieden in de processen van biodiversiteitsintegratie zonder enige betrokken partij te schaden.

Bevestiging:

Ik verklaar dat ik voldoende geïnformeerd ben over het onderzoek, vrijwillig deelneem en begrijp dat ik op elk moment mag stoppen zonder gevolgen. Ik geef toestemming voor het gebruik van mijn gegevens zoals beschreven in dit formulier.

Appendix D interview questions in Dutch and English

[Interview starts with personal introductions and a thank you for the interviewee's participation]

Questions in Dutch (English Below)

Algemene eerste vragen

- Kunt u de algemene aanpak van uw bedrijf met betrekking tot duurzaamheid beschrijven en waarom biodiversiteit een belangrijk onderdeel is van dat kader?
- Waarom denkt u dat biodiversiteit relevant is voor de duurzaamheidsdoelstellingen van uw bedrijf?

Biodiversiteit definiëren

- Hoe zou u biodiversiteit omschrijven?
- Heeft uw bedrijf een definitie voor biodiversiteit? Waarom is juist deze definitie gekozen?
- Zouden de meeste mensen binnen het bedrijf biodiversiteit op deze manier omschrijven?
- Kunt u beschrijven hoe het begrip biodiversiteit binnen uw bedrijf in de loop der tijd is geëvolueerd? Welke factoren hebben deze verandering beïnvloed?
- *(Mogelijke subvraag)* Heeft u te maken gehad met conflicten of meningsverschillen binnen het bedrijf over de interpretatie van biodiversiteit?

Bedrijfswaarden

- Integreert uw bedrijf biodiversiteit actief in bedrijfsprocessen en projecten? Zo ja, kunt u voorbeelden geven van waarom wel of niet?
- Op welke onderwerpen richt uw bedrijf zich bij het werken aan biodiversiteit?
- *(Subvraag)* Waarom richt uw bedrijf zich op deze specifieke biodiversiteitsonderwerpen (bijvoorbeeld habitatherstel, soortenbescherming)?
- Zijn er bestaande bedrijfswaarden die biodiversiteitsinitiatieven sturen? Zo ja, waarom worden deze waarden als prioriteit gesteld?

Meten van biodiversiteit

- Kunt u de huidige methoden beschrijven die uw bedrijf heeft ingevoerd om biodiversiteit te meten? Waarom zijn juist deze methoden gekozen?
- *(Subvraag)* Weet u welke specifieke meetinstrumenten of indicatoren worden gebruikt om de impact van uw bedrijf op biodiversiteit te beoordelen? Waarom zijn juist deze methoden gekozen?

- Gebruikt uw bedrijf externe organisaties om biodiversiteit te meten, of worden deze metingen intern uitgevoerd? Waarom is deze aanpak gekozen?
- Hoe zorgt u ervoor dat deze metingen recht doen aan de complexiteit van biodiversiteit?
- Waarom vindt u het belangrijk (of niet belangrijk) dat deze metingen aansluiten bij uw initiële begrip van biodiversiteit?

Afstemming op het Global Biodiversity Framework (GBF)

- Bent u bekend met het Global Biodiversity Framework (GBF)?
- Heeft uw bedrijf het GBF toegepast in de huidige strategieën? Waarom wel of niet?
- Hoe stemt uw bedrijf de biodiversiteitsinspanningen af op het Global Biodiversity Framework (GBF)?
- *(Subvraag)* Hoe nuttig zijn de richtlijnen van het GBF bij het vormgeven van de biodiversiteitsstrategieën van uw bedrijf? Waarom waren deze richtlijnen wel of niet effectief?

Beoordeling van impact

- Hoe beoordeelt uw bedrijf de impact van biodiversiteitsinitiatieven?
- Welke methoden gebruikt u om de effectiviteit van uw strategieën te evalueren?
- Werken jullie met extern groenbeheer voor onderhoud of het beoordelen van impact?

Afsluiting

- Is er nog iets anders dat u wilt delen over de aanpak van uw bedrijf met betrekking tot biodiversiteit dat we nog niet hebben besproken?

Questions in English.

General initial questions

- Can you describe your company's general approach to sustainability and why biodiversity is an important part of that framework?
- Why do you think biodiversity is relevant to your company's sustainability goals?

Defining Biodiversity

- How would you describe biodiversity?
- Does your company have a definition for biodiversity? Why were this specific definition chosen?

- Would most people within the company describe biodiversity in this way?
- Can you describe how the concept of biodiversity has evolved within your company over time? What factors have influenced this change?
- *(Possible follow-up question)* Have you encountered conflicts or disagreements within the company regarding the interpretation of biodiversity?

Company Values

- Does your company actively integrate biodiversity into business processes and projects? If so, can you give examples of why or why not?
- What topics does your company focus on when working on biodiversity?
- *(Follow-up question)* Why does your company focus on these specific biodiversity topics (e.g., habitat restoration, species protection)?
- Are there existing company values that guide biodiversity initiatives? If so, why are these values prioritised?

Measuring Biodiversity

- Can you describe the current methods your company has implemented to measure biodiversity? Why were these methods chosen?
- *(Follow-up question)* Do you know which specific measurement tools or indicators are used to assess your company's impact on biodiversity? Why were these methods chosen?
- Does your company use external organisations to measure biodiversity, or are these measurements conducted internally? Why was this approach chosen?
- How do you ensure that these measurements capture the complexity of biodiversity?
- Why do you think it is (or is not) important that these measurements align with your initial understanding of biodiversity?

Alignment with the Global Biodiversity Framework (GBF)

- Are you familiar with the Global Biodiversity Framework (GBF)?
- Has your company adopted the GBF in its current strategies? Why or why not?
- How does your company align its biodiversity efforts with the Global Biodiversity Framework (GBF)?
- *(Follow-up question)* How useful are the GBF guidelines in shaping your company's biodiversity strategies? Why were these guidelines effective or not?

Impact Assessment

- How does your company assess the impact of biodiversity initiatives?
- What methods do you use to evaluate the effectiveness of your strategies?
- Do you work with external ecological management for maintenance or impact assessment?

Closing

- Is there anything else you would like to share about your company's approach to biodiversity that we haven't discussed yet?